DRAFT

DESIGN ANALYSIS REPORT

TERMINAL 4 PHASE I REMOVAL ACTION

PORT OF PORTLAND, PORTLAND OREGON

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This document has not been reviewed or approved by USEPA and its federal, state and tribal partners and is subject to change in whole or in part

Prepared for

Port of Portland

Portland, Oregon

Prepared by

Anchor Environmental, L.L.C.

6650 SW Redwood Lane, Suite 333

Portland, Oregon 97224

In Association with

NewFields

Ash Creek Associates, Inc.

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µg/kg	micrograms per kilogram
µg/L	micrograms per liter
AAN	American Association of Nurserymen
ACGIH	American Conference of Governmental Industrial Hygienists
AINW	Archaeological Investigations Northwest, Inc.
AMS	Agricultural Marketing Service
Anchor	Anchor Environmental, L.L.C.
ANSI	American National Standards Institute
AOC	Administrative Order on Consent for the Removal Action
ARAR	Applicable or Relevant and Appropriate Requirement
ARCS	Assessment and Remediation of Contaminated Sediments
ASIC	American Society of Irrigation Consultants
ASTM	American Society for Testing and Materials
BA	Biological Assessment
BEBRA	Bank Excavation and Backfill Replacement Area
BMP	best management practice
cc	cubic centimeter
CDF	Confined Disposal Facility
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cfu	colony forming unit
CHASP	construction health and safety plan
CIH	certified industrial hygienist
City	City of Portland
CLP	Contract Laboratory Program
cm	centimeter
CM/GC	construction manager/general contractor
COC	chain-of-custody *or* chemical of concern
COPC	chemical of potential concern
CPR	cardiopulmonary resuscitation
CQAO	Construction Quality Assurance Officer
CQAP	Construction Quality Assurance Plan

CQC	Construction Quality Control
CRZ	contamination-reduction zone
CWA	Clean Water Act
cy	cubic yards
DAR	Design Analysis Report
DDT	dichloro-diphenyl-trichloroethanes
DEET	diethyltoluamide
DEQ	Oregon Department of Environmental Quality
DGPS	differential global positioning system
DO	dissolved oxygen
DOC	depth of contamination
DOT	U.S. Department of Transportation
DQO	data quality objective
DRET	dredging elutriate test
DSL	Department of State Lands
EDD	electronic data deliverable
EE/CA	Engineering Evaluation/Cost Analysis
EM	Engineering Manual
EMS	Emergency Medical Services
EPP	Environmental Protection Plan
EPS	electronic positioning system
ESA	Endangered Species Act
ESPC	erosion, sediment, and pollutant control
EZ	exclusion zone
FC	Field Coordinator
FM	Factory Mutual Engineering Corporation
GPS	global positioning system
H:V	horizontal to vertical
HASP	health and safety plan
HP	horsepower
HSO	health and safety officer
IA	Irrigation Associates

IMRP	Interim Monitoring and Reporting Plan
IRM	International Raw Materials
KHz	kilohertz
KMBT	Kinder Morgan Bulk Terminals
KW	kilowatt
LCS/LCSD	laboratory control sample/laboratory control sample duplicate
LWD	large woody debris
LWG	Lower Willamette Group
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mm	millimeter
MNR	Monitored Natural Recovery
mph	miles per hour
MSDS	Material Safety Data Sheet
MSL	mean sea level
MS/MSD	matrix spike/matrix spike duplicate
NCP	National Contingency Plan
NDE	non-destructive examination
NGVD	National Geodetic Vertical Datum
NIOSH	National Institute for Occupational Safety and Health
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NRMRL	National Risk Management Research Laboratory
NRR	noise reduction rating
NSF	National Sanitation Foundation
NTCRA	Non Time Critical Removal Action
NTU	Nephelometric Turbidity Units
OAR	Oregon Administrative Rules
ODFW	Oregon Department of Fish and Wildlife
ODOT	Oregon Department of Transportation
OERS	Oregon Emergency Response System
OHW	ordinary high water

OLW	ordinary low water
ORS	Oregon Revised Statutes
OSHA	Occupational Safety and Health Administration
OUNC	Oregon Utility Notification Center
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PDM	Precedence Diagram Method
PEC	Probable Effects Concentration
PEL	Permissible Exposure Limit
PFD	personal flotation device
PFRP	Process to Further Reduce Pathogens
Port	Port of Portland
PPE	personal protective equipment
PSEP	Puget Sound Estuary Program
psf	pounds per square foot
PVC	polyvinyl chloride
QAPP	quality assurance project plan
QA/QC	quality assurance/quality control
RAA	Removal Action Area
RACR	Removal Action Completion Report
RAO	Removal Action Objective
RAWP	Removal Action Work Plan
RI/FS	Remedial Investigation/Feasibility Study
RM	river mile
RMSF	Rocky Mountain Spotted Fever
RNA	regulated navigation area
ROD	Record of Decision
RPD	relative percent difference
RPM	revolution per minute
RTI	Reforestation Technologies International
RTK	real time kinematic
SAP	Sampling and Analysis Plan

SIM	selected ion monitoring
SMP	Settlement Monitoring Plan
SM	Standard Method
SOP	standard operating procedure
SOQ	Statement of Qualifications
SOW	Statement of Work
SPSA	Safe Performance Self-Assessment
SQO	Sediment Quality Objective
SVOC	semivolatile organic compound
SZ	support zone
T4	Terminal 4
TAT	turnaround time
TCLP	Toxicity Characteristic Leaching Procedure
TDP	Transportation and Disposal Plan
TEC	Total Effects Concentration
TOC	total organic carbon
TPH	total petroleum hydrocarbons
TSS	total suspended solids
UIC	Underground Injection Control
UL	Underwriters Laboratory
ULSD	ultra low-sulfur diesel
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VCP	Voluntary Cleanup Program
VOC	volatile organic compound
WQMCCP	Water Quality Monitoring and Compliance Conditions Plan
WQMP	Water Quality Monitoring Plan

1 INTRODUCTION

1.1 Background

In 2000, the U.S. Environmental Protection Agency (USEPA) added the Portland Harbor Superfund Site to the National Priorities List. The Port of Portland (Port) is one of 10 potentially responsible parties that entered into an Administrative Order on Consent with USEPA for a Remedial Investigation/Feasibility Study (RI/FS) of the Superfund Site in fall 2001. The Administrative Order on Consent allows Early Actions to be conducted to address known contamination at specific locations within the Superfund Site. Contaminants found in Terminal 4 (T4) sediment samples during a remedial investigation directed by the Oregon Department of Environmental Quality (DEQ) led to a determination that a Removal Action at T4 is warranted. Accordingly, the Port is conducting a Non-Time-Critical Removal Action (NTCRA) under an Administrative Order on Consent for Removal Action (the AOC) executed by the Port and USEPA in October 2003. Figure 1 shows the Removal Action boundary at T4.

The AOC sets forth the general legal requirements that govern the execution of the Early Action. Appendix A to the AOC is the statement of work (SOW) for the implementation of the Removal Action. The SOW provides a list of deliverables, their submittal schedule, and the technical requirements each deliverable has to meet in order to implement the Early Action.

As part of the execution of the Early Action, the Port completed an engineering evaluation and cost analysis (EE/CA; BBL 2005) in which various Removal Action alternatives were identified, compared, and ranked for their relative performance at meeting specific objectives associated with the evaluation criteria of effectiveness, implementability, and cost. Based on the alternatives evaluated in the EE/CA, the USEPA issued an Action Memorandum (Action Memo) on May 11, 2006 (USEPA 2006a) that documented the selection of the Removal Action. The Removal Action documented in the Action Memo included a combination of monitored natural recovery, capping, and dredging with placement of contaminated sediments in a confined disposal facility (CDF) to be built on site.

The Port proceeded down a path to implement the Removal Action, which included several steps (30, 60, and 100 percent design deliverables) in the Remedial Design process. The Port submitted the T4 Early Action 60 Percent Design Submittal in December 2006, and from early 2007 through November 2007, the Port and USEPA teams (note: USEPA's team partners include the Tribes, DEQ, and National Oceanic and Atmospheric Administration [NOAA]) worked collaboratively on resolving technical questions and issues associated with the design.

As part of the collaborative resolution process, it was determined that many of the design issues are linked to the overall harbor-wide RI/FS process. For this reason, the Parties agreed to revise the schedule for implementation of the T4 Removal Action to realign the project with the harbor-wide RI/FS schedule. As a condition of the approval of the schedule realignment, USEPA is requiring the Port to implement an abatement action during the 2008 in-water work window to reduce risks present at the T4 site (USEPA 2007). Essentially, this action results in the division of the Removal Action project into two phases. Phase I (the abatement action) is planned for the 2008 in-water work window and encompasses abatement measures that could be initiated in the near term to reduce risk and address any imminent and substantial endangerment at T4 that may exist. Phase II (including construction of the CDF) will commence once the project is realigned with the harbor-wide RI/FS process. The Port submitted an Abatement Measures Proposal (Phase I remedy) in October 2007 (Anchor 2007a). USEPA provided comments on the proposal in November 2007, and based on those comments and their resolution, a final Phase I Removal Action abatement remedy was identified.

Phase I of the Removal Action includes the following components:

- Dredging and off-site disposal of sediment exhibiting the highest chemical concentration, providing a permanent solution of contaminant mass removal
- Construction of a nearshore cap to isolate petroleum-contaminated sediments from aquatic receptors and control a potential ongoing source to nearby areas
- Stabilization of the Wheeler Bay bank to minimize contaminant migration to the river

- Dredging and off-site disposal of contaminated sediments in Slip 3 at Berth 410 to support water-dependent maritime use in a manner consistent with the Action Memo (USEPA 2006a) and in support of overall risk reduction in the Removal Action Area (RAA)

This Draft Design Analysis Report (DAR) presents the design details for that agreed-to Phase I remedy, which is described further in Section 2.2 and 2.4.

1.2 Organization of this Document

The remainder of this document provides detailed information on the development of the Prefinal Design as follows:

- **Section 2 – Phase I Removal Action Description** describes the setting of the Phase I work, summarizes the Phase I objectives and performance standards, and details the Phase I activities by subarea.
- **Section 3 – Existing Conditions** summarizes the information and data collected within the Phase I Area that will be used as the basis of the design, including physical conditions, hydrogeologic and geotechnical conditions, hydrodynamic characteristics, sediment quality, and site uses.
- **Section 4 – Dredge and Disposal Plan** provides the conceptual dredge plan for Phase I, including the basis for design, design approach, dredge design surface, volumes, equipment selection, and construction quality control.
- **Section 5 – Capping and Shoreline Stabilization Plan** provides the conceptual cap design at the Head of Slip 3, including the basis for design, design approach, source material description, volumes, and equipment selection. The section also provides the Wheeler Bay shoreline stabilization plan, including design, source material descriptions, volumes, and equipment selection.
- **Section 6 – Water Quality** discusses water quality criteria, contaminant mobility testing, and predicted water quality for the different Removal Action elements.
- **Section 7 – Substantive Requirements of Permits** discusses the regulatory requirements that must be achieved during the implementation of the Removal Action.

- **Section 8 – Construction Schedule and Sequencing** describes the duration and order of the Phase I Removal Action construction activities.
- **Section 9 – Access and Easement Requirements** provides access and easement information related to implementation of the Phase I Removal Action.
- **Section 10 – Impact Minimization** discusses measures to minimize impacts to the environment and community.
- **Section 11 – Institutional Controls** details the actions required to maintain capped areas.
- **Section 12 – References** summarizes the references used in the document.

The appendices provide the following information:

- Appendix A – Construction Quality Assurance Plan (CQAP)
- Appendix B – Water Quality Monitoring Plan (WQMP)
- Appendix C – Outline of the Interim Monitoring and Reporting Plan (IMRP)
- Appendix D – Construction Drawings
- Appendix E – Construction Specifications
- Appendix F – Annotated Outline of the Transportation and Disposal Plan (TDP)
- Appendix G – Pre-construction Sampling Data Report
- Appendix H – Removal Action Construction Sampling and Analysis Plan (SAP)
- Appendix I – Removal Action Construction Quality Assurance Project Plan (QAPP)
- Appendix J – Removal Action Construction Health and Safety Plan (HASP)

2 PHASE I REMOVAL ACTION DESCRIPTION

2.1 Phase I Removal Action Area

The Port is a port district of the State of Oregon, which owns the T4 uplands between River Miles (RMs) 4.1 and 4.5 on the Lower Willamette River. The Port acquired T4 from the City of Portland (City) as part of a merger with the City Commission of Public Docks in 1971. The Port also currently owns a portion of the submersible and submerged lands in Slip 1 and Slip 3 located within the RAA (defined below). The remainder of the submersible or submerged land is owned by the State of Oregon and managed by the State of Oregon Department of State Lands (DSL).

The T4 facility itself is within or adjacent to the Portland Harbor Superfund Site. The RAA is defined in the AOC as "that portion of the site adjacent to and within the Port of Portland's Terminal 4 at 11040 North Lombard, Portland, Multnomah County, Oregon, extending west from the ordinary high water line on the northeast bank of the Lower Willamette River to the edge of the navigation channel, and extending south from the downstream end of Berth 414 to the downstream end of Berth 401, including Slip 1, Slip 3, and Wheeler Bay."

A vicinity map and site plan locating T4 is provided on Figure 1.

2.2 Phase I Removal Action Objectives and Activities

After there was agreement on realigning the overall Removal Action and completing a Phase I Removal Action in 2008, the Port and USEPA management teams discussed what specific abatement measures should be scoped in Phase I, and agreed that the measures should address the following objectives:

- Proposed measures should be effective in abating imminent and substantial endangerment posed to aquatic life that may have direct contact with sediments within the RAA
- Proposed measures should be consistent with USEPA's selected Removal Action (i.e., CDF in Slip 1)

- Proposed measures should not unduly impede or disrupt the designated use of T4 for water-dependent maritime use
- Proposed measures should be consistent with sediment management activities that will be required at T4 to continue ongoing water-dependent maritime use (e.g., maintenance dredging)

The abatement measures that meet these criteria and are part of the Phase I project include:

- Removal of material with the highest surface sediment Probable Effects Concentration (PEC) exceedance ratios (greater than 20 times the PEC) in Slip 3 and north of Berth 414. This removal work is referred to as the Berth 411 "Plus" dredging.
- Removal of sediment along Berth 410/411 to eliminate navigational impediments consistent with USEPA's Action Memo (USEPA 2006a). This removal work is referred to as the Berth 410 dredging.
- Placement of a cap at the head of Slip 3 to address petroleum-contaminated sediment.
- Stabilization of the shoreline at Wheeler Bay.

These Phase I abatement measures will meet the objectives by:

- Dredging and off-site disposal of sediments exhibiting the highest surficial chemical concentrations
- Dredging and off-site disposal of contaminated sediments in Slip 3 at Berth 410 to support water-dependent maritime use in a manner consistent with the Action Memo (USEPA 2006a) and in support of overall risk reduction in the RAA.
- Constructing a nearshore cap to isolate petroleum-contaminated sediments from aquatic receptors and control a potential ongoing source to nearby areas
- Stabilizing the bank to minimize contaminant migration to the river

These Phase I abatement measures are shown on Figure 2 and described in detail below. The Head of Slip 3 cap and the Wheeler Bay shoreline stabilization are intended to be the final Removal Action for these areas, consistent with the 2005 USEPA-selected Removal

Action. The dredge areas will be reassessed and addressed as part of Phase II of the Removal Action implementation (i.e., final Removal Action activities).

2.3 Performance Standards

To achieve the Phase I Removal Objectives, performance standards were established as described below. These performance standards were used to guide the design of Phase I Removal Action activities and will be used to guide Phase I Removal Action construction and verification/monitoring activities.

1. Berth 411 "Plus" Dredging – Remove sediments that pose the highest ecological and human health risk. Removal of these highest risk sediments will provide a permanent solution of contaminant mass removal from the river. Specifically, the dredging will meet the following performance standards:
   - Remove contaminated sediments defined as those with surface sediments having a greater than 20 PEC exceedance ratio down to a specified elevation coinciding with PEC exceedance ratios of 10 or less as predetermined by sediment core data. If full removal is not technically feasible, complete partial removal and place a 6-inch sand layer to be determined by quantity measures.
   - Conduct the work consistent with the best management practices (BMPs) listed in the Dredging, Transportation, and Disposal specification (Section 352023; Appendix E) in order to minimize the movement of material with elevated chemical concentrations into unintended areas.
   - Conduct the work consistent with the BMPs listed in the Dredging, Transportation, and Disposal specification (Section 352023; Appendix E), in order to minimize dredging residuals and minimize recontamination of adjacent sediments.
   - Conduct the work consistent with the WQMP (Appendix B) and the Water Quality Compliance Conditions and Monitoring Plan (WQCCMP) in order to minimize water quality impacts outside the compliance boundary.
2. Berth 410 Dredging – Remove sediment to a depth necessary to maintain navigable water depths for deep draft vessels that call at the Slip 3 berths consistent with the

Port's statutory authorization and USEPA's Action Memo (USEPA 2006a). Specifically, the dredging will meet the following performance standards:

- Remove sediment to depths that allow vessels to safely access berthing areas in Slip 3.
- Conduct the work consistent with the BMPs listed in the Dredging, Transportation, and Disposal specification (Section 352023; Appendix E), in order to minimize the impacts to surrounding sediments and the "leave" surface of the dredge area.
- Conduct the work consistent with the WQMP (Appendix B) and the WQCCMP in order to minimize water quality impacts outside the compliance boundary.

3. Head of Slip 3 Capping – Isolate the surface sediments containing elevated contaminant concentrations from benthic communities and the aquatic environment by addressing appropriate long-term erosive, as well as contaminant transport, mechanisms. The cap will be designed to conform to USEPA and the U.S. Army Corps of Engineers (USACE) capping guidance documents, including *Assessment and Remediation of Contaminated Sediments (ARCS) Program Guidance for In Situ Subaqueous Capping of Contaminated Sediments* (Palermo et al. 1998). Specifically, the cap shall meet the following performance standards:

- Design the chemical isolation layer, where necessary, to contain sheens exiting from the shoreline.
- Design the armor layer of the cap to resist bed shear velocities induced by the largest of 100-year flood flow, 100-year waves, vessel-induced waves from typical passing vessels, and anticipated propeller wash from vessels that operate in the area.
- Use import cap material that meets defined chemical goals (presented in Table 4).
- Conduct the work consistent with the BMPs listed in the Capping specification (Section 352025; Appendix E), in order to minimize mixing of cap material with underlying contaminated sediments.
- Conduct the work consistent with the WQMP (Appendix B) and the WQCCMP, in order to minimize water quality impacts outside the compliance boundary.

4. Wheeler Bay Shoreline Stabilization – Stabilize targeted shoreline areas to address appropriate long-term erosive mechanisms.
   - To the extent feasible, regrade banks to slopes that are naturally stable.
   - For areas where armoring is necessary, design the armor layer to resist bed shear velocities induced by the largest of 100-year flood flow, 100-year waves, vessel-induced waves from typical passing vessels, and anticipated propeller wash from vessels that operate in the area.
   - Use import material for fill and grading that meets defined chemical goals (presented in Table 4).
   - Conduct the work consistent with the WQMP (Appendix B) and the WQCCMP in order to minimize water quality impacts outside the compliance boundary

2.4 Site-specific Sediment Quality Objectives

Site-specific sediment quality objectives (SQOs) are typically developed to guide the delineation and design of dredging, capping, and Monitored Natural Recovery (MNR) areas. Because SQOs have not yet been finalized for the Portland Harbor Superfund Site, the following approaches will be utilized:

1. Berth 411 "Plus" Dredging – A PEC factor has been used to define the dredge prism for Phase I. To abate imminent and substantial endangerment, surface sediments with PEC exceedance ratios greater than 20 times the PEC level are targeted for Berth 411 "plus" action. Addressing these sediments will include a permanent solution of contaminant mass removal for those sediments that are dredged. Remaining sediments will be addressed during Phase II of the Removal Action implementation.
2. Berth 410 Dredging – Although the Berth 410 dredge area does not have surface sediments with PEC exceedance ratios as high as 20 times the PEC level, this area was identified for dredging as part of Phase I of the Removal Action because a majority of the area is within the footprint identified for dredging by USEPA in the Action Memo (USEPA 2006a) as part of the Removal Action (previously anticipated to occur in 2008). In addition, dredging is necessary in 2008 to maintain navigable

water depths for deep-draft cargo vessels that call at these berths. The Berth 410 dredge area encompasses a prism of sediments that are elevated in concentration and will be permanently removed from Slip 3, and will, therefore, not have an opportunity to redistribute in the future.

3. Head of Slip 3 Capping – Surface sediments containing elevated contaminant concentrations will be isolated from benthic communities and the aquatic environment by addressing appropriate long-term erosive, as well as contaminant transport, mechanisms.
4. Wheeler Bay Shoreline Stabilization – Not applicable.

2.5 Area-specific Activities

2.5.1 Slip 3 – Combination of Dredging and Capping at Head of Slip

The Phase I Removal Action in Slip 3 consists of a combination of dredging, placing a sand layer, and capping. A portion of the area in Slip 3 will be dredged as shown on Figure 2. The area at the head of Slip 3 and in front of the existing pinch pile bulkhead will be capped. The activities of the Phase I work will be coordinated with the operations of Kinder Morgan, the Port's Slip 3 tenant. Dredged sediments from Slip 3 will be taken to an upland landfill.

2.5.2 North of Berth 414 – Dredging

In this subarea, high polycyclic aromatic hydrocarbon (PAH) concentrations were reported in two historical samples; the Port collected additional data in July 2006 to determine if elevated PAH concentrations are present and to what extent. The results in this area confirm the presence of elevated PAH concentrations; therefore, dredging will be used to address sediments in this subarea.

2.5.3 Wheeler Bay – Shoreline Stabilization

As part of the RI/FS and Source Control Measure Voluntary Cleanup Program (VCP) Agreements between DEQ and the Port, the river bank area was identified as requiring a

source control measure for stabilization. The Wheeler Bay shoreline will be graded to a more stable configuration and stabilized with surface erosion control measures.

3 EXISTING CONDITIONS

Existing conditions within the RAA were used to inform the Phase I Removal Action design. The primary information describing the existing conditions is the data collected as part of the Terminal 4 Early Action EE/CA (BBL 2005) as summarized in the Terminal 4 Characterization Report (BBL 2004a), supplemented with additional pre-construction data (see Section 3.6). This information includes data on physical, hydrodynamic, wind, and geotechnical conditions of the RAA; sediment quality; and other Removal Action design considerations, such as site use and source control. This information on existing site conditions, along with how the site is currently used by the Port and its tenants, are important considerations that were factored into the Phase I Removal Action design. Source control information is important to ensure that the contaminants addressed during the Removal Action activities are not re-introduced to the RAA.

The remainder of this section describes the physical site characteristics, hydrodynamic characteristics, wind conditions, geotechnical conditions, sediment quality, and additional site information that are available for the RAA and how they were used in the design process.

3.1 Physical Site Characteristics

Information on the physical conditions that were used to inform the Phase I Removal Action design include T4 physical characteristics.

The T4 physical site characteristics and subarea characteristics were used to generally inform the dredging, stabilization, and capping design process. The RAA encompasses roughly 38 acres, of which Slip 1, Slip 3, and Wheeler Bay make up about 28 acres, while the area from the mouths of the slips to the Harbor Line encompasses approximately 10 acres.

3.1.1 Terminal 4 Uplands

Boundaries of the Slip 1 and Slip 3 uplands, which are within T4 but are not included in the RAA, are shown on the RAA site plan on Figure 3. These uplands are about 283 acres in area (Port of Portland 2002), including the Toyota lease areas, and are generally

flat in grade in proximity to the slips. The surface covering is primarily asphalt, with minor areas of gravel and/or ballast associated with the rail lines.

The elevation of T4 generally ranges from 30 to 35 feet mean sea level (MSL) in proximity to the slips (see Figure 3). The river stage (i.e., elevation) is typically between 3.7 and 11.7 feet National Geodetic Vertical Datum (NGVD; also MSL), with the exception of peaks in river stage. This range is generally based on information from the Morrison bridge gage. The diurnal tidal range in the St. Johns area is 2.2 feet at low river stages and becomes progressively less with higher river stages (NOAA 2003b). East of T4, the topography is slightly sloping, but somewhat variable. The most notable nearby variation is a gradual rise in the ground surface to an elliptical hill feature that is about 50 feet MSL. Southeast of T4, the ground surface rises at a 5 horizontal to 1 vertical (5H:1V) slope, or shallower, to an elevation of about 100 feet MSL, corresponding to the St. Johns area of Portland. To the west of T4 and immediately west of the Willamette River channel are the Tualatin Mountains (Portland Hills), with elevation rising relatively steeply at about 1.5H:1V to 3.5H:1V to an elevation of about 1,000 feet MSL.

3.1.2 Wheeler Bay Physical Characteristics

Wheeler Bay is the small bay (approximately 3 acres) between Slip 1 and Slip 3. Wheeler Bay was originally to become Slip 2, but Slip 2 was never completed. Wheeler Bay is immediately adjacent to Slip 3, separated by Pier 4.

The embankment slopes above the shoreline at Wheeler Bay are relatively steep (2H:1V or steeper), with miscellaneous debris or armoring. Above the mean higher shoreline, the embankment area is littered with driftwood debris such as tree stumps, logs, and scattered plant matter.

The submerged slopes are very shallow, with mudline elevations generally ranging from -4.3 feet to -13.3 feet NGVD within the bay, then increasing in slope below Pier 4 to Slip 3 and toward the river.

Remnants from a partially demolished timber pile-supported structure span the relatively shallow embankment slope and remaining timber piles in the bay. Several single timber piles associated with this former structure are present. The only current structure at Wheeler Bay is Pier 4, which separates the bay from Slip 3.

3.1.3 Slip 3 Physical Characteristics

Slip 3 is the southern and smaller (approximately 12-acre) slip in the RAA, and is very actively used for Kinder Morgan Bulk Terminals (KMBT) soda ash export.

The mudline elevation ranges from about -34.3 feet to -48.3 feet NGVD (see Figure 3). The shallower depths occur at the head of the slip. Maintenance dredging of Berths 410 and 411 is performed relatively frequently, and the water depth is from -38.3 feet to -43.3 feet NGVD adjacent to the pier in Slip 3. The deeper portion of the slip (to -48.3 feet NGVD) consists of a trough that extends from the east side of Pier 4 to the mouth of the slip at its center. This trough appears to be related to erosion caused by the movement of ships out of berth as part of the KMBT operations. The active berthing areas for KMBT are Berths 410 and 411, which are on the north side of Slip 3. The trough widens and deepens near the mouth of the slip.

Under-pier slopes range from about 1.5H:1V to 2.5H:1V or flatter (Port of Portland, 2002). The bathymetry includes the submerged slope at the mouth of the slip, which is about 5H:1V to the deeper channel of the Willamette River.

Embankment slopes above the shoreline and the general locations of slope protection are similar to Slip 1, with the exception that slopes on the south side of Slip 3 (north of the Toyota facility) are generally flat and have less elevation between the shoreline and upland properties. The embankment slope on the south side of Slip 3 has remnant concrete columns from a former pier structure.

On the north side of Slip 3 at Berths 410 and Berth 411, a large pier structure, presently used extensively by KMBT, extends to the Harbor Line and visually separates the slip from Wheeler Bay. The structure is similar to the previously described piers, except that the structure foundation apparently included pre-stressed concrete, steel, and timber piles. A large crane is present on the deck of the pier. The remnant of a former pier with construction similar to the piers previously described occurs on the south side of Slip 3; all the above-water portions of the pier have been demolished and the timber piles remain in place, partially visible.

3.2 Hydrodynamic Characteristics

This section summarizes the hydrodynamic characteristics of T4. These characteristics will be used for sizing armor material on the cap surfaces to prevent erosion and for evaluating potential water quality impacts during dredging. The hydrodynamic characteristics of the RAA were summarized by BBL (2004b) as follows.

- Hydrodynamics within Slips 1 and 3 are affected by variations in river flow, river stage, ship-induced currents, and, to a lesser extent, localized currents from stormwater discharges. In general, given the orientation of the slips relative to the river, river-induced currents in the slips are low in velocity compared to the river velocity.
- Although river-induced currents have an influence on hydraulics of the RAA, current velocities in a majority of the RAA are dominated by propeller-induced currents.
- Propeller-induced currents cause circulation and increased velocities and turbidity levels that extend beyond the paths that ships take in Slip 3.
- Propeller-induced currents influence hydrodynamics and sediment transport in the RAA.
- Ongoing river-induced sedimentation of suspended sediments occurs nearly continuously throughout the RAA. The periodic redistribution of this material affects long-term sediment accumulation patterns within the slips.

- The data gathered during the field program are representative of low-flow, low-rainfall conditions; additional data are needed to support characterization of hydraulics and sedimentation in the slips under high-flow, high-rainfall conditions.

Appendices K and L of the T4 Early Action 60 percent DAR (Anchor 2006) provide more information on hydrodynamics.

3.3 Wind Conditions

Wind data were obtained for the Portland International Airport from the National Climatic Data Center (1976 to 2004) and the Meteorological Resource Center (Webmet.com; 1961 to 1975). Appendix L of the T4 Early Action 60 percent DAR (Anchor 2006) provides more information on wind data, which was used to determine the appropriate size of material to use as armor for the cap areas and the berm face.

3.4 Geotechnical Conditions in Dredge and Cap Areas

Geotechnical information that was used for various components of the design is summarized below. In general, this information was used for dredgeability assessment in the different dredge areas, for assessing cap stability in shoreline areas, and for assessing stability of shoreline structures near to which dredging and/or capping will occur.

Existing geotechnical conditions of the dredge and cap areas are important to understand during the design process for dredgeability and cap stability. Geotechnical data in these areas were provided by performing laboratory tests on samples from the in-water borings/cores and field tests including pocket penetrometer tests, torvane tests, and standard penetration resistance.

Results of the laboratory tests show that the recently deposited sediments overlying the grey, loose to medium dense sands consist predominantly of very soft organic silt and clay with liquid limits ranging from about 70 percent to nearly 100 percent and moisture contents ranging from 67 percent to 106 percent. The fines content of these sediments

generally ranges from 51 percent to 96 percent, with average fines content ranging from 75 percent to 85 percent.

Based on consolidation and plasticity results, as well as on testing conducted in the field (including pocket penetrometer tests, torvane tests, and standard penetration resistance), it is expected that these soils are normally consolidated and have very low undrained shear strengths. The undrained strength of the very soft sediments is estimated to be on the order of about 20 to 140 pounds per square foot (psf). The material to be dredged in Slip 3 consists of very soft to soft, slightly sandy to sandy organic silt and clay. Areas of higher density sediment may be encountered during dredging. The sediment to be dredged at Berth 414 consists of very soft to soft, clayey, fine sandy silt with occasional wood chunks. In addition, debris is anticipated to be encountered during the dredging.

3.5 Sediment Quality in Slip 3 Dredging Areas

Sediment quality information, including sediment chemistry data in the EE/CA database supplemented with additional pre-construction data, was used to guide the design of the Phase I Removal Action. Specifically, sediment quality data was used to determine the extent of dredge areas.

To determine the appropriate data to include in the database, a data quality review of the existing sediment chemistry data has been completed. The review was conducted to determine whether the data were classified as Category 1 or Category 2 data according to the data quality criteria defined in the Portland Harbor RI/FS (Lower Willamette Group 2003, currently in revision based on USEPA comments). Only Category 1 data (highest quality) were selected for use in the design of the T4 Phase I Removal Action. (Note that for the Portland Harbor RI/FS, USEPA allows only Category 1, QA2 data [most rigorous validation criteria] to be used in risk assessments.) Category 1, QA1 data were considered adequate for use for the design of the T4 Phase I Removal Action. In addition to the data quality review, information related to maintenance dredging activities was considered

when identifying the appropriate data to use. As a result, any sediment chemistry data for surfaces that were dredged and are no longer present at T4 were removed from the dataset.

A more detailed description of existing sediment chemistry that is used in the design of the Phase I Removal Action is provided in the following sections.

3.5.1 Existing Sediment Chemistry Data

A number of sources of existing sediment chemistry data for T4 are available from historical investigations of sediment contamination. The Port has been investigating the nature and extent of sediment contamination at T4 since before 1988. Other organizations, including USACE, USEPA, and DEQ, have investigated the nature and extent of sediment contamination in the Willamette River and have collected sediment samples in the vicinity of T4 as part of their investigations (BBL 2004a). Most recently, sediment chemistry data were collected as part of the T4 Early Action design.

The primary source of sediment chemistry data that was used for the design of the Phase I Removal Action is the data collected as part of the Terminal 4 Early Action EE/CA (BBL 2005). Other historical reports containing data with acceptable quality assurance and documentation (Category 1 data) that was considered include:

- USEPA Portland Harbor Sediment Investigation Report (Weston 1998)
- Remedial Investigation Report, Terminal 4, Slip 3 Sediments (Hart Crowser 2000)
- Willamette River Channel Maintenance Characterization Study (USACE 1999)

Based on a review of the existing data, Table 2 presents the constituents of concern (COCs) at Slip 3 that exhibited exceedances of PEC values in the EE/CA or in prior investigations. These COCs are listed in Table 2 along with their maximum PEC exceedance ratios (i.e., maximum concentration divided by PEC value). PEC values and actual concentrations for various areas are provided on figures referenced in the dredge and cap sections.

These identified COCs were used to guide the design of the Phase I Removal Action in terms of identifying the target areas for dredging as well as which parameters to model for contaminant transport evaluations.

3.5.2 Additional Pre-construction Data

Additional pre-construction samples were collected in the RAA in December 2007. As described in the sampling and analysis plan for Phase I sediment quality (Anchor 2007b), the objectives of the pre-construction sampling event included chemical analysis of 11 core locations in Slip 3 and north of Berth 414 to further define the extent of Phase I removal.

The results are presented in the Pre-construction Sampling Data Report, which is provided as Appendix G. The non-validated results will be incorporated into the existing sediment quality dataset for use in the design of the Phase I Removal Action.

3.5.3 Sediment Quality Data Used for Dredge Design

Table 3 presents the sediment quality data used to develop the dredge design. The data are a combination of existing sediment chemistry data as well as the recently collected new data.

3.6 Additional Site Information

This section addresses other site considerations that were important in guiding the design process.

3.6.1 Site Uses

The history of the T4 area and historical tenant operations are described in detail in the EE/CA Work Plan (BBL 2004b) and in Appendix A of the EE/CA (BBL 2005). Appendix A of the EE/CA provides a chronology of facility development between 1906 and 1999, a chronology of dredging and filling activity between 1917 and 2003, and a detailed description of T4 operations beginning in 1917.

Current tenants at T4 adjacent to the RAA are Cereal Food Processors, International Raw Materials (IRM), Rogers Terminal, and KMBT. Adjacent property owners include Schnitzer Steel Industries, Northwest Pipe and Casing, and Burgard Industrial Park (housing both Boydstun Metal Works and Western Machine Works), all of which are under VCP Agreements with the DEQ for remedial investigation of those properties. Toyota leases land from the Port on the southern portion of the T4 facility adjacent to Berth 414.

At this time, three active waterfront tenant operations occur at T4:

- **IRM –** Currently, IRM imports liquid bulk materials at Berth 408. Both barges and ships call on the berth. Vessel calls are very infrequent, typically less than once per month.
- **KMBT (Berths 410/411) –** KMBT exports soda ash from the Berth 410/411 facility. The facility has a fixed loader, so ships are brought in and line-towed during loading. Ships are typically loaded over a 2- to 3-day period. Ships call on the facility approximately eight times per month. The current lease provides the Port the option, with certain conditions, to schedule a shutdown of KMBT's operations at Slip 3 with a maximum duration of 10 consecutive days per year to facilitate necessary maintenance. Additional time required to complete the dredging would have to be negotiated with KMBT.
- **Toyota –** Berth 414 is currently used to offload automobiles. Toyota's shipping activities are not anticipated to impact the currently planned Removal Action.

It is important to consider site uses during the design process to ensure that Phase I Removal Action activities will not be compromised by day-to-day activities occurring at the site.

3.6.2 Typical Vessels that Call at Terminal 4

Local pilots were contacted to determine typical operational conditions at T4. Commercial vessels that call on Berth 410/411 in Slip 3 are "Panamax" size, deep-draft Bulk Carrier ships. These vessels are assisted in and out of port by large privately-owned tractor tugs. In addition to maneuvering within Slip 3, the tugs may also operate in Wheeler Bay and Berth 414 while on standby. Appendix L of the 60 Percent Early Action DAR (Anchor 2006) provides more information on vessels that call on the site and their characteristics. This information was used in the propwash analysis conducted as part of the Head of Slip 3 cap design to determine the required thickness of the chemical isolation layer and the material size for the armor layer.

3.6.3 Source Control

This section describes historic and/or ongoing sources at the RAA and how they are being addressed as part of the Phase I and II Removal Actions. Sources that are directly addressed by the Phase I and II Removal Actions include the following:

- **Resuspension of Slip 3 sediments –** The higher risk Slip 3 sediments will be dredged and disposed in a landfill as part of the Phase I Removal Action. The remaining contaminated Slip 3 sediments will be dredged and disposed as part of the Phase II Removal Action
- **Resuspension of Slip 1 sediments –** Slip 1 sediments will be confined as part of the Phase II Removal Action.
- **Resuspension of Wheeler Bay, Berth 411 underpier, Slip 3 sideslopes, and Berth 401 sediments.** Sediments within these areas will be confined below an isolation cap as part of the Phase II Removal Action.
- **River bank erosion along the Wheeler Bay shoreline –** Shoreline stabilization will be conducted as part of the Phase I Removal Action.
- **Diesel seep at head of Slip 3 –** Historic diesel seep located at the head of Slip 3 has been remediated as part of the Bank Excavation and Backfill Replacement Area (BEBRA; Hart Crowser 2000). In addition, a cap at the Head of Slip 3 will be amended with organoclay to limit transport mechanisms from the impacted sediments below the BEBRA action (outside the BEBRA Record of Decision

[ROD] boundary) as part of the Phase I Removal Action. The original BEBRA action did not go below the water line at the time of construction. As part of the Phase I Removal Action, the extent of the organoclay-amended fill layer will be enlarged.

- **Stormwater Outfalls –** Stormwater system improvements were implemented in conjunction with the railroad realignment project on the south side of Slip 1. A stormwater characterization program is currently being implemented at T4 to assess whether stormwater outfalls could provide a source of recontamination. The characterization program is anticipated to be completed by May 2008. Recontamination of the Phase I RAA is not anticipated. Two outfalls discharge near the Phase I RAA: one located in the southern portion of Wheeler Bay (referred to as Basin L) and one is located in the northeast corner of Slip 3 (referred to as Basin K). The outfall for Basin L discharges to an elevation that is below the Phase I RAA (see Drawing C-7). Therefore, discharges from this outfall will not reach the Phase I RAA, and recontamination is unlikely. Basin K primarily drains the roof of the warehouse at Slip 3; only a limited area of ground surface (approximately 1-1/2 acres) drains to this outfall. The limited drainage from this outfall is unlikely to provide a recontamination source to the Phase I RAA. However, discharges from both basins (as well as the other outfalls at T4) are being evaluated as a part of the stormwater characterization program, and Phase II will address the area that may be impacted in the interim. If the potential for recontamination is identified, appropriate management practices will be implemented for Phase II.
- **Potential Upstream Sources –** The following potential upstream sources are being evaluated as part of the recontamination analysis. The recontamination analysis will be completed before implementation of Phase II.
  - Resuspended sediment from other upstream contaminated sites
  - Municipal and private stormwater discharges
  - Point-source industrial discharges (both permitted and illicit)
  - Nonpoint source discharges (e.g., agricultural runoff)
  - Overwater activities (e.g., material handling, fueling, vessel traffic, etc.)

4 DREDGE AND DISPOSAL PLAN

4.1 General Dredging Approach

Dredging is the physical removal of sediments from a specific area of concern. As part of the Phase I Removal Action, dredging is required in isolated areas of Slip 3 and north of Berth 414 (see Figure 2). There are two unique dredge plans as part of the Phase I Removal Action:

- Berth 411 "Plus" – Three areas which are immediately adjacent to Berth 411, adjacent to Pier 5, and north of Berth 414. Dredge elevations in this area are controlled by the chemistry data.
- Berth 410 – An area adjacent to Berth 410, which is being removed for navigational purposes down to an elevation of between -39.3 to -41.3 feet NGVD.

Dredged sediment will be disposed at an approved Subtitle D landfill.

4.2 Berth 411 "Plus" Area

4.2.1 Basis of Design

The basis of the dredge design relates to dredging performance standards and design objectives and criteria. As described below, these elements were used to guide the development of the dredge plan.

4.2.1.1 Performance Standards

The following performance standards are established to guide the design of Phase I:

- Remove the highest risk sediments defined as those with surface sediments having a greater than 20 PEC exceedance ratio down to a specified elevation coinciding with PEC exceedance ratios of 10 or less as predetermined by sediment core data. If full removal is not technically feasible, complete partial removal and place a 6-inch sand layer to be determined by quantity measures.
- Conduct the work consistent with the BMPs listed in the Dredging, Transportation, and Disposal specification (Section 352023; Appendix E), in

order to minimize the movement of material with elevated chemical concentrations into unintended areas.

- Conduct the work consistent with the BMPs listed in the Dredging, Transportation, and Disposal specification (Section 352023; Appendix E), in order to minimize dredging residuals and minimize recontamination of adjacent sediments.
- Conduct the work consistent with the WQMP (Appendix B) and the WQCCMP, in order to minimize water quality impacts outside the compliance boundary.

Additionally, the design must consider and avoid the potential for the future Phase II Removal Action work to compromise the integrity of this remedial measure once constructed.

4.2.1.2 Design Objectives and Criteria

The following design objectives and related criteria were used to develop the dredge prisms:

- **Remove sediments with surface chemical concentrations above 20 PEC down to a concentration of 10 PEC.** Figure 4 presents the exceedance ratio of the surface PEC within the RAA. The abatement measure will focus on the highest risk surface sediments, removing surface materials with PEC exceedance ratios greater than 20. Figure 4 shows the dredge boundaries within Slip 3 and the area North of Berth 414. These target footprints will be removed down to predetermined dredge elevations established using existing and proposed cores located within the footprints. The dredge elevations will be established to remove materials with a PEC exceedance ratio greater than 10 within the dredge boundaries shown on Figure 4. Figure 5 also shows the sediment characterization sample station locations in the Phase I dredge areas that were used for the design of the dredge prism.
- **Utilize dredging BMPs to minimize residuals and recontamination.** The Construction Specifications (Appendix E) present BMPs that the Contractor

will need to implement to control the potential spread of contaminated sediment during the dredging event.

- **Minimize water quality impacts outside of the compliance boundary.** The need to meet water quality chemistry and turbidity or TSS standards factored into the selection of dredging methods. Water quality monitoring activities and criteria for dredging are described in detail in the WQMP (Appendix B). The removal of material in Slip 3 and Berth 414 must meet, to the extent practicable, the water quality criteria defined in the WQMP and the USEPA-issued Water Quality Compliance Conditions and Monitoring Plan (WQCCMP). The final USEPA-issued WQMCCP will take precedence if an inconsistency is found between the WQMP and the final USEPA-issued WQCCMP in the future.

4.2.1.3 Additional Considerations

Additional considerations that helped guide the development of the dredge plan include the following:

- Physical characteristics of the site, including dredging in 20- to greater than 50-foot water depths and the presence of waterfront structures (e.g., piers, sheetpile wall)
- The need to minimize disruption to the Port's tenant operations in Slip 3
- Dredged material will be disposed of in an upland landfill; therefore, the dredging technology to be used for Phase I is the most practical for upland disposal

The remainder of this section describes the detailed development of the dredge prism.

4.2.2 Dredge Design

Based on the information provided above, the dredge prism was developed using the following process:

1. Identify the predetermined depth of contamination (DOC; i.e., depth of sediments exceeding 10 times the PEC) in all sediment core samples within the Berth 411 "Plus" footprint.
2. Develop the Neatline Dredge Prism. Bound the contaminant distribution using a constructible mosaic of rectilinear dredging units with constant elevation or constant slope. The engineering design process must also incorporate allowances for stable slope requirements, waterfront structures, utilities, obstructions, navigation requirements, and other constraints.
3. In consideration of the dredging equipment best suited for the Phase I RAA conditions, as well as the depth and extent of removal, determine an appropriate overdredging allowance.
4. Develop a CQAP to minimize the potential for short-term water quality effects during construction and to verify that the target elevations have been effectively reached.

These steps are described in more detail below.

4.2.2.1 Determination of Dredge Surface—Depth of Contamination Surface

As discussed previously, the lateral boundaries of the Slip 3 and North of Berth 414 dredge prism were developed by determining the extent of surface sediments exceeding 20 times the PEC ratio. This boundary was predetermined based on a core-by-core analysis of PEC exceedances. Figure 4 determines the lateral extents of the dredge prism.

The depth and elevation of dredging within the Slip 3 and North of Berth 414 dredge prism have been predetermined based on a core-by-core analysis of PEC exceedances. The DOC has been predetermined for each core location using compaction-corrected sampling intervals and chemical analytical results. Table 3 presents the DOC elevations for less than 1, 10, and 20 times PEC for the cores located within the Berth 411 "Plus" boundary.

4.2.2.2 Neatline Dredge Prism—Engineering Considerations

Using the data in Table 3, the dredge design surface was sectioned into dredging units with constant dredging elevations based on engineering constraints. The dredge prism within each unit was set at or below the deepest point of contamination within a given area based on cores within that unit. The sizing and orientation of the units were established based on anticipated dredging approaches:

- The units were oriented parallel to the Berth 410/411 pier. Dredging will progress in the longest direction for efficiency—either from the mouth of the slip towards the head or vice versa.
- The width of the units ranges from 25 to 75 feet. All of the dredging will be completed with mechanical equipment, which is commonly 50-feet wide. Therefore, the units were set at multiples of 25 feet in width for ease of dredging.
- The length of the units was longer than 50 feet (i.e., nothing shorter than a 50-foot run). The longer the unit, the more efficient the dredge can work. However, the compromise is that more material will need to be removed.

As is typical with developing a dredge plan, there is a balance between creating an efficient dredge prism and limiting the amount of non-impacted sediment that is removed. Therefore, the neatline dredge prism includes removal of various amounts of sediment that do not exceed the PEC to ensure complete removal of the target sediment.

Finally, an allowable overdepth thickness of 12 inches will be given based on dredging equipment tolerances and other constructability considerations. Figure 5 presents the Berth 411 "Plus" dredge plan for Slip 3 and Berth 414. The plan considers the elements discussed earlier in this section as well as the engineering considerations discussed in the following section.

4.2.2.2.1 Slope Stability and Oversteepening

There are a number of areas within Slip 3 that present a potential for slope instability if the impacted sediments are fully removed. These areas are at the southeast corner of Slip 3 where the steel sheetpile wall stops and only the timber bulkhead remains and along Pier 5 (Berth 412) where only a timber bulkhead remains at the toe. In these two areas the timber bulkhead at the toe of the slope support cuts in areas. Geotechnical and structural evaluations indicate that if material were removed in front of the old bulkhead, the slope would become unstable. As presented in the T4 Early Action 60 percent Design submittal, both of these areas will be capped as part of the Phase II Removal Action. Therefore, Phase I dredging will not extend into these areas because of stability concerns.

Another area of concern is at the Head of Slip 3 in the northwest corner. This area (as shown in Figure 6) has a riprap slope extending down from the existing sheetpile bulkhead. Based on explorations, the riprap extends from the sheetpile wall down to an elevation of -30 to -35 feet NGVD. As seen in Figure 6, the dredging plan does not undermine the slope in this area in order to preserve stability of the slope and wall. Section 4.2.2.4 describes the sand layer that will be placed over these areas within the dredge prism that will not have complete removal.

4.2.2.2.2 Impacts to Waterfront Structures

Figure 3 shows the location of the steel sheetpile wall along Berths 410/411. An evaluation of the sheetpile wall given the structural properties of the wall and the geotechnical properties of the surrounding soils was completed as part of the 60 Percent Early Action design. There is a limiting dredge elevation in front of the wall beyond which dredging deeper than this elevation causes unacceptable wall movement and potential damage to Berth 410/411. Evaluations indicate that these elevations vary by condition and are:

- **Short-term –** This condition occurs before the Berth 411 cap is placed behind the wall. This limiting dredge elevation is -52 feet NGVD.

- **Long-term –** This condition represents conditions after the RAA is implemented (considering cap surcharge and seismic loading). This limiting dredge elevation is -46 feet NGVD.

Examination of the dredge elevations presented on Figures 5 and 6 indicates that the dredge plan should be able to be dredged as designed without impacting the sheetpile wall.

4.2.2.3 Overdredge Allowance

Depth control with dredging equipment has certain tolerances. To improve the reliability of achieving the design depths, an overdredge allowance is commonly given to the Contractor. The Contractor is paid for this allowance, but not for material removed below this allowance. For the Berth 411 "Plus" dredging, the overdredge allowance will be 12 inches.

4.2.2.4 Addressing Areas of Partial Removal

As seen on Figure 5 and discussed in Section 4.2.2.2, a portion of the dredge footprint will not have full removal down to a PEC exceedance ratio of 10 due to the concern over slope stability and waterfront structures. After dredging is completed, these select areas will have a sand layer placed. The area of partial removal is 13,300 square feet (sf). Six inches of the sand layer would equate to 400 tons of sand (assuming 1.65 tons per cubic yard for the sand). To ensure adequate coverage, the Contractor will be required to place 600 tons (roughly 50 percent above the 6-inch target).

The Construction Specifications (Appendix E) require the Contractor to place the 600 tons evenly over the 13,300 sf target area. The contractor will be required to develop a plan for Port and USEPA review on how they will monitor and confirm that they are placing 1 ton per 22 square feet. The Construction Specifications (Appendix E) require the Contractor to place the material from the slope toe upward, and in a manner to minimize mixing with underlying sediments. The sand material will be a

gravelly sand to sandy gravel—this gradation will allow the material to be more stable on the 3H:1V slope.

4.2.2.5 Volumes

The volume of dredged material from the Berth 411 "Plus" area is about 5,200 cubic yards (cy) without overdredge, to about 7,300 cy including overdredge.

4.3 Berth 410

4.3.1 Basis of Design

The basis of the dredge design relates to dredging performance standards and design objectives and criteria. As described below, these elements were used to guide the development of the dredge plan.

4.3.1.1 Performance Standards

The following performance standards are established to guide the design of the Berth 410 dredge prism:

- Remove sediment to depths that allow vessels to safely access berthing areas in Slip 3.
- Conduct the work consistent with the BMPs listed in the Dredging, Transportation, and Disposal specification (Section 352023; Appendix E), in order to minimize the impacts to surrounding sediments and the "leave" surface of the dredge area.
- Conduct the work consistent with the WQMP (Appendix B) and the WQCCMP, in order to minimize water quality impacts outside the compliance boundary.

Additionally, the design must consider and avoid the potential for the future Phase II Removal Action work to compromise the integrity of this remedial measure once constructed.

4.3.1.2 Design Objectives and Criteria

The following design objectives and related criteria were used to develop the dredge prisms.

Remove sediments above elevation -39.3 feet NGVD within the berth template. Figure 3 shows the bathymetry at Berth 410. The Berth 410 dredge area is defined by a continuous shoal along Berth 410 of which a small corner extends slightly beyond the Harborline (about a 50 by 100 feet area). This shoal is, by definition, the physical delineation of the portion of Berth 410 that needs to be dredged. The boundary of the Phase I dredge area will not be cut off arbitrarily by the Harborline, but instead will follow the delineation of this natural feature. Defining the dredge area consistent with the shoal boundary will also eliminate the potential for sloughing back into the RAA if the shoal were to be cut off at the Harborline.

Minimize water quality impacts outside of the compliance boundary. The need to meet water quality chemistry and turbidity or TSS standards factored into the selection of dredging methods. Water quality monitoring activities and criteria for dredging are described in detail in the WQMP (Appendix B). The removal of material at Berth 410 must meet, to the extent practicable, the water quality criteria defined in the WQMP and the USEPA-issued WQMCCP.

4.3.1.3 Additional Considerations

The same additional considerations presented above for the Berth 411 "Plus" area apply to the Berth 410 area as well.

4.3.2 Dredge Design

4.3.2.1 Neatline Dredge Prism

4.3.2.1.1 Navigational Considerations

Safe navigation for vessels calling on Berth 410/411 requires depths of -39.3 feet NGVD over a width of 150 feet from the pier face. Therefore, the dredge template is 150 feet wide extending from the Berth 411 "Plus" dredge area

towards the navigational channel. Areas above elevation -39.3 feet NGVD were identified for removal. This continuous depth will allow safe passage of vessels from the navigational channel into the 410/411 berth. Figure 5 presents the dredge plan for Berth 410.

4.3.2.1.2 Slope Stability and Oversteepening

The Berth 410 dredging is either adjacent to the sheetpile wall or open mudline. Therefore, slope stability or oversteepening is not a concern adjacent to the Berth 410 dredge prism.

4.3.2.1.3 Impacts to Waterfront Structures

The maximum cut elevation for the Berth 410 dredging (-41.3 feet NGVD) is higher than the critical sheetpile wall elevation (-46 feet NGVD) for stability by 4.7 feet. Therefore, impacts to the sheetpile wall from the Berth 410 dredging are not anticipated.

4.3.2.2 Overdredge Allowance

Depth control with dredging equipment has certain tolerances. To improve the reliability of achieving the design depths, an overdredge allowance is commonly given to the Contractor. The Contractor is paid for this allowance, but not for material removed below this allowance. For the Berth 410 dredging, the overdredge allowance will be 12 inches.

As is common in maintenance dredging, the maximum allowed depth the Contractor can dredge to will be 12 inches below the paid overdredge allowance described above. For Berth 410, dredging the maximum allowed dredge depth will be -41.3 feet NGVD.

4.3.2.3 Leave Surface Considerations

The Berth 410 dredge area generally does not have comparable contaminant concentrations as the Berth 411 "Plus" dredge area. Table 3 provides a summary of the existing chemistry data for samples collected within the Berth 410 dredging area. Based on this information, the chemical concentrations for the existing surface are generally less than 1 times the PEC for metals, except for one location towards the east end of the dredge area close to the Berth 411 dredge area where concentrations reach up to 4.3 times the PEC (T4-B411-01). In addition, the surface chemical concentrations for PAHs range from 1.8 (HC-S-35) to 2.8 (T4-B411-01) times the PEC. The proposed in-water action for 2008 includes dredging to the proposed design depth of –39.3 feet NGVD (-41 feet CRD) (based on current bathymetric surveys), plus a 2-foot overdredge allowance, for a total maximum depth of -41.3 feet NGVD (-43 feet CRD). Based on the existing sampling data provided in Table 3 within the dredge area, the final dredge surface chemical concentrations should be less than or equal to the existing surface concentrations. The exception to this interpretation is the east end of the dredge area near the Berth 411 dredge area that may have higher PAH concentrations exposed after dredging. The existing data in this location does not extend deep enough to determine the post-dredge leave surface below -41.7 feet NGVD. However, the expected concentrations if dredging went deeper than this elevation would be less than or comparable to adjacent surface sediments (e.g., HC-S-20 contains PAH concentrations up to 16 times the PEC).

4.3.2.4 Volumes

The volume of dredged material from the Berth 410 area is about 6,000 cy without overdredge, to about 9,000 cy including overdredge.

4.4 Equipment Selection – Mechanical Dredging

Mechanical dredging will be used for the dredging. An 8 cy clamshell bucket is anticipated for mechanical dredging (input from the Contractor is required before making the final equipment selection).

4.5 Sediment Transport and Disposal

Appendix F presents the TDP. This plan, along with the Construction Specifications (Appendix E), will detail the requirements for transporting and disposing of dredged sediments to the landfill. In general, dredged sediment will be loaded into haul barges and taken to a transloading facility, where the material will be transferred from the barges to trucks or rail cars for transportation to disposal facilities. The transloading facility may be located at T4 or, more likely, will be located on the Columbia River, upstream of the confluence with the Willamette River. Upland soils and other wastes may be loaded directly onto trucks for transport to disposal facilities or for transfer to rail cars for transport. The waste materials will be delivered to the disposal facilities by truck or rail. If rail transport is used, the Contractor will transload the waste from rail cars to trucks within the disposal facility for final delivery of the material to the landfill cells.

The haul route from the site to the disposal facility, including the locations of any transloading facilities, will be determined by the Contractor prior to construction. The Contractor will provide plans for transportation and disposal that will identify:

- Disposal facilities and waste acceptance criteria
- Methods of transportation and haul routes
- Locations of transloading facilities, if required, and schematic diagrams depicting operations at such facilities
- Amendments and anticipated mixture ratios, if needed to meet waste acceptance criteria
- Methods for mixing sediment with amendments, if required, and locations for performing sediment amendment
- Source of amendments and method to deliver amendments to the mixing location
- Permits, such as DEQ permits for temporary transfer stations, if any are required

The TDP and the Construction Specifications (Appendix E) also present the BMPs for the hauling, transloading, and disposal of the dredged material. These BMPs will help avoid losses of dredged material during the hauling and disposal process.

4.6 Dredging Implementation Approach

The Contractor will be required to dredge the Berth 411 "Plus" area prior to dredging the Berth 410 area. The Berth 411 "Plus" sediments are more elevated in contaminant concentrations than the Berth 410 sediments. The Contractor will be required to dredge the Berth 411 "Plus" sediments from the head towards the mouth as the sediments toward the head tend to be more contaminated.

Dredge cuts in the Berth 411 "Plus" area range from 1 to 5 feet. To minimize residuals from sloughing, the Contractor will be required to complete work under the following conditions:

- Beginning dredging at the highest elevation of material to be removed and work toward the lowest elevation
- Not overfilling the dredge bucket
- Maintaining cut side slopes of 3H:1V for all lifts through multiple long lifts or shorter lifts with stepping, in order to control "glory holing"

In addition, the Construction Specifications (Appendix E) provide more detailed BMP requirements that the Contractor will need to implement to reduce residuals and water quality impacts. These BMPs are based on standard practice for environmental dredging and were taken from the biological assessment (Anchor 2007c).

In addition to the BMPs presented in the Contract Specifications (Appendix E), the Contractor will be required to install a passive fish deterrent system that will be used to discourage any migrating salmonids that may be in the area from entering Slip 3 during key construction activities or work in areas with the highest chemical concentrations. The intent of the system will be to lead fish migrating downstream along the shoreline back out into the river, and the dimensions of the system will be targeted at deterring juvenile salmonids.

The system will consist of two components extending from the river bank out into the river, including a leader net that is intended to guide fish migrating downstream away from the mouth of Slip 3, and a bubble curtain placed across the mouth of Slip 3 as an additional deterrent (see Figure 5).

4.7 Construction Quality Control Related to Dredging

The CQAP (Appendix A) describes in detail the measures that will be implemented during construction to ensure the design objectives of dredging and disposal are met to achieve the performance standards. There are five specific quality control measures that will be implemented to ensure the dredge and disposal design is completed to meet the design objectives. Each of these is described in more detail below.

- **Achieve specified dredging depths and extents.** Confirmation must be obtained that the contaminated sediments were removed to the target elevations and full lateral extents, as depicted on the Construction Drawings (Appendix D) and in the Construction Specifications (Appendix E).
- **Provide specified sand coverage of areas not technically feasible to be dredged to the full vertical extent.** Confirmation must be obtained that the sand coverage is of the specified tonnage per area necessary for coverage.
- **Minimize dredging residuals and dispersal to adjacent areas.** Dredging techniques shall optimize the recovery of sediment from the dredge prism, minimize the resuspension and movement of sediment by the bucket, and minimize the loss of sediment from the bucket. The Contractor's operations will be monitored to confirm that the Contractor's personnel are avoiding dredging techniques that would spread contaminated sediment or allow contaminated sediment to settle back into dredged areas.
- **Avoid impacts on adjacent structures and tenants.** Dredging in front of existing sloped and waterfront structures shall not lessen the overall stability of the slopes and potentially cause movement in the structures. The performance criterion is no more than 1 inch of movement of waterfront structures.

- **Achieve no off-site tracking of contaminants during transport of disposal materials.** The transportation of dredged material to the disposal facility shall not result in the spreading of contamination from the site. The performance criterion is no statistical difference between soil sample results collected before and after transit activities begin.
- **Minimize short-term water quality impacts**. Water quality monitoring activities shall be conducted to ensure federal and state water quality requirements are met. Water quality requirements for dredging activities are described in detail in the WQMP (Appendix B).
- **Minimize potential impacts to cultural resources**. Archeological monitoring is required to minimize impacts to cultural resources or historic structures.

5 CAPPING AND STABILIZATION PLAN

Figure 2 shows the location of the capping at the head of Slip 3 and the shoreline stabilization in Wheeler Bay.

5.1 Head of Slip 3 Cap Design

Capping involves the placement of a natural material such as sand or gravel or a synthetic material on top of the contaminated sediment, thereby isolating chemicals from the overlying water. A cap will therefore prevent receptors from having direct contact with chemicals in the sediment, as well as prevent or substantially decrease the rate of flux of chemicals from the underlying sediments. In addition, a cap will prevent resuspension and downstream migration of chemicals adsorbed onto suspended sediment. The cap consists of two components. The lower layer is the base cap which serves to isolate the contaminants. The Construction Specifications (Appendix E) describe three types of the base cap:

- Base Cap Type 1 – This material is a fine to medium sand suitable for flatter subgrades less than 4H:1V in grade.
- Base Cap Type 2 – This material is coarser in gradation with gravels. The coarser gradation allows the material to be placed on steeper slopes.
- Base Cap Type 3 – This material has the same gradation as the Type 2 material but it has organoclay amended with it.

Above the base layer is an armor layer, which is designed to resist erosive forces. The gradation of the armor layer is a function of the design erosive forces.

The Head of Slip 3 cap consists of two unique parts. In front of the timber bulkhead, the cap will serve to confine contaminated sediments from receptors that cannot be dredged because of stability concerns as well as to provide a wedge to increase the stability of the bulkhead. The portion of the cap behind the bulkhead will serve to confine contaminated sediments from receptors and also control sheens.

5.1.1 Basis of Design

The in situ caps were designed using USEPA and USACE guidance documents, including ARCS Program Guidance for In-Situ Subaqueous Capping of Contaminated Sediments (Palermo et al. 1998). As described for the development of the dredge prism, the basis of the in situ cap design relates to performance standards and design objectives and criteria. Similarly, described below, these elements were used to guide the design of the in situ caps.

5.1.1.1 Performance Standards

- Isolate the surface sediments containing elevated contaminant concentrations from benthic communities and the aquatic environment by applying appropriate long-term erosive, as well as contaminant transport, mechanisms.
- Design the chemical isolation layer, where necessary, to contain sheens exiting from the shoreline.
- Design the armor layer of the cap to resist bed shear velocities induced by the largest of 100-year flood flow, 100-year waves, vessel-induced waves from typical passing vessels, and anticipated propeller wash from vessels that operate in the area.
- Use import cap material that meets defined chemical goals (presented in Table 4).
- Conduct the work consistent with the BMPs listed in the Capping specification (Section 352025; Appendix E), in order to minimize mixing of cap material with underlying contaminated sediments.
- Conduct the work consistent with the WQMP (Appendix B) and the WQCCMP, in order to minimize water quality impacts outside the compliance boundary.

5.1.1.2 Design Objectives and Criteria

The following design objectives and related criteria were used to design the in situ caps:

- **Delineate cap area in front of the timber bulkhead based on PEC exceedances.** Areas that were not identified for dredging that had surface concentrations exceeding PEC criteria were identified for capping. As discussed in Section 4.2.2, the area in front of the timber bulkhead was initially identified for removal, but due to stability concerns with the bulkhead, this area will require capping instead.
- **Delineate cap area behind bulkhead based on past construction activities and field observations**. The initial and approximate boundaries of the Head of Slip 3 cap can be determined by observations from the BEBRA. The Construction Drawings (Appendix D) present the Contractor with the boundaries of the initial excavation. Observations by the Port and USEPA during construction will be needed to determine the final boundaries of the work.
- **Determine cap thickness and composition of the base cap based on the BEBRA work.** Design studies for the BEBRA work as well as the performance of the BEBRA base cap can be used to determine the composition and thickness of the base cap layer.
- **Determine armor layer gradation and thickness necessary to resist erosion based on site characteristics.** The cap armor layer was determined based on the following components (from Palermo et al. 1998):
  - Propeller wash
  - Currents
  - Wind waves
  - Vessel-induced waves
- **Minimize water quality impacts outside of the compliance boundary.** The need to meet water quality chemistry and turbidity or TSS standards factored into the selection of cap material placement methods. Water quality

monitoring activities and criteria for capping are described in detail in the WQMP (Appendix B).

5.1.2 Chemical Isolation and Sheen Control Component

Appendix J of the T4 Early Action 60 Percent DAR (Anchor 2006) presents the contaminant transport modeling for the Head of Slip 3 cap. After submittal of the T4 Early Action 60 percent DAR and before initiation of the Phase I Removal Action work, two quarry samples were submitted for chemical analysis. The sample results indicated that a total organic carbon (TOC) concentration of 0.05 percent should be expected for imported quarry materials. The cap contaminant transport analysis was rerun with the new TOC and determined that an 18-inch-thick base cap layer would be required.

In addition, the Head of the Slip 3 cap will require the use of organoclay-supplemented material. This area is adjacent to the location of a previous upland remediation, the BEBRA. Organoclay was used for the BEBRA to address any remnant contamination caused by a historic petroleum product release from a former pipeline. Two previous investigations studied organoclay use in caps (Hart Crowser 2003; University of Texas 2005). The BEBRA design balanced the capacity of the amended sand to capture the petroleum product with the need to maintain hydraulic conductivity of the fill.

Using the results of the referenced studies, 1 percent organoclay was selected for the BEBRA fill as sufficient to capture residual petroleum product but not too high to materially affect hydraulic conductivity. For the Head of Slip 3 cap, maintaining hydraulic conductivity is not required because the area is relatively flat and, therefore, the primary function of the cap is to address potential vertical movement of contaminants, rather than lateral movement. The relatively thin layer of the cap (compared to the BEBRA fill) will not materially change groundwater flow even if the organoclay expands to reduce the hydraulic conductivity of the cap. To keep the handling characteristics of the fill similar to sand, the amount of organoclay will be limited to 10 percent. Based on a review of the referenced documents and the success of

the BEBRA fill, the Construction Specifications (Appendix E) require the use of organoclay manufactured either by CETCO remediation Technologies or Biomin, Inc., or a similar product.

5.1.3 Erosion Component

5.1.3.1 Wind-induced Wave Analysis

Appendix L of the T4 Early Action 60 percent DAR (Anchor 2006) presents a detailed memorandum describing the cap armor analysis for wind-induced waves. The methodology used for wind-induced wave analysis was comparable to that used for the McCormick & Baxter Superfund Site, located approximately 3 miles upstream of T4, (PB Ports & Marine 2002). Wind data was obtained for the Portland International Airport from the National Climatic Data Center (1976 to 2004) and the Meteorological Resource Center (Webmet.com; 1961 to 1975). Based on the wind information, a wind rose was developed for the site to determine the dominant wind directions—predominant winds blow from the southeast, northwest, and south.

The USACE's Coastal Engineering System (ACES) program was used to model wave growth and propagation due to winds. Bottom orbital velocities were calculated from waves approaching shore. The stable sediment size was linked to the bottom orbital velocity generated by the wave using the stable stone size equation developed by Blaauw et al. (1984) as recommended by Appendix A, "Armor Layer Design," of the *Guidance for In-Situ Subaqueous Capping of Contaminated Sediments* (Palermo et al. 1998).

Based on the modeling discussed above, fine gravel was determined to be necessary to resist wave-induced orbital velocities.

5.1.3.2 Vessel-Induced Waves Analysis

Waterway traffic in the vicinity of T4 ranges from Panamax vessels (which call at nearby Berths 410/411 and 415) to smaller recreational vessels. The analysis

performed for the McCormick & Baxter Superfund Site, located approximately 3 miles upstream of T4, concluded the following, "Ship, tug, and barge tow-generated wave heights were found to be smaller than those generated by fireboats during a response" (PB Ports & Marine 2002). Therefore, for the T4 analysis, a fireboat (converted tug) was selected as the most conservative vessel for wave generation. An empirical computer model was used to predict wave heights from the design vessel. The same approach that was used for wind-induced waves was used to predict orbital velocities of these waves as they approach shore.

Based on the modeling discussed above, the following grain sizes were determined to be necessary to resist wave-induced orbital velocities. Vessel-generated waves were determined to be less than 1 foot in height due to the low operating speeds of less than 5 knots within the slip. Therefore, the wind-induced waves would control the armor design over the vessel-generated waves.

The largest erosive force that a wave imparts is when it breaks on the shoreline. This area is called the surf zone. The shoreline portions of the Head of Slip 3 cap (i.e., cap areas that extend from ordinary low water [OLW] to ordinary high water [OHW]) are subject to breaking waves. From the previous sections, it is evident that vessel-generated waves would result in more erosive forces than those developed from wind waves. Accordingly, only vessel-generated breaking waves were considered. The ACES Rubble Mound Revetment Design module was used with the design wave characteristics to determine the appropriate armor size. The model indicates that cobbles (armor grain sizes between 7 and 10 inches) will be necessary to protect caps within the surf zone areas.

5.1.3.3 Currents

The Willamette River will impart an erosive force on caps from its flow. This erosive force, as well as the required armoring to resist this force, was evaluated under a 100-year flood event. Appendix L of the T4 Early Action 60 percent DAR (Anchor 2006) presents the detailed analysis.

USACE provides guidance for determining the material gradations for maximum flood flow or storm velocities near capped sediments. Appendix A, "Armor Layer Design," of the *Guidance for In Situ Subaqueous Capping of Contaminated Sediments* (Palermo et al. 1998) and Chapter 3 of the Engineering Manual (EM) 1110-2-1601 entitled, *Hydraulic Design of Flood Control Channels* (USACE 1994) provided procedures for evaluating the design.

The hydrodynamic and sediment transport (EFDC) model of the Lower Willamette River used by the Lower Willamette Group (LWG) was used to estimate bed shear velocities associated with river currents. The model is intended to help understand circulation and sediment transport processes in the system and to be used to help evaluate sediment remediation alternatives. The model is two-dimensional and depth-averaged.

Maximum river flow velocities were obtained from the hydrodynamic analysis of the 100-year flood event performed by WEST Consultants (Appendix K of the T4 Early Action 60 percent DAR [Anchor 2006]). The silt or finer grain size material were determined to be necessary to resist flood flow conditions.

5.1.3.4 Propeller Wash

The propeller jet of a maneuvering vessel has the potential to impact the cap surface and may cause erosion of capping materials if they are not sized appropriately. Propeller wash in prospective capping areas include commercial vessels and tugs. Propeller wash velocities from vessels will likely be localized and of short duration. The propeller wash from passing tugs and commercial vessels along the Willamette River will not likely affect the cap surface. However, the propeller from these vessels during a maneuvering operation (e.g., berthing with bow thruster or tug assist) can cause significant erosion of bottom sediments if an appropriate armor stone is not in place to resist the propeller-induced bottom velocities.

This evaluation approach is recommended in Appendix A of the USEPA/USACE guidance document *Guidance for In Situ Capping of Contaminated Sediments* (Palermo et al. 1998). This model requires specific input regarding vessel characteristics (e.g., propeller diameter, depth of shaft, and shaft horsepower) and has been used for several cap designs approved by state and federal agencies.

Discussions with local tug operators and the Columbia River Pilots indicate that the bulk carrier vessels and large tractor-tugs normally navigate in the deeper portions of Slip 3 as they enter from the river. Tugs that typically operate at the Port's facilities and were selected for analysis include the *Daniel Foss* (owned and operated by Foss Maritime) and the *Portland* (owned and operated by Shaver Transportation Company). The *Portland* is the most powerful tug that operates at the Port, with a maximum horsepower (HP) of 3,600 and a draft of 12.6 feet. The *Daniel Foss* has a larger draft, 16 feet, and a maximum HP of 3,200. Communications with the tug captains revealed that the tugs use an average of approximately 25 percent of their maximum HP for typical maneuvering and repositioning, and between 50 and 75 percent for escort operations when thrust is applied during initial movement of the larger vessels. In addition, the higher HP is typically applied in short, 30-second to 1-minute bursts for initial movement of the vessels, then decreased to lower levels (50 percent or less) for continual movement.

The large, deep-draft, foreign-flagged bulk carrier ships typical at T4 are single propeller with engine power from 5,000 to 12,000 HP and lengths of 500 to 700 feet. The *Duncan Bay*, 555 feet long with a 32-foot draft and a maximum HP of 7,800, is typical of vessels that call at Berth 411 in Slip 3. The *Monte Pelmo* is a larger vessel, nearly 740 feet long with a roughly 40-foot draft and maximum HP of 12,000, which could call at Berth 401 along the river where there is more room.

Characteristics of each design vessel were obtained and are summarized in Appendix L of the T4 Early Action 60 percent DAR (Anchor 2006). Assumed

physical characteristics of the Head of Slip 3 cap were also evaluated and summarized in Appendix L of the T4 Early Action 60 percent DAR (Anchor 2006).

Based on the model runs using T4 specific characteristics, the following grain sizes were determined to be necessary to resist prop wash conditions at the Head of Slip 3. The sheetpile wall on the northern side shields the cap area from propeller wash. The area in front of the timber bulkhead on the southern side would require cobbles (7-inch material) for erosion protection.

5.1.3.5 Final Armor Section

Based on the erosion analysis, an armor layer with cobbles 7 to 10 inches for the mean size would be required. This corresponds to an Oregon Department of Transportation (ODOT) Type 100(E) riprap.

5.1.4 Slope Stability (Geotechnical)

Figure 7 is a cross section through the Head of Slip 3 cap. The area of concern with regards to instability is the existing timber bulkhead. To stabilize the bulkhead, a wedge of armor material will be placed in front of the bulkhead as shown on Figure 7. The top of the wedge will match the existing grade behind the bulkhead.

The capping behind the bulkhead will match the existing slope grade (i.e., the cap will not steepen the slope). Therefore, stability in that portion of the cap is not a concern.

5.1.5 Bioturbation Component

Based on a review of information from literature, the bulk of bioturbation activity in freshwater systems is concentrated in the upper 5 to 10 centimeters (cm) (Palermo et al. 1998; Clarke et al. 2001). This information is consistent with site-specific observations from Slip 3 and Wheeler Bay derived from sediment profile imaging (SPI) studies performed for the Portland Harbor Superfund Site (SEA 2002). SPI images showed feeding voids from benthos as deep as 15 to 20 cm, but the bulk of activity is likely to be

shallower. Consistent with Palermo et al. (1998), the cap design presented herein (approximately 45 cm [18 inches] thick) will provide an erosion-protection layer component of the cap that is sufficient for both physical isolation and bioturbation.

5.1.6 Consolidation Component

The material to be used for the cap layers is granular in nature, and any consolidation of these layers will be minimal and will occur during construction. Therefore, the consolidation component will be equal to zero.

5.1.7 Operational Component

Given the inherent difficulties in achieving accurate placement tolerances for in-water construction, an additional thickness (overplacement allowance) is typically specified in the capping contract. For the Head of Slip 3 cap, the overplacement amount is expected to be 6 inches for each discrete layer. This amount is based on anticipated cap placement equipment (mechanical clamshell), experience at other similar capping projects, and considerations of likely contractor incentives to limit the amount of excess thickness.

5.1.8 Cap Design Summary and Sequencing

As shown on Figure 7, the cap design will consist of two components:

- **Behind the timber bulkhead** – 18 inches of sandy gravel to gravelly sand mixed with organoclay overlain with 18 inches of riprap
- **In front of the timber bulkhead** – 18 inches of sandy gravel to gravelly sand mixed with organoclay overlain with a riprap wedge

The cap work will be completed in a sequential manner as described below (see Figure 7):

- First, the wedge will be placed downslope against the timber bulkhead to increase the stability. The wedge will consist of armor material over base cap material.

- After the wedge is placed, the work behind the sheetpile wall will begin. First, the existing riprap and filter blanket material will be removed as needed to expose the bottom of the existing sand fill amended with organoclay. This fill was placed as part of the BEBRA work. The riprap material will be stockpiled for reuse.
- Organoclay-amended fill material will then be placed from elevation 3 feet NGVD to a minimum of 1 foot above the existing organoclay-amended fill to ensure a continuous layer. The area that needs to be addressed with the new organoclay-amended fill is the bench excavated into the silt at the time of the BEBRA. That bench will be entirely covered with organoclay/sand under the design as shown on Figure 7 (with the only excavation being removing a small portion of riprap/gravel placed during the BEBRA; there will be no silt excavation). Visual observations during excavations may indicate if the bottom elevation of the new excavation and fill needs to be lowered. Unnecessarily taking the new excavation and fill down to the timber bulkhead will be difficult due to access and will compromise the integrity of the bulkhead.
- After the organoclay amended fill is placed, a layer of filter material and armor will be placed on top.

This work will be primarily completed from the water. Difficult upland access will limit the amount of work done from shore.

5.2 Wheeler Bay Stabilization Design

As part of the RI/FS and Source Control Measure VCP Agreements between DEQ and the Port, the Wheeler Bay river bank area was identified as requiring a source control measure for stabilization. The Wheeler Bay shoreline will be graded to a more stable configuration and will be stabilized with surface erosion control measures. Figures 8 and 9 illustrate the Wheeler Bay stabilization grading plan and typical cross sections, respectively.

5.2.1 Basis of Design

The Wheeler Bay bank stabilization was designed using a combination of USEPA and USACE guidance documents for erosion resistance design and stability. Similarly, as described for the development of the dredge prism, the basis of the in situ cap design relates to performance standards and design objectives and criteria. As described below, these elements were used to guide the design of the in situ caps.

5.2.1.1 Performance Standards

- To the extent feasible, regrade banks to slopes that are naturally stable.
- Stabilize targeted shoreline areas to address appropriate long-term erosive mechanisms.
- For areas where armoring is necessary, design the armor layer to resist bed shear velocities induced by the largest of 100-year flood flow, 100-year waves, vessel-induced waves from typical passing vessels, and anticipated propeller wash from vessels that operate in the area.
- Use import material for fill and grading that meets defined chemical goals (presented in Table 4).
- Conduct the work consistent with the WQMP (Appendix B) and the WQCCMP in order to minimize water quality impacts outside the compliance boundary .

5.2.1.2 Design Objectives and Criteria

The following design objectives and related criteria were used to design the bank stabilization:

- **Determine stable slope configurations.** Slope angles were developed to provide stable long-term conditions.
- **Determine armor layer gradation and thickness necessary to resist erosion based on site characteristics.** The armor layer was determined based on the following (from Palermo et al. 1998) components:
  - Propeller wash

- Currents
- Wind waves
- Vessel-induced waves

- **Minimize water quality impacts outside of the compliance boundary.** Wheeler Bay work is anticipated to be conducted in the dry and above the water. Therefore, water quality impacts are not anticipated. Stormwater flow through the construction area to the river is the main source of potential water quality impacts. Water quality monitoring activities and criteria for stabilization work are described in detail in the Water Quality Monitoring Plan (Appendix B).

5.2.2 Geotechnical Component

Figures 8 and 9 presents a site plan and a number of cross sections through the Wheeler Bay shoreline stabilization area. As can be seen in the sections, the existing slope along the shoreline is typically 2H:1V, or steeper. To increase the stability of the shoreline area, one of two measures will be completed:

- From station 0 to 7+42, the slope will be graded back to 3H:1V. The surface of the new slope above elevation 15 feet NGVD will be planted to resist erosion. The surface of the new slope below elevation 15 feet NGVD will be armored with riprap.
- From station 7+42 to the south, the slope will be graded back by filling to 2H:1V with riprap.

5.2.3 Erosion Component

The portion above elevation 15 feet NGVD will have combinations of coir fabric, jute mat, and plantings to resist erosive forces. The lower portions of the shoreline stabilization area (typically below elevation 15 feet NGVD) will require granular erosion resistance. This section describes the size of armoring required in the area below elevation 15 feet NGVD to resist erosion.

The same erosion analyses described in Section 5.1.3 were performed for the Wheeler Bay shoreline stabilization areas to determine the appropriate armoring grain size. The following sizes were determined for the different erosion components:

- Wind-induced waves – fine sand to fine gravel
- Vessel-induced waves – coarse gravel
- Currents – silt
- Propeller wash – cobbles

Based on the erosion analysis, an armor layer with cobbles would be required. This corresponds to an ODOT Type 100(E) riprap. This layer would need to be placed on a filter layer of sandy gravel to gravelly sand.

5.2.4 Shoreline Stabilization Summary and Sequencing

Figures 8 and 9, as well as sheets C-7, C-8, C-9, L-1 and L-2 in Appendix D, detail the design and construction of the Wheeler Bay shoreline stabilization. The sequencing of the work will be as follows:

- The slope will be graded as shown on Figure 8 and sheets C-7, C-8, and C-9. The northern portion of the slope will be graded to a 3H:1V slope. The far southern portion of the slope will be graded to a 2H:1V slope. The northern portion will be a cut and fill exercise (net balance) to achieve the 3H:1V grade. Establishing the 2H:1V slope in the respective portion will require filling.
- Once the slope is to grade, the surface treatments will be constructed on the graded surface. For the toe portion (from elevation 15 feet NGVD down to the bottom of new grading), an armor layer over a filter layer will be placed. The armor will be covered with 1 foot of habitat material, large woody debris, and anchored habitat logs.
- For the middle section (from elevation 15 to 20 feet NGVD) topsoil, coir erosion control fabric, and live willow stakes will be placed.

- The top portion (from elevation 20 feet NGVD to the slope top) will have a jute mat over composted soil and hydroseeding. A row of cottonwood pole plantings will occur at elevation 20 feet NGVD.

This work will be completed from shore with land-based equipment.

5.3 Source Material for Capping and Stabilization

Sources for capping and stabilization material will most likely be upland site quarries. All materials used in imported material placement will meet the requirements established in the December 2003 Technical Plans and Specifications (Ecology and the Environment 2003) for the McCormick & Baxter sediment cap located within the Willamette River. The Construction Specifications (Appendix E) present both physical and chemical parameters for the imported materials. Base cap materials will either be fine to medium sand or sandy gravel/gravelly sand depending on the steepness of the area being capped. Steeper areas will require the sand and gravel material. Armor layers are varying sizes of riprap.

Table 4 presents chemical goals for import material. The table includes the results of the two quarry samples analyzed during remedial design as well as Threshold Effects Concentration (TEC) criteria where they exist. The import material should meet TEC criteria or regional background concentrations as appropriate. In addition, concentrations of key bioaccumulative constituents, including polychlorinated biphenyls (PCBs), dichloro-diphenyl-trichloroethanes (DDTs), and other chlorinated pesticides, should be undetectable using standard laboratory methods.

The CQAP (Appendix A) describes the methods that will be employed to confirm appropriate material types are being used for import materials.

5.4 Construction Quality Control During Capping and Stabilization Construction

The CQAP (Appendix A) describes in detail the measures that will be implemented during construction to ensure the design objectives of capping are met. Each of these measures is summarized below:

- **Verify quality of import material.** Import material must meet specified physical and chemical properties, as outlined in the Construction Specifications (Appendix E), prior to being used. Sampling and analysis of materials before and during construction, coupled with visual inspections of import materials, will be completed to verify suitability.
- **Achieve specified thickness and extent.** Cap and fill construction materials must be placed at the specified grades within 1/2-foot of the extents shown on the Construction Drawings (Appendix D) and Construction Specifications (Appendix E). Surveys will be completed to confirm grades.
- **Avoid impacts on adjacent structures and tenants.** Capping in front of existing slopes and waterfront structures should not lessen the overall stability of the slopes and potentially cause movement greater than 1 inch in the structures. Settlement monitoring will occur on critical structures near capping areas to confirm no damage is occurring.
- **Minimize release of suspended sediment.** The cap material must be placed in a manner that will minimize the release of suspended sediment (i.e., limiting the energy of the material as it strikes the bottom to minimize resuspension and mixing of contaminated material with the cap material). Water quality measurements will be used to monitor sediment resuspension. The Wheeler Bay shoreline stabilization work will be completed above the water level.
- **Minimize short-term water quality impacts**. Water quality monitoring activities shall be conducted to ensure that federal and state water quality requirements are met. Water quality standards for capping and filling activities are described in detail in the WQMP (Appendix B).

5.5 Volumes

Anticipated volumes of cap and fill material are presented below by area and by material type:

- Head of Slip 3
  - 950 cy of Base Cap Type 3
  - 1,500 cy of Armor Type 3
- Wheeler Bay Shoreline Stabilization
  - 1,300 cy of cutting
  - 1,950 cy of import select fill
  - 800 cy of Armor Type 3
  - 550 cy of Habitat Cover

5.6 Equipment Selection and Placement Techniques

Some of the main issues to consider when selecting appropriate capping equipment include:

- Availability and types of equipment
- Production rate capability
- Maintaining navigation access
- Minimizing disruption of Port tenant operations
- Water depths
- Strength of the material being capped
- Gradation of the cap material
- River currents and tides
- Minimization of short-term water quality impacts
- Accessibility of equipment

The cap at the Head of Slip 3 will be placed with water-based equipment due to site access limitations. The shoreline stabilization work in Wheeler Bay will be completed with land-based construction equipment. Anticipated equipment includes clamshell buckets or long reach excavators.

6 WATER QUALITY

This section presents the water quality standards and guidelines that will be used on the T4 Phase I Removal Action, results of contaminant mobility testing, and predicted water quality around the different Phase I Removal Action activities. These factors will be used to determine contractor-required BMPs to protect water quality during construction, and to guide construction water quality monitoring programs during the Phase I Removal Action.

6.1 Construction Water Quality Criteria

Water quality monitoring criteria are summarized in Table 5 and discussed below. These criteria will form the basis for evaluating water quality at the compliance boundary during construction.

6.1.1 Turbidity

Consistent with state water quality standards [OAR 340-041-036], the following turbidity criteria will apply at the compliance boundary:

- Turbidity should not exceed 5 Nephelometric Turbidity Units (NTUs) above background if background is less than 50 NTUs.
- Turbidity should not exceed 10 percent above background if background is greater than 50 NTUs.

If turbidity exceedances are observed, TSS results may be considered as part of the weight of evidence when evaluating the environmental significance of the exceedances. TSS data are relevant for the following reasons:

- TSS is measured in concentration units and is therefore relevant for contaminant transport and mass balance calculations; in contrast, turbidity is a measure of light transmission and does not have a direct relation with, and is not a direct measure of, concentration.
- TSS has greater ecological relevance, in that most literature studies that have investigated the biological effects of high turbidity on fish and other organisms actually use TSS as a metric.

- In a remedial dredging project, migration of contaminated sediments outside the project area is a key concern. TSS is a more direct measure of sediment resuspension and transport processes.

6.1.2 Dissolved Oxygen

At the compliance boundary, dissolved oxygen (DO) will not be less than 6.5 milligrams per liter (mg/L).

6.1.3 Chemicals of Concern

For laboratory analysis of COCs at the Phase I Removal Action project, state and federal aquatic life criteria will be used to evaluate water quality at the compliance boundary. Acute criteria will be the compliance criteria for water quality monitoring during all construction activities (i.e., dredging and capping) because such activities are migratory, intermittent, and ephemeral in nature. Chronic criteria will be used as action levels to trigger evaluation of additional construction BMPs, but will not be used for compliance purposes.

Metals Criteria – Water quality criteria for metals (cadmium, lead, and zinc) are derived from current USEPA Nationally Recommended Water Quality Criteria (USEPA 2006b), the same criteria that have been adopted by the State of Oregon. Metals criteria have been adjusted to a hardness value of 25 mg/L based on ambient measurements in the Lower Willamette River (USGS 2006). Metals criteria for cadmium, lead, and zinc are evaluated on a dissolved basis (USEPA 2006b).

PAH Guidance Values – Aquatic life criteria for PAHs are not available in either federal or state standards. However, estimated acute and chronic values for PAHs have been developed by USEPA for use in deriving sediment quality benchmarks (USEPA 2003a. These PAH values, listed in Table 5, may be used as guidance values during the monitoring program to assess the effectiveness of construction BMPs for controlling

releases of PAHs. However, these guidance values will not be used as compliance criteria.

6.1.4 Background Criteria

Background criteria will be set at the 90th percentile value of the background dataset, which will include existing data from U.S. Geological Survey (USGS) monitoring station No. 1421170 (Willamette River at Portland), data from the pre-construction background survey, and ongoing monitoring of background stations during construction. Turbidity criteria are based on direct comparisons to background values. In addition, ambient concentrations of certain COCs in the Willamette River may be at or above aquatic life criteria/guidelines due to natural occurrences in regional volcanic soils, or contributions from urban or agricultural runoff or other upstream sources. In such cases, the background criteria will supersede aquatice life criteria/guidelines as the basis for evaluating water quality that may be related to Phase I Removal Action activities. During short-term monitoring activities, concentrations must be shown to be below aquatic life criteria/guidelines or ambient background concentrations, whichever is greater.

Initial estimates of 90th percentile background values for turbidity, TSS, and dissolved metals based on USGS monitoring data are presented in Table 6. These background values will be updated and recalculated with the results of the pre-construction survey.

6.2 Compliance Boundaries

The proposed compliance boundaries for this project are as follows (see Figure 3 of the WQMP in Appendix B):

- Slip 3 Construction Activities
  - Turbidity: 100 meters from the mouth of Slip 3
  - TSS and COCs: 100 meters from the respective Phase I Removal Action Areas
- Berth 414 Construction Activities
  - Turbidity, TSS, and COCs: 100 meters from the Phase I Removal Action Area

- Berth 410 Construction Activities
  - Turbidity, TSS, and COCs – 100 meters from the mouth of Slip 3
- Upland Transfer Facility Activities
  - Field Parameters – 100 meters downstream from upland transfer location

6.3 Dredging Elutriate Testing

The dredging elutriate test (DRET) is used to help assess water quality at the point of dredging. The DRET results for the composite dredge prism sample T4-CM2 show that water quality effects from toxic constituents resuspended by dredging are expected to be negligible (Table 7). All metals results were well below their respective acute water quality criteria, with the exception of copper. The DRET copper concentration (4.3 micrograms per liter [μg/L]) was just slightly above the hardness-based acute criterion (3.6 μg/L, a very stringent criterion considering the low hardness of 25 mg/L in the Willamette River); similar concentrations have been reported as ambient background levels in the Willamette River (~5 μg/L dissolved copper; USGS 2006). As reported in Table 7, 9ug/L is the ODEQ suggested default background concentration for copper in freshwater (ODEQ, 2002). Only a few PAHs were detected, and the few detected PAHs were two or more orders of magnitude below their acute water quality guidance values (USEPA 2003a). No DDT isomers, PCBs, or petroleum compounds were detected.

6.4 Water Quality Effects During Phase I Removal Action

6.4.1 Water Quality during Dredging Activities

A number of factors will control the water quality around the dredging operations. These factors include dredging equipment and methods, sediment characteristics, hydrodynamic conditions, water depth, and others. Mechanical dredging will be utilized.

The USACE model DREDGE was used to predict suspended sediment concentrations around the dredging operation (Kuo and Hayes 1991). DREDGE model input parameters are summarized in Table 8. Simulations of mechanical dredging were

performed. A range of loss rates was used for mechanical dredging (ranging from 5 to 10 percent loss).

The critical conditions for mechanical dredging included somewhat higher ambient current speeds (i.e., to simulate clamshell work in the more open portions of the RAA) and shallower water depths (i.e., typical of Berth 414 area).

DREDGE model results are shown on Figure 10. In most scenarios, concentrations drop off rapidly within about 25 meters from the dredge. When dredging in shallow water and open currents, TSS concentrations may extend farther downstream. The DREDGE model predicts that TSS concentrations typical of ambient conditions in the Willamette River (i.e., 24 mg/L; see Table 6) will generally be reached at about 15 to 35 meters from the dredge.

Dredging BMPs to control water quality impacts are presented in the WQMP (Appendix B) and incorporated into the Construction Specifications (Appendix E).

6.4.2 Water Quality during Capping, Sand Layer Placement, and Stabilization Activities

All of the shoreline stabilization work is anticipated to occur above the water level. Portions of the Head of Slip 3 capping will occur below water. A number of factors will control the water quality around the capping operation. These factors include capping equipment and methods, sediment and cap material characteristics, hydrodynamic conditions, water depths, and others. The capping materials are anticipated to be placed using mechanical equipment such as clamshell bucket.

Predicting water quality associated with capping activities is difficult due to the lack of specific models. Resuspension of contaminated sediment during construction (both dredging and capping) is anticipated. However, monitoring data available from other similar projects indicates that resuspension during capping operations can be minimized by careful selection and sequencing of placement methods. Two investigations

conducted by USEPA's National Risk Management Research Laboratory (NRMRL) measured the release of in situ contaminated sediments during cap placement at Boston Harbor, Massachusetts, and Eagle Harbor, Washington (USEPA 2005). The results of both investigations indicated that resuspension occurred during the initial run(s), and progressively decreased and dissipated with each subsequent run. (Elevated releases were observed for the first lift only in Boston Harbor and for the first three lifts at Eagle Harbor due to the more aggressive placement technique in the latter case.) These results suggest that resuspension during cap placement may be minimized by placing cap materials in several lifts, such that the initial lift involves methods with minimal disturbance (i.e., low energy) followed by more aggressive techniques for subsequent lifts.

Cap placement BMPs to control water quality impacts during capping operations are presented in the WQMP (Appendix B) and incorporated into the Construction Specifications (Appendix E).

6.4.3 Water Quality during Sediment Transport and Offloading

Dredged sediment will be transported by barge from the dredging location to the transloading facility or landfill. Periodic measurement of field parameters will be collected at upstream and downstream locations at the transfer facility. In addition, visual monitoring for turbidity plumes will be ongoing at the transfer facility. Further details are provided in the WQMP (Appendix B). Appropriate construction BMPs are presented in the Construction Specifications (Appendix E).

6.5 Water Quality Monitoring Summary

Table 1 of the WQMP (Appendix B) summarizes the parameters wthat will be monitoried during each construction activity. The monitoring program will include regulary scheduled field measurements and laboratory analyses of the water samples from chemicals of concern (COCs). COCs have been established based on exceedances of PECs in sediment samples from the respective construction areas (cadmium, lead, zinc, PAHs).

Water quality monitoring schedules are divided into two tiers, as summarized in Table 3 of the WQMP (Appendix B). Tier I reflects "intensive monitoring" that will be performed at the beginning of a new construction activity or when there is a significant change in construction methods. Tier II reflects "routine monitoring" that will occur after an activity has been underway for a period of time and no water quality exceedances have been detected in several rounds of monitoring, contingent on EPA approval. Monitoring will revert back to a Tier I schedule if an exceedance occurs during Tier II monitoring. Additional information on monitoring schedules that will apply to specific construction activities is provided in Section 3 of and Table 3 of the WQMP (Appendix B).

7 SUBSTANTIVE REQUIREMENTS OF PERMITS

As described in the EE/CA, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) 121(e) exempts remediation actions conducted entirely onsite from having to comply with administrative requirements such as obtaining permits and meeting reporting and record keeping requirements. Thus, no federal, state, or local permits are required for onsite actions associated with the Removal Action at T4 [40 CFR 300.400(e)(1)]. The National Contingency Plan (NCP) defines onsite as "the areal extent of contamination and all suitable areas in very close proximity to the contaminants necessary for implementation of the response action." Areal extent of contamination refers to surface area, groundwater beneath the site, and air above the site. Offsite actions (e.g., offsite disposal of hazardous waste) must comply with all legally applicable substantive and administrative requirements, including obtaining permits. The concept of relevant and appropriate is not applicable to offsite actions.

7.1 Applicable or Relevant and Appropriate Requirements

For onsite actions, USEPA and support agencies must identify the legally applicable or relevant and appropriate requirements that may govern the Removal Action. Legally applicable requirements include those requirements promulgated under federal or state law or state facility siting law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at T4. Examples of legally applicable requirements include cleanup standards, standards of control, and other environmental protection requirements, criteria, or limitations. Relevant and appropriate requirements are requirements for environmental protection promulgated under federal or state law that address situations sufficiently similar to the circumstances of the Removal Action contemplated and are well-suited to T4 [40 CFR 300.400(g)(1) and (2)].

In addition, to qualify as an Applicable or Relevant and Appropriate Requirement (ARAR), a state requirement must be:

- A state law
- Promulgated under a federal or state environmental or facility siting law
- More stringent than the federal requirement

- Identified by the state in a timely manner
- Consistently applied

7.2 ARARs Classifications

CERCLA actions may have to address several types of requirements. USEPA developed ARARs classifications to provide guidance on how to identify and address ARARs. There are three ARAR classifications:

- Chemical-specific
- Location-specific
- Action-specific

These classifications are defined below.

- Location-specific requirements are restrictions on activities based on the characteristics of a site or its immediate environment. The restrictions on work performed in wetlands or wetland buffers provide an example in which location-specific requirements may require restoration of wetlands.
- Chemical-specific requirements are health- or risk-based concentration limits or ranges for specific hazardous substances, pollutants, or contaminants in various environmental media. An example is the maximum contaminant levels established by USEPA as safe levels in drinking water.
- Action-specific requirements are controls or restrictions on particular types of activities such as hazardous waste management or wastewater treatment. Examples of action-specific requirements are state and federal air emissions standards as applied to an in situ extraction treatment unit.

USEPA identified location-, chemical- and action-specific ARARs for on-site monitored natural recovery, capping, dredging, and CDF construction activities in the Action Memo (USEPA 2006a). Although these activities do not require federal, state, or local permits, they must comply with the substantive requirements of these permits, as detailed on Table 9.

Federal, state, and local permits are required for any offsite actions. Off-site actions that are a part of the Removal Action include disposal of sediment and debris.

7.3 ESA Compliance

The Phase I activities implement the Action Memo for the Removal Action (USEPA 2006a), and are considered a federal agency action under the Endangered Species Act (ESA), which are required to substantively comply with the ESA. A Biological Assessment (BA) was prepared to support consultation with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) in providing an Effects Analysis and Determination for effects of Phase I to evaluate compliance with ESA requirements (Anchor 2007c). General and activity-specific conservation measures were identified in the BA to avoid and minimize adverse effects of the project. General conservation measures that will be applied are listed here, while details on activity-specific conservation measures can be found in the BA (Anchor 2007c).

General conservation measures include:

- In-water work for this project will comply with the timing restrictions specified in the in-water work window that has been specified by the Oregon Department of Fish and Wildlife (ODFW; 2000), when salmonids are expected to be either not present or present only in very low numbers. In the Lower Willamette River, the work window is in the summer and early fall, from July 1 through October 31, and in the winter, from December 1 through January 31. As an additional conservation measure, in-water work will be limited to the late summer and fall in-water work window, from July 1 to October 31.
- Operations will be stopped temporarily if listed species are observed as injured, sick, or dead in the project area, to determine whether additional fish are present and to ensure that operations may continue without further impact. NMFS Law Enforcement will be notified, and fish will be handled with care to ensure effective treatment or analysis of cause of death or injury.

- Construction barges will be situated in areas of sufficient depth so as not to ground out during low water conditions.
- The Port will prepare a dredged and stockpiled material handling plan detailing BMPs that will be implemented to minimize the potential for off-site tracking of contaminated sediments while stockpiled and during transport to the landfill.
- The project will adhere to water quality protection conditions and monitoring found in the WQMCCP that will be issued by USEPA for this action. Because the WQMCCP is not available at the time of submittal of the DAR or BA, it is understood that water quality monitoring stated in the WQMCCP will be incorporated into the conservation measures of the Biological Opinion so that there are no inconsistent requirements between the Biological Opinion and WQMCCP. USEPA and the Port have agreed upon water quality monitoring details, which were approved by USEPA in the Abatement Measures Proposal submitted to USEPA in October 2007. Specific details from the Abatement Measures Proposal are provided in subsequent sections of this document for each specific construction activity.
- Prior to entering the water, all equipment will be checked for leaks and completely cleaned of any external petroleum products, hydraulic fluid, coolants, and other deleterious materials.
- A spill containment and control plan will be kept on site during construction activities and will contain notification procedures, specific cleanup and placement instructions for different products, quick response containment and cleanup measures that will be available, proposed methods for placement of spilled materials, and employee training for spill containment.
- The contractor will establish an Environmental Protection Plan (EPP), which prevents environmental pollution and minimizes environmental degradation during and as a result of construction operations, including consideration of noise levels, air, water, and land. The EPP will establish and maintain quality control for environmental protection of all proposed actions. Erosion and turbidity control measures will also be included in the EPP.

In addition to these conservation measures, the BA describes a passive fish deterrent system that minimizes fish handling and associated additional stresses, which will be used to discourage any migrating salmonids that may be in the area from entering Slip 3 during key construction activities or work in areas with the highest chemical concentrations. The intent of the system will be to lead fish migrating downstream along the shoreline back out into the river, and the dimensions of the system will be targeted at deterring juvenile salmonids. The system will consist of two components extending from the river bank out into the river, including a leader net intended to guide fish migrating downstream away from the mouth of Slip 3, and a bubble curtain placed across the mouth of Slip 3 as an additional deterrent (see Figure 5).

8 CONSTRUCTION SCHEDULE AND SEQUENCING

In-water work for this project will comply with the timing restrictions specified in the in-water work window that have been determined by ODFW (2000), when salmonids are expected to be present in very low numbers. In the Lower Willamette River, the work window is in the summer and early fall, from July 1 through October 31, and in the winter, from December 1 through January 31. As an additional conservation measure, in-water work will be limited to the late summer and fall in-water work window, from July 1 to October 31.

8.1 Phase I – Focused Slip 3 Dredging, Capping, and Shoreline Stabilization

Details on the Phase I Removal Action work are presented below in the sequential order of occurrence.

8.1.1 Fish Exclusion

Section 4.6 describes the fish exclusion system that the Contractor will be required to install before dredging can begin. Before the Berth 411 "Plus" dredging can begin, the bubble curtain and mesh lead panels will be installed. Divers will be needed to assist with the installation. Equipment will likely include derricks, barges, and small vessels. The system will require 2 weeks to install.

8.1.2 Dredging of Slip 3 and Berth 414

Sections 4.2 and 4.3 provide design details on the dredging in Slip 3 and north of Berth 414. The dredging work will be coordinated with the existing Slip 3 tenant to minimize disruptions to ongoing operations. The dredging work will be completed sequentially with the Berth 411 "Plus" dredging occurring prior to the Berth 410 dredging work to minimize the likelihood or extent of cross-contamination. This work will be completed with haul barges and an 8 cy clamshell bucket. The work is anticipated to be completed in about 3 weeks. Depending on equipment logistics, the Contractor may dredge 24 hours per day, 7 days per week to complete the Slip 3 dredging work.

8.1.3 Capping and Stabilization

Section 5.1 presents details on the Head of Slip 3 cap design and Section 5.2 presents the Wheeler Bay stabilization design. The majority of the Head of Slip 3 cap work will occur from the water due to poor access conditions from the shore. All of the Wheeler Bay shoreline stabilization work will occur with land-based equipment. These two activities could occur concurrently because they will involve separate crews. The crew and equipment that complete the dredging work will likely do most of the Head of Slip 3 cap work and none of the Wheeler Bay stabilization work.

The Wheeler Bay stabilization work will likely be performed simultaneously with dredging in Slip 3 to minimize tenant impacts related to the rail along Wheeler Bay. When Kinder Morgan shuts down their activities at Berth 410/411, the rail activity adjacent to Wheeler Bay will also be shut down to allow the Contractor better access to the stabilization activities. The Wheeler Bay shoreline stabilization crew and equipment is expected to include bulldozers, excavators, and compactors. The Wheeler Bay shoreline stabilization work is expected to require approximately 5 weeks, depending on the rail schedule impacts.

The Head of Slip 3 capping crew will consist of a clamshell derrick with a 5 to 8 cy bucket. This crew is anticipated to work one shift, 6 days per week. The Head of Slip 3 cap work is expected to last approximately 2 to 3 weeks and to occur simultaneously with the dredging.

8.1.4 Monitoring

Section 7 and Appendix B present details on the water quality monitoring. Water quality monitoring will be conducted as described in Appendix B, generally concurrent with the dredging and Head of Slip 3 capping.

8.2 Phase II – Completion of the Removal Action

Phase II of the T4 Removal Action will complete the 100 percent design in mid-2009, with construction currently anticipated to begin in mid-2010. This schedule is dependent on the current harbor-wide RI/FS and ROD schedule, which are currently anticipated to be completed in 2009 and 2010, respectively.

9 ACCESS AND EASEMENT REQUIREMENTS

As stated in Section IX (Access and Institutional Controls) of the AOC (USEPA 2003b), the Port shall provide USEPA and its representatives, including contractors, with access at all reasonable times to the T4 RAA for the purpose of conducting any activity related to the AOC. The AOC further states that if any portion of the T4 RAA, or any other riparian property where access is needed to implement the Order, is owned by or in the control of someone other than the Port, the Port shall use best efforts to obtain all necessary access for performing and overseeing the work required to be done in the SOW.

The Port owns a majority of the uplands adjacent to the RAA and leases some areas to its tenants. As stated previously in this document, current tenants at T4 are Cereal Food Processors, IRM, Rogers Terminal, and KMBT. As necessary, the Port will develop agreements with Port tenants to coordinate the work for the Removal Action.

Currently, the Port and the Oregon DSL both own portions of the submerged and submersible lands within the RAA. Phase I of the Removal Action will not locate any permanent structures or caps on DSL property.

Before the Removal Action work begins, the Port will provide to USEPA copies of all access agreements with other landowners or lessees for conduct of work on their properties and ensuring that access is provided to the regulatory agencies and other stakeholders as provided in the AOC.

10 IMPACT MINIMIZATION

10.1 Environment

Impacts to the environment will be minimized through the following measures:

- The Contractor will be required to implement BMPs for the construction of different remedial action elements. The required BMPs are defined in the Construction Specifications (Appendix E).
- The Contractor will be required to follow construction quality control measures, and the Port will implement quality assurance procedures to confirm that the work is being constructed as designed. The CQAP defines the different roles the contractor will follow (Appendix A).
- Transportation and offloading measures will be implemented to minimize spillage and accurately track material being hauled and disposed. The transportation and disposal requirements are presented in the Construction Specifications (Appendix E) and in the TDP (Appendix F).
- USEPA will issue a WQCCMP for the project. The WQCCMP will provide water quality requirements that the Contractor will need to follow.
- Water quality monitoring will be implemented to identify if environmental impacts are occurring and contingency plans to be implemented if the monitoring indicates they are warranted. Water quality monitoring is defined in the WQMP (Appendix B).

10.2 Community

RESERVED

11 INSTITUTIONAL CONTROLS

Section IX (Access and Institutional Controls) of the AOC states that "If after the Removal Action is complete, restrictions on the use of the Port's property, including the beds or banks of the slips or Willamette River, is necessary to maintain the Removal Action or avoid exposure to hazardous substances, pollutants, or contaminants, the Port shall take any and all actions to establish, implement, and maintain the necessary institutional controls." To meet this requirement, this section describes the institutional controls that will be implemented after the Phase I Removal Action.

The overall protectiveness of the Phase I Removal Action will be further enhanced by implementation of institutional controls for areas where contaminated sediment is contained in place with caps. The primary objective for the institutional controls is protecting the integrity of the capped surfaces such that the underlying isolated sediments remain isolated.

To meet this objective, regulated navigation areas will be established in capped areas. These areas will also be identified on the Port-maintained T4 base-map that is used for construction/redevelopment activities. Notification to the Port's tenants alerting them to the location of the capped areas will also be implemented to protect the integrity of the capped surfaces. Finally, a property record notice regarding the cap areas will be placed to ensure that future property owners are aware of the capped areas and long-term maintenance and monitoring requirements.

Regulated Navigation Areas – Regulated navigation area (RNA) requests for the Head of Slip 3 cap area will be submitted to the U.S. Coast Guard and/or NOAA after the cap is complete. An RNA designation will prohibit activities such as anchoring, dragging, trawling, or other activities that may disrupt the function or affect the integrity of the cap.

Update the Terminal 4 Base-map – The location of the capped area will be placed on the T4 base-map to alert personnel conducting future construction activities of the capped area. Additionally, a statement requiring coordination with the Port's Marine Environmental

department prior to conducting any construction activities within the footprint of the capped area will also be placed on the base-map. For any engineering design or construction work to be performed at a Port terminal, the design work would start from the base-map. The Port's CAD manager is responsible for maintaining the base-map or the official record of the Port's assets and situation at T4. As such, the base-map is the one appropriate place to secure geographic information that will be available and known for future construction activities.

Notification to Port Tenants – Written notification will be given to the Port's tenants about the presence of the capped area, which will include the following:

- Instructions and maps that show areas where boat and ship traffic should be minimized and anchoring prohibited, including notice of the RNA
- Direction that all proposed work in the vicinity of a cap should be cleared with the Port prior to starting
- Direction that excavation and/or purposeful sediment disturbance shall not be conducted in the capped areas
- Direction that the Port shall be notified in the event of any possible damage to a capped area

Additionally, lease language protecting the integrity of the capped area will be provided for any new tenants that occupy Port property at T4.

Property Record Notice – A notice will be placed in the property record documenting the cap locations and the interim monitoring requirements as stated in the IMRP.

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TABLES

Table 1
Terminal 4 Sediment Quality Guidelines

Substance	PEC	TEC	Draft Portland Harbor Screening (Level 2)
Conventionals (in mg/kg)			
Ammonia	---	---	170
Sulfides	---	---	32
Metals (in mg/kg)			
Arsenic	33	9.79	24
Cadmium	4.98	0.99	2.6
Chromium	111	43.4	---
Copper	149	31.6	562
Lead	128	35.8	---
Silver	---	---	32
Mercury	1.06	0.18	0.63
Nickel	48.6	22.7	---
Zinc	459	121	---
Polycyclic aromatic hydrocarbons (in µg/kg DW)			
Anthracene	845	57.2	---
Fluorene	536	77.4	---
Naphthalene	561	176	---
Phenanthrene	1,170	204	---
Benzo(a)anthracene	1,050	108	---
Benzo(a)pyrene	1,450	150	---
Chrysene	1,290	166	---
Dibenzo(a,h)anthracene	---	33	---
Fluoranthene	2,230	423	---
Pyrene	1,520	195	---
Total PAHs	22,800	1,610	1,270,000
TPH - Diesel Range	---	---	340,000
TPH - Residual Range	---	---	2,700,000
Polychlorinated biphenyls (in µg/kg DW)			
Total PCBs	676	59.8	1,400
Organochlorine pesticides (in µg/kg DW)			
Chlordane	17.6	3.24	---
Dieldrin	61.8	1.9	21.5
Sum DDD	28	4.88	---
Sum DDE	31.3	3.16	---
Sum DDT	62.9	4.16	---
Total DDTs	572	5.28	1,000
Endrin	207	2.22	---
Heptachlor Epoxide	16	2.47	---
Lindane (gamma-BHC)	4.99	2.37	---
beta-Hexachlorocyclohexane	---	---	9.6

Table 2
Terminal 4 Exceedance Ratio by Phase I Remediation Area

Remediation Area: Slip 3

Constituent	Maximum Concentration	PEC	TEC	Maximum PEC Exceedance Ratio	Maximum TEC Exceedance Ratio
Key Polycyclic Aromatic Hydrocarbons (PAHs) (µg/kg)					
Anthracene	15000	845	57.2	17.75	262.24
Fluorene	14000	536	77.4	26.12	180.88
Napthalene	11000	561	176	19.61	62.50
Phenanthrene	74000	1170	204	63.25	362.75
Benz(a)anthracene	81000	1050	108	77.14	750.00
Benzo(a)pyrene	94000	1450	150	64.83	626.67
Chrysene	78000	1290	166	60.47	469.88
Dibenz(a,h)anthracene	25000	---	33	---	757.58
Fluoranthene	130000	2230	423	58.30	307.33
Pyrene	110000	1520	195	72.37	564.10
Total PAHs	868000	22800	1610	38.07	539.13
Key Metals (mg/kg)					
Cadmium	10.1	4.98	0.99	2.03	10.20
Lead	1670	128	35.8	13.05	46.65
Zinc	2050	459	121	4.47	16.94
Other Key Constituents (ug/kg)					
Sum DDD	80	28	4.88	2.86	16.39
Sum DDE	17	31.3	3.16	0.54	5.38
Sum DDT	90	62.9	4.16	1.43	21.63
Total DDTs	158	572	5.28	0.28	29.92
Total PCBs	1000	676	59.8	1.48	16.72

Remediation Area: Berth 414

Constituent	Maximum Concentration	PEC	TEC	Maximum PEC Exceedance Ratio	Maximum TEC Exceedance Ratio
Key Polycyclic Aromatic Hydrocarbons (PAHs) (µg/kg)					
Anthracene	11000	845	57.2	13.02	192.31
Fluorene	9800	536	77.4	18.28	126.61
Napthalene	1100	561	176	1.96	6.25
Phenanthrene	60000	1170	204	51.28	294.12
Benz(a)anthracene	46000	1050	108	43.81	425.93
Benzo(a)pyrene	54000	1450	150	37.24	360.00
Chrysene	60000	1290	166	46.51	361.45
Dibenz(a,h)anthracene	15000	---	33	---	454.55
Fluoranthene	97000	2230	423	43.50	229.31
Pyrene	67000	1520	195	44.08	343.59
Total PAHs	620900	22800	1610	27.23	385.65
Key Metals (mg/kg)					
Cadmium	1.61	4.98	0.99	0.32	1.63
Lead	171	128	35.8	1.34	4.78
Zinc	579	459	121	1.26	4.79
Other Key Constituents (ug/kg)					
Sum DDD	22	28	4.88	0.79	4.51
Sum DDE	15	31.3	3.16	0.48	4.75
Sum DDT	10.5	62.9	4.16	0.17	2.52
Total DDTs	32.2	572	5.28	0.06	6.10
Total PCBs	169	676	59.8	0.25	2.83

Table 3
PEC Elevations for Different Cores Within Berth 410 and Berth 411 "Plus" Dredge Prisms

Station Name	Surface Only?	Mudline Elevation (NGVD)	Bottom of Core (NGVD)	Top Elevation of Deepest Interval (NGVD)			Contamination > 10x PEC Bounded?
				< 20x PEC	< 10x PEC	< 1x PEC	
Phase I Area							
T4-B414-01	N	-21.8	-30.0	-22.8	-22.8	>	Y
T4-PI-01	N	-42.5	-48.5	>	>	>	N
T4-PI-02	N	-35.3	-43.3	>	>	>	N
T4-PI-03	N	-45.6	-53.6	-45.6	-45.6	-46.6	Y
T4-PI-03-2	N	-43.9	-46.4	-43.9	-44.9	>	Y
T4-PI-04	N	-45.8	-49.5	-46.8	-46.8	-48.8	Y
T4-PI-04-2	N	-41.4	-46.4	-44.4	-44.4	-45.4	Y
T4-PI-07	N	-47.0	-49.8	-47.0	-47.0	>	Y
T4-PI-08	N	-38.8	-44.5	-38.8	-41.8	>	Y
T4-PI-09	N	-10.0	-12.1	-10.0	-10.0	>	Y
T4-B411-02[2]	N	-38.8	-41.0	-39.8	-39.8	>	Y
T4-B411-03[2]	N	-40.1	-47.6	-42.1	-42.1	-42.1	Y
T4-B411-04[2]	N	-40.3	-47.3	-42.3	-42.3	-42.3	Y
T4-S3-04	N	-46.7	-54.8	-47.7	-47.7	-49.7	Y
T4-VC24	N	-46.3	-55.9	-49.3	-49.3	-49.3	Y
SD032	Y	-31.3	NA	>	>	>	N
HC-S-01	Y	-44.3	NA	>	>	>	N
HC-S-02	Y	-36.1	NA	>	>	>	N
HC-S-03	Y	-23.9	NA	>	>	>	N
HC-S-08	Y	-41.9	NA	-41.9	-41.9	>	Y
HS-S-19	Y	-38.3	NA	>	>	>	N
Berth 410 Maintenance Dredging Area							
T4-01-01	N	-35.3	-43.3	-40.3	-40.3	-40.3	Y
T4-01-02	N	-38.3	-43.3	-40.3	-40.3	-42.3	Y
T4-01-03	N	-38.3	-40.8	-40.3	-40.3	>	Y
T4-B411-01	N	-39.8	-41.5	-39.8	-39.8	>	Y
T4-MD-01	N	-37.9	-41.2	-37.9	-37.9	>	Y
T4-MD-02	N	-37.2	-42.0	-37.2	-37.2	-37.2	Y
HC-S-30	Y	-43.4	NA	-43.2	-43.2	>	Y
HC-S-35	Y	-39.2	NA	-39.2	-39.2	>	Y
HC-S-37	Y	-39.8	NA	-39.8	-39.8	-39.8	Y

Note:

1. > indicates that no intervals at the location were less than the column's criteria
2. Archive sample results have not been received from the laboratory. These elevations may shallow based on the archived data.

Table 4
Import Material Chemical Goals

Chemical Name	Proposed Borrow Source Criteria	TEC	Quarry A		Quarry B	
Metals (mg/kg)						
Arsenic	9.79	9.79	**0.5**		**1.1**	
Cadmium	0.99	0.99	0.2	U	0.2	U
Chromium	43.4	43.4	**6.8**		**4.1**	
Cobalt	NC	NC	**14.8**		**4.5**	
Copper	31.6	31.6	**10.8**		**9.5**	
Iron	39,600	NC	**39,600**		**11,800**	
Lead	35.8	35.8	**2**		**1.3**	
Mercury	0.18	0.18	0.05	U	0.05	U
Nickel	22.7	22.7	**2.7**		**6.2**	
Selenium	Standard Method of Detection	NC	0.5	U	0.5	U
Silver	Standard Method of Detection	NC	0.2	U	0.2	U
Zinc	121	121	**47**		**27**	
PCBs (µg/kg)						
Aroclor 1016	Standard Method of Detection	NC	3.8	U	3.9	U
Aroclor 1221	Standard Method of Detection	NC	3.8	U	3.9	U
Aroclor 1232	Standard Method of Detection	NC	3.8	U	3.9	U
Aroclor 1242	Standard Method of Detection	NC	3.8	U	3.9	U
Aroclor 1248	Standard Method of Detection	NC	3.8	U	3.9	U
Aroclor 1254	Standard Method of Detection	NC	3.8	U	3.9	U
Aroclor 1260	Standard Method of Detection	NC	3.8	U	3.9	U
Aroclor 1262	Standard Method of Detection	NC	3.8	U	3.9	U
Aroclor 1268	Standard Method of Detection	NC	3.8	U	3.9	U
Total PCBs	59.8	59.8	3.8	U	3.9	U
Pesticides (µg/kg)						
2,4'-DDD	Standard Method of Detection	NC	2	U	2	U
2,4'-DDE	Standard Method of Detection	NC	2	U	2	U
2,4'-DDT	Standard Method of Detection	NC	2	U	2	U
4,4'-DDD	4.88	4.88	2	U	2	U
4,4'-DDE	3.16	3.16	2	U	2	U
4,4'-DDT	4.16	4.16	2	U	2	U
Total DDTs	5.28	5.28	2	U	2	U
Aldrin	Standard Method of Detection	NC	0.98	U	0.99	U
alpha-BHC	Standard Method of Detection	NC	0.98	U	0.99	U
alpha-Chlordane	Standard Method of Detection	NC	0.98	U	0.99	U
beta-BHC	Standard Method of Detection	NC	0.98	U	0.99	U
beta-Chlordane	Standard Method of Detection	NC	0.98	U	0.99	U
Camphechlor	Standard Method of Detection	NC	98	U	99	U
cis-Nonachlor	Standard Method of Detection	NC	2	U	2	U
delta-BHC	Standard Method of Detection	NC	0.98	U	0.99	U
Dieldrin	Standard Method of Detection	1.9	2	U	2	U
Endosulfan I	Standard Method of Detection	NC	0.98	U	0.99	U
Endosulfan II	Standard Method of Detection	NC	2	U	2	U
Endosulfan Sulfate	Standard Method of Detection	NC	2	U	2	U
Endrin	2.22	2.22	2	U	2	U

Table 4
Import Material Chemical Goals

Chemical Name	Proposed Borrow Source Criteria	TEC	Quarry A		Quarry B	
Endrin aldehyde	Standard Method of Detection	NC	2	U	2	U
Endrin ketone	Standard Method of Detection	NC	2	U	2	U
gamma-BHC (Lindane)	2.37	2.37	0.98	U	0.99	U
Heptachlor	Standard Method of Detection	NC	0.98	U	0.99	U
Heptachlor Epoxide	2.47	2.47	0.98	U	0.99	U
Hexachlorobenzene	Standard Method of Detection	NC	0.98	U	0.99	U
Hexachlorobutadiene	Standard Method of Detection	NC	0.98	U	0.99	U
Methoxychlor	Standard Method of Detection	NC	9.8	U	9.9	U
Oxychlordane	Standard Method of Detection	NC	2	U	2	U
trans-Nonachlor	Standard Method of Detection	NC	2	U	2	U
SVOC (µg/kg)						
1-Methylnaphthalene	Standard Method of Detection	NC	4.8	UJ	5	UJ
2-Methylnaphthalene	Standard Method of Detection	NC	4.8	U	5	U
Acenaphthene	Standard Method of Detection	NC	4.8	U	5	U
Acenaphthylene	Standard Method of Detection	NC	4.8	U	5	U
Anthracene	57.2	57.2	4.8	U	5	U
Benzo(a)anthracene	108	108	4.8	U	5	U
Benzo(a)pyrene	150	150	4.8	U	5	U
Benzo(b)fluoranthene	Standard Method of Detection	NC	4.8	U	5	U
Benzo(g,h,i)perylene	Standard Method of Detection	NC	4.8	U	5	U
Benzo(k)fluoranthene	Standard Method of Detection	NC	4.8	UJ	5	UJ
bis(2-Ethylhexyl)phthalate	Standard Method of Detection	NC	22	U	12	U
Butylbenzylphthalate	Standard Method of Detection	NC	4.8	U	5	U
Chrysene	166	166	4.8	UJ	5	UJ
Dibenzo(a,h)anthracene	33.0	33.0	4.8	UJ	5	UJ
Dibenzofuran	Standard Method of Detection	NC	4.8	U	5	U
Diethylphthalate	10	NC	**10**		5	U
Dimethylphthalate	Standard Method of Detection	NC	4.8	U	5	U
Di-n-butylphthalate	12	NC	**12**		**5**	
Di-n-octylphthalate	Standard Method of Detection	NC	4.8	U	5	U
Fluoranthene	423	423	4.8	U	5	U
Fluorene	77.4	77.4	4.8	U	5	U
Hexachlorobenzene	Standard Method of Detection	NC	0.98	U	0.99	U
Indeno(1,2,3-cd)pyrene	Standard Method of Detection	NC	4.8	UJ	5	UJ
Phenanthrene	204	204	4.8	UJ	5	UJ
Pyrene	195	195	4.8	U	5	U
Total PAHs	1610	1610	4.8	U	5	U
TPH (mg/kg)						
TPH - Residual Range	17	NC	**17**		12	U
TPH - Diesel Range	Standard Method of Detection	NC	5.1	U	6.1	U
VOC (µg/kg)						
1,1,1,2-Tetrachloroethane	Standard Method of Detection	NC	1	U	1.1	U
1,1,1-Trichloroethane	Standard Method of Detection	NC	1	U	1.1	U
1,1,2,2-Tetrachloroethane	Standard Method of Detection	NC	1	U	1.1	U
1,1,2-Trichloroethane	Standard Method of Detection	NC	1	U	1.1	U

Table 4
Import Material Chemical Goals

Chemical Name	Proposed Borrow Source Criteria	TEC	Quarry A		Quarry B	
1,1,2-Trichlorotrifluoroethane	Standard Method of Detection	NC	2.1	U	2.2	U
1,1-Dichloroethane	Standard Method of Detection	NC	1	U	1.1	U
1,1-Dichloroethene	Standard Method of Detection	NC	1	U	1.1	U
1,1-Dichloropropene	Standard Method of Detection	NC	1	U	1.1	U
1,2,3-Trichlorobenzene	Standard Method of Detection	NC	5.2	U	5.4	U
1,2,3-Trichloropropane	Standard Method of Detection	NC	2.1	U	2.2	U
1,2,4-Trichlorobenzene	Standard Method of Detection	NC	5.2	U	5.4	U
1,2,4-Trimethylbenzene	Standard Method of Detection	NC	1	U	1.1	U
1,2-Dibromo-3-chloropropane	Standard Method of Detection	NC	5.2	U	5.4	U
1,2-Dibromoethane	Standard Method of Detection	NC	1	U	1.1	U
1,2-Dichlorobenzene	Standard Method of Detection	NC	1	U	1.1	U
1,2-Dichloroethane	Standard Method of Detection	NC	1	U	1.1	U
1,2-Dichloropropane	Standard Method of Detection	NC	1	U	1.1	U
1,3,5-Trimethylbenzene	Standard Method of Detection	NC	1	U	1.1	U
1,3-Dichlorobenzene	Standard Method of Detection	NC	1	U	1.1	U
1,3-Dichloropropane	Standard Method of Detection	NC	1	U	1.1	U
1,4-Dichlorobenzene	Standard Method of Detection	NC	1	U	1.1	U
2,2-Dichloropropane	Standard Method of Detection	NC	1	U	1.1	U
2-Butanone (MEK)	Standard Method of Detection	NC	5.2	U	5.4	U
2-Chloroethylvinylether	Standard Method of Detection	NC	5.2	U	5.4	U
2-Chlorotoluene	Standard Method of Detection	NC	1	U	1.1	U
2-Hexanone	Standard Method of Detection	NC	5.2	U	5.4	U
4-Chlorotoluene	Standard Method of Detection	NC	1	U	1.1	U
4-Isopropyltoluene	Standard Method of Detection	NC	1	U	1.1	U
4-Methyl-2-pentanone (MIBK)	Standard Method of Detection	NC	5.2	U	5.4	U
Acetone	Standard Method of Detection	NC	7.6	U	6.9	U
Acrolein	Standard Method of Detection	NC	52	U	54	U
Acrylonitrile	Standard Method of Detection	NC	5.2	U	5.4	U
Benzene	Standard Method of Detection	NC	1	U	1.1	U
Bromobenzene	Standard Method of Detection	NC	1	U	1.1	U
Bromodichloromethane	Standard Method of Detection	NC	1	U	1.1	U
Bromoethane	Standard Method of Detection	NC	2.1	U	2.2	U
Bromoform	Standard Method of Detection	NC	1	U	1.1	U
Bromomethane	Standard Method of Detection	NC	1	U	1.1	U
Carbon disulfide	Standard Method of Detection	NC	1	U	1.1	U
Carbon tetrachloride	Standard Method of Detection	NC	1	U	1.1	U
Chlorobenzene	Standard Method of Detection	NC	1	U	1.1	U
Chloroethane	Standard Method of Detection	NC	1	U	1.1	U
Chloroform	Standard Method of Detection	NC	1	U	1.1	U
Chloromethane	Standard Method of Detection	NC	1	U	1.1	U
cis-1,2-Dichloroethene	Standard Method of Detection	NC	1	U	1.1	U
cis-1,3-Dichloropropene	Standard Method of Detection	NC	1	U	1.1	U
Dibromochloromethane	Standard Method of Detection	NC	1	U	1.1	U
Dibromomethane	Standard Method of Detection	NC	1	U	1.1	U
Dichloromethane	Standard Method of Detection	NC	2.2	U	2.9	U

Table 4
Import Material Chemical Goals

Chemical Name	Proposed Borrow Source Criteria	TEC	Quarry A		Quarry B	
Dichlorodifluoromethane	Standard Method of Detection	NC	1	U	1.1	U
Ethylbenzene	Standard Method of Detection	NC	1	U	1.1	U
Hexachlorobutadiene	Standard Method of Detection	NC	0.98	U	0.99	U
Iodomethane	Standard Method of Detection	NC	1	U	1.1	U
m,p-Xylenes	Standard Method of Detection	NC	1	U	1.1	U
Naphthalene	176	176	4.8	U	5	U
n-Butylbenzene	Standard Method of Detection	NC	1	U	1.1	U
n-Propylbenzene	Standard Method of Detection	NC	1	U	1.1	U
o-Xylene	Standard Method of Detection	NC	1	U	1.1	U
sec-Butylbenzene	Standard Method of Detection	NC	1	U	1.1	U
Styrene	Standard Method of Detection	NC	1	U	1.1	U
tert-Butylbenzene	Standard Method of Detection	NC	1	U	1.1	U
Tetrachloroethene	Standard Method of Detection	NC	1	U	1.1	U
Toluene	Standard Method of Detection	NC	1	U	1.1	U
trans-1,2-Dichloroethene	Standard Method of Detection	NC	1	U	1.1	U
trans-1,3-Dichloropropene	Standard Method of Detection	NC	1	U	1.1	U
trans-1,4-Dichloro-2-butene	Standard Method of Detection	NC	5.2	U	5.4	U
Trichloroethene	Standard Method of Detection	NC	1	U	1.1	U
Trichlorofluoromethane	Standard Method of Detection	NC	1	U	1.1	U
Vinyl Acetate	Standard Method of Detection	NC	5.2	U	5.4	U
Vinyl chloride	Standard Method of Detection	NC	1	U	1.1	U

Notes:
NC = No criteria available or proposed
U = not detected
UJ = not detected at estimated concentration
TEC = Threshold Effects Concentration
Bold = Detected

Table 5
Water Quality Criteria and Guidelines

Parameter	Units	Narrative Standard[1]	Acute WQC[2]	Chronic WQC[3]	Willamette River BG[4]	Acute Guidance Value[5]	Chronic Guidance Value[5]
Conventional Parameters							
Turbidity	NTU	BG <50 NTU: BG + 5 NTU BG >50 NTU: BG + 5%	--	--	27	--	--
Total Suspended Solids (TSS)	mg/L	--	--	--	49	--	--
Dissolved Oxygen (DO)	mg/L	> 6.5	--	--	TBD	--	--
Metals[6]							
Cadmium	µg/L	--	0.5	0.09	0.05	--	--
Lead	µg/L	--	14	0.54	0.14	--	--
Zinc	µg/L	--	36	36	TBD	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)							
Naphthalene	µg/L	--	--	--	TBD	807	194
Acenaphthylene	µg/L	--	--	--	TBD	1277	307
Acenaphthene	µg/L	--	--	--	TBD	233	56
Fluorene	µg/L	--	--	--	TBD	162	39
Phenanthrene	µg/L	--	--	--	TBD	79	19
Anthracene	µg/L	--	--	--	TBD	87	21
Fluoranthene	µg/L	--	--	--	TBD	30	7.1
Pyrene	µg/L	--	--	--	TBD	42	10
Benzo(a)anthracene	µg/L	--	--	--	TBD	9.2	2.2
Chrysene	µg/L	--	--	--	TBD	8.3	2.0
Benzo(b)fluoranthene	µg/L	--	--	--	TBD	2.8	0.68
Benzo(k)fluoranthene	µg/L	--	--	--	TBD	2.7	0.64
Benzo(a)pyrene	µg/L	--	--	--	TBD	4.0	0.96
Indeno(1,2,3-cd)pyrene	µg/L	--	--	--	TBD	1.2	0.28
Dibenzo(a,h)anthracene	µg/L	--	--	--	TBD	1.2	0.28
Benzo(g,h,i)perylene	µg/L	--	--	--	TBD	1.8	0.44

Notes:
[1] Applies to all construction activities
[2] Compliance criterion during dredging and capping activities
[3] Trigger for construction BMPs during dredging and capping activities
[4] Initial values determined from USGS Station #14211720; to be updated with pre-construction measurements at Terminal 4
[5] Final Acute Values and Final Chronic Values from USEPA 2003
[6] Based on Willamette River hardness of 25 mg/L
TBD = To be determined based on results of background monitoring program

Table 6
Ambient Background Concentrations WIlliamette River Portland

	Median	Mean	90th Percentile
Conventionals			
Turbidity (NTU) [1]	4.6	10	27
TSS (mg/L) [1]	12	24	49
Metals (µg/L)			
Cadmium [2]	<0.04	<0.04	0.05
Lead [2]	0.07	0.08	0.14
Zinc	TBD	TBD	TBD

Notes:

[1] 1974-2000, USGS Station #14211720

[2] 2004-2005, USGS Station #14211720

Table 7
DRET Elutriate Chemistry Results

Sample ID Lab ID Date Sampled	Acute Water Quality Value	Chronic Water Quality Value	Regional Background Concentrations[1]	T4-CM1-Dret K2402978-004 04/20/2004		T4-CM2-Dret K2403382-001 05/05/2004	
Metals (µg/L)							
Arsenic	340	150	2	0.9		0.8	
Cadmium	0.5	0.09	<1	0.02	U	0.04	U
Chromium	183	24	1	1.11		1.77	
Copper	3.6	2.7	9	5.08		4.25	
Lead	14	0.54	13.3	1.63		1.86	
Mercury	1.4	0.77	<0.1	0.2	U	0.2	U
Nickel	145	16	5.5	1.3		1.65	
Selenium			0.2	0.7	U	0.4	B
Silver	0.3		<1	0.03	U	0.03	
Zinc	36	36	38	5.62		6.7	
Semivolatile Organics (µg/L)							
Naphthalene	807	194		0.40	U	0.39	U
2-Methylnaphthalene	300			0.40	U	0.39	U
1-Methylnaphthalene	312			0.40	U	0.39	U
Biphenyl				0.40	U	0.39	U
2,6-Dimethylnaphthalene	108			0.40	U	0.39	U
Acenaphthylene	1,277	307		0.40	U	0.099	J
Acenaphthene	233	56		0.40	U	0.19	J
2,3,5-Trimethylnaphthalene	41			0.40	U	0.027	J
Fluorene	162	39		0.40	U	0.096	J
Phenanthrene	79	19		0.40	U	0.13	J
Anthracene	87	21		0.40	U	0.39	U
1-Methylphenanthrene	31			0.40	U	0.39	U
Fluoranthene	30	7.1		0.40	U	0.092	J
Pyrene	42	10		0.075	J	0.13	J
Benz(a)anthracene	9.2	2.2		0.40	U	0.39	U
Chrysene	8.3	2.0		0.40	U	0.39	U
Benzo(b)fluoranthene	2.8	0.68		0.40	U	0.39	U
Benzo(k)fluoranthene	2.7	0.64		0.40	U	0.39	U
Benzo(e)pyrene	3.7			0.40	U	0.39	U
Benzo(a)pyrene	4.0	0.96		0.40	U	0.39	U
Perylene	3.7			0.40	U	0.39	U
Indeno(1,2,3-cd)pyrene	1.2	0.28		0.40	U	0.39	U
Dibenz(a,h)anthracene	1.2	0.28		0.40	U	0.39	U
Benzo(g,h,i)perylene	1.8	0.44		0.40	U	0.39	U
Dimethyl phthalate				9.9	U	9.6	UJ
Diethyl phthalate				9.9	U	9.6	U
Di-n-butyl phthalate				9.9	U	9.6	U
Butylbenzyl phthalate				9.9	U	9.6	U
Bis(2-ethylhexyl) phthalate				9.9	U	9.6	U
Di-n-octyl phthalate				9.9	U	9.6	U
Total PAHs				0.075	J	0.737	J
Pesticides (µg/L)							
4,4'-DDE				0.099	U	0.097	U
4,4'-DDD				0.099	U	0.097	U
4,4'-DDT	1.1	0.001		0.099	U	0.097	U
2,4'-DDE				0.099	U	0.097	U
2,4'-DDD				0.099	U	0.097	U
2,4'-DDT				0.099	U	0.097	U

Table 7
DRET Elutriate Chemistry Results

Sample ID Lab ID Date Sampled	Acute Water Quality Value	Chronic Water Quality Value	Regional Background Concentrations[1]	T4-CM1-Dret K2402978-004 04/20/2004		T4-CM2-Dret K2403382-001 05/05/2004	
Total DDD				0.099	U	0.097	U
Total DDE				0.099	U	0.097	U
Total DDT				0.099	U	0.097	U
ΣDDTs	1.1	0.001		0.099	U	0.097	U
PCBs (µg/L)							
Aroclor 1016				0.099	U	0.097	U
Aroclor 1221				0.099	U	0.097	U
Aroclor 1232				0.099	U	0.097	U
Aroclor 1242				0.099	U	0.097	U
Aroclor 1248				0.099	U	0.097	U
Aroclor 1254				0.099	U	0.097	U
Aroclor 1260				0.099	U	0.097	U
Aroclor 1262				0.099	U	0.097	U
Aroclor 1268				0.099	U	0.097	U
Total PCBs	2	0.014		0.099	U	0.097	U
Petroleum Hydrocarbons (µg/L)							
Diesel Range Organics (DRO)				250	U	250	U
Residual Range Organics (RRO)				57	J	500	U
Conventionals (mg/L)							
Total suspended solids				5	U	5	U
Ammonia as Nitrogen				0.57		0.68	
Total Sulfide				0.05	U	0.05	U

Notes:

U = Analyte not detected above the reporting limit.

J = Analyte was positively identified; associated concentration is an estimated value.

UJ = Analyte not detected above the reporting limit. Reporting limit is approximate.

B = Analyte was also detected in method blank.

1. Orgeon DEQ Memorandum "Default Background Concentrations for Metals" dated October 28, 2002, Table 1

Table 8
DREDGE Model Input Parameters

	Typical	Worst Case	Units	Data Sources/References
Mechanical Dredging Parameters				
Open Bucket Size	6.2	6.2	m^3	Source: Manson
Cycle Time	150	150	sec	Source: Manson (average cycle time)
(Average) Settling Velocity	0.00423	0.00423		Calculated by model based on particle sizes
In-situ dry density	700	700	kg/m^3	Source: Typical for recently deposited sediments
Near-field TSS Model				
User Estimate (Mechanical)	5.00	10.00	% loss	Hayes and Wu, 2001; Anchor, 2003
Far-field TSS Models				
Kuo's Model				
Lateral diffusion coefficient	100000	100000	cm^2/s	Model default value
Vertical diffusion coefficent	10	10	cm^2/s	Model default value
(Average) settling velocity	0.00423	0.00423	m/s	Calculated by model based on particle sizes
Downstream locations (for output)	150	150	m	To determine TSS at point of compiance
Downstream step	5	5	m	
Lateral locations (for output)	100	100	m	
Lateral step	5	5	m	
Desired water depth (for output)	0	0	m	
Site Characteristics				
Water depth (Mechanical dredge areas)	3.5	3.5	m	Shallowest dredge depth in Berth 414
Ambient Water Velocity (Mechanical)	0.01	0.15	m/s	Source: EE/CA Figure G-1. From head of Slip 3 (0.01) to Harbor line (0.15).
Mean particle size	74	74	um	Source: (review of geotech data)
Specific gravity of sediment	2.64	2.64	g/cm^3	Source: Used Values from COMP-2
Fraction of particles < 74um	0.667	0.667	%	Source: Used Values from COMP-2
Fraction of particles < 5um	0.331	0.331	%	Source: Used Values from COMP-2

Table 9
ARARs for Shoreline Stabilization, Capping, and Dredging and Disposal

Regulation			
Federal ARARs			
Clean Water Act, Section 404	33 USC 1344 33 CFR Parts 320-323 40 CFR 230	Regulates discharge of dredged and fill material into waters of the United States. Action specific—potentially applicable to dredging, covering, capping, and construction of in-water disposal facility and in-water filling activities in the Willamette River.	Appendix Q of the EE/CA provides a preliminary draft 404(b)(1) evaluation and concludes there is a need for compensatory mitigation due to the permanent loss of aquatic habitat. Conceptual Compensatory Mitigation Plan and Draft Mitigation Plan identify mitigation actions to offset losses of aquatic habitat. Biological Assessment and Water Quality Monitoring Plan (WQMP, Appendix B of the DAR) address action-specific BMPs to minimize short-term water quality impacts due to discharges.
Clean Water Act, Ambient Water Quality Criteria	33 USC 1313, 1314 40 CFR Part 131	Provides minimum standards for water quality programs established by states. Two kinds of water quality criteria exist: one for protection of human health, and one for protection of aquatic life. Chemical-specific; action-specific—potentially relevant and appropriate to activities that may result in a discharge or affect waters of the State resulting from the implementation of the Removal Action.	Section 6.0 of the DAR, Water Quality addresses water quality details related to the Removal Action. The WQMP details water quality monitoring activities by construction action and details ambient water quality criteria as exceedance triggers. The WQMP will be consistent with the Water Quality Monitoring and Compliance Conditions Plan that will be issued by EPA prior to Removal Action construction. Biological Assessment and WQMP address action-specific BMPs to minimize short-term water quality impacts due to Removal Action construction activities.
Clean Water Act, Section 401	33 USC 1341 40 CFR Section 121.2(a)(3) and (4)	Applies to any federally authorized activity that may result in any discharge into navigable waters and requires that such discharge comply with applicable provisions of sections 1311, 1312, 1313, 1316, and 1317 of the CWA. Action-specific—potentially applicable to discharges into the river (i.e., during dredging and capping activities) resulting from implementation of the Removal Action.	Section 6.0 of the DAR, Water Quality addresses water quality details related to the Removal Action. The WQMP details water quality monitoring activities by construction action and identifies criteria that must be met during construction. The WQMP will be consistent with the Water Quality Monitoring and Compliance Conditions Plan that will be issued by EPA prior to Removal Action construction. This EPA-issued document is analogous to a CWA Section 401 Water Quality Certification.
Resource Conservation and Recovery Act	40 CFR 260, 261	Establishes identification and management standards for solid and hazardous waste. Action-specific—Potentially applicable to characterizing wastes generated from the action and designated for off-site disposal.	Sediment testing is being performed to determine if any sediment is characteristically hazardous for toxicity per 40 CFR 261.24. Sediment and wastes generated from the Phase I Removal Action will be managed at permitted disposal facilities.

Table 9
ARARs for Shoreline Stabilization, Capping, and Dredging and Disposal

Regulation	Citation	Criterion/Standard and Applicability	Compliance Reference
Fish and Wildlife Coordination Act Requirements	16 USC 662, 663 40 CFR 6.302(g)	Requires federal agencies to consider effects on fish and wildlife from projects that may alter a body of water and mitigate or compensate for project-related losses. Action-specific—Potentially applicable to determining appropriate mitigation for effects on fish and wildlife from performance of the removal action.	The Biological Assessment details potential impacts of the Removal Action on ESA-listed fish and wildlife species and construction BMPs and conservation measures that will be implemented to minimize potential impacts.
Magnuson-Stevens Fishery Conservation and Management Act	50 CFR Part 600	Evaluation of impacts to Essential Fish Habitat (EFH) is necessary for activities that may aversely affect EFH. Location-specific—Potentially applicable if the Removal Action may adversely affect EFH.	The Biological Assessment provides an evaluation of EFH impacts related to Removal Action construction activities.
National Historic Preservation Act	16 USC 470 et seq. 36 CFR Part 800	Requires the identification of historic properties potentially affected by the agency undertaking, and assessment of the effects on the historic property and seek ways to avoid, minimize or mitigate such effects. Historic property is any district, site, building, structure, or object included in or eligible for the National Register of Historic Places, including artifacts, records, and material remains related to such a property. Action-specific—potentially applicable if historic properties are potentially affected by the Removal Action.	The Archeological Monitoring Protocol for the Terminal 4 site is provided as an appendix to the CQAP (Appendix A of the DAR) and details process for identifying whether or not existing structures identified for demolition are historic properties and protocol to follow for compliance with this act.
Archeological and Historic Preservation Act	16 USC 469a-1	Provides for the preservation of historical and archeological data that may be irreparably lost as a result of a federally-approved project and mandates only preservation of the data Action-specific—potentially applicable if historical and archeological data may be irreparably lost by implementation of the Removal Action.	The Archeological Monitoring Protocol for the Terminal 4 site is provided as an appendix to the CQAP (Appendix C of the DAR) and details protocol for conducting ground disturbing activities in archeologically sensitive areas of Terminal 4. Given the highly disturbed condition of the RAA from prior excavation, dredging and filling, removal actions and sampling, it is not expected that historical and archeological resources will be encountered.

Table 9
ARARs for Shoreline Stabilization, Capping, and Dredging and Disposal

Regulation	Citation	Criterion/Standard and Applicability	Compliance Reference
Native American Graves Protection and Reparation Act	25 USC 3001-3013 43 CFR 10	Requires Federal agencies and museums which have possession of or control over Native American cultural items (including human remains associated and unassociated funerary items, sacred objects and objects of cultural patrimony) to compile an inventory of such items. Prescribes when such Federal agencies and museums must return Native American cultural items. "Museums" are defined as any institution or State or local government agency that received Federal funds and has possession of, or control over, Native American cultural items. Location-specific; Action-specific—if Native American cultural items are present on property belonging to the Oregon Department of State Lands that is a part of the RAA, this requirement is potentially applicable. If Native American cultural items are collected by an entity which is either a federal agency or museum, then the requirements of the law are potentially applicable.	The Archeological Monitoring Protocol for the Terminal 4 site is provided as an appendix to the CQAP (Appendix A of the DAR) and details protocol for conducting ground disturbing activities in archeologically sensitive areas of Terminal 4. Given the highly disturbed condition of the RAA from prior excavation, dredging and filling, removal actions and sampling, it is not expected that historical and archeological resources will be encountered.
Endangered Species Act	16 USC 1531 et seq.	Actions authorized, funded, or carried out by federal agencies may not jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their critical habitats. Agencies are to avoid jeopardy or take appropriate mitigation measures to avoid jeopardy. Action-specific—potentially applicable due to potential impacts the Removal Action may have on endangered or threatened species or critical habitat present at the site or that may be affected by the action.	The Biological Assessment details potential impacts of the Removal Action on ESA-listed fish and wildlife species and designated critical habitat. The assessment also details construction BMPs and conservation measures that will be implemented to minimize potential impacts such that the Removal Action activities do no jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their critical habitats.
Executive Order for Wetlands Protection	Executive Order 11990 (1977)	Requires measures to avoid adversely impacting wetlands whenever possible,	No wetlands will be affected by the Removal Action.

Table 9
ARARs for Shoreline Stabilization, Capping, and Dredging and Disposal

Regulation	Citation	Criterion/Standard and Applicability	Compliance Reference
	40 CFR 6.302 (a) 40 CFR Part 6, App. A	minimize wetland destruction, and preserve the value of wetlands. Location-specific—potentially relevant and appropriate in assessing impacts to wetlands, if any, from the Removal Action and for developing appropriate compensatory mitigation for the project.	
Rivers and Harbors Act	33 USC 403 33 CFR 320-330	Section 10 prohibits the unauthorized obstruction or alteration of any navigable water. Structures or work in, above, or under navigable waters are regulated under Section 10. Action-specific—potentially applicable to capping.	Appendix Q of the EE/CA contains a Draft 404(b)(1) Analysis Memorandum, which evaluates the Removal Action's potential impact on the aquatic environment. Additionally, the Biological Assessment details potential impacts of the Removal Action on ESA-listed fish and wildlife species and construction BMPs and conservation measures that will be implemented to minimize potential impacts.
Migratory Bird Treaty Act	16 USC 703-702 50 CFR 10.12	Makes it unlawful to take, import, export, possess, buy, sell purchase, or barter any migratory bird. "Take" is defined as pursuing, hunting, shooting, poising, wounding, killing, capturing, trapping and collecting. Action-specific—potentially relevant and appropriate to short-term impacts, if any, on migratory birds from Removal Action activities.	The Biological Assessment addresses potential impacts of the Removal Action to bald eagles. No short-term impacts are expected to other migratory birds from the Removal Action construction activities.
State ARARs			
Hazardous Waste Regulations	ORS 466.005-225, OAR 340-101-0033	Federally authorized state of Oregon hazardous waste identification and management program that operates in lieu of the base federal program. (Oregon: Final Authorization of State Hazardous Waste Management Program – Revisions September 10, 2002, 67 *Fed. Reg.* 57337 and June 26, 2006, 71 *Fed. Reg.* 36216). Chemical-specific—Potentially applicable to	TCLP testing will be performed to identify hazardous waste prior to off-site disposal. Although not expected, the Port will comply with generator requirements for any identified hazardous waste. The Sediment Acceptance Criteria Technical Memorandum details sediment exclusions, including characteristic hazardous waste as defined by hazardous waste criteria. TCLP testing will be required for determining hazardous waste designations.

Table 9
ARARs for Shoreline Stabilization, Capping, and Dredging and Disposal

Regulation	Citation	Criterion/Standard and Applicability	Compliance Reference
		characterizing wastes generated from the action, and determining appropriate off-site disposal options.	
Oregon Hazardous Substance Remedial Action Law and Regulations	ORS 465.315; OAR 340-122-0040, 0045, 0070, 0115.	Establishes cleanup objectives and criteria applicable to hazardous substances. Includes requirements applicable to removal actions that are patterned after CERCLA; enforces criteria very similar to those required by the National Contingency Plan, only substantive provisions more stringent or broader in scope than CERCLA are ARARs. Chemical-specific; Action-specific—potentially applicable to extent substantive criteria or requirements are more stringent or broader in scope than federal law.	Design Analysis Report provides cleanup objectives and criteria applicable to hazardous substances as well as the CQAP (Appendix A of the DAR).
State Removal Fill Law and Regulations	ORS 274.040, 0.43,.922, .944 OAR 141-85-0115, 0121, 0126, 0136, 0141, 0151 and 0171	Regulates activities associated with removal and fill operations in state waters, including requirements for wetland mitigation. Action-specific—potentially relevant and appropriate to the proposed dredging and capping.	The Biological Assessment details potential impacts of the Removal Action on ESA-listed fish and wildlife species and construction BMPs and conservation measures that will be implemented to minimize potential impacts. The Water Quality Monitoring Plan (Appendix B of the DAR) addresses action-specific BMPs to minimize short-term water quality impacts due to Removal Action construction activities. The Draft Mitigation Plan details mitigation actions that will be implemented to off-set loss of aquatic habitat from the Removal Action construction activities.
Certification of Compliance with Water Quality Requirements and Standards	ORS 468b.035	Provides that federally-approved activities that may result in a discharge to waters of the State require an evaluation of whether the activity may proceed and meet water quality standards. Certifications may be approved with conditions, which if met, will ensure that water quality standards are met. Chemical-specific—potentially applicable to implementation of the removal action (e.g., dredging and capping) that may result in a discharge to waters of the State.	Section 6.0 of the DAR, Water Quality addresses water quality details related to the Removal Action. The Water Quality Monitoring Plan (WQMP; Appendix B of the DAR) details water quality monitoring activities by construction action and identifies criteria that must be met during construction. The WQMP will be consistent with the Water Quality Monitoring and Compliance Conditions Plan that will be issued by EPA prior to Removal Action construction. Additionally, the WQMP and Biological Assessment address action-specific BMPs to minimize short-term water quality

Table 9
ARARs for Shoreline Stabilization, Capping, and Dredging and Disposal

Regulation	Citation	Criterion/Standard and Applicability	Compliance Reference
			impacts due to Removal Action construction activities.
State Water Quality Standards	ORS 468B.048; OAR Ch 340 Div 41	Provides Willamette Basin beneficial uses and establishes water quality standards and criteria to protect beneficial uses. Chemical-specific; Action-specific—potentially applicable to actions that may result in a discharge to or affect waters of the State; certain criteria may be potentially relevant and appropriate as performance standards and/or for long-term monitoring of surface water quality in the Removal Action Area.	Section 6.0 of the DAR, Water Quality addresses water quality details related to the Removal Action. The Water Quality Monitoring Plan (WQMP; Appendix B of the DAR) details water quality monitoring activities by construction action and identifies criteria that must be met during construction. The WQMP will be consistent with the Water Quality Monitoring and Compliance Conditions Plan that will be issued by EPA prior to Removal Action construction. Additionally, the WQMP and Biological Assessment address action-specific BMPs to minimize short-term water quality impacts due to Removal Action construction activities.
Indian Graves and Protected Objects	ORS 97.740-760	Prohibits willful removal of cairn, burial, human remains, funerary object, sacred object or object of cultural patrimony. Provides for reinterment of human remains or funerary objects under the supervision of the appropriate Indian tribe. Proposed excavation by a professional archeologist of a native Indian cairn or burial requires written notification to the State Historic Preservation Officer and prior written consent of the appropriate Indian tribe. Location-specific; Action-specific—potentially relevant and appropriate if archeological materials encountered.	The Archeological Monitoring Protocol for the Terminal 4 site is provided as an appendix to the CQAP (Appendix A of the DAR) and details protocol for conducting ground disturbing activities in archeologically sensitive areas of Terminal 4, and describes action to be taken if archeological materials are encountered. Given the highly disturbed condition of the RAA from prior excavation, dredging and filling, removal actions and sampling, it is not expected that historical and archeological resources will be encountered.
Archaeological Objects and Sites	ORS 358.905-955	Prohibits persons from excavating, injuring, destroying or damaging archaeological sites or objects on public or private lands unless authorized by permit. Location-specific; Action-specific—Potentially relevant and appropriate if archeological material encountered.	The Archeological Monitoring Protocol for the Terminal 4 site is provided as an appendix to the CQAP (Appendix A of the DAR) and details protocol for conducting ground disturbing activities in archeologically sensitive areas of Terminal 4, and describes action to be taken if archeological materials are encountered. Given the highly disturbed condition of the RAA from prior excavation, dredging and filling, removal actions and sampling, it is not expected that historical and archeological resources will be encountered.

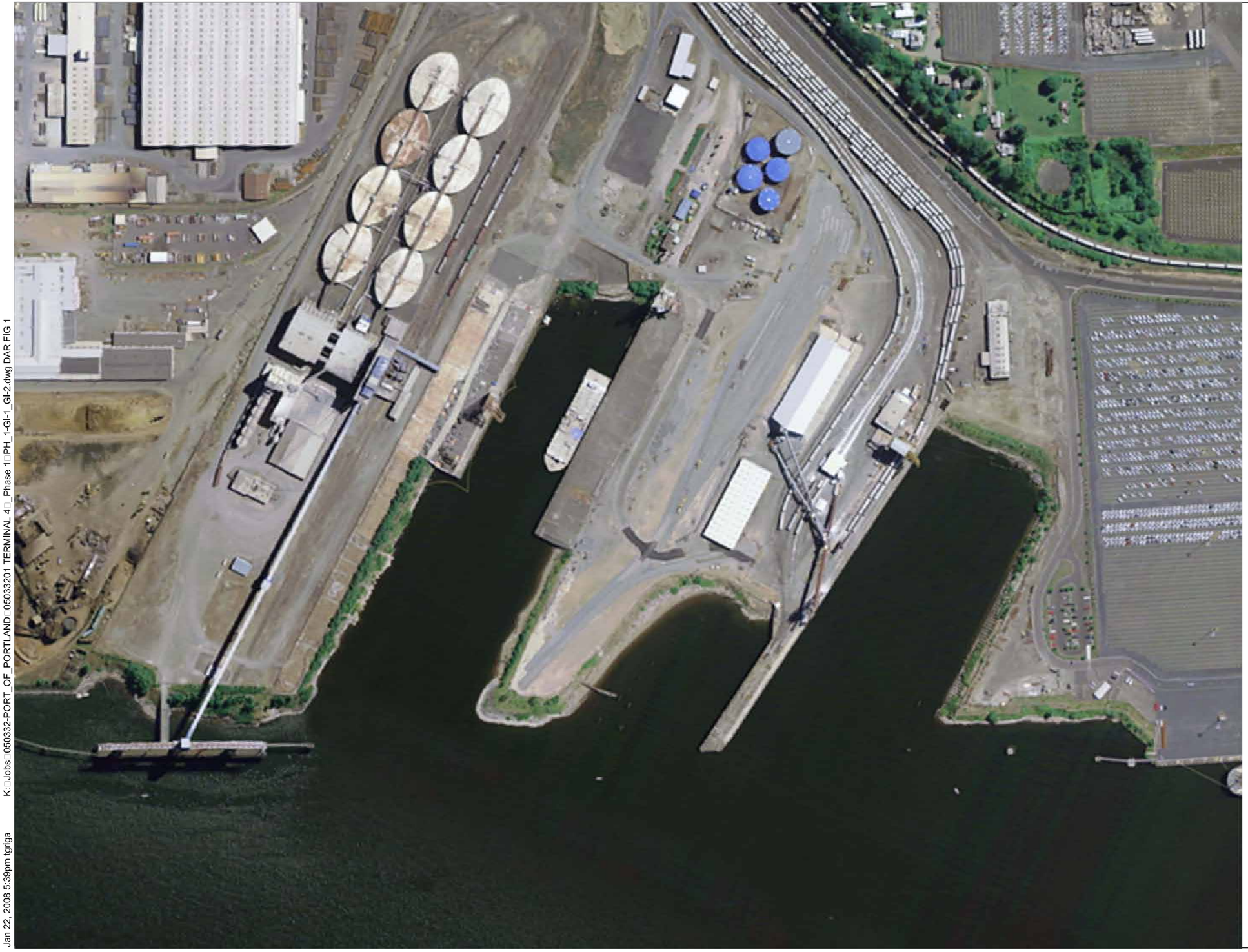
Table 9
ARARs for Shoreline Stabilization, Capping, and Dredging and Disposal

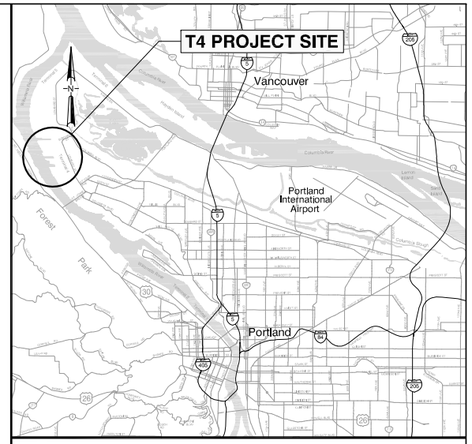
Regulation	Citation	Criterion/Standard and Applicability	Compliance Reference
Requirements regarding Excavation or Removal of Archaeological or Historical Material on Public Lands	ORS 390.235 OAR 736-051-0060 to 736-051-0090	Requires permits and imposes conditions for excavation or removal of archaeological or historical materials. Location-specific; Action-specific—potentially relevant and appropriate if archeological material encountered.	The Archeological Monitoring Protocol for the Terminal 4 site is provided as an appendix to the CQAP (Appendix A of the DAR) and details protocol for conducting ground disturbing activities in archeologically sensitive areas of Terminal 4, and describes action to be taken if archeological materials are encountered. Given the highly disturbed condition of the RAA from prior excavation, dredging and filling, removal actions and sampling, it is not expected that historical and archeological resources will be encountered.
State Air Quality Law and Noise Control	ORS 468A OAR 340-226-0100, OAR 340-035-0035	Provides general emission standards for fugitive emissions of air contaminants and requires the highest and best practicable treatment of control of such emissions. Prohibits any handling, transporting or storage of materials, or use of a road, or any equipment to be operated, without taking reasonable precautions to prevent particulate matter from becoming airborne. Sets noise standards for equipment, facilities, operations, or activities employed in the production, storage, handling, sale purchase, exchange or maintenance of a product, commodity, or service, including the storage or disposal of waste products. Action-specific—potentially relevant and appropriate to certain activities during implementation of the Removal Action	BMPs for emission standards for fugitive emissions of air contaminants are provided in the Construction Specifications.
State Essential Indigenous Salmonid Habitat	ORS 196.810(b) OAR 141-102	Designates Essential Salmonid Habitat and regulates activities affecting such habitat. Location-specific—potentially relevant and appropriate in assessing impacts to salmonid habitat and developing compensatory mitigation for the project, if necessary.	The Biological Assessment details potential impacts of the Removal Action on ESA-listed salmonid species and construction BMPs and conservation measures that will be implemented to minimize potential impacts.

Table 9
ARARs for Shoreline Stabilization, Capping, and Dredging and Disposal

Regulation	Citation	Criterion/Standard and Applicability	Compliance Reference
Lower Willamette River Management Plan	ORS 273.045 OAR 141-080-0105	Department of State Lands plan regulating leasing, license, and permit activities in the lower Willamette River. The plan describes allowable activities and conditions for waterway management areas based on state public trust values (fisheries, recreation, and navigation). Location-specific—potentially relevant and appropriate to performance of the Removal Action performed on DSL land.	No capping activities will be performed on DSL land for Phase I.
ODFW Fish Management Plans for the Willamette River.	OAR 635 div 500	Provides basis for in-water work windows in the Willamette River. Action-specific—potentially applicable to implementation of the Removal Action due to presence of protected species at the site.	The Biological Assessment details construction in-water work windows that apply to the in-water components of Removal Action construction.
Washington Hazardous Waste Management Act	Chapter 70.105 RCW Chapter 173-303 WAC	Federally authorized state of Washington hazardous waste identification and management program that operates in lieu of the base federal program. (Washington: Final Authorization of State Hazardous Waste Management Program – Revisions October 12, 1999, 64 *Fed. Reg.* 55142; April 11, 2002, 67 *Fed. Reg.* 17636; and October 30, 2006, 71 *Fed. Reg.* 63253. Action-specific—potentially applicable to off-site waste management if a disposal facility in Washington is selected. Washington regulates as Dangerous Wastes certain materials that are nonhazardous under Federal and Oregon regulations.	Appropriate characterization of sediment or wastes generated during the removal action will be performed if a disposal facility in Washington is selected. Materials from the Phase I Removal Action are expected to be nonhazardous in Oregon or Washington—characterization of materials as Dangerous or Extremely Hazardous Waste could preclude the use of a disposal facility in Washington.

FIGURES





VICINITY MAP
SCALE: N.T.S.

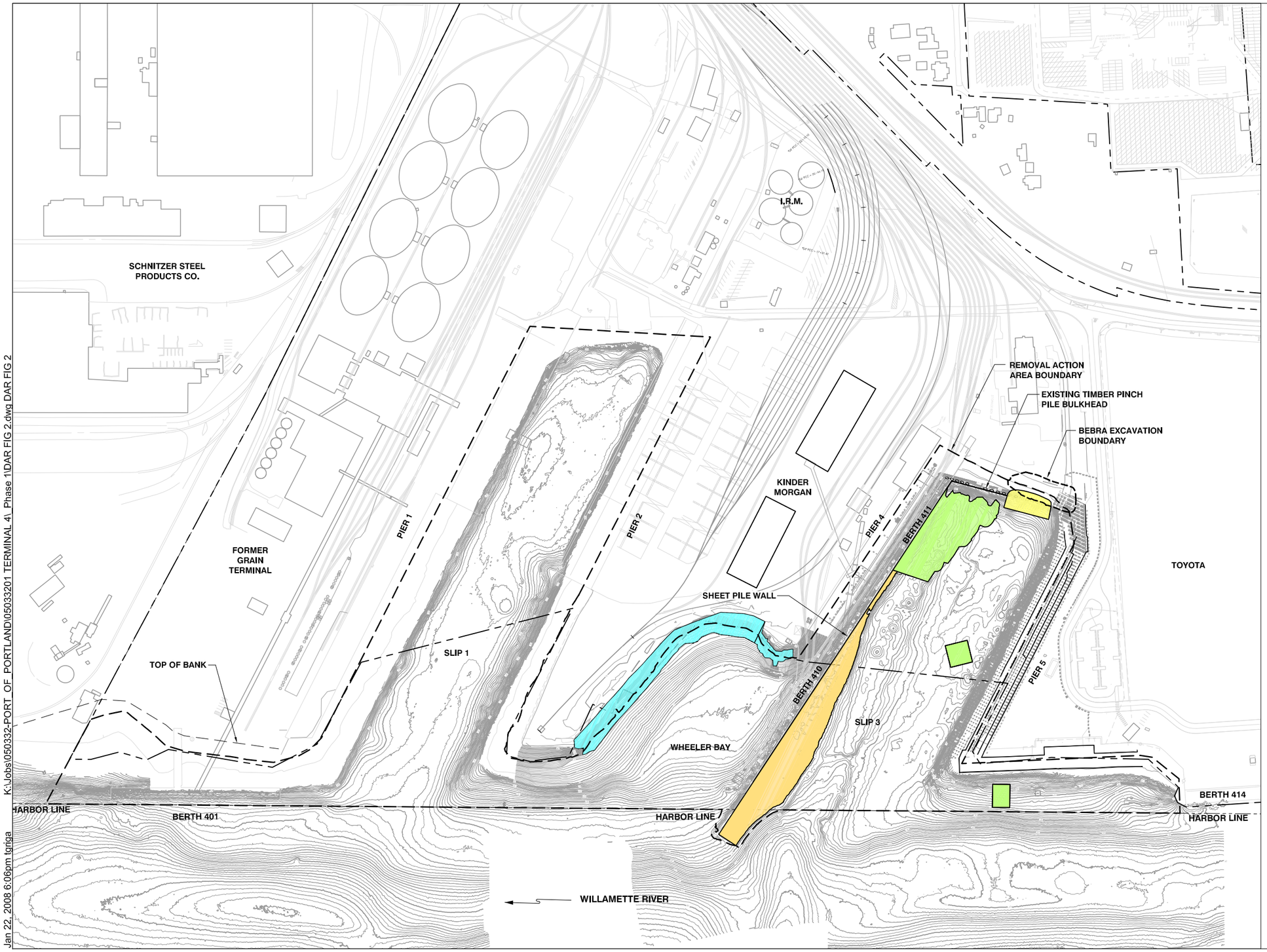
0 150 300
SCALE IN FEET

DRAFT DOCUMENT: DO NOT QUOTE OR CITE
THIS DOCUMENT HAS NOT BEEN REVIEWED OR APPROVED BY USEPA AND ITS FEDERAL, STATE, AND TRIBAL PARTNERS AND IS SUBJECT TO CHANGE IN WHOLE OR IN PART.

Jan 22, 2008 5:39pm tgriga K:\Jobs\050332-PORT_OF_PORTLAND\05033201 TERMINAL 4\Phase 1\PH_1-GI-1_GI-2.dwg DAR FIG 1

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 1
Site Plan and Vicinity Map
Terminal 4 Phase I Removal Action
Portland, Oregon



LEGEND:

- WHEELER BAY SHORELINE STABILIZATION
- HEAD OF SLIP 3 CAP
- BERTH 411 "PLUS" DREDGING
- BERTH 410 DREDGING
- DSL PROPERTY LINE

NOTES:

1. HORIZONTAL DATUM: PORT OF PORTLAND LOCAL PROJECTION (INTERNATIONAL FEET) VERTICAL DATUM: NGVD 29-47 CONTOUR INTERVAL = 1FT
2. BATHYMETRIC SURVEY BY PORT OF PORTLAND DATED MAY, 2007

0 150 300
SCALE IN FEET

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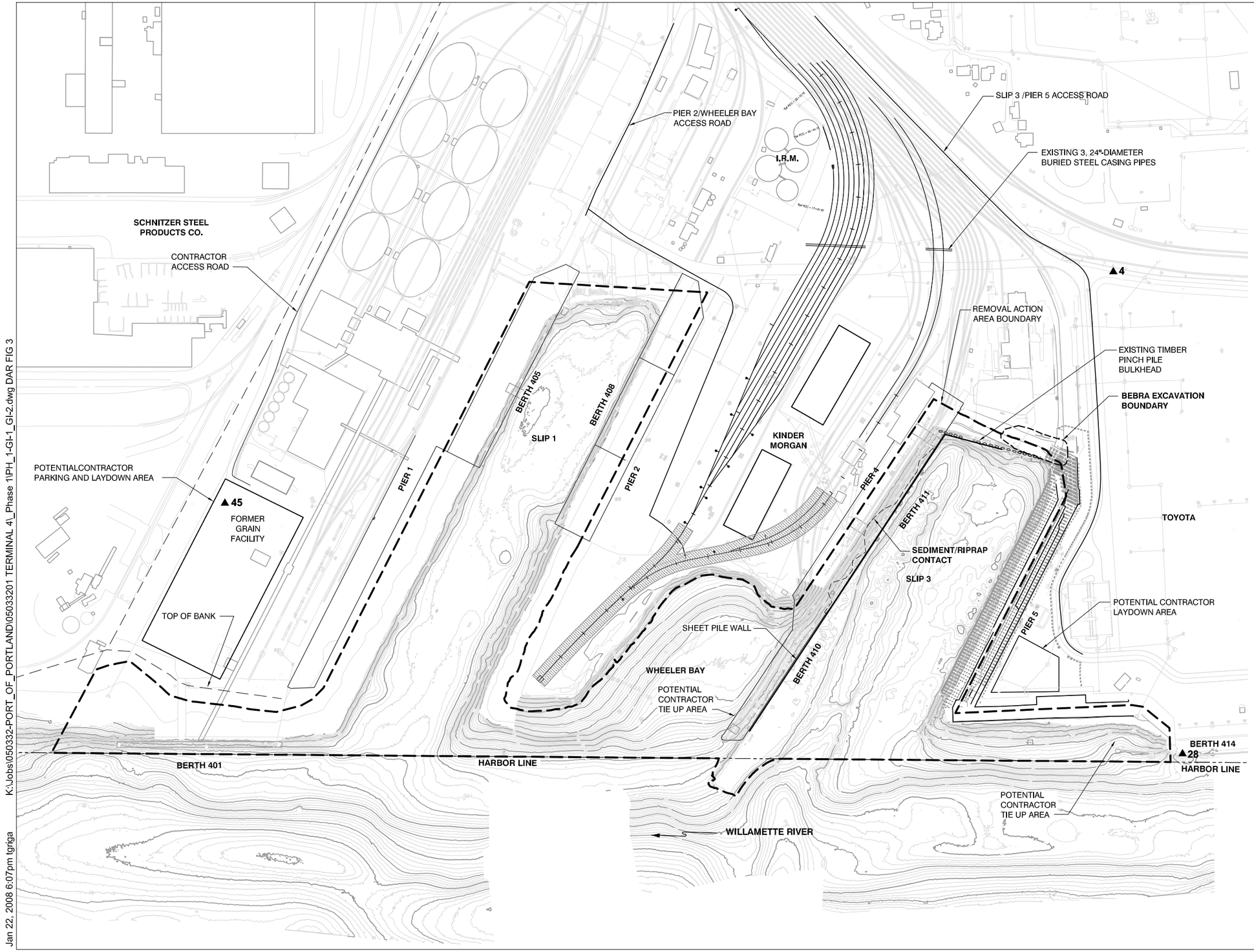
K:\Jobs\050332-PORT OF PORTLAND\05033201 TERMINAL 4\ Phase 1\DAR FIG 2.dwg DAR FIG 2
Jan 22, 2008 6:06pm tgriga

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 2
Summary of Phase I Removal Action
Terminal 4 Phase I Removal Action
Portland, Oregon



LEGEND:

TRACK FOUL AREA

REMOVAL ACTION AREA BOUNDARY

NOTES:

1. HORIZONTAL DATUM: PORT OF PORTLAND LOCAL PROJECTION (INTERNATIONAL FEET) VERTICAL DATUM: NGVD 29-47 CONTOUR INTERVAL = 1 FT
2. FOR NGVD CONTROL POINT, SEE PORT OF PORTLAND DRAWING RG 2006-3024 (NOVEMBER 2006)

0 150 300

SCALE IN FEET

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K:\Jobs\050332-PORT_OF_PORTLAND\05033201 TERMINAL 4_Phase 1\PH_1-GI-1_GI-2.dwg DAR FIG 3

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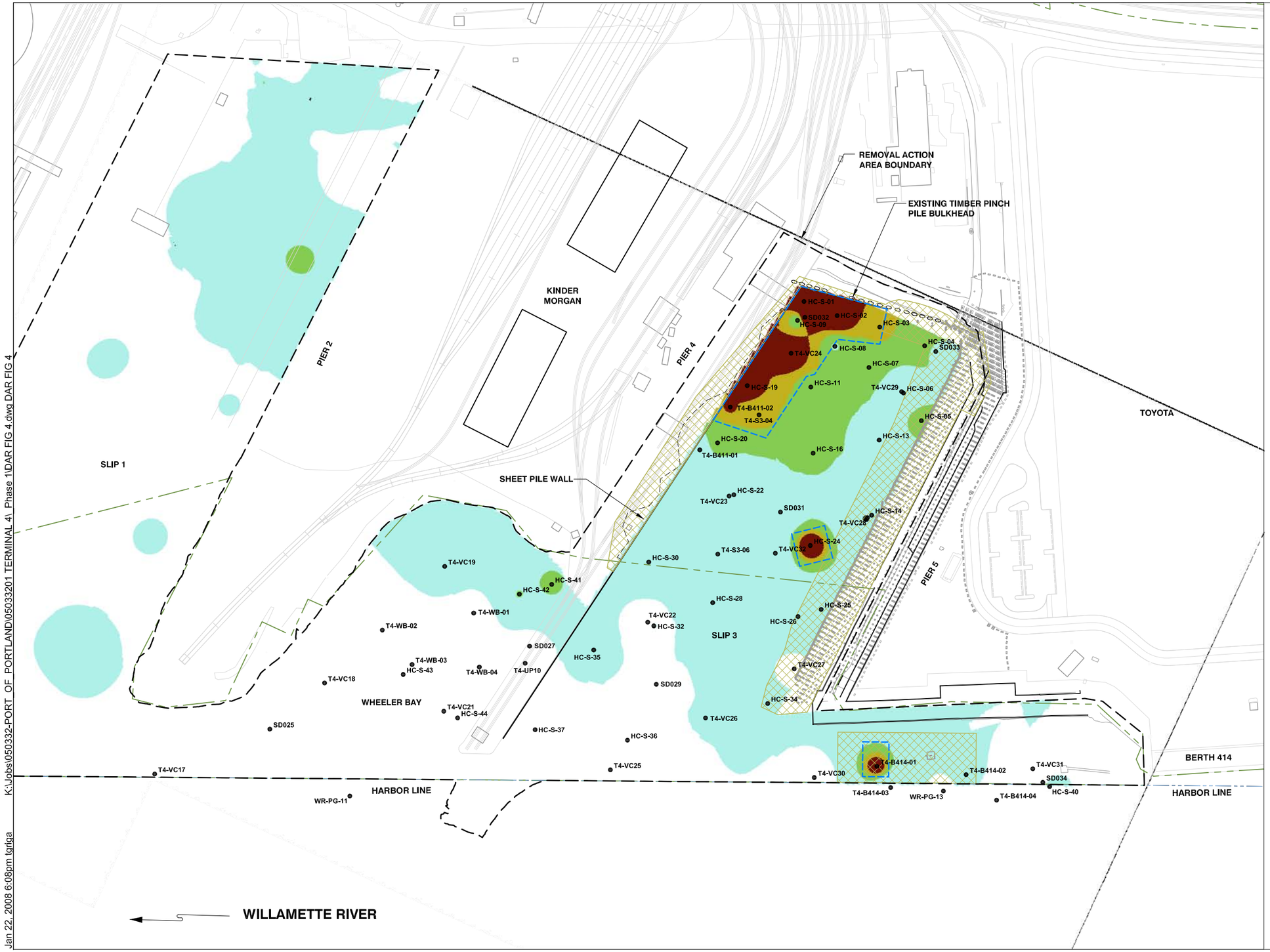
ANCHOR ENVIRONMENTAL, L.L.C.

Figure 3
Summary of Physical Condtions
Terminal 4 Phase I Removal Action
Portland, Oregon



LEGEND:

- 1-10 PEC SURFACE EXCEEDANCE RATIO
- 10.1-20 PEC SURFACE EXCEEDANCE RATIO
- 20.1-30 PEC SURFACE EXCEEDANCE RATIO
- >30 PEC SURFACE EXCEEDANCE RATIO
- PHASE I DREDGE BOUNDARY
- REMOVAL ACTION AREA BOUNDARY
- DSL PROPERTY LINE
- HARBOR LINE
- HC-S-13 EXISTING DATA
- TERMINAL 4 PHASE II CAP BOUNDARIES IN SLIP 3

NOTES:

1. HORIZONTAL DATUM: PORT OF PORTLAND LOCAL PROJECTION (INTERNATIONAL FEET) VERTICAL DATUM: NGVD 29-47 CONTOUR INTERVAL = 1FT
2. BATHYMETRIC SURVEY BY PORT OF PORTLAND DATED MAY, 2007

0 100 200
SCALE IN FEET

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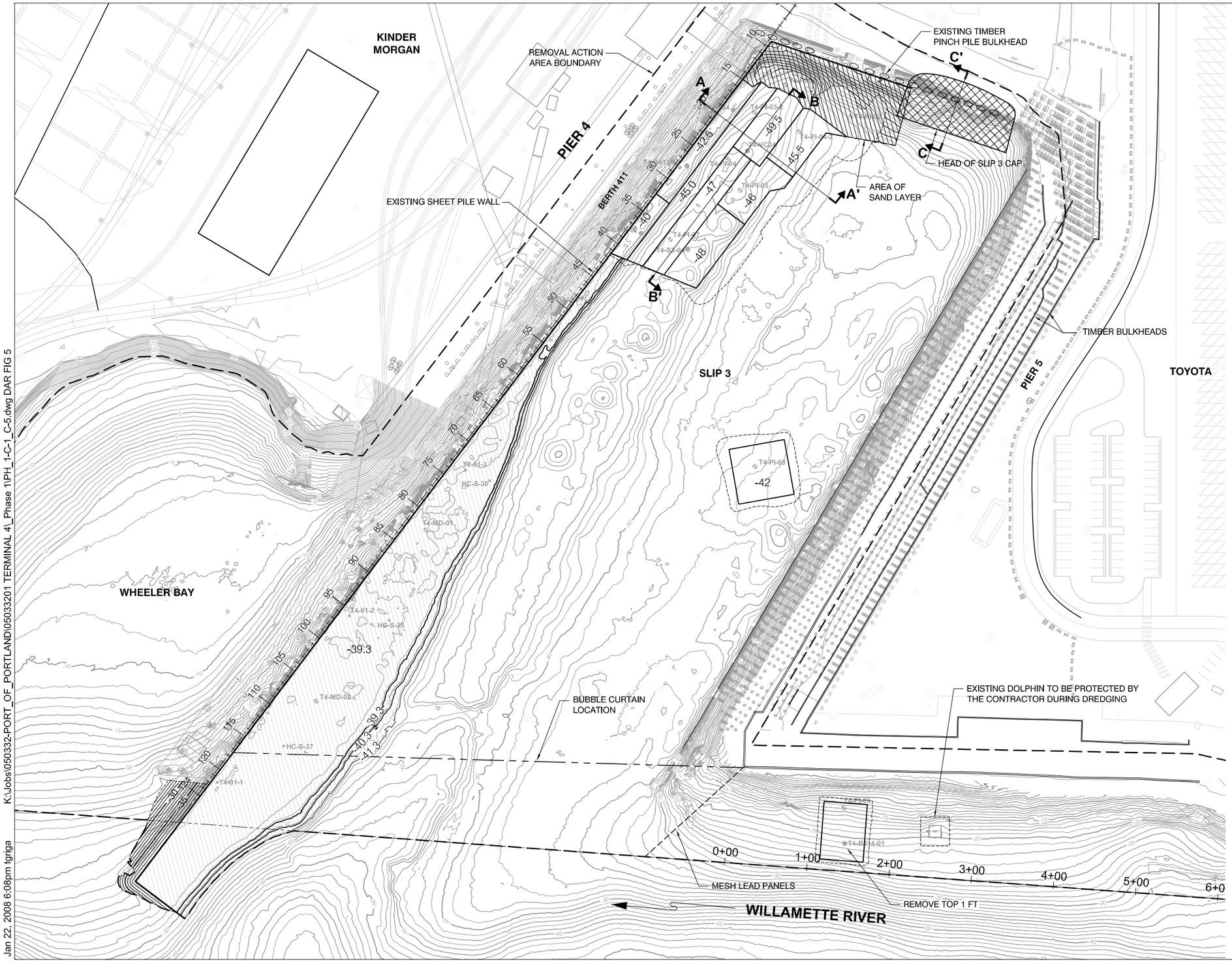
Figure 4
Removal Action Area Surface Sediment Concentrations and Phase I Dredge Boundaries
Terminal 4 Phase I Removal Action
Portland, Oregon



LEGEND:

-48	BERTH 411 "PLUS" DREDGE ELEVATION IN FEET
-39.3	BERTH 410 DREDGE ELEVATION IN FEET
-------	DAYLIGHT LINE AT EDGE OF CUT
● T4-B414-01	EXISTING DATA
AA'	CROSS SECTION LOCATION AND DESIGNATION

0 60 120
SCALE IN FEET

NOTES:

1. HORIZONTAL DATUM: PORT OF PORTLAND LOCAL PROJECTION (INTERNATIONAL FEET)
   VERTICAL DATUM: NGVD 29-47
   CONTOUR INTERVAL = 1 FT

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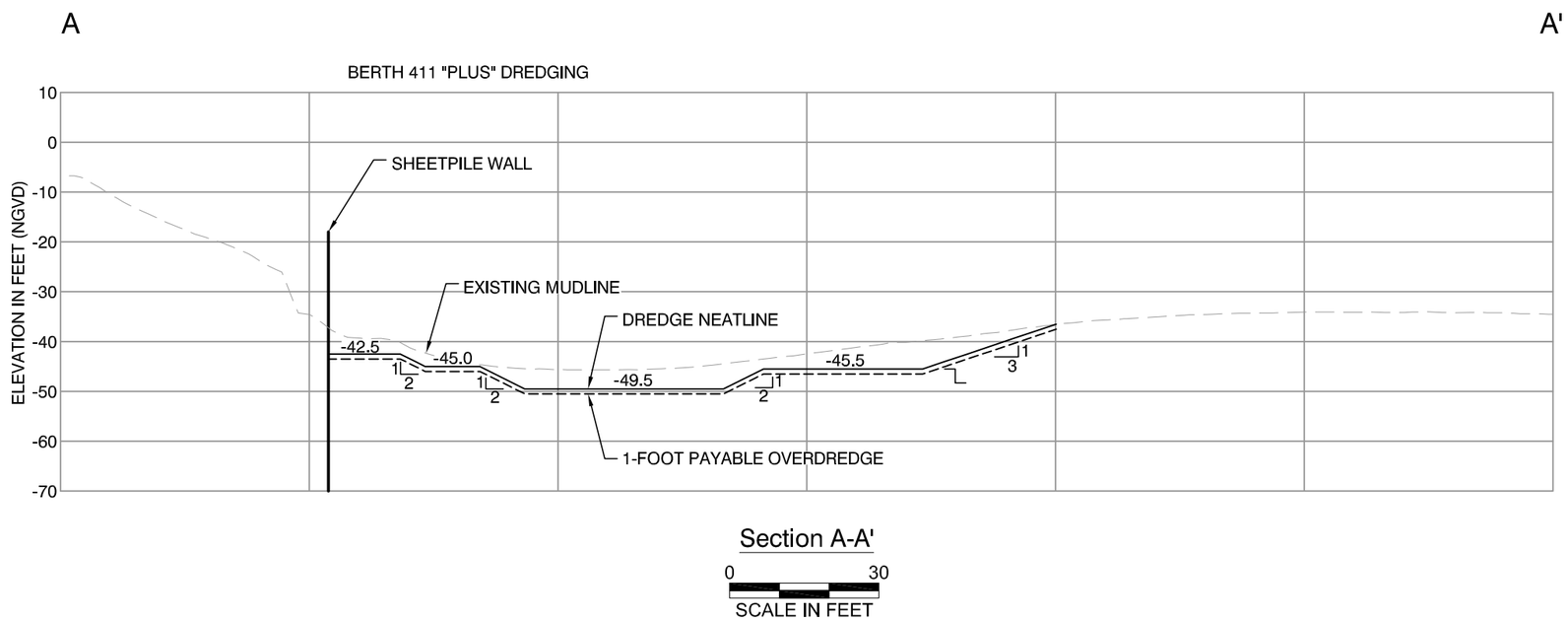
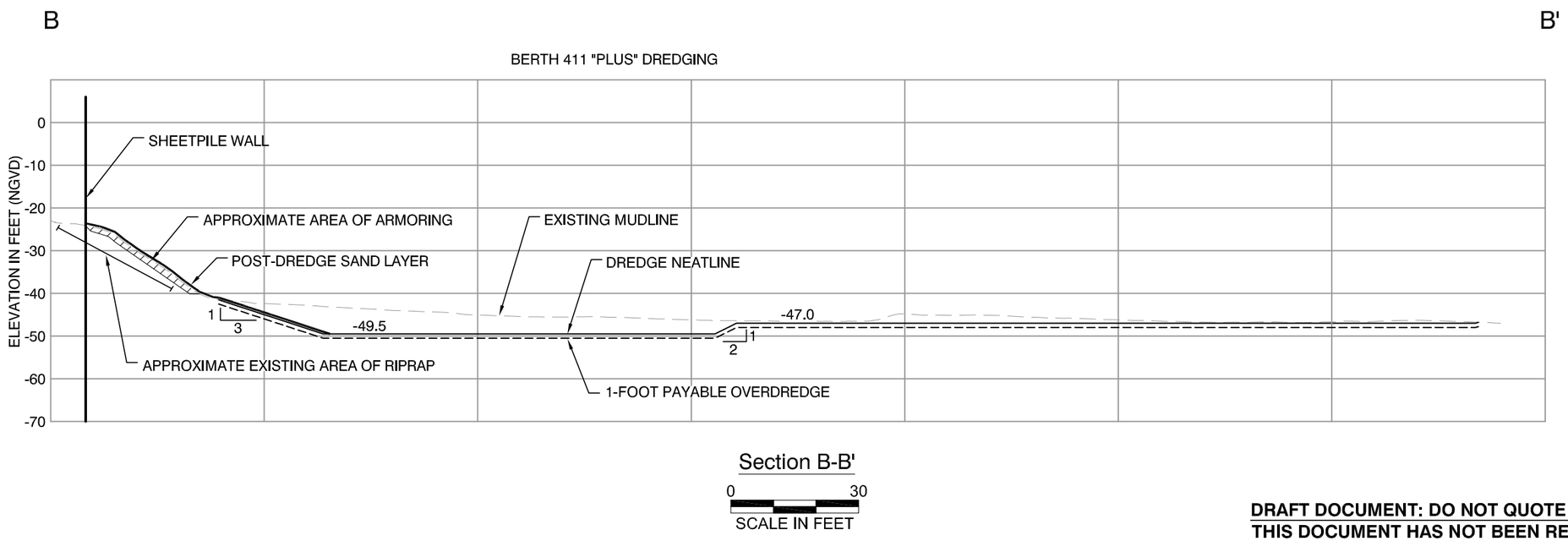
ANCHOR ENVIRONMENTAL, L.L.C.

Figure 5
Dredge Plan - Slip 3 and North of Berth 414
Terminal 4 Phase I Removal Action
Portland, Oregon





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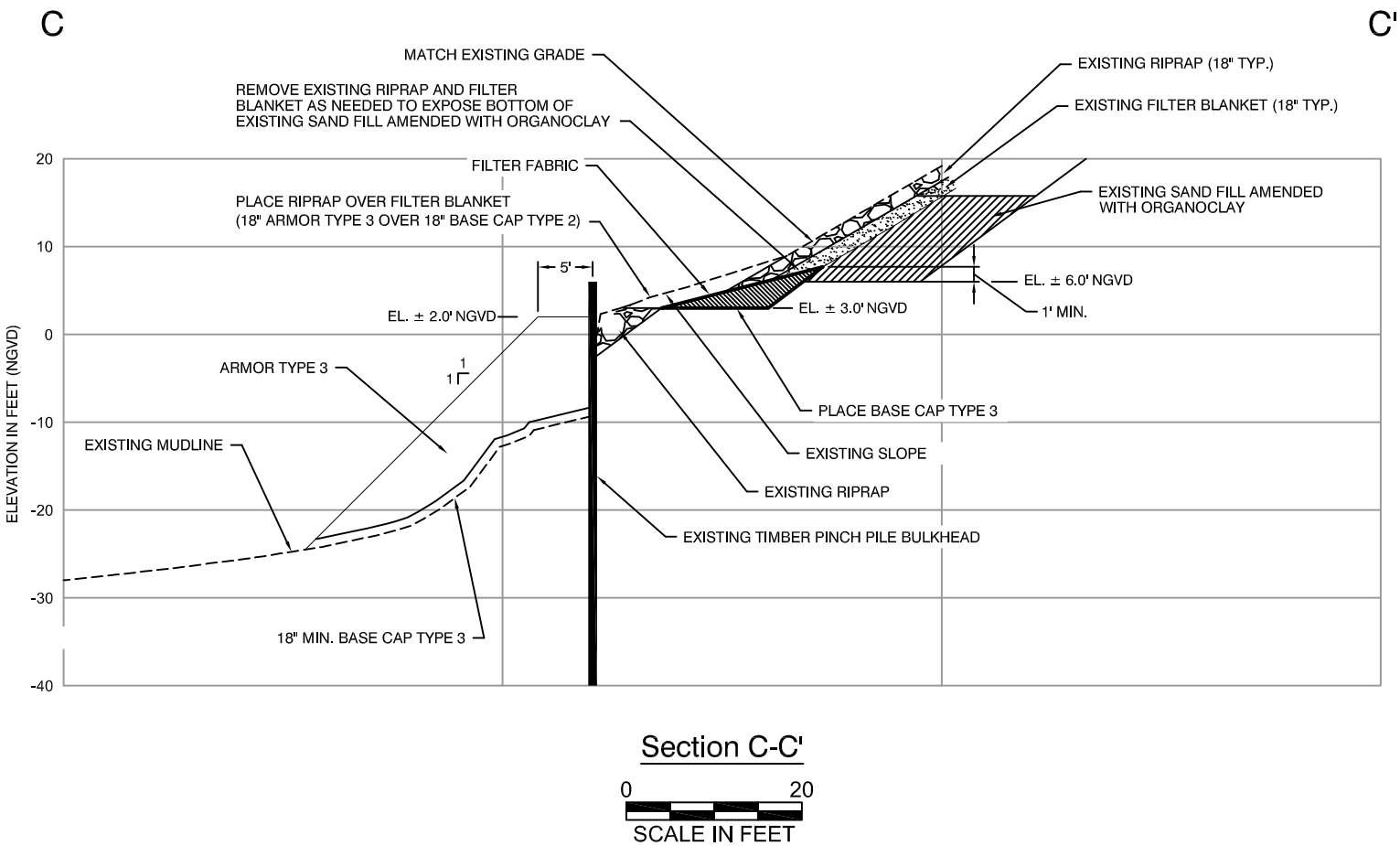
ANCHOR ENVIRONMENTAL, L.L.C.

Figure 6
Dredge Sections - Berth 411 "Plus"
Terminal 4 Phase I Removal Action
Portland, Oregon



NOTES:

1. HORIZONTAL DATUM: PORT OF PORTLAND
   LOCAL PROJECTION (INTERNATIONAL FEET)
   VERTICAL DATUM: NGVD 29-47
   CONTOUR INTERVAL = 1FT
2. BATHYMETRIC SURVEY BY PORT OF PORTLAND DATED MAY, 2007

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Figure 7
Cap Section - Head of Slip 3
Terminal 4 Phase I Removal Action
Portland, Oregon

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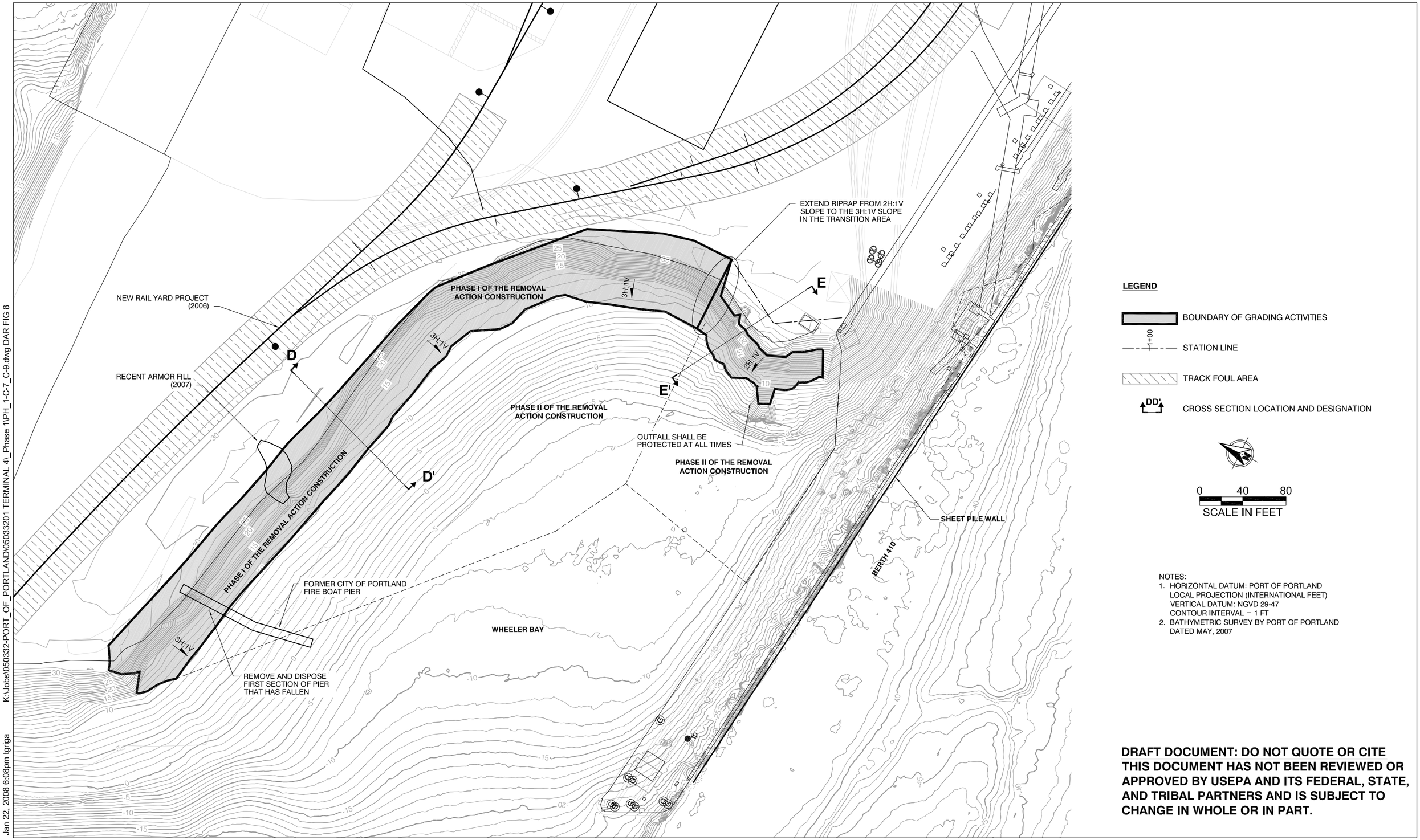
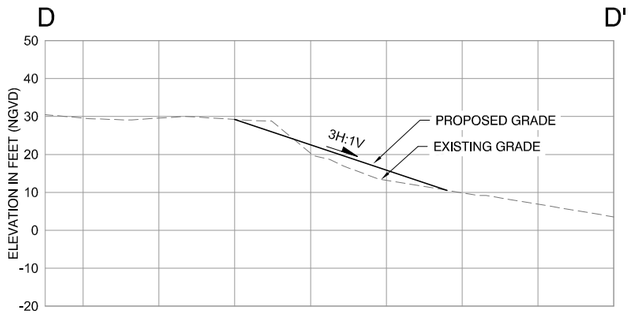


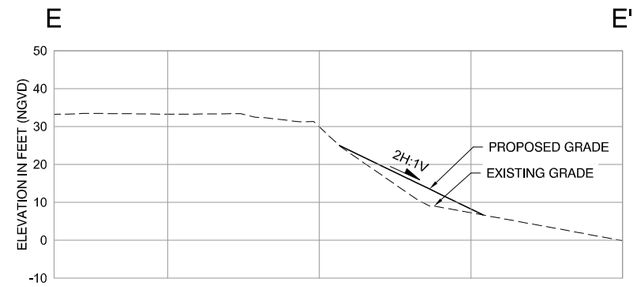
Jan 22, 2008 6:08pm tgriga K:\Jobs\050332-PORT_OF_PORTLAND\05033201 TERMINAL 4_Phase 1\PH_1-C-7_C-9.dwg DAR FIG 8

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 8
Wheeler Bay - Shoreline Stabilization Plan
Terminal 4 Phase I Removal Action
Portland, Oregon



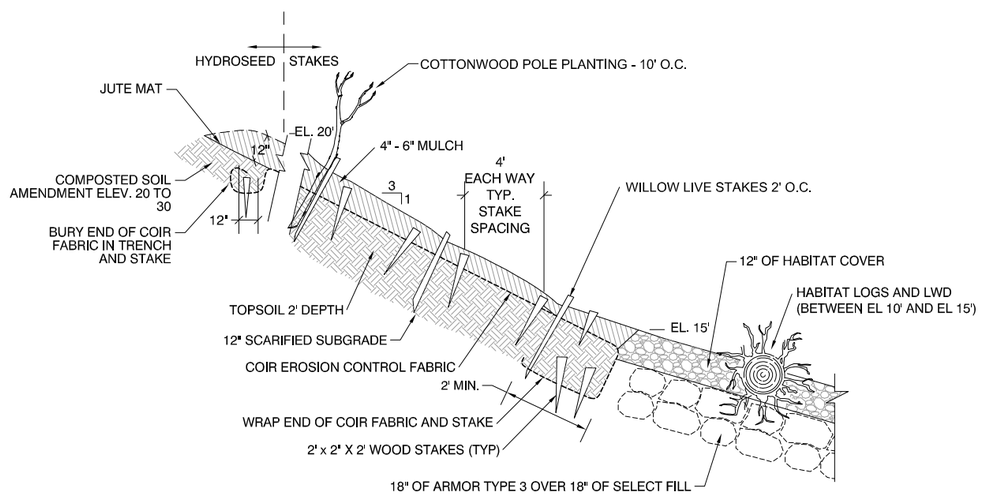
Section D-D'



Section E-E'

NOTES:

1. HORIZONTAL DATUM: PORT OF PORTLAND
   LOCAL PROJECTION (INTERNATIONAL FEET)
   VERTICAL DATUM: NGVD 29-47
   CONTOUR INTERVAL = 1 FT
2. BATHYMETRIC SURVEY BY PORT OF PORTLAND
   DATED MAY, 2007



Typical Plantings and Armoring for Section D-D'

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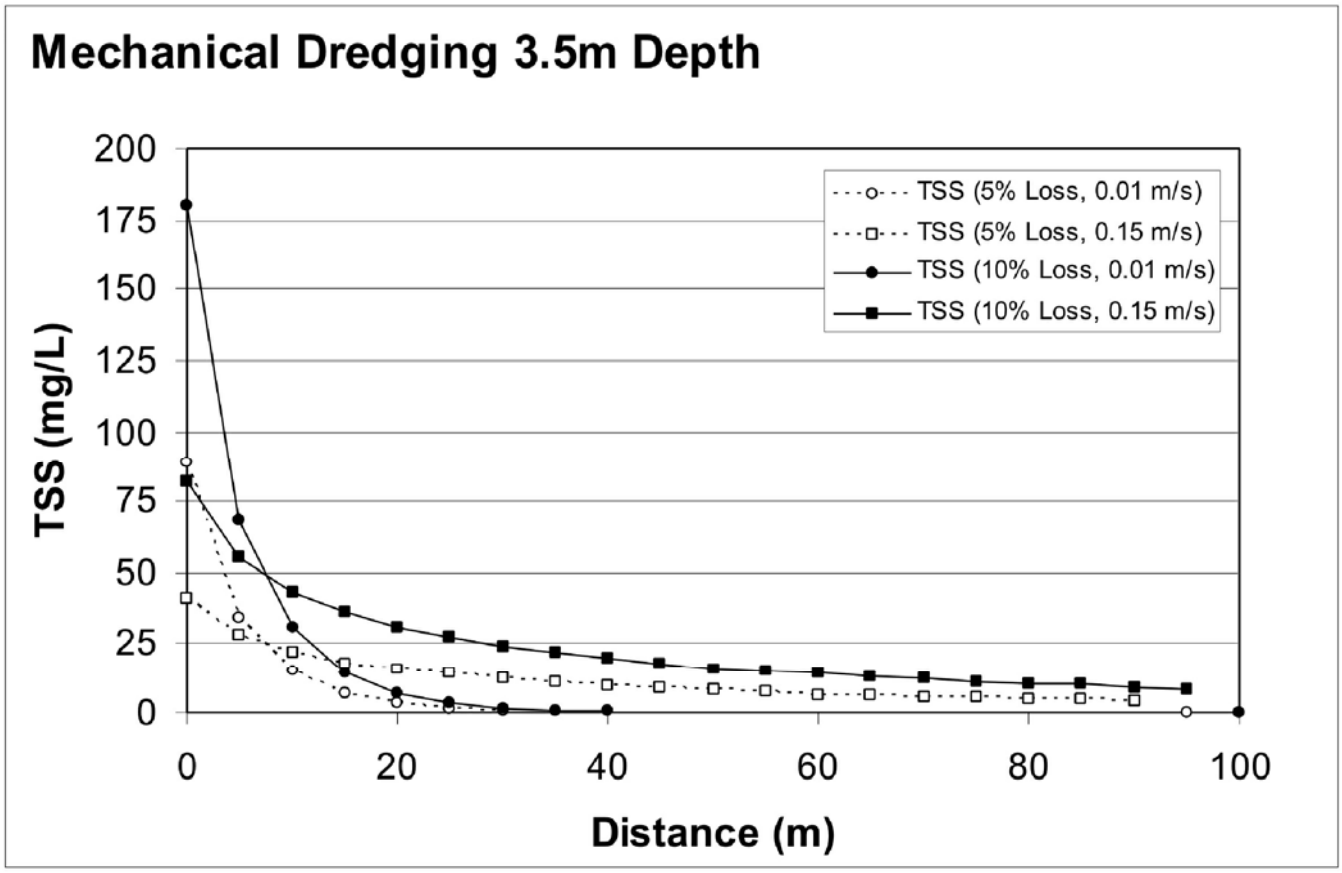
ANCHOR ENVIRONMENTAL, L.L.C.

Figure 9
Wheeler Bay - Shoreline Stabilization Sections
Terminal 4 Phase I Removal Action
Portland, Oregon

Jan 22, 2008 6:09pm tgriga K:\Jobs\050332-PORT_OF_PORTLAND\05033201 TERMINAL 4_Phase 1\PH_1-C-7_C-9.dwg DAR FIG 9



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Jan 22, 2008 11:45am tgriga K:\Jobs\050332-PORT_OF_PORTLAND\05033201 TERMINAL 4_Phase 1\DAR FIG 10-11.dwg DAR FIG 10

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 10
Dredge Model Results
Terminal 4 Phase I Removal Action
Portland, Oregon

APPENDIX A

DRAFT
CONSTRUCTION QUALITY ASSURANCE PLAN

TERMINAL 4 PHASE I REMOVAL ACTION
PORT OF PORTLAND, PORTLAND OREGON

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Prepared for

Port of Portland

Portland, Oregon

Prepared by

Anchor Environmental, L.L.C.

6650 SW Redwood Lane, Suite 333

Portland, Oregon 97224

January 2008

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1 INTRODUCTION

This Construction Quality Assurance Plan (CQAP) is an appendix to the Design Analysis Report (DAR) and is one of the design documents submitted to the U.S. Environmental Protection Agency (USEPA) for the Phase I Removal Action at the Terminal 4 Removal Action Area (RAA). This document addresses the requirement of the Statement of Work (SOW) to submit a site-specific CQAP. The purpose of this CQAP is to detail the Phase I Removal Action verification method and approach to quality assurance during construction activities in the project area, including compliance with applicable or relevant and appropriate requirements (ARARs). To accomplish this purpose, this document identifies the responsibilities during construction for performing the Phase I Removal Action and monitoring the performance of the construction activities in accordance with the final design documents through a quality assurance program. Additionally, this CQAP describes the methods used to measure compliance with performance objectives.

As noted above, the CQAP is an appendix to the DAR, which provides the details of the Phase I Removal Action design. Other appendices to the DAR provide additional details of the Phase I Removal Action that are pertinent to the CQAP. These other documents, which are cited in the CQAP, include:

- Construction Specifications (Appendix E to the DAR)
- Drawings (Appendix D to the DAR)
- Construction Water Quality Monitoring Plan (WQMP; Appendix B to the DAR)
- Transportation and Disposal Plan (TDP; Appendix F to the DAR)
- Sampling and Analysis Plan (SAP; Appendix H to the DAR)

The remainder of this CQAP is organized into the following sections to address the document requirements detailed in the SOW:

- **Section 2 – Project Organization and Responsibilities** presents the roles and responsibilities of the parties involved in the Phase I Removal Action, including USEPA and other agencies.
- **Section 3 – Construction Manager/General Contractor (CM/GC) and Construction Quality Assurance Officer (CQAO) Qualifications** describes the qualifications and

experience required for the CM/GC and any selected subcontractors as well as the qualifications of the CQAO and supporting inspection personnel.

- **Section 4 – Quality Assurance Program** describes the performance objectives and criteria, quality assurance measures, inspection and verification activities, and contingency actions for each construction activity.
- **Section 5 – Documentation and Reporting** describes the reporting requirements for construction quality assurance activities. These requirements include daily and weekly summary reports, inspection data sheets, problem identification and corrective measures reports, design acceptance reports, and final documentation. A description of the provisions for final storage of all records consistent with the requirements of the Administrative Order on Consent (AOC) is also included in this section.
- **Section 6 – References** presents the references cited and used to generate this document.

2 PROJECT ORGANIZATION AND RESPONSIBILITIES

The roles and responsibilities of the parties involved in the Terminal 4 Phase I Removal Action are delineated below. An organization chart depicting general project administration, management, and oversight is presented on Figure 1.

2.1 U.S. Environmental Protection Agency and Other Agencies

USEPA is the regulatory authority and is the responsible agency for overseeing and authorizing the Phase I Removal Action described herein. In this capacity, USEPA will review information described in the DAR, the Construction Specifications and Drawings, and this CQAP for consistency with the Phase I Removal Action Objectives (RAO), the AOC, and applicable state and federal laws and regulations. The USEPA Project Coordinator, or a designee, will exercise project oversight for USEPA, coordinate comments developed by USEPA and other agencies, and communicate agency observations with the Port of Portland (Port) and the Project Engineer. The USEPA Project Coordinator shall notify the Port if it identifies any concerns regarding the implementation of the Phase I Removal Action. The Port will propose to USEPA and the USEPA Project Coordinator response measures or recommendations, as appropriate. The USEPA, as appropriate, will make final decisions to resolve such issues or problems that may change the project scope.

The USEPA is working cooperatively with other government agencies, including the Oregon Department of Environmental Quality, other federal agencies, and tribal governments. The other agencies will continue to review documents and participate in decision making related to the Phase I Removal Action. Other agencies will provide their comments to the USEPA Project Coordinator for communication to the Port.

Access to Port facilities is restricted for security. Agency representatives should contact the CQAO to arrange for site visits. The CQAO will coordinate site access for site visitors with Port security in accordance with federal requirements per TSA and TWIC.

2.2 Port of Portland

The construction project will be managed by the Port. The Port has ultimate responsibility for implementing the Phase I Removal Action and addressing the RAO. The Port will hire the CM/GC and, indirectly, its subcontractors specializing in the required in-water/over-water Phase I Removal Action activities including dredging, transporting and disposing of dredged material, and capping. The Project Engineer and CQAO will also be contracted by the Port to fulfill the responsibilities identified in the following sections; the Port reviews all work products prepared by its contractors and consultants and takes responsibility for the actions of its employees, contractors, and consultants. The Port will communicate to the USEPA Project Coordinator concerns, if any arise, regarding the implementation of the Phase I Removal Action, including any proposed remedies, if warranted, to address unforeseen conditions.

2.3 Project Engineer

The Project Engineer is responsible for two main tasks. First, the Project Engineer is responsible for preparing the design of the Phase I Removal Action such that successful implementation of the design will result in achieving the RAO and construction activity-specific objectives.

Additionally, the Project Engineer will provide consultation and observations during construction to assist with implementation of the Phase I Removal Action in conformance with the USEPA-approved design documents. During implementation of the Phase I Removal Action, potentially noncompliant construction activities will be referred to the Project Engineer. The Project Engineer is responsible for determining whether the allegedly noncompliant construction is acceptable within the design, unacceptable, or acceptable with a design modification. USEPA will have final authority to approve design modifications proposed by the Project Engineer.

2.4 Construction Quality Assurance Officer

The CQAO will be responsible for overseeing the implementation of the CQAP. In overseeing implementation of the CQAP, the CQAO is responsible for monitoring

construction performance for compliance with construction performance standards and design requirements during implementation of the Phase I Removal Action, and is responsible for overseeing the required inspection and verification activities. The CQAO will review documentation submitted by and work completed by the CM/GC for adherence to performance standards and design requirements. The CQAO will be sufficiently familiar with the final design and the construction operations to recognize deviations from that design. The CQAO will also have the ability to manage and maintain the integrity of the data generated during the Phase I Removal Action.

The CQAO will also be responsible for identifying those field conditions that may warrant deviation from the final design. In such circumstances, the CQAO will coordinate with the USEPA Project Coordinator to identify and agree upon any necessary deviations to meet the overall objectives of the design. Any agreed-upon deviations will be documented in the weekly progress reports to USEPA.

The CQAO may use inspectors with the requisite expertise and experience to help perform the duties described above.

2.5 Construction Manager/General Contractor

The CM/GC will be responsible for the following tasks:

- **On-site responsibility for construction management and contract administration.** The CM/GC will have total authority and responsibility to deal with all contractual matters and to ensure that the work complies with contract final Construction Specification and Drawing requirements and provides all necessary quality control information.
- **Implementing the Phase I Removal Action by either performing tasks or contracting with subcontractors.** As part of the Phase I Removal Action implementation, the CM/GC will be responsible for implementing the CQAP, including the required monitoring, sampling, testing, and reporting. Included with this responsibility is the implementation of the quality control activities to ensure that project construction is conducted in accordance with the Construction

Specifications and Drawings. In accordance with implementing the Phase I Removal Action construction activities, the CM/GC will oversee the development of an Environmental Protection Plan (EPP).

The CM/GC will use key personnel to help with the tasks described above, including an on-site superintendent, construction quality control supervisor, and a health and safety manager.

2.5.1 CM/GC On-Site Superintendent

Direction of the work for the CM/GC will be through an on-site Superintendent who will be responsible for executing the work in full compliance with the Construction Specifications and Drawings. The Superintendent will work to resolve job-related problems and day-to-day project management. The Superintendent may utilize one or more foremen to directly supervise the major construction activities. The Superintendent will exercise supervision over subcontractors, if subcontractors are utilized.

2.5.2 CM/GC Construction Quality Control Manager

A Construction Quality Control (CQC) Manager will be provided by the CM/GC as required in the Construction Specifications. The CQC Manager will develop and implement a CQC Plan through which the CM/GC ensures compliance with the requirements of the Construction Specifications and Drawings. The CQC Plan will identify the duties and responsibilities assigned by the CM/GC to the CQC Manager and additional inspectors, as needed to monitor that the Phase I Removal Action is implemented in accordance with the Construction Specifications and Drawings. The CQC Plan will state the chain of command for the CQC team, including identification of responsibilities for each member, to ensure that any actions related to the quality of work will be executed in an accurate and expeditious manner.

2.5.3 CM/GC Health and Safety Manager

The CM/GC will employ a Health and Safety Manager to develop and implement a Phase I Removal Action Health and Safety Plan (HASP). This plan will contain details of the chain of command and personnel responsibilities, as discussed in the Construction Specifications.

2.6 Subcontractors

The CM/GC will either perform construction elements or contract with subcontractors to perform selected phases of the work for which they have special expertise. The subcontractors are responsible to the CM/GC for the quality of their work, protection of the environment, CQC Plan, EPP, and Construction HASP (CHASP). The subcontractor's principals will designate a job foreman with responsibility to see that the work is conducted in accordance with the contract requirements.

3 QUALIFICATIONS

As required by the SOW, qualifications of the CQAO and supporting inspection personnel, including minimum training and experience required, are provided below. Additionally, the qualifications for the CM/GC firm and personnel are also provided.

3.1 Port Project Manager

The Port Project Manager will have experience in managing environmental projects of a complexity and magnitude similar to or greater than the Phase I Removal Action. The Port Project Manager will be thoroughly familiar with the AOC, applicable environmental laws, and the requirements of the Phase I Removal Action design. The Port Project Manager will be supported by other Port personnel, such as an attorney and an engineer, assigned to the project.

3.2 CQAO and Inspector Qualifications

The CQAO will be determined prior to start of work. The CQAO will have an engineering degree and experience managing Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-related construction projects with similar quality assurance requirements. The CQAO will be required to have current health and safety training. Additionally, the CQAO will be sufficiently familiar with the final design and the construction operations to recognize deviations from that design. The CQAO will also have the ability to manage and maintain the integrity of the data generated during the project. Additional inspectors may be used to help the CQAO. These inspectors will have experience inspecting construction activities for CERCLA-related projects and will have current federal and state health and safety training.

3.3 CM/GC Qualifications

The CM/GC was selected through a competitive qualifications-based selection process. Each potential CM/GC proposing on the project was required to provide a Statement of Qualifications (SOQ) to the Port with its proposal. This allowed the Port to determine that the proposer was qualified, in terms of experience and capability, to perform the work.

The CM/GC will employ as part of its permanent organization, senior, knowledgeable, and experienced personnel to oversee the project. The journeyman operators, surveyors, and other CM/GC personnel performing key jobs must also have the demonstrated ability and skills to satisfactorily perform their respective assignments.

The CQC Manager, and the CM/GC as a whole, must have documented qualifications and experience to perform independent checks on the CM/GC's operations as necessary to determine compliance with the contract provisions. These documented qualifications will be submitted to the Port for approval prior to identifying a CQC Manager. Additionally, any subcontractors utilized in the work must have demonstrated to the satisfaction of the Port that they are qualified and have satisfactorily performed the type of work for which they will be engaged. However, responsibility for the subcontractor performance rests with the CM/GC. All CM/GC and subcontractor personnel working on this project will be required to have current federal and state health and safety training, as applicable to the work they will be doing on this project.

4 QUALITY ASSURANCE PROGRAM

The quality assurance program to be implemented during the Phase I Removal Action is described in this section by construction activity. Specific construction activities to be implemented are described, along with specific performance objectives, performance criteria, quality assurance measures, inspection and verification activities, and contingency actions. Phase I Removal Action construction elements include the following:

- Dredging
- Shoreline Stabilization and Capping

For each construction activity, inspection and verification activities will be implemented to confirm performance objectives have been met. Table 1 summarizes the required construction inspection and verification activities and frequencies of inspection for each construction activity.

During the Phase I Removal Action, the quality assurance process will progress as follows:

- The CM/GC will submit a CQC Plan as detailed in Section 5. The CQC Plan will be subject to Port approval before Phase I Removal Action field work begins.
- The CM/GC will provide documentation to the CQAO to demonstrate that specific components of the final design have been properly implemented. The Port, in consultation with the CQAO, will determine whether the components of the Phase I Removal Action are acceptable.
- The CM/GC and the CQAO will conduct inspection and verification activities (i.e., sampling, testing, and monitoring) to ensure compliance with the approved design documents and that performance objectives have been met. The Port will have final approval authority for all such inspections and for verifying that corrective actions, if any are warranted, are implemented.

The remainder of this section details each construction element and associated performance objectives and criteria, along with quality assurance measures and specific inspection and verification activities that will be performed to confirm that performance objectives have been met.

4.1 Dredging

4.1.1 Task Description

Dredging will be performed in Slip 3 and north of Berth 414. Dredged material will be removed to a permitted landfill for disposal. As explained in the *Abatement Measures Proposal* (Anchor 2007), surface sediments with probable effects concentration (PEC) exceedance ratios greater than 20 will be removed to accomplish the following objectives:

1. Eliminate exposure to the highest risk surface sediments within the Phase I RAA until Phase II of the Phase I Removal Action is implemented
2. Eliminate a significant mass of contaminated sediments from the RAA.

4.1.2 Performance Objectives and Criteria

Performance objectives and criteria associated with dredging include the following:

- **Achieve Specified Dredging Depths and Extents.** Confirmation must be obtained that the contaminated sediments were removed to the target elevations and full lateral extents as depicted on the Construction Specifications and Drawings.
- **Provide Specified Sand Coverage of Areas Not Technically Feasible to be Dredged to the Full Vertical Extent.** Confirmation must be obtained that the sand coverage is of the specified tonnage per area necessary for coverage.
- **Minimize Dredging Residuals and Dispersal to Adjacent Areas.** Dredging techniques shall optimize the recovery of sediment from the dredge prism, minimize the resuspension and movement of sediment by the bucket, and minimize the loss of sediment from the bucket. The Contractor's operations will be monitored to confirm that Contractor's personnel are avoiding dredging techniques that would spread contaminated sediment or allow contaminated sediment to settle back into areas dredged.
- **Avoid Impacts on Adjacent Structures and Tenants.** Dredging in front of existing sloped and waterfront structures shall not lessen the overall stability of the slopes and potentially cause movement in the structures. The performance criterion is no more than 1 inch of movement of waterfront structures.

- **Achieve No Off-Site Tracking of Contaminants During Transport of Disposal Materials.** The transportation of dredged material to the disposal facility shall not result in the spreading of contamination from the site. The performance criterion is no statistical difference between soil sample results collected before and after transit activities begin.
- **Minimize Short-Term Water Quality Impacts**. Water quality monitoring activities shall be conducted to ensure federal and state water quality requirements are met. Water quality requirements for dredging activities are described in detail in the WQMP (Appendix B to the DAR).
- **Minimize Potential Impacts to Cultural Resources**. Archeological monitoring is required to minimize impacts to cultural resources or historic structures.

4.1.3 Quality Assurance Methods, Inspection and Verification Activities, and Contingency Actions

Quality assurance measures described below will be implemented during the Phase I Removal Action to ensure performance objectives are met and construction is completed according to Construction Specifications and Drawings. Inspection and verification activities will be implemented and compared to criteria to determine if performance objectives have been achieved. If performance standards have not been achieved, contingency actions as described below will be implemented.

4.1.3.1 Achieve Specified Dredging Depths and Extents

Quality assurance measures to be implemented during dredging to achieve specified dredging depths and extents are described below. The CM/GC will present a work plan before construction that will describe their proposed methods for dredging and controlling grades. They will also submit a survey control plan prior to construction. The CM/GC will be required to employ an electronic positioning system (EPS), sonar sounding devices, automated electronic tide gauge, and tide gauges to accurately determine their dredging equipment location at all times. The CM/GC will perform quality control hydrographic surveys, as described in the Specifications. The control for this system must meet 0.25 feet vertical accuracy. These surveys will be

performed at a minimum of every 2 working days to establish actual excavated depths and extent of dredging. The surveys will be performed using an EPS and a single-beam, dual-frequency or multi-beam, single-frequency echosounder system. If a single-beam system is used, the trackline spacing will be no greater than 25 feet to minimize interpolation error. Additionally, the CQAO will work closely with the CM/GC's CQC Manager and hydrographic survey crew to independently verify the dredge's horizontal position and dredging depth. This may be done either by evaluation of the CM/GC's daily quality control surveys or positioning data, conducting independent surveys, or a combination of both methods.

If surveys show dredge depths have not been achieved in surveyed areas, the CM/GC will be required to continue dredging in those areas until target dredge depths are achieved.

4.1.3.2 Provide Specified Sand Coverage of Areas Not Technically Feasible to be Dredged to the Full Vertical Extent

The CM/GC will present a work plan before construction that will describe their proposed methods for placing the sand layer and determining the area covered and quantity placed. The CM/GC will be required to provide daily summaries of the work completed to date to the Port for review.

4.1.3.3 Minimize Dredging Residuals and Dispersal to Adjacent Areas

The CM/GC will present a work plan before construction that will describe their proposed methods for dredging and controlling the resuspension, movement, and loss of sediment during dredging. At a minimum, the CM/GC's work plan will address the best management practices (BMPs) identified in the Dredging, Transportation, and Disposal specification (Section 352023), which include:

- The Contractor shall begin dredging at the highest elevation of material to be removed and work toward the lowest elevation. "Glory holing" will not be allowed.
- No bottom stockpiling or multiple bites of the clamshell bucket is allowed.
- No grounding of construction barges is allowed.

- Overdredging at the base of a slope shall not occur.
- Dragging of a dredged surface to level the mudline is not allowed.
- Overfilling of the bucket is not allowed

The CQAO will use visual observation of dredging operations to monitor dredging for compliance with the Specifications and the work plan, including all BMPs. Any variance from approved plans will be reported to the CM/GC for correction.

4.1.3.4 Avoid Impacts on Adjacent Structures and Tenants

The design of the dredge prism has been tailored to lessen the potential for instability of slopes and adjacent structures. Prior to the start of dredging, the CM/GC will submit a Settlement Monitoring Plan (SMP). This plan will identify the personnel, procedures, methods, and documentation required to monitor the movement of waterside structures and/or upland areas. The CM/GC will install survey monitoring points and perform monitoring at specified locations of critical structures. A baseline survey will be conducted to establish conditions prior to dredging. In addition, a structural condition survey will be performed on these structures to document their structural condition prior to commencing work. If movements on structures are greater than 1 inch, the Project Engineer will be notified and work will stop in that area. The Project Engineer will evaluate the situation and determine a mitigation plan to stabilize the affected structure.

4.1.3.5 Achieve No Off-Site Tracking of Contaminants During Transport of Disposal Materials

Quality assurance measures will be implemented during construction to prevent the off-site tracking of contaminants during transport of dredged material to the disposal facility. These measures include use of spill plates, visqueen, and tire washes (as appropriate). In addition, soil samples will be collected at unpaved areas of road shoulders at the loading and offloading areas to verify that no material transported during the Phase I Removal Action is spreading contamination during transit and offloading.

The TDP (Appendix F to the DAR) describes the specifics of the sampling approach, including sampling quantities, compositing schemes, approach to archiving samples, and contingency measures. Additionally, for off-site areas that are paved, an important component of the sampling investigation design will be to target catchment basins or other areas of topographic depression where contaminated material may have been released and accumulated. Another important component of the investigation will be to adequately sample pre-transport conditions to be able to distinguish whether or not the presence of contaminated sediment in the post-transport condition can be attributed to the Phase I Removal Action activities.

The density of samples and area of sampling will be defined in the SAP (Appendix H to the DAR) once the actual offloading facility is identified. Samples will be collected prior to the start of transit activities and once per week for the duration of disposal activities. The samples will be submitted to the laboratory for chemical analyses. Results from samples collected during transit activities will be compared to results obtained before any transit activities began.

Statistical analyses will be performed on the results to determine if there are any differences between samples collected during transit and prior to the beginning of any transit activities. If there are any statistical differences, the Port will coordinate with USEPA to determine an appropriate response action based on the sample results.

4.1.3.6 Minimize Short-term Water Quality Impacts

Details of the water quality monitoring that will be completed, water quality criteria, and contingency actions that may be implemented if criteria are not met during dredging activities are provided in the WQMP (Appendix B to the DAR).

4.1.3.7 Minimize Potential Impact to Cultural Resources

Archeological monitoring will be implemented for activities occurring within the archeologically sensitive areas according to the Archeological Monitoring Protocol, as detailed in Attachment A-1.

4.2 Shoreline Stabilization and Capping

4.2.1 Task Description

Two areas require shoreline stabilization and capping as part of the Phase I Removal Action:

- Head of Slip 3
  - Timber bulkhead stabilization
  - Cap behind the timber bulkhead
- Wheeler Bay shoreline stabilization

The timber bulkhead stabilization (Head of Slip 3) will be accomplished by placing the following two layers of materials (from the sediment surface upward):

- **Base Cap Type 1.** This layer consists of fine to medium sand. The purpose of this layer is to separate the native sediment from the armor layer and to provide the mass of the earthen wedge that will stabilize the bulkhead, countering forces that will result from placing the cap on the other (upland) side of the bulkhead.
- **Armor Type 3.** This layer consists of small riprap. The purpose of this layer is to protect the Base Cap from erosive forces and to provide additional mass to stabilize the bulkhead.

The cap behind the timber bulkhead (Head of Slip 3) will consist of the following layers:

- **Chemical Isolation Layer (Base Cap Type 3).** This layer consists of 10 parts Base Cap Type 2 (sandy gravel to gravelly sand) and one part organoclay. The purpose of this layer is to isolate the underlying contaminated sediments from biota and the environment.
- **Erosion Protection Layer (Armor Layer).** This layer consists of small riprap. The purpose of this layer is to resist forces from currents, waves, and propeller wash.

The Wheeler Bay shoreline stabilization will be accomplished by regrading the slope and placing a layer of erosion protection, such as riprap or jute mat, on the surface.

4.2.2 Performance Objectives and Criteria

Performance objectives and criteria associated with capping activities include the following:

- **Verify Quality of Import Material.** Import material must meet specified physical and chemical properties, as detailed in the Specifications prior to the use of an imported material.
- **Achieve Specified Thickness and Extent.** The capping materials must be placed to the exact specified limits and thickness.
- **Avoid Impacts on Adjacent Structures and Tenants.** Capping in front of existing slopes and waterfront structures should not lessen the overall stability of the slopes and potentially cause movement greater than 1 inch in the structures.
- **Minimize Release of Suspended Sediment.** The cap material must be placed in a manner that will minimize the release of suspended sediment (i.e., limiting the energy of the material as it strikes the bottom to minimize re-suspension and mixing of contaminated material with the cap material). Water quality measurements will be used to monitor sediment resuspension.
- **Minimize Short-term Water Quality Impacts**. Water quality monitoring activities shall be conducted to ensure federal and state water quality requirements are met. Water quality standards for capping/filling activities are described in detail in the Water Quality Monitoring Plan (Appendix B to the DAR).

4.2.3 Quality Assurance Measures, Inspection and Verification Activities, and Contingency Actions

Quality assurance measures described below will be implemented during the Phase I Removal Action to ensure performance objectives are met and construction is completed according to the Construction Specifications and Drawings. Inspection and verification

activities will be implemented and compared to criteria to determine if performance objectives have been achieved. If performance standards have not been achieved, contingency actions as described below will be implemented.

4.2.3.1 Verify Quality of Import Material

All cap materials will be clean, granular material free of roots, organic material, contaminants, and all other deleterious and objectionable material. The CM/GC will submit a Borrow Source Characterization Report (geotechnical and chemical results) prior to construction for each import material type. Chemical and physical characteristics of imported materials must meet the requirements detailed in the Specifications. The CM/GC will sample imported material for grain size analysis, chemistry, and total organic carbon throughout the project (one sample per 20 percent of import volume will be analyzed) for confirmation to Specifications. The CM/GC will obtain the certified tickets from borrow source for each load of material delivered. Additionally, inspectors will visually inspect representative barge loads of import materials delivered to the Phase I RAA. Inspectors will observe unsuitable coatings or materials (e.g., debris and organics), as well as general conformity with the specified gradation. If necessary, the inspectors may obtain representative samples for physical testing to confirm compliance with the gradation.

If import materials do not meet chemical criteria or physical requirements, material will be rejected prior to placement and the CM/GC will have to obtain a different material.

4.2.3.2 Achieve Specified Thickness and Extent

The Specifications require a number of quality control measures to control cap construction, which will limit the chance for caps not conforming to the Drawings. These quality assurance measures include the following:

- All fill and caps on the slope must be placed from the toe of the slope up towards the crest.

- Base Cap material shall be placed in a manner to minimize disturbance and mixing of the cap material and sediment.
- The Base Cap shall be placed prior to placing the Armor Layer.
- The Armor Layer shall be placed in a manner that does not damage the Base Cap.
- A 6-inch over-placement allowance shall be used to facilitate achieving the required cap thickness.

The CM/GC will present a work plan before construction that will describe its proposed methods for placing the cap layers and controlling grades. The CM/GC will also submit a survey control plan prior to construction. The CM/GC will be required to use EPS for locating and tracking their equipment. The CQAO will work closely with the CM/GC's CQC Manager to independently verify the horizontal position of cap placement equipment. If the CQAO determines the CM/GC is not placing cap materials in the correct location, the CM/GC will be immediately contacted to correct the situation. Bathymetric/topographic surveys will be completed on 25-foot spacings to confirm specified thicknesses (same survey controls as described for dredging). The CM/GC may advance two cores through the base cap placed to visually confirm bathymetric results. Wherever the cap thickness based on bathymetry and/or cores is less than the specified amount, the CM/GC will be required to add a sufficient amount of additional material to achieve the specified thickness.

4.2.3.3 Avoid Impacts on Adjacent Structures and Tenants

Quality assurance measures to be implemented for capping activities to avoid impacts to adjacent structures and tenants are described below. The design of the capping plan has been tailored to lessen the potential for instability of slopes and adjacent structures. Prior to the start of capping, the CM/GC will submit an SMP. This plan will identify the personnel, procedures, methods, and documentation required to monitor the movement of waterside structures and/or upland areas. The CM/GC will install survey monitoring points and perform monitoring at specified

locations of critical structures. A baseline survey will be conducted to establish conditions prior to capping. In addition, a structural condition survey will be performed on these structures to document their structural condition prior to commencing work. If movements on structures are greater than 1 inch, the Project Engineer will be notified and work will stop in that area. The Project Engineer will evaluate the data and determine mitigation measures to stabilize the affected structure.

4.2.3.4 Minimize Release of Suspended Sediment

The Construction Specifications present a number of quality assurance measures to be implemented during capping activities to minimize the release of suspended sediment, such that the mixing of the contaminated surface material with the cap material is minimized. Measures to control cap-induced suspension of sediment being capped include:

- All caps on the slope must be placed from the toe of the slope up towards the crest.
- Base Cap material shall be placed in a manner to minimize disturbance and mixing of the cap material and sediment.
- The Base Cap shall be placed prior to placing the Armor Layer.

The CM/GC will present a work plan before construction that will describe its proposed methods for placing the cap layers and minimizing the release of suspended sediment. Water quality monitoring as described in the WQMP (Appendix B to the DAR) will be used to monitor sediment re-suspension.

4.2.3.5 Minimize Short-term Water Quality Impacts

Details of the water quality monitoring that will be completed, water quality criteria, and contingency actions that may be implemented if criteria are not met during capping activities are provided in the WQMP (Appendix B to the DAR).

5 DOCUMENTATION AND REPORTING

Documentation and reporting for construction quality assurance activities will include pre-construction documentation, construction documentation, and post-construction documentation as detailed below. The CM/GC and the CQAO will work closely on a daily basis during the Phase I Removal Action to complete the project as specified in the final design and to collect the documentation required. The following sections describe documentation that will be required throughout the Phase I Removal Action. Table 2 summarizes the list of submittals that are required of the CM/GC in the Construction Specifications (Appendix E to the DAR).

5.1 Pre-Construction Documentation

The CM/GC will be required to submit a Phase I Removal Action Work Plan (RAWP) for approval by the Port and USEPA. The RAWP will contain the following elements:

- Project Work Plan
- CQC Plan
- CHASP
- Construction EPP
- Project Construction Schedule
- SMP
- Survey Control Plan
- Procedures for processing design changes and securing USEPA review and approval of such changes to ensure changes are consistent with the objectives of this Phase I Removal Action
- Procedures for coordinating with USEPA regarding compliance with USEPA's Off-Site Rule, as applicable

USEPA's approval authority for these plans is defined in the Consent Decree and SOW for the Terminal 4 Early Action. Construction quality assurance and quality control procedures will be addressed in various elements of the RAWP. A brief description of the contents of each plan component of the RAWP is provided below.

5.1.1 Project Work Plan

The Project Work Plan will describe, in narrative form, the methods to be employed in the Phase I Removal Action including equipment types, modes of operation, schedules, sequence of activities, and other aspects necessary to describe how and when the specified work will be performed. The Work Plan will have specific sections detailing how the following elements will be completed:

- Dredging
- Shoreline stabilization and capping

The Work Plan will describe how each of the QA Measures and Verification Activities identified in Section 4 will be addressed in the field.

5.1.2 Contractor Quality Control Plan

The CQC Plan will present the system through which the CM/GC ensures that construction activities are being implemented in compliance with the requirements of the contract and specifically how each of the QA Measures and Verification Activities identified in Section 4 will be addressed in the field. The CQC Plan will identify personnel, procedures, methods, instructions, inspections, records, and forms to be used in the CQC system. Specifically, the CQC Plan will include a description of procedures for maintaining and updating daily activity logs, procedures for reporting out-of-spec conditions, recordkeeping procedures for personnel, equipment maintenance and calibration, and daily and weekly reporting requirements.

5.1.3 Construction Health and Safety Plan

The CM/GC will submit its CHASP presenting the minimum health and safety requirements for job site activities, and the measures and procedures to be employed for protection of on-site personnel. The CM/GC will employ a Certified Industrial Hygienist (CIH), whose proof of certification and resume will be submitted along with the CHASP, to produce this plan. The plan will cover the controls, work practices, personal protective equipment (PPE), and other health and safety requirements that will

be implemented by the CM/GC in connection with the Phase I Removal Action construction activities.

5.1.4 Construction Environmental Protection Plan

The CM/GC will be required to submit an EPP describing the environmental protection measures and monitoring activities that will accompany all construction activities. The plan will cover potential environmental releases as a result of the CM/GC operations, as well as monitoring and corrective actions necessary to control such releases. The EPP will contain separate sections addressing contamination prevention, containment and cleanup, erosion and turbidity control, sound level control, air pollution and dust control, and water quality monitoring as they pertain to the pertinent construction activities described in Section 4.

5.1.5 Project Construction Schedule

A detailed Project Construction Schedule will be submitted by the CM/GC for each construction element prior to construction. Periodic schedule updates will be submitted by the CM/GC following progress meetings.

5.1.6 Settlement Monitoring Plan

The CM/GC will submit an SMP prior to construction that describes specific procedures, personnel, and recordkeeping methods for installing settlement monitoring equipment and for monitoring settlements (and lateral movements) on existing structures adjoining the dredging and capping areas. The intent of this monitoring is to ensure that adjacent structures do not undergo excessive movement or structural damage associated with earthwork activities. In the event that cumulative movements exceed 1 inch, the CM/GC will temporarily cease activities in the area and contact the Project Engineer.

5.1.7 Survey Control Plan

The CM/GC will submit a Survey Control Plan prior to construction. The plan will detail the specific procedures, equipment, and personnel to be used for all upland and

in-water surveying work. The plan will also discuss the QA/QC measures to confirm surveying results.

5.2 Construction Documentation

During construction activities, the construction CM/GC will be required to provide a variety of documentation to the CQAO, including testing results of materials received, weigh tickets for shipments of materials removed, survey results, and documentation of pay items completed. The CM/GC will also maintain a daily log of activities, as described below. The CQAO will maintain a field report of daily activity and complete an internal weekly report. The contents of the reports are described below. Weekly progress reports will be submitted to USEPA. The records described in this section will be maintained in the project files. Monitoring data will be provided electronically to USEPA in the Phase I Removal Action Completion Report (RACR).

5.2.1 CM/GC's Daily Quality Control Report

During construction activities, the CM/GC shall prepare a Daily Quality Control Report and submit it to the CQAO. The CM/GC's daily report will record at a minimum:

- Identification of personnel on-site
- Activities completed
- Any changes to BMPs or environmental controls
- Materials delivered or used
- Equipment used
- Materials dredged and disposed of off-site
- Debris removed and disposed of off-site
- Surveys completed
- Results of any quality control inspections, tests, or other monitoring activities
- Problems encountered and resolution of problems
- Any USEPA-authorized deviations from the final design

Daily Quality Control Reports will be sent to USEPA on a weekly basis as part of the Weekly Summary Report as discussed below.

5.2.2 Construction Quality Assurance Officer's Daily Report

The CQAO will maintain a daily field log to record observations, measurements, inspections completed, data received, communications with other members of the project team or USEPA, any water quality exceedances, additional environmental controls that were implemented, problems encountered, and resolutions. The daily field log will be supported by submittals received from the CM/GC, such as survey results and weigh tickets, chain of custody forms for water quality monitoring samples collected, laboratory data received, inspection reports, and written communication from members of the project team or USEPA. Water quality results will also be separately recorded and reported as defined in the WQMP (Appendix B of the DAR).

5.2.3 Weekly Summary Reports

The CQAO, in cooperation with the CM/GC, will prepare weekly summaries of progress. These summaries will facilitate the preparation of the RACR. The Weekly Summary Report will identify progress organized by activity:

- Dredging
  - Area worked (supported by CM/GC's log)
  - Volume of material removed (supported by CM/GC's log)
  - Surveys completed (supported by CM/GC's log)
  - Problems encountered
  - Corrective actions
- Shoreline Stabilization and Cap
  - Area worked (supported by CM/GC's log)
  - Weight/volume of material placed
  - Problems encountered
  - Corrective actions
- Environmental Controls
  - Samples collected
  - Summary of analytical results
  - Problems encountered

- Corrective actions

5.2.4 Weekly Construction Meetings

Weekly progress meetings will be coordinated with USEPA and its partner agencies including pre-notification of time and place of meetings. Conference call access will be provided as needed and requested by those agencies and meeting minutes will be prepared and made available to attendees.

5.2.5 Import Material Characterization

Prior to any on-site placement of import materials, the CM/GC shall submit a Borrow Site Characterization Report to the CQAO. The characterization report will include identification of the source (including a map documenting the origin of the material), site inspection, and material sample and characterization (physical and chemical testing, as specified) to ensure that the import material will uniformly meet the physical specifications of its intended use.

5.3 Post-Construction Documentation

As stated in the SOW, within 60 days after completion of the construction phase of the Phase I Removal Action, the Port will submit a RACR. The RACR will contain the following information:

- Introduction
  - Site location
  - Environmental setting
  - Relevant operational history
  - Summary of previous investigations and actions
- Phase I Removal Action Background
  - Basis for the Phase I Removal Action (i.e., the AOC)
  - Context within Portland Harbor remedial program
  - Phase I RAO
  - Summary of design basis
  - Summary of deviations from the design, if any

- Construction Activities
  - Description of dredging in Slip 3 and north of Berth 414
  - Description of bulkhead stabilization at the head of Slip 3
  - Description of capping at the head of Slip 3
  - Description of shoreline stabilization at Wheeler Bay
  - Description of completion and demobilization
- Chronology of Events
  - Description of the timing of construction activities, identifying milestones with reference to a tabular summary of a more detailed construction timeline
- Performance Standards and Construction Quality Control
  - Description of performance objectives (as stated in Sections 4.1.2 and 4.2.2 of the CQAP) and verification activities performed to confirm the Phase I Removal Action was implemented in accordance with the Specifications and Drawings.
  - Description of actual construction performance relative to performance objectives, including a summary of the results of construction QA measurements and analyses
  - Description of contingency actions implemented, if any were necessary
  - Description of USEPA's oversight activities
  - (Note: QA for water quality monitoring analytical data will be included in the Final Water Quality Monitoring Report)
- Final Inspection and Certifications
  - Description of final inspections, including the scope of inspections and noting any deficiencies identified and corrective actions implemented
  - Summary of health and safety monitoring during the implementation of the Phase I Removal Action with notation of deviations or incidents, if applicable
  - Identification of any institutional or engineering controls that are implemented to maintain the integrity of the Phase I Removal Action, including identification of parties responsible for maintaining and enforcing controls
- Operation and Maintenance Activities
  - Description of post-construction monitoring and maintenance requirements

  - Description of contingency measures that would be implemented if post-construction monitoring indicates such measures are warranted
- Summary of Project Costs
  - Identification of the actual final costs incurred to comply with the provisions of the AOC
  - Identification of costs previously estimated for implementation of the Phase I Removal Action and an update of the cost estimate for post-construction monitoring and maintenance costs
- Observations and Lessons Learned
  - Identification of problems encountered, if any, in implementing the Phase I Removal Action and corrective actions implemented
  - Identification of successes in implementing the Phase I Removal Action
  - Analysis of lessons learned that may be applied to future activities
- Phase I Removal Action Contact Information
  - Identification of individuals (contact names, addresses, phone numbers) for design and remediation contractors, USEPA oversight contractors, and key personnel at the Port, USEPA, and other agencies.

The RACR will also include copies of as-built drawings, summaries of waste disposal and analytical results, the Final Water Quality Monitoring Report, and the certification statement required by the AOC.

6 REFERENCES

Anchor Environmental, L.L.C. 2007. *Abatement Measures Proposal, Terminal 4 Removal Action Project*. Prepared for The Port of Portland, Portland, Oregon.

TABLES

Table 1
Summary of Construction Monitoring and Testing Requirements

Construction Element*	Specification Section	Specification Reference	Monitoring, Testing, and Inspection Requirements	Monitoring Frequency
Construction Progress Documentation	013200	3.4	Schedule Monitoring	Continuously
Safety and Health	013529	3.1	Inspect site to determine protection requirements	Before mobilization
		3.1	Monitoring work efforts for additional protection	After mobilization
		3.1	Assess integrity of all appropriate structures	Prior to work
		3.1	Site Safety Meetings	Weekly
Temporary Erosion, Sediment, and Pollution Control	015713	3.3.B	Inspect erosion control measures	Daily
		3.3.C	ESPC measures during inactive work	Once every 14 days when inactive and within 24 hours after a storm with 0.5-inches precipitation per 24-hour period
Environmental Protection	015719	3.3.C	Inspection of equipment and materials for environmental protection	Every 2 weeks
Site Clearing, Earthwork, and Shoreline Stabilization	312000	3.1	In-Place Moisture Density Testing	Each lift
		3.1, 3.7	Compaction Testing	Each lift
Trees, Shrubs, and Ground Covers	329300	1.3.D	Inspect Plants, etc. (Port)	Give 24 hours notice
Dredging, Transportation, and Disposal	352023	1.3	Post-dredge soundings (Port)	After completion of dredging activity
		1.3.J	Daily survey	Daily
		3.1.A	Monitor hull displacement of scows	During filling, transport, and offloading
		3.1.F	Monitor sediment offloading facility for spillage	During offloading
		3.2.F	Monitor dredge work for vertical and lateral tolerances	Throughout dredging
		3.2.M	Settlement monitoring of structures	While dredging near structures
		3.8.C	Water quality and turbidity monitoring	Daily

Table 1
Summary of Construction Monitoring and Testing Requirements

Construction Element*	Specification Section	Specification Reference	Monitoring, Testing, and Inspection Requirements	Monitoring Frequency
Capping	352025	1.4	Post-cap soundings (Port)	After capping is completed
		1.4.J	Daily survey	Daily
		2.3.D	Borrow source inspection	Prior to importing material
		2.3.E	Physical and chemical testing of materials	Prior to importing
		2.3.G	Visual inspection of import materials	Each load
		2.3.I	Import samples	1 for every 20% of imported material
		3.4.K	Monitor cap placement for vertical and lateral tolerances	Through capping
		3.6	Water quality and turbidity monitoring	Daily

* This table summarizes those Divisions of the Draft Design Specifications that are most relevant to the CQAP.

Table 2
Phase I Removal Action Contractor List of Submittals

Construction Element*	Specification Section	Specification Reference	Submittal	Due Date
Construction Progress Documentation	013200	1.2	Statement of Critical Path Method (CPM) capability	Within 10 days of contract
		1.2	Work Progress Schedule	One week after preconstruction meeting
		3.2	Monthly Update Report	Within 30 days after contract schedule acceptance
		3.2	Applications for Payment	
		3.3	Progress Meeting Schedules	24 hour advance
		3.5	Contract Schedule Revisions	
		3.7	As-Built Schedule and Documentation	Within 15 days of substantial completion
Submittal Procedures	013300	1.8	Interim Operation and Maintenance Manuals	45 days prior to anticipated date of beneficial use of system and maintenance instruction
		1.8	Final Operation and Maintenance Manuals	45 days prior to anticipated date of substantial completion
		1.9	As-Constructed Drawings	Upon completion of work
		1.10	Proof of registration with the Bureau of Labor and Industries Apprenticeship and Training Division as a training agent	Prior to work where apprentices will be employed
Safety and Health	013529	1.2	Contractor Health and Safety Plan (CHASP)	Within 14 days of receiving the Notice to Proceed
		1.2	Amendment to CHASP	As appropriate
		3.2	Employee Training and Medical Certificates	Prior to work
Marine Terminal Security, Safety, and Operating Regulations	013553	1.4	Contact information and vehicle information for all personnel that will enter Port facilities	Prior to work
		1.4	Documentation that personnel have received training from Port marine security department	Prior to work
Quality Control	014500	1.3	Contractor's Quality Control (CQC) Plan	14 days prior to beginning work
		1.3	Proposed Project Administrator's qualifications	
		1.3	Daily CQC Reports (includes Daily Inspection Reports and Daily Test Reports) submitted as part of the Contractor's Daily Construction Report	Daily
		1.3	Certified test reports	As required
Temporary Facilities and Controls	015000	1.5	Work Plan for any work that will generate dust (review dust control procedures with Port)	Prior to beginning work
		1.7	Solid Waste Management Documentation	Upon request
		1.16	Confined Space Entry Procedure	Upon request

Table 2
Phase I Removal Action Contractor List of Submittals

Construction Element*	Specification Section	Specification Reference	Submittal	Due Date
Tree and Plant Protection	015639	3.1	Results of inspection with documentation of unusual conditions	Prior to beginning work
Temporary Erosion, Sediment, and Pollution Control	015713	1.6	Erosion, Sediment, and Pollutant Control (ESPC) Plan	Prior to beginning work
		1.6	Construction start and completion dates	Pre-construction meeting
		1.6	Dates when ESPC measures will be in place	Pre-construction meeting
		1.6	Projected date of removal of erosion control structures (after soil is stabilized by vegetation or pavement)	Pre-construction meeting
		1.6	Description of control procedures to prevent the discharge of all wash water from concrete trucks into the storm sewer system	Pre-construction meeting
		1.6	Description of procedures for prompt maintenance or repair of ESPC measures utilized on-site	Pre-construction meeting
		1.6	Description of clearing and grading practices, including a schedule of implementation, that will minimize the area of exposed soil throughout the duration of the project. (Whenever practicable, clearing and grading shall be phased to prevent exposed inactive areas from becoming a source of erosion.)	Pre-construction meeting
		1.6	Description of best management practices that will be used to prevent or minimize storm water from being exposed to pollutants from spills, cleaning and maintenance activities, and waste handling activities. These pollutants include fuel, hydraulic fluid, and other oils from vehicles and machinery as well as debris, leftover paints, solvents, and glues from construction operations	Pre-construction meeting
		1.6	Name, title, and telephone number of designated employee to perform the Contractor's inspection and monitoring of ESPC measures.	Pre-construction meeting
		1.6	Any requested changes or modifications to the ESPC measures shown on the drawings shall be submitted to the Port for approval prior to implementation	
		3.3	ESPC Inspection Reports	Completion of work

Table 2
Phase I Removal Action Contractor List of Submittals

Construction Element*	Specification Section	Specification Reference	Submittal	Due Date
Environmental Protection	015719	1.3	Environmental Protection Plan (EPP)**	4 weeks prior to start of scheduled construction activities
		3.3.C	Written inspection report	Every 2 weeks
Execution Requirements	017000	1.2.A	Notification of Intent to Commence Work	2 days prior to beginning work
		1.3.F	Field Notes	Upon request
		1.3.G	Sealed survey of replaced monuments and verification that survey was recorded in Multnomah County	Completion of work
Construction Waste Recycling	017419	1.4	Initial Pre-Construction Estimate (site waste recycling form)	Before site work begins
		1.4	Monthly Reports (updated site waste recycling forms)	Monthly
		1.4	Closeout Project Summary	Prior to contract closeout
Closeout Procedures	017700	1.1	Drawing set	Upon completion of work
		1.7	Certificates of approval	Prior to final payment
		1.8	Confined spaces informational submittal form	
Site Demolition and Debris Removal	024113	3.4	Names and locations of disposal facilities	Prior to beginning work
		3.4	EPP**	
Site Clearing, Earthwork, and Shoreline Stabilization	312000	2.2.A	Borrow Source Characterization Report	
		2.2.A	Borrow Material Test Results	2 weeks prior to delivery
		2.2.A	Certified Tickets from Borrow Source	After each load delivered
Planting Irrigation	328400	1.5.A	Manufacturer catalog data and full descriptive literature	30 days prior to performing work
		1.5.C	Shop drawings	30 days after acceptance of Contract
		3.12.A	Record Drawings (working)	Immediately upon installation of any equipment in locations other than indicated on Shop Drawings
		3.12.B	Record Drawings	After final acceptance of completed installation
Soil Preparation	329113	1.3	Certification of qualities of topsoil and composted amendment	
		1.3	Sample of yard debris compost and topsoil	
		1.3	Notify Engineer of source of topsoil and composted amendment and provide sample	Before installation

Table 2
Phase I Removal Action Contractor List of Submittals

Construction Element*	Specification Section	Specification Reference	Submittal	Due Date
Seeding	329219	1.3	Seed Certification	Prior to delivery
		3.6	Request for Inspection	5 working days before requested inspection date
Trees, Shrubs, and Ground Covers	329300	1.4	Certify confirmed orders for plants and provide quantity, location, telephone number, and address of growers; submit color and dated photograph of each species	Within 5 days of Notice to Proceed
		1.4	Material Samples (bark mulch)	10 days prior to delivery
		1.4	Fertilizer product information and material certification. Certificates required by law	10 days prior to delivery
		1.6.B	Notification of delivery schedule	24 hour advance
Dredging, Transportation, and Disposal	352023	1.3.F	CQC Plan	
		1.3.G	EPP**	
		1.3.G	Water Quality Control and Contingencies Plan	7 days before mobilization
		1.3.H	CHASP	
		1.4.G	Survey Control Plan	Before beginning work
		1.4.L	Sounding Cross Sections	Daily
		1.4.M	Survey Drawings	After each survey
		1.5.D	Validate receipt of Permits	Before commencement of work
		1.6.G	Dredging and Disposal Workplan (part of the Phase I Removal Action Workplan)	Before dredging begins
		3.2.K	Dredge Work Complete Notification	
		3.2.M	Settlement Monitoring Plan (SMP)	Prior to construction
		3.3.A	Certification that Barges are Seaworthy and Sealed	Prior to construction
		3.3.B	Dredge Material Barge Information	
		3.4.A	Name and Location of Proposed Landfill	Prior to construction
		3.4.B	Disposal Verification	After each load
		3.4.B	Dredge Debris Offloading Facility Name and Location	
		3.4.D	EPP**	
		3.5.B	Fueling Plan (part of CHASP)	
		3.6.C	Operations Log and Daily Progress Chart	Completion of work
		3.6.D	Water Quality Control and Contingencies Plan	7 days before mobilization

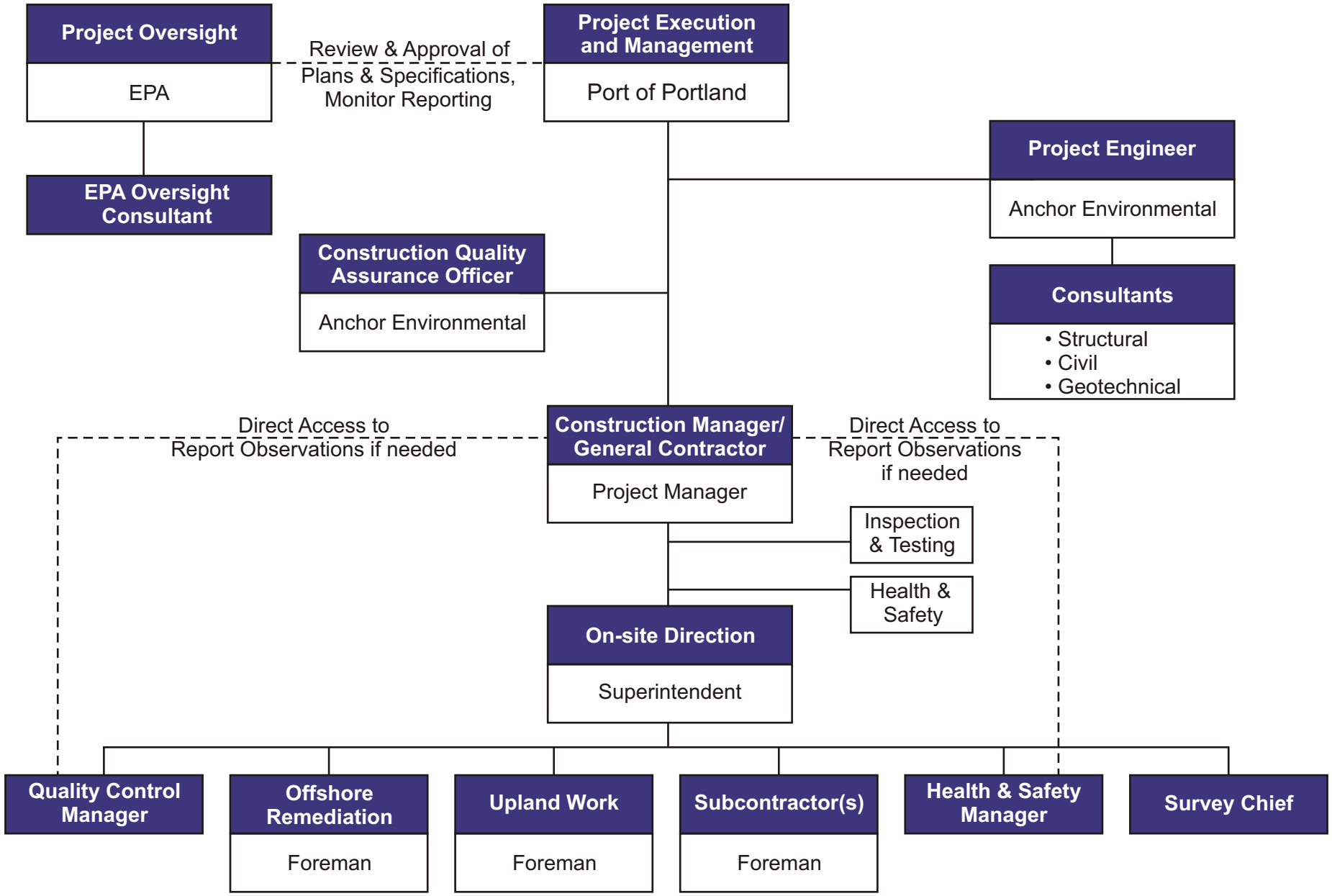
Table 2
Phase I Removal Action Contractor List of Submittals

Construction Element*	Specification Section	Specification Reference	Submittal	Due Date
Capping	352025	1.3.H	CQC Plan	
		1.3.I	EPP**	
		1.3.I	Water Quality Control and Contingencies Plan	
		1.3.J	CHASP	
		1.5.F	Survey Control Plan	Prior to beginning work
		1.5.L	Sounding Cross Sections	Daily
		1.5.M	Survey Drawings	After each survey
		1.7	Capping Work Plan (include in Removal Action Work Plan)	
		2.2.A	Borrow Source Characterization Report	Prior to any on-site placement
		2.2.A	Source Identification	
		2.2.A	5-Gallon Sample of import materials	14 days prior to delivery
		2.2.A	Notification of Borrow Source Inspection	2 weeks before inspection
		2.2.A	Borrow Source Test Results	2 weeks before delivery
		2.2.A	Certified Tickets	With each delivery
		3.2.B	Daily Capping Report	Daily
		3.2.C	Post-Cap Confirmation (Notification that base cap and armor layer work is complete)	Before Contractor demobilizes
		3.3.L	SMP	Prior to construction
		3.4.B	Barge information	
		3.5.C	Daily Progress Chart and Operator's Log	Completion of work
		3.5.D	Water Quality Control and Contingencies Plan	7 days before mobilization
Woody Debris Structures	353200	1.5.A	Source of habitat logs	Prior to transport to the site
		1.5.B	Anchor and chains product literature	
		3.3.B	Notification of Habitat Log Placement	48 hours notice

* This table summarizes those Divisions of the Draft Design Specifications that are most relevant to the CQAP.

** These submittals constitute the Phase I Removal Action Submittals required of the CM/GC and will be approved by USEPA prior to the start of work.

FIGURES



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ANCHOR ENVIRONMENTAL, L.L.C.

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Figure 1
Organization Chart
Terminal 4 Phase I Removal Action
Port of Portland

ATTACHMENT A-1

ARCHEOLOGICAL MONITORING PROTOCOL

ARCHAEOLOGICAL PROTOCOL

TERMINAL 4
PORTLAND, OREGON

December 2006

Port of Portland
Portland, Oregon

BACKGROUND

The Port of Portland operates three marine terminals on the Willamette and Columbia rivers, one of which is Terminal 4 located on the east bank of the Willamette River at about River Mile 4.4-5.7. As a state port district and in connection with its investigation and cleanup of contamination, the Port has responsibilities under state law to properly manage the archaeological, historical, and other cultural resources that may be located at Terminal 4. The cultural resources survey of Terminal 4 (Ellis and O'Brien 2003) has identified locations within Terminal 4 that are considered to have a high potential for archaeological resources. In addition to its responsibilities under state law and several agreements with Oregon Department of Environmental Quality ("DEQ") under the Oregon Voluntary Cleanup Program, the Port has responsibilities under federal law arising out of the Port's Administrative Order on Consent for Removal Action at Terminal 4 with the United States Environmental Protection Agency ("USEPA") and the Port's Administrative Order on Consent for an RI/FS of the Portland Harbor, also with USEPA.

Six Tribal governments are also interested in the protection of cultural resources at Terminal 4:

- Confederated Tribes of the Grand Ronde Community of Oregon,
- Confederated Tribes of Siletz Indians of Oregon,
- Confederated Tribes of the Warm Springs Reservation of Oregon,
- Confederated Tribes of the Umatilla Indian Reservation,
- Confederated Tribes and Bands of the Yakama Indian Nation, and
- The Nez Perce Tribe.

Conducting archaeological surveys prior to any ground-disturbing activity associated with contamination investigation and cleanup projects is intended to determine if the proposed activity is likely to affect significant archaeological resources. There is, however, a possibility that archaeological resources may be encountered during project-related activity, even with a thorough and systematic survey, through inadvertent discovery. In addition, it is important that any "discovered" human remains, including the remains of Native Americans, and associated cultural materials and deposits be treated with care and respect and protected from further disturbance and exposure to weather, as outlined in these protocols. These clarify and establish mutually acceptable protocols to process inadvertent discoveries of possible historic properties, human remains, funerary objects, objects of cultural patrimony, and other cultural items during ground-disturbing activities undertaken at Terminal 4.

FORMALIZING PROTOCOLS

These protocols are modeled after the protocols developed for the cleanup of the McCormick and Baxter Superfund Site in the lower Willamette River. They have been developed with input from affected stakeholders. It is the intent of the Port to seek

letter acknowledgements from the stakeholder regulatory agencies and governments to assure that all agree to abide by these protocols for future ground-disturbing activity at Terminal 4.

ARCHAEOLOGICAL SENSITIVITY AREAS

The archaeological sensitivity areas at Terminal 4 are those defined in the 2003 archaeological survey report, subsequently refined with the results of additional research, and shown in Figure 1. The Port may retain the services of a professional archaeologist to periodically update the definition of the sensitivity areas as new information comes to light. Revisions of boundaries of these areas will be made by the Port in consultation with affected stakeholders.

ON-SITE PROCEDURES WITHIN TERMINAL 4 ARCHAEOLOGICAL SENSITIVITY AREAS

To assure compliance with the National Historic Preservation Act (16 USC 470) and applicable Oregon statutes (ORS 97.740 et seq., 358.905 et seq., and 390.235 et seq.), the following procedures have been developed to address potential discoveries, including inadvertent discoveries, of cultural materials and deposits (including sacred objects, funerary objects, and objects of cultural patrimony as defined in ORS 358.905) and Indian burials and human remains (as defined in ORS 358.905) during ground-disturbing contamination investigation and removal or remedial actions within the archaeological sensitivity areas at Terminal 4. These procedures also apply to ground-disturbing activities that are associated with or an outcome of removal or remedial actions (e.g., construction of new outfalls or removal of existing outfalls) for which the Port is responsible.

Ceremonies Prior to Ground-Disturbing Activity
Tribal governments may desire to perform ceremonies prior to ground-disturbing removal or remedial actions at Terminal 4. The Port will give two weeks notice, by e-mail or by letter, of planned ground-disturbing removal or remedial actions that are considered likely to encounter or extend into native soils or sediments. Tribes will coordinate with the Port so that scheduling and logistics of such ceremonies will not delay project schedules.

Notification of Ground-Disturbing Activity
The Port will notify the six interested Tribes by e-mail or by letter in advance of any planned ground-disturbing removal or remedial actions that are expected to encounter or extend into native soils or sediments within the archaeological sensitivity areas at Terminal 4.

The notice will be given in as much advance of the activity as is possible. Attachment A provides the list of Tribal members and who will be notified by the Port and their contact information. Changes to this list will be made if requested by the respective Tribes.

Professional Archaeologist On-Site
The Port will retain the services of a professional archaeologist as defined in ORS 97.740 and ORS 390.235(6) (b) to provide on-site monitoring when ground-disturbing activity is conducted within the boundaries of the archaeological sensitivity areas at Terminal 4 (Figure 1) and is expected to encounter or extend into native soils or sediments.

Tribal Representatives On-Site
Interested Tribes are welcome to provide Tribal monitors during on-site activity within the archaeological sensitivity areas on Figure 1. Since the planned activity will likely occur at locations that are known or considered likely to be contaminated with hazardous substances, Tribal representatives will be required to comply with OSHA requirements provided in 29 CFR 1910.120 (aka, HAZWOPER). The application of these requirements will vary, depending on the type of activity at the site, and the proximity of the monitors to the activity. The requirements may include:

- Supervision by someone who is appropriately trained for hazardous substance sites, a briefing on Health and Safety issues, and sign–in;
- Restriction from the immediate area of the work;
- Prohibition of handling contaminated material;
- Use of personal protective equipment (PPE) such as rubber booties, that will be provided at the site; and
- 24- or 40-hour Hazardous Waste Operations (HAZWOPER) health and safety training.

Additionally, all on-site personnel, including Tribal monitors, are subject to the directions of the on-site Health and Safety Officer at all times.

Discovery
At the discretion of the on-site monitoring archaeologist, excavation or other ground-disturbing activities may be slowed or halted at any time a suspected archaeological object or archaeological site (as defined in ORS 358.905) is encountered. The objective of this slowing or halting of ground-disturbing cleanup activity is to allow the archaeologist to confirm and/or make a preliminary assessment of the discovery. All requests for such slowing or halting of construction activity must be communicated to the contractor's personnel through the Port's on-site personnel and must be cleared with the Port's project manager.

Figure 2 identifies the steps to be taken in the event of a potential discovery. Should the on-site monitoring archaeologist determine that a possible significant cultural resource has been encountered, he or she may direct the immediate cessation of all ground-disturbing activity in the vicinity of the discovery. The monitoring archaeologist will work with Port's contractor and Port personnel to determine when and where work may continue.

For discovery situations in which CERCLA does not provide the chief legal framework, the monitoring archaeologist will promptly apply for a State of Oregon Archaeological Permit on behalf of the Port requesting an expedited review process and permit per

OAR 736-51-080(9). Further excavation and/or recovery of artifacts or other archaeological deposits will not proceed until the permit has been issued.

At the request of the monitoring archaeologist, the Port's contractor and Port personnel will either:

- assist in securing access to the location of the discovery and take appropriate measures to protect the location of the discovery from rain, stormwater, and other possible disturbances, or
- assist the archaeologist in moving the artifacts to a protected and secure area of the site away from the immediate construction area.

The monitoring archaeologist will immediately notify the Port's project manager of the discovery. The Port will also promptly notify the Oregon State Historic Preservation Office, and representatives of the six Tribes – through the contacts listed below – of any discovery of likely or demonstrated cultural materials or deposits.

It has been suggested that there may be Native American remains in the Terminal 4 area. In the event that likely or confirmed human remains are encountered, the monitoring archaeologist will be responsible for immediately notifying the Port project manager. The Port will then notify the Oregon State Police, the Oregon State Historic Preservation Office (SHPO), the six Tribes referenced above, and the Commission on Indian Services (pursuant to ORS 97.745(4)).

The Port will also promptly notify the Multnomah County Medical Examiner if it cannot be clearly determined that the remains are those of a prehistoric individual. Human remains and associated funerary objects shall remain in place, with minimal disturbance by the county medical examiner in completing his or her work.

If the site is determined not to be a crime scene, and the human remains are identified as Native American, the Port shall continue to secure the remains and any associated funerary objects in place, until a decision is made regarding the appropriate course of action to address the discovery. The Port shall give due consideration to and honor, to the extent practicable, any request by the Tribe to leave the remains and/or other cultural items in place.

ON-SITE PROCEDURES FOR CERCLA-RELATED GROUND-DISTURBING ACTIVITY WITHIN TERMINAL 4 ARCHAEOLOGICAL SENSITIVITY AREAS

To assure compliance with the National Historic Preservation Act (16 USC 470) and applicable Oregon statutes (ORS 97.740 et seq., 358.905 et seq., and 390.235 et seq.), the following procedures have been developed to address potential discoveries, including inadvertent discoveries, of cultural materials and deposits (including sacred objects, funerary objects, and objects of cultural patrimony as defined in ORS 358.905) and Indian burials and human remains (as defined in ORS 358.905) during

remedial investigations and removal and remedial actions at Terminal 4. These procedures will also apply to CERCLA-related field sampling activities.

Media Samples

A professional archaeologist will examine core samples collected as part of removal or remedial actions from within the archaeological high-probability areas (Figure 1) at Terminal 4. This examination will consist of inspecting the samples as they are opened as described in the appropriate Field Sampling Plan (FSP). The archaeologist will determine if evident or likely artifacts are present or if other deposits are present that are likely to be cultural in origin. If artifacts or likely archaeological deposits are present, the archaeologist will record the location of the materials within the sample and photograph and sketch the materials in place in such a manner to provide information on provenience within the sample.

The evident or suspected artifact(s) or archaeological deposits and surrounding matrix totaling 1 liter in volume will be removed and screened through a set of nested sieves (12.7-, 6.3-, and 3.3-mm mesh) to recover any artifacts or archaeological materials that may be present. All recovered artifacts and other archaeological materials will be placed in an appropriate container or containers, labeled with all pertinent provenience information, and sealed. The recovered materials will be stored in a secure location pending disposition. The inspection, documentation, and removal of any archaeological materials present will be completed prior to the subsampling procedure outlined in the appropriate FSP. If artifacts or archaeological deposits are clearly associated with modern activity or with activities associated with use of Terminal 4, the archaeologist will document the materials but no collection will occur.

Should archaeological deposits be encountered that appear to total more than 1 liter in volume, a 1-liter sample will be extracted for screening and the remaining deposit will be removed in a manner that does not compromise the remedial investigations subsampling and placed in an appropriate container or containers, labeled with all pertinent provenience information, and sealed. The recovered materials will be stored in a secure location pending disposition.

Geotechnical Samples and Monitoring Wells

A professional archaeologist will monitor the geotechnical borings and monitoring wells excavated as part of cleanup activities within the archaeological high-probability areas on Figure 1. The monitoring will consist of on-site inspection of the excavations as they occur to determine if evident or likely artifacts are present or if other deposits are present that likely to be cultural in origin. If artifacts or likely archaeological deposits are present, the archaeologist will record the depth and—if appropriate—the thickness of any artifacts or archaeological deposits encountered in the excavations. The archaeologist will also photograph any materials as they are discovered and provide a written description. Artifacts and a sample of any archaeological deposits exposed in the excavations will be collected and placed in an appropriate container or containers, labeled with all pertinent provenience information, and sealed. The recovered materials will be stored in a secure location pending disposition.

At the discretion of the monitoring archaeologist and based on his or her professional judgment, excavations for a geotechnical boring or monitoring well may be slowed to

allow a more thorough examination of possible archaeological materials or may be halted if it is clear that the excavations are encountering archaeological materials or deposits that are clearly significant.

On-Site Staging and Coordination
An area of Terminal 4 will be designated as a staging area for the archaeologist and Tribal representatives to more closely examine artifacts. If artifacts are associated with contaminated deposits, the Port and the archaeologist will consult with the Tribes regarding whether artifacts are to be decontaminated and what decontamination options are available. Also, a location will be identified in consultation with the Tribes for reburial of discovered artifacts that are contaminated and unlikely to successfully undergo decontamination procedures, such as textiles and basketry. The location of this area would be known only to the Tribes, the Port, the SHPO, and the USEPA and/or DEQ, depending on which agency has jurisdiction over the investigation and cleanup.

Removal and Remedial Actions
When planned removal or remedial actions have been determined or are considered likely to affect archaeological resources, the Port will consult with the Tribes and the SHPO to define an appropriate course (or courses) of action to avoid or mitigate for adverse project effects. Courses of action may include archaeological monitoring that is implemented within the framework of this protocol or may require a protocol that is specific to the proposed remedial action and the archaeological resources known or considered likely to be present. Use of the present protocol or a project-specific protocol should be implemented within the framework of a Memorandum of Understanding (MOU) with Tribes, the SHPO, and other appropriate agencies or of a Memorandum of Agreement (MOA) if significant resources will be adversely affected by the planned actions.

If planned removal or remedial actions at Slip 1 would require removal of piers or pilings, the Port will have any of these structures that are known or likely to be 50 years or older in age recorded as historical or archaeological resources and evaluated to determine if any are eligible for listing in the National Register of Historic Places (unless they have been previously recorded and evaluated). If any piers or pilings are considered eligible, appropriate mitigation measures will be developed in consultation with the appropriate Tribes, the SHPO, and appropriate agencies.

If planned removal or remedial actions would affect any buildings or structures at Terminal 4 that have been recommended as eligible for listing in the National Register of Historic Places, the Port will have Section 106 Documentation Forms prepared for the affected building(s) or structure(s) and will submit these forms to the SHPO for review. The Port will coordinate and consult with the appropriate Tribes, the SHPO, and appropriate agencies to define appropriate measures as needed to address effects to the eligible buildings and structures.

Human Remains
If evidence of human remains is observed in any of the samples, no further processing will occur with the specific sample. After documentation of the find, the sample will be closed, sealed, and stored at a secure location. If evidence of human remains is

encountered in the geotechnical boring or monitoring well excavations, the monitoring archaeologist will immediately halt the excavations and no further excavation will occur at that location. Provenience data on the evidence of human remains will be recorded and then the remains and any associated funerary objects and soil matrix placed in an appropriate container, labeled, sealed, and placed in a secure location.

If evidence of human remains is encountered in any of the samples or excavations, the monitoring archaeologist will immediately notify representatives of the contractor directing the excavations and the Port's project manager. A representative of the Port will then promptly notify the Oregon State Police, the appropriate Tribes, the Legislative Commission on Indian Services, and the Oregon State Historic Preservation Office to comply with ORS 97.745(4), through the contacts below. The Port will then coordinate with these agencies and the appropriate Tribes to define a response to the discovery.

Other Issues

When the presence of artifacts or other archaeological deposits is confirmed, the appropriate Tribes and the SHPO will be notified and an appropriate response to the discovery defined by the Port in consultation with the appropriate Tribes and the SHPO. The materials observed will be documented as archaeological isolates or sites on the appropriate SHPO forms. The Oregon Department of State Lands (DSL) will be notified of any archaeological resources encountered on lands administered by DSL.

Artifacts and other archaeological deposits recovered during investigation and removal or remedial actions will be stored in a secure location as noted above. Those materials that can be successfully decontaminated (if necessary) will be curated at the Oregon Museum of Anthropology in accordance with ORS 358.920 and 390.235, with the exception of human remains, funerary objects, sacred objects, and objects of cultural patrimony. Alternative curation arrangements may be made by the Port in consultation with the Oregon State Museum of Anthropology, the appropriate Tribes, and the SHPO in accordance with ORS 390.235-390.240. Disposition of human remains, funerary objects, sacred objects, and objects of cultural patrimony will be determined in accordance with ORS 390.235-390.240. Alternative procedures for the disposition of contaminated human remains, funerary objects, sacred objects, objects of cultural patrimony, and other artifacts, including on-site reburial, will be developed by the Port in consultation with the appropriate Tribes, the Oregon State Museum of Anthropology, and the SHPO.

PROCEDURES FOR INADVERTENT ARCHAEOLOGICAL DISCOVERIES AT TERMINAL 4 OUTSIDE ARCHAEOLOGICAL SENSITIVITY AREAS

The Port recognizes that while the previous archaeological research has identified areas within Terminal 4 considered to have a moderate to high potential for archaeological resources, artifacts and other archaeological deposits may be encountered during ground-disturbing investigation and removal or remedial actions elsewhere at Terminal 4. This section of the protocol addresses procedures to be

followed for inadvertent discoveries outside of the archaeological sensitivity areas on Figure 1.

Should suspected or evident artifacts or other archaeological deposits be encountered during ground-disturbing investigation and removal or remedial actions at Terminal 4 that are not being monitored by a professional archaeologist, further ground-disturbing activity will be halted in the immediate vicinity of the discovery and the location secured from further disturbance. The Port will arrange for the location of the discovery to be examined by a professional archaeologist in a timely manner. If the archaeologist confirms the presence of artifacts or other archaeological deposits, the procedures defined above for discoveries made during ground-disturbing activity monitored by an archaeologist will be implemented.

The procedures defined for responding to inadvertent discoveries of human remains or suspected Indian burials will be implemented for similar discoveries that may occur outside of the designated archaeological sensitivity areas.

CONFIDENTIALITY

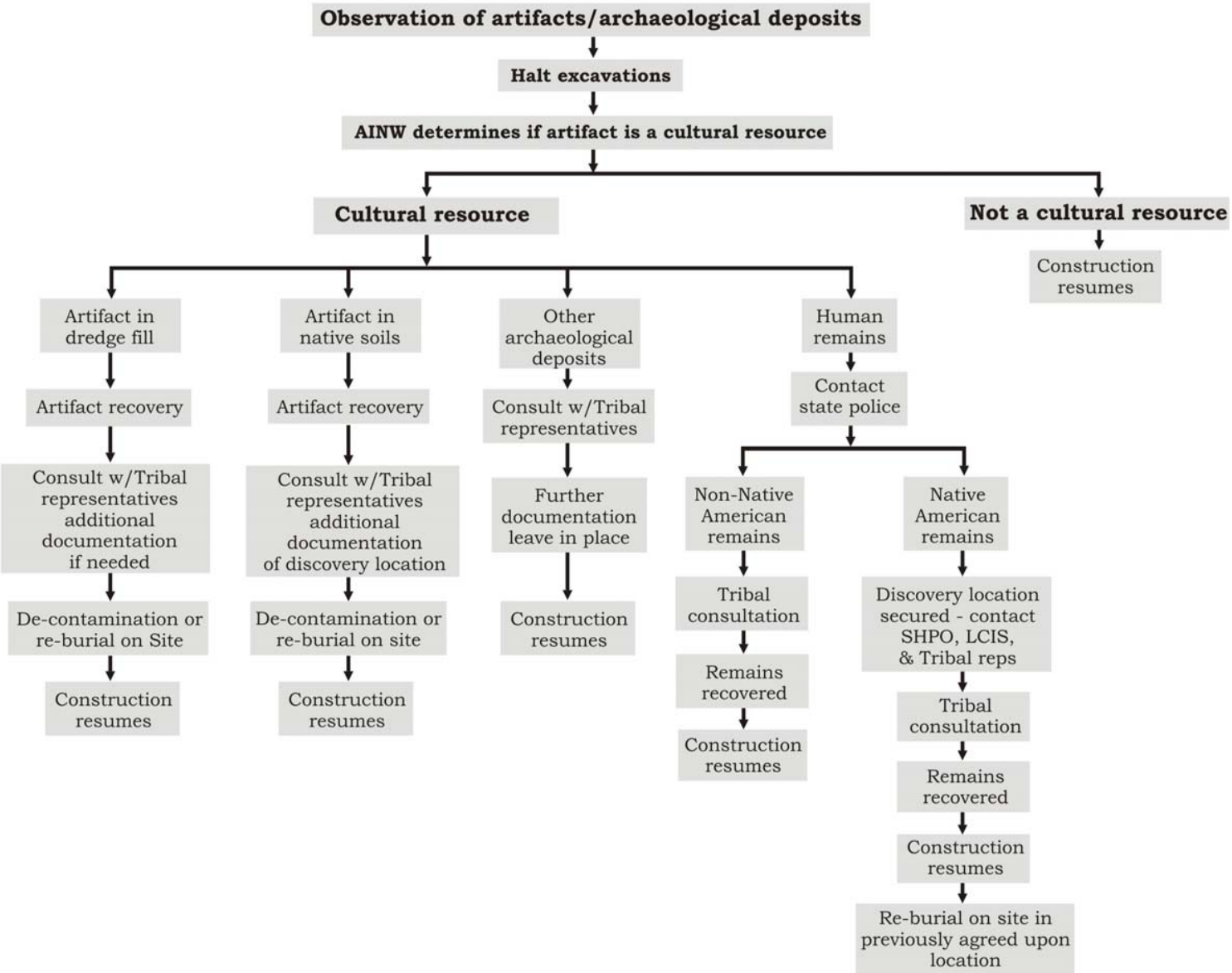
The Port shall make its best efforts, in accordance with state and federal law, to ensure that its employees and investigation and cleanup contractors keep the discovery of any found or suspected human remains, other cultural items, and potential historic properties confidential. Pertinent Port employees and contractors will be instructed that they are prohibited from contacting the media or any third party or otherwise sharing information regarding the discovery with any member of the public, and that they should immediately notify the Port of any inquiry from the media or public. To the extent permitted by law, prior to any release of information, the Port, the SHPO, and the Tribes shall concur on the amount of information, if any, to be released to the public, any third party, and the media and the procedures for such a release.

DISPUTE RESOLUTION

All Parties will strive to address and resolve disagreements informally and with the Port project manager. In the event agreement is not reached to the satisfaction of the regulatory agency and Tribal representative(s), the matter will be raised to the level of the Port's Marine Director and equivalent regulatory agency and Tribal management. Should the matter remain unresolved, the matter will be raised to the Port's Executive Director, the heads of the regulatory agencies, and the Chair of the Tribe(s). Each Party reserves any and all rights it may otherwise have to enforce its rights or seek resolution of the dispute under applicable law.

Figure 2

Archaeological Protocol Flow Chart
Terminal 4, Portland, Oregon



Attachment A
Contact Information for Archaeological Protocol
Terminal 4, Portland, Oregon

Tribe/Agency	Contact Name	Email Address	Phone Number
AINW	David Ellis	dellis@ainw.com	503-761-6605
SHPO	Dennis Griffin	dennis.griffin@state.or.us	503-978-0674
Oregon State Police	Steve Lane (NWR Office in Woodburn)	Not applicable	503-682-0208 x 228 (phone) 503-370-1114 (pager) 503-931-7273 (cell)
EPA	Chip Humphrey	humphrey.chip@epa.gov	503 326-2678
	Eric Blischke	blischke.eric@epa.gov	503 326-3250
DEQ	Thomas E. Roick	roick.tom@deq.state.or.us	503 229-5502
	Jim Anderson	anderson.jim@deq.state.or.us	503 229-6825
Commission on Indian Services	Karen Quigley	Karen.m.quigley@state.or.us	503-986-1068
Grand Ronde	Steve Kelly	stephen.kelly@grandronde.org	503-879-2339
	Khani Schultz	khani.schultz@grandronde.org	503 879-2185
Siletz	Tom Downey	tomd@ctsi.nsn.us	
	Robert Kentta	rkentta@ctsi.nsn.us	541-444-8244
	Billy Barquin	wbarquin@lwilder.com	503-242-0705
Warm Springs	Sally Bird	sbird@wstribes.org	541-553-2006
	Brian Cunninghame	cunninghame@gorge.net	541-490-2009
Umatilla	Audie Huber	audiehuber@ctuir.com	541-966-2334
	Catherine Dickson	CatherineDickson@CTUIR.com	541-276-3629
Yakama	Johnson Meninick	johnson@yakama.com	509-865-5121
	Paul Ward	ward@yakama.com	509-865-5121
Nez Perce			
	Kevin Cannell	kevinc@nezperce.org	208-843-7400

APPENDIX B

DRAFT
WATER QUALITY MONITORING PLAN

TERMINAL 4 PHASE I REMOVAL ACTION
PORT OF PORTLAND, PORTLAND OREGON

DRAFT DOCUMENT: DO NOT QUOTE OR CITE
This document has not been reviewed or approved by USEPA and its federal, state and tribal partners and is subject to change in whole or in part.

Prepared for

Port of Portland

Portland, Oregon

Prepared by

Anchor Environmental, L.L.C.

6650 SW Redwood Lane, Suite 333

Portland, Oregon 97224

January 2008

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Attachment B-1 Water Quality Monitoring Form

1 INTRODUCTION

This document presents a Draft Water Quality Monitoring Plan (WQMP) to address substantive requirements of the Clean Water Act (CWA) Section 401 water quality certification that arise because of activities associated with Phase I Removal Action at the Port of Portland's (Port) Terminal 4 (T4) facility in Portland, Oregon (see Figure 1).

This document details the water quality monitoring activities and protections that will be implemented during the Phase I Removal Action to minimize adverse impacts to water quality during Phase I capping and dredging operations. Phase I of the Removal Action includes the following components:

- Dredging and off-site disposal of sediment exhibiting the highest chemical concentration providing a permanent solution of contaminant mass removal
- Placement of a sand layer on a portion of the dredge footprint where full removal is not feasible due to concern over slopes and waterfront structures
- Construction of a nearshore cap to isolate petroleum contaminated sediments from aquatic receptors and control a potential ongoing source to nearby areas
- Stabilization of the Wheeler Bay bank to minimize contaminant migration to the river
- Dredging and off-site disposal of contaminated sediments in Slip 3 at Berth 410 to support water-dependent maritime use in a manner consistent with the Action Memo and in support of overall risk reduction in the Removal Action Area.

The remainder of this document provides the following information related to water quality monitoring during construction:

- **Section 2 – Water Quality Monitoring Program** describes the monitoring objectives, monitoring approach, background survey, compliance boundaries, station locations and depths, and applicable water quality criteria.
- **Section 3 – Activity-Specific Monitoring Requirements** presents specific monitoring activities and schedules for each construction activity.
- **Section 4 – Sampling and Analysis Methods** describes the details of sampling and analysis including station identification, sample location and depth control, monitoring methods and equipment, decontamination procedures, monitoring equipment

calibration and maintenance, measurement documentation, sample handling and custody, and analytical laboratory parameters and methods.

- **Section 5 – Reporting Requirements** describes the requirements for water quality data submittals, laboratory turnaround times, and documentation required for the Removal Action Completion Report (RACR).
- **Section 6 – Contingency Plan** describes exceedance notification requirements, contingency response actions, and construction best management practices (BMPs) to be implemented to minimize water quality exceedance potential.
- **Section 7 – Monitoring Personnel and Key Contacts** details the responsibilities of key monitoring personnel.

2 WATER QUALITY MONITORING PROGRAM

The objective of water quality monitoring during Phase I Removal Action construction activities is to confirm that water quality criteria are met or to ensure approval to allow temporary exceedances of water quality standards during any construction activity that may affect the water column (USEPA 2003a). To meet this objective, water quality monitoring will occur during the following in-water construction activities:

- Berth 411 Plus dredging (Slip 3 and Berth 414)
- Berth 411 sand layer placement
- Capping in Slip 3
- Berth 410 dredging
- Transport and transfer of materials from barge to upland transport at an upland transfer facility (transfer facility to be determined)
- Wheeler Bay shoreline stabilization

The details of the water quality monitoring program, including monitoring parameters, background survey, compliance boundary locations, monitoring station locations and depths, monitoring schedules, and applicable water quality criteria are described below.

2.1 Monitoring Parameters

The following parameters will be monitored during Phase I Removal Action construction activities (see Table 1).

- Visual Parameters
  - Ongoing observation for turbidity plumes
- Field Parameters
  - Turbidity (in nephelometric turbidity units [NTU])
  - Dissolved oxygen (DO; in milligrams per liter [mg/L])
  - Temperature (in degrees centigrade)
  - pH (in standard units)
- Laboratory Parameters
  - Total suspended solids (TSS; in mg/L)
  - Dissolved metals (cadmium, copper, lead, and zinc; in micrograms/Liter [μg/L])

- Polycyclic aromatic hydrocarbons (PAHs; priority pollutant list; in ug/L)

Table 1 summarizes the parameters that will be monitored during each construction activity. The monitoring program will include regularly scheduled field measurements and laboratory analyses of the water samples for chemicals of concern (COCs). COCs have been established based on exceedances of PECs in sediment samples from the respective construction areas (cadmium, lead, zinc, PAHs).

2.2 Background Survey

Initial characterization of ambient background conditions for conventional and laboratory parameters in the vicinity of Terminal 4 will be established prior to the start of over-water and in-water work. The objectives of the background survey are:

- To provide baseline conditions for evaluating monitoring data (in particular, turbidity and DO) that are based on maintaining acceptably small changes to background conditions in the river
- To establish ambient background concentrations of metals and organic compounds in the river caused by natural enrichments in regional volcanic soils or upstream urban and agricultural inputs

2.2.1 Pre-construction Survey

The pre-construction background survey will consist of three sampling events completed in the vicinity of Terminal 4 prior to the start of in-water construction work. If possible, at least one storm event will be included in the survey. Four monitoring stations will be sampled during each of the background events, as shown on Figure 2.

Two of the four stations will be monitored only during the background survey to characterize ambient river conditions in the vicinity of the construction areas. These stations include the following (see Figure 2):

- Mouth of Slip 3
- Center of Slip 3

The other two stations will be monitored during the background survey, and in addition, one or both of these stations will continue to be monitored during in-water work activities to characterize background water quality excursions that may occur during the Phase I Removal Action. These stations include the following (see Figure 2):

- 300 meters upstream from Slip 3
- Opposite riverbank from Slip 3

Conventional field parameters (turbidity, DO, temperature, and pH) will be measured at each sampling station at three different depths (surface, middle, and bottom). In addition, a sample will be collected from the depth with the highest turbidity reading and submitted for laboratory analysis of project COCs (TSS, PAHs, cadmium, lead, and zinc). With three events and four monitoring stations, the pre-construction background survey will generate 36 measurements of field parameters and 12 analyses of water samples for project COCs.

2.2.2 Background Criteria

Background criteria will be established at the 90th percentile concentration of the background dataset. The 90th percentile concentration is calculated from the following equation:

Rank of Sample that corresponds to 90th percentile = (N+1) X 0.9

Initial estimates of 90th percentile background concentrations for turbidity, TSS, and dissolved metals are provided by U.S. Geologic Survey (USGS) monitoring station No. 14211720 (Willamette River at Portland). These values are summarized in Table 2. The USGS background dataset will be updated with pre-construction survey data, and 90th percentile values will be recalculated.

2.3 Compliance Boundaries

The proposed compliance boundaries for this project are (see Figure 3):

- Slip 3 Construction Activities

  - *Turbidity* – 100 meters from the mouth of Slip 3
  - *TSS and COCs* – 100 meters from the respective Phase I Removal Action Berth 411 Plus Areas
- Berth 414 Construction Activities
  - *Turbidity, TSS, and COCs* – 100 meters from the Phase I Removal Action Area
- Berth 410 Construction Activities
  - *Turbidity, TSS, and COCs* – 100 meters from the mouth of Slip 3
- Upland Transfer Facility Activities
  - *Field Parameters* – 100 meters downstream from upland transfer location

2.4 Monitoring Station Locations and Depths

Three monitoring stations will be symmetrically placed around the compliance boundary as shown on Figure 3. These stations are configured to capture flow reversals when they occur. Therefore, the field crew will not be required to determine the exact current direction during each monitoring event. Determining the current direction may be difficult in the field due to the slow current speeds in the slips, wind generated surface flow, eddy effects, propwash, and other complicating factors. In addition to the monitoring stations along the compliance boundary, an "early warning" station will be placed at the midpoint of the compliance zone, 50 meters from the mouth of the slip or the construction activity. Two stations will be available for ongoing monitoring as background stations, one located 300 meters upstream of all construction activities along the same (east) riverbank, and the other located on the opposite (west) riverbank across from Terminal 4. One monitoring station will be located 100 meters downstream from the upland transfer facility location. In addition, a background station will be located 50 meters upstream from the upland transfer location. Although pre-determined stations will be targeted for sampling, if there is a visual plume, stations will be adjusted to sample within the plume.

At each station, monitoring will occur at three depths:

- Surface – 3 feet below the water surface
- Middle – Center of the water column
- Bottom – 3 feet above the sediment bottom

For conventional field parameters (turbidity, DO, temperature, and pH), samples will be collected at three compliance boundary stations, one early warning station, and one background station. At these locations, field parameters will be measured at the surface, middle, and bottom depths. For chemistry monitoring, discrete samples will be collected at one compliance boundary station (the station with the highest turbidity readings) and a background station. During Tier I events (see Section 2.5 for a description of the tiered sampling approach), chemistry samples will be collected at the surface, middle, and bottom depths, and during Tier II events, a single sample will be composited from the surface, middle, and bottom depths at the selected station. Tier II samples are considered routine samples and would be implemented after intensive Tier I sampling results showed no elevated levels of turbidity or COCs during the associated construction activity.

2.5 Monitoring Tiers and Schedules

Water quality monitoring schedules are divided into two tiers, as summarized in Table 3. Tier I reflects "intensive monitoring" that will be performed at the beginning of a new construction activity or when there is a significant change in construction methods. Tier II reflects "routine monitoring" that will occur after an activity has been underway for a period of time and no water quality exceedances have been detected in several rounds of monitoring, contingent on EPA approval. Monitoring will revert back to a Tier I schedule if an exceedance occurs during Tier II monitoring. Additional information on monitoring schedules that will apply to specific construction activities is provided in Section 3 and Table 3.

2.6 Water Quality Monitoring Criteria

Water quality monitoring criteria are summarized in Table 2 and discussed below. These criteria will form the basis for evaluating water quality at the compliance boundary.

2.6.1 Turbidity

Consistent with state water quality standards [OAR 340-041-036], the following turbidity criteria will apply at the compliance boundary:

- Turbidity should not exceed 5 NTUs above background if background is less than 50 NTUs.
- Turbidity should not exceed 10 percent above background if background is greater than 50 NTUs.

If turbidity exceedances are observed, TSS results may be considered as part of the weight of evidence in evaluating the environmental significance of the exceedances. TSS data are relevant for the following reasons:

- TSS is measured in concentration units and is therefore relevant for contaminant transport and mass balance calculations; in contrast, turbidity is a measure of light transmission and does not have a direct relation with, and is not a direct measure of concentration.
- TSS has greater ecological relevance, and literature studies have investigated the biological effects of high TSS concentrations on fish and other organisms actually use TSS as a metric.
- In a remedial dredging project, migration of contaminated sediments outside the project area is a key concern. TSS is a more direct measure of sediment resuspension and transport processes.

2.6.2 Dissolved Oxygen

At the compliance boundary, DO will not be less than 6.5 mg/L.

2.6.3 Chemicals of Concern

For laboratory analysis of COCs at the Phase I Removal Action project, state and federal aquatic life criteria will be used to evaluate water quality at the compliance boundary. Acute criteria will be the compliance criteria for water quality monitoring during all construction activities (i.e., dredging and capping) because such activities are migratory, intermittent, and ephemeral in nature. Chronic criteria will be used as action levels to trigger evaluation of additional construction BMPs, but will not be used for compliance purposes.

2.6.4 Metals Criteria

Water quality criteria for metals (cadmium, lead, and zinc) are derived from current USEPA Nationally Recommended Water Quality Criteria (USEPA 2006b), which are the same criteria that have been adopted by the State of Oregon. Metals criteria have been adjusted to a hardness value of 25 mg/L based on ambient measurements in the Lower Willamette River (USGS 2006). Metals criteria for cadmium, lead, and zinc are evaluated on a dissolved basis (USEPA 2006b)

2.6.5 PAH Guidance Values

Aquatic life criteria for PAHs are not available in either federal or state standards. However, estimated acute and chronic values for PAHs have been developed by USEPA for use in deriving sediment quality benchmarks (USEPA 2003b). These PAH values, listed in Table 2, may be used as guidance values during the monitoring program to assess the effectiveness of construction BMPs for controlling releases of PAHs. However, these guidance values will not be used as compliance criteria.

2.6.6 Background Criteria

Background criteria will be set at the 90th percentile value of the background dataset, which includes data from the pre-construction background survey, ongoing monitoring of background stations during construction, and existing data from USGS monitoring station #14211720 (Willamette River at Portland). Turbidity and TSS criteria are based on direct comparisons to background values. In addition, ambient concentrations of certain COCs in the Willamette River may be at or above aquatic life criteria/guidelines due to natural occurrences in regional volcanic soils or due to contributions from urban or agricultural runoff or other upstream sources. In such cases, the background criteria will supersede aquatic life criteria/guidelines as the basis for evaluating water quality that may be related to Phase I Removal Action activities. During short-term monitoring activities, concentrations must be shown to be below aquatic life criteria/guidelines or ambient background concentrations, whichever is greater.

Initial estimates of 90th percentile background criteria for turbidity, TSS, and dissolved metals based on USGS monitoring data are presented in Table 2. These background criteria will be updated and recalculated with the results of the pre-construction survey.

3 ACTIVITY-SPECIFIC MONITORING REQUIREMENTS

In this section, specific monitoring requirements and schedules are described for each construction activity that will be implemented during the Phase I Removal Action. General monitoring schedules are outlined in Table 3. To the extent construction activities overlap, the monitoring station locations and criteria may overlap and be coordinated to achieve efficiencies as appropriate.

Turbidity may be a reliable "real time" surrogate for chemical monitoring to evaluate the extent to which sediments and their associated contaminants may be resuspended in the Phase I construction areas. As directed by USEPA, chemical testing will be performed at the start of each in-water construction activity (as detailed below) to confirm the reliability of using turbidity as a surrogate for environmental monitoring based on actual field data.

3.1 Berth 411 Plus Dredging in Slip 3 and Berth 414

3.1.1 Description

Approximately 5,200 (neatline volume) to 7,300 (neatline with overdredge allowance volumes) cubic yards (cy) of contaminated sediment with varying degrees of contamination levels covering 1.3 acres will be removed from Slip 3 and Berth 414 using mechanical dredging equipment, as described in the Design Analysis Report (DAR). Figure 5 of the DAR shows the dredge prism. The sediment will be disposed at an upland landfill. The footprints of the Phase I Removal Action areas are shown on Figure 3.

3.1.2 Monitoring Parameters

Monitoring requirements during all dredging activities will include conventional field parameters (turbidity, DO, temperature, and pH) and laboratory parameters (TSS and COCs) at the compliance boundary and early warning boundary.

3.1.3 Compliance Boundaries

The compliance boundary for turbidity during dredging and transport activities in Slip 3 will be 100 meters from the mouth of Slip 3. The compliance boundary for COCs

during dredging and transport activities in Slip 3 will be 100 meters from the dredge prism boundaries within Slip 3 (see Figure 3). For dredging and transport activities occurring at Berth 414, the compliance boundary for both turbidity and COCs will be 100 meters from the dredging activity.

3.1.4 Monitoring Schedule

Conventional parameters (turbidity, DO, temperature, pH) will be measured once every 4 hours (Tier I) at the start of dredging activities (i.e., beginning 1 hour after dredging begins) or if construction methods drastically change. If no results above chronic or acute criteria are observed after 3 consecutive days of monitoring, the sampling frequency may be reduced to once per day (Tier II), subject to USEPA approval.

Chemical monitoring during initial startup will occur once per day for 3 consecutive days (Tier I), and results will be compared to acute and chronic water quality criteria. If no results above chronic or acute criteria are observed, chemical monitoring may be scaled back to once per week (Tier II), subject to USEPA approval, unless a significant construction modification is made. Chemistry samples will be collected for 3 consecutive days and submitted each day to the laboratory for a 3-day turnaround (based on when the sample arrives at the laboratory; see Section 5.2 for more details on turnaround times). Results for the samples collected on Day 1 will be received on Day 4 to determine if additional sampling and/or implementation of construction BMPs are necessary.

If any monitoring results are reported that are above of water quality criteria (e.g., narrative, acute, or chronic criteria) at the compliance boundary during Tier II monitoring, or if a significant construction modification is made; monitoring will revert back to Tier I requirements.

3.2 In-water Capping in Slip 3

3.2.1 Description

In-water capping will occur at the head of Slip 3 as described in the DAR and shown on Figure 2 of the DAR. The cap consists of two components. Below the timber bulkhead, the cap consists of approximately 12 inches of fine/medium sand or gravel with low fines content and free of large organic or other debris. Cap materials will be placed mechanically from a barge. A riprap wedge will be placed on top of the sand or gravel and against the timber bulkhead for stability. The second component of the cap is above the timber bulkhead. A sand and gravel material mixed with organoclay will be placed below an armor layer. A majority of the work above the timber bulkhead should occur above the water surface. Sorbent booms will be deployed around the area under construction when work is taking place in water.

3.2.2 Monitoring Parameters

During capping activities, monitoring of field parameters (turbidity, DO, temperature, and pH) and laboratory analytical parameters (TSS and COCs) will be performed at the compliance boundary and early warning boundary.

3.2.3 Monitoring Schedule

Field parameters (turbidity, DO, temperature, and pH) will be measured once every 4 hours (Tier I) at the start of capping activities (i.e., beginning one hour after capping begins) or if construction methods drastically change . If no results above chronic or acute criteria are observed at the compliance boundary following 3 consecutive days of monitoring, the sampling frequency may be reduced to once per day (Tier II) subject to USEPA approval.

Chemical monitoring during initial startup will occur once per day for 3 consecutive days (Tier I), and results will be compared to acute and chronic water quality criteria. If no results above chronic or acute criteria are observed at the compliance boundary during this period, chemical monitoring may be scaled back to once per week (Tier II), subject to USEPA approval, unless a significant construction modification is made (e.g.,

switch from placement using a mechanical bucket to placement using a conveyor). Chemistry samples will be collected for 3 consecutive days and submitted each day to the laboratory for a 3-day turnaround (see Section 5.2 for more details on turnaround times) based on when the sample is received by the laboratory. Results for the sample collected on Day 1 will be received on Day 4 to determine if additional sampling and/or implementation of construction BMPs is necessary.

If any results above chronic or acute criteria of (e.g., narrative, acute, or chronic) are detected at the compliance boundary during Tier II monitoring, or if a significant construction modification is made (e.g., switch from placement using a mechanical bucket to placement using a conveyor), monitoring will revert back to Tier I requirements.

3.3 Sand Layer Placement in Slip 3

3.3.1 Description

Sand layer placement will occur at the head of Slip 3 as described in the DAR and shown on Figure 5 of the DAR. A portion of the dredge footprint will not have full removal down to a PEC exceedance ratio of 10 due to the concern over slopes and waterfront structures. After dredging is completed these select areas will have a sand layer placed. The specifications require the Contractor to place the 600 tons evenly over the 13,300 sf target area. The specifications require the Contractor to place the material from the slope toe upward and in a manner to minimize mixing with underlying sediments. The sand material will be a gravelly sand to sandy gravel-this gradation will allow the material to be more stable on the 3 horizontal to 1 vertical (3H:1V) slope.

3.3.2 Monitoring Parameters

During sand layer placement activities, monitoring of field parameters (turbidity, DO, temperature, and pH) and laboratory analytical parameters (TSS and COCs) will be performed at the compliance boundary and early warning boundary.

3.3.3 Monitoring Schedule

Field parameters (turbidity, DO, temperature, and pH) will be measured once every 4 hours (Tier I) at the start of sand layer placement activities (i.e., beginning one hour after sand layer placement begins) or if construction methods drastically change . If no results above chronic or acute criteria are observed at the compliance boundary following 3 consecutive days of monitoring, the sampling frequency may be reduced to once per day (Tier II) subject to USEPA approval.

Chemical monitoring during initial startup will occur once per day for 3 consecutive days (Tier I), and results will be compared to acute and chronic water quality criteria. If no results above chronic or acute criteria are observed at the compliance boundary during this period, chemical monitoring may be scaled back to once per week (Tier II), subject to USEPA approval, unless a significant construction modification is made (e.g., switch from placement using a mechanical bucket to placement using a conveyor). Chemistry samples will be collected for 3 consecutive days and submitted each day to the laboratory for a 3-day turnaround (see Section 5.2 for more details on turnaround times) based on when the sample is received by the laboratory. Results for the sample collected on Day 1 will be received on Day 4 to determine if additional sampling and/or implementation of construction BMPs is necessary.

If any results above chronic or acute criteria of (e.g., narrative, acute, or chronic) are detected at the compliance boundary during Tier II monitoring, or if a significant construction modification is made (e.g., switch from placement using a mechanical bucket to placement using a conveyor), monitoring will revert back to Tier I requirements.

3.4 Berth 410 Dredging in Slip 3

3.4.1 Description

Approximately 3,700 (neatline volume) to 9,200 (maximum allowed volume) cy of contaminated sediment with varying degrees of contamination covering 1.9 acres will be removed from the Berth 410 area using mechanical dredging equipment, as

described in the DAR. Figure 5 of the DAR shows the dredge prism. The material will be disposed at an upland landfill.

3.4.2 Monitoring Parameters

Monitoring requirements during all dredging activities will include conventional field parameters (turbidity, DO, temperature, and pH) and laboratory parameters (TSS and COCs) at the compliance boundary and early warning boundary.

3.4.3 Compliance Boundaries

The compliance boundary for turbidity, TSS, and COCs during dredging and transport activities in Slip 3 will be 100 meters from the mouth of Slip 3 (see Figure 3).

3.4.4 Monitoring Schedule

Conventional parameters (turbidity, DO, temperature, pH) will be measured once every 4 hours (Tier I) at the start of dredging activities (i.e., beginning 1 hour after dredging begins) or if construction methods drastically change. If no results above chronic or acute criteria are observed after 3 consecutive days of monitoring, the sampling frequency may be reduced to once per day (Tier II), subject to USEPA approval.

Chemical monitoring during initial startup will occur once per day for 3 consecutive days (Tier I), and results will be compared to acute and chronic water quality criteria. If no results above chronic or acute criteria are observed, chemical monitoring may be scaled back to once per week (Tier II), subject to USEPA approval, unless a significant construction modification is made. Chemistry samples will be collected for 3 consecutive days and submitted each day to the laboratory for a 3-day turnaround (based on when the sample arrives at the laboratory; see Section 5.2 for more details on turnaround times). Results for the samples collected on Day 1 will be received on Day 4 to determine if additional sampling and/or implementation of construction BMPs are necessary.

If any results above chronic or acute criteria (e.g., narrative, acute, or chronic criteria) are detected at the compliance boundary during Tier II monitoring, or if a significant construction modification is made, monitoring will revert back to Tier I requirements.

3.5 Upland Transfer Facility Monitoring

3.5.1 Description

Approximately 16,500 cy of contaminated sediment with varying degrees of contamination will be transferred from barges to trucks using mechanical equipment, as described in the DAR. The material will be disposed at an upland landfill.

3.5.2 Monitoring Parameters

Monitoring requirements during all sediment transfer activities will include conventional field parameters (turbidity, DO, temperature, and pH) at the compliance boundary.

3.5.3 Compliance Boundaries

The compliance boundary for conventional field parameters will be 100 meters downstream from the upland transfer facility.

3.5.4 Monitoring Schedule

Conventional parameters (turbidity, DO, temperature, pH) will be measured once every 4 hours (Tier I) at the start of transfer activities (i.e., beginning 1 hour after transfer begins). If no results above chronic or acute criteria are observed after 3 consecutive days of monitoring, the sampling frequency may be reduced to once per day, or further reduced to once per week (Tier II), subject to USEPA approval.

If any results above chronic or acute criteria (e.g., narrative, acute, or chronic criteria) are detected at the compliance boundary during Tier II monitoring, or if a significant construction modification is made, monitoring will revert back to Tier I requirements.

3.6 Wheeler Bay Shoreline Stabilization Monitoring

3.6.1 Description

The Wheeler Bay Shoreline will regraded to a more stabile configuration as described in the DAR. Once the slope is graded to the design grade, a final surface treatment of riprap, jute mat, or other materials will be constructed to eliminate erosion. Most of the work will be performed above elevation 10 feet National Geodetic Vertical Datum (NGVD) and will not take place in or over the water (see Drawing C-7 in Appendix D).

3.6.2 Monitoring Schedule

The monitoring schedule is designed to ensure that any stormwater flow through the construction area to the river weather will be detected and addressed. Visual monitoring will take place once every hour (Tier I) at the start of stabilization activities (i.e., beginning 1 hour after construction begins) in the event that it is raining at the construction site. Visual monitoring will take place once every 4 hours (Tier II) at the start of stabilization activities (i.e., beginning 1 hour after construction begins) in the event that it is not raining at the construction site.

4 SAMPLING AND ANALYSIS METHODS

4.1 Methods and Equipment

Water column samples will be collected in accordance with *Methods for Collection, Storage, and Manipulation of Sediments for Chemical and Toxicological Analyses: Technical Manual* (USEPA 2001b). Samples will be collected from a self-propelled vessel. Field parameters will be measured with a calibrated field probe. Water chemistry grab samples will be collected using a decontaminated van Dorn bottle or similar device. Recovered water from the appropriate depth will be transferred immediately to appropriate laboratory-provided, pre-labeled, pre-cleaned sample containers.

Turbidity and other field parameters will be measured using a calibrated field probe deployed to the appropriate depth (surface, middle, and deep intervals) as described in Section 2.4.

4.2 Sample Location and Depth Control

A differential global positioning system (DGPS) will be used to navigate to and verify station locations. Sampling will take place within 3 meters of the target sampling locations. Depth to the bottom will be determined using a lead line or depth sounder. From this measurement, the appropriate sampling depths will be determined. Both the depth to the bottom and the sampling depths will be recorded at each location sampled.

4.3 Decontamination Procedures

Sample containers, instruments, working surfaces, technician protective gear, and other items that may come into contact with the water sample must meet high standards of cleanliness. A van Dorn water sampler will be used to collect grab samples for chemical and TSS analyses. The van Dorn sampler (or equivalent) will be decontaminated prior to each day's use and between sampling events. The decontamination procedure is as follows:

- Pre-wash rinse with site water
- Wash with solution of laboratory grade non-phosphate based soap (brush)
- Rinse with site water
- Rinse three times with laboratory grade distilled water

- Store in clean, closed container for next use

Additionally, the laboratory will provide pre-cleaned and labeled sample containers.

4.4 Sample Identification

All grab samples will be properly identified on their attached labels as well as in any forms or other documentation. All sample identifications will be consistent with the following identification scheme consisting of 13 alphanumeric characters:

1. The first two characters will be "T4" to identify the samples as Port of Portland Terminal 4 samples. For the Background Survey, "BG" will be used rather than "T4."
2. The next three characters will be used to identify each water quality monitoring location as listed below:
   - S3A = Head of Slip 3 Dredging Area
   - S3B = Head of Slip 3 Capping Area
   - S3C = Middle of Slip 3 Dredging Area
   - S3M = Mouth of Slip 3 (turbidity compliance boundary)
   - 414 = Dredging Area North of Berth 414
3. The next character will be a letter (N, M, or S) indicating the position along the compliance boundary arc as follows:
   - N = the station on the north side of the compliance boundary arc
   - M = the middle station along the compliance boundary arc
   - S = the station on the south side of the compliance boundary arc
   - E = the "early warning" station at the mid-point of the compliance zone
4. The next character will indicate the sampled water depth category as described below:
   - A = surface sample collected within 3 feet of the surface
   - B = sample collected at mid-depth
   - C = bottom sample collected 3 feet from the sediment surface
   - D = sample composited from the surface, mid-, and bottom depths
5. The last 6 characters will indicate the sample date by YYMMDD.

For example, following this identification scheme, T4-411-NA-080808 indicates a surface sample collected at Terminal 4 during dredging in the vicinity of Berth 414 at the station on the north side of the compliance boundary arc on August 8, 2008.

4.5 Measurement Documentation

The water quality monitoring data (e.g., station coordinates, water depths sampled, date, time, parameter results, and other observations) will be recorded on water quality monitoring forms.

4.6 Monitoring Equipment Calibration and Maintenance

Monitoring equipment will be calibrated prior to its use in the monitoring program following manufacturers' instructions. The calibration will be conducted once at the beginning of each sampling day for all equipment. Where not covered by manufacturers' instructions, calibration procedures will follow Standard Methods 2130-b (turbidity), 4500-O (DO), 2550 (temperature), and 4500-H^+ (pH; AWWA 1998).

For the turbidity meter, at the end of each day of monitoring, a post-calibration procedure will be performed by measuring one of the calibration standards (preferably the standard whose value is closest to the river turbidity during that day). In addition, standards may be measured to check the calibration throughout the day, especially if higher or lower than expected turbidity values occur.

All calibration information will be recorded in the field notebook. Equipment that does not properly calibrate will not be used.

Instruments and equipment will be tested and inspected before each monitoring event. Any field equipment that is faulty or not functioning properly will not be used for monitoring.

4.7 Sample Handling and Custody

After the water grab sample is collected, it will be immediately transferred to a pre-cleaned container provided by the analytical laboratory and placed in a cooler with ice. All containerized water samples will be transported to the analytical laboratory. Specific sample shipping procedures will be as follows:

1. Each cooler or container containing the sediment samples for analysis will be shipped to the laboratory within 24 hours of being sealed.
2. 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.
3. Glass jars will be separated in the shipping container by shock absorbent material (e.g., bubble wrap) to prevent breakage.
4. A generous amount of ice will be sealed in separate plastic bags and placed into the cooler.
5. A sealed envelope containing chain-of-custody forms will be enclosed in a plastic bag and taped to the inside lid of the cooler.
6. If sending via Fed Ex, the cooler lids will be secured by wrapping the coolers in strapping tape.
7. Signed and dated chain-of-custody seals will be placed on all coolers prior to shipping.

Upon transfer of sample possession to the analytical laboratory, the persons transferring custody of the sample container will sign the chain-of-custody form. Upon receipt of samples at the laboratory, the shipping container seal will be broken and the condition of the samples recorded by the recipient. Chain-of-custody forms will be used internally in the lab to track sample handling and final disposition.

4.8 Analytical Laboratory Parameters and Methods

Grab samples collected for analytical parameters (including TSS, cadmium, copper, lead, zinc, PAHs, DDTs, and PCBs) will be submitted to a qualified laboratory for analysis on a

72-hour turnaround time. The laboratory methods, criteria, and reporting limits are summarized in Table 4.

4.9 Quality Control and Assurance Procedures

Field and laboratory quality control and assurance procedures are discussed in detail in the Removal Action Quality Assurance Project Plan (QAPP) provided as Appendix I to the DAR. If there are any inconsistencies between the procedures specified in the QAPP and those specified in this WQMP, the WQMP will take precedence.

4.10 Health and Safety Procedures

Health and safety procedures for water quality monitoring activities are provided in the Removal Action Health and Safety Plan provided as Appendix J to the DAR.

5 REPORTING REQUIREMENTS

5.1 Data Submittals

Data will be collected and recorded in the field on the water quality monitoring forms. These data will be reported to USEPA in the following communications and submittals:

- **Daily Reporting** – Any exceedances of the water quality criteria specified in Section 2.6 and Table 2 will be reported verbally or by email to USEPA on a daily basis.
- **Weekly Reporting** – Results from each week's Water Quality Monitoring Forms will be compiled into a summary table with a comparison to criteria values and provided to USEPA on a weekly basis.
- **Final Reporting –** Once all construction is complete, results for the entire construction period will be compiled and reported to USEPA along with supporting documentation in a Draft and Final RACR, as described in Section 5.3 below.

Daily and weekly reporting will be conducted by the Water Quality Monitoring Field Leader. All reporting will include both regularly scheduled monitoring and any additional monitoring results that may have been triggered by exceedances of water quality criteria.

5.2 Laboratory Turnaround Times

5.2.1 Chemical Analysis

Preliminary, unvalidated laboratory chemical analytical results (TSS, target metals, and PAHs) will be reported to USEPA no more than 3 days (72 hours) following sample receipt by the laboratory. These reporting timelines will apply to samples collected on both weekdays and weekends.

To ensure that laboratory turnaround times (TATs) are met, the selected laboratory will be required to dedicate one primary and one back-up instrument and chemist to perform each analysis type. In addition, a back-up laboratory or a sister laboratory will be identified prior to the start of the project. The back-up laboratory will be involved in the kick-off meeting and kept up to date with daily project changes. This process will prevent last-minute issues with coordination should the lab need to be utilized. Any instrument malfunctions must be communicated to the Anchor Environmental, L.L.C.,

(Anchor) project manager or their designee the day they occur. This will allow for the back-up facility to receive samples the same day they are taken.

The laboratory will identify a lab designee (usually the project manager or project chemist) along with a back-up person. The primary laboratory project manager will communicate with the Anchor designee daily in a status phone call as to sample status, issues encountered, and sample loading concerns, as well as any other pertinent project concerns. The time of the daily status call will be determined in the kick-off meeting. If project samples become problematic for the laboratory and processing time increases or sample volumes increase due to increased sampling requirements, daily samples will be diverted to a back-up lab so that the primary lab does not become too affected and delay sample results.

Between 90 and 180 chemistry samples are estimated during the 6-week duration of the project, assuming, at a minimum, that chemical analysis will follow the Tier I schedule for 3 of the 6 weeks (i.e., three discrete samples from the compliance boundary station with the highest turbidity readings and three discrete samples from the background station, for a total of six analyses per day). The expected number of samples that may be generated each day following the Tier I schedule would be between 6 and 12, depending on the number of construction activities that may be occurring simultaneously.

Any QA/QC issues will be brought to the attention of the Anchor designee the day they occur so that resolution can be made the same day, preventing delay of sample processing. The Anchor designee will contact the lab project manager daily by 3 p.m. to communicate the number of samples to be picked up by the laboratory at the field site. All sample data will be sent to the project manager by 3 p.m. on the day they are due via e-mail (PDF format) or fax.

The primary laboratory and back-up laboratory will identify their routine and contingency clean-up procedures prior to the start of the project, which will allow the

chemist to perform the approved clean-up procedures as they occur under normal foreseeable circumstances (e.g., internal standard problems, matrix effects) rather than wait. Issues that are more complex will be handled as described above through the lab and Anchor designees on the day they occur.

For evening and weekend communications, the lab project manager, designated lab QA/QC reviewer, and primary chemist performing the work will be required to communicate with the Anchor designee at the prescribed timelines set-up in the kick-off meeting. For weekend sample receipt, the laboratory will identify a phone number and person(s) responsible for receiving the samples, logging in samples, and communicating any log-in issues. This will prevent log-in delays during the off-hour shifts. The Anchor designee will be responsible for following up with the laboratory on the daily sample receipts.

The Anchor designee and the Anchor project manager will meet daily after the laboratory status meeting and receipt of sample data for that day. The status meeting will review current sampling status to laboratories, data status, and on-time or QA/QC issues. If during the meeting it is determined that the primary laboratory is not meeting its goals, the back-up laboratory will be utilized until the primary laboratory is on track again. The Anchor designee will contact both labs as to the decisions made in the project status meeting.

5.3 Removal Action Completion Report

After all construction is complete, the results of water quality monitoring will be provided to USEPA in the draft RACR. The RACR will be revised to address USEPA comments, if applicable, and submitted as a final report. The results section of the RACR will include:

- Any deviations from this WQMP and reasons for deviations
- Tabular summaries of all water quality monitoring data with comparisons to compliance criteria and trigger values
- Narrative text on results of water quality monitoring related to each operation and removal action area (e.g., dredging and capping in Slip 3, Berth 414)

- Discussion of water quality criteria exceedances and any additional monitoring that may have resulted, or additional construction BMPs that may have been implemented
- An appendix containing all completed water quality monitoring forms
- An appendix containing all calibration information

6 CONTINGENCY PLAN

6.1 Notification Requirements

The primary purpose of water quality monitoring during construction is to determine when water quality impacts may be occurring so that additional contingency actions can be implemented, if necessary, as described in this document. Consequently, immediate notification of water quality measurements that exceed triggers described in this plan is necessary. Upon obtaining results that exceed any trigger, the Water Quality Monitoring Field Leader will notify the Construction Quality Assurance Officer (CQAO) as quickly as possible. The CQAO will notify the Port Project Coordinator, who in turn will immediately notify the USEPA Remedial Project Manager (Sean Sheldrake) and USEPA Water Quality Specialist (Jonathan Freedman) by telephone. Contact information for the USEPA Remedial Project Manager and Water Quality Specialist are provided below:

Mr. Sean Sheldrake
USEPA, Region 10
Environmental Cleanup Office
1200 Sixth Avenue
Mailstop: ECL-110
Seattle, WA 98101-1128
(206) 553-1220 Telephone
(206) 553-0124 Fax
Sheldrake.sean@epa.gov

Mr. Jonathan Freedman
USEPA, Region 10
Aquatic Resources Unit
1200 Sixth Avenue
Mailstop: ETPA-083
Seattle, WA 98101-1128
(206) 553-0266 Telephone
(206) 553-1775 Fax
Freedman.jonathan@epa.gov

6.2 Contingency Response Actions (If Water Quality Criteria are Exceeded)

6.2.1 Exceedance of Visual Monitoring Criteria

If visual monitoring criteria are exceeded, the following contingency actions will be implemented.

- Determine if the turbidity plume is attributed to the construction activity or other activities occurring within the river (e.g., wind waves, boat wakes, etc.).
- Determine if the turbidity plume is of sufficient extent (i.e., width of the compliance zone) and sufficient duration (i.e., 1 hour or more) to trigger a response action.

- If the turbidity plume is attributed to the construction activity, and is of sufficient extent and duration, begin turbidity monitoring to determine if the visual exceedance is also an exceedance of turbidity criteria.
- If turbidity criteria are exceeded, inform the CQAO.
- Immediately retake measurements at all depths at the station. If no exceedance occurs, retake measurements within 45 minutes of initial reading to confirm the pass. If the pass is confirmed, inform USEPA of resolved exceedance.
- If exceedance is confirmed, inform USEPA of exceedance and identify plan for implementing BMPs. BMPs for specific construction activities are listed in Section 6.3.
- Monitoring will revert to Tier I schedule.

6.2.2 Exceedance of Conventional Parameters

If conventional parameters (turbidity and DO) are exceeded at the compliance boundary during construction activities at Terminal 4, the following actions will occur:

- Determine if exceedance is attributed to the construction activity or other activities occurring within the river (e.g., wind waves, boat wakes, barge/ship traffic, etc.).
- If determined that the exceedance is attributed to the construction activity, inform the CQAO.
- Immediately retake measurements at all depths at the station. If no exceedance occurs, retake measurements within 45 minutes of initial reading to confirm the pass. If the pass is confirmed, inform USEPA of resolved exceedance.
- If exceedance is confirmed, inform USEPA of exceedance and identify plan for implementing BMPs. BMPs for specific construction activities are described in Section 6.3.
- Monitoring will revert to a Tier I schedule.

6.2.3 Exceedance of Laboratory Analytical Parameters

If chemical criteria are exceeded, USEPA will be notified as soon as possible upon receipt of the analytical data. The Port and USEPA will discuss if and what additional

BMPs may need to be implemented to minimize the potential for any future exceedances of chemical criteria. Because laboratory analytical results require a 72-hour turnaround time, it will be difficult to use such results to manage the construction operations in "real time," but these results can be used to help manage construction activities through the duration of the Phase I project. "Real time" management decisions will by necessity rely primarily on field parameter measurements. Based on the results of elutriate tests conducted on sediments at Terminal 4 (see DAR, Section 7.3), it is expected that turbidity will be the most sensitive monitoring parameter. Therefore, controlling turbidity impacts through the implementation of appropriate construction BMPs should implicitly control for sediment-associated COCs as well.

6.3 Construction Best Management Practices

The Contractor shall implement the following best management practices (BMPs) construction operations:

- The Contractor shall begin dredging at the highest elevation of material to be removed and work toward the lowest elevation. "Glory holing" will not be allowed.
- The Contractor shall pause the dredge bucket as it breaks the surface of the water and allow the bucket to drain free water prior to swinging and placing dredge material on the haul barge.
- No bottom stockpiling or multiple bites of the clamshell bucket is allowed
- The Contractor shall seal off barge scuppers on haul barges, repair any holes in fences to prevent sediment to drain off a haul barge.
- Barges shall not be overfilled.
- No grounding of construction barges is allowed.
- Overdredging at the base of a slope shall not occur.
- Dragging of dredged surface to level the mudline is not allowed.
- Overfilling of the bucket is not allowed.

7 MONITORING PERSONNEL AND KEY CONTACTS

Personnel to fulfill the following roles will be designated at least 1 week prior to the start of the first monitoring events:

- Water Quality Monitoring Field Leader
- Monitoring personnel
- CQAO
- USEPA Project Coordinator – Sean Sheldrake (for receipt of reports)

Contact information for key personnel will be provided once personnel assignments have been made. All monitoring personnel in these roles will be experienced in the collection and measurement of water quality parameters.

The Water Quality Monitoring Field Leader is responsible for:

- Oversight of all water monitoring activities
- Verification that results are properly recorded and forms are completely filled out
- Verification that appropriate calibration and quality control and assurance procedures are conducted
- Notification to CQAO in the event that water quality triggers are exceeded
- Daily and weekly reporting of water quality results to USEPA's designated contact

Monitoring personnel are responsible for conducting the field activities, necessary calibrations, quality assurance and quality control procedures, and recording of results as directed by the Water Quality Monitoring Field Leader.

The CQAO is responsible for acting upon water quality information as provided by the Water Quality Monitoring Field Leader as necessary.

8 REFERENCES

American Water Works Association (AWWA). 1998. Standard Methods for the Examination of Water and Wastewater. 20th edition. American Public Health Association, Water Pollution Control Federation, Washington, DC, U.S.

U.S. Environmental Protection Agency (USEPA). 2001b. Methods for Collection, Storage and Manipulation of Sediment for Chemical and Toxicological Analyses: Technical Manual. U.S. Environmental Protection Agency Office of Water, EPA-823-B-01-002, October 2001.

USEPA. 2003a. Administrative Order on Consent for Removal Action in the Matter of Portland Harbor Superfund Site, Terminal 4, Removal Action Area, Portland, Oregon.

USEPA. 2003b. Procedures for Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: PAH Mixtures. Office of Research and Development, USEPA-600-R-02-013.

USEPA. 2006b. National Recommended Water Quality Criteria. Office of Water. (http://www.epa.gov/waterscience/criteria/wqcriteria.html).

U.S. Geological Survey (USGS). 2006. National Water Information System Online Database, Station No. 14211720, Willamette River at Portland Oregon. (http://waterdata.usgs.gov/nwis/sw).

TABLES

Table 1
Water Quality Monitoring Parameters

Subarea	Construction Activity	Visual	Field Parameters				Analytical Lab Parameters[1]				
			Turbidity	Temperature	pH	Dissolved Oxygen (DO)	Total Suspended Solids (TSS)	Cadmium	Lead	Zinc	Polycyclic Aromatic Hydrocarbons (PAHs)
Slip 3	Dredging	X	X	X	X	X	X	X	X	X	X
	Capping	X	X	X	X	X	X	X	X	X	X
	Sand Layer Placement	X	X	X	X	X	X	X	X	X	X
Berth 414	Dredging	X	X	X	X	X	X				X
Berth 410	Dredging	X	X	X	X	X	X				X
Upland Transfer Location	Transport and transfer of Mechanically Dredged Sediment to Upland transfer location	X	X	X	X	X					
Wheeler Bay	Shoreline Stabilization	X									

Note:

1 = Analytical lab parameters are based on PEC exceedances in sediment at depths that could be exposed during Terminal 4 Phase 1 Removal Action construction activities, plus additional parameters as directed by USEPA.

Table 2
Water Quality Criteria for Terminal 4 Phase I Removal Action Project

Parameter	Units	Narrative Standard[1]	Acute WQC[2]	Chronic WQC[3]	Willamette River BG[4]	Acute Guidance Value[5]	Chronic Guidance Value[5]
Conventional Parameters							
Turbidity	NTU	BG <50 NTU: BG + 5 NTU BG >50 NTU: BG + 5%	--	--	27	--	--
Total Suspended Solids (TSS)	mg/L	--	--	--	49	--	--
Dissolved Oxygen (DO)	mg/L	> 6.5	--	--	TBD	--	--
Metals[6]							
Cadmium	µg/L	--	0.5	0.09	0.05	--	--
Lead	µg/L	--	14	0.54	0.14	--	--
Zinc	µg/L	--	36	36	TBD	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)							
Naphthalene	µg/L	--	--	--	TBD	807	194
Acenaphthylene	µg/L	--	--	--	TBD	1277	307
Acenaphthene	µg/L	--	--	--	TBD	233	56
Fluorene	µg/L	--	--	--	TBD	162	39
Phenanthrene	µg/L	--	--	--	TBD	79	19
Anthracene	µg/L	--	--	--	TBD	87	21
Fluoranthene	µg/L	--	--	--	TBD	30	7.1
Pyrene	µg/L	--	--	--	TBD	42	10
Benzo(a)anthracene	µg/L	--	--	--	TBD	9.2	2.2
Chrysene	µg/L	--	--	--	TBD	8.3	2.0
Benzo(b)fluoranthene	µg/L	--	--	--	TBD	2.8	0.68
Benzo(k)fluoranthene	µg/L	--	--	--	TBD	2.7	0.64
Benzo(a)pyrene	µg/L	--	--	--	TBD	4.0	0.96
Indeno(1,2,3-cd)pyrene	µg/L	--	--	--	TBD	1.2	0.28
Dibenzo(a,h)anthracene	µg/L	--	--	--	TBD	1.2	0.28
Benzo(g,h,i)perylene	µg/L	--	--	--	TBD	1.8	0.44

Notes:

[1] Applies to all construction activities

[2] Compliance criterion during dredging and capping activities

[3] Trigger for construction BMPs during dredging and capping activities

[4] Initial values determined from USGS Station #14211720; to be updated with pre-construction measurements at Terminal 4

[5] Final Acute Values and Final Chronic Values from USEPA 2003

[6] Based on Willamette River hardness of 25 mg/L

TBD = To be determined based on results of background monitoring program

Table 3
Water Quality Monitoring Locations and Schedules

Construction Activity	Compliance Boundary	Standards for Compliance	Monitoring Activity and Frequency						Trigger to Switch from Tier I to Tier II
			Tier I (Intensive Schedule)			Tier II (Routine Schedule)			
			Visual	Field	Chemistry	Visual	Field	Chemistry	
Slip 3 Dredging	Turbidity: 100 meters from mouth of Slip Other Analytes: 100 meters from construction activity	Acute Water Quality Criteria (Chronic critieria will be used as action levels for additional BMPs, not compliance)	1/ hr	1/hr; 1/ 4 hr[4]	1/ day[1]	1/ hr	1/ day[2, 3]	1/ week[1]	If results indicate no exceedances of chronic or acute criteria for 3 consecutive days, Port will propose reduction to USEPA.
Slip 3 Capping	Turbidity: 100 meters from mouth of Slip Other Analytes: 100 meters from construction activity	Acute Water Quality Criteria (Chronic critieria will be used as action levels for additional BMPs, not compliance)	1/ hr	1/hr; 1/ 4 hr[4]	1/ day[1]	1/ hr	1/ day[2, 3]	1/ week[1]	If results indicate no exceedances of chronic or acute criteria for 3 consecutive days, Port will propose reduction to USEPA.
Slip 3 Sand Layer Placement	Turbidity: 100 meters from mouth of Slip Other Analytes: 100 meters from construction activity	Acute Water Quality Criteria (Chronic critieria will be used as action levels for additional BMPs, not compliance)	1/ hr	1/hr; 1/ 4 hr[4]	1/ day[1]	1/ hr	1/ day[2, 3]	1/ week[1]	If results indicate no exceedances of chronic or acute criteria for 3 consecutive days, Port will propose reduction to USEPA.
Berth 414 Dredging	Turbidity and Other Analytes: 100 meters from construction activity	Acute Water Quality Criteria (Chronic critieria will be used as action levels for additional BMPs, not compliance)	1/ hr	1/hr; 1/ 4 hr[4]	1/ day[1]	1/ hr	1/ day[2, 3]	1/ week[1]	If results indicate no exceedances of chronic or acute criteria for 3 consecutive days, Port will propose reduction to USEPA.
Slip 3 B410 Dredging	Turbidity and Other Analytes: 100 meters from mouth of Slip	Acute Water Quality Criteria (Chronic critieria will be used as action levels for additional BMPs, not compliance)	1/ hr	1/hr; 1/ 4 hr[4]	1/ day[1]	1/ hr	1/ day[2, 3]	1/ week[1]	If results indicate no exceedances of chronic or acute criteria for 3 consecutive days, Port will propose reduction to USEPA.
Transport and Transfer of Mechanically Dredged Sediment at Upland Transfer Location	100 meters downstream from transfer location	Acute Water Quality Criteria (Chronic critieria will be used as action levels for additional BMPs, not compliance)	1/ hr	1/hr; 1/ 4 hr[4]	--	1/ hr	1/ day[2, 3]	--	If results indicate no exceedances of chronic or acute criteria for 3 consecutive days, Port will propose reduction to USEPA.
Wheeler Bay Shoreline Stabilization	--	--	1/ hr	--	--	1/ 4 hr	--	--	Tier I monitoring will be performed in the event construction takes place while it is raining at the site. Otherwise, Tier II monitoring will be performed.

Table 3
Water Quality Monitoring Locations and Schedules

Notes:

1 Tier 1 samples will be taken at the surface, middle, and bottom depths at the compliance station with the highest turbidity readings.

2 Contingent monitoring for field parameters is implemented if visual plume observed

3 May be reduced to 1 per week with EPA approval

4 Field parameters will be measured at the start of each new activity at least once every hour beginning one hour after active in-water work begins. This frequency will continue until four consecutive hourly events indicate no exceedance of any parameters. If no exceedance is identified following four consecutive hourly events, the sampling frequency will be reduced to once every 4 hours.

Table 4
Analytical Parameters and Methods

Parameter	Method	Criteria	Target Detection Limit	Target Reporting Limit	Units
Field Parameters					
Turbidity	Field Probe	BG+5%, BG+5 NTU	0.05	1.0	NTU
Dissolved Oxygen (DO)	Field Probe	>6.5 mg/L	0.1	1.0	mg/L
Chemical Analytical Parameters					
Total suspended solids	USEPA 160.2	N/C	1.0	-	mg/L
Cadmium	USEPA 200.8	0.09[1]	0.02	0.2	µg/L
Lead	USEPA 200.8	0.54[1]	0.15	1.0	µg/L
Zinc	USEPA 200.8	36[1]	1.05	4.0	µg/L
Polycyclic Aromatic Hydrocarbons (PAHs)	USEPA 8270C	0.3 - 300[2]	Varies	0.1	µg/L

Notes:

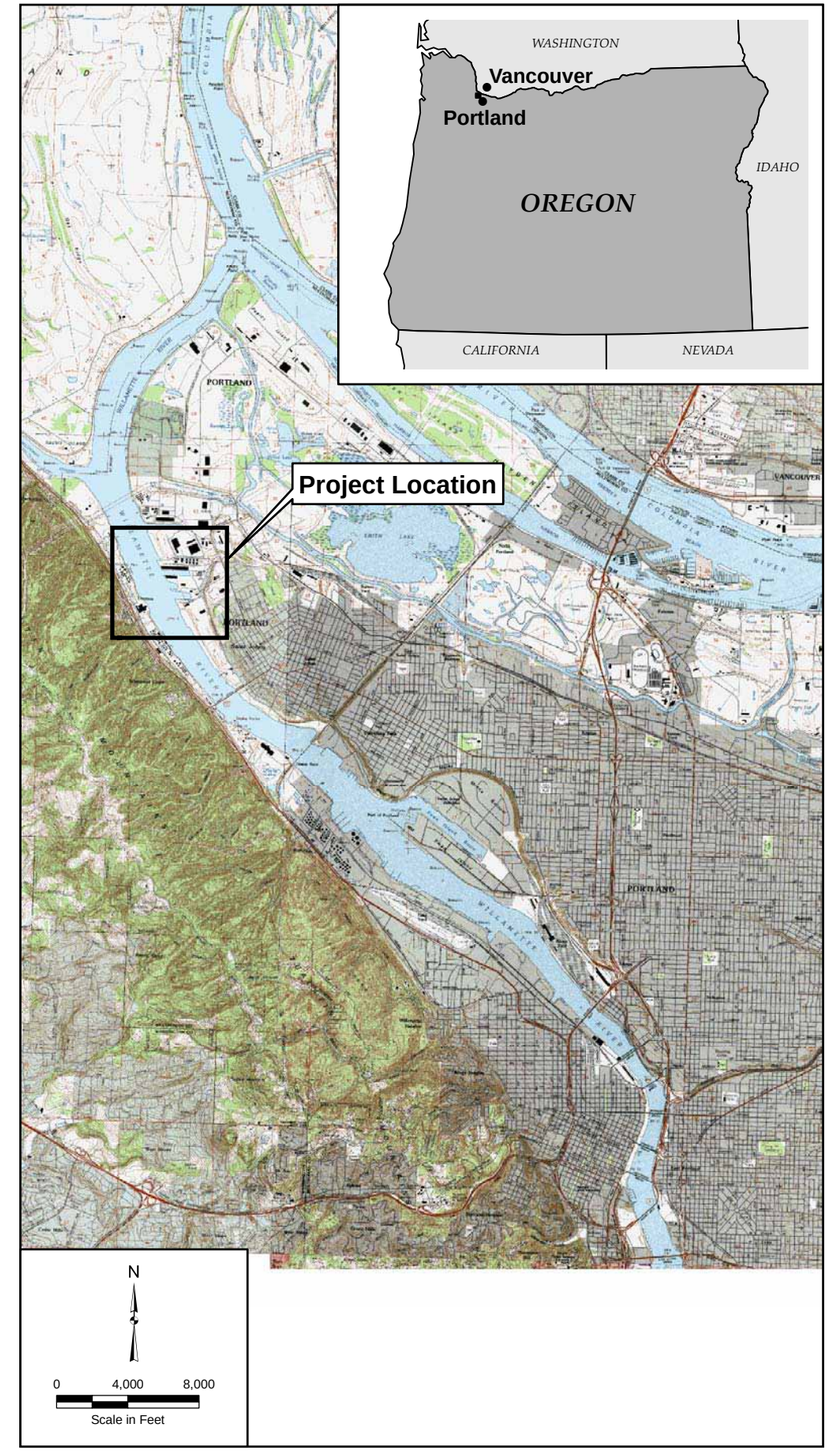
N/C = No Criterion

NTU = Nephelometric Turbidity Units

[1] Chronic ambient water quality criteria (used for BMP evaluation trigger)

[2] Chronic water quality guidance value

FIGURES



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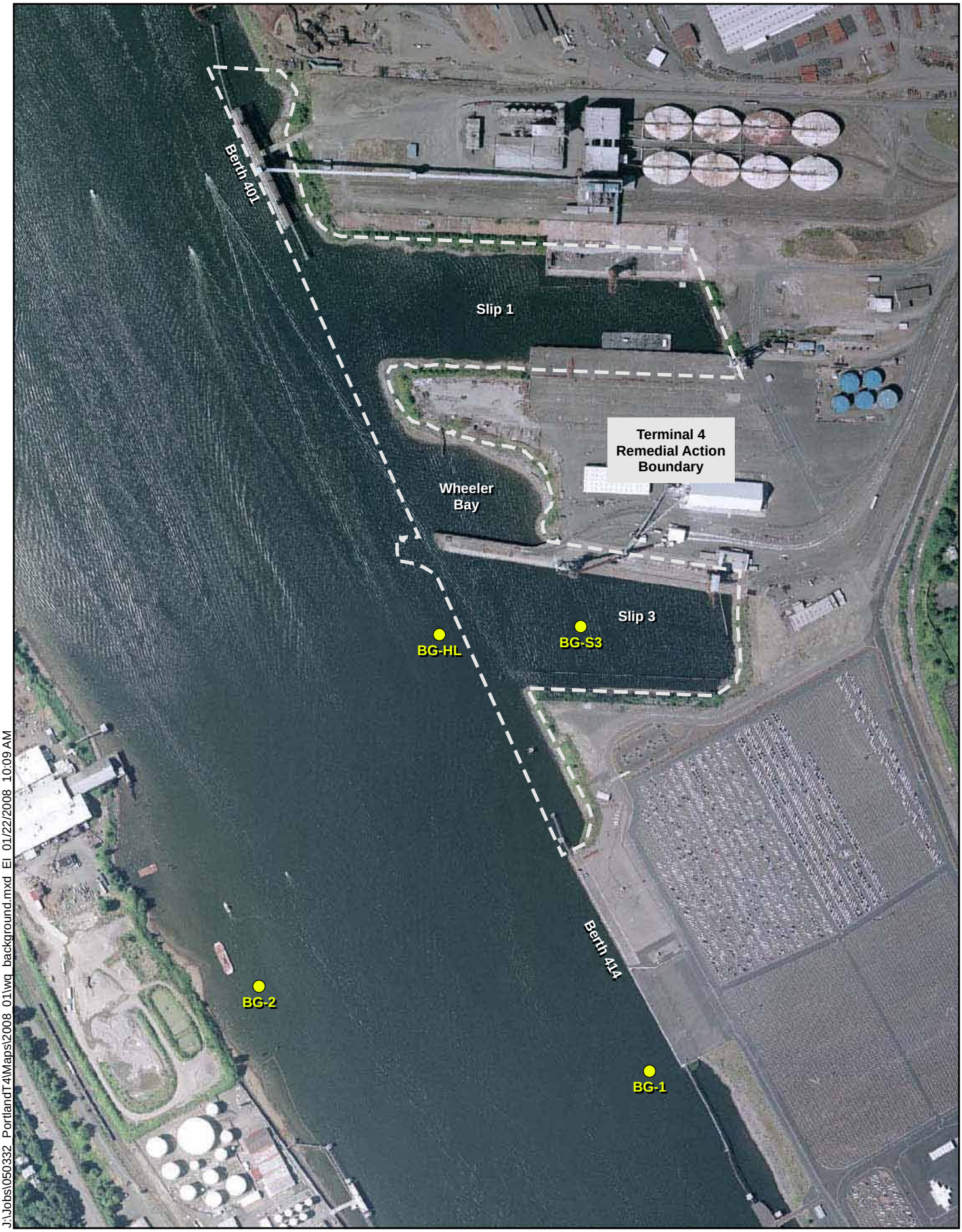
ANCHOR ENVIRONMENTAL, L.L.C.

Notes:
1. High resolution imagery dated July 2005.

Figure 1
Vicinity Map
Terminal 4 Phase I Removal Action
Portland, Oregon



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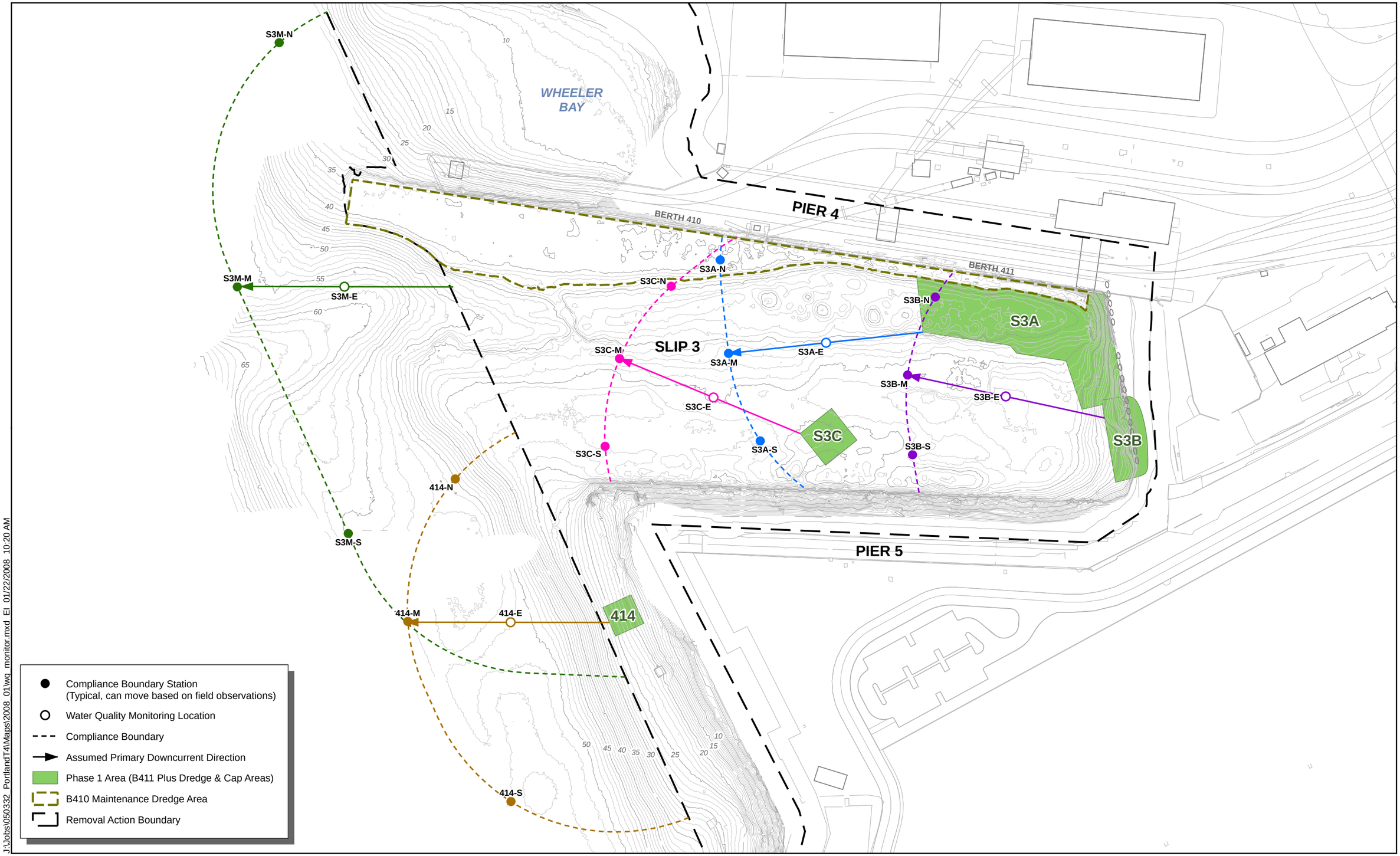
ANCHOR ENVIRONMENTAL, L.L.C.

0 250
Scale in Feet

Bathymetry and base map from
Port of Portland, 2006.
Bathymetric elevations in feet NGVD.

Figure 2
Proposed Water Quality Background Samples
Terminal 4 Phase I Removal Action
Portland, Oregon



ANCHOR ENVIRONMENTAL, L.L.C.

0 150
Scale in Feet

Bathymetry and base map from Port of Portland, 2006.
Bathymetric elevations in feet NGVD.

Figure 3
Proposed Water Quality Monitoring
Terminal 4 Phase I Removal Action
Portland, Oregon

ATTACHMENT B-1

WATER QUALITY MONITORING FORM

ANCHOR ENVIRONMENTAL, L.L.C.

1423 3rd Ave., Suite 300
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287-9131
www.anchorenv.com

Water Quality Monitoring Form

Station ID:		**Date:**	**Time:**
Project Name:		**Project Number:**	
Coordinates Datum:			
Lat/Northing:		Long/Easting:	
Weather/River Stage/Flow Observations: Status/Description of Operation at Time of Sampling:			
Depth to Bottom: _____ (m)			
	Dissolved Oxygen (mg/L)	Temperature (C)	Turbidity (NTU)
Depth 1: ____ (m)			
Depth 2: ____ (m)			
Depth 3: ____ (m)			
Other:			
Evidence of floating or suspended materials:			
Evidence of oil/hydrocarbon sheen: (Thickness, contiguous?, size, rate of dissipation)			
Discoloration and Turbidity:			
Velocity at stated depth:			
Color:			
Odor:			
Other Observations:			
Comments:			
Recorded by:		Other Monitoring Personnel:	

APPENDIX C

DRAFT
INTERIM MONITORING AND REPORTING PLAN
(ANNOTATED OUTLINE)

TERMINAL 4 PHASE I REMOVAL ACTION
PORT OF PORTLAND, PORTLAND, OREGON

DRAFT DOCUMENT: DO NOT QUOTE OR CITE
This document has not been reviewed or approved by USEPA and its federal, state and tribal partners and is subject to change in whole or in part.

Prepared for

Port of Portland

Portland, Oregon

Prepared by

Anchor Environmental, L.L.C.

6650 SW Redwood Lane, Suite 333

Portland, Oregon 97224

January 2008

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5 REFERENCES 9

This document will describe the monitoring that will occur between the Phase I and Phase II work. An annotated outline will be submitted with the Draft Design Submittal. Once the scope of the work is agreed to, this document will be completed and submitted as part of the Final Design Submittal.

1 INTRODUCTION

1.1 Purpose and Scope of Interim Monitoring and Reporting Plan

This Interim Monitoring and Reporting Plan (IMRP) document will provide the monitoring and reporting requirements between the completion of the Terminal 4 Phase I Removal Action work and the beginning of the Phase II Removal Action work.

1.1.1 Slip 3 and North of Berth 414 Dredging

Because the proposed abatement measure for dredging in Slip 3 and Berth 414 is not intended to be a final action, but a true interim action, no interim monitoring activities are proposed. This area will be reassessed and addressed as part of Phase II of the Removal Action.

The current anticipated Phase II Removal Action schedule has the Slip 1 CDF beginning construction in the third quarter of 2010 with Slip 3 dredging being completed in the third quarter of 2011. If the Slip 3 dredging is delayed past this schedule the Port will re-evaluate the effectiveness of the Slip 3 dredging abatement measure at that time. The Port will work collaboratively with EPA to determine the scope of the reevaluation if it is necessary.

1.1.2 Head of Slip 3 Cap Integrity Monitoring

Monitoring will be completed to confirm the following:

- Bulkhead stability
- Armor layer stability
- Absence of sheens

1.1.3 Wheeler Bay Stabilization Area Monitoring

Monitoring will be completed to confirm the following:

- Slope stability
- Armor layer stability
- Establishment of vegetation
- Stability/presence of woody debris as designed

1.2 Related Design Documents

1.3 Organization of the IMRP

2 MONITORING OF CAPPING AND STABILIZATION AREAS

2.1 Head of Slip 3

2.1.1 Monitoring Objectives and Criteria

The post-construction performance standards for the Head of Slip 3 cap are:

- Isolate the surface sediments containing elevated contaminant concentrations from benthic communities and the aquatic environment by applying appropriate long-term erosive as well as contaminant transport mechanisms.
- Where necessary, the chemical isolation layer shall be designed to contain sheens exiting from the shoreline.
- The armor layer of the cap shall be designed to resist bed shear velocities induced by the largest of 100 year flood flow, 100 year waves, vessel-induced waves from typical passing vessels, and anticipated propeller wash from vessels that operate in the area.

To meet these standards, the following monitoring objectives and criteria are established:

- Confirm the stability of the cap. This will include monitoring the:
  - Stability of the bulkhead
  - Stability of the armor layer
- Confirm the control of sheens

2.1.2 Bulkhead Stability

The following activities will be completed:

- A survey of the riprap wedge will be completed.
- A survey of the timber bulkhead will be completed.

2.1.3 Armor Layer Stability

The following activities will be completed:

- A survey of the riprap wedge in front of the bulkhead, as well as the riprap armor layer behind the bulkhead, will be completed.

2.1.4 Presence of Sheens

The following activities will be completed:

- A survey for the visual presence of sheens will be completed at different water level conditions.

2.2 Wheeler Bay Shoreline Stabilization

2.2.1 Monitoring Objectives and Criteria

The post-construction performance standards for the Wheeler Bay shoreline stabilization are:

- Regrade banks to slopes that are naturally stable.
- Stabilize targeted shoreline areas to address appropriate long-term erosive mechanisms.
- For areas where armoring is necessary, the armor layer shall be designed to resist bed shear velocities induced by the largest of 100 year flood flow, 100 year waves, vessel-induced waves from typical passing vessels, and anticipated propeller wash from vessels that operate in the area.

To meet these standards, the following monitoring objectives and criteria are established:

- Confirm the stability of the slope. This will include visual monitoring the slope for sloughing.
- Confirm the protectiveness of the erosion-resistant layers. This will include monitoring the the armor layer at the toe as well as plantings for indications of erosion.

2.2.2 Slope Stability

The following activities will be completed:

- A visual survey of the slope will be completed to determine if it is stable.

2.2.3 Armor Layer Stability

The following activities will be completed:

- A visual survey of the riprap layers will be completed to determine if excessive erosion is occurring.

2.2.4 Establishment of Vegetation

The following activities will be completed:

- The vegetation in the stabilization areas will be evaluated to determine if the vegetation is serving its intended function.

3 SAMPLING SCHEDULE AND REPORTING

The sample program described above will be completed under the following schedule:

- Baseline conditions at the end of construction (as-built drawings)
- At the end of the first high water season (May 2009)
- Yearly thereafter until the Phase II work begins

4 POTENTIAL RESPONSE ACTIONS

4.1 Head of Slip 3 Cap

This section describes potential response actions if certain observations are made as part of the monitoring described above.

4.1.1 Bulkhead is Unstable

If the bulkhead is determined to be unstable such that it compromises the integrity of the cap behind the bulkhead, the following measures would be completed:

- Determine the cause of failure.
- Address the stability based on the findings. Measures to improve the stability may include:
  - Placing additional material down slope of the bulkhead
  - Structurally improving the bulkhead with bracing

4.1.2 Armor Layer is Eroding

If the armor layer is determined to be eroding such that it compromises the integrity of the cap, the following measures would be completed:

- Determine the cause of erosion.
- Address the erosion based on the findings. Measures to improve the erosion may include:
  - Increasing the gradation and/or thickness of the armor layer

4.1.3 Sheens are Present

If the sheens are present, the following measures would be completed:

- Determine the cause of sheens.
- Address the source based on the findings. Measures to control sheens may include:
  - Placing additional sheen control material

4.2 Wheeler Bay Shoreline Stabilization

This section describes potential response actions if certain observations are made as part of the monitoring described above.

4.2.1 Slope is Unstable

If the slope is determined to be unstable such that it compromises the integrity of the shoreline stabilization, the following measures would be completed:

- Determine the cause of failure.
- Address the stability based on the findings. Measures to improve the stability may include:
  - Regrading of the slope
  - Placement of a toe buttress

4.2.2 Armor Layer is Eroding

If the armor layer is determined to be eroding such that it compromises the integrity of the shoreline slope, the following measures would be completed:

- Determine the cause of erosion.
- Address the erosion based on the findings. Measures to improve the erosion may include:
  - Increasing the gradation and/or thickness of the armor layer

4.2.3 Vegetation is Stressed or Failing

If the vegetation is determined to be stressed or failing to serve its purpose such that it compromises the integrity of the shoreline slope, the following measures would be completed:

- Determine the cause of vegetation distress.
- Address the distress based on the findings. Measures to improve the erosion may include:
  - Selecting different vegetation
  - Changing the care of the existing vegetation

5 REFERENCES

Port of Portland

THE PORT OF PORTLAND COMMISSION
JUDI JOHANSEN - PRESIDENT
MARY F. OLSON - VICE PRESIDENT
WILLIAM THORNDIKE JR. - TREASURER
STEVE H. COREY - SECRETARY
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PAUL A. ROSENBAUM

BILL WYATT, EXECUTIVE DIRECTOR
TOM PETERSON, CHIEF ENGINEER
SAM RUDA, DIRECTOR, MARINE

SHEET LIST

SHEET NO.	DESCRIPTION
GENERAL INFORMATION	
1(GI-1)	SITE PLAN AND VICINITY MAP
2(GI-2)	EXISTING CONDITIONS
CIVIL	
3(C-1)	DREDGE PLAN - SLIP 3 & BERTH 414
4(C-2)	DREDGE PLAN SECTIONS
5(C-3)	DREDGE PLAN SECTIONS
6(C-4)	DREDGE PLAN SECTIONS
7(C-5)	DREDGE PLAN SECTIONS
8(C-6)	HEAD OF SLIP 3 CAP PLAN
9(C-7)	STABILIZATION PLAN - WHEELER BAY
10(C-8)	WHEELER BAY SECTIONS
11(C-9)	WHEELER BAY & HEAD OF SLIP 3 SECTIONS
LANDSCAPE	
12(L-1)	SURFACE STABLIZATION AND PLANTING PLAN
13(L-2)	SURFACE STABLIZATION AND PLANTING DETAILS

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TERMINAL 4

REMOVAL ACTION - PHASE 1

DRAFT DESIGN DRAWINGS

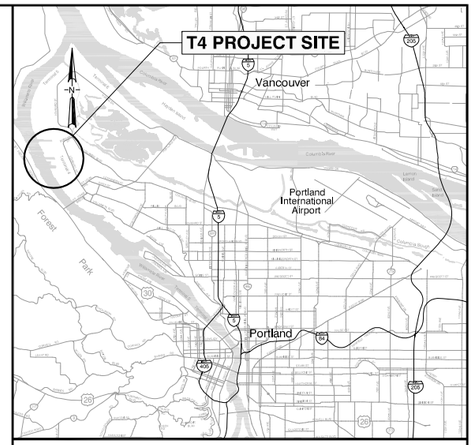
JANUARY 2008

DESIGN NO. 2008D001 PROJECT MANAGER MARCEL HERMANS

PROJECT NO. 820027 DRAWING NO. T4 2008-501

TERMINAL 4, REMOVAL ACTION - PHASE I

SITE PLAN
SCALE: 1" = 150'
1
GI-1



VICINITY MAP
SCALE: N.T.S.

NOTES:

1. HORIZONTAL DATUM: PORT OF PORTLAND LOCAL PROJECTION (INTERNATIONAL FEET)
   VERTICAL DATUM: NGVD 29-47
   CONTOUR INTERVAL = 1 FT
2. FOR NGVD CONTROL POINT, SEE PORT OF PORTLAND DRAWING RG 2006-3024 (NOVEMBER 2006)

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NO.	DATE	BY	REVISIONS	CK'D	APPV'D

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PORTLAND, OREGON

ANCHOR ENVIRONMENTAL, L.L.C.
1423 3rd Avenue, Suite 300
Seattle, WA 98101 (206) 287-9130

2008D001 — DESIGN NUMBER
820027 — PROJECT NUMBER

REGISTERED PROFESSIONAL ENGINEER 77473PE OREGON NOV. 8, 2005 JOHN RICHARD VERDUIN
PRELIMINARY
EXPIRATION DATE:

DESIGNED BY J. VERDUIN
DRAWN BY T. GRIGA
CHECKED BY J. VERDUIN
DATE JAN 2008
GRAPHICAL SCALE BAR 0 1/4" 1/2" 1" 2"

TERMINAL 4

REMOVAL ACTION - PHASE I
SITE PLAN AND VICINITY MAP

SUBMITTED BY ROGER ANDERSON, PROJECT ENGINEER
TYPE CD
DRAWING NO. T4 2008-501 1 / 13 (GI-1)

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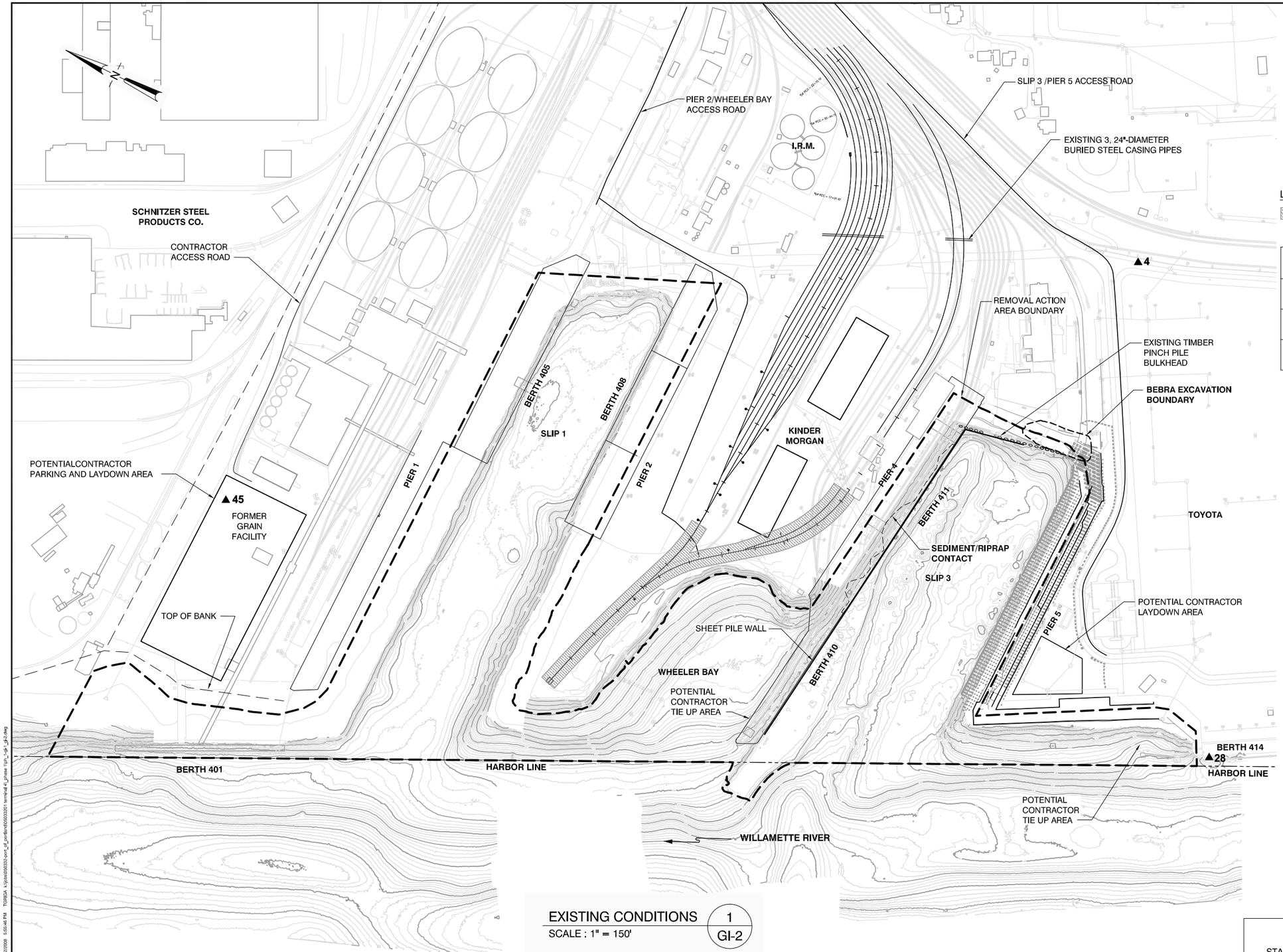

LEGEND:

TRACK FOUL AREA

4▲ SURVEY CONTROL POINT

STATION	NORTHING	EASTING	NGVD29 (47) ELEV.	DESCRIPTION
4	67011.054	71927.686	35.18	3" BRASS CAP STAMPED "4-B"
28	66167.751	70697.587	26.148	3" BRASS CAP STAMPED "T-4-28, 1999"
45	69137.290	70087.858	32.790	4" BRASS CAP SW COR. GRATTON DLC

NOTES:

1. HORIZONTAL DATUM: PORT OF PORTLAND LOCAL PROJECTION (INTERNATIONAL FEET)
   VERTICAL DATUM: NGVD 29-47
   CONTOUR INTERVAL = 1 FT
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EXISTING CONDITIONS (1 / GI-2)

SCALE : 1" = 150'

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REMOVAL ACTION - PHASE I
EXISTING CONDITIONS

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TYPE CD | DRAWING NO. T4 2008-501 | 2 / 13 (GI-2)

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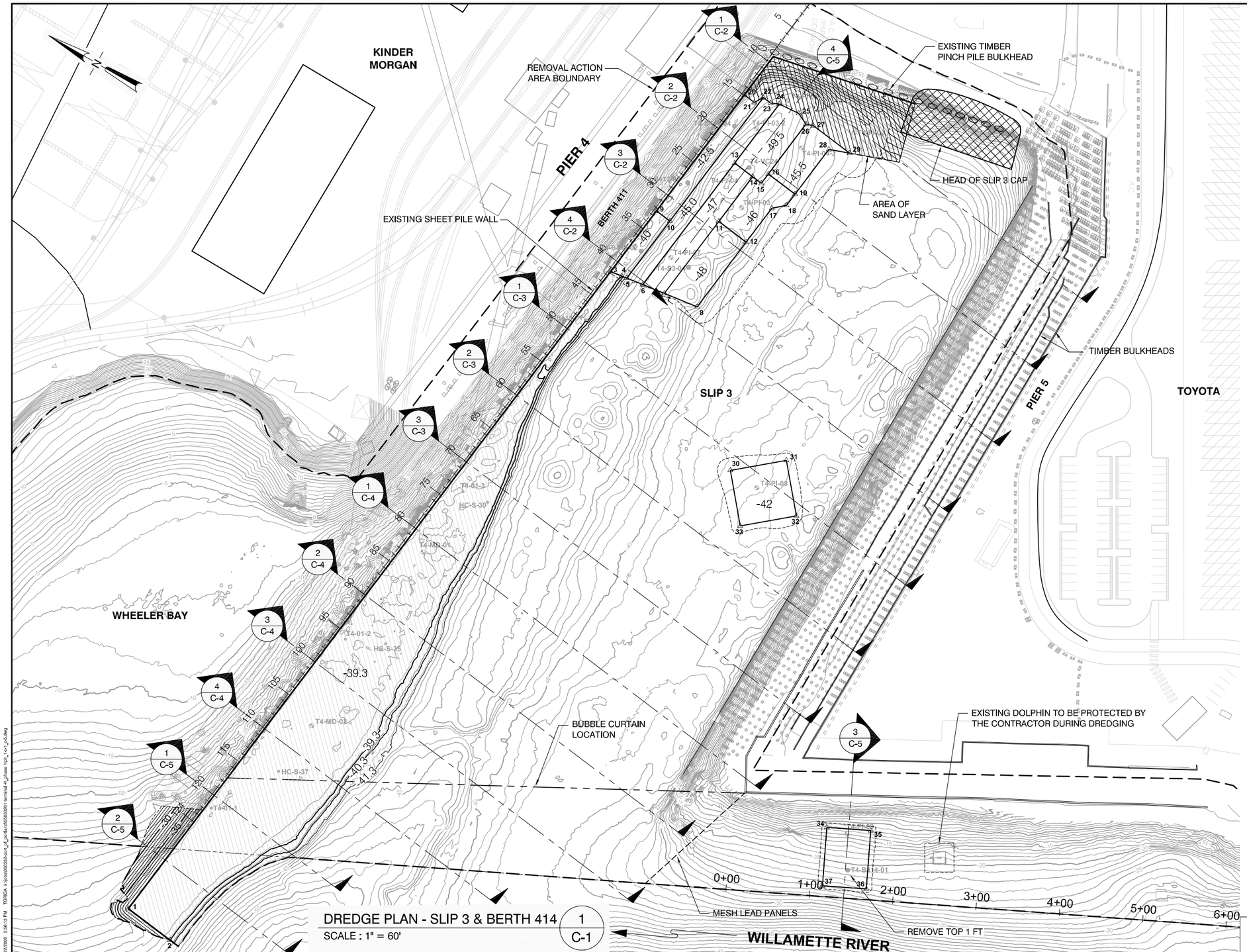

DREDGE PLAN - SLIP 3 & BERTH 414 (1 / C-1)
SCALE : 1" = 60'

CONTROL POINTS		
POINT	NORTHING	EASTING
1	67411.37	69985.32
2	67349.47	69977.61
3	67292.73	70933.79
4	67278.73	70935.71
5	67272.22	70936.60
6	67251.70	70939.51
7	67224.02	70943.26
8	67181.99	70948.94
9	67281.45	71023.98
10	67261.60	71021.50
11	67210.62	71050.39
12	67169.94	71045.30
13	67229.09	71120.23
14	67202.30	71116.87
15	67189.40	71115.26
16	67187.67	71129.15
17	67163.63	71095.71
18	67150.05	71107.63
19	67147.98	71124.19
20	67259.84	71196.71
21	67244.95	71194.84
22	67238.61	71205.26
23	67227.70	71203.90
24	67218.09	71208.23
25	67192.44	71210.09
26	67178.55	71203.28
27	67169.97	71206.16
28	67139.63	71190.87
29	67115.83	71199.39
30	67049.81	70799.35
31	66997.67	70843.39
32	66954.09	70791.79
33	67006.23	70747.75
34	66736.26	70487.35
35	66688.88	70510.17
36	66658.51	70447.10
37	66705.89	70424.28

LEGEND:

- -48 — BERTH 411 "PLUS" DREDGE ELEVATION IN FEET
- -39.3 — BERTH 410 DREDGE ELEVATION IN FEET
- ------- DAYLIGHT LINE AT EDGE OF CUT
- EXISTING DATA
- △19 CONTROL POINT

NOTES:

1. HORIZONTAL DATUM: PORT OF PORTLAND LOCAL PROJECTION (INTERNATIONAL FEET) VERTICAL DATUM: NGVD 29-47 CONTOUR INTERVAL = 1 FT
2. FOR NGVD CONTROL POINT, SEE PORT OF PORTLAND DRAWING RG 2006-3024 (NOVEMBER 2006)
3. FENDER PILES THAT "FLOAT" DUE TO DREDGING SHALL BE REPLACED.
4. FENDERS VARY IN DISTANCE FROM SHEET PILE WALL.

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CHECKED BY J. VERDUIN
DATE JAN 2008
GRAPHICAL SCALE BAR 0 1/4" 1/2" 1" 2"

TERMINAL 4

REMOVAL ACTION - PHASE I
DREDGE PLAN - SLIP 3 & BERTH 414

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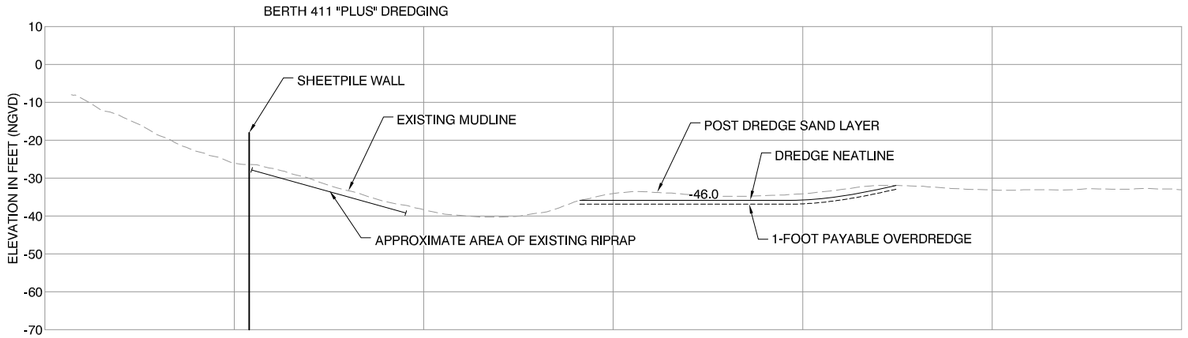
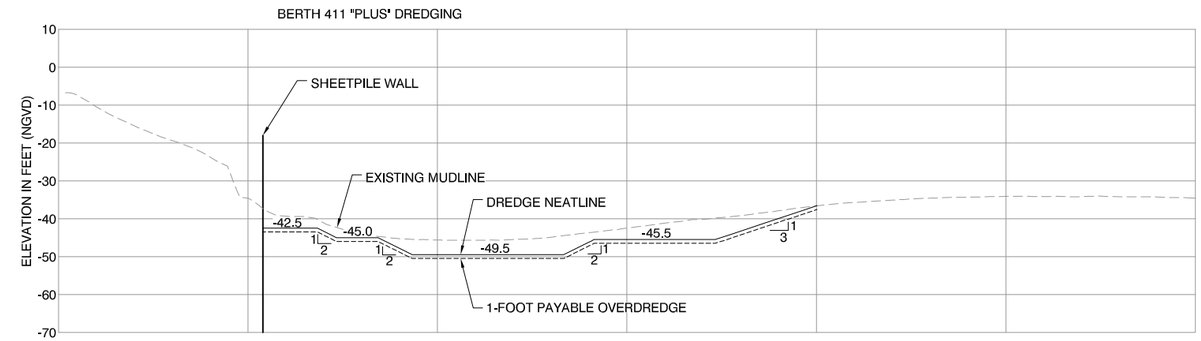


SLIP 3 - BENT 10 (1 / C-2)
SCALE: 1" = 20'



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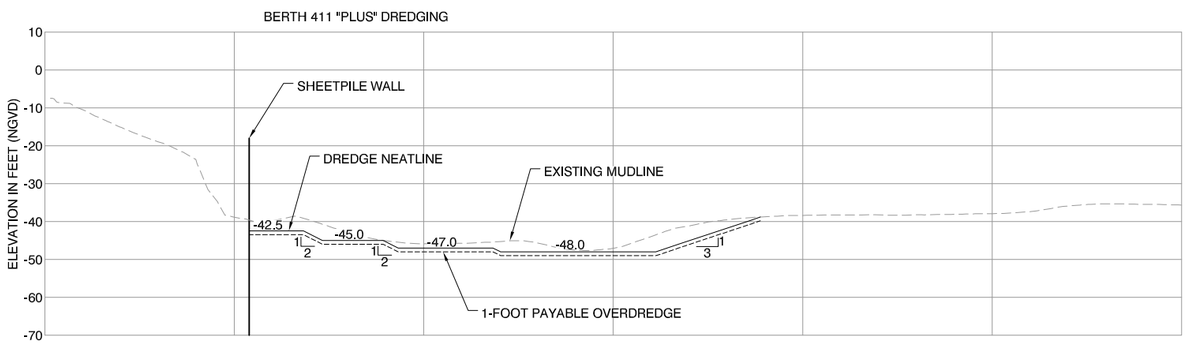

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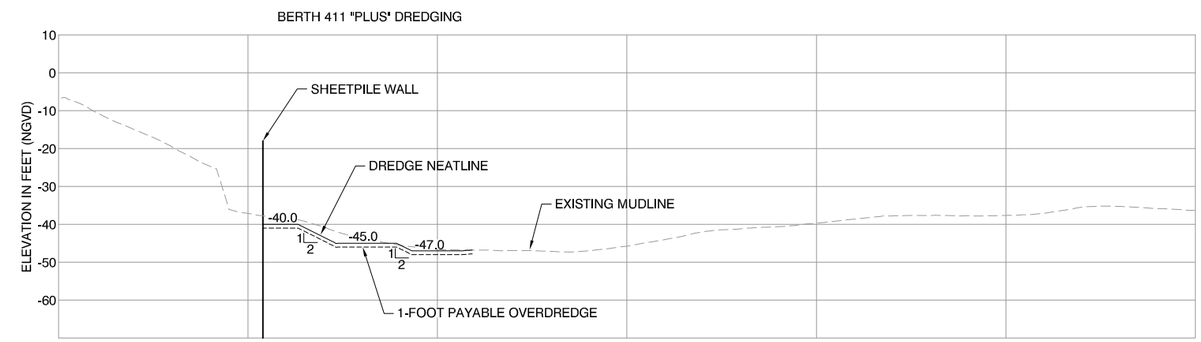

SLIP 3 - BENT 40 (4 / C-2)
SCALE: 1" = 20'

NOTES:

1. HORIZONTAL DATUM: PORT OF PORTLAND
   LOCAL PROJECTION (INTERNATIONAL FEET)
   VERTICAL DATUM: NGVD 29-47
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TERMINAL 4

REMOVAL ACTION - PHASE I
DREDGE PLAN SECTIONS

SUBMITTED BY ROGER ANDERSON — PROJECT ENGINEER
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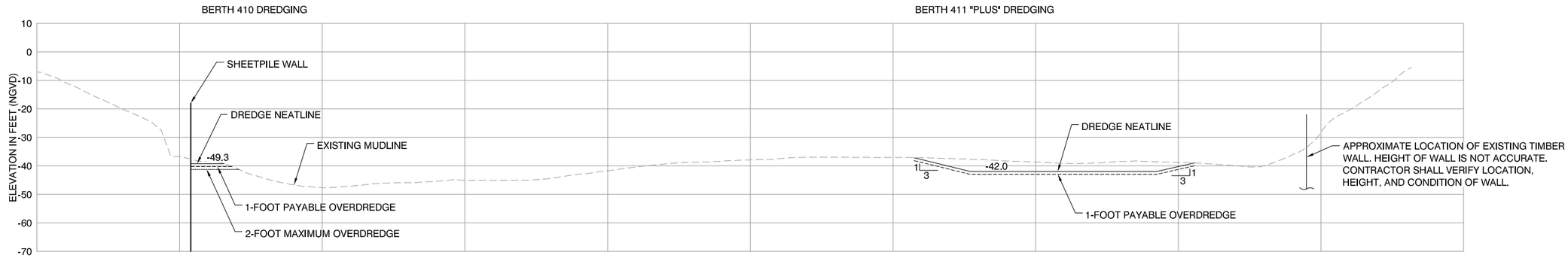

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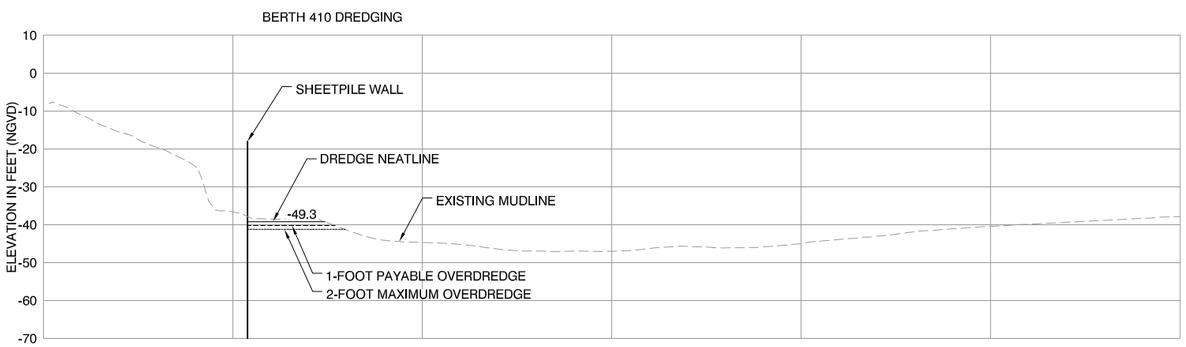

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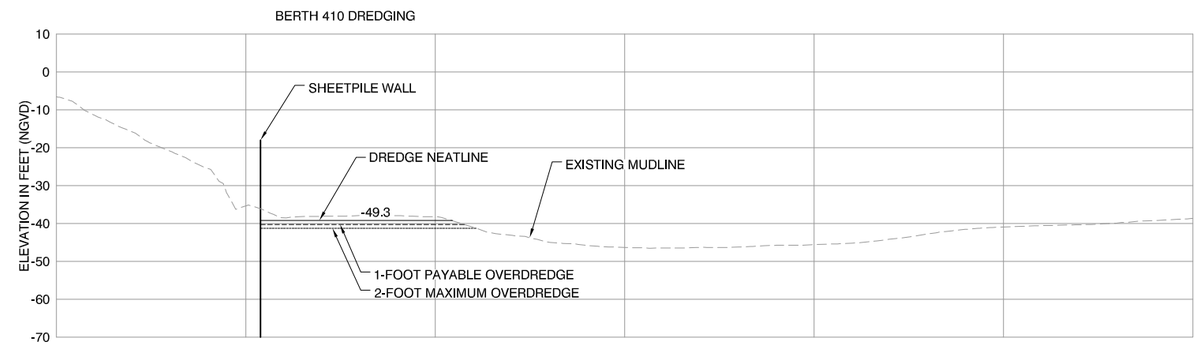

SLIP 3 - BENT 70 — 3 / C-3
SCALE: 1" = 20'

NOTES:

1. HORIZONTAL DATUM: PORT OF PORTLAND
   LOCAL PROJECTION (INTERNATIONAL FEET)
   VERTICAL DATUM: NGVD 29-47
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EXPIRATION DATE:

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DRAWN BY T. GRIGA
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DATE JAN 2008
GRAPHICAL SCALE BAR 0 1/4" 1/2" 1" 2"

TERMINAL 4

REMOVAL ACTION - PHASE I
DREDGE PLAN SECTIONS

SUBMITTED BY ROGER ANDERSON — PROJECT ENGINEER
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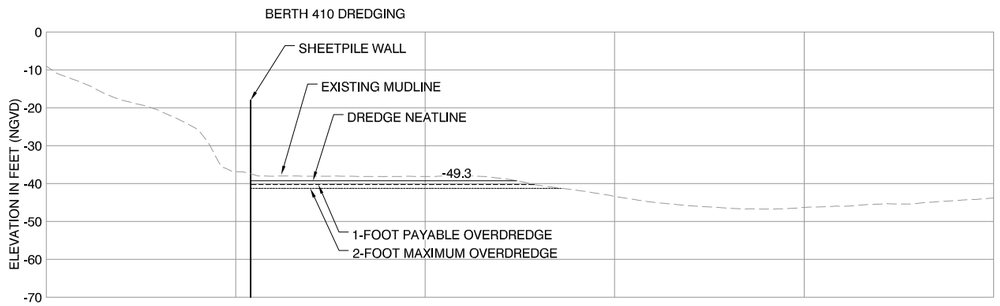
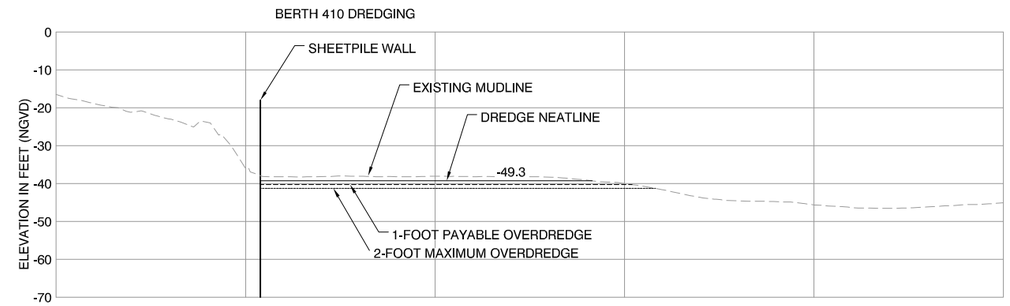


SLIP 3 - BENT 80 (1 / C-4)
SCALE: 1" = 20'



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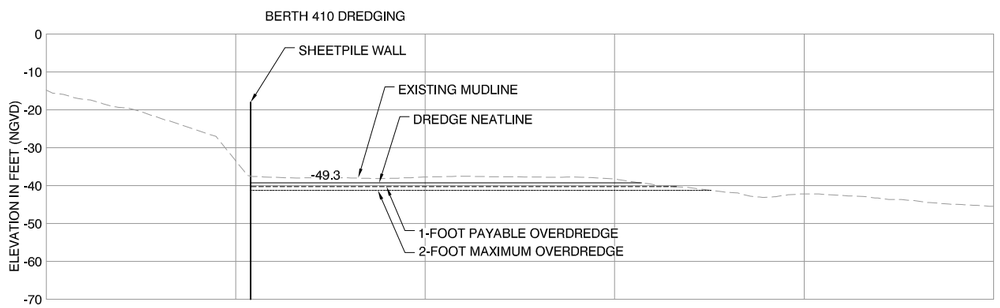
SCALE: 1" = 20'



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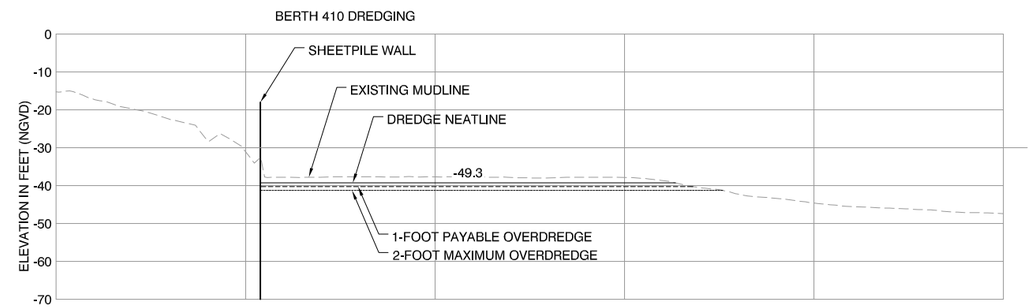
SCALE: 1" = 20'



SLIP 3 - BENT 110 (4 / C-4)
SCALE: 1" = 20'

NOTES:

1. HORIZONTAL DATUM: PORT OF PORTLAND
   LOCAL PROJECTION (INTERNATIONAL FEET)
   VERTICAL DATUM: NGVD 29-47
   CONTOUR INTERVAL = 1 FT
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TERMINAL 4

REMOVAL ACTION - PHASE I
DREDGE PLAN SECTIONS

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TYPE CD
DRAWING NO. T4 2008-501 6/13 (C-4)

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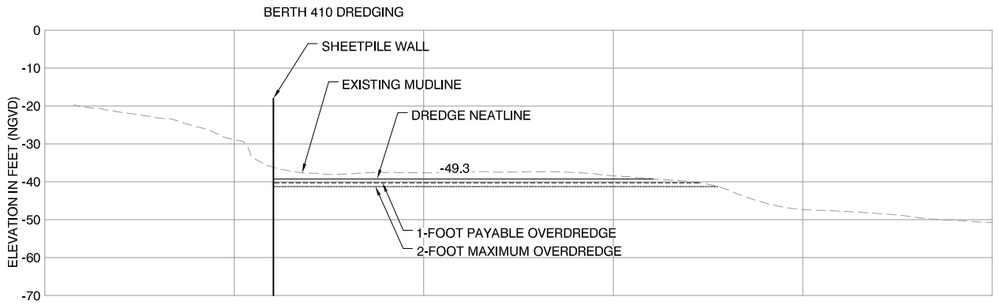
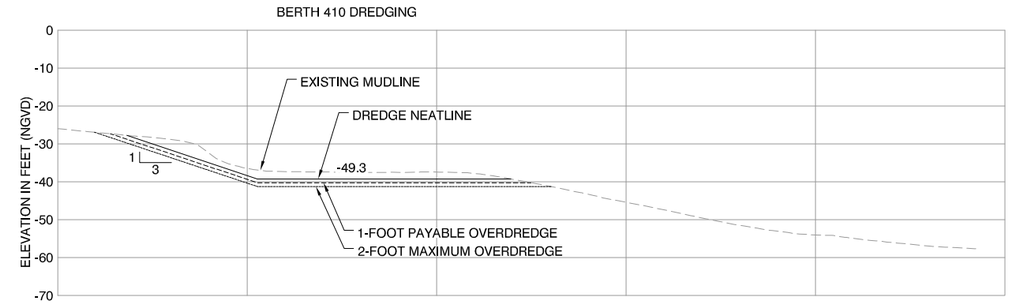
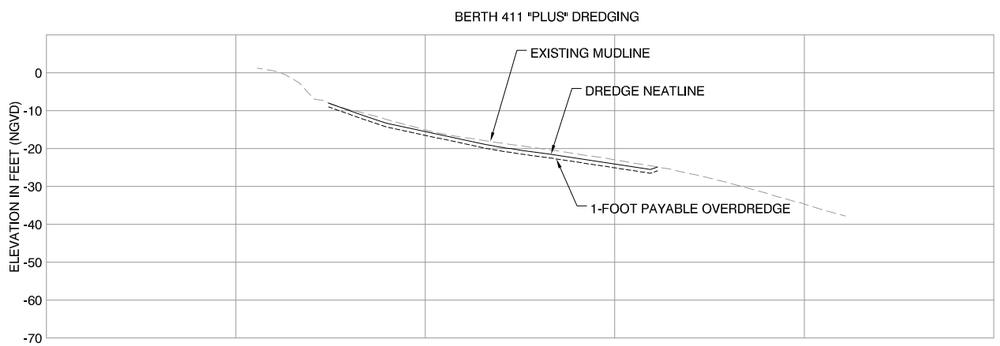


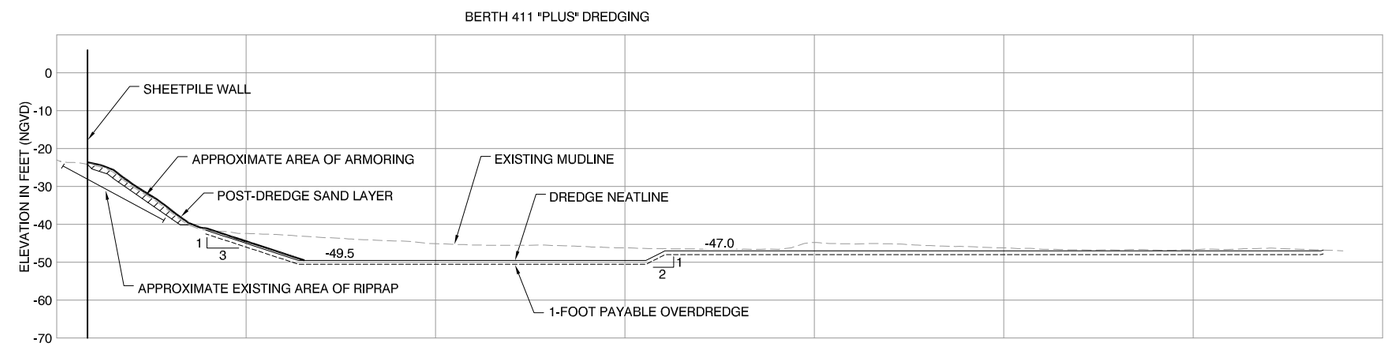
SLIP 3 - BENT 120 (1 / C-5)
SCALE: 1" = 20'



SLIP 3 (2 / C-5)
SCALE: 1" = 20'



SLIP 3 (3 / C-5)
SCALE: 1" = 20'



SLIP 3 (4 / C-5)
SCALE: 1" = 20'

NOTES:

1. HORIZONTAL DATUM: PORT OF PORTLAND
   LOCAL PROJECTION (INTERNATIONAL FEET)
   VERTICAL DATUM: NGVD 29-47
   CONTOUR INTERVAL = 1 FT
2. FOR NGVD CONTROL POINT, SEE PORT OF PORTLAND DRAWING RG 2006-3024 (NOVEMBER 2006)

DRAFT DESIGN SET - NOT FOR CONSTRUCTION
DRAFT DOCUMENT: DO NOT QUOTE OR CITE
THIS DOCUMENT IS BEING REVIEWED BY USEPA AND ITS FEDERAL, STATE, OR TRIBAL PARTNERS AND IS SUBJECT TO CHANGE IN WHOLE OR IN PART

NO.	DATE	BY	REVISIONS	CK'D	APPV'D	NO.	DATE	BY	REVISIONS	CK'D	APPV'D

PORT OF PORTLAND
PORTLAND, OREGON

ANCHOR ENVIRONMENTAL, L.L.C.
1423 3rd Avenue, Suite 300
Seattle, WA 98101 (206) 287-9130

2008D001 — DESIGN NUMBER
820027 — PROJECT NUMBER

REGISTERED PROFESSIONAL ENGINEER 77473PE OREGON NOV. 8, 2005 JOHN RICHARD VERDUIN
PRELIMINARY
EXPIRATION DATE:

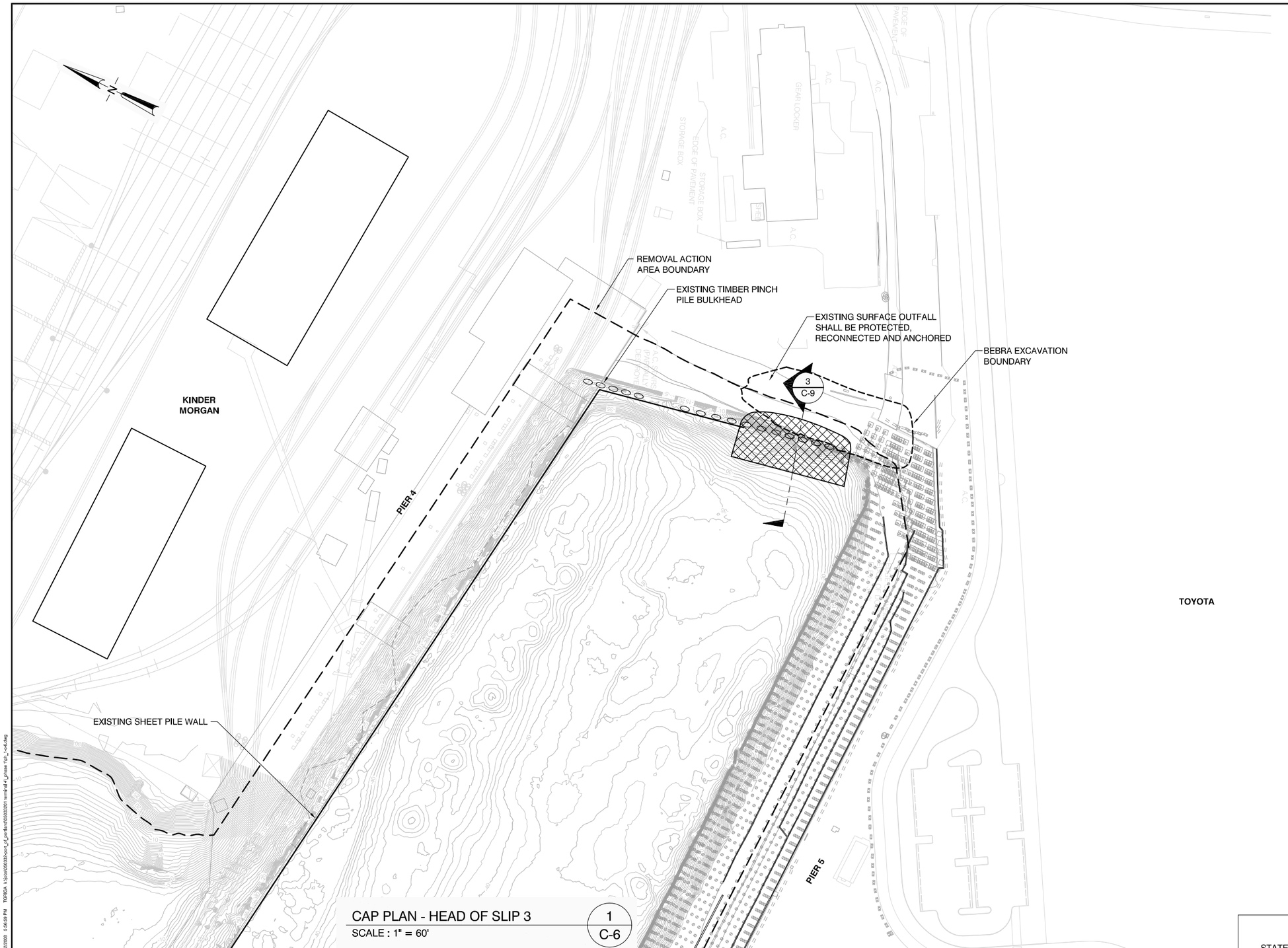
DESIGNED BY J. VERDUIN
DRAWN BY T. GRIGA
CHECKED BY J. VERDUIN
DATE JAN 2008
GRAPHICAL SCALE BAR 0 1/4" 1/2" 1" 2"

TERMINAL 4

REMOVAL ACTION - PHASE I
DREDGE PLAN SECTIONS

SUBMITTED BY ROGER ANDERSON, PROJECT ENGINEER
TYPE CD
DRAWING NO. T4 2008-501 7/13 (C-5)

12/22/2008 5:56:39 PM TGRIGA K:\jobs\050032-port_of_portland\050032001 terminal 4_phase 1\pn_1-c-1_c-5.dwg



LEGEND:

- HEAD OF SLIP 3 CAP
- DSL PROPERTY LINE
- TIMBER PILES

NOTES:

1. HORIZONTAL DATUM: PORT OF PORTLAND LOCAL PROJECTION (INTERNATIONAL FEET) VERTICAL DATUM: NGVD 29-47 CONTOUR INTERVAL = 1 FT
2. FOR NGVD CONTROL POINT, SEE PORT OF PORTLAND DRAWING RG 2006-3024 (NOVEMBER 2006)
3. BATHYMETRIC SURVEY BY PORT OF PORTLAND DATED MAY, 2007
4. EXACT BOUNDARY OF HEAD OF SLIP 3 CAP TO BE CONFIRMED DURING CONSTRUCTION
5. EXISTING MONITORING WELLS SHALL BE PROTECTED.

CAP PLAN - HEAD OF SLIP 3

SCALE : 1" = 60'

1 / C-6

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DRAFT DOCUMENT: DO NOT QUOTE OR CITE

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PORT OF PORTLAND
PORTLAND, OREGON

ANCHOR ENVIRONMENTAL, L.L.C.
1423 3rd Avenue, Suite 300
Seattle, WA 98101 (206) 287-9130

2008D001 — DESIGN NUMBER
820027 — PROJECT NUMBER

REGISTERED PROFESSIONAL ENGINEER 77473PE OREGON NOV. 8, 2005 JOHN RICHARD VERDUIN
PRELIMINARY
EXPIRATION DATE:

DESIGNED BY J. VERDUIN
DRAWN BY T. GRIGA
CHECKED BY J. VERDUIN
DATE JAN 2008
GRAPHICAL SCALE BAR 0 1/4" 1/2" 1" 2"

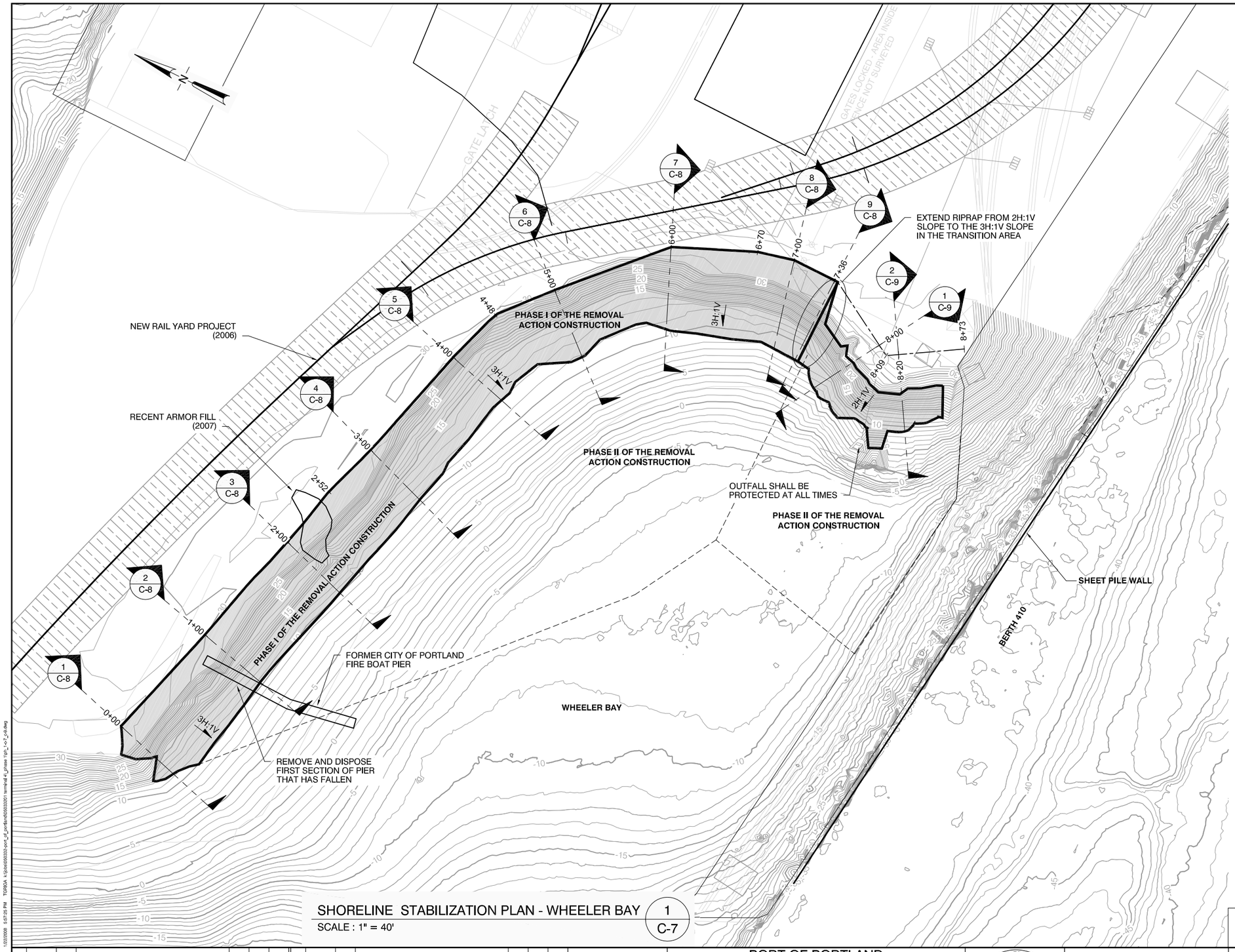
TERMINAL 4

REMOVAL ACTION - PHASE I
HEAD OF SLIP 3 CAP PLAN

SUBMITTED BY ROGER ANDERSON — PROJECT ENGINEER

TYPE CD | DRAWING NO. T4 2008-501 | 8 / 13 | (C-6)

1/22/2008 5:46:59 PM TGRIGA k:\jobs\050320-port_of_portland\050320301 terminal 4_phase 1\gh_1-c-6.dwg



LEGEND:

- BOUNDARY OF GRADING ACTIVITIES (PAHSE I)
- 1+00 STATION LINE
- TRACK FOUL AREA

CONTROL POINTS		
STATION	NORTHING	EASTING
0+00	67929.62	70047.47
1+00	67901.48	70143.43
2+00	67874.31	70239.62
2+52	67863.21	70290.78
3+00	67847.54	70335.78
4+00	67821.15	70432.23
4+48	67806.05	70477.85
5+00	67771.73	70516.99
6+00	67703.04	70589.43
6+70	67638.79	70616.74
7+00	67609.37	70623.74
7+36	67572.84	70623.54
7+38	67570.39	70623.52
8+00	67517.73	70592.69
8+09	67509.11	70587.64
8+20	67474.84	70608.28
8+73	67455.00	70620.24

NOTES:

1. HORIZONTAL DATUM: PORT OF PORTLAND LOCAL PROJECTION (INTERNATIONAL FEET) VERTICAL DATUM: NGVD 29-47 CONTOUR INTERVAL = 1 FT
2. FOR NGVD CONTROL POINT, SEE PORT OF PORTLAND DRAWING RG 2006-3024 (NOVEMBER 2006)
3. BATHYMETRIC SURVEY BY PORT OF PORTLAND DATED MAY, 2007.
4. EQUIPMENT CAN ONLY ENTER FOUL AREA WHEN RAIL LINE IS OUT OF SERVICE.

SHORELINE STABILIZATION PLAN - WHEELER BAY (1 / C-7)

SCALE : 1" = 40'

DRAFT DESIGN SET - NOT FOR CONSTRUCTION

DRAFT DOCUMENT: DO NOT QUOTE OR CITE

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PORT OF PORTLAND
PORTLAND, OREGON

ANCHOR ENVIRONMENTAL, L.L.C.
1423 3rd Avenue, Suite 300
Seattle, WA 98101 (206) 287-9130

2008D001 — DESIGN NUMBER
820027 — PROJECT NUMBER

REGISTERED PROFESSIONAL ENGINEER 77473PE OREGON NOV. 8, 2005 JOHN RICHARD VERDUIN
PRELIMINARY
EXPIRATION DATE:

DESIGNED BY J. VERDUIN
DRAWN BY T. GRIGA
CHECKED BY J. VERDUIN
DATE JAN 2008
GRAPHICAL SCALE BAR 0 1/4" 1/2" 1" 2"

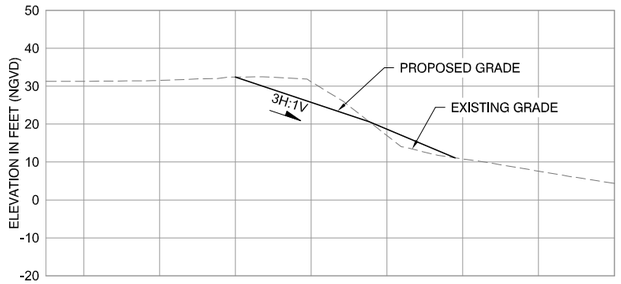
TERMINAL 4

REMOVAL ACTION - PHASE I
STABILIZATION PLAN -WHEELER BAY

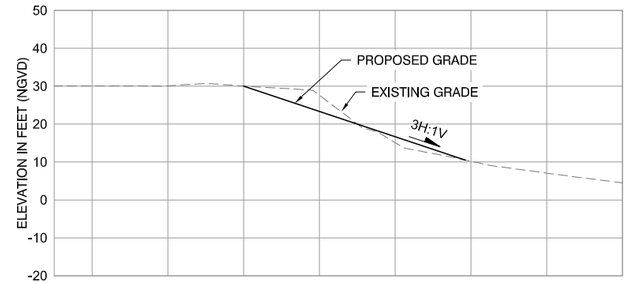
SUBMITTED BY ROGER ANDERSON, PROJECT ENGINEER

TYPE CD | DRAWING NO. T4 2008-501 9/13 (C-7)

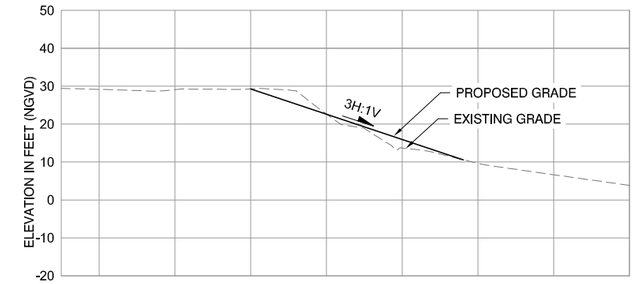
1/22/2008 5:57:26 PM TGRIGA k:\jobs\05\0532-port_of_portland\05\0532001 terminal 4_phase 1\gh_1-c-7_c-9.dwg



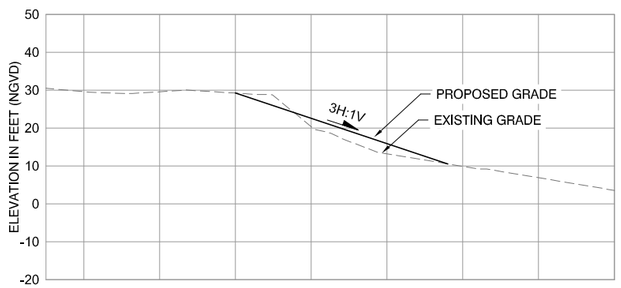
WHEELER BAY - STA 0+00 (1 / C-8)
SCALE: 1" = 20'



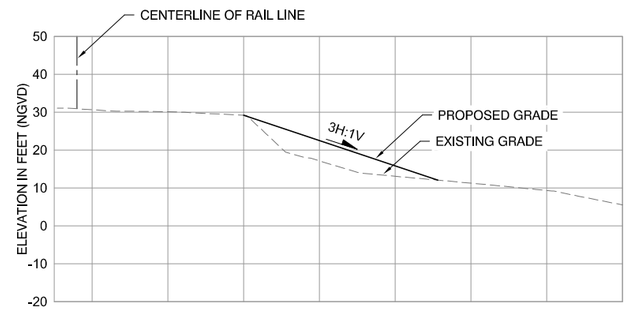
WHEELER BAY - STA 1+00 (2 / C-8)
SCALE: 1" = 20'



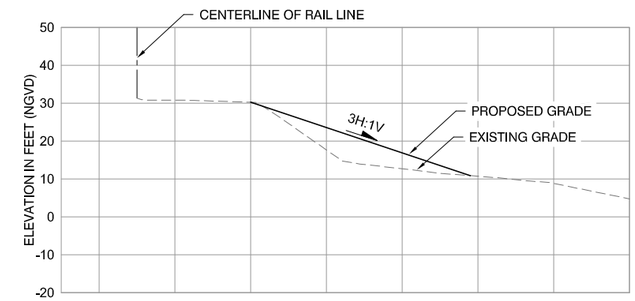
WHEELER BAY - STA 2+00 (3 / C-8)
SCALE: 1" = 20'



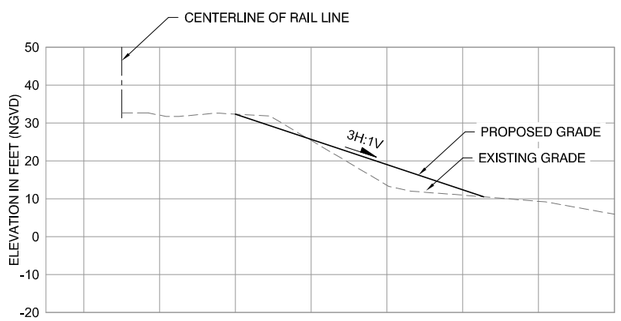
WHEELER BAY - STA 3+00 (4 / C-8)
SCALE: 1" = 20'



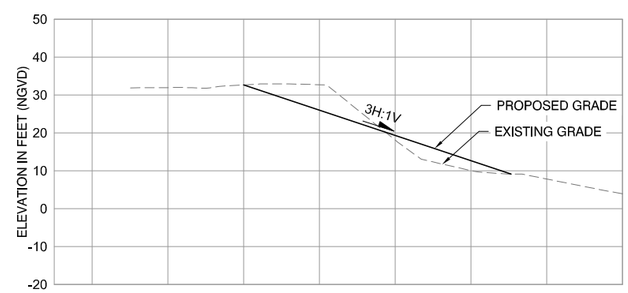
WHEELER BAY - STA 4+00 (5 / C-8)
SCALE: 1" = 20'



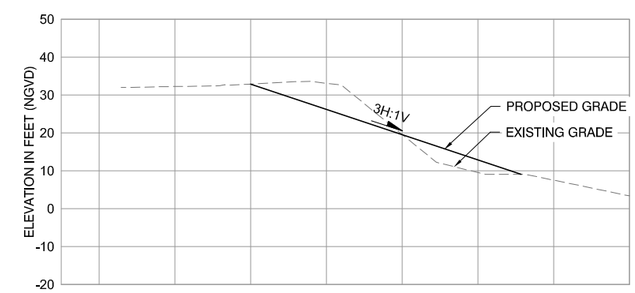
WHEELER BAY - STA 5+00 (6 / C-8)
SCALE: 1" = 20'



WHEELER BAY - STA 6+00 (7 / C-8)
SCALE: 1" = 20'



WHEELER BAY - STA 7+00 (8 / C-8)
SCALE: 1" = 20'



WHEELER BAY - STA 7+36 (9 / C-8)
SCALE: 1" = 20'

NOTES:

1. HORIZONTAL DATUM: PORT OF PORTLAND
   LOCAL PROJECTION (INTERNATIONAL FEET)
   VERTICAL DATUM: NGVD 29-47
   CONTOUR INTERVAL = 1 FT
2. FOR NGVD CONTROL POINT, SEE PORT OF PORTLAND DRAWING RG 2006-3024 (NOVEMBER 2006)
3. BATHYMETRIC SURVEY BY PORT OF PORTLAND DATED MAY, 2007
4. COMMON EXCAVATION SHALL BE PLACED IN LOWER LIFTS WITH STRUCTURAL FILL IN THE UPPER LIFTS
5. SEE DRAWINGS L-1 AND L-2 FOR GRADE FINISHES AND PLANTINGS.

DRAFT DESIGN SET - NOT FOR CONSTRUCTION
DRAFT DOCUMENT: DO NOT QUOTE OR CITE
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NO.	DATE	BY	REVISIONS	CK'D	APPV'D	NO.	DATE	BY	REVISIONS	CK'D	APPV'D

PORT OF PORTLAND
PORTLAND, OREGON

ANCHOR ENVIRONMENTAL, L.L.C.
1423 3rd Avenue, Suite 300
Seattle, WA 98101 (206) 287-9130

2008D001 — DESIGN NUMBER
820027 — PROJECT NUMBER

REGISTERED PROFESSIONAL ENGINEER 77473PE OREGON NOV. 8, 2005 JOHN RICHARD VERDUIN
PRELIMINARY
EXPIRATION DATE:

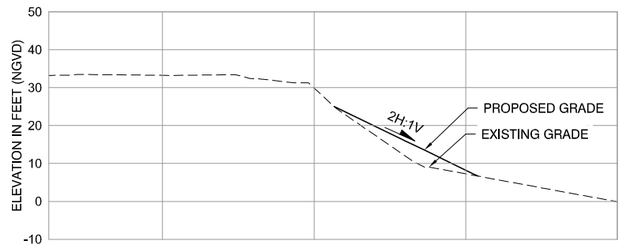
DESIGNED BY J. VERDUIN
DRAWN BY T. GRIGA
CHECKED BY J. VERDUIN
DATE JAN 2008
GRAPHICAL SCALE BAR 0 1/4" 1/2" 1" 2"

TERMINAL 4

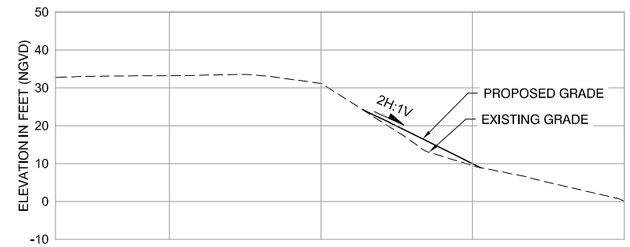
REMOVAL ACTION - PHASE I
WHEELER BAY SECTIONS

SUBMITTED BY ROGER ANDERSON, PROJECT ENGINEER
TYPE CD
DRAWING NO. T4 2008-501 10/13 (C-8)

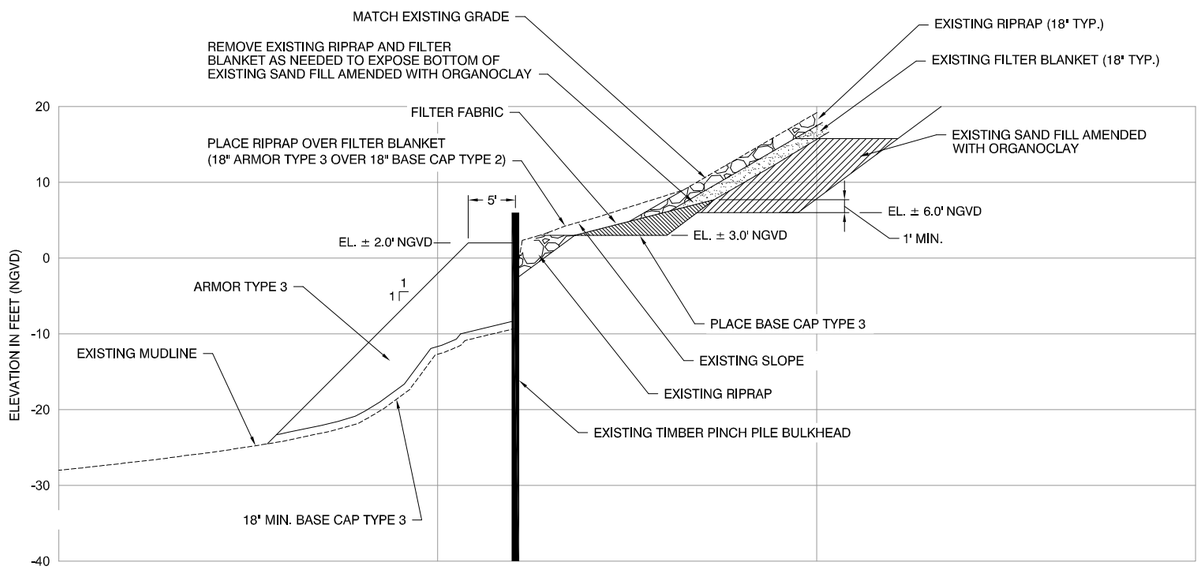
1/22/2008 5:57:24 PM TORIGA \\pdxfs\projects\2008D001\terminal 4_phase 1\ph_1-c-7_c-8.dwg



WHEELER BAY - STA 8+00 (1 / C-9)
SCALE: 1" = 20'



WHEELER BAY - STA 8+20 (2 / C-9)
SCALE: 1" = 20'



HEAD OF SLIP 3 CAP SECTION (3 / C-9)
SCALE: 1" = 10'

NOTES:

1. HORIZONTAL DATUM: PORT OF PORTLAND LOCAL PROJECTION (INTERNATIONAL FEET)
   VERTICAL DATUM: NGVD 29-47
   CONTOUR INTERVAL = 1FT
2. FOR NGVD CONTROL POINT, SEE PORT OF PORTLAND DRAWING RG 2006-3024 (NOVEMBER 2006)
3. BATHYMETRIC SURVEY BY PORT OF PORTLAND DATED MAY, 2007
4. MEANS AND METHODS TO BE DETERMINED BY CONTRACTOR TO MAINTAIN SAFE WORKING CONDITIONS.

DRAFT DESIGN SET - NOT FOR CONSTRUCTION
DRAFT DOCUMENT: DO NOT QUOTE OR CITE
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NO.	DATE	BY	REVISIONS	CK'D	APPV'D	NO.	DATE	BY	REVISIONS	CK'D	APPV'D

PORT OF PORTLAND
PORTLAND, OREGON

ANCHOR ENVIRONMENTAL, L.L.C.
1423 3rd Avenue, Suite 300
Seattle, WA 98101 (206) 287-9130

2008D001 — DESIGN NUMBER
820027 — PROJECT NUMBER

REGISTERED PROFESSIONAL ENGINEER 77473PE OREGON NOV. 8, 2005 JOHN RICHARD VERDUIN
PRELIMINARY
EXPIRATION DATE:

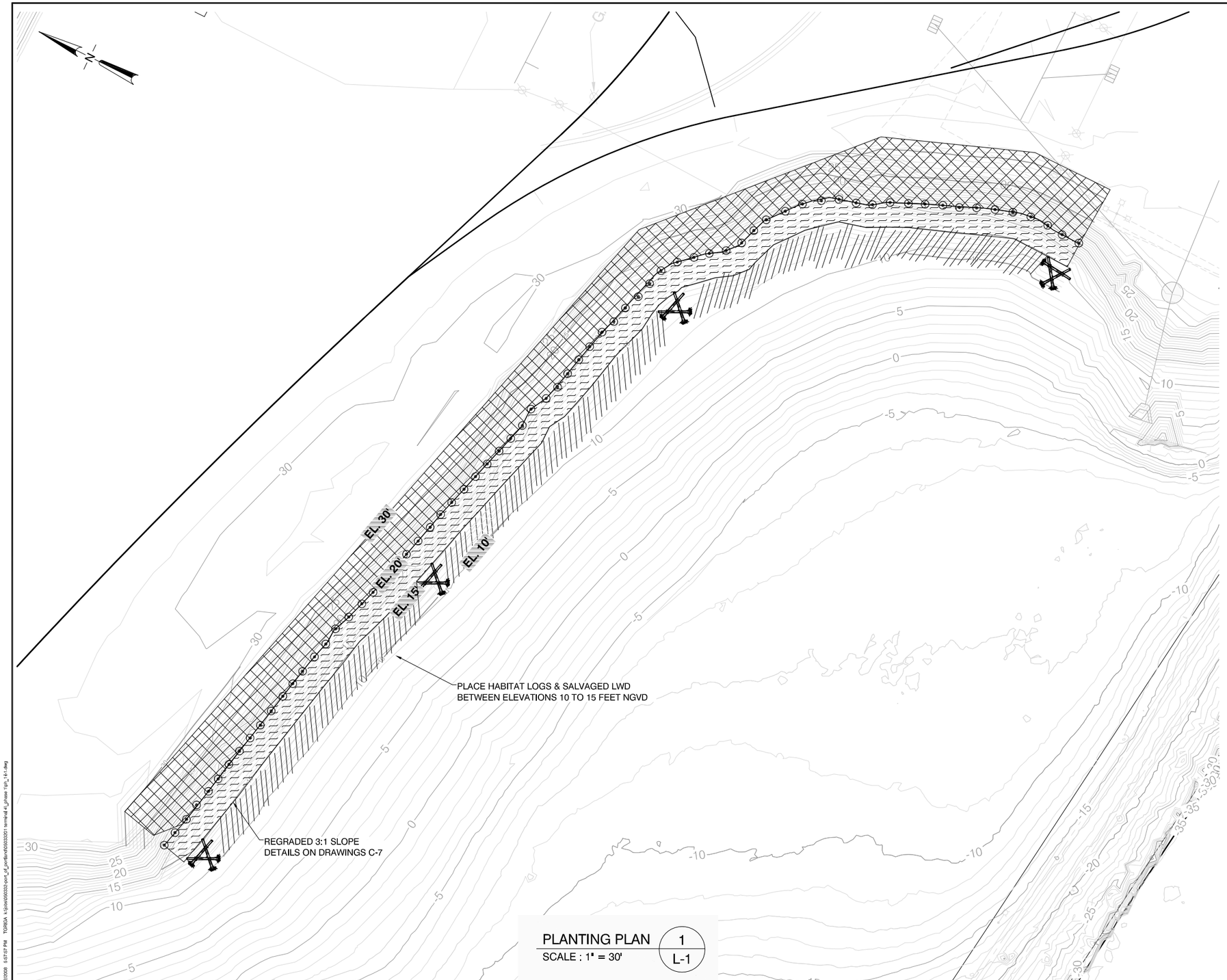
DESIGNED BY J. VERDUIN
DRAWN BY T. GRIGA
CHECKED BY J. VERDUIN
DATE JAN 2008
GRAPHICAL SCALE BAR 0 1/4" 1/2" 1" 2"

TERMINAL 4

REMOVAL ACTION - PHASE I
WHEELER BAY & HEAD OF SLIP 3 SECTIONS

SUBMITTED BY ROGER ANDERSON — PROJECT ENGINEER
TYPE CD | DRAWING NO. T4 2008-501 | 11 / 13 | (C-9)

1/22/2008 5:57:41 PM TGRIGA k:\jobs\050532-port_of_portland\050532001 terminal 4_phase 1\gh_1-c-7_c-9.dwg



PLANTING PLAN (1 / L-1)
SCALE : 1" = 30'

LEGEND:

- HYDROSEEDING WITH JUTE MATTING (6 / L-2)
- WILLOW LIVE STAKE PLANTING ZONE (1 / L-2) (2 / L-2) (3 / L-2)
- COTTONWOOD POLE PLANTING (1 / L-2) (4 / L-2)
- HABITAT LOG (ANCHORED) (TYPICAL) (5 / L-2)
- LARGE WOODY DEBRIS (UNANCHORED, SALVAGED) OVER TOE ARMOR (TYPICAL SHCEMATIC) (1 / L-2)

PLANT SCHEDULE:

COMMON NAME	SCIENTIFIC NAME	% OF AREA	SIZE	SPACING
LIVE STAKES PLANTING (EL. +15' TO +18')				
Scouler Willow	*Salix scouleriana*	50	1-2" DIA. MIN. 24-36"/STAKES	2' O.C. TRIANGULAR
Hooker Willow	*Salix hookeriana*	50	1-2" DIA. MIN. 24-36"/STAKES	2' O.C. TRIANGULAR
LIVE STAKES PLANTING (EL. +18' TO +20')				
Columbia River Willow	*Salix pacifica*	100	1-2" DIA. MIN. 24-36"/STAKES	2' O.C. TRIANGULAR
COTTONWOOD POLE PLANTING (EL. +18' TO +20')				
BLACK COTTONWOOD	*Populus trichocarpa balsamifera*	NA	3-4" DIA 5-6 POLES	10' O.C.

NOTES:

1. HORIZONTAL DATUM: PORT OF PORTLAND
   LOCAL PROJECTION (INTERNATIONAL FEET)
   VERTICAL DATUM: NGVD 29-47
   CONTOUR INTERVAL = 1 FT
2. FOR NGVD CONTROL POINT, SEE PORT OF PORTLAND DRAWING RG 2006-3024 (NOVEMBER 2006)

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PORTLAND, OREGON

ANCHOR ENVIRONMENTAL, L.L.C.
1423 3rd Avenue, Suite 300
Seattle, WA 98101 (206) 287-9130

2008D001 — DESIGN NUMBER
820027 — PROJECT NUMBER

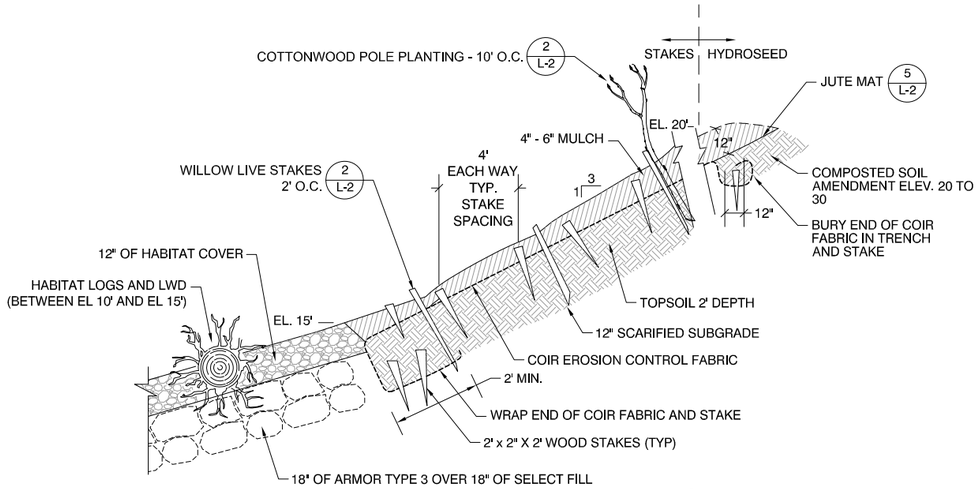
DESIGNED BY R. DESROSIERS
DRAWN BY T. GRIGA
CHECKED BY P. HUMMEL
DATE JAN 2008
GRAPHICAL SCALE BAR 0 1/4" 1/2" 1" 2"

TERMINAL 4

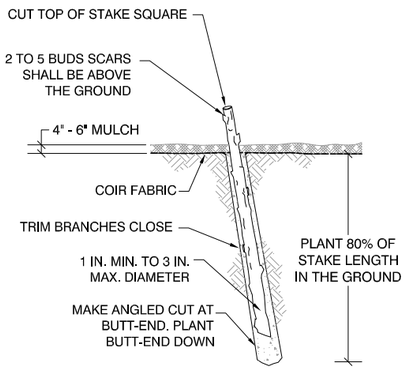
REMOVAL ACTION - PHASE I
SURFACE STABLIZATION AND PLANTING PLAN

SUBMITTED BY ROGER ANDERSON, PROJECT ENGINEER
TYPE CD
DRAWING NO. T4 2008-501 12 / 13 (L-1)

1/23/2008 5:37:07 PM TGRIGA k:\jobs\05053\03201_port_of_portland\05053201 terminal-4_phase 1\pln_t-41.dwg



COIR FABRIC INSTALLATION DETAIL — 1 / L-2
TRANSITION TO AQUATIC CAP
NOT TO SCALE

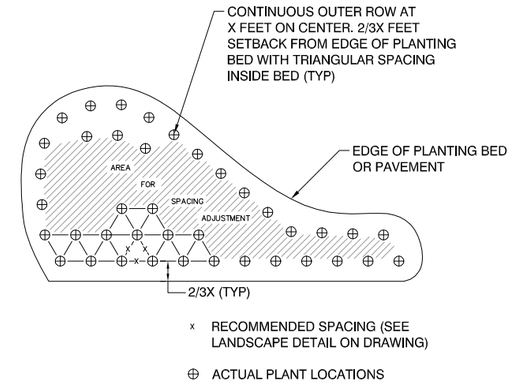


SECTION (TYP)

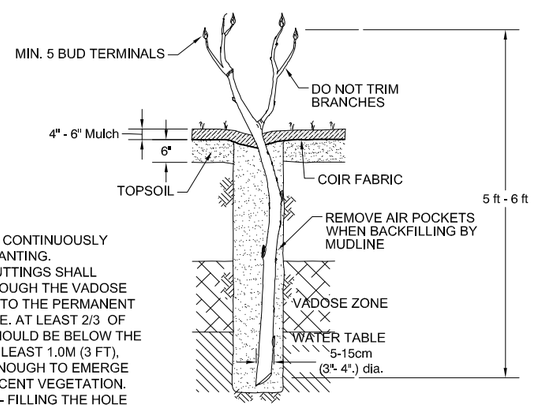
WILLOW LIVE STAKING DETAIL — 2 / L-2
NOT TO SCALE

NOTES:

1. HARVEST AND PLANT STAKES DURING THE DORMANT SEASON.
2. MAKE CLEAN CUTS AND DO NOT DAMAGE STAKES OR SPLIT ENDS DURING INSTALLATION, USE A PILOT BAR IN FIRM SOILS.
3. SOAK CUTTINGS CONTINUOUSLY PRIOR TO INSTALLATION.
4. TAMP THE SOIL AROUND THE STAKE.
5. ONLY NURSERY GROWN STOCK SHALL BE USED. HARVESTING OF WILD PLANTS IS NOT ACCEPTABLE.
6. USE EQUAL NUMBER AND EVEN DISTRIBUTION OF EACH WILLOW SPECIES.



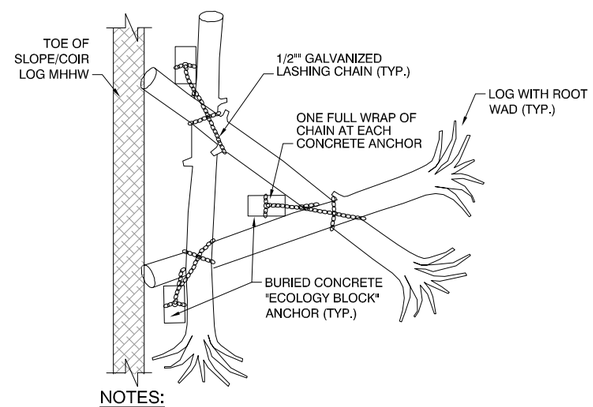
WILLOW PLANTING PATTERN — 3 / L-2
NOT TO SCALE



NOTES:

1. SOAK POLES CONTINUOUSLY PRIOR TO PLANTING.
2. THE POLE CUTTINGS SHALL EXTEND THROUGH THE VADOSE ZONE AND INTO THE PERMANENT WATER TABLE. AT LEAST 2/3 OF THE POLE SHOULD BE BELOW THE GROUND, AT LEAST 1.0M (3 FT), AND LONG ENOUGH TO EMERGE ABOVE ADJACENT VEGETATION.
3. "MUDDYING" - FILLING THE HOLE WITH WATER AND THEN SOIL TO MAKE A MUD SLURRY CAN REMOVE AIR POCKETS.

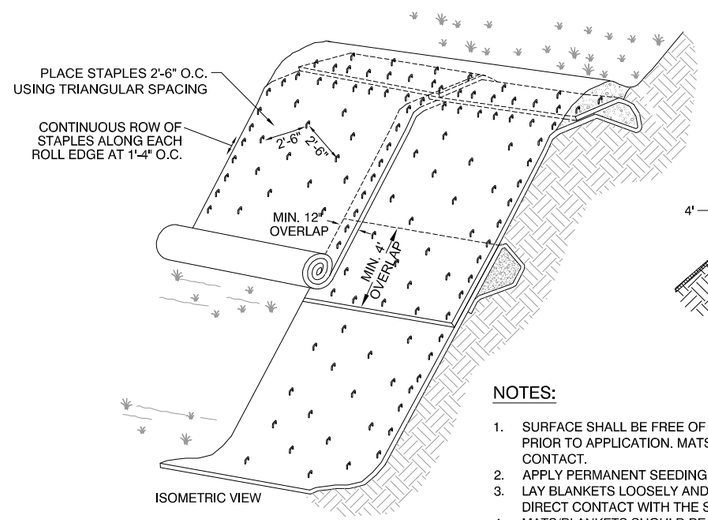
COTTONWOOD POLE PLANTING DETAIL — 4 / L-2
NOT TO SCALE



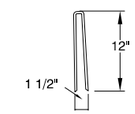
NOTES:

1. WRAP CHAINS TIGHTLY AROUND EACH LOG AND EACH ECOLOGY BLOCK ANCHOR AT LEAST ONE FULL LOOP.
2. SET CONCRETE ANCHORS BELOW ELEVATION OF ADJACENT LOGS AND FULLY COVERED BY ONE FOOT OF GRAVEL OR ROCK.
3. EXACT LAYOUT OF INDIVIDUAL LOGS SHALL BE DETERMINED IN THE FIELD AS DIRECTED BY THE ENGINEER.
4. PLACE HABITAT LOGS BETWEEN ELEVATIONS 10 TO 15 FEET.

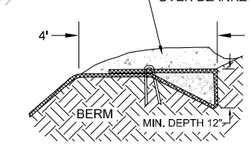
HABITAT LOGS - ANCHORED (TYP) DETAIL — 5 / L-2
NOT TO SCALE



TYPICAL SLOPE SOIL STABILIZATION



STAPLES



TOP OF SLOPE ANCHOR DETAIL

NOTES:

1. SURFACE SHALL BE FREE OF ROCKS, CLODS, STICKS AND GRASS, PRIOR TO APPLICATION. MATS/BLANKETS SHALL HAVE GOOD SOIL CONTACT.
2. APPLY PERMANENT SEEDING BEFORE PLACING BLANKETS.
3. LAY BLANKETS LOOSELY AND STAKE OR STAPLE TO MAINTAIN DIRECT CONTACT WITH THE SOIL. DO NOT STRETCH.
4. MATS/BLANKETS SHOULD BE INSTALLED VERTICALLY DOWNSLOPE.
5. INSTALL JUTE MAT BETWEEN EL. +20 AND +30 FEET.

JUTE MAT INSTALLATION DETAIL — 6 / L-2
NOT TO SCALE

HORIZONTAL DATUM: PORT OF PORTLAND LOCAL PROJECTION (INTERNATIONAL FEET)
VERTICAL DATUM: NGVD 29-47

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NO.	DATE	BY	REVISIONS	CK'D	APPV'D	NO.	DATE	BY	REVISIONS	CK'D	APPV'D

PORT OF PORTLAND
PORTLAND, OREGON

ANCHOR ENVIRONMENTAL, L.L.C.
1423 3rd Avenue, Suite 300
Seattle, WA 98101 (206) 287-9130

2008D001 — DESIGN NUMBER
820027 — PROJECT NUMBER

DESIGNED BY R. DESROSIERS
DRAWN BY T. GRIGA
CHECKED BY P. HUMMEL
DATE JAN 2008
GRAPHICAL SCALE BAR 0 1/4" 1/2" 1" 2"

TERMINAL 4

REMOVAL ACTION - PHASE I
SURFACE STABLIZATION AND PLANTING DETAILS

SUBMITTED BY ROGER ANDERSON — PROJECT ENGINEER
TYPE CD
DRAWING NO. T4 2008-501 13 / 13 (L-2)

1/22/2008 3:56:07 PM TGRIGA \\-p/data/5/0332/cont_all_portland/050332001 terminal 4_phase 1\gis_1-L2.dwg

APPENDIX E

DRAFT
CONSTRUCTION SPECIFICATIONS

TERMINAL 4 PHASE I REMOVAL ACTION
PORT OF PORTLAND, PORTLAND OREGON

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Prepared for

Port of Portland

Portland, Oregon

Prepared by

Anchor Environmental, L.L.C.

6650 SW Redwood Lane, Suite 333

Portland, Oregon 97224

January 2008

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EXHIBITS

A	Regulatory Documents (not included)
B	Debris Records (not included)

DIVISION 1

GENERAL REQUIREMENTS

SECTION 011100 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 DESCRIPTION

A. In 2000, the U.S. Environmental Protection Agency (USEPA) added the Portland Harbor Superfund Site to the National Priorities List. The Port of Portland (Port) is one of ten potentially responsible parties that entered into an Administrative Order on Consent with USEPA for a Remedial Investigation/Feasibility Study (RI/FS) of the Superfund Site in fall 2001. The Administrative Order on Consent allows Early Actions to be conducted to address known contamination at specific locations within the Superfund Site. Contaminants found in Terminal 4 sediment samples during a remedial investigation directed by the Oregon Department of Environmental Quality (DEQ) led to a determination that a Removal Action at Terminal 4 is warranted. Accordingly, the Port is conducting the first phase (Phase I) of a more comprehensive Removal Action at Terminal 4 under an Administrative Order on Consent for Removal Action (the AOC) executed by the Port and USEPA in October 2003. Final design and implementation of Phase II (the final phase of the Removal Action) is dependent upon information from the harbor-wide investigation and will be conducted after that information is available.

B. This project implements Phase I of the Removal Action. Elements of the Phase I Removal Action covered in this project include the following:
   1. Dredging approximately 16,500 cubic yards (cy) from Slip 3 and north of Berth 414 and placing 600 tons of sand layer over portions of the dredge area.
   2. Capping a portion of the head of Slip 3.
   3. Stabilizing the shoreline within Wheeler Bay.

C. The Terminal 4 facility is within and adjacent to the Portland Harbor Superfund Site. The Removal Action Area (RAA) was defined in the AOC as "that portion of the site adjacent to and within the Port of Portland's Terminal 4 at 11040 North Lombard, Portland, Multnomah County, Oregon, extending west from the ordinary high water line on the northeast bank of the Lower Willamette River to the edge of the navigation channel, and extending south from the downstream end of Berth 414 to the downstream end of Berth 401, including Slip 1, Slip 3, and Wheeler Bay."

1.2 PERMITS

A. The following regulatory agency documents have been or will be issued specifically for this project and pertain to the work and contract conditions: (see Exhibit A):
   1. USEPA, Section 401 Water Quality and Monitoring Compliance Conditions Plan
   2. National Marine Fisheries Services (NMFS), Biological Opinion

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B. The Contractor shall be responsible for adhering and conforming to all applicable provisions, conditions, and requirements of these agency documents.

C. All permits, certifications, or orders for capping work under this Contract will be issued by the entities stated in this part prior to commencement of the work.

D. The Contractor is responsible for validation to the Port, in writing, of the receipt of these permits, certifications, or orders before commencement of the work.

1.3 REGULATORY AGENCY DOCUMENTS

A. The Port has procured the following regulatory agency documents, which are included in the project manual as Exhibit A:
   1. NMFS Biological Opinion
   2. USEPA Water Quality Monitoring Compliance and Conditions Plan

B. The Contractor shall familiarize himself (herself) with the regulatory agency documents and ensure full compliance with all of their conditions.

C. Conflicts, if any, between the contract documents and these issued regulatory agency documents, observed by the Contractor, shall be brought to the attention of the Port immediately.

1.4 SOILS AND SEDIMENT INFORMATION

A. Records of soil and sediment exploration in the vicinity of this work are available in the Port Engineering files for examination by the Contractor upon request. The Port makes no representation as to the completeness or accuracy of this information.

1.5 KNOWN SITE CONDITIONS AFFECTED BY REGULATORY AGENCIES

A. The following materials or conditions are known to exist on the construction site. The Contractor shall comply with federal, state, or local agencies' ordinances or regulations pertaining to these conditions:
   1. Contaminated soil or groundwater
   2. Heavy metals
   3. Pencil-pitch
   4. Grease, oils, fuels, and other hydrocarbons
   5. Polychlorinated biphenyls (PCBs)
   6. Volatile organic compounds (VOCs)
   7. Environmental (E) – Zone

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1.6 UNEXPECTED HAZARDOUS OR ENVIRONMENTALLY SENSITIVE SITE CONDITIONS

A. If the Contractor encounters suspected hazardous or environmentally sensitive conditions in the work area beyond those mentioned in these specifications or on the drawings, the Contractor shall immediately stop all work in the area of the suspected condition and notify the Port.

B. The Port will make arrangements for testing and appropriate abatement, if required.

C. The Contractor shall alert his (her) employees to these facts and shall assure that no operations occur that disturb the suspected hazardous or environmentally sensitive condition.

1.7 PROGRESS MEETINGS

A. Regularly scheduled job meetings will be held between the Contractor and the Port. The Contractor's representative at job meetings shall be the person directly responsible for the work. The time and place of the meetings will be established by the Port.

B. Other unscheduled meetings may be required to resolve specific issues at the work area.

END OF SECTION 011100

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SECTION 013100 – PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 PORT/TENANT OPERATIONS

A. Work shall be conducted in coordination and cooperation with the Port of Portland (Port), tenants, and other contractors so that normal operations may be carried on without interruption.

B. The Port or tenant operations may require that certain of the Contractor's operations be scheduled around Port or tenant activities, and certain areas of the work may be required to be bypassed and accomplished when Port or tenant operations permit.

C. Work shall be coordinated with Port tenants through the Port.

1.2 WORK AREA RESTRICTIONS

A. Construction Period:
   1. The fish window for the Lower Willamette River is July 1 to October 31 each year. This is the period when in-water work is allowed to be performed. Outside of this window, all activities within any of the waterways, or considered in-water, will not be allowed.
   2. In-water work restrictions do not apply to upland work or work that is not considered in-water work by the applicable regulations and/or agencies.
   3. The Port does not have a restriction on work hours at the site. However, the Contractor's work shall adhere to City of Portland (City) ordinances regarding light and noise.
   4. The Slip 3 dredge plan, as presented in the drawings, shall be removed within the Port-tenant agreed-upon window while Berth 410/411 is shut down. The Port will coordinate with the Contractor in finalizing the dredging period, in accordance with USEPA and the tenant schedule.
   5. Dredging and capping tasks shall be completed within the timeframe defined above.

B. Scheduling Conflicts: Time-sensitive conflicts that may affect the construction schedule are listed below. The Contractor shall work with the tenants of the Port to accommodate their schedules. Currently, three active Port waterfront operations are occurring at Terminal 4:
   1. IRM: IRM will be importing and exporting liquid bulk materials at Berth 401 and/or Berth 408. Both barges and ships call on the berth. Vessel calls are very infrequent, typically less than once per month.
   2. Kinder Morgan (Berths 410/411): Kinder Morgan exports soda ash from the Berth 410/411 facility. The facility has a fixed loader, so ships are brought in and line-towed during loading. Ships are typically loaded over a 2- to 3-day period. Ships call on the facility approximately 8 times per month. The current lease provides the Port the option, with certain conditions and timely notification, to schedule a shutdown of Kinder Morgan's operations at Slip 3 with a maximum duration of 10 consecutive days per year

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to facilitate necessary maintenance. The Port does have the option of approaching Kinder Morgan about shutdowns that extend past the 10 consecutive days.

3. Toyota: Berth 414 is currently used to offload automobiles. Toyota's shipping activities are not anticipated to impact the currently planned removal action.

C. Haul Routes: The Contractor shall use the haul routes identified on the drawings and established by the Port.

1.3 OTHER CONTRACTORS

A. The Port reserves the right to award other contracts for work in the vicinity of work covered by this contract.

B. The Contractor shall contemplate, in planning and work scheduling, the following projects that may be in progress in the vicinity during the time of this contract:
   1. Terminal 4 earthen stockpile removal
   2. IRM Upgrades
   3. Kinder Morgan maintenance work
   4. Steel storage tank demolition

C. The various contractors and the Port will mutually establish a schedule of construction for the use of common work areas.

1.4 CONTRACTOR'S COORDINATION

A. The U.S. Environmental Protection Agency (USEPA) has legal authority over the project work and the Contractor shall allow unrestricted access to USEPA employees and its contractor staff (collectively referred to in the remainder of this paragraph as USEPA) to observe the work. The Contractor shall coordinate and cooperate with USEPA to the maximum extent possible. The Contractor shall neither temporarily nor permanently withhold any relevant data, observations, or information from USEPA. USEPA shall not provide, nor shall the Contractor accept, verbal direction regarding the means and methods of the work, except that the Contractor shall immediately heed USEPA upon USEPA's direction to the Contractor to shut down the work and standby until further notice. Other than shutting down the work, USEPA shall communicate all direction regarding means and methods and other contractual issues relevant to the Contractor through the Port.

B. The Contractor is responsible for overall coordination of the work.

C. The drawings and specifications are arranged for convenience only and do not necessarily determine which trades perform the various portions of the work.

END OF SECTION 013100

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SECTION 013200 – CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. The work progress schedule requirement is established to ensure adequate planning, scheduling, management, and execution of the work by the Contractor, and to enable the Port of Portland (Port) to evaluate work progress and make contract time adjustments. The work specified in this section consists of submitting a contract schedule, monthly updates, 4-week schedules for progress meetings, and a final as-built schedule. The planning, scheduling, management, and execution of the work in accordance with the contract are the responsibility of the Contractor.

1.2 SUBMITTALS

A. Except as modified in this section, the procedures required by Section 013300 – Submittal Procedures shall be observed.

B. Within 10 days after the Port's delivery of the fully executed contract, the Contractor shall submit a statement of CPM capability, stating that the Contractor has in-house capability, or naming a scheduling subcontractor who will be employed to prepare the required schedules. The Contractor shall include with this submittal the scheduler's name and a list of qualifications demonstrating that the scheduler has performed scheduling for projects of the same magnitude and complexity as this project. Failure to provide this information may result in disqualification of the proposed scheduler.

C. One week after the preconstruction meeting, the Contractor shall submit for review and approval by the Port, a work progress schedule meeting the requirements below.

D. During active construction, the Contractor shall submit a Daily Construction Report summarizing the activities of the previous work day.

PART 2 - PRODUCTS

Not Used.

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PART 3 - EXECUTION

3.1 CONTRACT SCHEDULE SUBMITTAL REQUIREMENTS

A. The contract schedule submittal shall be developed in Precedence Diagram Method (PDM) format using Primavera Project Planner (P3)®, Suretrack®, Microsoft Project®, or pre-bid approved equal. It shall include:

1. A CPM Network Diagram meeting the following requirements:

a. Be time-scaled (by week, starting Monday), grouped by work areas, and sorted by early start dates.

b. Be clear, neat, and legible. It shall be submitted on sheets at least 22 inches by 34 inches to allow for 50 percent reduction printing. Each sheet shall contain a title block, revision block, project name and contract number, Contractor, type of tabulation (i.e., initial, update, or project status), project duration, scheduled substantial completion date, and a legend explaining the basic notation, terms, and codes used.

c. Identify critical path activities, including critical paths to contract milestone dates.

d. Activity durations shall not exceed 10 days. Should an activity require more than 10 days, it shall be subdivided to define appropriate activities. The Port may approve using longer durations on such non-construction activities as the procurement and fabrication of materials and equipment.

e. All activity descriptions shall clearly define the location and type of work to be performed.

f. Show schedule critical deliverables (i.e., permits and submittals).

g. Schedule fabrication and delivery of all materials and equipment.

h. Scheduled start or completion dates imposed on the schedule by the Contractor shall be consistent with contract milestone dates and other restrictions. Contract milestone dates are the work area starting and completion dates and shall be clearly identified and connected to the appropriate activities.

i. The schedule shall include contingencies for normal weather delays and seasonal periods of heavy traffic flow.

j. The schedule shall list resources required to perform work within durations shown, and indicate the estimated quantities of work anticipated where applicable.

k. Failure to include any element of work required for performance of this contract shall not excuse the Contractor from timely completion of work required to achieve the contract milestones, notwithstanding the acceptance of the contract schedule submittal.

l. The contract duration shall be the duration specified in the contract documents and awarded by the Port.

m. Schedules extending beyond the contract completion date will not be accepted.

n. Schedules showing the work completed in less than the contract duration may be found by the Port to be impractical, requiring resubmittal.

o. Schedules showing the work completed in less than the contract duration, if practical to the Port, shall be considered to have float. Float is the time between the scheduled duration of the work and the contract duration. Float is a resource available to both the Contractor and the Port, and is non-compensable. Acceptance

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of a schedule showing the work completed in less than the contract duration shall not constitute a change to the contract completion date.

p. The schedule shall be coded by activity identifying shift work, restricted hours, electrical work, etc.

q. All Port-required activities shall be shown as part of the critical path.

2. A Narrative: The contract schedule submittal shall include a "stand-alone" document that conveys, in writing:

a. The Contractor's schedule assumptions; constraints; critical path/critical activities and why they are critical; permit requirements; coordination required with the Port, other contractors, utilities, or any other parties; and long-lead delivery items.

b. The basis for resources, to include anticipated quantities of work for each activity and the production rates used in determining resource allocation for activities.

3. The contract schedule submittal shall include a 3.5-inch diskette or a compact disk containing a copy of the project files. All data shall be written to disk via the Primavera Project Planner (P3)®, Suretrack®, Microsoft Project® Backup, or pre-bid approved equal utility.

B. The above items shall be included in the preliminary work progress schedule submitted to the Port at the preconstruction meeting.

1. The Contractor shall incorporate the Port's comments, finalize, and resubmit the work progress schedule within 5 days of receipt of review comments.

C. The final, accepted work progress schedule shall be the baseline from which changes in duration and logic shall be determined.

D. The final, accepted work progress schedule shall be the basis for planning, scheduling, managing, and executing the work.

3.2 MONTHLY UPDATE REPORT

A. No later than 30 days after acceptance of the contract schedule and monthly thereafter, the Contractor shall submit seven Monthly Update Reports. Six of the reports will be submitted to USEPA by the Port once the Port is satisfied with the submittal.

B. The Monthly Update Report shall consist of:

1. An updated CPM Network Diagram of the contract schedule, formatted as previously specified herein, and a 3.5-inch diskette or a compact disk containing an exact copy of the submittal. All data shall be written to disk via the Primavera Project Planner (P3)®, Suretrack®, Microsoft Project® Backup, or pre-bid approved equal utility.

2. A narrative that identifies the work actually completed and reflects the progress along the critical path in terms of days ahead of or behind the contract milestone dates. Specific requirements of the narrative are as follows:

a. If the Monthly Update Report indicates an actual or potential delay to the contract milestone dates, the narrative shall identify the problem, cause, and the activities affected.

b. The narrative shall also address the following:

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1) A detailed change in duration of any activity and/or logic changes to activities that were performed in a sequence different from the accepted contract schedule.
2) Activities proposed to be added to or deleted from the contract schedule.
3) Identification of executed change orders.

3. Incorporation of all Port-accepted schedule revisions.
4. The mutually agreed-to Monthly Update Report shall be the basis for evaluating the Contractor's progress. Documents in a single Monthly Update Report shall have the same data date irrespective of the dates of preparation of the individual documents.
5. If the latest completion time for any required contract milestone date as indicated by the current Monthly Update Report does not fall within the time allowed by the contract, the Contractor shall prepare and submit a plan to recover the lost time.

C. The Port may call for more frequent status meetings (e.g., weekly or biweekly), at no additional cost to the Port, at which the Contractor shall provide the required information.

D. Review of Monthly Update Report:
1. The Port will review the Monthly Update Report and respond within 7 days after receipt.
2. If necessary, the Contractor shall resubmit within 7 days of receipt of review comments.

E. Applications for Payment: Submission of monthly schedule updates shall accompany applications for progress payments, and will be a condition of payment.

3.3 PROGRESS MEETING SCHEDULES

A. During on-site construction, at each progress meeting, the Contractor shall provide a 1-week back and 3-week forward activity schedule. This schedule shall be in Gantt bar chart form and include, but not be limited to, reporting of the following:
1. A detailed listing of specific work items, duration of work items, actual work hours, resources to be used in accomplishing work items, work area closing and opening dates and times, operational impacts, and other pertinent items.
2. The weekly progress meeting schedules shall be submitted not less than 24 hours in advance of the scheduled progress meeting.

3.4 SCHEDULE MONITORING

A. If the progress of critical path activities falls behind the timelines shown on the latest, accepted version of the CPM schedule by 7 days, the Contractor shall document the means that will be employed to bring work back on schedule.

3.5 CONTRACT SCHEDULE REVISIONS

A. Proposed revisions to the accepted contract schedule shall be submitted to the Port on a separate fragnet for review and acceptance prior to incorporation into the current contract schedule. This

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fragnet must clearly outline the impact of the revision within the context of the contract schedule. Each proposed revision shall be submitted with the following minimum components:

1. A CPM Network Diagram showing revised and affected activities.
2. An Activity Report and Predecessor/Successor Report for all revised and affected activities.

3.6 CONTRACT TIME ADJUSTMENTS

A. Float is not for the exclusive use or benefit of either the Port or the Contractor. Extensions of time for contract performance, as specified in the contract, will be granted only to the extent that time adjustments to the affected work items exceed the total float time along the affected path(s) of the contract schedule current at the time of the delay.

3.7 AS-BUILT SCHEDULE AND DOCUMENTATION

A. Within 15 days after substantial completion, the Contractor shall submit for the Port's acceptance a final, as-built CPM Network Diagram.

3.8 SUSPENSION OF PAYMENTS

A. If the Contractor fails at any time to submit a schedule or update as noted above, the Port reserves the right to suspend progress payments wholly or in part until the Contractor submits a schedule that is accepted by the Port.

3.9 DAILY CONSTRUCTION REPORT

A. The Daily Construction Report shall provide a summary of activities completed the previous work day such that the progress of the work is documented daily. The Daily Construction Report shall contain, at a minimum:

1. Identification of equipment in use and activities performed
2. Identification of personnel on-site and activities performed
3. Quantities of material delivered to the site
4. Quantities of material removed from the site
5. Results of surveys performed, if any
6. Safety performance (noting accidents, illnesses, and near-miss incidents and corrective actions taken)
7. Quality Control (attach the Daily Construction Quality Control [CQC] Report per Section 014500)

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B. The Daily Construction Report shall be submitted to the Construction Quality Assurance Officer (CQAO) during the morning of the work day following the day covered by the report. The Daily Construction Report is not subject to formal review. The Contractor shall, however, address questions raised by the CQAO and issue corrections, as necessary, in a subsequent Daily Construction Report.

END OF SECTION 013200

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SECTION 013300 – SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes administrative and procedural requirements for all types of submittals.

1.2 CONTENT AND FORMAT – ALL SUBMITTALS

A. Accompany all submittals with the Port of Portland's (Port's) General Submittal Transmittal Form (example attached at the end of this section).

B. Unless specified otherwise in the applicable technical section, submit seven copies; one copy will be returned to the Contractor. Three copies will be submitted to the U.S. Environmental Protection Agency (USEPA) through the Port.

C. Organize each submittal by specification section and paragraph number.

D. Include the following information with each submittal:
   1. The Contractor's submittal identification number marked on each item.
   2. Date and revision dates.
   3. Port project title and number.
   4. The names of: The Contractor, subcontractor, supplier, and manufacturer.
   5. Identification of product or material, with the appropriate specification section and paragraph number marked on each item.
   6. Relation to adjacent critical features of work or materials.
      a. A clearly detailed sectional drawing of each system, identifying all components and their method of attachment to supporting structure, adjacent Contractor-designed work, or both.
   7. Field dimensions, clearly identified as such.
   8. Applicable standards.
   9. Identification of deviations from contract documents. Products shall be accompanied by a substitution request form.
   10. The Contractor's stamp.

E. Resubmission Requirements:
   1. Revise initial submittals as directed by the Port and resubmit as specified for the initial submittal. Use the same submittal identification number, except add ".1" to each successive resubmittal (e.g., 024100-4, 024100-4.1, 024100-4.2, etc.). Mark each item with the Contractor's submittal identification number and the appropriate Port specification section and paragraph number.
   2. Indicate on the submittals any changes which have been made to the initial submittal.

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1.3 MATERIAL SUPPLIERS/SUBCONTRACTORS LIST

A. Provide a complete list of material suppliers and subcontractors to the Port at the preconstruction conference.

1.4 SHOP DRAWINGS

A. Submit complete shop drawings as required by the applicable technical sections.

B. Present data in a clear and thorough manner.
   1. Drawings shall be identified by reference to the specification section and paragraph number when the item is called out in the specifications and by the original sheet and detail number, schedule, or room numbers when the item is shown on the drawings.
   2. Structural items shall be identified by location in the completed structure.

C. Shop drawing quality:
   1. All line work shall be clean and crisp with no feathering or fading.
   2. Line work important to the drawing shall be emphasized by increasing the line weight and density.
   3. Text size shall be a minimum of 1/8 inch in height and shall be Helvetica style font.
   4. Notes shall be clear and concise.
   5. CAD-generated drawings are preferred.

1.5 PRODUCT/MATERIAL DATA

A. Submit for Port review, prior to commencement of on-site work, all product or material data required by the applicable technical sections.

B. Product or material data consist of manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations, and other standard descriptive data. Catalog cuts or brochures for items that are standard products shall show the type, size ratings, style, color, manufacturer, and catalog number of each item and be complete enough to provide for positive and rapid identification in the field. Catalog data shall be submitted in loose-leaf, three-ring binders, organized by specification section and paragraph number. Each product or material data item shall be clearly marked and annotated with the appropriate specification section and paragraph number. General catalogs or partial lists will not be accepted.
   1. Clearly mark each copy to identify pertinent product or models.
   2. Show dimensions, weights, and clearances required.
   3. Show performance data consisting of capabilities, revolutions per minute (RPM), kilowatts (KW), pressure drops, design and operating pressures, temperatures, performance curves, noise level curves, and power characteristics and consumption; conforming as closely as possible to the test methods referenced in the drawings and specifications.
   4. Show wiring or piping diagrams and controls.
   5. Modify manufacturer's standard schematic drawings and diagrams to indicate which information is not applicable.

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6. Supplement standard information to provide information specifically applicable to the work.

1.6 SAMPLES

A. Office Samples:
   1. Provide samples of sufficient size and quantity to clearly illustrate the item.
   2. Show functional characteristics of the product or material, with integrally related parts and attachment devices.
   3. Provide full range of color samples.
   4. After review, samples may be used in the work.

B. Where "match sample" is specified, the Contractor's samples shall match the Port's existing sample.

C. Field Samples and Mock-Ups:
   1. Construct, at the work area, at a location acceptable to the Port.
   2. Size or Area: As specified in the respective specification section.

D. Submit the number and type stated in each specification section.

1.7 AS-CONSTRUCTED DRAWINGS

A. At the start of construction, the Port will provide the Contractor with a full-size set of drawings for use in recording revisions (redlines) that develop during construction.
   1. Mark these drawings to indicate the actual installation where the installation varies appreciably from the installation shown originally. Special attention shall be paid to legibility and reproducibility of drawings. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later. Items required to be marked include, but are not limited to:
      a. Dimensional changes to the drawings.
      b. Revisions to details shown on the drawings.
      c. Locations and depths of underground utilities (if different by more than 1 inch in depth or more than 1 foot in location).
      d. Revisions to routing of piping and conduits (if different by more than 1 foot from where shown).
      e. Revisions to electrical circuitry.
      f. Actual equipment locations (located to within 1 inch).
      g. Routing and size of ductwork, piping, and conduit (located to within 1 inch).
      h. Locations of concealed internal utilities (located to within 1 inch).
      i. Details not on original contract drawings.
   2. Mark completely and accurately on contract drawings or shop drawings, whichever is most capable of showing actual physical conditions. Where shop drawings are marked, show a cross-reference on contract drawings location.
   3. All attached documents to the marked-up drawings shall reference original drawings and sheet numbers.

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4. Mark drawings with red pencil or pen.
5. Mark important additional information, which was either shown schematically or omitted from original drawings.
6. Note construction change directive numbers, alternate numbers, change order numbers, and similar identification.
7. Accurately record information in an understandable drawing technique.
8. Record data as soon as possible after it has been obtained. In the case of concealed installations, record and check the mark-up prior to concealment.

B. Store the Contractor's redline drawings in the field office, apart from contract documents used for construction. Do not permit redline drawings to be used for construction purposes. Maintain redline drawings in good order, and in a clean, dry, legible condition.

C. The Contractor's redline drawings shall be available at all times for inspection by the Port.

D. Submit the final redline drawings upon completion of the work.

1.8 APPRENTICESHIP FOR CONSTRUCTION TRADES

A. Before starting work on any construction contract over $500,000, the Contractor shall submit proof of registration with the Bureau of Labor and Industries Apprenticeship and Training Division as a training agent for each trade where apprentices will be employed. The Contractor shall also submit such proof for each subcontractor employing registered apprentices if the subcontract is greater than $100,000.

1.9 OTHER SUBMITTALS

A. Other submittals include but are not limited to:

Section	013200	1.2, 3.2, 3.3, 3.5, 3.7
	013300	1.8, 1.9, 1.10
	013529	1.2, 3.2
	013553	1.4
	014500	1.3
	015000	1.5, 1.7, 1.16
	015639	3.1
	015713	1.6, 3.3
	015719	1.3, 3.3
	017000	1.2, 1.3
	017419	1.4
	017700	1.1, 1.7, 1.8
	017419	1.4
	017700	1.1, 1.7, 1.8

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024113	3.4
312000	2.2
328400	1.5, 3.12
329113	1.3
329219	1.3, 3.6
329300	1.4, 1.6
352023	1.3, 1.4, 1.5, 1.6, 3.2, 3.3, 3.4, 3.5, 3.6
352025	1.3, 1.5, 1.7, 2.2, 3.2, 3.3, 3.4, 3.5
353200	1.5, 3.3

END OF SECTION 013300

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GENERAL SUBMITTAL TRANSMITTAL FORM

Please fill in all information as completely as possible. One "submittal type" per form. Highlighted areas are information necessary for documents sent to the Technical Reference Center.

Submittal Type: ☑ One ☐ **Material Description** ☐ **Shop Drawing** ☐ **O&M Manual** ☐ **Specification** ☐ **Calculations** ☐ **Warranty** ☐ **Change Order** ☐ **Other** _____	**Submittal No.**	**Port Project Name**	**Port Project No.**	**Port EAN**
	Submitted By (name of person)	**General Contractor**	Contractor Job No.	
		Sub-Contractor		
	Port Drawing Reference	Router		
	Drawing No. / **Sheet No.**	**Primary Consultant**		

Port of Portland

Transmittal Review Routing ("From" > "To")	Copies	Attention (destination name)	Date Sent	Date Rec'd	Date Due
Contractor > Port Const.					
Port Const. > Consultant					
Consultant > Sub-Consultant					
Sub-Consultant > Consultant					
Consultant > Port Engineering					
Port Const. > Port Engineering					
Consultant > Port Const.					
Port Engineering > Port Const.					
Port Const. > Contractor					
Port Const. > TRC	**1**	**TRC Specialist**			

Specification Reference			**Review Action**			
Section No.	**Paragraph No.**	**Submittal Title or Description**	**A**	**B**	**C**	**D**

CONTRACTOR/CONSULTANT NOTES:	**TRC USE ONLY**		PORT NOTES:
	Date Rec'd at TRC:		
	Index No.:		
	Document Quality:		
	OK	**Resubmit**	

SUBJECT TO ALL CONTRACT REQUIREMENTS:

A = PROCEED.
B = CORRECT AS NOTED & PROCEED.
C = REVISE & RESUBMIT.
D = FOR INFORMATION ONLY. NO PORT REVIEW REQUIRED.

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SECTION 013529 – SAFETY AND HEALTH

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This section includes the requirements for safety and health for site workers and the adjacent community. This contract includes excavation of contaminated sediments and earthwork activities in other sediments and soils with low to moderate contamination levels. All Contractor activities shall comply with Hazardous Waste Operation and Emergency Response, 29 Code of Federal Regulations (CFR) 1910.120, and Oregon Administrative Rules, Chapter 437 (OAR 437), where applicable. The work of this section includes, but is not limited to, worker certification, health and safety plans, personal protective equipment (PPE), health and safety equipment, decontamination, and engineering controls.

B. Many of the work tasks will place workers in the probable position of coming in contact with contaminated sediment. Therefore, the Contractor shall comply with appropriate regulations. The Contractor health and safety plan (CHASP; see article 3.3 of this section for specific contents) shall clearly define health and safety requirements for specific site activities. At a minimum, 40-hour health and safety training will be required for:
   1. Workers performing construction activities within excavations and placement of backfilling and capping materials;
   2. Workers handling decontamination residuals and other potentially contaminated materials;
   3. Workers in contact with spoils from pile maintenance or other subsurface operations; and
   4. Workers performing dredging activities outside of enclosed equipment.
   5. The CHASP may allow for reduced training requirements following exposure monitoring if deemed appropriate by the Contractor's health and safety representative.

C. The Contractor shall have a health and safety representative. The health and safety representative shall, at a minimum, be a certified industrial hygienist (CIH). The health and safety representative shall be on site at the beginning of any hazardous waste operations and available for consultation as necessary and as required by site conditions for the Contractor's continued operations.

D. When training requirements are specifically defined for site activities, increased supervision and monitoring must be performed by the Contractor. At a minimum:
   1. All construction activities with a potential risk of exposure to dredged and excavated material must be supervised by personnel who, at a minimum, have 40-hour health and safety training and are able to identify potential upgrades needed in the level of health and safety protection.
   2. The Contractor’s health and safety representative shall be on site at the start of all hazardous waste operations and shall monitor all earthwork-related activities.
   3. Site-specific safety and hazard awareness briefings shall be required for all workers and other people entering the site. Briefings will inform these individuals of the chemical hazards of the sediment and define appropriate protections to minimize potential exposure. A written record of the date(s) and time(s) of such training and of the attendees is required.

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E. All required health, safety, and environmental monitoring for worker health and safety shall be the responsibility of the Contractor.

1.2 SUBMITTALS

A. A site-specific CHASP (see article 3.3), subject to review by the Port and the U.S. Environmental Protection Agency (USEPA), shall be submitted by the Contractor. The Port will review the CHASP only for completeness, not to approve it.

B. For work conditions that the Contractor's health and safety representative elects or determines to fall under 29 CFR 1910.120, an amendment to the CHASP shall be submitted to the Port. Such amendment will describe the personnel assigned to the particular site activity and their current status in terms of health and safety training, medical clearance, respirator fit testing, first aid and cardiopulmonary resuscitation (CPR) certification, and any other requirements as outlined in the CHASP.

C. No earthwork may commence until the Contractor has submitted the CHASP and the Port and USEPA have acknowledged receipt of the same. Because USEPA's review and acknowledgement requires some time, the Contractor shall submit the CHASP within 14 days of receiving the Notice to Proceed.

D. The Contractor is responsible for implementation of the CHASP. The Port and USEPA reserve the right to halt work in the event of health and safety violations.

1.3 JOB CONDITIONS

A. The Contractor represents that it has visited the site to become familiar with the quantity, location, and character of existing materials and contaminants on the site. The Contractor agrees that the premises were made available prior to submission of bids for whatever inspection and tests the Contractor deemed appropriate. The Contractor agrees that remedial investigation reports were made available for supplemental documentation of site conditions. The Contractor assumes full responsibility for compliance with all applicable health and safety requirements as mandated in city, county, state, and federal statutes.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 PREPARATORY WORK

A. Inspection:
   1. The Contractor's health and safety representative shall inspect the site and determine area- or activity-specific and worker-specific protection requirements. The Contractor

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will not be allowed to mobilize work crews for earthwork activities until a CHASP has been submitted to the Port.

2. After mobilization, the Contractor's site safety officer shall monitor work efforts and shall determine the need for additional worker protection as required by the work being performed or by action levels specified in the CHASP.
3. Prior to commencement of the work, the Contractor shall assess the structural integrity of all structures and provide adequate means of worker protection.
4. The Health and Safety Representative shall supervise and monitor the site safety officer and shall verify that all work is performed in accordance with the CHASP.
5. Site safety meetings will be held a minimum of once per week for each crew to address changing site conditions, activities, and personnel. Site safety meetings shall also be held at the start of each major task and whenever site conditions that affect the safety of personnel change. In addition, safety and hazard awareness training (see article 1.1 of this section) is required for all workers and others entering the site.

B. Discrepancies:
1. In the event of a discrepancy related to any aspect of the CHASP, the Contractor shall not proceed with contract work until such discrepancies have been resolved and a method for handling any associated risk has been determined and implemented.
2. Health and safety for workers and the surrounding community is the responsibility of the Contractor's health and safety representative.

3.2 WORKER CERTIFICATION REQUIREMENTS

A. Prior to initiating any work subject to the CHASP, the Contractor shall provide the Port with written documentation of employee training and medical certifications as necessary for work required under 29 CFR 1910.120.
1. Specifically, documentation of the following is required for each site worker for sites and work phases determined by the Contractor’s health and safety representative to fall under the requirements of 29 CFR 1910.120:
   a. Initial 40-hour (or 24-hour or 80-hour, where appropriate) hazardous waste health and safety training and current annual 8-hour refresher training, as per requirements of the Occupational Safety and Health Administration (OSHA).
   b. Enrollment in a medical monitoring program, with clearance within the previous 12 months from a licensed physician allowing the worker to participate in field activities and use respiratory protective equipment, if required in the CHASP.
   c. Current respiratory fit testing certification, if respiratory protective equipment is required.
   d. Provision of appropriate PPE for each worker, as necessary, at the highest level of protection identified for the site.
2. In addition, documentation of the following is required for specified site workers for sites and work phases determined by the Contractor’s health and safety representative to fall under the requirements of 29 CFR 1910.120:
   a. Eight-hour OSHA hazardous waste supervisory training (required for the field supervisor).
   b. Current CPR and first aid certification for at least one member of each crew.

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3.3 CONTRACTOR HEALTH AND SAFETY PLAN

A. The CHASP shall be developed by the Contractor for use by the Contractor. The CHASP shall be consistent with all applicable local, state, and federal health standards and guidelines implemented through, but not limited to, OSHA, the National Institute of Occupational Safety and Health (NIOSH), the American Conference of Governmental Industrial Hygienists (ACGIH), and USEPA. Where these are in conflict, the more stringent requirement shall be followed. The plan shall protect on-site and off-site personnel from the potential physical, chemical, and/or biological hazards particular to the site. The CHASP shall be reviewed and approved by the Contractor's management and health and safety representative.

B. The following points shall be addressed in the CHASP, at a minimum:
   1. Contractor's definition of site-specific work activities that the Contractor has determined would meet the definition of hazardous waste operations or require 40-hour health and safety training.
   2. Identification of specific chemical and physical hazards that may occur during the project.
   3. Description of site control and decontamination procedures for personnel and equipment to be used.
   4. Explanation of potential emergencies and contingency plan of action, including description of the route to the nearest appropriate hospital and posting of emergency phone numbers on the job site.
   5. Delineation of specific tasks and the associated hazards and protective measures to be instituted. This list will cover all tasks performed under this contract, including but not limited to, demolition, dredging, and capping activities.
   6. Other pertinent or required issues.

C. No earthwork may commence until the Contractor has submitted the CHASP and received acknowledgement of its completeness as described in article 1.2 of this section.

3.4 PERSONAL PROTECTIVE EQUIPMENT

A. The appropriate level of personal protection will be identified for specific tasks in the CHASP. As work progresses and hazards are identified, the Contractor's staff shall notify the Contractor's site safety officer. If hazards are identified that require a level of protection greater than Level C, work will be suspended and the Port and the Contractor's health and safety representative will be notified. The health and safety representative will determine what actions are required before work can restart.

B. At a minimum, all on-site personnel will wear a hard hat, orange reflective work vests, long pants, steel-toed boots, and safety glasses.

C. The Contractor shall provide additional PPE, other than respiratory PPE, for the use of Port employees and representatives and other visitors authorized by the Port. PPE will be provided in sufficient numbers and sizes that at least five visitors may be accommodated at one time. PPE shall be appropriate for any location on the site and for any work being conducted at that time. This PPE shall include hard hats, safety glasses, orange reflective work vests, boot covers, and personal floatation devices for work near water, per U.S. Coast Guard regulations.

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3.5 HEALTH AND SAFETY EQUIPMENT

A. The CHASP shall outline specific health and safety equipment required at each work site.

B. At a minimum, each construction project shall have the following equipment at the site:
   1. First aid kit;
   2. Fire suppression equipment;
   3. Emergency eye wash facility;
   4. Decontamination facilities;
   5. Traffic control; and
   6. First aid station.

3.6 ENGINEERING SAFETY CONTROLS

A. The CHASP shall describe engineering controls to protect health and safety during equipment use and against atmospheric hazards.

B. At a minimum, engineering controls shall include:
   1. Roll-over cages for bulldozers, backhoes, loaders, and tractors;
   2. Back-up alarms for all trucks and heavy equipment;
   3. Decontamination of equipment leaving the site (see Section 015000); and
   4. Barricades for open trenches, pits, excavations, and structure demolition.

3.7 OTHER CONTROLS

A. A comprehensive survey of existing utilities shall be performed prior to the initiation of demolition, intrusive digging, or excavation at depths greater than 1 foot. The survey shall include a review of applicable site drawings depicting utility locations in the demolition and excavation areas and an on-site inspection by a utility location company.

END OF SECTION 013529

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SECTION 013553 – MARINE TERMINAL SECURITY, SAFETY, AND OPERATING REGULATIONS

PART 1 - GENERAL

1.1 MARINE TERMINAL SECURITY POLICY

A. These requirements are in accordance with the federal Marine Transportation Security Act. The Contractor shall obtain, thoroughly review, and comply with all Port of Portland (Port) rules and regulations pertaining to marine security before commencing work under this contract.

B. The regulations contained in this section and the regulations adopted by the Port are subject to change at any time without notice. Copies of current Port rules and regulations may be obtained during the Port's normal business hours at the Terminal 6 marine security office.

C. Some time during 2008 the federal TWIC regulations will go into effect at Terminal 4. Contractor will have to apply with TWIC regulations and its application at Terminal 4.

1.2 SECURITY CONTACTS

A. Contact Port marine security to obtain security information and make arrangements for entry:
   1. 24-hour telephone number: 503-240-2230
   2. Terminal 6 administration office: 503-240-2009
   3. E-mail: marinesecuritydept@portofportland.com

B. Port marine security superintendent: 503-240-2235

C. Port marine security manager: 503-240-2232

1.3 SECURITY GATES AND FENCES

A. Access to the work site shall be through the project security gate as shown on the drawings.

B. The Contractor shall maintain security against unauthorized access to the marine terminal area through the project security gate.

C. Temporary fence replacement panels and gates shall provide the same level of security and protection against unauthorized access as the adjacent security fence. Temporary fences may utilize undamaged salvaged fence materials. Fence materials need not be galvanized, and posts may be driven. The height of fence or gate woven-wire fabric shall match the height of adjacent security fence fabric. Replaceable panels, used in lieu of gates or temporary fencing, shall be constructed so that they provide protection against unauthorized access equal to that of the gates and temporary fencing specified herein. Use of such panels is subject to the Port's approval.

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D. All equipment and vehicles shall be positioned a minimum of 10 feet away from either side of the perimeter security fence.

1.4 SUBMITTALS

A. Prior to being granted authorization to enter Port marine terminals, the Contractor shall complete the following:
   1. Submit complete contact information, including company name, address, telephone number, and name and telephone number of project superintendent.
   2. Submit a complete list of vehicles that will be accessing the terminal to carry out the work. The list shall include the vehicle make, model, year, color, license plate number including state of issuance, and description of identifying markings on the vehicle.
   3. Submit a list of Contractor personnel and subcontractor personnel who will be accessing the terminal to perform work. The list shall include complete names as they appear on their driver's licenses.
   4. Submit documentation that personnel have received training on security measures from the Port marine security department.

1.5 PERSONNEL SECURITY REGULATIONS

A. Contractor personnel, subcontractor personnel, material delivery personnel, and others entering the marine terminal shall present a valid state driver's license or government-issued ID as identification. All identification cards must:
   1. Be tamper resistant and show no signs of tampering or such disrepair that verification of the veracity of the ID is impossible.
   2. Include a photograph bearing a close resemblance to the person presenting the credential.
   3. Be current within a visible expiration date on the ID.
   4. Be an original issue document/card. Reproductions, copies, enlargements, etc. are not acceptable forms of ID.
   5. Show the relevant details of the holder such as the name, description, and controlling authority (issuer) of the ID.

B. The Port's marine security officer may request to see the identification of any person on the terminal at any time. Refusal to comply will result in immediate removal from the terminal.

1.6 VEHICLE REGULATIONS

A. Contractor Vehicles
   1. Contractor vehicles in the ship berth areas shall be clearly marked either by permanent markings or temporary markings (such as magnetic signs) on both sides of the vehicle.
   2. When outside the work area, all personnel, vehicle, and equipment movement shall be under the control of the Contractor's authorized escort, using the Contractor's approved escort vehicle(s).
      a. The Contractor escort vehicle(s) shall be equipped with an amber flashing light mounted on the roof of the cab. The escort vehicle(s) shall have signs mounted on

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the front and rear of the vehicle consisting of a black background and yellow lettering containing the Contractor's name and the words "ESCORT ONLY." Signs shall be readable from a distance of 300 feet.

b. The escort vehicle driver shall serve as liaison and shall be responsible for transporting workers to and from the work area.

c. Personnel and vehicles authorized to be in the marine terminal environment shall remain with the escort vehicle(s) while traveling to and from the work area.

d. Multiple vehicles may be escorted in convoy formation. Convoy vehicles shall travel in close formation, and the escort vehicle driver shall control speed to maintain safety. Convoys shall consist of no more than three vehicles plus the escort vehicle.

B. Personal Vehicles

1. Personal vehicles shall be parked in designated areas away from the berth. The Contractor's personnel shall be shuttled to and from the work area by the Contractor.

C. Material Delivery Vehicles

1. Material delivery personnel will be permitted to access the Port's marine terminals between the hours of 6 a.m. and 8 p.m.

2. The Contractor shall notify the Port prior to deliveries. This notification shall precede arrival at the terminal and shall include:

   a. The name of the company.

   b. The nature of the items being delivered.

   c. The date of delivery.

   d. Notification is not a substitute for the driver and vehicle information required in advance as noted above.

3. Temporary Passes: Upon entry at the terminal, a material delivery vehicle will receive a temporary pass, which shall be displayed on the dashboard of the vehicle while on the marine terminal. The pass is not valid for re-entry. The pass does not need to be returned and may be discarded upon departure.

D. Passengers in Vehicles: Only employees of the delivery company will be allowed access to the terminal. A passenger whose information was not previously provided as an employee of the delivery company will not be allowed access.

1.7 TRAINING INFORMATION

A. The Contractor shall contact the Port marine security superintendent to schedule training classes for all Contractor's and subcontractors' personnel.

B. The Contractor shall provide as much notice as possible, a minimum of 48 hours, to schedule training class requests for large groups.

C. The approximate duration of the training class is 30 minutes.

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1.8 PROHIBITIONS

A. The following prohibitions are in place:
   1. Giving rides to non-Contractor personnel (including ship's crew) on and off the terminal is not allowed.
   2. After completing work, all persons shall directly depart the terminal. Vehicles left on the terminal or parked improperly will be towed at the vehicle owner's expense.

1.9 REMEDIES OF THE PORT UPON VIOLATION OF REGULATIONS REFERENCED OR CONTAINED IN THIS SECTION

A. In addition to any other rights or remedies that the Port may have in the event that the Contractor, subcontractor, anyone directly or indirectly employed by any of them, and anyone for whose acts any of them may be liable fails to comply with the regulations referenced or contained in this section, the Port shall have the right to:
   1. Revoke security clearance of the offending individual and/or the Contractor permanently or for a prescribed period of time.
   2. Suspend the work or any portion thereof and continue the suspension until completion of any investigation or evaluation by the Port and full compliance with any corrective measures which the Port may reasonably require.
   3. Require the Contractor to provide to the Port a written plan, satisfactory to the Port, to demonstrate the Contractor's ability to prevent future violations.

B. The Contractor shall be fully liable to the Port for any costs or damages incurred by the Port as a result of any breach of security or violation of security regulations by the Contractor. The Contractor shall also be liable to reimburse the Port for any fines, penalties, assessments, judgments or other costs imposed upon the Port as a result of the Contractor's breach of security or violation of security regulations, as described herein. As used herein, reference to the Contractor shall include all of his employees, agents, subcontractors, suppliers, or other invitees.

C. The Contractor shall defend, indemnify, and hold harmless the Port against any and all claims of any nature made against the Port by any party resulting, in whole or in part, from the Contractor's breach of security or security violations. Defense shall be provided by legal counsel acceptable to the Port. As used herein, reference to the Contractor shall include all of his employees, agents, subcontractors, suppliers, or other invitees.

END OF SECTION 013553

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SECTION 014500 – QUALITY CONTROL

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This section describes the quality control requirements, duties, and responsibilities of the Contractor and the Port of Portland (Port) during execution of the work. The intent of this section is to require the Contractor to establish a necessary level of control that will:
   1. Adequately provide for the production of acceptable quality materials and workmanship.
   2. Provide sufficient information to assure both the Contractor and the Port that the specification requirements are and have been met.

B. The Contractor shall establish, provide, and maintain a construction quality control (CQC) plan as specified herein, detailing the methods and procedures that will be taken to assure that all materials and completed construction elements conform to the drawings, technical specifications, and other requirements, whether these elements be manufactured by the Contractor, or procured from subcontractors or vendors. Although guidelines are established and certain minimum requirements are specified herein and elsewhere in the contract technical specifications, it is the responsibility of the Contractor to ensure that construction and construction quality control are accomplished in accordance with the stated purpose and specifications as described herein.

C. The Contractor shall be prepared to discuss and present, at the preconstruction conference, its understanding of the quality control requirements. The Contractor shall not begin any construction or production of materials to be incorporated into the completed work until the quality control program has been reviewed and approved by the Port. No partial payment will be made for materials subject to specific quality control requirements until the quality control program has been reviewed and approved.

D. Quality control requirements contained in this section and elsewhere in the technical specifications are in addition to and separate from any acceptance testing requirements. Acceptance testing requirements are the responsibility of the Port. The Contractor shall cooperate fully in facilitating the sampling and inspection necessary for an effective acceptance testing program by the Port.

1.2 RELATED WORK DESCRIBED ELSEWHERE

A. Construction Quality Assurance Plan (CQAP; an exhibit to this contract).

B. Section 013300 – Submittal Procedures

C. Individual tests required in accordance with the pertinent sections of these specifications and the contract drawings, where applicable.

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1.3 SUBMITTALS

A. The Contractor shall submit the following in accordance with Section 013300 – Submittal Procedures:
   1. CQC plan
   2. Proposed program administrator's qualifications
   3. Daily CQC reports
   4. Daily inspection reports
   5. Daily test reports
   6. Certified test reports

PART 2 - PRODUCTS

2.1 GENERAL

A. Products that are used to accomplish or be incorporated into the work of this section shall be as selected by the Contractor, subject to approval by the Port.

PART 3 - EXECUTION

3.1 CONTRACTOR QUALITY CONTROL PROGRAM

A. The Contractor shall establish a quality control program to perform inspection and testing of all items of work required by the technical specifications, including those performed by subcontractors. This quality control program shall ensure conformance to applicable specifications and plans with respect to materials, workmanship, construction, finish, and functional performance. The quality control program shall be effective for control of all construction work performed under this Contract and shall specifically include surveillance and tests required by the technical specifications, in addition to other requirements of this section and any other activities deemed necessary by the Contractor to establish an effective level of quality control.

3.2 CONSTRUCTION QUALITY CONTROL PLAN

A. The Contractor shall describe the quality control program in a written document titled "Construction Quality Control Plan," which shall be submitted to the Port not later than 14 days prior to the start of any production, off-site fabrication, backfilling, or capping. The CQC plan will be used to document inspections, monitoring, surveys, and other actions to be taken by the Contractor to ensure that the work complies with all Contract requirements.

B. The CQC plan shall demonstrate the Contractor's understanding of the total quality control requirements of the Contract and, generally, how these will be utilized to control all processes within material/construction tolerances and acceptance criteria.

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C. The CQC plan shall incorporate the requirements of the construction quality assurance plan (an exhibit to this contract, that defines the roles and responsibilities of the Contractor, the Port, and the U.S. Environmental Protection Agency (USEPA) in regards to quality assurance of the work components). The CQC plan shall specifically address the following performance standards and objectives as described in the CQAP:

1. Dredging:
   a. Achieve the specified dredging depths and extents.
   b. Avoid impacts to adjacent structures and tenants.
   c. Achieve no off-site tracking of contaminants during transport of disposal material.
   d. Minimize short-term water quality impacts.
   e. Minimize potential impacts to cultural resources.
2. Shoreline Stabilization and Capping:
   a. Verify quality of import material.
   b. Achieve specified thickness and extent.
   c. Avoid impacts to adjacent structures and tenants.
   d. Minimize release of suspended sediment.
   e. Minimize short-term water quality impacts.

D. The CQC plan shall be organized to address, as a minimum, the following items:

1. General requirements;
2. Quality control organization;
3. Inspection and testing requirements;
4. Inspection and test plan;
5. Documentation of quality control activities; and
6. Requirements for corrective action when quality control and/or acceptance criteria are not met.

E. The Contractor is encouraged to add any additional elements to the CQC plan deemed necessary to adequately control all production and/or construction processes required by this contract.

F. Control of Non-conforming Items:

1. The CQC plan shall include a non-conformance procedure that provides for the identification, documentation, disposition, and control of non-conforming items, and identifies the responsibilities for preparation, review, approval, and the proposed resolution. In addition, the procedure shall include requirements for:
   a. Documentation of re-inspection results;
   b. Tagging and segregation, whenever practical;
   c. Approval of repair or accept-as-is dispositions by the Port, prior to implementation; and
   d. Review of completed non-conformance reports by the Port.
2. Material and items that do not conform to the applicable drawings, specifications, or documents shall be identified as non-conforming and, whenever practical, segregated to prevent their installation or inadvertent use. Non-conformances shall be reviewed by the responsible personnel, and disposed of accordingly.
3. When the associated documentation for received material or items, such as manufacturer inspection or test reports, certified material test reports, and certificates of compliance or conformance, indicate that the material or items do not comply with the specification or

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drawing requirements, the subject material or item shall be treated as non-conforming and not used until the non-conformance is resolved.

G. Control of Special Processes:
   1. The CQC plan shall identify special processes and the means by which the Contractor will ensure that they comply with the requirements of the applicable codes and standards identified in the construction specifications. Personnel and procedures shall be qualified in accordance with the requirements of the applicable code or standard identified in the construction specification. When the construction specification requires procedures and/or personnel qualifications in excess of those defined and required by the codes, the additional requirements will be identified in the construction specification or additional procedures or instructions by reference to the required industry code or standard, or by specific description in the document.
   2. Personnel performing or evaluating non-destructive examinations (NDE) must be qualified to the level appropriate to the activity they perform in accordance with the requirements of the American Society for Non-destructive Testing, SNT-TC-1A, latest edition, and supplements. NDE subcontractor(s) hired by the Contractor shall be an NDE service company that has been qualified and evaluated by the Port.
   3. Procedures and/or instructions for the performance of special processes shall be placed at the work location prior to commencement of the work.

H. Control of Measuring and Test Equipment:
   1. The CQC plan shall establish a system for the calibration, maintenance, and control of measuring and test equipment used by Contractor during construction. Procedures shall provide for the identification of each instrument or equipment item that requires calibration or checking, and the establishment of a calibration system based on the elapsed time or usage cycles.
   2. Records of calibration shall be traceable to nationally recognized standards; otherwise, the basis for calibration shall be established and documented. Calibration standards used must meet the accuracy tolerance recommended by the manufacturer of the equipment being calibrated.

I. Supplier Quality Control: The CQC plan shall establish a system for the evaluation and selection of suppliers of material, items, and services. The system shall include:
   1. Documented review and assessment of potential suppliers' quality system;
   2. Development of specified evaluation criteria;
   3. Inclusion of applicable quality criteria in purchase documents; and
   4. Regular reviews and evaluations of suppliers' on-going quality performance.

J. The CQC plan shall describe the responsibility, authority, and interrelation of all personnel who manage, perform, and verify work affecting quality. This shall include personnel who need organizational freedom and authority to:
   1. Initiate the actions necessary to prevent the occurrence of non-conformances;
   2. Identify and record any product quality problems;
   3. Initiate, recommend, or provide solutions through designated channels;
   4. Verify the implementation of solutions; and
   5. Control further processing, delivery, or installation of non-conforming material or items until the deficiency has been corrected.

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3.3 QUALITY CONTROL ORGANIZATION

A. The Contractor's quality control program shall be implemented by the establishment of a quality control organization. An organizational chart shall be developed to show all quality control personnel and how these personnel integrate with other management, production, and construction functions and personnel. The organizational chart shall be included in the CQC plan. Qualifications of all proposed personnel and independent testing laboratories shall be documented and submitted in the CQC plan.

B. The organizational chart shall identify all quality control staff by name and function, and shall indicate the total staff required to implement all elements of the quality control program, including inspection and testing for each item of work. If necessary, different technicians can be utilized for specific inspection and testing functions for different items of work. If an outside organization or independent testing laboratory is used for implementation of all or part of the quality control program, the personnel assigned shall be subject to the qualification requirements indicated below. The organizational chart shall indicate which personnel are Contractor employees and which are provided by an outside organization.

1. The Contractor shall designate an individual within its organization who is responsible for overall management of the quality control program and has full authority to institute any and all actions necessary for the successful implementation of the quality control program to ensure compliance with the contract plans and technical specifications. This individual, termed the CQC supervisor, shall report directly to a responsible officer of the construction firm and not to this project's line management.
2. The CQC supervisor's qualifications shall be submitted to the Port for review and approval. At the option of the Port, the candidate(s) for CQC supervisor shall be subject to interview by the Port prior to approval. The Contractor's approved CQC supervisor shall not be removed or replaced without prior written approval by the Port.
3. The CQC supervisor shall have the authority to stop the work when and where deemed necessary to ensure compliance with the contract documents.
4. Quality Control Personnel: The Contractor shall maintain a sufficient number of qualified quality control personnel to adequately implement the quality control program. The Contractor shall provide sufficient qualified quality control personnel to monitor each work activity at all times. Quality control personnel shall report directly to the CQC supervisor and shall perform the following functions:
   a. Inspection of all materials, construction, plant, and equipment for conformance with the technical specifications, and as required by article 3.4.
   b. Performance of all quality control tests as required by the technical specifications and the Inspection and Test Plan article (3.6) in this section.
5. Where material is being produced in a plant for incorporation into the work, separate plant and field technicians shall be provided at each plant and field placement location. The scheduling and coordinating of all inspection and testing must match the type and pace of work activity. The CQC plan shall state where different personnel will be required for different work elements.

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3.4 INSPECTION AND TESTING REQUIREMENTS

A. Quality control inspection functions shall be organized to provide inspections for all definable features of work, as detailed below. All inspections shall be documented by the Contractor as specified herein.

1. The CQC plan shall establish a system for ensuring that all inspections are performed in accordance with the inspection and test plan defined in this section. The Contractor shall only use inspection personnel who are independent of craft supervision and field engineering to perform quality verification inspection and testing.
2. The CQC plan shall describe and specify control testing operations required to qualify, demonstrate, or ensure the quality and characteristics of items, site conditions, or the erection and construction of contract-required items. All testing shall be performed in accordance with the inspection and test plan.
3. Modifications, repairs, and replacements required as a result of test failures will be treated as non-conforming items and controlled in accordance with the controls for non-conforming items.
4. Inspection and testing activities must be performed in accordance with procedures that may be supplemented by specific or standard instructions, work operations, or planning documents, including inspection plans delineating inspection hold points. The inspection activities that shall be planned in advance include:
   a. Receiving inspection;
   b. Construction inspection and testing;
   c. Installation inspection and testing; and
   d. Plant inspections.
5. Inspection and test activities shall have documentation reflecting the applicable inspections or tests performed. Inspection and test procedures and instructions shall provide:
   a. References to applicable documents, such as drawings, specifications, and procedures;
   b. Identification of prerequisites and special-process control requirements, such as personnel, procedure, or equipment qualifications; suitable and controlled environmental conditions; and calibrated instrumentation;
   c. Identification of characteristics to be inspected;
   d. Identification of individuals or groups responsible for performing the inspection;
   e. Identification or frequency of inspection or sampling;
   f. Provisions for establishing mandatory inspection hold points for witness by the Port;
   g. Requirements that inspections of modifications, repairs, and replacements be performed in accordance with either the original inspection procedure, instruction, plan, special procedures or plans appropriate to the work activity; and
   h. Requirements that inspection and test records contain:
      1) A description of the observation;
      2) A record of the date and results of the inspection or test, including any special documentation and sign-off by the inspector;
      3) Inspector identification;
      4) Evidence as to acceptability of the results;
      5) Verification that inspection or test operations are complete and acceptable;
      6) Action taken to resolve any discrepancies noted; and

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7) Adequate documentation to demonstrate that the completed inspections or tests have met the objectives defined in the inspection and test plan.

6. Inspections shall be performed daily to ensure continuing compliance with contract requirements until completion of the particular feature of work. These inspections shall include the following minimum requirements:
   a. During any plant operation for material production, quality control test results and periodic inspections shall be utilized to ensure the quality of aggregates and other mix components, and to adjust and control mix proportioning to meet the approved mix design and other requirements of the technical specifications. All equipment utilized in proportioning and mixing shall be inspected to ensure its proper operating condition. The quality control program shall detail how these and other quality control functions will be accomplished and utilized.
   b. During field operations, quality control test results and periodic inspections shall be utilized to ensure the quality of all materials and workmanship. All equipment utilized in placing, finishing, and compacting shall be inspected to ensure its proper operating condition and to ensure that all such operations are in conformance to the technical specifications and are within the plan dimensions, lines, grades, and tolerances specified. The quality control program shall document how these and other quality control functions will be accomplished and utilized.

3.5 PLANT INSPECTION

A. The Port or its authorized representative may inspect, at its source, any specified material or assembly to be used in the work. Manufacturing plants may be inspected from time to time for the purpose of determining compliance with specified manufacturing methods or materials to be used in the work, and to obtain samples required for acceptance of the material or assembly.

B. Should the Port conduct plant inspections, the following conditions shall exist:
   1. The Port shall have the cooperation and assistance of the Contractor and the producer contracted for materials.
   2. The Port shall have full entry at all reasonable times to such parts of the plant that concern the manufacture or production of the materials being furnished.
   3. If required by the Port, the Contractor shall arrange for adequate office or working space that may be reasonably needed for conducting plant inspections. Office or working space should be conveniently located with respect to the plant.

C. It is understood and agreed that the Port shall have the right to re-test any material that has been tested and approved at the source of supply after it has been delivered to the site. The Port shall have the right to reject only material that, when re-tested, does not meet the requirements of the contract documents.

3.6 INSPECTION AND TEST PLAN

A. As a part of the overall quality control program, the Contractor shall implement an inspection and test plan, as required by the individual technical specifications. The inspection and test plan

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shall include the minimum tests and test frequencies required by each technical specification item, as well as any additional quality control tests that the Contractor deems necessary to adequately control production and/or construction processes.

B. The Contractor shall prepare an inspection and test plan that identifies all inspection and test activities required by the specifications. The inspection and test plan shall be included in the CQC plan, and shall include:
   1. An itemized listing of inspection and test requirements.
   2. A reference of documents for each plan.
   3. Inspection and test methods employed in determining compliance.
   4. Documentation requirements necessary to show evidence of compliance.
   5. Identification of the inspection or test status for work in process by using work sequence plans, inspection or test records, tags, markings, or other devices compatible with the item, system, or operation being inspected or tested. Work sequence plans shall identify hold and witness points for inspections and tests, which shall also be shown on the project schedule.
   6. Any other information or verification required to assure compliance with contractual requirements.
   7. Verification that material marking is visible and correct material has been used.
   8. Specification section number, and the following information:
      a. Item description;
      b. Test standard (e.g., American Society for Testing and Materials [ASTM]);
      c. Test frequency;
      d. Control requirements.

C. The inspection and test plan shall contain a statistically based procedure of random sampling for acquiring test samples in accordance with ASTM D 3665. The Port shall be provided the opportunity to witness quality control sampling and testing.

D. All quality control test results shall be documented by the Contractor as specified herein.

3.7 DOCUMENTATION

A. The Contractor shall maintain current quality control records of all inspections and tests performed. These records shall include factual evidence that the required inspections or tests have been performed, including the type and number of inspections or tests involved; results of inspections or tests; nature of defects, deviations, or causes for rejection; proposed remedial action; and corrective actions taken.

B. Specific Contractor quality control records required for the contract shall include, but are not necessarily limited to, the following:
   1. Certified test reports for off-site testing and inspections shall be submitted in accordance with Section 013300 – Submittal Procedures.
   2. Quality control records are those documents that have been reviewed and accepted by the Contractor as complete, correct, and legible. Quality control records shall include documents such as:

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a. Drawings, specifications, procedures used for construction, procurement documents, and inspection and test records;
b. Submittals;
c. Personnel and procedure qualification records;
d. Material, chemical, and physical property test results;
e. Certificates of compliance and shipment releases;
f. Supplier surveillance records;
g. Receiving inspection, storage, cleaning, and cleanliness control records; and
h. Non-conformance reports and corrective action.

C. All quality control records shall be identified in the CQC plan and maintained in the Contractor's job-site files. The Port shall be provided access to these files when requested. Upon the completion of the Contractor's contractual activities, these files shall be turned over to the Port.

D. Quality control records must cover both conforming and defective or deficient features, and must include a statement that all supplies and materials incorporated in the work are in full compliance with the terms of the contract. Legible copies of these records shall be submitted to the Port daily, as specified below. The records shall cover all work placed subsequent to the previously furnished records and shall be verified and signed by the Contractor's program administrator.

E. Daily CQC Report: The Contractor shall prepare and maintain a daily CQC report of operations. The daily CQC report shall be attached to the Contractor's daily construction report, submitted in accordance with Section 013300 – Submittal Procedures. At a minimum, information in this daily CQC report will include the date, period covered by the report, equipment used, description of activity as identified by stationing and offset, quantity of sediments placed that day and to date, downtime and delays to the operation, health and safety status, and other relevant comments concerning conduct of the operation. The daily CQC report shall include the results of all inspections, surveys, and monitoring activities and shall be signed by the Contractor's superintendent or CQC supervisor. The daily CQC report shall include the following elements:

1. Daily Inspection Reports: Each member of the Contractor's quality control personnel shall maintain a daily report of all inspections performed for both Contractor and subcontractor operations on a form acceptable to the Port. These daily inspection reports shall provide factual evidence that continuous quality control inspections have been performed and shall, at a minimum, include the following:
   a. Technical specification item number and description;
   b. Compliance with approved submittals;
   c. Proper storage of materials and equipment;
   d. Proper operation of all equipment;
   e. Adherence to plans and technical specifications; and
   f. Review of quality control tests.
   g. The daily inspection reports shall identify inspections conducted, results of inspections, location and nature of defects found, causes for rejection, and remedial or corrective actions taken or proposed.

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h. The daily inspection reports shall be signed by the responsible quality control technician and the program administrator, and shall be attached to the Contractor's daily CQC report.

2. Daily Test Reports: The Contractor shall be responsible for establishing a system that will record all quality control test results. Daily test reports shall document the following information:
   a. Technical specification item number and description;
   b. Test designation;
   c. Location;
   d. Date of test;
   e. Control requirements;
   f. Test results;
   g. Causes for rejection;
   h. Recommended remedial actions; and
   i. Retests.
   j. The daily test reports shall be signed by the responsible quality control technician and the CQC supervisor and shall be attached to the Contractor's daily CQC report. When required by the technical specifications, the Contractor shall maintain statistical quality control charts.

F. Document Control

1. The Contractor's CQC plan shall require that Contractor-generated documents pertaining to quality-related items be controlled. The following types of documents shall be on controlled distribution to ensure that changes to them are transmitted and received when applicable:
   a. Manuals
   b. Instructions
   c. Procedures
   d. Specifications
   e. Drawings
   f. Inspection and test plans
   g. Field change requests
   h. Inspection test and manufacturing procedures

3.8 CORRECTIVE ACTION REQUIREMENTS

A. The CQC plan shall indicate the appropriate action to be taken when a process is deemed, or believed, to be out of control (out of tolerance), and detail what action will be taken to bring the process into control. The requirements for corrective action shall include both general requirements for operation of the quality control program as a whole, and for individual items of work contained in the technical specifications.

B. The CQC plan shall detail how the results of quality control inspections and tests will be used for determining the need for corrective action, and shall contain clear sets of rules to gauge when a process is out of control and the type of correction to be taken to regain process control.

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C. When applicable or required by the technical specifications, the Contractor shall establish and utilize statistical quality control charts for individual quality control tests. The requirements for corrective action shall be linked to the control charts.

3.9 OVERSIGHT BY THE PORT

A. All items of material and equipment shall be subject to oversight by the Port at the point of production, manufacture, or shipment to determine if the Contractor, producer, manufacturer, or shipper maintains an adequate quality control system in conformance with the requirements detailed herein and the applicable technical specifications and plans. In addition, all items of materials, equipment, and work in place shall be subject to surveillance by the Port at the site for the same purpose.

B. Oversight by the Port does not relieve the Contractor of performing quality control inspections of either on-site or off-site Contractor's or subcontractor's work.

3.10 PORT ACCEPTANCE TESTING AND INSPECTION

A. The Port may perform acceptance testing of all or portions of the work at its discretion.
   1. No work shall commence or be covered until approved by the Port.
   2. Prior to requesting acceptance tests, the Contractor shall perform check tests (monitoring of construction products, methods, and progress to assure work acceptability). Include check testing costs in the bid; no separate payment will be made for this work.
   3. The Port will have the right to perform various types of tests at any time prior to formal acceptance. This may include evaluation of line, elevation, grade, depth, thickness, compaction, density, material, composition, pressure, or other analyses deemed necessary by the Port.
   4. Acceptance tests by the Port will be initiated by the Contractor's request for approval.
   5. Acceptance surveys will be performed by the differential leveling method, using a mutually agreed-upon grid not to exceed 25-feet transverse by 50-feet longitudinal.
   6. Compaction testing will be conducted in accordance with ASTM D 2922 for subgrade, subbase, and aggregate base.
   7. The Contractor shall allow sufficient time in his/her schedule to accommodate Port acceptance testing. No separate payment will be made for delays or standby during this time.
   8. Results of the Port's acceptance tests will be made known to the Contractor as soon as practical; however, it remains the responsibility of the Contractor to obtain the specified requirements at all times. Any delay in advising the Contractor of test results shall not act as a waiver of this responsibility.
   9. Acceptance tests that fail to meet the specified requirements may be re-checked by the Port after the Contractor takes remedial action. The cost of re-checking shall be borne by the Contractor.
   10. The Contractor shall furnish, for approval or evaluation by the Port whenever requested, samples of materials as directed. These samples shall be completely representative of the materials or products proposed to be used in the work. The results will be used as a basis

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for acceptance or rejection in accordance with the specifications for the particular material(s).

11. The Contractor shall notify the Port at least 24 hours before burying underground utilities such as storm sewers, electrical conduits, lights, catch basins, and manholes. Upon notification by the Contractor, the Port will arrange for its surveyor to verify the locations and elevations of catch basins, manholes, lights, and similar structures. The Contractor shall take corrective measures if the Port's survey finds unacceptable discrepancies with the contract documents.
12. Pressure tests called for in the specifications or deemed necessary by the Port shall be performed by the Contractor and witnessed by the Port.
13. Specific testing tasks are specified in individual sections as required.

3.11 NON-COMPLIANCE

A. The Port will notify the Contractor of non-compliance with any of the foregoing requirements. The Contractor shall, after receipt of such notice, immediately take corrective action. Any notice, when delivered by the Port or its authorized representative to the Contractor or its authorized representative at the site of the work, shall be considered sufficient notice.

B. In cases where quality control activities do not comply with either the Contractor's quality control program or the contract provisions, or where the Contractor fails to properly operate and maintain an effective quality control program, as determined by the Port, the Port may:
   1. Order the Contractor to replace ineffective or unqualified quality control personnel or subcontractors.
   2. Carry out the functions and operations of the Contractor's approved quality control program. Costs incurred by the Port to operate the quality control program or to otherwise remedy the Contractor's non-compliance with quality-related provisions of the Contract shall be deducted from the total amount due the Contractor. This deduction shall be based on the actual cost to the Port for operation of the quality control program, as opposed to the amount that the Contractor may have bid initially for quality control services.
   3. Order the Contractor to stop operations until appropriate corrective actions are taken.

C. Any failure by the Port to notify the Contractor of any non-compliance with any of the foregoing requirements shall not be deemed as a waiver of its enforcement rights hereunder, and the Contractor is still bound by the terms and conditions of said requirements.

END OF SECTION 014500

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SECTION 015000 – TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 TEMPORARY UTILITIES

A. The Contractor may use water and electric power from Port of Portland (Port)-owned facilities at no cost, as available.

B. The Contractor shall maintain temporary facilities in a safe and proper manner and completely remove them from the site prior to final acceptance.

C. The Contractor shall provide labor and equipment for temporary lines and services at no added cost to the Port.

1.2 SANITARY FACILITIES

A. The Contractor shall provide and maintain sanitary facilities that meet the requirements of Oregon Revised Statutes (ORS) 654.150 and other applicable state and local health regulations. The Contractor shall bear the costs that may be incurred in complying with ORS 654.150 and the rules adopted pursuant thereto.

1.3 TEMPORARY HEAT

A. The Contractor shall furnish and maintain temporary movable heating units where temporary heat is required.

1.4 FIRE PROTECTION

A. The Contractor shall provide adequate fire fighting equipment to contain an equipment fire. The fire fighting equipment shall be made available and accessible in the work area.

B. The Contractor shall provide fire protection as required by Oregon Administrative Rules, Division 3, Chapter 437, Subdivision F, for building construction and demolition.

1.5 DUST CONTROL

A. If work includes clearing, grubbing, excavating, grading, hauling, placing, stockpiling, sawing, coring, drilling, sandblasting, general demolition, or other activities that will create dust or blowing soil, the Contractor shall review the Removal Action work plan with the Port prior to starting the work. The Removal Action work plan shall include all methods required to retain

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or control dust and soil so that they do not leave the immediate work site, present health hazards, or enter any public areas.

B. If conditions exist that cause dust or soil to become windblown or otherwise entrained in the air by vehicular traffic or equipment activities, the Contractor shall employ methods to control and abate nuisance dust conditions including, but not limited to:
   1. Covering excavated, graded, and disturbed areas or stockpiles with tarps or sheeting until removed from the site or finished in accordance with the contract documents.
   2. Cleaning, sweeping, or vacuuming areas to remove the dust source.
   3. Removing or relocating dust-creating materials or activities to other areas that will eliminate the dust problem.
   4. Applying dust-control agents, such as water, or water misting, to the dust source. Application of any wetting agents other than water requires the written approval of the Port prior to use.
      a. Application of dust control agents is not acceptable for materials that will dissolve in water or become friable.
      b. Materials that will dissolve in water or become friable when wetted shall be stored only on impervious surfaces, field-installed ground sheeting, or other barriers.
      c. Run-off from wetted materials shall be controlled to prevent contamination of other portions of the site.

C. The Contractor shall take precautions to contain the particulate matter from sandblasting operations and provide covered storage of the spent abrasive materials. Sandblasting shall be managed as hazardous or solid waste in accordance with applicable state, federal, and local regulations.

1.6 NOISE CONTROL

A. The Contractor shall comply with local noise control regulations.

1.7 SOLID WASTE MANAGEMENT

A. The Contractor shall be solely responsible for determining the proper disposition of all solid waste, including documentation showing that the solid waste and recyclables are not regulated as hazardous waste in accordance with state and federal regulations. Upon request, this documentation shall be made available to the Port.

B. Receptacles:
   1. All drop boxes, bins, totes, and cans located in areas exposed to wind or precipitation shall be equipped with metal, canvas, or plastic covers. Drop boxes, bins, totes, and cans shall be kept closed at all times, except when adding waste material.
   2. Where possible, large receptacles such as drop boxes, bins, and totes shall be placed on impervious areas, such as concrete or asphalt pavement, at locations away from public traffic, storm drain inlets, ditches, and other conveyances.
   3. If any receptacle is observed to be leaking any liquid, it shall be considered a solid waste leachate. The Contractor shall immediately take action to contain the leakage.

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4. Discarding of aerosol cans, used oil, paints, solvents, fluorescent light tubes, or any hazardous waste into a receptacle is strictly prohibited.
5. Receptacles larger than 33-gallon capacity used for recyclables and general solid waste and portable toilets shall not be located within 50 feet of a storm drain inlet, drainage ditch, surface water, or wetland.
6. The Contractor shall ensure that all recyclable and solid waste receptacles are kept closed, are not overfilled, are not leaking, and that general housekeeping is performed in the area.
7. All recyclable and general solid waste hauled from the Port shall be secured prior to leaving the work site so that no waste material blows out, falls out, or leaks out during transportation to the designated off-site location.

1.8 DISPOSAL

A. The Contractor shall dispose of waste material off Port property and in accordance with applicable state, federal, and local regulations.

B. Burning or burying of waste material within Port property is not permitted.

C. Disposal of waste material within the area cleared, or a river, stream, wetland, or other waterway or waterfront is not permitted.

1.9 STAGING, PARKING, AND WORK AREA

A. Access to and from staging, parking, and work areas shall be as shown on the drawings.

B. The Contractor shall perform operations and movement within the staging, parking, and work areas in strict conformance with Port rules and regulations.

C. Employees' vehicles shall be parked in the staging/employee parking area. The Contractor shall be responsible for transporting workers between the parking area and the work area.

D. Only marked Contractor-owned or -operated vehicles required for proper execution of the work will be allowed in the work area. No private passenger vehicles will be admitted.

1.10 STORAGE AND PROTECTION OF MATERIAL AND EQUIPMENT

A. The Port will designate the area in which the Contractor may store material and equipment.

B. The Contractor shall protect materials and equipment from damage, pilfering, etc., and fully relieve the Port of this responsibility.

C. Upon completion of the work, the Contractor shall remove unused materials and equipment and restore the area to original condition, including any grading necessary to restore drainage patterns and surface smoothness.

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D. Materials to be salvaged by the Contractor shall be stored in the staging area.

E. Plant material delivered to the work area that cannot be planted within 4 hours shall be stored in the area designated by the Port for the heeling-in of plant material.

F. Materials and equipment shall be stored at least 50 feet from any riverbank.

1.11 WARNING SIGNS AND BARRICADES

A. Before starting work, the Contractor shall provide and install any signs and/or barricades necessary for protection of the work.

B. The Contractor shall install and maintain adequate warning signs and lighted barricades to protect property and personnel in the work area. Barricades shall be weighted or anchored to prevent overturning from wind.

C. The Contractor shall space barricades a maximum of 20 feet apart, unless directed otherwise by the Port.

D. The Contractor shall relocate barricades, at the direction of the Port, whenever required to maintain protection of the work area or when changing work areas.

E. Open trenches, excavations, or obstructions not being actively worked shall be marked with lighted and weighted barricades that can be seen from a reasonable distance.

1.12 TRANSPORTATION OF MATERIAL

A. If shipments of hazardous material (including hazardous debris, contaminated soil or water, and hazardous waste) will be unloaded onto or loaded from Port property, the Contractor shall have a qualified person, who is current with U.S. Department of Transportation (DOT)-approved training for the transportation of hazardous materials, available on site when shipments are received or made. The storage and shipment of hazardous waste shall also comply with the requirements of these specifications.

B. The Contractor shall properly characterize and manifest waste material leaving Port property for disposal.

C. The Contractor shall ensure that hazardous goods and material delivered to or from the construction site meet applicable DOT labeling and placarding requirements.

D. The Contractor shall minimize and abate the creation of nuisance dust conditions during the loading and unloading of vehicles used to haul debris, rubble, soil, trash, or other material that may create dust during loading or unloading operations.

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E. Before leaving the loading area, the Contractor shall adequately secure and cover vehicles used to haul debris, rubble, soil, trash, or other material that may be blown off or fall during transportation on site or over public thoroughfares.

F. In areas that may result in the tracking of soil, sediments, or hazardous materials on the wheels of hauling equipment outside areas that are enclosed by erosion and silt or sediment control devices, the Contractor shall provide the means and methods to remove these materials prior to the vehicle exiting the controlled area. If water wash stations are used, the Contractor shall provide systems for the collection, treatment, and disposal of wheel wash water and accumulated sediment.

1.13 TRAFFIC CONTROL

A. Portions of the work may be in areas where there will be traffic involved in terminal activities and cargo handling. The Contractor shall make arrangements for the safe handling of traffic in the work area, and coordinate the work with the Port.

B. The Contractor shall keep pavement surfaces that are available to others for their use during construction of the work, free and clear of dirt, mud, and debris.

1.14 HAUL ROUTE CONSTRUCTION AND MAINTENANCE

A. The term “haul route” applies to any designated paved or unpaved road used by the Contractor for travel of construction equipment.

B. Construction equipment shall follow agreed-upon haul routes.

C. Electrical or communication cables shall not be crossed unless protected by approved means.

D. Equipment operated on haul routes over existing pavement shall conform to legal load limits for public highways unless approved protection is provided.

E. The Contractor shall maintain haul routes over unpaved areas in good, usable condition during the course of the work. Roads shall be sprinkled as necessary to prevent dust.

F. The Contractor shall restore any impacted paved roads to original condition at the conclusion of construction and prior to final acceptance. Haul roads over unpaved areas shall be obliterated by scarifying and smooth grading in conformance with existing drainage patterns.

G. The Contractor shall construct, maintain, and restore haul routes to the satisfaction of the Port. Cost shall be considered an incidental item.

1.15 HARD HATS AND SAFETY CLOTHING

A. Hard hats and high visibility clothing that comply with current American National Standards Institute (ANSI) requirements shall be worn. All safety equipment shall be in good repair.

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1.16 CONFINED SPACES

A. Performance of contract work may require workers to enter confined spaces. The Contractor is solely responsible for ensuring compliance with proper applicable confined space entry and working procedures in accordance with state and federal Occupational Safety and Health Administration (OSHA) regulations. The Port may review those procedures and perform its own tests for the limited purpose of ensuring the safety of its own employees.

B. The Contractor shall request and, if available, have a copy of any Port history on the confined space prior to entry.

C. At the end of the project, the Contractor shall submit a copy of all entry permits generated in the course of the work for the Port's use in building history of the confined space.

END OF SECTION 015000

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SECTION 015639 – TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide temporary fencing, barricades, and guards as necessary or required to protect trees that are to remain, from damage above and below grade.

B. Protect root systems from smothering and compaction. Do not store construction materials or permit vehicles to drive or park within the drip line area of any tree to remain.

C. Protect all plant growth, including root systems of trees from the dumping of refuse or chemically injurious material or liquids, and continual puddling of running water.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect all trees and document, by written memorandum and photograph, any unusual existing conditions. Submit copies to the Port of Portland (Port) prior to commencement of work.

3.2 FIELD SUPERVISION

A. The Port must be present during demolition of existing conditions within the drip line of trees to remain.

3.3 GENERAL

A. Protect root systems of trees to remain from damage due to noxious materials in solution caused by runoff or spillage during mixing and placement of construction materials, or drainage from stored materials.

B. Protect root systems of trees to remain from flooding, erosion, or excessive wetting resulting from dewatering operations and compaction.

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C. Protect all existing trees to remain against unauthorized cutting, breaking, or skinning roots and branches, and skinning and bruising of bark.

D. Do not allow fires on the project site.

E. Where cutting seems necessary, review conditions with the Port before proceeding, and comply with its directives.

F. All tree pruning or root cutting to be performed with sharp pruning instruments; do not break or chop. Do not prune without explicit approval of the Port.

3.4 EXCAVATION AROUND TREES

A. Excavate within drip line of trees only where indicated on drawings or as approved by the Port.

B. Where trenching for utilities is required within drip lines, tunnel under or around roots by hand digging or boring. Do not cut main lateral roots or tap roots over 1 inch in diameter; cut smaller roots that interfere with installation of new work. Cut roots with sharp pruning instruments; do not break or chop.

C. Do not allow exposed roots to dry out before permanent backfill is placed; provide temporary earth cover, or pack with peat moss and wrap with burlap. Water and maintain in moist condition and temporarily support and protect from damage until permanently relocated and covered with backfill.

3.5 GRADING AND FILLING AROUND TREES

A. Maintain the existing grade within the drip line of trees unless otherwise indicated on the drawings and approved by the Port.

3.6 REPAIR AND REPLACEMENT OF TREES

A. Repair trees damaged by construction operations as directed by the Port. Make repairs promptly after damage occurs to prevent progressive deterioration of damaged trees.

B. Remove and replace dead trees and damaged trees that are determined by the Port to be incapable of restoration to a normal growth pattern.
   1. Provide new trees of the same size (up to 13-inch caliper) as those damaged. Plant and maintain as directed. Species shall be selected by the Port.
   2. For trees exceeding replaceable size (over 13-inch caliper), the Port shall be compensated on the basis of an evaluation schedule on the damaged trees by a qualified consulting arborist registered with the American Society of Consulting Arborists.

END OF SECTION 015639

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SECTION 015713 – TEMPORARY EROSION, SEDIMENT, AND POLLUTION CONTROL

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes temporary measures and monitoring to control water pollution, soil erosion, and siltation. Erosion, sediment, and pollutant control (ESPC) devices or methods include the use of berms, dikes, dams, sediment basins, fiber mats, gravel, mulches, sediment (filter) fences, grasses, slope drains, and other techniques.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 312000 – Site Clearing, Earthwork, and Shoreline Stabilization

1.3 REFERENCED STANDARDS AND APPLICABLE CODES

A. National Pollutant Discharge Elimination System (NPDES) General Permit 1200-CA dated February 20, 2001

B. City of Portland Erosion Control Manual, current edition

C. City of Portland Title 10, Chapter 10.10 – 10.80

1.4 SUBMITTALS

A. At the pre-construction meeting, the Contractor shall submit the following supplemental ESPC information:
   1. Construction start and completion dates.
   2. Dates when ESPC measures will be in place.
   3. Projected date of removal of erosion control structures (after soil is stabilized by vegetation or pavement).
   4. Description of control procedures to prevent the discharge of all wash water from concrete trucks into the storm sewer system.
   5. Description of procedures for prompt maintenance or repair of ESPC measures utilized on-site.
   6. Description of clearing and grading practices, including a schedule of implementation, that will minimize the area of exposed soil throughout the duration of the project. (Whenever practicable, clearing and grading shall be phased to prevent exposed inactive areas from becoming a source of erosion.)
   7. Description of best management practices (BMPs) that will be used to prevent or minimize stormwater from being exposed to pollutants from spills, cleaning and maintenance activities, and waste handling activities. These pollutants include fuel,

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hydraulic fluid, and other oils from vehicles and machinery, as well as debris, leftover paints, solvents, and glues from construction operations.

8. Name, title, and telephone number of designated employee to perform the Contractor's inspection and monitoring of ESPC measures.

B. Any requested changes or modifications to the ESPC measures shown on the drawings shall be submitted to the Port of Portland (Port) for approval prior to implementation.

1.5 INJECTION WELLS

A. The Oregon Department of Environmental Quality regulates underground injection, including dry wells and most stormwater injection wells. Use of injection systems shall comply with Oregon Underground Injection Control (UIC) rules. The Contractor is solely responsible for ensuring compliance with the UIC rules. In addition, the construction or use of any injection well is prohibited without prior written approval from the Port.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 GENERAL

A. The implementation of the ESPC measures and the construction, performance monitoring, maintenance, replacement, and upgrading of the ESPC measures are the responsibility of the Contractor until all construction is completed and accepted and vegetation or landscaping is established.

B. The ESPC measures shown on the drawings shall be constructed in conjunction with all clearing, grading, trenching, and earthwork activities and in a manner that ensures that sediment and sediment-laden water does not enter the drainage system or roadways, or violate applicable water quality standards.

C. The ESPC measures shown on the drawings are the minimum requirements for anticipated site conditions and Contractor methods and sequences. During the construction period, the ESPC measures shall be upgraded as needed for unexpected conditions, storm events, or Contractor methods or sequences and to ensure that sediment and sediment-laden water does not leave the site.

D. The Contractor shall be responsible for implementing temporary erosion control measures during construction to correct unforeseen conditions. The Contractor shall be responsible for additional erosion control due to the Contractor's negligence, carelessness, or failure to install planned controls as a part of the work.

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E. Implementation, construction, and maintenance of ESPC measures shall be in accordance with the City of Portland Erosion Control Manual.

F. Soil disturbance activities shall not begin until ESPC measures are in place.

G. The Contractor shall schedule and perform ground disturbance activities in order to minimize impact to the overall project.

H. The erosion control drawings, together with the supplemental ESPC information, constitute the ESPC plan. A copy of the ESPC plan shall be retained on site and made available to the Port upon request.

3.2 CONSTRUCTION DETAILS

A. The Contractor shall install and maintain all site public notification signs as shown on the drawings and keep signs easily readable from the public right-of-way throughout the duration of the ground-disturbing activities. The signs shall be removed and disposed of upon completion of the work.

B. No visible or measurable erosion material or pollutant shall exit the construction site. Visible or measurable is defined as:
   1. Deposits of mud, dirt, sediment, or similar material exceeding 1/2 cubic foot in volume in any area of 100 square feet or less on public or private streets, adjacent property, or into the storm and surface water system, either by direct deposit, dripping, discharge, or as a result of the action of erosion.
   2. Evidence of concentrated flows of water over bare soils; turbid or sediment-laden flows; or evidence of on-site erosion such as rivulets on bare soil slopes, where the flow of water is not filtered or captured on the site.
   3. Earth slides, mud flows, earth sloughing, or other earth movement that leaves the property.

C. All reasonable means and methods to control or divert upslope stormwater runoff away from cleared and grubbed areas, stockpiled materials, and other disturbed areas that will be open or stockpiled for periods longer than 2 weeks shall be employed.

D. Construction entrances, exits, and parking areas shall be graveled or paved to reduce the tracking of sediment onto public or private roads, and maintained for the duration of the project.

E. Unpaved roads on the site shall be graveled or under other effective erosion and sediment control measures, either on the road or down gradient, to prevent sediment and sediment-laden water from leaving the site.

F. Existing vegetation shall be preserved where practicable, and open areas shall be revegetated after grading or construction.

G. Soil stockpiles shall be continuously secured or protected from runoff and erosion with temporary soil stabilization measures or protective cover throughout the project.

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H. Ongoing maintenance, repair, and restoration of ESPC measures shall be provided to keep them continually functional.

1. The following maintenance activities shall be included:

   a. Visual or measurable amounts of sediment and pollutants that leave the site shall be cleaned up immediately and placed back on the site or properly disposed of. Under no conditions shall sediment be intentionally washed into storm sewers or drainage ways.

   b. Clean catch basin protection when design capacity has been reduced by 50 percent.

   c. Remove sediment trapped by sediment fences before it reaches one-third of the above-ground fence height.

   d. Remove trapped sediments from sediment basins when design capacity has been reduced by 50 percent.

I. If fertilizers are used to establish vegetation, the application rates shall follow manufacturer's guidelines and the application shall be done in a way that minimizes nutrient-laden runoff to receiving waters.

J. If construction activities cease for 30 days or more, the entire site shall be stabilized using vegetation or a heavy mulch layer, temporary seeding, or another method that does not require germination to control erosion.

K. Any use of toxic or other hazardous materials shall include proper storage, application, and disposal.

L. When trucking saturated soils from the site, either watertight trucks shall be used or loads shall be drained on-site until dripping has been reduced to minimize spillage on roads and streets.

M. The Contractor shall clean all catch basins and inlets protected from sediment prior to paving and final acceptance. The cleaning operation shall not flush sediment-laden water into the downstream system.

N. ESPC measures installed during construction shall be removed when construction and site disturbance activities are complete and permanent soil stabilization is in place.

O. The Contractor shall remove and dispose of waste and unused building material.

3.3 MONITORING AND REPORTING REQUIREMENTS

A. The Contractor shall designate an employee to perform inspections of ESPC measures. The employee shall have knowledge and experience in construction stormwater controls and management practices.

B. The designated employee shall inspect erosion control measures daily and maintain as necessary to ensure their continued functioning.

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C. For inactive periods of work, the designated employee shall inspect ESPC measures at least once every 14 days and within 24 hours after any storm with precipitation greater than 0.5 inches per 24-hour period.

D. The designated employee shall visibly monitor stormwater runoff to evaluate the effectiveness of the erosion control measures or practices. If visible quantities of sediment are leaving the property, take corrective action immediately. The Contractor shall notify the Port of all corrections and violations.

E. The Contractor shall keep a record of inspections. This record shall be made available to the Port upon request, and be submitted to the Port upon final completion of the work.

F. Visual inspections shall document the following information:
   1. Inspection date, inspector's name, weather conditions, and rainfall amount for the past 24 hours (inches). (Rainfall information can be obtained from the nearest weather recording station.)
   2. List observations of all BMPs: Erosion and sediment controls, chemical and waste controls, locations where vehicles enter and exit the site, status of areas that employ temporary or final stabilization control, status of soil stockpile area, and non-stormwater controls.
   3. At representative discharge location(s) from the construction site, conduct observations and document the quality of the discharge for any turbidity, color, sheen, or floating materials. If possible, in the receiving stream, observe and record color and turbidity or clarity upstream and downstream within 30 feet of the discharge from the site. For example, a sheen or floating material shall be noted as present or absent. If present, it may indicate possible spill and/or leakage from vehicles or materials storage. Observation for turbidity and color shall describe any apparent color, the clarity of the discharge, and apparent differences compared with the receiving stream.
   4. If visual or measurable amounts of sediment are leaving the property, briefly explain the corrective measures taken to reduce the discharge and/or clean it up. Describe efforts to prevent future releases. The ESPC shall be amended accordingly.
   5. If a site is inaccessible due to inclement weather, the inspection shall include observations at a relevant discharge point or downstream location, if practical.

END OF SECTION 015713

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SECTION 015719 – ENVIRONMENTAL PROTECTION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This section covers preventing environmental pollution and minimizing environmental degradation during and as a result of construction operations. Other technical sections may also contain specific requirements for environmental protection. Those specific requirements are in addition to or modify the requirements in this section, the more stringent requirements shall control. The control of environmental pollution requires consideration of noise levels, air, water, and land.

B. All environmental pollution shall be prevented, abated, and controlled, and environmental degradation arising from construction activities shall be minimized by complying with all applicable federal, state, and local laws and regulations concerning environmental pollution control and abatement, as well as the specific requirement in this contract.

C. The Contractor shall comply with all substantive requirements of permits.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 013300 – Submittal Procedures

B. Section 024113 – Site Demolition and Debris Removal

C. Section 352023 – Dredging, Transportation, and Disposal

D. Section 352025 – Capping

1.3 SUBMITTALS

A. Environmental Protection Plan (EPP)
   1. The Contractor shall submit an EPP as one of the removal action submittals. This plan shall specify how the Contractor will adhere to best management practices (BMPs) for in-water construction work, and will describe methods that will be taken to prevent any petroleum products, chemicals, or other toxic or deleterious materials from entering the water.
   2. The EPP shall be submitted in accordance with Section 013300 – Submittal Procedures.
   3. The EPP submitted pursuant to this section presents the procedures by which the Contractor shall establish and maintain quality control for environmental protection of all items of the removal action. This plan shall address all construction tasks.
   4. The Contractor shall record on daily reports any problems in complying with laws, regulations, and ordinances, and any corrective action taken.

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5. The conservation measures required by the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) shall be implemented to minimize short-term impacts from construction activities.
6. Potential conservation measures include, but are not limited to, the following list. Additional conservation measures may be required through issuance of the Biological Opinion by NMFS, which is expected in late spring 2008.
    a. In-water work for this project will comply with the timing restrictions specified in the in-water work window that has been specified by the Oregon Department of Fish and Wildlife (ODFW; "Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources," June 2000), when salmonids are expected to be present in very low numbers. In the Lower Willamette River, the work window is in the summer and early fall, from July 1 through October 31, and in the winter, from December 1 through January 31. As an additional conservation measure, in-water work will be limited to the late summer and fall in-water work window, from July 1 to October 31. A spill containment and control plan will be present at the work site and will contain notification procedures, specific cleanup and placement instructions for different products, quick-response containment and cleanup measures that will be available for the removal action, proposed methods for placement of spilled materials, and employee training for spill containment.
    b. Prior to entering the water, all equipment will be checked for leaks and completely cleaned of any external petroleum products, hydraulic fluid, coolants, and other deleterious materials.
    c. All treated wood debris removed during the project shall be taken to a U.S. Environmental Protection Agency (USEPA)-approved upland facility. Once removed, any treated wood piling shall not be left in the water or stacked on the riverbank.
    d. Construction debris shall be collected and removed from the project area to an appropriate upland facility.
    e. Construction barges shall be placed at sufficient depth so as to not ground out during low water conditions.
    f. During dredging, the Contractor will not be permitted to perform bottom stockpiling or multiple bites of the clamshell bucket.
    g. All dredged materials shall be completely contained on barges and/or in dump trucks to prevent spillovers from occurring during transport to the landfill. Include details of measures to be implemented in case of spillage either during transloading or during trucking to the landfill.
    h. No cast-in-place concrete shall be used in-water.
    i. For earthwork activities, material excavated from the trench shall be piled in such a way as to preclude material from falling into the river. Erosion control measures shall be employed for this material and may include silt fences, geofabric, straw bale structures, jute mats, and coconut (coir) logs.
    j. Appropriate methods shall be used (e.g., oil pads, oil boom) to contain or remedy any sheen that appears on the water surface during construction.
    k. Water quality monitoring will be conducted by the Port to ensure that applicable standards are not exceeded outside compliance boundaries specified by the USEPA Section 401 Water Quality and Monitoring Compliance Conditions Plan (see Exhibit A). The Contractor may be required to modify production rates or construction methods if water quality exceedances occur.

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l. To minimize impacts to water quality, capping material used shall have a minimum amount of fines.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 NOTIFICATION OF NONCOMPLIANCE

A. The Contractor will be notified by the Port of noncompliance with the provisions of this section. Immediate corrective action shall be taken. Such notice, delivered at the site, shall be sufficient for the Contractor to take action. The Port may issue an order stopping all or part of the work for failure to comply until corrective action has been taken. No time lost resulting from such stop orders shall be the subject of a claim for extension of time or for costs or damages. The Contractor is required to comply with all environmental requirements whether or not notified by the Port of noncompliance.

3.2 IMPLEMENTATION

A. EPP: At least 4 weeks prior to the start of any scheduled activities, an EPP, including proposals for implementing this section for environmental protection, shall be submitted by the Contractor for approval. The Port will require 3 weeks to review the plan. If unsatisfactory, it will be returned for resubmission. No physical work at the site shall be started until this plan has been approved, or until specific authorization is obtained to start a phase of the work. The Port may require preparation and submittal of supplemental plans if additional environmental protection planning is found necessary for later phases of work. At a minimum, the plan shall include the sections indicated below:

1. Contamination Prevention: A contamination prevention section shall list all potentially hazardous products, such as petroleum and toxic materials, on the job site and corresponding provisions to be taken to prevent accidental introduction of such materials into any water body, the air, or the ground. The section shall also include plans for preventing polluted runoff from plant, equipment parking, and maintenance areas from entering local water bodies. The Contractor shall detail the methods that will be used to monitor the haul barges for leakage during loading and transport of dredged material to the disposal site. If leakage is evidenced, however minor, the operations shall be terminated and not restarted until repairs, satisfactory to the Port, are made. Any spillage or leaks shall promptly be cleaned up and placed in the prescribed disposal area.
2. Containment and Cleanup: A containment and cleanup section shall include the procedures, instructions, and reports to be used in the event of an unforeseen incident requiring a containment action. This section shall include, at a minimum:
   a. The name of the individual on each shift who will be responsible for implementing and supervising the containment and cleanup.

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b. A list of materials and equipment to be immediately available. For all work in or adjacent to water, a 200-foot-long, minimum, containment boom, and a cleanup kit consisting of absorptive pads and other materials necessary to remove and dispose of the spill material safely, shall be available at the job site. Materials and equipment for other cleanup work shall be tailored to the potential hazards involved.

c. The names and locations of suppliers of containment materials and names and locations of additional fuel oil recovery, cleanup, restoration, and disposal equipment available in case of an unforeseen spill emergency.

d. The methods and procedures to be used for expeditious cleanup.

e. The name of the individual on each shift who will report any spills and who will follow-up with complete documentation.

f. The requirements for containment and cleanup measures from spills or leakages or other types of releases shall be included in the plan.

g. Agencies, individuals, and phone numbers of agencies to be contacted on a 24-hour basis.

3. Erosion and Turbidity Control: An erosion and turbidity control section shall include any construction that will disturb upland or intertidal surfaces or introduce turbidity into water bodies. This section shall include the Contractor's plan for controlling erosion and water turbidity as a result of upland soil or intertidal excavation, stockpiling, stabilization, filling and grading, mechanical dredging, dredge material disposal,, demolition, and capping operations. Temporary erosion and sediment control measures such as booms, silt curtains, ditches, dikes, drains, and sedimentation basins shall be identified. Potential changes to operations that may be implemented if water quality standards are violated shall also be included. These measures and any others that may be necessary to achieve specified water quality shall be included in the plan.

B. Coordination: At the pre-construction meeting, the Port and the Contractor shall discuss the Contractor's operations to develop mutual understandings relative to the administration of the environmental protection program.

C. Supervision: During the work, all activities, including those of subcontractors, shall be supervised to ensure compliance with the intent and details of the plan. Environmental Compliance meetings shall be conducted by the Contractor for employees and subcontractors to ensure that all personnel working at the site are familiar with the environmental protection provisions. All equipment and materials for environmental protection shall be inspected every 2 weeks to ensure that they are in proper order and have not deteriorated. A written inspection report must be provided to the Supervising Contractor, giving the condition of the equipment and materials.

3.3 PROTECTION OF LAND RESOURCES

A. The land resources within the project boundaries and outside the limits of work under this contract shall be preserved in their present condition or be restored to a condition after construction that will appear to be natural, agreeable to the Port, and not detract from the appearance of the project. Activities shall be confined to areas defined by the contract documents. Areas of bare soil exposed at any time shall be held to a minimum.

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3.4 PROTECTION OF WATER RESOURCES

A. General: Compliance with state water quality standards and substantive requirements of any permits and clearances obtained for the work is the Contractor's responsibility.

B. Erosion Control: Surface drainage from cuts and fill, whether or not completed, and from borrow and waste disposal areas, shall be held in sedimentation ponds or the areas shall be graded to control erosion within acceptable limits. Temporary erosion and sediment control measures such as partial backfilling, mulching, ditches, dikes, drains, sedimentation basins, or silt fences or curtains shall be provided as needed, and maintained. The area of bare soil exposed at any time by construction shall be held to a minimum.

C. Disposal: Disposal of any wastes, effluents, trash, grease, chemicals, or other contaminants in water bodies shall not be allowed. If any waste material is dumped in unauthorized areas, the material shall be removed and the area restored to a condition approximating the adjacent undisturbed area.

3.5 WATER QUALITY MONITORING

A. Water quality monitoring will be performed by the Port, consistent with the water quality monitoring plan (Appendix B of the Phase I Removal Action Design Analysis Report). The Contractor shall familiarize itself with water quality requirements and with the Port's monitoring plans and activities. In the event of a water quality exceedance, the Contractor may be required to modify their procedures, methods, or equipment appropriately so as to remedy the exceedances, at no additional expense to the Port. The purpose of the specified water quality monitoring is to provide ongoing assessment of the water quality impacts of the removal action activities, as specified in the water quality monitoring plan.

3.6 PROTECTION OF FISH AND WILDLIFE

A. All work shall be performed and all steps taken to prevent interference or disturbance to fish and wildlife. Water flows or habitat outside the project boundaries that are critical to fish or wildlife shall not be altered or disturbed. The Contractor shall stop dredging, capping, pile driving, or other operations, if fish kill or distressed fish are observed, and immediately notify the Port, USEPA, and the appropriate permitting agencies.

3.7 PROTECTION OF AIR – EQUIPMENT FUELING AND MAINTENANCE

A. Ultra Low-Sulfur Diesel Fuel
   1. All diesel-powered off-road vehicles and equipment used on the project site for 3 consecutive days or more shall be fueled with ultra low-sulfur diesel (ULSD). This includes, at a minimum, vehicles with engine horsepower (HP) ratings of 50 HP and above, and internal combustion engines used to power generators, compressors, and similar equipment.
   2. The ULSD fuel shall contain no more than 15 parts per million sulfur.

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3. The Contractor shall submit the following:
   a. Prior to beginning construction, submit a list of the diesel-powered equipment that will use ULSD fuel. The list shall include:
      1) Equipment number, make, model, and contractor/subcontractor name.
      2) Type and source of ULSD fuel to be used.
   b. Submit monthly updates to the list of construction equipment.
   c. Submit monthly reports of hours of operation for all diesel-powered equipment.
4. Submit copies of diesel fuel delivery slips and fuel receipts each month, noting the type of diesel fuel used with each piece of diesel-powered equipment.
5. The Port encourages the use of other diesel emission reduction alternative fuels (e.g., biodiesel).
6. The Port encourages retrofit emission control devices on equipment or use of USEPA Tier II or Tier III equipment.

3.8 MAINTENANCE OF POLLUTION CONTROL FACILITIES

A. The Contractor shall maintain all constructed facilities and portable pollution control devices for the duration of the contract or for that length of time construction activities create the particular pollutant.

END OF SECTION 015719

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SECTION 017000 – EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 INSPECTION OF WORK AREA

A. Examine the work area and become satisfied as to the conditions of the work involved and the quantities of materials required for the performance of the work.

1.2 NOTIFICATION TO PORT

A. Notify the Port of Portland (Port) at least 48 hours before intent to commence work. Do not start work until authorized to do so by the Port.

1.3 LAYOUT OF WORK

A. Survey work performed under this contract shall be performed under the direct supervision of an Oregon-registered professional land surveyor.

B. Lay out the work from reference points shown on the drawings and be responsible for measurements connected therewith.

C. Furnish stakes, templates, platforms, equipment, and labor as required to lay out every part of the work from the established references.

D. Maintain and preserve stakes and monuments established by the Port until authorized to remove them. If such marks are destroyed by the Contractor prior to authorized removal, they may be replaced by the Port at its discretion. The expense of replacement will be deducted from any amounts due, or to become due, to the Contractor.

E. Submit a copy of field notes made in connection with layout measurements to the Port, if they are requested. The Port may check field layout measurements at any time.

F. Engage a professional land surveyor licensed in the State of Oregon to replace monuments that are disturbed, damaged, or destroyed during the course of the work, and ensure that a record of survey depicting replaced monuments is filed at the appropriate county survey office, all at no additional cost to the Port.

1.4 VERIFICATION OF MEASUREMENTS

A. Verify elevations and measurements and be responsible that executed dimensions fit actual conditions, regardless of the drawings, and report discrepancies to the Port before proceeding with the work. The Contractor will not receive extra compensation for verification of measurements or for labor or material expended on account of such differences.

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1.5 EXISTING UTILITIES

A. Notify the Oregon Utility Notification Center (OUNC) and owners of underground utilities within the construction area or within affected public rights-of-way or easements, via the "one-call" notification system (1-800-332-2344), in advance of the commencement of excavation activities as prescribed in Oregon Revised Statutes (ORS) 757.541 to 757.571, Excavation Regulations.

B. Notify the Port when the "one-call" request is being initiated.

C. Protect existing utilities and other public and private facilities and improvements that are to remain in place, from damage in the course of the work.

D. Perform any shutdown of utilities only when such shutdown will not interfere with Port or tenant operations. Schedule shutdowns through the Port, allowing time for adequate coordination.

E. In the event of interruption to field-located utility services as a result of the work, promptly notify the Port first, and then the proper authority. Cooperate with said authority in restoring service as promptly as possible. If required, the Contractor shall install suitable temporary service until permanent repair is completed and bear the cost of the repair and temporary service.

F. Unless noted as abandoned, expose utilities only by hand excavation.

G. Notify the Port of all utilities exposed. Do not disrupt or cut utilities until identified and until the Port has approved the cut.

H. Repair damages that result from execution of the work at no cost to the Port. Repairs shall be subject to approval of the Port.

1.6 SALVAGE

A. Any useable parts or materials removed or replaced by the Contractor remain the property of the Port, unless specified otherwise. The Port encourages recycling to the extent feasible and practicable (see Section 017419 – Construction Waste Recycling).

END OF SECTION 017000

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SECTION 017419 – CONSTRUCTION WASTE RECYCLING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes recycling goals for construction and demolition work on Port of Portland (Port) property.

B. The Contractor shall salvage, reuse, recycle, compost, mulch, or use for energy recovery as many construction, demolition, and yard waste materials as is feasible and cost-effective. The Contractor shall coordinate all salvaging and recycling operations.

C. Unless specified elsewhere in this contract, salvaged and recycled material shall be removed from Port property in accordance with local, state, and federal regulations.

1.2 PROJECT-SPECIFIC RECYCLING

A. Items to be recycled on this project may include, but are not limited to:
1. Concrete
2. Asphalt
3. Metals (ferrous and non-ferrous)
4. Land-clearing debris
5. Wood
6. Piping
7. Mechanical and electrical components

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Section 024113 – Site Demolition and Debris Removal

B. Section 312000 – Site Clearing, Earthwork, and Shoreline Stabilization

1.4 SUBMITTALS

A. Initial Pre-Construction Estimate: Before site work begins, submit a completed site waste recycling form (see example attached at the end of this section) for work to be performed on this project. The initial form submitted shall identify the types of construction or demolition materials that are expected to be recycled over the duration of the work.

B. Monthly Reports: Submit updated site waste recycling forms on a monthly basis. The updates shall include the actual amounts of construction or demolition materials recycled during the previous 30-day period.

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1. Report quantities of materials recycled or salvaged in tons, based on weight slips, bills of lading, etc. Estimated volumes shall be calculated to the nearest 0.5 ton.

C. Closeout Project Summary: Prior to contract closeout, submit a final site waste recycling form that records the total amount of construction or demolition materials recycled during the duration of the project. Attach the following information to the form:
   1. A summary statement identifying and explaining any discrepancies between the amounts originally estimated and the actual amounts recycled.
   2. Copies of receipts, weight slips, bills of lading, etc. for recycled or reused materials.

1.5 QUALITY ASSURANCE

A. Comply with applicable regulations pertaining to collection, management, hauling, and disposal of waste or recyclable materials.

B. Use facilities properly permitted by appropriate jurisdictions.

1.6 RECYCLING PROCESSORS AND FACILITIES

A. Contact Metro (503-234-3000) for a comprehensive list of recyclable materials and recycling facilities in the Portland area.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 GENERAL

A. Provide handling, containers, storage, signage, transportation, and other items as required to facilitate the recycling process during the duration of the work.

B. Designate a “waste coordinator” who shall be responsible for coordinating the Contractor’s recycling measures and verifying the accuracy of the recycling information submitted.

C. Train employees, subcontractors, and suppliers on proper recycling procedures, as appropriate for the work.

D. Conduct recycling operations to ensure minimum interference with roads, streets, walkways, and other adjacent occupied and used facilities.

E. Do not sell or distribute recycled or salvaged items to the public from Port property.

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3.2 ON-SITE MATERIALS SORTING

A. Coordinate with recycling and salvage vendors to determine if materials targeted for recycling will be source-separated or co-mingled on site. Space or other site-specific factors shall be considered.

B. Separate recyclables from non-recyclable waste materials, trash, and debris.

C. Provide one or more appropriately marked containers or bins for collecting and managing recyclable waste until it is removed from the work site.
   1. Post a list of acceptable and unacceptable materials at each container and bin.
   2. Inspect containers and bins for contamination and remove contaminated materials if found.

END OF SECTION 017419

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PORT OF PORTLAND

APPLICATION NO. _____
PAGE _____ OF _____

SITE WASTE RECYCLING

CONTRACTOR: _____
PROJECT TITLE: _____
PROJECT NO: _____
LOCATION: _____

☐ Initial Pre-Construction Estimate ☐ Monthly Report (from: _____ to _____, 20 _____) ☐ Closeout Project Summary *

MATERIAL SUMMARY

RECYCLED MATERIAL	Not generated at this site	Collected for offsite recycling (tons)	Collected for salvage/reuse (tons)	Destination (facility name and location)	Comments
Concrete					
Asphalt					
Metals (ferrous)					
Metals (non-ferrous)					
Land-clearing debris					
Wood					
Corrugated cardboard					
Plastics					
Other (specify)					
Other (specify)					

* For closeout project summary, include copies of documentation (receipts, bills of lading, etc.) with this report.

_____ _____ _____
Signature of Waste Coordinator Certifying Accuracy of this Report | Title | Date

_____ _____
Print Name | Contact Telephone Number

See reverse for instructions and additional information.

Submit with Contractor's Monthly Request for Payment to Construction Contract Manager.

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INSTRUCTIONS FOR COMPLETING SITE WASTE RECYCLING FORM

This form is to be used multiple times throughout the project as shown in the examples below.

MATERIAL SUMMARY [X] Initial Pre-Construction Estimate

RECYCLED MATERIAL	Not generated at this site	Collected for offsite recycling (tons)	Collected for salvage/reuse (tons)
Concrete		X	
Asphalt	X		
Metals (ferrous)	X		
Metals (non-ferrous)	X		
Land-clearing debris		X	
Wood			X
Corrugated cardboard	X		
Plastics		X	
Other			

Pre-Construction Estimate: Prior to beginning work at the site, submit a completed form that indicates the TYPES (not amounts) of site materials expected to be recycled or salvaged. Do this by marking the appropriate columns for each material as shown.

MATERIAL SUMMARY [X] Monthly Report (from: 4/1 to 4/30 , 20 05)

RECYCLED MATERIAL	Not generated at this site	Collected for offsite recycling (tons)	Collected for salvage/reuse (tons)
Concrete		35	
Asphalt	X		
Metals (ferrous)	X		
Metals (non-ferrous)	X		
Land-clearing debris		15	
Wood			1.5
Corrugated cardboard	X		
Plastics			
Other			

Monthly Report: Each month, submit a completed form that indicates both the TYPES and QUANTITIES (to the nearest 0.5 ton) of site materials that were actually recycled or salvaged during the monthly reporting period. Do this by marking the appropriate columns for each material as shown.

MATERIAL SUMMARY [X] Closeout Project Summary

RECYCLED MATERIAL	Not generated at this site	Collected for offsite recycling (tons)	Collected for salvage/reuse (tons)
Concrete		220	
Asphalt	X		
Metals (ferrous)	X		
Metals (non-ferrous)	X		
Land-clearing debris		65	
Wood			4.5
Corrugated cardboard	X		
Plastics		0.5	
Other			

Closeout Summary: After all site work is completed, submit a completed form that indicates both the TYPES and QUANTITIES (to the nearest 0.5 ton) of site materials that were actually recycled or salvaged throughout the entire project. Do this by marking the appropriate columns for each material as shown.

IN ADDITION, include documentation (weight receipts, bills of lading, etc.) that support the numbers you report.

- Forms shall be filled out completely and legibly. All amounts shall be reported in tons.
- Use the "Comments" column in the form to supply additional and clarifying information.
- Forms shall be signed by the Contractor's waste coordinator certifying the accuracy of the information.
- Completed forms and supporting documentation shall be submitted to the Port construction contract manager.

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SECTION 017700 – CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 AS-CONSTRUCTED DRAWINGS

A. Upon completion of the work, and as a requirement of final acceptance, submit to the Port of Portland (Port) two drawing sets showing all as-constructed changes and information. One set will be given to the U.S. Environmental Protection Agency (USEPA) from the Port for their review.

B. See Section 013300 – Submittal Procedures for requirements.

1.2 OPERATION AND MAINTENANCE MANUALS

A. See Section 013300, Submittal Procedures, for requirements.

1.3 MAINTENANCE INSTRUCTION

A. Instruct Port maintenance personnel in the operation, adjustment, and preventive maintenance procedures for any system or equipment installed or modified as part of the work.

B. Schedule instruction through the Port.

1.4 TRAINING

A. Train Port personnel in the operation of any system or equipment installed or modified as part of the work.

B. Schedule training through the Port.

1.5 CONSTRUCTION STAKE AND MARKINGS REMOVAL

A. Remove stakes and painted markings used in construction layout.

1.6 CLEANUP

A. Remove debris from the staging and work area(s).

B. Thoroughly sweep paved areas prior to final acceptance.

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1.7 CERTIFICATES OF FINAL APPROVAL

A. Submit originals or clearly readable copies of certificates of approval from the inspection authority prior to application for final payment.

1.8 CONFINED SPACES INFORMATION FORM

A. Submit the Confined Spaces Information Submittal Form for confined spaces that have been altered or newly constructed.

END OF SECTION 017700

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DIVISION 2

EXISTING CONDITIONS

SECTION 024113 – SITE DEMOLITION AND DEBRIS REMOVAL

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes demolition of items specified herein and shown on the drawings.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 017419 – Construction Waste Recycling

B. Section 312000 – Site Clearing, Earthwork, and Shoreline Stabilization

C. Section 352023 – Dredging, Transportation, and Disposal

1.3 DEFINITIONS

A. Demolish: Completely remove and legally dispose of off Port of Portland (Port) property.

B. Debris shall include, but is not limited to:
   1. Concrete, asphalt, stone, brick, tile, etc.
   2. Building wood, glass, tar paper, metal, cloth, paper, etc.
   3. Abandoned vehicles, and automotive and machinery parts, tires, boxes, crates, barrels, fencing, etc.
   4. Material dumped within the work areas during the time of the contract.

1.4 WORK ITEMS

A. The work includes, but is not limited to, demolition of the following:
   1. Wharves:
      a. Timber decks.
   2. Materials or structures called out by word description on the drawings or in the specifications shall be included as work items.

PART 2 - PRODUCTS

Not Used.

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PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall demolish, as needed, and remove all debris within the work area in the manner specified and as shown on the drawings.

B. Stones 12 inches or larger and concrete rubble shall be disposed of off Port property. Riprap or armoring material may be reused as armor at the discretion of the Port.

3.2 ENVIRONMENTAL CONSIDERATIONS

A. Nuisance Dust Control:
   1. Debris that contains dust or other material that could become airborne or create a nuisance shall either be removed from the work site daily, or shall be covered and secured with tarps or sheeting until removed from the site.
   2. A water mist, or other means approved by the Port, shall be applied on debris to control or mitigate airborne dust or airborne nuisances, unless the material will become friable (i.e., crumble easily) or will dissolve in water. Friable material and material that may dissolve in water shall be securely covered with tarps or sheeting.
   3. Debris that becomes friable when wetted or will dissolve in water shall be stored only on impervious surfaces, field-installed ground sheeting, or other barriers.

B. Debris:
   1. The Contractor shall manage debris or demolition material as hazardous waste or solid waste in accordance with these specifications.
   2. Unless specifically identified in the contract documents or approved by the Port, no debris shall be placed as fill material or otherwise disposed of on Port property.
   3. The Contractor shall use applicable special demolition techniques, material handling, and disposal requirements for demolition debris.
   4. The Contractor shall minimize the volume of accumulated demolition debris.
   5. Metal and other material salvage or recycling operations shall be performed in a defined area within the work site.
   6. Salvage by cutting torch or other mechanical cutting means of any vessel, tank, pipe, or other equipment that contains any liquid (except potable water) shall not be performed on Port property or at the work site unless prior written approval has been obtained from the Port.
   7. Temporary storage and piling of demolition debris within 50 feet of the property line is not permitted unless storage piles are covered and secured with tarps or sheeting. The Port may waive this requirement if the material does not contain dust or other materials that could become airborne or contaminate stormwater.

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3.3 WHARF AND PILING DEMOLITION AND/OR REMOVAL WITHIN THE WORK AREA

A. Remove wharf deck as required on the drawings by demolition. Debris resulting from demolition of wharf deck shall be immediately removed from Port property.

3.4 OFFLOADING AND HAULING OF DEBRIS

A. All debris shall be required to be hauled to an approved Subtitle D landfill for disposal. The Contractor shall submit the name and location of the proposed landfill for approval prior to beginning dredging.

B. The Contractor shall provide the names and locations of transloading facilities, as needed for the management of debris, and a dredge-debris offloading facility location for approval by the Port. The Contractor shall ensure the following minimum measures are implemented during debris transloading:

1. As much sediment as practicable shall be removed from the debris prior to loading
2. Maintain the swing path of the crane over a constructed spill apron during material transfer.
3. Provide clean tarping of the truck loading area, as necessary, to prevent tire contact with materials.
4. Following loading of each truck, the truck and area immediately around the truck will be visually inspected for spilled material. Spilled material shall be cleaned up immediately.
5. Cleaning of tires (if necessary) before leaving the offloading site, including dry brushing and/or tire/wheel washing is required.
6. The truck bed shall be covered before leaving the site.
7. Street sweeping using non-compressed air type sweeper is required from the loading area to the off-site street.
8. The Contractor shall provide a disposable pad for any material loadout areas in order to keep the ground surface clean before the next truck is loaded.
9. Once the truck is cleared to leave the facility following inspection and cleaning, if applicable, the load will be documented on a manifest that will be carried by the driver.
10. Copies of all project records, including manifests and weigh tickets, will be maintained for the project file.
11. The driver will provide copies of the manifest and documentation that the load was received by the landfill.

C. The Port will implement a sampling and analysis program to monitor for off-site tracking of contaminants as a result of transloading. The Contractor shall modify operations, as needed to prevent off-site tracking of contaminants if there are any visual signs of tracking within the transloading facility or if concentrations of contaminants are significantly elevated in monitoring samples.

D. The Contractor shall prepare a sampling and analysis plan (SAP) to describe the sampling and analysis program to be implemented to confirm that no off-site tracking of contaminants occurred as a result of transloading dredge debris. The SAP shall present the number of samples, sample locations, list of analytes, and statistical method to be used to compare pre-

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loading results to the post-loading results. Samples shall be collected weekly during the transloading operation.

E. The Contractor shall provide, in its environmental protection plan, details of measures to be implemented in case of spillage either during transloading or during trucking to the landfill.

3.5 MISCELLANEOUS DEMOLITION AND/OR DEBRIS REMOVAL WITHIN THE WORK AREA

A. The work area is defined as the area within 25 feet of the outer edges of the work item.

B. Work items include slabs, footings, pavement, cellars, debris, and materials or structures other than buildings called out by the work description on the drawings.

C. No trees shall be removed unless necessary for the completion of the specified work. If a tree must be removed, its stump must also be removed. No extra payment will be made for tree removal.

D. Blasting will not be permitted.

E. Debris removal on slopes shall not occur until erosion protection measures are in place.

3.6 REMOVAL AND PLUGGING OF ABANDONED PIPES, CULVERTS, AND MISCELLANEOUS STRUCTURES

A. Abandoned pipes or portions of other exposed items shall be removed a minimum of 2 feet back of the face of slope or 2 feet below subgrade.

B. The ends of partially removed pipes, culverts, and miscellaneous structures shall be capped or plugged with concrete to produce a watertight seal.

C. The Contractor shall contact the Port for direction if unidentified utilities are uncovered during the work.

D. The Contractor shall dispose of removed pipes, culverts, and miscellaneous structures off Port property, at no added cost to the Port.

3.7 SITE RESTORATION

A. See Section 312000 – Site Clearing, Earthwork, and Shoreline Stabilization.

3.8 DISPOSAL OF DEMOLISHED MATERIALS

A. The Contractor shall remove demolition waste materials from the work site and dispose of them off Port property in accordance with local, state, and federal laws and regulations.

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1. Demolished materials will not be allowed to accumulate on-site.
2. Debris shall be removed and transported in a manner that will prevent spillage on adjacent surfaces and areas.

B. Demolished materials shall not be burned.

C. See Section 017419 – Construction Waste Recycling for recycling requirements.

3.9 CLEANING

A. Adjacent structures and improvements shall be cleaned of dust, dirt, and debris caused by building demolition operations. The Contractor shall return adjacent areas to condition existing before building demolition operations began.

END OF SECTION 024113

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DIVISION 31

EARTHWORK

SECTION 312000 – SITE CLEARING, EARTHWORK, AND SHORELINE STABILIZATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes site clearing and grubbing, excavation, grading, and shoreline stabilization.

1.2 REFERENCED STANDARDS

A. AASHTO: American Association of State Highway and Transportation Officials

B. ASTM: American Society for Testing and Materials

C. ODOT: Oregon Department of Transportation – 2002 Standard Specifications

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Section 015713 – Temporary Erosion, Sediment, and Pollution Control

B. Section 024113 – Site Demolition and Debris Removal

1.4 DEFINITIONS

A. Clearing and Grubbing: Trees, stumps, brush, roots larger than 1 inch in diameter, other vegetation, and debris removed.

B. Stripping: Grass, sod, and other types of vegetation removed.

C. Common Excavation: Material, regardless of condition, excavated from the work area that is not classified elsewhere.

D. Unsuitable Excavation: Material excavated from the site determined to be unusable as subgrade or fill.

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PART 2 - PRODUCTS

2.1 GENERAL

A. The Contractor shall provide all required materials for the project. Materials shall be of the quality, size, shape, and gradation as specified in this part. Imported cap materials to be used for construction of the sediment cap will be imported, clean, granular material free of roots, organic material, contaminants, and all other deleterious and objectionable material.

B. Material shall be from igneous or metamorphic rock.

C. Imported material shall have chemical concentrations less than the chemical concentration goals presented in Table 1 at the end of Section 352025. Armor material does not need to be tested for chemical criteria due to its size.

2.2 BORROW SOURCE AND MATERIALS CHARACTERIZATION

A. The following activities shall be performed by the Contractor, as specified below, to ensure that imported materials are natural, native, virgin materials and free of contaminants, including debris or recycled materials, and which meet construction specifications. The Contractor shall provide assurance that imported materials are free of hazardous or otherwise objectionable materials. The Port of Portland (Port) maintains the right to reject any materials that have been determined to be substandard for any reason. In the event of rejections, it shall be the responsibility of the Contractor to remove all stockpiles of rejected material from the site.

1. A characterization of any and all imported material shall be performed by the Contractor prior to any on-site placement. The characterization will include analysis of a borrow source sample, site inspection, and site characterization. The Contractor shall submit a Borrow Source Characterization report summarizing all the information contained within this section.
2. Source Identification: Prior to borrow source sampling, the Contractor shall provide documentation of the origin of borrow source materials.
3. The Contractor shall provide the Port with a 5-gallon sample of granular material from each borrow source. Note, samples of rock are not required. Each sample should be composed from no less than five sub-samples taken throughout any one source. The Contractor shall ensure that the samples are representative of all materials to be imported. Samples shall be provided to the Port at least 14 days before the materials represented by the samples are delivered to the site.
4. The borrow source shall be inspected by the Contractor. During such inspection, the Contractor shall ensure that the materials to be delivered to the site are likely to meet the appropriate specifications. The Contractor shall provide the Port with 2-weeks' notice of such inspections. At the Port's discretion, the Port or a representative may accompany the Contractor to witness such inspections. This witnessing shall in no way release the Contractor form complying with the specifications and shall in no way be construed as approval of any particular source of material.
5. Testing, Reporting, and Certification: The Contractor shall test samples of materials to be imported for the following:

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a. Grain size distribution (ASTM method D422-63)
b. In situ moisture content (ASTM method D2216)
c. Priority pollutant metals (U.S. Environmental Protection Agency [USEPA] publication SW 846, the 6000/7000 method series)
d. Volatile organic compounds (USEPA publication SW 846, method 8270, as modified by the Puget Sound Estuary Program [PSEP])
e. Polychlorinated biphenyls (PCBs) (EPA publication SW846, method 8082 as modified by PSEP)
f. Pesticides (USEPA publication SW846, method 8081, as modified by PSEP
g. Total organic carbon (Standard Methods [SM] method 5310B)

6. The Contractor shall provide the results of such tests at least 2 weeks before delivery of the materials to the site. The results shall be provided in report form, with the reports clearly identifying the following:
   a. Source of samples
   b. Sampling dates
   c. Chain of custody
   d. Sampling locations
   e. Contractor's certification that the samples tested and the results provided are representative of materials that shall be delivered to the site
7. Inspection of Materials at the Site: Truckloads of imported material shall be visually inspected by the Contractor upon delivery. Materials shall be inspected for the presence of foreign, recycled, or reprocessed material. The Port may, at any and all times, perform an independent inspection. Material may be rejected if identified as substandard or if test results show it to be substandard. Materials may be segregated for testing based on appearance or odor. Segregated materials may be tested according to designated procedures at the Port's discretion.
8. The Contractor shall collect certified tickets from the borrow source for each load of material brought to the site. The tickets shall be supplied to the Port.
9. One sample for every 20 percent of the total volume of each material used shall be taken and submitted for grain size analysis, chemistry, and total organic carbon.
10. The Port maintains the right to reject any materials that have been determined to be substandard for any reason. In the event of rejections, it shall be the responsibility of the Contractor to remove all stockpiles of rejected material from the site.
11. The Contractor shall verify the quantity of capping material to be placed for each location. Verification of Contractor's volume estimates to those shown in the drawings shall be made before signing the negotiated contract.

2.3 SELECT FILL

A. Material shall be clean, free-draining, granular material obtained from natural deposits. Individual particles shall be free from all objectionable coatings. The material shall contain no organic matter, nor soft friable particles in quantities considered objectionable by the Port.

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B. Material shall be graded between the limits specified below:

Sieve Size	Percent Passing (by weight)
4-inch	90 to 100
¾-inch	50 to 75
U.S. No. 4	35 to 55
U.S. No. 10	25 to 45
U.S. No. 40	10 to 25
U.S. No. 200	0 to 4

2.4 TOPSOIL

A. Stripping or materials obtained from the topsoil borrow area shown on the drawings.

2.5 GEOTEXTILE

A. Amoco 4553, or pre-bid approved equal.

2.6 ARMOR TYPE 3

A. Material shall be clean, free-draining, granular material obtained from natural deposits. Individual particles shall be free from all objectionable coatings. The material shall contain no organic matter, nor soft friable particles in quantities considered objectionable by the Port.

B. Material shall meet the requirements of ODOT Type 100(E) riprap.

PART 3 - EXECUTION

3.1 GENERAL

A. The Port will designate the disposition and determine the suitability of products.

B. The right is reserved to make minor adjustments or revisions in lines or grades, if found necessary as the work progresses.

C. No excavation or stripping shall be started until the Contractor has staked out the proposed work.

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D. The Contractor shall suspend earthwork when satisfactory results cannot be obtained because of rain, freezing weather, or other unsatisfactory conditions.

E. The Contractor shall drag, blade, or slope the grade to provide proper surface drainage. Temporary drains and drainage ditches shall be installed to intercept or divert surface water that may affect the prosecution or condition of the work.

F. The Contractor shall excavate and place embankment to such depth that sufficient material will be left above the designated grade to allow for compaction to the proper grade. Material excavated below the designated lines shall be replaced with approved materials, in an approved manner and condition, at no added cost.

G. Hauling equipment shall be routed around or away from areas of soft or yielding subgrade.

H. The Contractor shall furnish and maintain earth-moving equipment in satisfactory condition and operate such equipment as necessary to control uniform density, section, and smoothness of grade.

I. Soil or other foreign materials that fall on pavements shall be promptly removed.

J. In-place density and moisture content will be determined by ASTM D 2922. The Contractor shall cooperate with this testing by leveling small test areas as designated.

K. The rail line and structures adjacent to the Wheeler Bay and head of Slip 3 work shall be protected at all times. The Contractor shall follow all rail guidelines while working around an active rail line.

L. The outfall shown on the drawings shall be protected at all times from damage.

3.2 CLEARING AND GRUBBING

A. Clearing and grubbing materials shall be removed to a depth of 1 foot below original ground.

B. Stumps and roots larger than 1 inch in diameter shall be completely removed.

C. Clearing and grubbing materials shall be disposed of off Port property.

D. The Contractor shall limit the total cleared and grubbed area excavations, and other disturbance, to only those areas necessary for the orderly flow of work.

3.3 STRIPPING

A. Existing topsoil recently placed for the Pier 2 Rail Yard Improvements project shall be stripped, as necessary, and stockpiled for reuse.

B. Approximately 6 inches of sod and topsoil shall be stripped from designated areas, if present.

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C. Stripping not retained for reuse shall be disposed of off Port property.

3.4 EXCAVATION

A. The Contractor shall excavate to the depth, lines, and grades shown on the drawings, or as otherwise specified.

B. Common excavation shall be temporarily stockpiled at an approved location within the work area until site grading requirements have been met. The Contractor shall shape as necessary to ensure the surface of the stockpile is free-draining.

3.5 UNSUITABLE EXCAVATION AND BACKFILLING

A. Unsuitable excavation and backfilling shall be performed only at the direction of the Port.

B. The Contractor shall excavate to the depth and extent required.

C. No wheeled or tracked equipment will be allowed to operate on the surface of the excavation. Only backhoe, grade-all, drag line, or equal shall be used.

D. Underlying soil disturbed by the Contractor's methods of excavation or backfilling shall be removed and replaced as directed, at no added cost.

E. Unsuitable material shall be hauled off Port property, unless otherwise directed.

F. The Contractor shall backfill with select fill.

3.6 SHORELINE STABILIZATION

A. Shoreline grading shall be constructed to the lines and grade shown on the drawings.

B. Shoreline grading shall be constructed from common excavation materials where shown on the drawings. Select fill shall be used only after available common excavation has been used.

C. The Contractor shall construct in lifts of not more than 12 inches in loose depth. The full width of the cross section shall be brought up uniformly.

D. Material shall be placed in layers and shall be near optimum moisture content before rolling to obtain the prescribed compaction. Wetting or drying of the material and manipulation to secure uniform moisture content throughout the layer may be required. Such an operation shall be incidental to the appropriate bid item. Should the material be too wet to permit proper compaction by rolling, work on portions of the fill thus affected shall be delayed until the material has dried to acceptable moisture content.

E. Frozen material shall not be placed in the embankment, and embankment material shall not be placed on frozen material.

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F. The Contractor shall be responsible for the stability of shoreline stabilization and for replacing any portion that has become displaced due to the Contractor's improper operations.

G. Layers shall be started in the deepest portion of the fill and, as placement progresses, constructed approximately parallel to the finished grade line.

H. Equipment, both loaded and empty, shall be routed over the full width of the embankment to ensure uniform distribution and density of material placement.

I. Each lift shall be compacted to a minimum of 92 percent of AASHTO T-180.

J. No upland construction equipment shall enter the water during construction.

K. Erosion control measures shall be selected and implemented according to the Oregon Department of Environmental Quality's (ODEQ's) "Sediment and Erosion Control Manual," and shall remain in place during all of the shoreline activities to prevent material from entering the waterway.

L. If there is excavated material, following grading activities, that requires stockpiling and landfill disposal, proper sediment and erosion control methods shall be implemented to contain the material and prevent any material from entering the waterway.

3.7 SITE GRADING

A. The Contractor shall, using common excavation materials, shape, trim, finish, and compact surface areas to conform to the lines, grades, and cross sections shown on the drawings or as designated by the Port.

B. Four inches of topsoil shall be placed on grading areas to be seeded.

C. Surfaces shall be graded to drain.

D. Wheel ruts shall be eliminated by regrading.

E. The top 12 inches shall be compacted to 92 percent of maximum density, as determined by AASHTO T-180.

F. The finished surface of site grading areas shall not be more than 0.08-foot from the specified grade.

3.8 SUBGRADE PREPARATION

A. The top of subgrade shall be shaped to the lines and grades shown on the drawings.

B. The top of subgrade shall be maintained in a free-draining condition.

C. Stockpiling materials on top of subgrade will not be permitted unless approved.

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D. Vehicles will not be allowed to travel in a single track. If ruts are formed, the Contractor shall reshape and reroll.

E. The top 12 inches of subgrade shall be compacted to a minimum of 95 percent of AASHTO T-180.

F. The finished top of subgrade shall not vary by more than 0.05-foot from the specified grade and cross section.

3.9 ARMOR TYPE 3

A. Armor shall be placed in accordance with ODOT 00390.00.

END OF SECTION 312000

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DIVISION 32

EXTERIOR IMPROVEMENTS

SECTION 328400 – PLANTING IRRIGATION

PART 1 - GENERAL

1.1 SUMMARY

A. Description of work: The Contractor shall design, furnish, and install one completely automatic drip irrigation system to provide adequate irrigation of all willow and cottonwood planting shown on the drawings and described in specifications, complete and ready for operation. The work shall consist of preparation of an accepted design, and providing and installing all material necessary for a complete system, including pipe, valves, fittings, heads, automatic control equipment, and all appurtenances related thereto. All labor shall be included for trenching, plumbing, backfill, electrical adjustments, mechanical connections, and other labor necessary for installation of a satisfactorily operating system. Whether mentioned or not, the intent is that the Contractor furnish a complete and operable system covering the willow and cottonwood planting areas as indicated on the drawings.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 329300 – Trees, Shrubs, and Ground Covers

1.3 QUALITY ASSURANCE

A. Materials: Whenever any material is specified by name or number, such specifications are for the purpose of facilitating a description of materials and establishing quality, and shall be deemed and construed to be followed by the words, "or approved equal." No substitutions will be permitted that have not been submitted for prior approval to the Port of Portland (Port). All materials shall be new, without flaws or defects, and shall be the best of their class and kind. The Contractor shall furnish sufficient descriptive literature and/or samples for any material submitted as "equal" substitutes. All materials shall be guaranteed for a period of 1 year against material defects and workmanship.

B. Qualifications: The sprinkler system shall be designed by a licensed landscape architect with at least 3 years of experience in commercial landscape irrigation design, or a designer certified by the American Society of Irrigation Consultants (ASIC) or the Irrigation Association (IA). It shall be installed by a journeyman lawn sprinkler mechanic or experienced journeyman plumber. All electrical work shall be done by a licensed electrical Contractor.

C. Quality of Work: All materials and equipment shall be installed in a neat and professional manner. The Port reserves the right to direct removal and replacement of any items that, in their opinion, do not present an orderly and neat or professional appearance. Such removal and replacement shall be done, when directed in writing, at the Contractor's expense without additional cost to the Port.

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D. Codes and regulations: All local, municipal, and state laws, rules, and regulations governing or relating to any of this work are hereby incorporated into and made part of these specifications, and their provisions shall be carried out by the Contractor. Anything contained in these specifications shall not be construed to conflict with the above-mentioned rules, regulations, or requirements. Where conflict may occur, rules, regulations, or requirements of the governing code shall be adhered to. However, when these specifications and/or drawings call for or describe materials, quality, or construction of a better quality, higher standard, or larger size, these specifications and/or drawings shall take precedence over the requirements of said rules, regulations, and codes.

E. System coverage: The system is to provide full coverage for all areas shown on the drawings. It is anticipated that the Contractor will exercise professional judgment in location and placement of all irrigation components. Should the Contractor elect to make changes to the approved design without prior written approval of the Port, the responsibility for full coverage in the area to be affected rests solely with the Contractor.

1.4 SUBSTITUTIONS

A. Substitute equipment will be considered only when the performance by gallonage, pressure, flow rate, etc. is equal to the product originally specified.

1.5 DESIGN

A. General: The Contractor is responsible for designing the irrigation system in accordance with the design parameters, zones, and per other provisions on the drawings, and to the highest standards of durability, distribution uniformity, efficiency of design, and ease of maintenance.

B. All areas indicated on the drawings shall be irrigated. The Contractor shall exercise professional judgment in location and placement of all irrigation components. Should the Contractor elect to make changes to the approved design without prior written approval of the Port, the responsibility for full coverage in the area to be affected rests solely with the Contractor.

C. Design parameters: The following shall be incorporated into the design:
1. System shall be impact heads mounted on risers similar to existing system.
2. Supply piping shall be placed on surface similar to existing.
3. No placement of pipe or heads closer than 6 inches from paved areas, walls, or buildings.
4. Polyvinyl chloride (PVC) pipe flow rates not to exceed 5 feet per second (fps).
5. No 1/2-inch PVC pipe permitted.
6. Zone size limited to 40 gallons per minute (gpm) or less.
7. Irrigation mainline downstream of double check valve assembly to be 2-inch Class 200 PVC.
8. Gallonage calculations shall be based on a dynamic pressure of 45 pounds per square inch (psi).
9. Zones to be laid out according to similar types of planting requirements and overall exposure.

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10. Head spacing at a maximum 35 feet on center. Provide quick coupler valves every 100 feet along mainline.

1.6 DAMAGE TO PROPERTY

A. The exact location of all existing utilities and structures, whether or not indicated on the drawings, shall be determined by the Contractor. Any of the Port's property, including existing buildings, equipment, piping, pipe covering, sewers, sidewalks, landscaping, etc., damaged by the Contractor during the course of the work shall be replaced or repaired by the Contractor in a manner satisfactory to the Port at the Contractor's expense before final payment is made.

1.7 SUBMITTALS

A. The Contractor shall submit a complete materials list 30 days prior to performing the work. The Contractor shall submit manufacturer catalog data and full descriptive literature.

B. Equipment or materials installed or furnished without prior approval of the Port will be rejected, and such materials will be required to be removed and replaced with approved materials at the complete expense of the Contractor.

C. The Contractor shall submit the design in the form of shop drawings for review and approval 30 days after acceptance of the contract. Shop drawings shall be at 1 inch = 30 feet scale, showing:
1. Valve location, type, flow, and size
2. Head location, type, and nozzle
3. Pipe location and size
4. Wire location
5. All necessary irrigation details
6. Sleeving plan showing size, location, and quantity

D. The Contractor shall submit cut sheets for approval of all proposed materials.

1.8 WARRANTY PERIOD

A. See the General Conditions.

B. During the warranty period, the Contractor shall check, clean, and adjust the sprinkler heads and otherwise ensure adequate operation of the system as directed by the Port, and in any event, on no less than two separate occasions a minimum of 4 months apart during the 1-year period.

C. System protection: As part of the warranty under this contract, the Contractor shall be responsible for the deactivating and draining of the system prior to the onset of the freezing season, and for reactivating the system at the onset of the spring season; each event must be accomplished during the 1-year warranty. In the event the system is completed in a season when the system will not be in use, the Contractor will winterize the system upon completion of testing (and approval of the Port) and reactivate the system in the spring. The Contractor shall, upon completion of the winterizing phase, submit a letter to the Port certifying that the system

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was winterized and drained, and indicating the date such action was accomplished. The Contractor will be liable for any damages resulting from failure to comply.

PART 2 - PRODUCTS

2.1 GENERAL

A. Each type of material or model of equipment shall be of one manufacturer throughout.

2.2 HEADS

A. Heads: Shall be Rainbird model 2045-PJ Maxi-Bird impact sprinkler with #8 nozzle mounted on 1/2-inch x 36-inch-length Schedule 40 PVC riser similar to existing, or pre-bid approved equal.

B. Staking: Shall be 48-inch length rebar and two stainless steel hose clamps per head, or pre-bid approved equal.

C. Fittings: All fittings shall be Schedule 40 PVC.

2.3 PIPE

A. Plastic pipe: Shall be Rigid, unplasticized Schedule 40 PVC or Class 200 PVC extruded from virgin parent material of the size specified on the drawings. Pipe shall be homogeneous throughout and free from visible cracks, holes, foreign materials, blisters, wrinkles, and dents. No 1/2-inch pipe is allowed. Damaged pipe, or pipe rejected because of defects, shall be removed from the site at the time of rejection.

B. Plastic pipe fittings: Shall be Schedule 40 or Schedule 80 molded fittings manufactured of same material as the pipe and suitable for solvent weld, slip joint ring right seal, or screwed connection. Slip fittings socket taper shall be so sized that a dry, unsoftened pipe end, conforming to these special provisions can be inserted no more than halfway into the socket. Plastic saddle and flange fittings will not be permitted.

C. Identification: All pipes shall be continuously and permanently marked with the following information:
   1. Manufacturer’s name or trademark
   2. Size
   3. Schedule and type of pipe
   4. Working pressure at 73° F
   5. National Sanitation Foundation (NSF) approval

D. Delivery: Plastic pipe shall be delivered to the site in unbroken bundles or rolls, packaged in such manner as to provide adequate protection for pipe ends, either threaded or plain.

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E. Sleeving: Shall be Schedule 40 PVC.

F. PVC solvent cement: Shall be in accordance with American Society for Testing and Materials (ASTM) D-2564-7a.

2.4 VALVES

A. Control valves: Shall be plastic bodied, solenoid actuated, with flow control, and manual bleed and pressure regulation capabilities; Rainbird PEB series or pre-bid approved equal, 1-1/2-inch size.

B. Gate valves: Shall be Aqua IPS Bronze, or pre-bid approved equal.

C. Backflow preventer: Existing.

D. Manual drain valve: Shall be Buckner 80-M, or pre-bid approved equal.

E. Quick coupler valve: Shall be brass, two-piece construction; Rainbird 33 DLRC, or pre-bid approved equal.

2.5 CONTROL WIRE

A. General: Shall be No. 14 single-strand copper, designed for 24 to 50 volts, UL approved, Type U.F. (Underground Feeder). Copper conductor must meet or exceed ASTM B-3 specifications. White: common. Red: valve impulse. Third color: run through each valve box to farthest valves as a spare.

B. Wire connectors: Shall be 3M DBY wire splice kit, or pre-bid approved equal.

C. Above-ground conduit: Shall be per electrical code.

2.6 BOXES

A. General: Shall be plastic type standard or jumbo-size vaults with bolt-down 'T' type covers, bolts installed. Acceptable manufacturers include Carson, NDS, or pre-bid approved equal.

B. All required extensions shall be of the same manufacturer as the vault.

2.7 CONTROLLER

A. General: Existing, Rainbird ESP Modular.

B. Provide additional controller modules as necessary.

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2.8 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper irrigation system installation, shall be new, first quality of their respective kinds, and subject to the approval of the Port.

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall install all materials and equipment in strict accordance with the manufacturer's written instructions and recommendations, local and state codes, laws, ordinances, and regulations.

B. Turn-off and turn-on: The Contractor shall turn off and winterize the entire system to prevent freezing damage at the end of the watering season during the first year. The system shall be turned on by the Contractor in the spring and check-out shall be made to ensure proper operation for the coming season in the first year.

3.2 LAYOUT

A. Layout: Prior to beginning work, the Contractor shall schedule an appointment with the Port for approval of the layout. The Contractor shall flag head and valve locations, subject to review and minor modifications by the Port. Head spacing shall be 35 feet on center, maximum.

B. General: All pipe and valves shall be placed directly on the finish grade. All rocks and other debris or obstructions within 6 inches of pipe shall be cleared away.

C. Point of connection: The Contractor shall connect to existing backflow protected mainline as directed.

3.3 INSTALLATION

A. General: The Contractor shall exercise care in handling, loading and unloading, and storing to avoid damage. The pipe and fittings shall be stored under cover and shall be transported in a vehicle with a bed long enough to allow the length of pipe to lay flat.

B. Pipe: Shall be installed in a manner so as to provide for expansion and contraction as recommended by the manufacturer. The Contractor shall cut plastic pipe to ensure a square cut, and remove burrs at cut ends prior to installation. All plastic joints shall be solvent-welded or slip sealed. Only solvent recommended by the pipe manufacturer shall be used. The Contractor shall install all plastic pipe and fittings as shown and instructed by the pipe manufacturer and as shown on the drawings. The Contractor shall assume full responsibility for correct installation. All mainline and lateral piping shall be Class 200 PVC. No PVC pipe shall be threaded.

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C. Joints: All plastic-to-metal joints shall be made with plastic Schedule 80 male adapters. The male adapter shall be hand-tightened plus one turn with a strap wrench. Care shall be taken at solvent joints not to use an excess amount of solvent. The Contractor shall allow PVC joints to set at least 24 hours before pressure is applied to the system. Primer shall be used at joints. No fittings are to be closer than 6 inches apart.

D. Backfilling shall be done when pipe is not in an expanded condition due to heat or pressure. Cooling of the pipe can be accomplished by operating the system for a short time before backfilling, or by backfilling in the early part of the morning before the heat of the day.

E. Great care must be taken to ensure that the inside of the pipe is absolutely clean. Any pipe ends not being worked must be protected and not left open.

3.4 CONTROL WIRE

A. Control wires are to be taped to the bottom of the supply line at 10-foot intervals, with at least three wraps of electrical tape. Place in pipe sleeves or conduit under all paving.

B. Splices will be permitted only at the valves and never between valves or valve controller. There must be a separate lead or "hot" wire to each automatic valve. One common wire will be acceptable. All splices shall be contained in valve boxes. Extra control wire to run to the remote valves of the system for future repairs, but not connected.

C. Three unconnected spare control wires are to be run from the controller through each intermediate control valve box, both directions.

3.5 AUTOMATIC CONTROL VALVES

A. Control valve assembly shall include gate valve and control valve. The Contractor shall stake all proposed control valve locations for approval.

3.6 TESTING

A. Flushing: After all new irrigation piping and risers are in place and connected and all necessary division work has been completed, and prior to installation of irrigation heads, all control valves shall be opened sequentially and a full head of water shall be used to flush out the system completely.

B. The Contractor shall pretest prior to request for system testing. No tests shall be requested until confident the work will pass. The Contractor shall notify the Port 48 hours prior to a test.

C. Pressure test: After flushing is complete, the Contractor shall pressure test the mainline with all control valve assemblies installed (control valve isolation valve open, flow control in operating position), to 100 psi. The system will pass the test when it maintains less than 2 percent drop in a 15-minute time period.

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3.7 FINAL INSPECTION

A. Coverage: Before the sprinkler system will be accepted, the Contractor, in the presence of the Port, shall perform a water coverage test to determine if the water coverage and operation of the system is adequate for planting. If the system is determined to be inadequate due to the Contractor's poor design, work quality, or materials, it shall be repaired or replaced at the Contractor's expense and the test shall be repeated until accepted. Dry spots or areas without sufficient overlap will not be acceptable.

3.8 CLEAN-UP

A. The Contractor shall keep the premises reasonably free from accumulation of debris. On completion of each division of work, the Contractor shall remove all debris, equipment, and surplus materials and leave the site in a neat and orderly fashion

3.9 RECORD DRAWINGS

A. The Contractor shall record all changes that may be made during installation of the system. Immediately upon installation of any piping, valves, wiring, sprinkler heads, etc., in locations other than shown on the shop drawings, or of sizes other than indicated, the Contractor shall clearly indicate such changes on a clean set of drawings. Main lines and remote-control electric valves shall be positively located by dimension from fixed reference points. The Contractor shall note main lines sizes clearly and accurately for maintenance reference, and submit in accordance with Section 013300.

B. After final acceptance of the completed installation, the Contractor shall be responsible for having complete drawings prepared showing all such changes, and these shall be submitted to the Port for recording purposes.

3.10 SYSTEM FAMILIARIZATION

A. Upon acceptance of the system by the Port, the Contractor shall provide the necessary keys and/or other tools necessary to operate, drain, or activate the system, and shall spend sufficient time with the Port to ensure that the system operation, maintenance, and winterizing can continue after the departure of the Contractor.

END OF SECTION 328400

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SECTION 329113 – SOIL PREPARATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes preparation of soil, including application of soil amendments and topsoil.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 312000 – Site Clearing, Earthwork, and Shoreline Stabilization

B. Section 329119 – Landscape Grading

C. Section 329300 – Trees, Shrubs, and Ground Covers

1.3 SUBMITTALS

A. Certification of quantities of topsoil and composted amendment delivered to the site shall be submitted to the Port of Portland (Port).

B. A sample of yard debris compost and topsoil shall be submitted to the Port for approval.

C. The Contractor shall notify the Port of the source of supply and provide a 2-pound sample for review and approval, before installation.

1.4 PRODUCT DELIVERY

A. Topsoil and composted amendment shall be covered with plastic while stockpiled on site, and shall be stockpiled on a paved surface to prevent mixing with on-site soils prior to placement.

1.5 PROTECTION

A. Utility lines, storm drainage lines, site improvements, and underground irrigation systems shall be protected during execution of the work (see Section 015000 – Temporary Facilities and Controls).

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PART 2 - PRODUCTS

2.1 COMPOSTED SOIL AMENDMENT

A. Yard debris compost: The compost shall consist of 100 percent decomposed organic yard waste material; shall consist of materials that have been sorted, ground-up, aerated, and aged; and shall be fully composted, stable, and mature (non-aerobic). The composting process shall take place for at least 6 months, and the organic amendment shall have a uniform dark, soil-like appearance and consist of 100 percent recycled content. In addition, the composted amendment shall have the following physical characteristics:

1. Minimal weed seed present, based on germination testing of representative samples
2. Less than 100 plant parasitic nematodes per 100 cubic centimeters (cc) of organic matter
3. Be relatively free of soil-borne plant pathogens
4. A pH range of 5.5 to 7.5
5. A sodium extract concentration less than 6.0
6. A saturation extract concentration of Boron less than 1.0 part per million (ppm)
7. A minimum of 0.08 percent dilute acid extractable iron, based on dry weight
8. A maximum carbon-to-nitrogen ratio of 40:1
9. Be certified by the Process to Reduce Pathogens (PFRP) guidelines for composting, as established by the U.S. Environmental Protection Agency (USEPA)

B. Recommended Sources:

1. Grimms
2. McFarlanes
3. Or equal

2.2 TOPSOIL

A. The planting soil mix (topsoil) is intended for use in landscape planting (tree, shrub, and groundcover bed) areas, shall consist of 67 percent sandy/loam mix component and 33 percent compost amendment by volume, and shall meet or exceed the following requirements:

1. The sandy/loam mix component of the planting soil mix shall be soil, based on U.S. Department of Agriculture (USDA) standards, and shall have the following characteristics:

Class	Particle Size Range
Coarse sand	0.5 – 2.0 millimeters (mm)
All sands	0.05 – 2.0 mm
Silt	0.002 – 0.05 mm
Clay	<0.002 mm

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2. The sandy/loam component shall also meet or exceed the following specifications:

Screen Size	Percent Retained	Percent Passing
6.35 mm	5	95
#10	15	85
#30	50	50
#60	60	40
#100	80	20
#200	90	10

3. The compost amendment component shall be as specified herein.

PART 3 - EXECUTION

3.1 SUBGRADE PREPARATION

A. Subgrade shall consist of clean, imported Columbia River sand, or equivalent, with a minimum depth of 1 foot. Stones, mortar, concrete, asphalt, rubbish, debris, and other materials larger than 1-1/2 inches shall be removed from planting areas (see Section 329119 – Landscape Grading).

B. The Contractor shall rip, disc, or scarify subgrade soils to a minimum depth of 12 inches. Subgrade elevations shall be as follows:
   1. Compost amendments: 4 inches below finished grade
   2. Topsoil areas: 24 inches below finished grade

C. See Section 329119 – Landscape Grading if subgrade soil is not sandy or silty, thus requiring over-excavation and placement of fill material.

3.2 COMPOST AMENDMENT INSTALLATION

A. The Contractor shall add 4 inches of composted soil amendment in two, 2-inch lifts, as follows:
   1. First lift: Add 2 inches (6 cubic yards per 1,000 square feet) of composted amendment and rototill, in two directions, to a depth of 8 inches. Create a uniform mix of subgrade soil and composted amendment.
   2. Second lift: Add an additional 2 inches of composted amendment over tilled-in first lift. Repeat process described in first lift.

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3.3 TOPSOIL PLACEMENT

A. The Contractor shall place 6 inches of topsoil and thoroughly rototill soil into the top 8 inches of the prepared subgrade in areas indicated on the drawings. The remaining 18 inches of topsoil shall be installed in three, 6-inch lifts. Topsoil shall be placed in conformance with Section 329119 – Landscape Grading.

END OF SECTION 329113

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SECTION 329119 – LANDSCAPE GRADING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes clearing, grading, placing fill material, and finish grading.

1.2 REFERENCED STANDARDS

A. AASHTO: American Association of State Highway Transportation Officials

B. ASTM: American Society for Testing and Materials

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Section 015713 – Temporary Erosion, Sediment, and Pollution Control

B. Section 312000 – Site Clearing, Earthwork, and Shoreline Stabilization

C. Section 329113 – Soil Preparation

D. Section 329300 – Trees, Shrubs, and Ground Covers

PART 2 - PRODUCTS

2.1 DISPOSAL EXCAVATION

A. Eexcess excavation and material not suitable for use as subgrade or embankment. This includes material excavated from grading areas and subgrade material that is unsuitable, as determined by the Port of Portland (Port). The Contractor shall dispose of disposal excavation material where shown on the drawings.

2.2 FILL MATERIAL

A. Refer to Section 312000 for imported subgrade fill soils. Refer to Section 329113 for topsoil and composted amendment materials.

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2.3 JUTE MATTING

A. Jute matting shall be of a uniform, open, plain weave of unbleached, single just yarn. The yarn shall be of a loosely twisted construction and shall not vary in thickness by more than half of its normal diameter. Jute matting shall be furnished in rolled strips approximately 50 yards in length. Matting width shall be 48 inches with an average weight of 0.92 pounds per square yard. A tolerance of plus or minus 1 inch in width and 5 percent in weight will be allowed.

2.4 COIR FABRIC

A. Geocoir/Deko We900, or pre-bid approved equal, available from Belton Industries, http://www.beltonindustries.com/, Roll size 118 inches, length 55 yards.

B. Stakes for coir fabric shall be 2-inch x 2-inch Douglas Fir (untreated) stakes, 2 feet in length, with one tapered end. No split or badly splintered stakes will be accepted.

2.5 WOOD STAKES

A. Stakes shall be 2-inch x 2-inch Douglas Fir (untreated) with one tapered end. Stakes for securing jute matting shall be 2 feet in length. No split or badly splintered stakes will be accepted.

PART 3 - EXECUTION

3.1 EQUIPMENT

A. The Contractor shall furnish and maintain earth-moving equipment in satisfactory condition and operate such equipment as necessary to control uniform density, section, and smoothness of grade.

3.2 REFERENCE POINTS

A. All reference points shall be located before starting work. The Contractor shall take such steps as are necessary to prevent dislocation or destruction of reference points. If reference points are destroyed or disturbed, they shall be replaced as directed.

3.3 CLEARING AND GRUBBING

A. See Section 329113 – Soil Preparation for requirements prior to performing earthwork.

B. The Contractor shall clear the site within the limits shown, removing brush and waste material that would interfere with the work. Waste material shall be disposed of off site.

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C. Existing vegetation shall be cleared and removed prior to grading and working the soil.

D. The Contractor shall limit the total cleared and grubbed area excavations, and other disturbances, to only those areas necessary for the orderly flow of work.

3.4 EXCAVATION AND GRADING

A. Subgrade shall be excavated where necessary to allow for topsoil and soil amendments, as shown on the drawings and as specified in Section 329113.

B. Subsoil material suitable for fill material may be stockpiled within the work area. Unsuitable material shall be treated as disposal excavation.

C. The Contractor shall not place fill material until subgrade has been approved by the Port.

D. The Contractor shall place and shape fill material to the elevations and grades shown on the drawings, leaving room for any required soil preparation amendments. Material within the work area suitable for fill material shall be used prior to hauling in additional fill material from the borrow site.

E. Fill material shall be spread in layers not to exceed 4 inches of uncompacted depth. Except as noted otherwise, fill material shall be compacted to 85 percent of maximum density, as measured by AASHTO T-180.

F. Abrupt changes in slopes shall be smoothly rounded to avoid damming of surface drainage.

G. The Contractor shall suspend earthwork when satisfactory results cannot be obtained because of rain, freezing weather, or other unsatisfactory conditions in the field.

H. The Contractor shall drag, blade, or slope the embankment to provide proper surface drainage to prevent ponding of water.

I. The Contractor shall take care not to damage root zones of existing plant material to remain.

3.5 PLACING JUTE MATTING FOR SEEDED AREAS

A. Immediately following the establishment of the finished grade, jute matting shall be unrolled parallel to the flow of water. Where more than one strip of jute matting is required to cover the given area, it shall overlap the adjacent mat by a minimum of 4 inches. The upslope end of each jute matting shall be staked and buried in a 6-inch-deep trench with the soil firmly tamped against the mat. Three stakes per width of matting (one stake at each overlap) shall be driven below the finish ground line prior to backfilling of the trench. The Port may require that any other edge exposed to more than normal flow of water or strong prevailing winds be staked and buried in a similar manner.

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B. The edges of jute matting shall be buried around the edges of catch basins and other structures. Jute matting and erosion control blanket must be spread evenly and smoothly, and be in contact with the soil at all points.

C. Jute matting shall be held in place by approved wooden stakes driven vertically into the soil. The matting and blanket shall be fastened at intervals not more than 3 feet apart in three rows for each strip of the matting and blanket, with one row along each edge and one row alternately spaced in the middle. All ends of the matting and blanket and check slots shall be fastened at 24-inch intervals across their width. The length of fastening devices shall be sufficient to securely anchor the matting and blanket against the soil, and the fastening devices shall be driven flush with the finished grade.

3.6 COIR FABRIC INSTALLATION

A. Coir fabric shall be placed immediately after topsoil is placed to final grade to prevent erosion. The Contractor shall install coir erosion control fabric to the limits shown on the drawings and per the manufacturer's instructions. Where more than one strip of coir fabric is required to cover the given area, it shall overlap the adjacent mat by a minimum of 4 inches. The upslope end of each coir mat shall be staked and buried in a 6-inch-deep trench with the soil firmly tamped against the mat.

B. Three stakes per width of matting (one stake at each overlap) shall be driven below the finish ground line prior to backfilling of the trench. The Port may require that any other edge exposed to more than normal flow of water or strong prevailing winds be staked and buried in a similar manner.

C. Coir erosion control fabric shall be held in place by approved wooden stakes driven vertically into the soil. The fabric shall be fastened at intervals not more than 3 feet apart in three rows for each strip of fabric, with one row along each edge and one row alternately spaced in the middle. All ends of the fabric shall be fastened at 24-inch intervals across its width. The length of fastening devices shall be sufficient to securely anchor the fabric against the soil, and the fastening devices shall be driven flush with the finished grade.

3.7 TOLERANCES

A. The finished surface in landscaped areas shall not deviate from the specified grade by more than 0.10 foot, as measured with a 10-foot straightedge.

B. Deviation in excess of these amounts shall be corrected by loosening, adding, or removing materials; reshaping; and recompacting by sprinkling and rolling. A 10-foot straightedge for testing shall be furnished by the Contractor.

END OF SECTION 329119

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SECTION 329219 – SEEDING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes the hydroseeding of erosion control slope areas.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 329113 – Soil Preparation

B. Section 328400 – Planting Irrigation

1.3 SUBMITTALS

A. Seed certification: Lawn seed shall be blue tag certified grass seed. Prior to delivery of seed, the Contractor shall submit one copy of the grass seed analysis tag. The tag shall state the seed name(s), mixture, blend or variety, lot number, and origin of each variety with its associated purity; germination and test date; percentages of crop, inert, and weed; "use before" date; Agricultural Marketing Service (AMS) number; and net weight. The grass seed analysis tag shall comply with standards established by the Official Seed Analysts of North America.

B. For non-blue tag certified seed, the Contractor shall submit the seed vendor's certified statement of each seed required.

1.4 PROTECTION

A. The Contractor shall provide temporary twine barricades at the perimeter of foot-traffic areas receiving seed.

B. Seeding shall be performed when wind velocity is less than 5 miles per hour.

1.5 QUALITY ASSURANCE

A. Seed shall be furnished in containers that show the following information: seed name, lot number, net weight, percentage of purity, germination, weed seed, and inert material. Seed that has become wet, moldy, or otherwise damaged will not be accepted. Seed shall conform to the requirements of the Oregon State Seed Law and, when applicable, the Federal Seed Act and shall be "certified" grade or better.

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PART 2 - PRODUCTS

2.1 GRASS SEED MIX

A. General:
1. Oregon “certified” quality, or better
2. Minimum germination not less than 90 percent
3. Minimum purity at least 98 percent

B. Seed mix shall be the following:
1. Seed by weight: 40 percent Elka Perennial Rye
40 percent Ensylva Creeping Red Fescue
10 percent White Clover
10 percent Highland Colonial Bentgrass

2.2 COMPOSTED SOIL AMENDMENT

A. Refer to Section 329113 – Soil Preparation.

2.3 STARTER FERTILIZER

A. Lawn installation fertilizer 15-22-15 shall be as manufactured by Lilly Miller (or pre-bid approved equal).
1. Guaranteed Fertilizer Analysis:

Total Nitrogen (N)	15 percent
Ammoniacal Nitrogen	4.6 percent
Urea Nitrogen	3.2 percent
Coated Slow Release Urea Nitrogen	3.3 percent
Slowly Available Water Soluble Nitrogen*	2.3 percent
Water Insoluble Nitrogen	1.6 percent
Available Phosphoric Acid (P205)	22 percent
Soluble Potash (K20)	15 percent
Sulfur (S)	4 percent
Boron (B)	0.06 percent
Copper (Cu)	0.06 percent
Iron (Fe)	1 percent
Manganese (Mn)	0.15 percent
Zinc (Zn)	0.14 percent

Note: Derived from Urea, Sulfur-Coated Urea, Methylene Ureas, Ammonium Phosphate, Sulfate of Potash, Muriate of Potash, Iron Sulfate, Calcium and Sodium Borate, Copper Oxide and Sulfate, Iron Oxide Sulfate and Frit, Manganese Oxide and Sulfate, and Zinc Oxide and Sulfate.

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* Slowly Available Water Soluble Nitrogen from Methylene Ureas

2.4 WOOD CELLULOSE FIBER CARRIER

A. Wood cellulose fiber carrier shall consist of pure wood fiber products with tackifier, and shall be one of the following:
   1. Pacific Wood Fiber Spray-Mulch X-100
   2. Weyerhaeuser Silva-Fiber
   3. Or equal

2.5 SOIL-BINDING AGENT (TACKIFIER)

A. Soil-binding agent shall consist of non-toxic, biodegradable materials that are environmentally safe, such as ESI – TAK, or approved equivalent. Tackifier shall be applied, at a minimum, in quantities sufficient to equal the retention properties of guar when applied at a rate of 60 gallons per ton of mulch.

2.6 HYDROSEEDER

A. A commercial model hydroseeder with an agitator to mix seed, mulch, and fertilizer into a slurry solution, and capable of spraying the slurry at the desired application rates, shall be used.

B. The Contractor shall give the Port of Portland (Port) 48 hours notice prior to beginning seeding operations. Equipment shall utilize water as a carrying agent, utilizing a continuous, built-in agitation system.

C. Equipment with a gear pump is not acceptable.

PART 3 - EXECUTION

3.1 PREPARATION

A. See Section 329113 – Soil Preparation, for application of compost amendment prior to seeding and fertilizing. See Section 328400 – Planting Irrigation for installation of irrigation system prior to seeding.

B. The Contractor shall grade as necessary to create a firm, professional quality finish grade, free of irregular depressions and humps.

C. Tracked equipment shall be operated perpendicular to the desired contours in areas to be seeded.

D. The finish grade shall be smoothly blended into adjoining existing grades.

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E. The Contractor shall request inspection of grades. The condition of planting surfaces shall meet approval of the Port prior to commencing seeding.

F. Soil shall be lightly irrigated prior to seeding.

3.2 HYDROSEEDING

A. Seasonal restrictions: Seed shall be applied between spring and late summer (April 1-Sept 15). The Contractor shall obtain Port approval for seeding at other times.

B. Hydroseeding mix shall be applied at the rate of 2,950 pounds per acre.

C. Seed shall be applied at the rate of 300 pounds per acre.

D. Fertilizer shall be applied at the rate of 650 pounds per acre.

E. Wood fiber carrier shall be applied at the rate of 2,000 pounds per acre.

F. The Contractor shall pump a continuous, non-fluctuating supply of homogenous slurry to provide a uniform distribution of material over designated areas.

G. Mulch, seed, and fertilizer shall be removed from surfaces not intended for seeding.

H. At the completion of work, the Contractor shall remove all debris, equipment, and surplus materials and leave the work area in a neat and orderly condition.

3.3 TEMPORARY FENCE

A. Upon completion of seeding, the Contractor shall construct a temporary fence at the limits of hydroseeded areas to protect from foot traffic. The Contractor shall use posts that are 4-feet–long, and untreated binder twine, or other approved materials. Posts shall be placed 10 feet apart, maximum. Three separate strands of twine shall be strung between posts, and marked regularly with pieces of bright plastic surveyor's tape.

B. The Contractor shall remove the temporary fence when the seeded area is established.

3.4 ACCEPTANCE REQUIREMENTS

A. For acceptance, seeded areas shall meet the following requirements:
   1. Ninety percent seed germination within 14 days
   2. Ninety-five percent seed mix purity
   3. Minimum of one sprouting seed per 1/4-inch uniformly throughout entire seeded area
   4. Uniform green color throughout entire seeded area

B. The Contractor shall reseed areas failing to meet the above conditions at 5-day intervals until all areas are acceptable.

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3.5 ADJUSTMENTS AND MAINTENANCE

A. The seed bed shall be kept moist at all times to ensure seed germination until the date of substantial completion.

B. The Contractor shall repair “washouts” and reseed within 7 days. Bare spots shall be reseeded, fertilized, and raked to an even grade.

C. When grass reaches 3 inches in height, it shall be fertilized with 25-5-15 at the rate of 1 pound of nitrogen per 1,000 square feet.

3.6 SUBSTANTIAL COMPLETION

A. Inspection to determine substantial completion of seeded areas will be made by the Port upon the Contractor’s notification of completion. The Contractor may request a specific inspection date, provided that the request is made at least 5 working days before the requested inspection date.
   1. Seeded areas will be accepted, provided all requirements, including maintenance, have been complied with and grass is well-established and exhibits a vigorous growing condition.
   2. Areas failing to show a uniform stand of grass shall be reseeded at the Contractor’s expense.

END OF SECTION 329219

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SECTION 329300 – TREES, SHRUBS, AND GROUND COVERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes planting willow live stakes and cottonwood poles, and includes fertilizing and mulching.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 312000 – Site Clearing, Earthwork, and Shoreline Stabilization

B. Section 328400 – Planting Irrigation

C. Section 329113 – Soil Preparation

D. Section 329119 – Landscape Grading

1.3 QUALITY ASSURANCE

A. The Contractor shall provide one person who shall:
   1. Direct work performed under this section
   2. Be familiar with the materials and best methods for installation
   3. Be present at all times during execution of work in this section

B. Government inspection: Plants and planting material shall meet or exceed the specifications of federal, state, and county laws requiring inspection for plant disease and control.

C. Industry standards:
   1. Sizes and conditions: Quality definitions, grading tolerances, and caliper-to-height ratios shall be no less than the minimums specified in "American Standards for Nursery Stock," published by the American Association of Nurserymen, Inc., ANSI Z60.1-1996.
   2. Botanical names: American Joint Committee on Horticultural Nomenclature, "Standard Plant Names" or "Hortus Third."

D. The Port of Portland (Port) may inspect plants and planting materials at a growing or holding site in addition to the work area. Approval of material at a growing or holding site is a qualified endorsement of general quality only, and does not certify compliance with the specifications in all cases. Such approval does not preclude the right of rejection at the work area.

E. Nursery: All plants shall be nursery-grown or collected materials that have been held in a nursery for at least 1 year. Nursery climatic conditions must be similar to those in the locality of the project. All plants shall be weed-free at the time of planting. Stock furnished shall be at

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least the minimum size indicated. Larger stock is acceptable at no additional cost, and providing that the larger plants will not be cut back to the size indicated. The Contractor shall provide plants indicated by two measurements, so that only a maximum of 25 percent are of the minimum size indicated, and 75 percent are of the maximum size indicated.

F. Unless otherwise approved by the Port, all plants of each type shall be obtained from the same nursery.

1.4 SUBMITTALS

A. Plant nursery sources and photographs:
   1. The Contractor shall certify, in writing, within 5 days of Notice to Proceed, confirmed orders for plants and provide the quantities, locations, telephone numbers, and addresses of the growers who have agreed to supply all plant species shown on the drawings. Representative color, dated photographs of each plant species shall be submitted.

B. The Contractor shall submit the following material samples and certificates:
   1. A sample of bark mulch for review 10 days prior to delivery to the work area.
   2. Fertilizer product information and material certification.
   3. Certificates required by law shall accompany shipments. All certificates shall be delivered to the Port.

1.5 PREPARATION FOR DELIVERY

A. Bare root and balled and burlapped plants shall conform to American National Standards Institute (ANSI) Z60.1-1996.

1.6 DELIVERY

A. Fertilizer shall be delivered to the work area in original, unopened containers bearing manufacturer's guaranteed chemical analysis, name, trade name, and trademark.

B. The Contractor shall notify the Port of the delivery schedule 24 hours in advance to allow inspection upon arrival at the work area.

C. Unacceptable plant material shall be removed from the work area immediately.

D. The Contractor shall not deliver more plant materials than can be planted in 1 week.

E. The butt-end of live cuttings shall be kept in water continuously from the time of harvest until planting.

F. Plants shall be protected during delivery to prevent damage to the root ball or desiccation of leaves.

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1.7 STORAGE

A. The butt-end of live cuttings shall be kept in water continuously from the time of harvest until planting.

B. Plants shall be stored in the shade and protected from harmful weather until planted.

C. Stored material shall be watered, maintained, and protected from drying or other injury or damage.

D. Plants shall be stored in an upright position and allowed sufficient ventilation.

1.8 HANDLING

A. Containerized or balled plants shall not be picked up by stems or trunks.

B. Plants shall not be dropped.

1.9 SEQUENCING AND SCHEDULING

A. Live cuttings shall be installed during the dormant season (October 15 to March 1).

1.10 SITE CONDITIONS

A. The Contractor shall plant after installation of topsoil and coir fabric has been completed and approved by the Port.

B. Planting conditions: Planting is not permitted under the following conditions, unless otherwise approved:
   1. Cold weather: Less than 35°F
   2. Hot weather: Greater than 80°F
   3. Windy weather: Wind velocity greater than 20 mph

C. The irrigation system shall be operational prior to any planting.

1.11 PROTECTION

A. See Section 015000 – Temporary Facilities and Controls for requirements for location and protection of underground utilities.

B. The Contractor shall barricade or cover excavations as necessary to protect pedestrians, workers, equipment, and adjacent property.

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1.12 WARRANTY PERIOD

A. The Contractor will not be held responsible for vandalism, theft, atypical weather conditions, or hidden peculiarities of the work area during the warranty period.

B. Plant materials must be in a healthy condition at the end of the warranty period.

C. The Contractor shall remove dead and rejected material within 5 days of being so directed, and replace as soon as possible.

D. The Contractor shall repair, at no added cost to the Port, any damage to other plants or other property caused by the Contractor during replacement of plant materials during the 1-year warranty period.

PART 2 - PRODUCTS

2.1 GENERAL PLANT REQUIREMENTS

A. Quality and size:
   1. The Contractor shall provide healthy nursery stock, well-branched and -rooted, full foliaged when in leaf; healthy; sound; vigorous; and free from insects, diseases, weeds, weed roots, injuries, and defects such as knots, sun-scald, windburn, abrasions, or disfigurement; and equal to or exceeding measurements specified in the plant list.
   2. The Contractor shall provide trees that are well shaped and properly pruned with normal branching configurations. Trees of the same species and size shall be headed to the same height, unless noted otherwise.
   3. Sizes and methods of handling shall be according to the American Standard for Nursery Stock recommended by the American Association of Nurserymen (AAN).

B. Root protection:
   1. Container-grown plants shall be in containers from 6 months to 2 years prior to delivery, with roots filling the container, but not root bound.
   2. Greenhouse plants shall be acclimated outdoors for 30 days prior to delivery.
   3. Bare-root stock shall have well-branched, fibrous root systems.

C. Trees shall be well-branched, with straight single leaders, tops, and trunks; no cross branches, dead or broken leaders, or major branches; no fresh cuts over 1-inch in diameter; and not “topped” or sheared. Grafted trees shall be base grafted or base budded, unless indicated otherwise.

D. Willow live stakes: Live stakes shall be live wood, 2 to 5 years old, with smooth bark that is not deeply furrowed. The Contractor shall make clean cuts and trim branches of stakes as closely as possible. Stakes with split ends or peeled bark are unacceptable. The stakes shall be consistently cut so that the top end is square, and the bottom end (planted end) is angled. Live stakes shall be a minimum of 2 feet and a maximum of 3 feet in length, and the diameter shall be as shown on the drawings.

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E. Cottonwood poles: Poles shall be live wood, 2 to 5 years old, with smooth bark that is not deeply furrowed. The Contractor shall make clean cuts at the butt end, and shall not trim terminal ends' branches (growing tips). Poles with split ends or peeled bark are unacceptable. Poles shall be a minimum of 5 feet and a maximum of 6 feet in length, and the diameter shall be as shown on the drawings.

2.2 MULCH AND FERTILIZER

A. Bark mulch shall be standard commercial produce, medium-coarse ground bark mulch. Bark shall be ground fir or hemlock; of uniform color; free from weeds, seed, sawdust, and splinters; and shall not contain resin, tannin, wood fiber or other compounds detrimental to plant life. The source shall be from a freshwater mill. Mulch shall be less than 1-inch particle size and greater than No. 35 sieve.

B. Fertilizer shall conform to reference FS O-F-24D, Commercial Fertilizers, and Oregon state laws. Fertilizer for all trees and plantings shall be "BioPaks-16-6-8 plus minors and biostimulants," available from Reforestation Technologies International (RTI), 1-800-784-4769.

BioPak®, or pre-bid approved equal, shall consist of:

Rhizosphere Bacteria	45 billion colony forming units (cfu)/lb
7.5 billion cfu/lb (8.3 million cfu/cc) *Bacillus licheniformis*	
7.5 billion cfu/lb (8.3 million cfu/cc) *Bacillus megaterium*	
7.5 billion cfu/lb (8.3 million cfu/cc) *Bacillus polymyxa*	
7.5 billion cfu/lb (8.3 million cfu/cc) *Bacillus subtilis*	
7.5 billion cfu/lb (8.3 million cfu/cc) *Bacillus thuringiensis*	
7.5 billion cfu/lb (8.3 million cfu/cc) *Paenibacillus azotofixans*	
Humic acids	31 percent
Sea kelp extract	35 percent
Sugar (dextrose)	13.5 percent
Yeast extract	5.5 percent

2.3 COIR FABRIC

A. Refer to Section 329119 – Landscape Grading.

PART 3 - EXECUTION

3.1 PREPARATION

A. Landscape grading and soil preparation shall be inspected and approved by the Port prior to planting.

B. Coir fabric shall be inspected and approved by the Port prior to planting.

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C. Plant material shall be inspected and approved by the Port at the nursery or site prior to installation. Unsatisfactory material shall be removed from the site immediately.

D. The Contractor shall locate plants by staking with stakes and flags as indicated on the drawings, or as approved in the field. If obstructions are encountered that are not shown on the drawings, the Contractor shall not proceed until the Port has selected alternate plant locations.

3.2 LIVESTAKE PLANTING

A. Willow live stakes:

1. Preparation of cuttings: All cuttings shall be continuously soaked in water immediately after cutting until delivery to the site. Cuttings shall be planted the same day that they are delivered to the site. Cuttings shall be kept continually soaked in water on site until immediately before planting.
2. Installation of live stakes: The Contractor shall use an iron stake or bar of similar diameter to the live stakes to create a pilot hole of sufficient depth. Stakes shall be planted with the angled bottom end in the ground and at least 2 to 5 emerging buds exposed at the top end. Stakes shall be installed with a rubber mallet and protected from damage such as splitting, bark peeling, and bud breakage during installation. Each stake shall be installed with 80 percent (4/5) buried and 20 percent (1/5) exposed. Good contact with the soil shall be ensured by tamping or backfilling. Stakes shall be installed perpendicular to the slope, as shown on the drawings.

3.3 COTTONWOOD POLE PLANTING

A. Preparation of poles: All cuttings shall be continuously soaked in water immediately after cutting until delivery to the site. Cuttings shall be planted the same day that they are delivered to the site. Cuttings shall be kept continually soaked in water on site until immediately before planting.

B. Installation of poles: The Contractor shall use a power auger or backhoe punch bar or “stinger” to create a hole of sufficient depth and diameter. Poles shall be planted with the angled bottom end in the ground and at least 5 to 10, minimum, terminal emerging buds exposed at the top end. Poles shall be installed by hand to protect from damage. Each pole shall be installed with 2/3 buried and 1/3 exposed. Good contact with the soil shall be ensured by filling the hole with water and adding soil to create a mud slurry that eliminates air pockets. Poles shall be installed perpendicular to the slope, as shown on the drawings.

3.4 MULCH

A. Following approval of planting by the Port, the Contractor shall apply bark mulch over coir fabric to the depths shown on the drawings.

B. The Contractor shall apply mulch around trees and shrubs within 2 days after planting.

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3.5 ADJUSTMENT AND CLEANING

A. The Contractor shall remove and replace plants or materials not meeting specified standards.

B. The Contractor shall reinstall plants not located as indicated on the drawings.

C. The Contractor shall keep the work area clean during progress of the work until completion.

3.6 MAINTENANCE

A. The Contractor shall irrigate when necessary to avoid drying out of plant materials and to promote healthy growth, until the date of substantial completion.

END OF SECTION 329300

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DIVISION 35

WATERWAY & MARINE

SECTION 352023 – DREDGING, TRANSPORTATION, AND DISPOSAL

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes the dredging to be completed as part of the project. Dredging shall be completed within Slip 3 and north of Berth 414.

1.2 RELATED WORK SPECIFIED ESLEWHERE

A. Section 312000 – Site Clearing, Earthwork, and Shoreline Stabilization

B. Section 352025 – Capping

1.3 GENERAL

A. There are two unique dredge plans as part of the Phase I removal action:
   1. Berth 411 "Plus" – as shown on the drawings, there are three areas immediately adjacent to Berth 411, adjacent to Pier 5, and north of Berth 414. Dredge elevations in this area are controlled by the chemistry data. Each sub-area will be dredged down to an elevation corresponding to chemical concentrations predicted to be less than 10 times the probable effects concentration (PEC).
   2. Berth 410 – as shown on the drawings, there is an area adjacent to Berth 410 that is being removed for navigational purposes down to a required elevation of -39.3 feet National Geodetic Vertical Datum (NGVD) and no deeper than an elevation of -41.3 feet NGVD.

B. Debris Material and Handling – The Contractor shall anticipate encountering significant amounts and types of debris material during dredging. Any debris material encountered from the dredge prism shall be properly disposed of at an approved upland landfill. Handling of debris shall be as described in Part 3.

C. Construction Quality Control Plan (CQCP) Compliance – The Contractor shall develop a CQCP as specified in Section 014500. The CQCP shall be complied with throughout all activities specified within this section.

D. Construction Health and Safety Plan (CHASP) Compliance – The Contractor shall develop a CHASP as part of the Removal Action work plan, as described in Section 013529. The CHASP shall be complied with throughout all activities specified within this section.

1.4 SOUNDINGS

A. The frequency of soundings is discussed within this article and in Part 3.

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B. Soundings of the work area are shown on the drawings.

C. The Contractor will be provided with updated pre-dredge soundings taken within 1 month of the scheduled start of dredging work, for each of the dredge locations.

D. Post-dredge soundings will be taken by the Port after contractor notifies the Port that dredging is completed.

E. Bathymetric surveys performed by the Port will be completed with a Reson SeaBat 8101 multibeam bathymetric sonar using a frequency of 240 kilohertz (KHz), or similar equipment. Multibeam data will be conducted by running lines on a 50-foot spacing parallel with the berthing lines of the project. The sonar swath will be clipped to 45 degrees on either side of vertical. Post-processing of multibeam data will be performed utilizing Caris HIPS multibeam analysis and presentation software, or similar equipment. A 3-foot shoal biased data set will be exported from accepted data and used for mapping of contours and calculations of volumes for the Contractor's payment.

F. The vertical datum used in this project shall be NGVD. A local NGVD control point can be found on Port drawing RG 2006-3024.

G. The Contractor shall prepare a survey control plan prior to beginning work. The plan shall describe the Contractor's methods, procedures, and equipment to be employed to control grades and locations during all construction activities. The Contractor is required to employ electronic positioning system (EPS), sonar sounding devices, automated electronic tide gauge, and tide gauges to accurately determine their dredging location at all times. The plan shall present alternative methods for conducting surveys if structures prevent the use of sounding equipment.

H. The Port will provide a tide gauge located at the head of Slip 3.
   1. The Contractor shall supply temporary gauges and buoys at the dredge site.
   2. The Contractor shall establish and maintain a calibrated tide gauge or board, consistent with the tide gauge provided by the Port, in a location where it may be clearly seen during all in-water work specified throughout this section.

I. The Contractor shall conduct surveys using a survey-grade depth sounder with a frequency of 200 KHz, or other frequency as approved by the Port. The surveys will be performed using an EPS and a single-beam, dual-frequency or multi-beam, single-frequency echosounder system.

J. The top return of the signal trace shall be the point of interpretation of the soundings.

K. Surveys shall be converted to bottom elevation with respect to NGVD, and plotted to the nearest 0.1 foot.

L. The Contractor shall provide daily sounding cross sections of the previous day's work, at no greater than 25-foot trackline intervals, using a survey-grade depth sounder. The volume of material dredged and the area affected shall be determined daily. Accuracy for measured depth shall be +/- 0.25 foot; accuracy of horizontal positions shall be +/- 3 feet at the 95 percent confidence interval.

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M. The Contractor shall have a set of the previous day's surveys available to the Port for review at the Contractor's on-site project office the following day. Drawings shall be prepared at a scale of 1 inch = 50 feet on plan sheets and shall depict the survey control lines. Cross section plots shall be prepared every 100 feet perpendicular to the capping area. The cross sections shall be depicted on plan sheets.

N. Survey Control – Accurate and precise methods of horizontal and vertical control shall be established by the Contractor before work begins. These control methods shall be used accordingly as specified in the CQCP and the survey control plan. The Contractor shall lay out its work from horizontal and vertical control points indicated on the CQCP and the drawings, and shall be responsible for all measurement taken from these points. The Contractor shall employ a suitable method to locate and control horizontal and vertical in-water work. The Contractor is required to use Real Time Kinematic (RTK) for survey control work.

O. Quality Control Supervisor – The quality control supervisor shall be present on site at all times while any survey activity specified in this section is taking place in accordance with the CQCP. Daily CQC reports shall be submitted to the Port each day on the previous day's activities specified in this section.

1.5 PERMITS

A. See Section 011100 – Summary of Work.

1.6 EXISTING CONDITIONS

A. Dredged material shall consist of all material excavated between the existing river bottom and the dredge neat lines, as shown on the drawings.

B. The Port has conducted explorations and sampling to determine the character of sediments to be removed. The explorations are representative of the subsurface conditions at their respective locations. The exploration and sampling logs are available upon request. These conditions are generally described below for each dredging location; however, the Contractor shall determine the soil classifications to its own satisfaction prior to commencing work.

C. Hard material is not expected to be encountered. Hard material in its natural state is defined as material requiring blasting, and includes boulders or fragments too large to be removed in one piece by a dredge that is customary for this work. If hard material or material necessary for off-site disposal is encountered, it shall be reported to the Port within 24 hours.

D. Dredge Material – Expected soil conditions for the following dredge site locations are anticipated. The Contractor shall review the existing data to their own satisfaction.

1. Slip 3 Dredging – The material to be dredged consists of very soft to soft, slightly sandy to sandy organic silt and clay to loose, very silty sand. Areas of higher density sediment may be encountered during dredging, especially when dredging the deeper cuts. Debris is anticipated during the dredging. Exhibit B includes a summary of debris encountered in previous Slip 3 dredging.

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2. Berth 414 Dredging – The material to be dredged consists of very soft to soft, clayey, fine sandy silt with occasional wood chunks.

E. Debris Material – The Contractor shall anticipate encountering significant amounts and types of debris material during dredging. Debris is defined as any materials with at least one dimension larger than 2 feet excavated as part of the dredging operations. Debris shall be disposed of at an appropriate off-site facility. This facility shall be designated on the Contractor's Removal Action work plan.

F. The Contractor shall submit a dredging and disposal work plan as part of the Phase I Removal Action work plan before dredging operations begin. The work plan shall conform to sequencing, equipment, method, and special provisions as specified throughout this section. The work plan shall include at least the following items:

1. Work Sequence and Equipment:
   a. Order in which the work is to be performed, indicating the work sequence by stationing, regions, zones, and seasons.
   b. Number, types, and capacity of equipment to be used.
   c. Hours of operation.
   d. Method of operation and the time required to complete each activity.
2. Means and Methods For Dredging, Transport, and Handling:
   a. Methods, procedures, and equipment to be used for dredging, specifically including the horizontal and vertical approach to performing the work in a manner that will minimize the dispersal of contaminated sediment/dredging residuals.
   b. Methods, procedures, and equipment to be used for transport, offloading, and hauling of Slip 3 contaminated sediments to the landfill.
   c. Methods, procedures, and equipment for preventing sediment loss and uncontrolled release of effluent from the barge or scow.
   d. Methods, procedures, and equipment for loading, transport, and disposal of debris and other pollutants to an appropriate waste facility.
   e. Methods, procedures, and equipment for cleanup and removal of project staging areas.
   f. Methods and procedures to prevent interference with tenant activity.
   g. Methods and procedures to prevent damage to Port facilities.
3. Means and Methods Placing Sand Layer
   a. Methods, procedures, and equipment to be used for sand layer, specifically including the horizontal and vertical approach to performing the work in a manner that will minimize the mixing of sand material and sediment.
   b. Methods and equipment to track and monitor placement of sand layer over the required area.

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PART 2 - PRODUCTS

2.1 FISH DETERRENT SYSTEM

A. The intent of the system is to lead fish migrating downstream along the shoreline back out into the river and away from the Slip 3 dredging area. The system shall be located as shown on the drawings and consist of two parts:

1. Mesh Leader – The leader shall be a 10-foot-deep panel intended to guide fish in the top 10 feet of the water column and shall be made of knotless nylon net mesh material of an appropriate size so as not to impinge or gill juvenile salmonids down to a size of 40 millimeters (mm). The mesh netting shall be colored such that juvenile fish can see it in the water column. Floats and lead lines shall be used to keep the net upright. The net shall be properly secured throughout the Slip 3 dredging activity.
2. Bubble Curtain – The second component of the fish deterrent system shall be a bubble curtain. The curtain shall be constructed such that a continuous stream of bubbles rise up from the pipeline on the bottom of the water column. The piping for the bubble curtain shall be constructed such that the pipeline does not embed into the mudline—an embedded pipeline may increase the turbidity if the bubbles agitate the sediments. The bubble curtain will be employed during any dredging taking place 150 feet or more to the inside of the opening of the slip. Bubble curtain is not needed for dredging outside of or near the opening of Slip 3.

2.2 SELECT FILL

A. Material shall be clean, free-draining, granular material obtained from natural deposits. Individual particles shall be free from all objectionable coatings. The material shall contain no organic matter, nor soft friable particles in quantities considered objectionable by the Port.

B. Imported material shall have chemical concentrations less than the chemical concentration goals presented in Table 1 at the end of Section 352025.

C. Material shall be graded between the limits specified below:

Sieve Size	Percent Passing (by weight)
4-inch	90 to 100
¾-inch	50 to 75
U.S. No. 4	35 to 55
U.S. No. 10	25 to 45
U.S. No. 40	10 to 25
U.S. No. 200	0 to 4

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PART 3 - EXECUTION

3.1 EQUIPMENT AND STRUCTURES

A. Mechanical Dredging – The Contractor shall use a “clamshell” bucket or similar (as approved by the Port) for the dredging in Slip 3 and at the Berth 414 area.

1. Clamshell buckets shall have straight closing edges for full closure without leakage and shall be fully shrouded to prevent dredged material from washing out or falling out of the bucket and to reduce re-suspension of material in the water column. The Contractor shall obtain approval from the Port prior to using a bucket with digging teeth. Buckets with teeth are not allowed unless the Port approves their use for dredging denser materials or for removing debris.
2. The Contractor shall calibrate and mark cables at 6-inch intervals to visually check the cut elevation of the bucket. The Contractor shall also employ RTK electronic equipment to determine bucket elevations at all times.
3. The Contractor shall monitor hull displacement and position of each scow loaded by the dredge. Monitoring shall be from initial loading through the completion of offloading at the transloading facility. The Contractor shall develop their own system of monitoring displacement and capacity for submittal. The approved monitoring shall be able to measure and record average hull displacement and loaded capacity of each scow as specified.

B. The fish deterrent system shall be installed and functional at least 8 hours before dredging can commence. The Contractor shall inspect and maintain the fish deterrent system on a daily basis.

3.2 DREDGING

A. Dredging shall include excavation of material to the dredge limits, depth, lines, and grades, as shown on the drawings.

B. Dredging tolerances are +0.0 foot and -1.0 feet from the required final elevation.

C. The area shall be dredged to the minimum elevations shown on the drawings. To ensure excavation to the required dredge elevation, the Contractor is allowed a maximum 2-foot dredging allowable overdepth in the Berth 410 dredge prism and 1-foot dredging allowable overdepth in the Berth 411 “plus” dredge prism. In both instances, only 1 foot of the allowable overdepth will be paid.

D. Dredging shall begin at the head of Slip 3 and work towards the mouth, as the head of the slip contains material with the highest chemical concentrations, and concentrations generally decrease towards the mouth.

E. Contractor vessel draft and movement shall be controlled within dredge areas during construction to limit the potential for scour.

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F. Side slope steepness shall be as noted on the drawings. Side slopes shall be dug from top to bottom to the grades shown on the drawings. The dredging tolerance, per above, also applies anywhere on the slopes. The Contractor shall dredge to the daylight lines shown on the drawings. No undermining of slopes and sloughing will be allowed.

G. The Contractor shall monitor the dredge work on a daily basis throughout the course of work for elevation, slopes, location, and tolerances, and shall be responsible for damages due to excessive overdepth dredging or dredging outside the required dredge prism limits. The Contractor shall use a dredge-tracking system and software. Data files shall record all dredging activities and be submitted to the Port at the end of each day.

H. The Contractor shall complete a debris survey prior to beginning dredging. Debris shall be disposed of at an approved upland disposal site by the Contractor.

I. The Contractor shall implement the following best management practices (BMPs) during mechanical dredging operations:
   1. The Contractor shall begin dredging at the highest elevation of material to be removed and work toward the lowest elevation. "Glory holing" will not be allowed.
   2. The Contractor shall pause the dredge bucket as it breaks the surface of the water and allow the bucket to drain free water prior to swinging and placing dredge material on the haul barge.
   3. No bottom stockpiling or multiple bites of the clamshell bucket is allowed.
   4. The Contractor shall seal off barge scuppers on haul barges and repair any holes in fences to prevent sediment from draining off a haul barge.
   5. Barges shall not be overfilled.
   6. No grounding of construction barges is allowed.
   7. Overdredging at the base of a slope shall not occur.
   8. Dragging of the dredged surface to level the mudline is not allowed.
   9. Overfilling of the bucket is not allowed.

J. The Contractor shall base their estimates on the survey information provided with the design and contract documents. A pre-dredge survey of the area to be dredged will be taken by the Port within 1 month of beginning work. If there are any significant changes in profile or quantity between the surveys, adjustments in the quantities and associated pay amounts will be made.

K. The Contractor shall notify the Port when dredge work is complete. A post-dredge survey of the dredged areas will be taken by the Port and used to verify completion of work to specified elevations and grades, before the Contractor demobilizes. If the Port's post-dredge hydrosurvey finds the Contractor's work not meeting contract plans and specifications, the Port will notify and provide the Contractor with hydrosurvey results. Any area found above the specified dredge elevations and grades shall be dredged to meet the required elevations and grades. All additional post-dredge hydrosurveys necessary to confirm the Contractor's work shall be provided by the Port and withheld from payment to the Contractor.
   1. The Contractor shall anticipate standby time during the post-dredge survey operation, and during the evaluation of the hydrosurvey results.

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L. If, in the dredging operation, excess quantities of material over the contract quantities are encountered, the Contractor shall notify the Port immediately.

M. The Contractor shall protect existing piling and structures in and near dredge areas from damage. The Contractor shall submit a settlement monitoring plan (SMP) prior to construction. The plan will identify the personnel, procedures, methods, and documentation required to monitor the movement of waterside structures and/or upland areas. The Contractor shall install survey monitoring points and perform monitoring at specified locations of critical structures as defined in the SMP. Prior to construction, a baseline survey will be completed. During construction, the Contractor shall monitor structure and/or upland movements—notify the Port if movements are greater than 1 inch and stop work in that area until a thorough assessment of the movement, its impacts and risks can be made.

N. Misplaced Material – If, during construction, the Contractor knowingly, purposefully, and/or accidentally loses, dumps, throws overboard, sinks, or misplaces any material, dredge, barge, scow, machinery, appliance, or any item that would be considered debris or a pollutant, the Contractor shall promptly recover and remove the item. The Contractor shall give immediate verbal notice to the Port, and submit a written explanation with the description and location of the misplaced material and the method of the resolved issue or the plan for resolving the issue. The item or location of the item shall be clearly marked.

3.3 POST-DREDGE SAND LAYER

A. After dredging is complete, a sand layer shall be placed over the areas designated on the drawings.

B. The sand layer shall consist of select fill.

C. The Contractor shall place a minimum of 1 ton of select fill per 22 square feet sand layer placed. The material shall be placed evenly over the area shown on the drawings. The Contractor shall establish a method for tracking the quantity of material placed over a given area. The quantity of material placed and the area covered shall be reported each day.

D. The sand layer shall be placed in a manner to minimize disturbance and mixing of cap material and sediment.

3.4 TRANSPORTING DREDGED MATERIAL BY BARGE

A. Bottom dump, split hull, or flat deck barges shall be in good condition with no leaks in the hull or in the bottom dumping mechanism. The barge shall sail with sufficient freeboard inside the barge so that no water spills over the side walls while underway. Load lines shall be clearly shown on the barge and loading shall not take the barge below the load lines. The tug shall be of sufficient horsepower for moving the barge and maneuvering through the area and marine traffic encountered between the dredging site and the disposal site. The Contractor shall certify that all barges are seaworthy and have been sealed to prevent leakage.

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B. The Contractor shall provide the following information on each dredge material barge that will be used:
   1. Name of barge.
   2. Length, beam, and molded depth of each barge.
   3. Dredge material capacity of barge.
   4. Hydrostatic data certified by a naval architect for determining barge displacement in short tons, per each 1 foot of displacement between loaded and light drafts. The disposal barge shall have clear and distinct draft marks.
   5. Expected draft of barge loaded to capacity with dredge material.

3.5 OFFLOADING AND HAULING OF DREDGED MATERIAL AND DEBRIS

A. All dredged material and debris will be required to be offloaded and hauled to an approved Subtitle D landfill for disposal. The Contractor shall submit the name and location of the proposed landfill for approval prior to beginning dredging.

B. The Contractor shall provide a dredged material and debris offloading facility location, as required, for approval by the Port. The Contractor shall ensure the following minimum measures are implemented during transloading:
   1. Spill aprons, upland spill control curbing and collection systems, and other spill control measures shall be used when transferring material from the haul barges to the transloading facility. If a bucket is used to offload dredged material from the barge, a dribble apron shall be used to catch and collect any material dropped during offloading operations. No material shall be allowed to re-enter the river at the offloading facility.
   2. The swing path of the crane shall be maintained over a constructed spill apron during material transfer, and the Contractor shall monitor for any spillage.
   3. Clean tarping of the truck loading area shall be provided, as necessary, to prevent tire contact with materials.
   4. Following loading of each truck, the truck and area immediately around the truck will be visually inspected for spilled material. Spilled material shall be cleaned up immediately.
   5. Cleaning of tires (if necessary), including dry brushing and/or tire/wheel washing, is required before leaving the offloading site.
   6. The truck shall be covered before leaving the site.
   7. Street sweeping using non-compressed air type sweeper is required from the loading area to the off-site street.
   8. The Contractor shall provide a disposable pad for any material loadout areas in order to keep the ground surface clean before the next truck is loaded.
   9. Once the truck is cleared to leave the facility following inspection and cleaning, if applicable, the load will be documented on a manifest that will be carried by the driver.
   10. Copies of all project records, including manifests and weigh tickets, will be maintained for the project file.
   11. The Contractor will provide copies to the Port of the manifest and documentation that the load was received by the landfill.
   12. Dock curbing shall be used to prevent any potential spill material and rainwater from entering the river.
   13. Trucks or rail cars shall be water-tight and covered during transport to the disposal facility. Trucks shall be loaded on disposable pads or tarps and underloaded to minimize

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loss during transport. Routine visual inspections of the loading area and access routes shall be performed. Caution shall be exercised so that material does not leak out of the vehicles, slosh over the tops, or get blown off during transport from the offloading facility to the final disposal site.

C. The Port will implement a sampling and analysis program to monitor for off-site tracking of contaminants as a result of transloading. The Contractor shall modify operations as needed to prevent off-site tracking of contaminants if there are any visual signs of tracking within the transloading facility, or if concentrations of contaminants are significantly elevated in monitoring samples.

D. No water shall be created or discharged. Any free liquid remaining in the haul barge shall be removed and contained for appropriate disposal.

E. Dewatering of sediments shall occur either in a barge or at an approved upland facility. If the elutriate is dewatered in a barge, the water shall be released into a municipal sanitary sewer system, pursuant to applicable discharge requirements.

F. No surface water releases of dredge elutriate material to the river shall occur.

G. The dredged material shall be disposed of in a manner consistent with its characterization. Dredge material shall be transported to an approved upland landfill. No material will be allowed to re-enter any waterway at the offloading site.

3.6 CONTROL OF POLLUTANTS OTHER THAN SEDIMENT

A. Specifications for all pollutants other than sediments, and/or any potentially harmful substance that does not have prescriptions for disposal within this section, are contained herein. These pollutants that occur on site during construction shall be handled and disposed of in a manner that does not contaminate surface water or surface water runoff, groundwater, or upland areas.

B. Fueling of Equipment – The Contractor shall provide a plan within the CHASP for fueling of equipment. At a minimum, the following procedures should be followed and described in the Contractor's CHASP:
   1. Use of a boom around floating equipment
   2. Use of oil-absorbent pads on upland equipment
   3. A Contractor's representative shall be present at all times during all fueling operations

C. Any fuel spills or leaks shall promptly be reported to the fire department and the Port.

D. Spill protection material shall be in place before performing any emergency repair to equipment.

E. Any sheens due to leakage, spills, or from dredging operations (e.g., from sediment) shall be contained by a boom and cleaned up with oil-absorbent material.

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3.7 WATER QUALITY AND TURBIDITY

A. The Contractor shall conduct dredging operations such to ensure adherence to the turbidity and water quality requirements stipulated in the permits. Resuspension of sediment in the vicinity of the site shall be minimized.

B. Work in the dredging area shall be done to minimize turbidity, erosion of banks or bottom, or other water quality impacts. The Contractor shall take all normal precautions to prevent turbidity at the dredging site. These include making each pass of the bucket complete, including dredging and placing sediment into the barge, and bringing the bucket fully over the barge before discharging. There will be no filling of the barge that will result in water or sediment overflow from the barge. The bucket shall be slowly placed on the bottom rather than dropped unless dropping is required to excavate the sediments. Vertical bucket retrieval shall be at slow to moderate speed to minimize the loss of materials from within the bucket. Retrieval speed of the bucket shall be reduced if water quality monitoring indicates increased levels of turbidity.

C. The Contractor shall keep an operator's log and a daily progress chart aboard the dredge at all times for inspection. The daily progress chart shall include data regarding work areas completed, names of barges used, and cubic yards loaded. These documents shall be submitted to the Port for retention with the contract file at the completion of the dredging work. The Contractor will be provided a copy of this log.

D. Water Quality Control and Contingency Plan: The Contractor shall submit a plan with methods and procedures for controlling water quality during dredging. The plan shall also address contingency measures that the Contractor will implement if operations with the planned control measures fail to meet water quality requirements.

E. The Contractor shall submit the plans described above to the Port 7 days before mobilization.

3.8 REPORTING REQUIREMENTS

A. A daily report of operations shall be prepared and maintained and copies submitted to the Port.

B. The Contractor shall maintain records of the number of bucket cycles per hour during the first 3 days of dredging to compare to water quality monitoring results.

END OF SECTION 352023

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SECTION 352025 – CAPPING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes the construction of in situ caps. The caps generally consist of two layers. The lower layer is the base cap, intended to provide isolation between the water column and the contaminated sediments. The surface layer is the armor layer, designed to resist erosive forces from propeller wash, waves, and river currents.

1.2 RELATED WORK SPECIFIED ESLEWHERE

A. Section 312000 – Site Clearing, Earthwork, and Shoreline Stabilization

B. Section 352023 – Dredging, Transportation, and Disposal

1.3 REFERENCED STANDARDS

A. ODOT: Oregon Department of Transportation – "Standard Specifications for Highway Construction," 2002 edition.

1.4 DESCRIPTIONS

A. Capping – In situ capping is required at the Head of Slip 3.

B. Capping Sections – The capping sections are shown on the drawings. In general, the capping sections will consist of the following layers (from the sediment surface upward):
   1. Chemical isolation layer (Base Cap) – This layer consists of either fine to medium sand or select fill, depending on the angle of the slope where the cap is to be placed. The purpose of this layer is to isolate the underlying contaminated sediments from biota and the aquatic environment.
   2. Erosion protection layer (Armor Layer) – This layer varies in material type, thickness, and gradation by location, depending on the anticipated erosive forces. The purpose of this layer is to resist the erosive forces from currents, waves, and propeller wash.

C. Debris Material and Handling – Debris material will likely be encountered during capping; any debris material encountered during capping shall be properly disposed of at an approved upland landfill.

D. Construction Quality Control Plan (CQCP) Compliance – The Contractor shall develop a CQCP as specified in Section 014500. The CQCP shall be complied with throughout all activities specified within this section.

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E. Environmental Protection Plan (EPP) Compliance – The Contractor shall develop an EPP as part of the Removal Action work plan, as specified in Section 015719. The EPP shall be complied with throughout all activities specified within this section.

F. Construction Health and Safety Plan (CHASP) Compliance – The Contractor shall develop a CHASP as part of the Removal Action work plan, as described in Section 013529. The CHASP shall be complied with throughout all activities specified within this section.

1.5 SURVEYS

A. Bathymetry and topography of the work area are shown on the drawings.

B. The Contractor will be provided with updated pre-work surveys taken within 1 month before the scheduled start of capping work.

C. Post-cap surveys will be taken by the Port after capping is completed.

D. Bathymetric surveys will be completed in areas below water and with adequate water depth for survey equipment. Topographic upland surveys will be completed in areas not suitable for bathymetric surveys.

E. Bathymetric surveys performed by the Port will be completed with a Reson SeaBat 8101 multibeam bathymetric sonar using a frequency of 240 kilohertz (KHz), or similar equipment. Multibeam data will be conducted by running lines on a 50-foot spacing parallel with the berthing lines of the project. The sonar swath will be clipped to 45 degrees on either side of vertical. Post-processing of multibeam data will be performed utilizing Caris HIPS multibeam analysis and presentation software, or similar equipment. A 3-foot shoal biased data set will be exported from accepted data and used for mapping of contours and calculations of volumes for the Contractor's payment.

F. The vertical datum used in this project shall be National Geodetic Vertical Datum (NGVD).

G. The Contractor shall prepare a Survey Control Plan prior to beginning work. The plan shall describe the Contractor's methods, procedures, and equipment to be employed to control grades and locations during all construction activities. The Contractor is required to employ electronic positioning system (EPS), sonar sounding devices, automated electronic tide gauge, and tide gauges to accurately determine their capping location at all times.

H. The Port will provide a tide gauge located at the Head of Slip 3.
   1. The Contractor shall supply temporary gauges and buoys at the capping site.
   2. The Contractor shall establish and maintain a calibrated tide gauge or board, consistent with the tide gauge provided by the Port, in a location where it may be clearly seen during all in-water work specified throughout this section.

I. The Contractor shall conduct surveys using a survey-grade depth sounder with a frequency of 200 KHz, or other frequency as approved by the Port. The surveys will be performed using an EPS and a single-beam, dual-frequency or multi-beam, single-frequency echosounder system.

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J. The top return of the signal trace shall be the point of interpretation of the soundings.

K. Surveys shall be converted to bottom elevation with respect to NGVD, and plotted to the nearest 0.1 foot.

L. The Contractor shall provide daily sounding and topographic cross sections of the previous day's work, at no greater than 25-foot trackline intervals, using a survey-grade depth sounder. The volume of material placed and the area affected shall be determined daily. Accuracy for measured depth shall be +/- 0.25 foot; accuracy of horizontal positions shall be +/- 3 feet at the 95 percent confidence interval.

M. The Contractor shall have a set of the previous day's surveys available to the Port for review at the Contractor's on-site project office the following day. Drawings shall be prepared at a scale of 1 inch = 50 feet on plan sheets and shall depict the survey control lines. Cross section plots shall be prepared every 100 feet perpendicular to the capping area. The cross sections shall be depicted on plan sheets.

N. Survey Control – Accurate and precise methods of horizontal and vertical control shall be established by the Contractor before work begins. These control methods shall be used accordingly as specified in the CQCP and the Survey Control Plan. The Contractor shall lay out its work from horizontal and vertical control points indicated on the CQCP and the drawings, and shall be responsible for all measurement taken from these points. The Contractor shall employ a suitable method to locate and control horizontal and vertical in-water work. The Contractor is required to use Real Time Kinematic (RTK) for survey control work.

O. Quality Control Supervisor – The Quality Control Supervisor shall be present on site at all times any survey activity specified in this section is taking place in accordance with the CQCP. Daily CQC reports shall be submitted to the Port each day on the previous day's activities specified in this section.

1.6 PERMITS

A. See Section 011100 – Summary of Work.

1.7 CAPPING WORK PLAN

A. As part of the removal action work plan, the Contractor shall submit to the Port a detailed capping work plan. At a minimum, the plan shall contain the following information:
   1. The order in which the capping is to be performed, indicating the work sequence; the number, types, and capacity of equipment to be used; hours of operation; methods of operation; and the time required to complete each activity.
   2. The source of the capping material (see article 2.2).
   3. Procedures and equipment for coordinating and performing hydrographic and topographic progress surveys, layout of the work, and position of cap equipment.
   4. Methods and means for monitoring cap placement, including:
      a. The rate of deposition of the cap material at all times

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b. The location of placed cap material in the project coordinate system.
c. The area capped in the previous day.
d. Average thickness of cap material placed during the previous day.

5. Procedures for environmental monitoring, including procedures for emergency spill containment and removal operations.
6. Notification and procedures to be used for moving equipment to accommodate commercial vessel traffic using the surrounding waterway.
7. Means, methods, equipment, and procedures for placing cap material.

PART 2 - PRODUCTS

2.1 GENERAL

A. The Contractor shall provide all required materials for the project. Materials shall be of the quality, size, shape, and gradation as specified in this part. Imported cap materials to be used for construction of the sediment cap will be imported, clean, granular material free of roots, organic material, contaminants, and all other deleterious and objectionable material.

B. Material shall be from igneous or metamorphic rock.

C. Imported material shall have chemical concentrations less than the chemical goals presented in Table 1 at the end of this section. Armor material does not need to be tested for chemical criteria due to its size.

2.2 BORROW SOURCE AND MATERIALS CHARACTERIZATION

A. The following activities shall be performed by the Contractor, as specified below, to ensure that imported materials are natural, native, virgin materials and free of contaminants, including debris or recycled materials, and which meet construction specifications. The Contractor shall provide assurance that imported materials are free of hazardous or otherwise objectionable materials. The Port maintains the right to reject any materials that have been determined to be substandard for any reason. In the event of rejections, it shall be the responsibility of the Contractor to remove all stockpiles of rejected material from the site.

1. A characterization of any and all imported material shall be performed by the Contractor prior to any on-site placement. The characterization will include analysis of a borrow source sample, site inspection, and site characterization. The Contractor shall submit a Borrow Source Characterization report summarizing all the information contained within this section.
2. Source Identification: Prior to borrow source sampling, the Contractor shall provide documentation of the origin of borrow source materials.
3. The Contractor shall provide the Port with a 5-gallon sample of granular material from each borrow source. Note, samples of rock are not required. Each sample should be composed from no less than five sub-samples taken throughout any one source. The Contractor shall ensure that the samples are representative of all materials to be imported.

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Samples shall be provided to the Port at least 14 days before the materials represented by the samples are delivered to the site.

4. The borrow source shall be inspected by the Contractor. During such inspection, the Contractor shall ensure that the materials to be delivered to the site are likely to meet the appropriate specifications. The Contractor shall provide the Port with 2-weeks' notice of such inspections. At the Port's discretion, the Port or a representative may accompany the Contractor to witness such inspections. This witnessing shall in no way release the Contractor form complying with the specifications and shall in no way be construed as approval of any particular source of material.
5. Testing, Reporting, and Certification: The Contractor shall test samples of materials to be imported for the following:
    a. Grain size distribution (American Society for Testing and Materials [ASTM] method D422-63).
    b. In situ moisture content (ASTM method D2216)
    c. Priority pollutant metals (U.S. Environmental Protection Agency [USEPA] publication SW 846, the 6000/7000 method series)
    d. Volatile organic compounds (USEPA publication SW 846, method 8270, as modified by the Puget Sound Estuary Program [PSEP])
    e. Polychlorinated biphenyls (PCBs) (USEPA publication SW846, method 8082, as modified by PSEP)
    f. Pesticides (USEPA publication SW846, method 8081, as modified by PSEP)
    g. Total organic carbon (Standard Methods [SM] method 5310B)
6. The Contractor shall provide the results of such tests at least 2 weeks before delivery of the materials to the site. The results shall be provided in report form, with the reports clearly identifying the following:
    a. Source of samples
    b. Sampling dates
    c. Chain of custody
    d. Sampling locations
    e. Contractor's certification that the samples tested and the results provided are representative of materials that shall be delivered to the site
7. Inspection of Materials at the Site: Truckloads of imported material shall be visually inspected by the Contractor upon delivery. Materials shall be inspected for the presence of foreign, recycled, or reprocessed material. The Port may, at any and all times, perform an independent inspection. Material may be rejected if identified as substandard or if test results show it to be substandard. Materials may be segregated for testing based on appearance or odor. Segregated materials may be tested according to designated procedures at the Port's discretion.
8. The Contractor shall collect certified tickets from the borrow source for each load of material brought to the site. The tickets shall be supplied to the Port.
9. One sample for every 20 percent of the total volume of each material used shall be taken and submitted for grain size analysis, chemistry, and total organic carbon.
10. The Port maintains the right to reject any materials that have been determined to be substandard for any reason. In the event of rejections, it shall be the responsibility of the Contractor to remove all stockpiles of rejected material from the site.
11. The Contractor shall verify the quantity of capping material to be placed for each location. Contractor shall verify it's volume estimates to those shown in the drawings before signing the negotiated contract.

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2.3 BASE CAP TYPE 1

A. Material shall be clean, free-draining, granular material obtained from natural deposits. Individual particles shall be free from all objectionable coatings. The material shall contain no organic matter, nor soft friable particles in quantities considered objectionable by the Port.

B. Material shall be graded between the limits specified below:

Sieve Size	Percent Passing (by weight)
U.S. No. 4	100
U.S. No. 10	25 to 100
U.S. No. 40	20 to 60
U.S. No. 200	5 max

2.4 BASE CAP TYPE 2

A. Material shall be clean, free-draining, granular material obtained from natural deposits. Individual particles shall be free from all objectionable coatings. The material shall contain no organic matter, nor soft friable particles in quantities considered objectionable by the Port.

B. Material shall be graded between the limits specified below:

Sieve Size	Percent Passing (by weight)
4-inch	90 to 100
¾-inch	50 to 75
U.S. No. 4	35 to 55
U.S. No. 10	25 to 45
U.S. No. 40	10 to 25
U.S. No. 200	0 to 4

2.5 BASE CAP TYPE 3

A. Material shall be Base Cap Type 2 amended to consist of 10 parts Type 2 cap mixed with 1 part organoclay (dry weight). Organoclay is a bulk granular product manufactured by amending natural clay materials with organic molecules so that the organoclay preferentially absorbs petroleum rather than water. Product specification sheets for the selected organoclay must be submitted to the Port for review and approval 14 days prior to ordering the organoclay.

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Acceptable organoclay manufacturers include CETCO Remediation Technologies or Biomin, Inc. Base Cap Type 3 shall be manufactured prior to placement. Base Cap Type 3 shall be manufactured by proportioning Base Cap Type 2 and organoclay in the proper amounts and thoroughly mixing using mechanical means. The materials shall be mixed until the mixture has a uniform texture and color.

2.6 ARMOR TYPE 3

A. Material shall be clean, free-draining, granular material obtained from natural deposits. Individual particles shall be free from all objectionable coatings. The material shall contain no organic matter nor soft friable particles in quantities considered objectionable by the Port

B. Material shall meet the requirements of ODOT Type 100(E) riprap

2.7 HABITAT COVER

A. Material shall be clean, free-draining, granular material obtained from natural deposits. Individual particles shall be free from all objectionable coatings. The material shall contain no organic matter, nor soft friable particles in quantities considered objectionable by the Port.

B. Material shall be graded between the limits specified below:

Sieve Size	Percent Passing (by weight)
2-inch	90 to 100
¾-inch	60 to 80
U.S. No. 4	40 to 60
U.S. No. 40	15 to 35
U.S. No. 200	0 to 5

PART 3 - EXECUTION

3.1 EQUIPMENT

A. Capping shall be completed with either mechanical or hydraulic equipment. Equipment to be used for capping shall place the cap in a manner that does not disturb the subgrade or previous lifts of capping material. Placing cap material by use of a bottom dump barge is not allowed. The Port shall approve all proposed equipment to be used for cap placement.

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3.2 CAPPING QUALITY CONTROL

A. The Contractor shall establish procedures for monitoring the rate of placement of the cap, including use of a positioning system, and a method for determining the rate of capping material placed. The method should also determine the area of cap coverage on a daily basis. The Contractor shall also develop quality control/quality assurance methods to monitor cap placement rates and cap thickness.

B. The Contractor shall supply the Port the following information pertaining to the previous day's capping activities on a daily basis:
   1. The area capped
   2. The volume/tonnage of material placed
   3. Types of material placed
   4. Daily surveys
   5. Construction quality control daily report

C. Post-cap confirmation:
   1. The Contractor shall notify the Port after base cap and armor layer work is complete. A post-cap survey of the capped areas will be taken by the Port and used to verify completion of work to specified thickness, slopes, and tolerances, before the Contractor demobilizes. If the Port's post-cap hydrosurvey finds the Contractor's work not meeting contract plans and specifications, the Port will notify and provide the Contractor with hydrosurvey results. Any capping areas found with thicknesses thinner than the required thickness shall be capped to meet minimum thickness. All additional post-cap hydrosurveys necessary to confirm the Contractor's work shall be provided by the Port and withheld from payment to the Contractor. Cap thickness will be determined by the difference between the pre-cap survey and the post-cap survey of the site.
   2. The Port may complete cores through the base cap. Cores will be used to confirm the bathymetric results and account for possible settlement during construction. The cap thickness shall be to the minimum thicknesses as shown on the drawings.
   3. The Contractor shall anticipate standby time during the post-cap hydrosurvey operation, core collection, and during the evaluation of the hydrosurvey results.
   4. Pre- and post-bathymetric surveys will be used to confirm the thickness of the armor layers.

3.3 CONDUCT OF CAPPING

A. Capping shall be accomplished in the designated areas, within the tolerances, and to the depths indicated on the drawings. The Contractor shall attain full grade and lateral extent at each unique cap location prior to moving to a new location or subsequent layer.

B. Debris of concern in cap areas shall be properly removed and disposed of prior to capping. Debris of concern is any debris that extends above the mudline grade more than half the total thickness of the cap section in that area.

C. All caps on slopes must be placed from the toe of the slope up towards the crest.

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D. The base cap layer shall be placed in a manner to minimize disturbance and mixing of cap material and sediment.

E. The entire base cap layer shall be placed prior to placing the armor layer.

F. The armor layer shall be placed in a manner that does not damage the base cap layer. Damage includes penetration of the armor layer material into the base cap layer.

G. Use of spuds is not allowed in areas previously capped.

H. The cap in each area shall be placed to the minimum thickness shown on the drawings. To ensure placement to the minimum pay thickness, the Contractor is allowed a 1-foot higher capping tolerance and a maximum pay thickness to 0.5-feet thicker than the minimum noted elevation.

I. The Contractor shall monitor the cap work throughout the course of work for depth, slopes, location, and tolerances, and shall be responsible for damages due to over-placement or capping outside the given limits for capping.

J. The Contractor will not be allowed to drag cap areas to even out cap overplacements.

K. The Contractor shall base estimates on the initial survey provided. A pre-cap survey of the area to be capped will be taken by the Port within 1 month of the scheduled start of capping work. If there are any significant changes in profile or quantity between the surveys, adjustments in the quantities and associated pay amounts will be made.

L. The Contractor shall protect existing piling and structures in and near cap areas from damage. The Contractor shall submit a settlement monitoring plan (SMP) prior to construction. The plan shall identify the personnel, procedures, methods, and documentation required to monitor the movement of waterside structures and/or upland areas. The Contractor shall install survey monitoring points and perform monitoring at specified locations of critical structures as defined in the SMP. Prior to construction, a baseline survey will be completed. Surveying will also be completed during construction—movements of greater than 1 inch will require the Port to be notified and work shall stop in that area.

M. Any cap material that is deposited other than in the area indicated on the drawings, or other than as approved by the Port, will not be paid for, and the Contractor may be required to remove such misplaced material and deposit it where directed at its own expense.

N. The Contractor shall install and maintain absorbent booms around the head of Slip 3 cap construction area.

3.4 TRANSPORTING CAPPING MATERIAL FOR PLACEMENT

A. Haul barges shall be in good condition with no leaks in the hull. The barge shall sail with sufficient freeboard inside the barge so that no water or material spills over the side walls while underway. Load lines shall be clearly shown on the barge, and loading shall not take the barge below the load lines. The tug shall be of sufficient horsepower for moving the barge and

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maneuvering through the area, bridges, and marine traffic encountered between the borrow site and the placement site.

B. The Contractor shall provide the following information on each cap material barge that will be used:
   1. Name of barge.
   2. Length, beam, and molded depth of each barge.
   3. Material capacity of barge.
   4. Hydrostatic data certified by a naval architect for determining barge displacement in short tons, per each 1 foot of displacement between loaded and light drafts. The barge shall have clear and distinct draft marks.
   5. Expected draft of barge loaded to capacity with cap material.

3.5 WATER QUALITY AND TURBIDITY

A. The Contractor shall conduct capping operations to ensure adherence to the turbidity and water quality requirements stipulated in the permits. Resuspension of material shall be prevented in the vicinity of the site.

B. Work in the capping area shall be done to minimize turbidity, erosion of banks or bottom, or other water quality impacts. The Contractor shall take all normal precautions to prevent turbidity at the capping site.

C. The Contractor shall keep an operator's log and a daily progress chart aboard the capping derrick at all times for inspection. The daily progress chart shall include data regarding work areas completed, names of barges used, and cubic yards placed. These documents shall be submitted to the Port for retention with the contract file at the completion of the capping work. The Contractor should keep a copy of this log.

D. Water Quality Monitoring and Control Contingency Plan: The Contractor shall submit a contingency plan with methods and procedures for modifications of methods which fail to meet water quality requirements. The plan shall also address contingency measures that the Contractor will implement if operations with the planned control measures fail to meet water quality requirements

END OF SECTION 352025

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Table 1
Import Material Chemical Goals

Chemical Name	Proposed Borrow Source Criteria	TEC	Quarry A		Quarry B	
Metals (mg/kg)						
Arsenic	9.79	9.79	**0.5**		**1.1**	
Cadmium	0.99	0.99	0.2	U	0.2	U
Chromium	43.4	43.4	**6.8**		**4.1**	
Cobalt	NC	NC	**14.8**		**4.5**	
Copper	31.6	31.6	**10.8**		**9.5**	
Iron	39,600	NC	**39,600**		**11,800**	
Lead	35.8	35.8	**2**		**1.3**	
Mercury	0.18	0.18	0.05	U	0.05	U
Nickel	22.7	22.7	**2.7**		**6.2**	
Selenium	Standard Method of Detection	NC	0.5	U	0.5	U
Silver	Standard Method of Detection	NC	0.2	U	0.2	U
Zinc	121	121	**47**		**27**	
PCBs (µg/kg)						
Aroclor 1016	Standard Method of Detection	NC	3.8	U	3.9	U
Aroclor 1221	Standard Method of Detection	NC	3.8	U	3.9	U
Aroclor 1232	Standard Method of Detection	NC	3.8	U	3.9	U
Aroclor 1242	Standard Method of Detection	NC	3.8	U	3.9	U
Aroclor 1248	Standard Method of Detection	NC	3.8	U	3.9	U
Aroclor 1254	Standard Method of Detection	NC	3.8	U	3.9	U
Aroclor 1260	Standard Method of Detection	NC	3.8	U	3.9	U
Aroclor 1262	Standard Method of Detection	NC	3.8	U	3.9	U
Aroclor 1268	Standard Method of Detection	NC	3.8	U	3.9	U
Total PCBs	59.8	59.8	3.8	U	3.9	U
Pesticides (µg/kg)						
2,4'-DDD	Standard Method of Detection	NC	2	U	2	U
2,4'-DDE	Standard Method of Detection	NC	2	U	2	U
2,4'-DDT	Standard Method of Detection	NC	2	U	2	U
4,4'-DDD	4.88	4.88	2	U	2	U
4,4'-DDE	3.16	3.16	2	U	2	U
4,4'-DDT	4.16	4.16	2	U	2	U
Total DDTs	5.28	5.28	2	U	2	U
Aldrin	Standard Method of Detection	NC	0.98	U	0.99	U
alpha-BHC	Standard Method of Detection	NC	0.98	U	0.99	U
alpha-Chlordane	Standard Method of Detection	NC	0.98	U	0.99	U
beta-BHC	Standard Method of Detection	NC	0.98	U	0.99	U
beta-Chlordane	Standard Method of Detection	NC	0.98	U	0.99	U
Camphechlor	Standard Method of Detection	NC	98	U	99	U
cis-Nonachlor	Standard Method of Detection	NC	2	U	2	U
delta-BHC	Standard Method of Detection	NC	0.98	U	0.99	U
Dieldrin	Standard Method of Detection	1.9	2	U	2	U

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Chemical Name	Proposed Borrow Source Criteria	TEC	Quarry A		Quarry B	
Endosulfan I	Standard Method of Detection	NC	0.98	U	0.99	U
Endosulfan II	Standard Method of Detection	NC	2	U	2	U
Endosulfan Sulfate	Standard Method of Detection	NC	2	U	2	U
Endrin	2.22	2.22	2	U	2	U
Endrin aldehyde	Standard Method of Detection	NC	2	U	2	U
Endrin ketone	Standard Method of Detection	NC	2	U	2	U
gamma-BHC (Lindane)	2.37	2.37	0.98	U	0.99	U
Heptachlor	Standard Method of Detection	NC	0.98	U	0.99	U
Heptachlor Epoxide	2.47	2.47	0.98	U	0.99	U
Hexachlorobenzene	Standard Method of Detection	NC	0.98	U	0.99	U
Hexachlorobutadiene	Standard Method of Detection	NC	0.98	U	0.99	U
Methoxychlor	Standard Method of Detection	NC	9.8	U	9.9	U
Oxychlordane	Standard Method of Detection	NC	2	U	2	U
trans-Nonachlor	Standard Method of Detection	NC	2	U	2	U
SVOC (µg/kg)						
1-Methylnaphthalene	Standard Method of Detection	NC	4.8	UJ	5	UJ
2-Methylnaphthalene	Standard Method of Detection	NC	4.8	U	5	U
Acenaphthene	Standard Method of Detection	NC	4.8	U	5	U
Acenaphthylene	Standard Method of Detection	NC	4.8	U	5	U
Anthracene	57.2	57.2	4.8	U	5	U
Benzo(a)anthracene	108	108	4.8	U	5	U
Benzo(a)pyrene	150	150	4.8	U	5	U
Benzo(b)fluoranthene	Standard Method of Detection	NC	4.8	U	5	U
Benzo(g,h,i)perylene	Standard Method of Detection	NC	4.8	U	5	U
Benzo(k)fluoranthene	Standard Method of Detection	NC	4.8	UJ	5	UJ
bis(2-Ethylhexyl)phthalate	Standard Method of Detection	NC	22	U	12	U
Butylbenzylphthalate	Standard Method of Detection	NC	4.8	U	5	U
Chrysene	166	166	4.8	UJ	5	UJ
Dibenzo(a,h)anthracene	33.0	33.0	4.8	UJ	5	UJ
Dibenzofuran	Standard Method of Detection	NC	4.8	U	5	U
Diethylphthalate	10	NC	**10**		5	U
Dimethylphthalate	Standard Method of Detection	NC	4.8	U	5	U
Di-n-butylphthalate	12	NC	**12**		**5**	
Di-n-octylphthalate	Standard Method of Detection	NC	4.8	U	5	U
Fluoranthene	423	423	4.8	U	5	U
Fluorene	77.4	77.4	4.8	U	5	U
Hexachlorobenzene	Standard Method of Detection	NC	0.98	U	0.99	U
Indeno(1,2,3-cd)pyrene	Standard Method of Detection	NC	4.8	UJ	5	UJ
Phenanthrene	204	204	4.8	UJ	5	UJ
Pyrene	195	195	4.8	U	5	U
Total PAHs	1610	1610	4.8	U	5	U
TPH (mg/kg)						
TPH - Residual Range	17	NC	**17**		12	U
TPH - Diesel Range	Standard Method of Detection	NC	5.1	U	6.1	U

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Chemical Name	Proposed Borrow Source Criteria	TEC	Quarry A		Quarry B	
VOC (µg/kg)						
1,1,1,2-Tetrachloroethane	Standard Method of Detection	NC	1	U	1.1	U
1,1,1-Trichloroethane	Standard Method of Detection	NC	1	U	1.1	U
1,1,2,2-Tetrachloroethane	Standard Method of Detection	NC	1	U	1.1	U
1,1,2-Trichloroethane	Standard Method of Detection	NC	1	U	1.1	U
1,1,2-Trichlorotrifluoroethane	Standard Method of Detection	NC	2.1	U	2.2	U
1,1-Dichloroethane	Standard Method of Detection	NC	1	U	1.1	U
1,1-Dichloroethene	Standard Method of Detection	NC	1	U	1.1	U
1,1-Dichloropropene	Standard Method of Detection	NC	1	U	1.1	U
1,2,3-Trichlorobenzene	Standard Method of Detection	NC	5.2	U	5.4	U
1,2,3-Trichloropropane	Standard Method of Detection	NC	2.1	U	2.2	U
1,2,4-Trichlorobenzene	Standard Method of Detection	NC	5.2	U	5.4	U
1,2,4-Trimethylbenzene	Standard Method of Detection	NC	1	U	1.1	U
1,2-Dibromo-3-chloropropane	Standard Method of Detection	NC	5.2	U	5.4	U
1,2-Dibromoethane	Standard Method of Detection	NC	1	U	1.1	U
1,2-Dichlorobenzene	Standard Method of Detection	NC	1	U	1.1	U
1,2-Dichloroethane	Standard Method of Detection	NC	1	U	1.1	U
1,2-Dichloropropane	Standard Method of Detection	NC	1	U	1.1	U
1,3,5-Trimethylbenzene	Standard Method of Detection	NC	1	U	1.1	U
1,3-Dichlorobenzene	Standard Method of Detection	NC	1	U	1.1	U
1,3-Dichloropropane	Standard Method of Detection	NC	1	U	1.1	U
1,4-Dichlorobenzene	Standard Method of Detection	NC	1	U	1.1	U
2,2-Dichloropropane	Standard Method of Detection	NC	1	U	1.1	U
2-Butanone (MEK)	Standard Method of Detection	NC	5.2	U	5.4	U
2-Chloroethylvinylether	Standard Method of Detection	NC	5.2	U	5.4	U
2-Chlorotoluene	Standard Method of Detection	NC	1	U	1.1	U
2-Hexanone	Standard Method of Detection	NC	5.2	U	5.4	U
4-Chlorotoluene	Standard Method of Detection	NC	1	U	1.1	U
4-Isopropyltoluene	Standard Method of Detection	NC	1	U	1.1	U
4-Methyl-2-pentanone (MIBK)	Standard Method of Detection	NC	5.2	U	5.4	U
Acetone	Standard Method of Detection	NC	7.6	U	6.9	U
Acrolein	Standard Method of Detection	NC	52	U	54	U
Acrylonitrile	Standard Method of Detection	NC	5.2	U	5.4	U
Benzene	Standard Method of Detection	NC	1	U	1.1	U
Bromobenzene	Standard Method of Detection	NC	1	U	1.1	U
Bromodichloromethane	Standard Method of Detection	NC	1	U	1.1	U
Bromoethane	Standard Method of Detection	NC	2.1	U	2.2	U
Bromoform	Standard Method of Detection	NC	1	U	1.1	U
Bromomethane	Standard Method of Detection	NC	1	U	1.1	U
Carbon disulfide	Standard Method of Detection	NC	1	U	1.1	U
Carbon tetrachloride	Standard Method of Detection	NC	1	U	1.1	U
Chlorobenzene	Standard Method of Detection	NC	1	U	1.1	U

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Chemical Name	Proposed Borrow Source Criteria	TEC	Quarry A		Quarry B	
Chloroethane	Standard Method of Detection	NC	1	U	1.1	U
Chloroform	Standard Method of Detection	NC	1	U	1.1	U
Chloromethane	Standard Method of Detection	NC	1	U	1.1	U
cis-1,2-Dichloroethene	Standard Method of Detection	NC	1	U	1.1	U
cis-1,3-Dichloropropene	Standard Method of Detection	NC	1	U	1.1	U
Dibromochloromethane	Standard Method of Detection	NC	1	U	1.1	U
Dibromomethane	Standard Method of Detection	NC	1	U	1.1	U
Dichloromethane	Standard Method of Detection	NC	2.2	U	2.9	U
Dichlorodifluoromethane	Standard Method of Detection	NC	1	U	1.1	U
Ethylbenzene	Standard Method of Detection	NC	1	U	1.1	U
Hexachlorobutadiene	Standard Method of Detection	NC	0.98	U	0.99	U
Iodomethane	Standard Method of Detection	NC	1	U	1.1	U
m,p-Xylenes	Standard Method of Detection	NC	1	U	1.1	U
Naphthalene	176	176	4.8	U	5	U
n-Butylbenzene	Standard Method of Detection	NC	1	U	1.1	U
n-Propylbenzene	Standard Method of Detection	NC	1	U	1.1	U
o-Xylene	Standard Method of Detection	NC	1	U	1.1	U
sec-Butylbenzene	Standard Method of Detection	NC	1	U	1.1	U
Styrene	Standard Method of Detection	NC	1	U	1.1	U
tert-Butylbenzene	Standard Method of Detection	NC	1	U	1.1	U
Tetrachloroethene	Standard Method of Detection	NC	1	U	1.1	U
Toluene	Standard Method of Detection	NC	1	U	1.1	U
trans-1,2-Dichloroethene	Standard Method of Detection	NC	1	U	1.1	U
trans-1,3-Dichloropropene	Standard Method of Detection	NC	1	U	1.1	U
trans-1,4-Dichloro-2-butene	Standard Method of Detection	NC	5.2	U	5.4	U
Trichloroethene	Standard Method of Detection	NC	1	U	1.1	U
Trichlorofluoromethane	Standard Method of Detection	NC	1	U	1.1	U
Vinyl Acetate	Standard Method of Detection	NC	5.2	U	5.4	U
Vinyl chloride	Standard Method of Detection	NC	1	U	1.1	U

Notes:
NC = No criteria available or proposed
U = not detected
UJ = not detected at estimated concentration
TEC = Threshold Effects Concentration
Bold = Detected

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SECTION 353200 – WOODY DEBRIS STRUCTURES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This work consists of salvaging and re-installing large woody debris (LWD) and anchoring habitat logs with rootwads as indicated on the drawings. A limited supply of LWD is available from on-site salvage and additional material may be available from the Port of Portland (Port) and stockpiled on site.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 312000 – Site Clearing, Earthwork, and Shoreline Stabilization

1.3 SCOPE OF WORK

A. The Contractor shall furnish all labor, material, and equipment necessary to salvage specified LWD, transport it to the storage site, and install the LWD.

B. The Contractor shall visit the sites and familiarize himself/herself with existing conditions, including but not limited to, access roads, railroad crossing areas, and storage areas prior to commencing salvage operations.

1.4 APPROVAL AND SELECTION OF MATERIAL AND WORK

A. The collection of LWD and the execution of all operations required under the drawings and/or specifications shall be subject to the approval of the Port. The Port shall have the right to reject any and all salvaged or imported materials and any and all work that, in its opinion, does not meet the requirements of the contract documents during any stage of construction. All rejected materials shall be removed from the site by the Contractor at the Contractor's expense.

1.5 SUBMITTALS

A. Sources of habitat logs: The source of the habitat logs shall be submitted to the Port prior to transport to the site.

B. Anchors and chains: Product literature for anchors and chains shall be submitted to the Port for approval.

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1.6 PROTECTION OF ADJACENT PROPERTY

A. For the duration of salvage operations and until the Contractor is released, all adjoining property shall be protected from any disturbance and debris from the work site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. LWD will be salvaged natural wood obtained from the project shoreline as driftwood, as part of clearing and grubbing, or as approved by the Port. LWD shall be washed of soil and debris prior to installation. All logs retained on site shall be free of wood preservatives, including creosote. Logs salvaged from on site containing wood preservatives shall be removed and disposed of off site at the Contractor's expense.

B. Habitat logs shall have trunk and root wad intact. The length will be 21 feet, minimum, as measured from the base of the trunk above the roots to the end of the trunk. The trunk diameter shall be a minimum of 12 inches as measured 21 feet above the base of the trunk. The rootwad shall be at least 3 to 5 feet in diameter. Logs shall consist of on- or off-site, salvaged natural wood that has not been preservative-treated. Preservative-treated logs are not acceptable. The Contractor shall obtain logs from approved on- or off-site sources. Logs shall be of coniferous species native to Oregon State, such as Western Hemlock, Western Red Cedar, Douglas Fir, or other approved species. Logs shall be washed free of soil and other debris. The Contractor shall trim logs as directed by the Port.

C. Chains for anchoring habitat logs
   1. Chains shall be 1/2-inch galvanized lashing chains with one galvanized screw shackle per anchor. The Contractor shall obtain chains from approved sources.

D. Concrete anchors
   1. Concrete anchors shall be rectangular blocks of concrete measuring 2 feet x 2 feet x 6 feet (commonly termed "Ecology Blocks") with a galvanized steel eye for chain connection. The Contractor shall obtain concrete anchors from approved sources.

PART 3 - EXECUTION

3.1 PREPARATION

A. All shoreline materials such as sand, gravel, and rock, shall be installed and approved by the Port prior to installing LWD and habitat logs.

B. The LWD and habitat logs shall be installed on the shoreline between the elevations shown on the drawings. All log placement shall occur in the dry when river levels are below the elevation range for the logs.

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3.2 EQUIPMENT

A. Transportation: Salvaged LWD shall be transported by truck and/or trailer from the approved salvaging site(s) to an approved stockpile site.

3.3 INSTALLING HABITAT LOGS

A. Anchored habitat logs shall be constructed as shown on the drawings. Concrete anchors shall be placed during excavation and/or grading operations and buried. The Contractor may use colored stakes or other Port-approved means to identify locations of concrete anchors underneath the surface.

B. The Contractor shall alert the Port at least 48 hours before selection and placement of habitat logs. A Port representative shall be present during selection and placement of habitat logs.

C. Placement of anchored habitat logs shall occur at water levels at least 2 feet below the elevation of the working surfaces, throughout the duration of the placement activity. The Contractor shall not prepare placement or place more than one habitat log structure at a time, unless directed otherwise by the Port. The Contractor shall identify the location of the concrete anchor and the anchor's steel eye before placement. The Contractor shall minimize native soil and backfill disturbance during installation and exposure of the concrete anchor steel eye. The Contractor shall install habitat log structures as presented in the contract drawings and securely fasten logs to steel chains and concrete anchors to prevent movement by high water. Once the habitat log structure is installed and approved by the Port, the Contractor shall carefully backfill material on top of the steel eye to conceal the concrete anchor from view. Concrete anchors, branches, and root mass shall not disturb the adjacent bank.

3.4 INSTALLING LWD

A. The Contractor shall place LWD over the prepared surface as directed by the Port and shown on the drawings. LWD shall be installed after anchored habitat logs are installed. LWD shall not be anchored.

END OF SECTION 353200

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EXHIBIT A

REGULATORY DOCUMENTS

(not included)

EXHIBIT B

DEBRIS RECORDS

(not included)

APPENDIX F

DRAFT
TRANSPORTATION AND DISPOSAL PLAN

TERMINAL 4 PHASE I REMOVAL ACTION
PORT OF PORTLAND, PORTLAND OREGON

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January 2008

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1 INTRODUCTION

This Transportation and Disposal Plan (TDP) is an appendix to the Design Analysis Report (DAR) and is one of the design documents submitted to the U.S. Environmental Protection Agency (USEPA) for the Phase I Removal Action at the Terminal 4 Removal Action Area. The location of the site and the full scope of the Phase I Removal Action are discussed in the DAR. The scope of the Phase I Removal Action includes off-site disposal of dredged sediment, encountered debris, potentially excavated capping materials, and other waste that will be generated in implementing the Removal Action. The purpose of this document is to provide plans for managing these materials, including describing:

- Details regarding the transportation of dredged materials, including loading materials onto barges, adding drying reagent to the sediments on the barge (if needed), transferring materials from barges to trucks or rail, and transport by truck or rail to the disposal facility
- Precautions that will be used while mixing sediments, and during transport and disposal of the material
- Contingencies for any spills that might occur
- Details regarding the disposal of waste materials, including the disposal facility location

As details of the transportation and disposal are to be established by the Construction Manager/General Contractor (CM/GC), the following sections describe potential activities that may apply and provide a framework for achieving the objectives of safely disposing of all wastes generated during the Phase I Removal Action with no off-site tracking of contamination.

The final version of this document will include more site specific information—the disposal site and transloading facilities will be known at that time.

2 TRANSPORTATION

The loading and transportation of dredged materials and waste from the Removal Action Area are described in the following sections. In general, dredged sediment will be loaded into haul barges and taken to a transloading facility, where the material will be transferred from the barges to trucks or rail cars for transportation to disposal facilities. Upland soils and other wastes may be loaded directly onto trucks for transport to disposal facilities or for transfer to rail cars for transport. The waste materials will be delivered to the disposal facilities by truck or rail. If rail transport is used, the disposal contractor will transload the waste from rail cars to trucks within the disposal facility for final delivery of the material to the landfill cells.

The haul route from the site to the disposal facility, including the locations of any transloading facilities, will be determined by the CM/GC prior to construction. The CM/GC will provide plans for transportation and disposal that will identify:

- Disposal facilities and waste acceptance criteria
- Methods of transportation and haul routes
- Locations of transloading facilities, if required, and schematic diagrams depicting operations at such facilities
- Amendments and anticipated mixture ratios, if needed to meet waste acceptance criteria
- Methods for mixing sediment with amendments, if required, and locations for performing sediment amendment
- Source of amendments and method to deliver amendments to the mixing location
- Permits, such as Oregon Department of Environmental Quality (DEQ) permits for temporary transfer stations, if any are required

2.1 Loading

2.1.1 Barge Loading

Water-tight haul barges will be used to transport sediment from the dredge area to a transloading facility. The dredge will load sediment directly into the barges. Loading operations will be managed to protect water quality and minimize the loss of dredged material through the implementation of best management practices (BMPs). BMPs will include, at a minimum, sealing barge scuppers and repairing holes in the deck fence to prevent sediment from draining off the barge, not overfilling barges, and not grounding barges.

2.1.2 Truck Loading

Lined trucks will be used to haul excavated upland materials and other wastes to disposal facilities. Truck-loading operations will be performed on lined containment pads. Containment pads will be designed with sumps to remove rainwater or other fluids. Collected fluids will be contained and treated prior to discharge. The Contractor will hire a permitted service to collect the fluids and properly discharge the treated material.

BMPs will be used to prevent releases or off-site tracking of contaminants from loading areas. BMPs will include, at a minimum, immediately picking up any material spilled on the containment pad to keep truck tires from rolling over it and to minimize contamination of rainwater that is collected on the containment pad. Trucks, including all tires and all surfaces near the truck bed that could collect spilled material, will be thoroughly inspected before the truck is cleared to leave the containment pad.

2.2 Sediment Drying

Two potential disposal facilities—Columbia Ridge Landfill and Regional Disposal Company—accept materials with free liquids. The other potential disposal facilities cannot accept materials with free liquids. If free liquids must be eliminated from waste prior to landfilling, an absorbent will be added to the sediment prior to transloading the material. Testing will be performed prior to construction to determine the appropriate drying agent and mixture ratio. If any other treatment is required to meet acceptability criteria for the selected disposal facility, the treatment will be similarly performed prior to transloading the material.

2.3 Transloading

Sediment and other materials from the site may be transloaded between barges, trucks, and rail cars to transport it from the site to the disposal facility. A transloading facility will be identified by the CM/GC. As described in Section 2.1.2, truck-loading operations will be performed on lined containment pads. Containment pads will be designed with sumps to remove rainwater or other fluids. Collected fluids will be contained and treated prior to discharge. Transloading facilities for rail will also be designed with secondary containment to prevent releases of contamination to the environment if material is dropped during

transloading. The sides of trucks or rail cars will be protected from material that may drop prematurely from transfer buckets.

The facility for transloading sediment from barges to trucks or rail will be designed with a cantilevered spill apron to prevent material from falling into the water between the barge and the dock. Spill aprons will direct any dropped material back into the barge. The travel of buckets used to transfer sediment from barges to trucks or rail cars will be limited such that they are always above the barge, the spill apron, or the lined loading area.

BMPs will be used to prevent releases or off-site tracking of contaminants from loading areas. BMPs will include, at a minimum, the following items. The movement of buckets or other equipment used to transload sediment will be restricted to a path where the barge, spill apron, or containment pad will catch dropped material. Material spilled on the containment pad will be immediately picked up to keep truck tires from coming into contact with such material and to minimize contamination of rainwater that is collected on the containment pad. Trucks, including all tires and all surfaces near the truck bed that could collect spilled material, will be thoroughly inspected before the truck is cleared to leave the containment pad.

3 ENVIRONMENTAL PROTECTION

Precautions to protect the environment will be implemented throughout the removal action, including during transfer to upland transport and transportation to the disposal site. Environmental controls for these processes, and contingencies for potential spills, are outlined below, but will be discussed in greater detail in the CM/GC's Environmental Protection Plan.

3.1 Spill Prevention

BMPs will be implemented during transport to prevent accidental spills on land. The primary goals of the environmental controls and BMPs at the site, during transport, and at the upland transfer facility will be:

- Prevent spilling contaminated material or sediment drying reagent into surface water at the site, in transit, or at the upland transfer facility.
- Prevent tracking contaminated material off-site or into any area where it may contact water that would be uncontrolled by containment measures at the transfer facility.
- Control surface runoff from the upland portion of the transfer facility so that contaminated runoff does not enter the river.
- Prevent material spilling from the truck during transport from the transfer facility to the disposal facility.

Operations will be visually observed at all times. If there is a threat of the above goals not being met, work will be stopped and controls will be modified as needed until these goals are met. If, despite these controls, accidental releases of material occur, the released material will be recovered, conditions leading to the accident will be corrected, and the releases will be documented and reported to USEPA at that time. BMPs for transport include:

- No excessive piling of material in the haul barge or other methods of transport and tarping (or similar covering) to contain material in transport containers
- Addition of the amendments, if required, at a minimal height above the sediment surface to prevent windborne loss and spilling of the amendments or sediment
- Slow addition of the amendments to avoid spills
- Visual inspection of the haul barge deck area (and removal of any material to barge interior) prior to transport from the site
- Overwater spill apron at transloading facility

- Spill/material return control curbing on the dock at the transloading facility
- Water-tight barges, trucks, or rail cars to prevent leakage during transport
- Under-loading of trucks or rail cars to prevent sloshing loss
- Clean tarping of truck loading area to prevent tire contact with materials
- Spill apron to prevent spilling contaminated material on the outside surfaces of trucks or rail cars
- Visual inspection of the truck loading area and the truck prior to releasing the truck and visual inspection of the access route for tracking prior to releasing the truck from the offload facility to public roads
- Cleaning of tires (if necessary) before leaving offloading site including dry brushing and/or tire/wheel washing
- Decontamination or disposal of transloading area and all equipment used in transloading

3.2 Contingencies for Spills

The marine and trucking contractors and their subcontractors will be informed prior to start of construction that they will be hauling contaminated materials. They will acknowledge in writing their understanding and acceptance of responsibility for preventing spills and conducting spill contingency procedures in the event of spills. If a barge accidentally spills (e.g., turns over, breaks, or collides with something) the following will immediately occur:

- Once equipment is under control and safety of personnel is ensured, the tug operator will note the exact area of the spill by recording Global Positioning System (GPS) coordinates and visual notes (e.g., 300 yards upstream of visible landmark). The operator will also note to the best of their ability the approximate quantity of material lost (i.e., 25 percent of barge load).
- If substantial visual sheen or oil is present on the water, the tug operator will notify the Construction Quality Assurance Officer (CQAO) and the spill response team immediately via radio or cell phone.
- The CQAO will notify USEPA immediately of the spill no matter the quantity of material spilled.
- As notified, the spill response team will deploy booms, absorbent materials, etc. and operate oil skimming boats as necessary to contain the sheen/floating oil to the

extent practicable. Cleanup will be completed as soon as possible and take precedence over normal site-related activities.

- The CQAO will set up a site meeting with USEPA to determine further actions.
- In consultation with agencies, further actions may include conducting bathymetry or other testing in the spill area to determine the location of spilled material, dredging spilled material for reloading onto another barge, and subsequent monitoring of the spill location after dredging. Depending on the quantity of the spill, all of these actions may not be necessary or other actions may be warranted.

If a truck accidentally spills (e.g., collision during transport or turns over) the following will immediately occur:

- Once the safety of personnel is ensured, the truck driver will estimate to the best of their ability the approximate quantity of material lost (e.g., 25 percent of load).
- The driver will notify DEQ, the CQAO, and the spill response team immediately via radio or cell phone. The Oregon Emergency Response System (OERS) will also be contacted at 1-800-452-0311.
- As notified, the spill response team will deploy booms, absorbent materials, etc., as necessary to contain the material to the extent practicable. Cleanup will be completed as soon as possible and take precedence over normal site-related activities.
- The CQAO will notify USEPA for a site meeting and determination of further actions.
- In consultation with agencies, further actions may include conducting testing in the spill area to determine the extent of the spilled material (if not on paved surfaces), and removing all affected materials. Depending on the quantity of the spill, these actions may not be necessary or other actions may be warranted.

3.3 Transloading Facility

The primary BMP to avoid releasing contaminants at the transloading facility is visual monitoring of the loading operation to avoid spilling material that is being transferred from the barge to the trucks (see Section 2.3). The operator will be required to maintain the swing path of the transfer bucket over the spill apron and open the transfer bucket the smallest amount possible to unload the material into the trucks or rail cars slowly to avoid spilling

material. The loading area will be lined to collect any material that potentially spills in the direct vicinity of the trucks or rail cars. During loading, visual monitoring will be conducted continuously by the transloading personnel and transloading oversight contractor to detect any spilled material and prevent it from being tracked off-site. Spilled material will be removed from the liner until no visual signs of the material remain. If the material cannot be adequately removed, the liner will be removed for disposal and replaced with a new liner.

Following loading of each truck or rail car, the loading area will be inspected for spilled material and the container of the truck or rail car will be covered. Spilled material will be removed and placed into the barge. Material on the outside of the truck or rail car will be removed prior to releasing the truck or train from the transloading facility. Contaminated material that cannot be removed from the containment pad prior to moving the truck will be covered to avoid contaminating tires. Following moving of the truck, the liner will be removed for disposal and replaced.

The transloading facility will be lined and bermed to contain contaminants. Rainfall runoff will be collected in sumps for removal and disposal.

3.4 Transloading Facility Soil Sampling

The Removal Action Construction Sampling and Analysis Plan (SAP) (Appendix H to the DAR) will be revised after the transloading facility is identified to incorporate requirements for monitoring soil for evidence of off-site tracking of contaminants. The SAP will contain provisions for:

- Selecting representative sampling locations (sampling locations shall include, at a minimum, one location on the designated truck path near the entry to the loading containment pad, one location on the designated truck path near the exit from the loading containment pad, one location on or near the designated truck path near the exit from the transloading facility—i.e., near the beginning of a public road, and one location within the transloading facility but not on or near the designated truck path—a control location).
- Sampling soil prior to beginning use of the transloading facility (sample locations should be as near as possible to the sampling locations indicated above, recognizing

that sampling such locations may be impractical and unhelpful if the facility surface is paved or gravel).

- Sampling soil weekly during the operation of the transloading facility. (The plan may include the creation of sampling locations if the facility surface is gravel or paved. Sampling locations may be prepared by removing a small area of gravel or pavement and filling the area with clean sand. The sand will then serve as the sampling medium during the operation of the transloading facility.)
- Sampling soil after the operation of the transloading facility. (Post-Operation sampling will be performed after operations have been completed and temporary facilities, such as containment liners, have been removed. Created sample locations may be used for the Post-Operation sampling.)
- Requiring expedited analysis of Post-Operation samples within two weeks of collecting the Post-Operation samples to allow delivery of a statistical evaluation of off-site tracking data.
- Selecting analytical parameters, methods, and chemical quality assurance parameters.
- Maintaining the integrity of samples, sampling field data, and analytical laboratory data.

4 DISPOSAL

Material from the removal action will be taken to a permitted non-hazardous waste landfill for disposal. The CM/GC will establish a contract for disposal.

The following subsections describe waste profiling for disposal, operations at the disposal facility, and the administrative requirements for documenting and tracking the disposal process.

4.1 Disposal Facility

Upon entering the disposal facility, shipments of sediment and other Removal Action materials may be sampled by the facility operator to confirm that the materials meet the waste acceptability criteria. For shipments delivered by truck, drivers will conform to the facility's health and safety procedures at all times while on-site.

Shipments will be weighed at the disposal facility to determine the quantity of material sent to the disposal facility during the Phase I Removal Action. Weight records will be maintained in the project file as described in Section 4.4.

4.2 Waste Profiling

Sediment cores were collected from the Slip 3 dredge area in December 2007. The results of the analyses, including Toxicity Characteristic Leaching Procedure (TCLP) tests, will be reported in the final design. These data will also be provided to disposal facilities and used to characterize the sediment for disposal.

4.3 Compliance Status

After identifying a disposal facility and before establishing a contract, the USEPA Region 10 Off-Site Rule Coordinator will be contacted to verify that the facility meets the requirements for accepting material from a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) removal action. Documentation of Off-Site Rule compliance verification will be maintained in the project waste management files.

4.4 Documentation and Tracking

Accurate documentation of transport and disposal will be collected and tracked during the transportation process. The approximate volume of material loaded onto the receiving haul barge and the date of the removal operation will be recorded in the field log. Each shipment to the disposal facility will be accompanied by a bill of lading. Records of shipments sent to the disposal facility and logged into the disposal facility will be reconciled on a daily basis by the CQAO. The disposal facility will provide weight records and confirmation of shipments received at the facility to the CQAO. The CQAO will maintain a log of shipments to the disposal facility and the weight of each shipment throughout the Phase I Removal Action. The gross, net, and tare weights of all loads of material removed from the site will be presented in a table in the Removal Action Completion Report.

APPENDIX G

PRE-CONSTRUCTION SAMPLING DATA REPORT

(TO BE PROVIDED SEPARATELY)

APPENDIX H

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SAMPLING AND ANALYSIS PLAN

TERMINAL 4 PHASE I REMOVAL ACTION
PORT OF PORTLAND, PORTLAND OREGON

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Figure 3 Subsurface Core Log Form

1 INTRODUCTION AND SCOPE OF DOCUMENT

This sampling and analysis plan (SAP) has been prepared as an appendix to the Port of Portland (Port) Terminal 4 Phase I Removal Action Design Analysis Report (DAR). The SAP addresses the collection of data required during the construction phase of the Phase I Removal Action at Terminal 4. The data will be used for verification and documentation purposes during the construction phase of the Phase I Removal Action. Note that only surface water and soil sampling are currently scoped for the Phase I Removal Action Project. This SAP also includes procedures for sediment sampling for cap thickness confirmation. In addition, sediment sampling for chemistry and diver-assisted sediment sampling are included as contingent components because these activities may in fact be performed before, during, or after the Phase I work due to spills or other unforeseen reasons.

This SAP has been updated from the document used for the Engineering Evaluation/Cost Analysis (EE/CA) work plan and prepared in accordance with the U.S. Environmental Protection Agency's (USEPA's) *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (USEPA 1988) and USEPA's *Methods for Collection, Storage, and Manipulation of Sediments for Chemical and Toxicological Analyses* (USEPA 2001). It has also been prepared in accordance with the Terminal 4 Archaeological Monitoring Protocol. Additionally, all sampling activities described in the SAP will be performed within the guidelines of the site-specific health and safety plan (HASP) (see Appendix J of the DAR).

A discussion of existing information relevant to the Terminal 4 Phase I Removal Action is presented in the DAR, including information on the Phase I Removal Action Area characteristics and existing sediment quality data. The DAR, including appendices, also provides the rationale for sampling activities planned for the construction phase of the Phase I Removal Action Area.

This SAP addresses the following:

- Soil sampling
- Sediment sampling for cap thickness confirmation

- Contingent sediment sampling for contaminants of potential concern (COPCs) (both surface and subsurface)
- Preparation of composite samples
- Decontamination procedures
- Sampling documentation, sample handling, and chain-of-custody procedures
- Quality assurance and quality control (QA/QC) requirements
- Waste management
- Water quality sampling

Field sampling activities will be performed in accordance with the Terminal 4 Archaeological Monitoring Protocol provided as Attachment A-1 to the Construction Quality Assurance Plan (CQAP; Appendix A to the DAR). There is a possibility that archaeological resources may be encountered during field sampling activities. It is important that any "discovered" human remains and associated cultural materials and deposits be treated with care and respect and be protected from further disturbance and exposure to weather, as outlined in the Archaeological Monitoring Protocol.

The on-site procedures from the Archaeological Monitoring Protocol ensure compliance with the National Historic Preservation Action (16 USC 470) and applicable Oregon statutes (ORS 97.740 et seq., 358.905 et seq., and 390.235 et seq.) to address potential inadvertent discoveries of cultural materials and deposits (including sacred objects, funerary objects, and objects of cultural patrimony as defined in ORS 358.905) and Indian burials and human remains (as defined in ORS 358.905) during ground disturbing activities. The Archaeological Monitoring Protocol is briefly summarized here:

- Pre-field sampling ceremonies – Tribal governments may desire to perform pre-field sampling ceremonies at the removal action area. The Port will give 2 weeks' notice, by e-mail, of the construction start date. Tribes will coordinate with the Port so that scheduling and logistics of pre-field sampling ceremonies will not delay the sampling schedule.
- Notification of ground disturbing work – The Port will notify the tribes by e-mail in advance of any ground disturbing field sampling. The ground disturbing activities

anticipated to occur during the Removal Action construction field sampling activities are surface sediment grabs in dredged areas.

- Professional archaeologist on site – The Port will retain the services of a professional archaeologist, as defined in ORS 97.740 and ORS 390.235(6) (b). The professional archaeologist will provide on-site monitoring when ground disturbing work is conducted within the boundaries of the archaeological sensitivity area as determined in the cultural resource survey of the removal action area (Archaeological Investigations Northwest, Inc. 2003).
- Tribal representative on site – Interested Tribes are welcome to provide Tribal monitors during field sampling activities. Since the site is contaminated with hazardous substances, Tribal representatives will be required to comply with Occupational Safety and Health Administration (OSHA) requirements provided in 29 CFR 1910.120. The application of these requirements will vary, depending on the type of activity at the site and the proximity of the monitors to the activity. The requirements may include: supervision by someone who is appropriately trained for hazardous substance sites, restriction from the immediate work area, prohibition of handling contaminated material, use of personal protective equipment, and 24- or 40- hour hazardous waste operations health and safety training. Also, all on-site personnel, including Tribal monitors, are subject to the directions of the Health and Safety Supervisor at all times.
- Discovery – At the discretion of the monitoring archaeologist, ground disturbing activities may be slowed or halted at any time that a suspected archaeological object or archaeological site (as defined in ORS 358.905) is encountered. Discovery will be performed in accordance with the Archaeological Monitoring Protocol.

The Port shall make its best efforts, in accordance with state and federal law, to ensure that its appropriate personnel and contractors keep the discovery of any found or suspected human remains, other cultural items, or potential historic properties confidential. Contractors and Port personnel are prohibited from contacting the media or any third party or otherwise sharing information regarding the discovery with any member of the public, and to immediately notify the Port of and direct any inquiry from the media or public. Prior to any release, the Port and

the Tribes shall concur on the amount of information, if any, to be released to the public, any third party, and the media, and the procedures for such a release to the extent permitted by law.

2 SOIL SAMPLING

This SAP will be revised after the transloading facility is identified to incorporate requirements for monitoring soil for evidence of off-site tracking of contaminants. The revision will contain provisions for:

1. Selecting representative sampling locations – Sampling locations shall include, at a minimum, one location on the designated truck path near the entry to the loading containment pad, one location on the designated truck path near the exit from the loading containment pad, one location on or near the designated truck path near the exit from the transloading facility (i.e., near the beginning of a public road), and one location within the transloading facility but not on or near the designated truck pat (a control location).
2. Sampling soil prior to beginning use of the transloading facility – Sample locations should be as near as possible to the sampling locations indicated above, recognizing that sampling such locations may be impractical and unhelpful if the facility surface is paved or gravel.
3. Sampling soil weekly during the operation of the transloading facility – The plan may include the creation of sampling locations if the facility surface is gravel or paved. Sampling locations may be prepared by removing a small area of gravel or pavement and filling the area with clean sand. The sand will then serve as the sampling medium during the operation of the transloading facility.
4. Sampling soil after the operation of the transloading facility – Post-operation sampling will be performed after operations have been completed and temporary facilities, such as containment liners, have been removed. Created sample locations may be used for the post-operation sampling.
5. Selecting analytical parameters, methods, and chemical quality assurance parameters
6. Maintaining the integrity of samples, sampling field data, and analytical laboratory data

3 SEDIMENT SAMPLING

Sediment sampling will be conducted during the construction phase of the Phase I Removal Action to confirm cap thickness. Additional sediment sampling for COPCs may be performed in response to spills or for other unforeseen reasons. Sediment sampling methods that may be used include surface sampling using a Van Veen sampler (or equivalent) and if necessary, subsurface sampling using vibracoring methods. Additionally, piston coring methods or contingent diver-assisted sediment core collection will be used to verify the placement of capping materials. The remainder of this section provides information that is consistent for all sampling methods, including station positioning, the equipment list, and laboratory analytical parameters. The following sections provide method-specific collection and processing procedures.

3.1 Station Positioning

The objective of location control is to accurately determine horizontal and vertical positioning of sampling locations. To achieve this objective, each sample location will be referenced to known survey control points using the methods described below.

The following parameters will be documented at each sampling location:

- Location coordinates (Oregon state plane north zone, North American Datum 83, international survey feet)
- Vertical elevation in feet National Geodetic Vertical Datum (NGVD, including mudline and tidal elevation above mudline)
- Actual water depth
- Time and date
- Tidal elevation referenced to NGVD

These parameters will be measured using pre-surveyed, visual horizontal triangulation to known control points and/or landmarks on shore if necessary, a differential global positioning system (DGPS), and weighted tape measures.

3.1.1 Differential Global Positioning System

Location control will be performed with a DGPS unit onboard the sampling vessel. DGPS coordinates for each sampling location will be recorded at the time of sampling.

3.1.2 Visual Horizontal Triangulation Methods

Visual horizontal triangulation methods will be used as a backup method to the DGPS. This system will use pre-surveyed markers and/or established landmarks on shore. This method determines sampling locations based on horizontal distances to survey control points and/or landmarks identifiable on base maps. Locations will be identified by measuring the horizontal distance from the actual sampling location to the known control point or landmark to the nearest foot using a tape measure. Horizontal measurements can be calculated from registered base maps so field measurements can be translated to state plane coordinates. Buoy markers may be used to mark the sampling location.

3.1.3 Vertical Control

The vertical control parameters measured will be depth to sediment (mudline), tidal elevation, and land surface elevation. The depth to sediment will be measured during each sampling event using a hand-held weighted tape (lead line). The tape will be dropped from the work platform to the bottom, pulled taut, and read to the nearest 0.1 foot. This observation will be cross-checked against the onboard depth sounder.

Tidal readings will be taken periodically from a tide board installed on site and checked against daily tide charts for the Terminal 4 vicinity. Tidal elevations and time will be monitored and recorded before each sample is collected to the nearest 0.1 foot. Sample elevations will then be corrected to NGVD.

3.2 Equipment List

The following general equipment will be required during collection procedures:

- Personal protective equipment (PPE), as required by the HASP (Appendix J of the DAR)

- Navigation and site maps
- Aluminum decked boat equipped with outboard motor
- Appropriate sampling device (Van Veen grab sampler, vibracore, etc.)
- Aluminum or polycarbonate tubing with end caps
- Calibrated rod for sediment depth measurement
- Weighted tape measure calibrated in 0.1-foot increments
- Duct tape
- Camera
- Field notebook

3.3 Laboratory Analytical Parameters

The surface sediment samples and the subsurface sediment samples will be analyzed for the following chemical constituents defined as the COPCs for the dredge areas, as defined in the CQAP (Appendix A to the DAR). A subset of these parameters may be analyzed based on decisions in the field and consultation with USEPA.

- Metals (cadmium, lead, zinc)
- Polycyclic aromatic hydrocarbons (PAHs)
- Total petroleum hydrocarbons (TPH; diesel and motor oil range)

Analytical methods and detection limits are presented in Table 1 of the quality assurance project plan (QAPP), which is provided as Appendix I to the DAR.

3.4 Surface Sediment Sample Collection

Surface sediment samples may be collected from the Phase I Removal Action Area in response to spills or for other unforeseen reasons.

Surface sediment samples from the 0- to 10-centimeter (cm) biologically active zone will be collected for chemical testing using a Van Veen grab sampler, in accordance with the protocol listed below. The verification sampling approach is described in detail in the CQAP (Appendix A to the DAR).

3.4.1 Van Veen Sampling Procedure

- Maneuver the sampling vessel to the target sample location.
- Once the targeted area is deemed suitable for grab sample collection, the Van Veen jaw assembly will be decontaminated.
- Deploy the sampler vertically through the water column until the river bottom is reached.
- The winch cable to the grab sampler will be drawn taut and vertical.
- The location of the cable hoist will be measured and recorded by the location control personnel.
- The jaw assembly will be closed to collect the sediment sample to a penetration depth of approximately 15 cm.
- The apparatus will be pulled upward out of the river bottom (using a winch) and raised to the surface.
- The sediment sample will be retrieved aboard the vessel and evaluated against the following acceptability criteria:
  - Grab sampler is not overfilled (i.e., sediment surface is not against the top 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
- Overlying water will be siphoned off and a stainless steel trowel or similar device will be used to collect the sediment from inside the sampler, taking care not to collect sediment in contact with the sides/surface of the sampler.

3.4.2 Processing Procedure

The collected sediment will be placed in a stainless steel mixing container and homogenized using a stainless steel spoon or an electric drill with stirring paddle until the sediment is of uniform color. Once homogenized, the subsamples will be placed in appropriate containers and properly labeled. Discrete samples from each sampling

location making up the composite will also be collected and archived for additional analyses as necessary. The samples will be submitted for laboratory analysis following appropriate handling and chain-of-custody requirements. A complete description of analytes, analytical methods, target detection limits, and holding requirements can be found in Table 1 of the QAPP (Appendix I to the DAR).

3.5 Subsurface Sediment Samples

Subsurface sediment samples are not be necessary during the Phase I Removal Action construction phase, but these samples are included in this SAP in the event that they are needed. If necessary, subsurface sediment core samples collected from the Phase I Removal Action Area will be used to evaluate the vertical extent of contamination if surface sediment sample results indicate exceedances, and the Port and USEPA determine that it is necessary to determine how deep the exceedances extend.

Sediment cores will be collected to obtain subsurface sediment samples. The vibracore will be equipped with aluminum core barrels. Multiple cores may be collected at each location to obtain adequate sediment volume as necessary. All coring procedures will be performed in accordance with the following procedure.

3.5.1 Vibracore Collection Procedure

- Maneuver the sampling vessel to the target sample location. Secure the vessel in place using spuds, anchors, or tie lines.
- Once the targeted area is deemed suitable for core collection, select an appropriate 3- or 4-inch (outside diameter) core tube type (aluminum) and length based on the bathymetry data and target elevation. Mount a clean coring tube into the vibracore device.
- Lower the coring apparatus with the core tube attached vertically through the water column, tube end first, until the river bottom is reached.
- Vibrate the core into the sediment to the point of refusal. Measure and record the depth of core tube penetration into the sediments in the field notebook.

- Pull the apparatus upward out of the river bottom (using a winch) and raise it to the surface while maintaining the core in a vertical position. Cap the bottom of the core tube.
- Allow water overlying the core tube in the coring apparatus to drain prior to removing the core tube.
- Estimate the recovered length of the sediment core and record it in the field notebook.
  - The length of the cores recovered in aluminum tubing will be determined indirectly by tapping the core with a metal rod from top to bottom. The spot where the pitch of the sound changes corresponds to the approximate top of the recovered core.
  - The distance between the top of the sediment in the core tube and the bottom of the coring tube corresponds to the estimated length of the recovered core.
- Compare the length of the recovered core with the core penetration depth.
  - If the recovered length of the sediment core is more than 60 percent of the penetration depth, keep the core.
  - If an insufficient amount of material is recovered, discard the core over the side of the sampling vessel. Rinse the core tube with river water and prepare to make an additional attempt.
  - An additional attempt will be made at a minimum distance of 10 feet from the previously attempted location.
  - A maximum of three attempts to collect a core will be made for a given location ID.
  - Rinse the core tubes with river water between consecutive attempts.
  - If all three attempts to collect a core are unsuccessful based on recovery alone (i.e., less than 60 percent recovery), retain the final core for analysis and indicate that the targeted recovery was not achieved.
- Remove the core tube from the vibracore device and place a second cap on top of the core tube. Secure the cap in place with duct tape. Rinse the outside of the core tube with a small amount of river water.

- Section acceptable cores into manageable lengths on the vessel. Cover each end of the core sections, top and bottom, with aluminum foil. Place a plastic cap firmly over the aluminum foil to keep the core intact until processing. Secure the plastic caps with duct tape.
- Label each core section with the station identification, sample depth, and an arrow indicating the top of the core. Label the core by scratching into the surface of the core barrel and with an indelible marker.
- Store the core vertically while on the vessel and transport to the processing area.

3.5.2 Processing Procedures

Cores will be processed on shore in the Phase I Removal Action Area. Processing will occur using an electric saw to cut along the length of the core in two places, forming two D-shaped core halves. Only the barrel, not the sediments, will be cut by the saw. When sediment is collected from the core, care will be taken not to collect sediment in contact with the core barrel. Any excess sediment that may come loose will be collected on plastic sheeting so that it may be disposed of properly (see Section 6, Waste Management Plan).

For evaluating the vertical extent of contamination, the following subsampling scheme will be used for the cores. The top 1 foot of the core will be collected as the surface sample. The vibracore subsurface sample will be subsampled at 1-foot intervals beyond the top 1 foot used for the surface sample. Therefore, the first subsample will be the 1- to 2-foot section below mudline, and the subsamples will continue in 1-foot segments (i.e., 2 to 3 feet, 3 to 4 feet, and so on). The number of subsamples that will be submitted will be determined in the field if subsurface sampling is deemed necessary. A representative sample of each remaining core section will be placed in a frozen archive for possible future analysis. These additional subsurface subsamples may be submitted for analysis depending on the chemistry results for the initial sections submitted for analysis.

3.6 Cap Thickness Verification Sampling

Piston core collected sediment samples will be used to confirm engineered pilot cap thicknesses in each of the in situ cap locations.

Subsurface sediment cores will be collected through the cap areas as described in the CQAP (Appendix A to the DAR) to confirm the thickness of the cap and validate the bathymetry data. A tiered approach to confirming cap thickness will be used. If field conditions make piston coring impossible from the surface, diver-assisted coring methods will be used.

A description of piston core collection methods are described in detail below.

3.6.1 Piston Core Procedures

- Maneuver the sampling vessel to the target sample location.
- Once the targeted area is deemed suitable for piston core collection, a 4-inch inside diameter, pre-cut, polycarbonate tube will be inserted into the piston corer.
- The core tubes will be decontaminated immediately prior to use following the procedures outlined in Section 4. Care will be taken during sampling to avoid contact of the sample tube with potentially contaminated surfaces. Extra sample tubes will be available during sample operations for uninterrupted sampling in the event of a potential core tube breakage or contamination. Core tubes suspected to have been accidentally contaminated will not be used.
- The piston depth will be set at approximately 3 feet above the surveyed sediment-water interface and the piston cable will be tied off to the deck of the vessel.
- The corer will be driven into the sediment with drive rods approximately 3 feet or until the core tube hits a hard surface.
- The corer will be retrieved slowly and steadily to avoid agitating the sample.
- Prior to lifting the core tube out of the water, a plug will be inserted into the bottom of the core tube to prevent sediment from slipping out of the bottom.

- During deployment and retrieval of the coring device, care will be taken to ensure that the end of the core tube does not become contaminated.
- When retrieved, each core will be inspected, and a physical description of the material at the mouth of the core will be entered into the core log.

3.6.2 Contingent Diver Team Collected Sediment Samples

Diver team collected sediment samples collected in the Remedial Action Area may be used to confirm engineered pilot cap thicknesses in each of the in situ cap locations if piston coring methods are unsuccessful. Dive team sediment collection methods include hand-operated push cores and the MudMole™ vibratory corer.

Subsurface sediment cores will be collected through the cap areas as described in the CQAP (Appendix A to the DAR) to confirm the thickness of the cap and validate the bathymetry data. A tiered approach to confirming cap thickness will be used. If field conditions make hand-operated push coring impossible, MudMole™ vibratory corers will be used.

Clearance from the Port engineering division will be required prior to diving field activities. The engineering team will need to provide approval that the piers and pilings are structurally sound to allow diving underneath and within them. No diving will be performed until this clearance is issued. Prior to field activities, sampling locations will be pre-plotted using visual recognition points and located using tape measures from known landmarks (e.g., pier pilings). Actual water depth will be measured using a lead line and recorded as NGVD.

Push core and MudMole™ vibratory core collection methods are described in detail below.

3.6.2.1 Hand-operated Push Core Procedures

After locating the sampling point, dive teams will descend and collect a surface sediment sample using a hand-operated push core. The core devices will consist of a

variety of lengths (1 foot, 2 feet, and 3 feet) of polycarbonate or acetate tube with a 4-inch diameter. Divers will push the core tube into the sediment approximately 3 feet or until the core tube hits hard substrate, whichever is shorter. Because it is possible that sediment conditions will be extremely soft, the core tubes may be fixed with a hand-operated valve on the top to help retain the sediment. After the divers push the cores into the sediment, they will place a plastic core cap on the bottom of the tube and withdraw the core from the sediment. The divers will then place a top cap on the tube and return to the surface, keeping the core upright. Upon surfacing, the divers will hand the core off to land-based personnel for processing.

If additional sediment is necessary to facilitate all analyses, additional cores may be collected. If multiple cores are necessary, the divers will not surface between cores and will place the completed cores into an upright core rack. All completed cores will be returned together.

3.6.2.2 Hand-operated Vibratory Sediment Sampling

In the event that divers encounter difficulties coring through the bottom substrate, a MudMole™ vibratory hand corer will be employed. The MudMole™ pneumatic linear hammer drives a 4-inch square aluminum core tube into bottom sediments. Data on the depth of penetration and sediment recovered are collected while the core tube is driven, thus providing an accurate picture of in situ conditions.

Divers will follow all procedures for hand-operated sampling detailed in Section 3.6.2.1.

4 DECONTAMINATION

To ensure accurate sampling and to minimize cross-contamination from one sample location to the next, proper decontamination techniques must be followed in the field. These techniques apply to small sampling equipment, field-dedicated equipment, disposable equipment, and personal protective clothing and PPE. Different techniques apply to different types of equipment.

Reusable equipment, such as personal protective clothing, must be washed with non-phosphate detergent and rinsed with tap water. When appropriate, disposable equipment should be disposed of in accordance with the waste management plan in Section 7 of this document.

Decontamination of small sampling equipment such as sampling devices, spoons, bowls, and mixing devices will be performed according to the following decontamination procedure:

- Wash with non-phosphate detergent
- Rinse with tap water
- Rinse with deionized water
- Allow to air dry

Field sampling equipment will not be decontaminated with solvents (e.g., methanol) unless free-phase petroleum product comes in contact with the equipment. If this occurs, a methanol rinse step will be added after the tap water rinse.

5 DOCUMENTATION, SAMPLE HANDLING, AND CHAIN OF CUSTODY

5.1 Documentation

Field activities and samples must be properly documented during the sampling process. Documentation of field activities provides an accurate and comprehensive record of the work performed sufficient for a technical peer to reconstruct the day's activities and provide certification that all necessary requirements were met. General requirements include:

- Use of bound field books as the primary source for information collection and recording. Field books should be dedicated to the project and appropriately labeled.
- Use of a Field Activity Log to formally document activities and events as a supplement to bound field books. The Field Activity Log can be a standard or project-specific form or a bound field book. Preprinted standard forms are available for many activities and should be used whenever possible. These forms will provide prompts and request additional information that may be useful and/or needed, and that the author is not aware of at the time. Project-specific field forms may be generated or existing forms may be modified to meet specific project needs. As required, client-supplied forms may be substituted.
- Appropriate header information documented on each page, including project title, project number, date, weather conditions, changes in weather conditions, other persons (if any) in the field party, and author. The specific information requested depends on the nature of the work being performed and on the form being used. Information fields that are not applicable should be noted "N/A" or with other appropriate notations.
- Field documentation entries using indelible ink.
- Legible data entries. A single line should be drawn through incorrect entries and the corrected entry should be written next to the original strikeout. Strikeouts are to be initialed and dated by the originator.
- Applicable units of measurement with entry values.
- Field records maintained in project files unless otherwise specified by a client or stipulated by a contract.

5.1.1 Documentation Entries

A chronology of field events will be recorded. General entry requirements include:

- Visitors to the site, including owner and regulatory representatives
- Summary of pertinent project communications with the client, regulators, or other site visitors
- Other contractors working on site
- A description of the day's field activities, in chronological sequence using military time notation (e.g., 9:00 am: 0900, and 5:00 pm: 1700)
- If applicable, calibration of measuring and test equipment and identification of the calibration standard(s) and use of a Calibration Log, if available, with cross-reference entered into the field book
- Field equipment identification, including type, manufacturer, model number, or other specific information
- General weather conditions, including temperature, wind speed, and direction readings, including time of measurement and units
- Safety and/or monitoring equipment readings, including time of measurements and units
- If applicable, reference in the field notebook to specific forms used for collection of data
- Subcontractor progress and/or problems encountered
- Changes in the scope of work
- Other unusual events

5.1.2 Specific Requirements

5.1.2.1 Sample Collection

Sample collection data will be documented in a bound field book and/or on a sample collection form. Where both are being used, information contained in one is cross-referenced to the other. Entries include:

- Sample identification number, location taken, depth interval, sample media, sample preservative, collection time, and date
- Sample collection method and protocol

- Physical description of the sample (standard classification system for soil)
- If a composite sample, the sample's make-up, including number and location of grab samples incorporated
- Quality-control-related samples collected (e.g., duplicates, blinds, trip blanks, field blanks)
- Container description and sample volume
- Pertinent technical data, such as pH, conductivity, temperature, and headspace reading
- Pertinent technical comments
- Identification of personnel collecting the sample

5.1.2.2 Sample Labeling

Sample labels must be prepared and attached to sample containers. Labels will either be provided by the laboratory performing the analyses or will be generated internally. The information to be provided includes:

- Sample identification number
- Sample date and collection time
- Physical description of the sample (e.g., water, solid, gas)
- Analytical parameters
- Preservatives, if present
- Sample location
- Client

5.1.2.3 Surface Sediment Collection

The field logbook will include clear information concerning surface collection activities. Sample Collection Forms (Figure 1) will be completed for each sediment grab. In addition to standard entries of personnel, date, and time, the log sheet will also include information regarding station coordinates, penetration of the sampler, and physical characteristics of the sediment such as texture, color, odor, stratification, and sheens.

5.1.2.4 Subsurface Core Logs

Subsurface sediment samples are to be recorded in bound field books and may be supplemented with prepared core collection forms (Figure 2). Personnel completing the log are to supply the following information:

- Names(s) of personnel logging boring
- Administrative and technical information included in the header
- Types of equipment used
- Subcontractor/driller used
- Descriptions of subsurface materials encountered and the number and type of samples collected, if any
- Subsurface exploration depth and units of measure
- Length of recovery
- Sample type and sample number for geotechnical or analytical samples collected (these data are also to be entered on the sample collection log, if used, and the sample label)
- Classification standard protocol used, if any (e.g., ASTM SPT)
- Narrative description of the soil (using standard classification system) and other pertinent information
- Description of consistency of cohesive soils

For vibracoring, sediment logging information will be recorded on a subsurface core log sheet (Figure 3).

5.1.3 Equipment Calibration Documentation

If field equipment requiring calibration is used, calibration will be performed on field parameter probes at the beginning of each day of intended use. Subsequent calibration during the day will be performed if needed (e.g., if an instrument malfunctions).

Records must be maintained for each piece of calibrated measuring and test equipment and each piece of reference equipment. The records must indicate that established calibration procedures have been followed.

Records for periodically calibrated equipment must include the following minimum information:

- Type and identification number of equipment
- Calibration frequency and acceptance tolerances
- Calibration dates
- The individual and organization performing the calibration
- Reference equipment and/or standards used for calibration
- Calibration data
- Certificates or statements of calibration provided by manufacturers and external organizations
- Documentation of calibration acceptance or failure and of repair of failed equipment

An individual file folder should be established to maintain records for each piece of measuring and testing equipment. Equipment calibration files should contain an equipment calibration and maintenance record, calibration data forms and/or certification of calibration provided by manufacturers or external organizations, and notice of equipment calibration failure.

Measuring and testing equipment used for field investigations will typically be calibrated as part of operational use. For this equipment, records of the calibrations or checks will be documented as part of the test data (e.g., in the field notebook). Equipment-specific forms may also be developed. These records should include information similar to that required for periodically calibrated equipment. Documentation related to malfunctioning equipment or equipment that fails calibration should also be included in the individual equipment file.

Calibration files for equipment requiring periodic calibration should be sent with equipment that is transferred to allow a continuously updated record to be maintained. Recalibration of sensitive equipment should be performed following the transfer. When measuring and testing equipment is rented or leased, procurement documents must

specify that a current certificate of calibration must accompany the equipment. This certificate must be maintained with the project documentation calibration records.

5.2 Sample Handling

5.2.1 Sample Identification

All samples must be properly identified on their labels as well as in any forms or other documentation. Sample identification for the Removal Action construction project will follow the naming scheme detailed below:

- All samples will have the prefix "T4" to identify them as Port of Portland Terminal 4 samples.
- Following T4, all samples will have the prefix "PI" to identify them as Phase I Removal Action samples.
- Following PI, the notations listed below will be used to identify each sample type:
  - Surface sediment – SS
  - Vibracore – VC
  - Dive Team – DT
- Following the sample type identification is the two-digit sample number.
- Following the sample number is the date in the form YYMMDD.

For samples that have depths associated with them (such as vibracores), the depth range (in feet) will follow the sample name. For example, T4-PI-VC-01-080719-1-3 would indicate vibracore sample number "01" taken on July 19, 2008, from 1 to 3 feet below the mudline.

5.2.2 Sample Labeling and Packing

All samples must be labeled and packed correctly before transport for laboratory testing. Sample containers will be obtained from the analytical laboratory. Each container will be labeled appropriately with all relevant information, including at a minimum:

- Sample type
- Project number and site name

- Sample number
- Date
- Time
- Sampler's initials

Samples will be stored and shipped in a properly packed container at 4°C. All samples will be delivered to the laboratory within 48 hours of the time of collection, with the possible exception of some samples collected on Friday or Saturday. In those cases, the samples will be stored at 4°C and shipped at the earliest allowable time.

5.3 Chain of Custody

An important component of data collection is the ability to demonstrate that the samples were obtained from the stated locations and that they reached the laboratory or archive without alteration. Evidence of collection, shipment, laboratory receipt, and laboratory custody until disposal or archive must be properly documented. Documentation will be accomplished through a Chain-of-Custody Record (COC) that documents each sample and identifies the individuals responsible for sample collection, shipment, and receipt. A sample is considered in custody if at least one of the following criteria is met:

- The sample is in a person's actual possession
- The sample is in unobstructed view, after being in the person's actual possession
- The sample is locked and only accessible by the custodian after having been in the person's actual possession
- The sample is in a secured area, restricted to authorized personnel (e.g., laboratory)

A laboratory typically will not accept samples for analysis without a correctly prepared COC form. The COC must be signed by each individual who has the sample in his/her custody. A COC is to be prepared for each sample shipped to a laboratory for analysis. Information on this form correlates with other supporting documentation, including sample labels and sample collection logs.

The COC accounts for the elapsed time and custodians of the sample from the time of its collection. The individuals who have physically handled the sample or witnessed initial sample collection and packaging (e.g., a sample team member) must be identified on the form. A sample team member relinquishes the sample by signing the COC. Individuals who either relinquish or receive samples must include their complete names, company affiliation, and the date and time the samples were relinquished. The times that the samples are relinquished and received by the next custodian should coincide, with the exception of transfer by commercial carriers. Commercial carriers will not be required to sign the COC.

If a sample is to be stored for a period of time (e.g., overnight), measures are to be taken to secure the sample container in a manner that provides only the custodian of record with access. If samples are relinquished to a commercial carrier (e.g., UPS, Federal Express), the carrier waybill number is recorded, and a copy of the waybill is attached to the COC. These documents are maintained with other field documentation. The original COC is sealed inside the shipping container with the samples.

If a correction is made to the COC, the correction should be made by the originator of the change, who will draw a single line through the error, initial and date the correction, and, if necessary, provide an explanation of the change. The documentation should have sufficient detail to clearly document the change to a third-party reviewer.

6 QUALITY ASSURANCE AND QUALITY CONTROL REQUIREMENTS

All analyses described in this SAP will be conducted in accordance with the standard QA/QC procedures described in the QAPP (Appendix I of the DAR). Analytical instruments will be maintained and calibrated regularly. Logbooks will be maintained for major field and laboratory instrumentation to document servicing, maintenance, and instrument modification.

6.1 Analytical Chemistry

Quality procedures are described for each analytical method in the QAPP (Appendix I of the DAR). The type and frequency of QA/QC samples analyzed by the laboratory will be according to the specified analytical method. Necessary corrective actions will be taken to address problems, according to the guidelines for a particular method. All corrective actions will be reported, along with any deviations from the standard protocols.

Results of all laboratory QA/QC analyses and anything that might affect the integrity of the results will be reported. Any deviations from the standard testing guidelines, QA/QC limits, and acceptability criteria will be reported, including a discussion of their effect on data validity. All data sheets will be checked to ensure that test conditions are within the protocol specifications, and project data will be reviewed to determine their usability for making suitability determinations. All QA/QC records and raw data will be kept on file for review for 10 years.

7 WASTE MANAGEMENT PLAN

This waste management plan presents the procedures that will be used to properly dispose of field-generated waste from the Phase I Removal Action Area field work. Waste disposal will fall into two categories:

- Sediment that is spilled on the vessel deck during surface sample collection and vibracoring and sediment from rejected cores will be washed into the surface water at the collection site.
- Waste in the category of disposable sampling materials and PPE will be placed in heavy-weight garbage bags or other appropriate containers.

All disposable sampling materials and PPE used in sample processing, such as disposable coveralls, gloves, and tubing, will be placed in heavyweight garbage bags or other appropriate containers. Disposable materials will be placed in an on-site refuse container for disposal at a solid waste landfill.

8 WATER QUALITY SAMPLE COLLECTION

Water quality grab samples will be collected during water quality monitoring procedures as described in the Water Quality Monitoring Plan (WQMP; Appendix B to the DAR). Grab samples will be collected to confirm that water quality chemistry standards as described in the WQMP are being met at the point of compliance during Removal Action construction activities. Additionally, field parameters will also be monitored during construction activities.

Specific sampling and analysis procedures for collection of water grab samples are provided in the WQMP (Appendix B to the DAR) and include the following information:

- Methods and equipment
- Sample location and depth control
- Sample identification
- Documentation
- Equipment calibration and maintenance
- Sample handling and custody
- Analytical parameters and methods

9 REFERENCES

U.S. Environmental Protection Agency (USEPA). 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA.

USEPA. 2001. Methods for Collection, Storage, and Maintenance of Sediments for Chemical and Toxicological Analyses.

FIGURES

Collection Date:
Date/Time Lab Drop Off:

Surface Sediment Field Sample Record

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

Sampling Crew: _____
Sampling Vessel: _____ Sampling Method: _____
Subcontractor(s): _____
Station Coordinates: N / Lat. _____ Weather: _____
E / W / Long. _____
Datum: NAD 83 / WGS 84 Zone:

Sample ID: _____
Analysis: SQO Metals /Hg (total) / SQO PCBs / SQO PAH; Phenols / SQO PAH; Phenols; Pthalates
TS / Grain Size / TOC / Moisture
(Circle Appropriate Analyses)

Grab Number: _____ Water Depth:_____ Penetration/Sampled Depth: _____ Time: _____
Bioassay

Sediment Type:	Sediment Color:	Sediment Odor:		Comments:
cobble	D.O.	none	H2S	
gravel	gray	slight	Petroleum	
sand C M F	black	moderate	other:	
silt clay	brown	strong		
organic matter	brown surface	overwhelming		

Grab Number: _____ Water Depth:_____ Penetration/Sampled Depth: _____ Time: _____
Chemistry

Sediment Type:	Sediment Color:	Sediment Odor:		Comments:
cobble	D.O.	none	H2S	
gravel	gray	slight	Petroleum	
sand C M F	black	moderate	other:	
silt clay	brown	strong		
organic matter	brown surface	overwhelming		

Grab Number: _____ Water Depth:_____ Penetration/Sampled Depth: _____ Time: _____
Chemistry (circle) AVS/SEM; Total Sulfides; VOC Sample (circle)

Sediment Type:	Sediment Color:	Sediment Odor:		Comments:
cobble	D.O.	none	H2S	
gravel	gray	slight	Petroleum	
sand C M F	black	moderate	other:	
silt clay	brown	strong		
organic matter	brown surface	overwhelming		

Grab Number: _____ Water Depth:_____ Penetration/Sampled Depth: _____ Time: _____
Chemistry (circle) AVS/SEM; Total Sulfides; VOC Sample (circle)

Sediment Type:	Sediment Color:	Sediment Odor:		Comments:
cobble	D.O.	none	H2S	
gravel	gray	slight	Petroleum	
sand C M F	black	moderate	other:	
silt clay	brown	strong		
organic matter	brown surface	overwhelming		

Recorded by:_____

Figure 1
Sample Collection Form
Terminal 4 Phase I Removal Action
Portland, Oregon

Sediment Core Collection Form

Station ID: _____ **Date:** _____

Project Name: _____ **Project Number:** _____

Coordinates:
Lat/Northing _____ Long/Easting: _____

Vertical Datum MLLW MLW Other:

Depth Measurement Sounder Leadline

Project Depth _____ **Overdredge** _____

	Attempt 1	Attempt 2	Attempt 3
Time:			
(A) Measured Water Depth			
(B) Tide Height			
(C) Mudline Elevation			
(-A+B = C include sign of tide height as reported)			
Estimated Penetration			
Description of Core Drive			
Refusal Encountered?			
Total Core Length			

Core Characteristics

Sediment Type	cobble, gravel, sand C M F , silt clay, organic matter	cobble, gravel, sand C M F , silt clay, organic matter	cobble, gravel, sand C M F , silt clay, organic matter
Sediment Color	gray, black, brown brown surface, olivine	gray, black, brown brown surface, olivine	gray, black, brown brown surface, olivine
Sediment Odor	None, slight, mod, strong H_2S, petroleum, septic	None, slight, mod, strong H_2S, petroleum, septic	None, slight, mod, strong H_2S, petroleum, septic
Any Layering Homogeneous			

Comments:

Recorded by: _____

Figure 2
Subsurface Core Collection Form
Terminal 4 Phase I Removal Action
Portland, Oregon

Visual Classification of Subsurface Core

ANCHOR ENVIRONMENTAL, L.L.C.

Job	Date
Job No.	Core Pushed By
Exploration No.	Core Logged By
Core No.	Type of Core ☐ Shelby ☐ Piston Core ☐ Other
Water Depth/Elevation of Core	Diameter of Core (inches)
Cored Length (feet; from log)	Core Quality ☐ Good ☐ Fair ☐ Poor ☐ Disturbed
Core Recovery (feet)	Average % Compaction =

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

Figure 3
Subsurface Core Log Form
Terminal 4 Phase I Removal Action
Portland, Oregon

APPENDIX I

DRAFT
QUALITY ASSURANCE PROJECT PLAN

TERMINAL 4 PHASE I REMOVAL ACTION
PORT OF PORTLAND, PORTLAND OREGON

DRAFT DOCUMENT: DO NOT QUOTE OR CITE
This document has not been reviewed or approved by USEPA and its federal, state and tribal partners and is subject to change in whole or in part.

Prepared for

Port of Portland

Prepared by

Anchor Environmental, L.L.C.
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January 2008

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1 INTRODUCTION

This quality assurance project plan (QAPP) describes the quality assurance and quality control (QA/QC) procedures that will be implemented as part of the construction phase for the Port of Portland's (Port's) Terminal 4 Phase I Removal Action. The purpose of the QAPP is to ensure that the data generated are of sufficient quality to meet the sampling objectives as described in the Design Analysis Report (DAR) and Construction Quality Assurance Plan (CQAP; Appendix A to the DAR). This QAPP was prepared in accordance with the U.S. Environmental Protection Agency's (USEPA's) Requirements for Quality Assurance Project Plans (USEPA 2001a), USEPA Guidance for Quality Assurance Project Plans (USEPA 1998), and USEPA Requirements for Quality Management Plans (USEPA 2001b). Chemistry analytical laboratory work will be performed in accordance with the specified analytical methods, the data quality objectives (DQOs), and this QAPP. The QAPP should be reviewed with the sampling and analysis plan (SAP; Appendix H to the DAR).

2 PROJECT ORGANIZATION AND RESPONSIBILITIES

2.1 Technical Project Manager

Mr. Tom Schadt is the Technical Project Manager and will work in conjunction with the Port's overall Project Manager, Ms. Anne Summers. Mr. Schadt will be responsible for overall project coordination, including review of procedures and documents relative to contractual commitments. Mr. Schadt will also be responsible for coordinating these tasks with the Project QA Manager, Project Chemist, Field Manager, and Health and Safety Officer. Mr. Schadt can be reached at:

Anchor Environmental, L.L.C.
1423 Third Avenue, Suite 300
Seattle, WA 98101
(206) 287-9130
tschadt@anchorenv.com

2.2 Project Quality Assurance Manager

Ms. Susan Snyder is the Project QA Manager. Ms. Snyder will be responsible for ensuring data quality for all sample collection efforts and supervising project quality assurance coordination. Ms. Snyder's responsibilities and duties include:

- Ensuring data of known and acceptable quality are generated
- Supervising the group that reviews and inspects all project-related laboratory activities
- Conducting audits of all laboratory activities

Ms. Snyder can be reached at:

Anchor Environmental, L.L.C.
1423 Third Avenue, Suite 300
Seattle, WA 98101
(206) 287-9130
ssnyder@anchorenv.com

2.3 Project Chemist

Dr. Todd Thornburg is the Project Chemist. Dr. Thornburg will be responsible for ensuring that all chemistry-related goals are attained and that sample collection and analytical activities are implemented in accordance with the SAP and QAPP. Dr. Thornburg can be reached at:

Anchor Environmental, L.L.C.
6650 SW Redwood Lane, Ste. 333
Portland, OR 97224
(503) 670-1108 X18
tthornburg@anchorenv.com

2.4 Chemistry Laboratory Project Manager

The contract chemistry laboratory for this project will be a qualified analytical laboratory with demonstrated expert capability in sediment and water chemistry analysis. Final selection of the laboratory and laboratory personnel is subject to the approval of the Project QA Manager and the Port. A back-up laboratory may be identified once the Phase I Removal Action construction sequencing is finalized. If additional analytical capacity is needed, this QAPP will be revised to include the requirements, responsibilities, and duties of the back-up laboratory.

The contract laboratory is expected to meet the following minimum requirements:

- Adhere to the methods outlined in the QAPP, including methods referenced for each analytical procedure
- 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 analysis plan requirements, and performance evaluation testing requirements
- Allow laboratory and data audits to be performed, if deemed necessary
- Follow documentation, chain-of-custody (COC), and sample logbook procedures

Once the analytical laboratory is chosen, a Chemistry Laboratory Project Manager will be named. The Chemistry Laboratory Project Manager will provide analytical support to this project and will be responsible for ensuring that all laboratory analyses meet the project DQOs and other specifications detailed in the SAP/QAPP. The Chemistry Laboratory Project Manager's responsibilities and duties include:

- Serving as primary communication link between Anchor and laboratory technical staff
- Monitoring workloads and ensuring availability of resources
- Overseeing preparation of analytical reports
- Supervising in-house COC

The Chemistry Laboratory Project Manager's contact information will be provided after the analytical laboratory has been selected.

2.5 Distribution List

The SAP and QAPP will be distributed to the USEPA and its team members as required in the Administrative Order on Consent (AOC). The SAP and QAPP will also be distributed to the Port, the Project Manager, Project QA Manager, Project Chemist, Chemistry Laboratory Project Manager, all field team members, and subcontractors.

2.6 Special Training Requirements/Certification

Training requirements are presented in Section 7 of the Health and Safety Plan (Appendix J to the DAR).

3 DATA QUALITY OBJECTIVES

DQOs (USEPA 2000) provide a qualitative and quantitative framework and series of planning steps based on the scientific method around which data collection programs can be designed. The use of DQOs ensures that:

- The objectives of the investigation are clearly defined.
- The type, quantity, and quality of environmental data used in decision making are appropriate for their intended application.
- Acceptable levels of decision error and performance goals are specified, such that the quantity and quality of data needed to support management decisions are provided.

The DQOs are further described below.

3.1 Data Use and Type

3.1.1 Data Use

Data collected for the construction phase will be used to assess and document the implementation of construction activities. The most important data needs for evaluating the construction activities are listed below.

For dredging:

- Confirm compliance with water quality standards during dredging

For capping:

- Confirm that the thickness of each cap area meets project specifications
- Confirm compliance with water quality standards during placement of cap material

For the transloading facility:

- Confirm compliance with Transportation and Disposal Plan (Appendix F to the DAR) specifications

3.2 Measurement Quality Objectives for Chemical Data

Reporting limit goals for sediment and water are presented in Tables 1 and 2, respectively.

The measurement of quality objectives for the chemistry data will assess precision, accuracy, representativeness, comparability, and completeness of the data (as detailed in Section 6.3 of this document). Laboratory-generated control limits will be used to assess analytical performance with regard to precision and accuracy. Data representativeness will be addressed by the sample quantities and locations identified in the DAR, Water Quality Monitoring Plan (Appendix B to the DAR), and SAP (Appendix H to the DAR). Data comparability will be achieved through the use of standard USEPA-approved methods. Data completeness will be assessed at the conclusion of analytical activities.

4 ANALYTICAL METHODS

Sampling will be performed in accordance with the methods presented in the SAP (Appendix H to the DAR). Soil samples and contingent sediment samples will be submitted for chemical analysis of Terminal 4 constituents of potential concern (COPCs) including:

- Total metals (cadmium, lead and zinc) by USEPA Method 6000/7000
- Semivolatile organic compounds (SVOCs), including polycyclic aromatic hydrocarbons (PAHs) and phthalates, by USEPA Method 8270D–selected ion monitoring (SIM)
- Total petroleum hydrocarbons (diesel-range and heavy oil-range) by NWTPH-D

Surface water samples will be submitted for chemical analysis of COPCs including:

- Dissolved metals (cadmium, lead and zinc) by USEPA Method 200.8
- SVOCs, including PAHs and phthalates, by USEPA Method 8270D–SIM
- Total suspended solids (TSS) by USEPA Method 160.2

Table 1 presents the methods of analysis and reporting limit goals for sediment samples. Table 2 presents the methods of analysis and reporting limit goals for water samples. The laboratory standard operating procedure (SOP) provided by the contracted analytical laboratory will describe the chemical analytical procedures in detail. These SOPs will be maintained in the analytical laboratory's file.

Based on the project DQOs, the level of support requested of the laboratory will be Level IV, as described by USEPA (1987). Level IV consists of using standard and modified standard methods with sufficient documentation to enable full validation of the data.

4.1 Reporting Limits

In general, reporting limit goals for sediment are based on dry weight and assume 50 percent total solids content in the sediment samples. If the total solids content is less than 50 percent, sample reporting limits will increase. Interferences in individual samples may also result in increased reporting limits. To achieve the required low reporting limits, some modifications to the methods may be necessary. These modifications from standard SW846 methodology protocol will be provided by the laboratory at the time of sample submittal,

and any modifications to the methods will be documented in the case narrative that accompanies the final report.

5 SAMPLE HANDLING, CHAIN-OF-CUSTODY, AND RECEIPT

Sample documentation is a critical aspect of environmental investigations. Sample possession and handling must be traceable from the time of sample collection, through laboratory and data analysis, to the time sample results are potentially introduced as evidence. A sample log form and field logbook entries will be completed for each location occupied and each sample collected. Documentation procedures for sampling are provided in greater detail in the SAP (Appendix H to the DAR).

5.1 Sample Containers, Preservation, and Holding Time Requirements

Pre-cleaned, certified sample containers, which will be provided by the contract analytical laboratory, must be used for all sediment and water samples that will be analyzed by the laboratory. Specific types and sizes of containers for each parameter, as well as holding time and preservation requirements, are listed in Table 3.

Sample containers for conventional parameters, metals, and organics will be cleaned to USEPA protocols. Certifications attesting to the cleanliness of pre-cleaned containers are required for containers used for organic analyses and will be maintained in the project file.

Sample custody seals and packing materials for filled sample containers will be provided by the analytical laboratory. The filled, labeled, and sealed containers will be placed in a cooler on ice (see below) and carefully packed to eliminate the possibility of container breakage.

5.2 Sample Packing, Handling, and Shipping

Sample packaging and shipment procedures are designed to ensure that the samples will arrive at the laboratory with the COC intact.

Samples will be packaged for shipment as outlined below:

1. Ensure that sample labels are securely affixed to sample containers with clear packing tape.
2. Check the caps on the sample containers to ensure that they are properly sealed.

3. Wrap sample container caps with clear packing tape to prevent them from loosening.
4. Complete the COC form with the required sampling information and ensure that the recorded information matches the sample labels. NOTE: If the designated sampler relinquishes the samples to other sampling or field personnel for packing or other purposes, the sampler will complete the COC prior to this transfer. The appropriate personnel will sign and date the COC form to document the sample custody transfer. If multiple coolers are shipped at one time, a separate COC should be prepared for each cooler.
5. Using duct tape, secure the outside drain plug at the bottom of the cooler.
6. Wrap sample containers in bubble wrap or other cushioning material.
7. Place 1 to 2 inches of cushioning material at the bottom of the cooler.
8. Place the sealed sample containers and a temperature blank in the cooler.
9. Place ice in plastic bags and seal. Place the ice-filled bags loosely in the cooler.
10. Fill the remaining space in the cooler with cushioning material.
11. Place COC forms in plastic bags and seal. Tape the forms to the inside of the appropriate cooler lid.
12. Close, lock, and secure the cooler lid with duct tape.
13. Wrap strapping tape around both ends of the cooler at least twice.
14. Mark the cooler on the outside with the following information: shipping address, return address, "Fragile" labels, and arrows indicating “this side up.” Cover the labels with clear plastic tape. Place a signed custody seal over the cooler lid.

Samples will be packaged by the field personnel and transported as low-concentration environmental samples. The samples will either be delivered by an express carrier or will be picked up by a laboratory courier. Shipments will be accompanied by the COC form identifying the contents. The original form will accompany the shipment; copies will be retained by the sampler for the sampling office records. If the samples are sent by common carrier, a bill of lading will be used. Receipts or bills of lading will be retained as part of the permanent project documentation. Commercial carriers are not required to sign off on the

COC form as long as the forms are sealed inside the sample coolers and the custody seals remain intact.

5.3 Sample Receipt

All samples received at the laboratory will be carefully checked for label identification and complete, accurate COC documentation. The condition of the samples will be checked, and the temperature blank will be measured and recorded (with a calibrated digital thermometer) immediately after the cooler is opened. These results, along with any questions or comments regarding sample integrity, will be recorded on the COC form (or the appropriate laboratory cooler receipt form). The laboratory will contact Anchor immediately if discrepancies between the samples and COC records are found upon receipt. If it is necessary for the receiving laboratory to ship samples to other laboratories, the COC form will be completed and will accompany the samples. A copy of the COC form (and cooler receipt form) will be faxed to Anchor on the day the samples were received and included in the final analytical data report.

Once received at the laboratory, the samples will be maintained at 4 ± 2°C, unless it is required that the samples be held at a lower temperature (not less than -20 ± 10°C) to extend their holding time.

If a sample container is received broken, a sample is received in an inappropriate container, or a sample has not been preserved by appropriate means, the laboratory will notify Anchor as soon as possible on the day of sample receipt. The laboratory sample custodian will be responsible for logging the samples in, assigning a unique laboratory identification number to each sample, labeling each sample bottle with its laboratory identification number, and moving the samples to appropriate storage locations to await analysis. The project name, field sample code, date sampled, date received, analysis required, storage location and date, and action for final disposition will be recorded in the laboratory tracking system. Relevant custody documentation will be placed in the project file.

6 QUALITY ASSURANCE PROCEDURES

6.1 Preventive Maintenance

Preventive maintenance of laboratory equipment generally will follow the guidelines recommended by the manufacturer. A malfunctioning instrument will be repaired immediately by in-house staff or through a service call to the manufacturer. If the instrument malfunction is of a nature to impact the project's turnaround time, this must be communicated to the Anchor Project QA Manager as soon as the malfunction is discovered so that contingencies for analysis can be coordinated.

Maintenance schedules for laboratory equipment will adhere to the manufacturers' recommendations. Records will reflect the complete history of each instrument and specify the time frame for future maintenance. Major repairs or maintenance procedures will be performed through service contracts with manufacturers or qualified contractors. Paperwork associated with service calls and preventive maintenance calls will be kept on file by the laboratory.

Laboratory systems managers are responsible for the routine maintenance of instruments used in a particular laboratory. Any routine preventive maintenance carried out is logged into the appropriate logbooks. Routine and non-routine maintenance schedules and procedures will be performed in accordance with the laboratory's quality assurance manual.

All major instruments will be backed up by comparable (if not equivalent) instrument systems in the event of unscheduled downtime. An inventory of spare parts will also be available to minimize equipment/instrument downtime.

6.2 Calibration Procedures and Frequency

When analyses are conducted according to USEPA methods, the calibration procedures and frequencies specified in the applicable method will be followed. For analyses governed by SOPs, see the appropriate laboratory SOP for the required calibration procedures and frequencies. Records of calibrations will be filed and maintained by the laboratory. These

records will be subject to QA audit. For all instruments, the laboratory will maintain trained repair staff and in-house spare parts or will maintain service contracts with vendors.

All standards used in the calibration of equipment will be traceable, directly or indirectly, to the National Institute of Standards and Technology, Environmental Resource Associates, National Research Council of Canada, or other documented, reliable, commercial sources. All standards received shall be logged into standard receipt logs maintained by the individual analytical groups. Each group shall maintain a standards log that tracks the preparation of standards used for calibration and QC purposes.

6.3 Laboratory Quality Control Requirements

6.3.1 Quality Assurance Indicators

The overall QA objective of this QAPP is to develop and implement procedures for sampling, COC, laboratory analysis, instrument calibration, data reduction and reporting, internal quality control, audits, preventive maintenance, and corrective action such that valid data will be generated. These procedures are presented or referenced in the following sections of the QAPP. Specific QC checks are discussed in Section 6.5 of this document.

Quality assurance indicators are generally defined in terms of five parameters:

- Precision
- Accuracy
- Representativeness
- Comparability
- Completeness

Each parameter is defined below. Specific sampling objectives for the Phase I Removal Action are set forth in other sections of this QAPP as referenced below.

6.3.2 Precision

Precision is a measure of the reproducibility of sample results. The goal is to maintain a level of analytical precision consistent with the objectives of the action. To maximize precision, sampling and analytical procedures will be followed. All work for this project will adhere to established protocols as presented in the QAPP. Analytical precision will be measured through matrix spike/matrix spike duplicates (MS/MSDs) and laboratory control sample/laboratory control sample duplicates (LCS/LCSDs) for organic analyses and through laboratory duplicate samples and MS for inorganic analyses. Analytical precision measurements will be carried out on project-specific samples at a minimum frequency of one per laboratory analysis group or one in 20 samples, whichever is more frequent, per matrix analyzed. Laboratory precision will be evaluated against laboratory control limits established under the USEPA method for that analysis.

Field precision will be evaluated by the collection of blind field duplicates at a frequency of 10 percent. Field duplicate precision will be screened against a relative percent difference (RPD) of 50 percent for water samples and 75 percent for sediment samples.

The equation used to express precision is:

$$RPD = \frac{(A-B)}{(A+B)\ /2} \times 100$$

Where:

A = Analytical result from one of two duplicate measurements

B = Analytical result from the second measurement

Precision will generally be evaluated against laboratory control limits. Precision measurements can be affected by how close a chemical concentration is to the reporting limit, which can increase the percent error (expressed as RPD). When a sample or duplicate concentration is within five times the reporting limit, alternative control limits recommended by the USEPA (1999, 2002) of +/- the reporting limit for water samples and two times +/- the reporting limit for sediment samples will be used.

6.3.3 Accuracy

Accuracy is a measure of how close a measured result is to the true value. Both field and analytical accuracy will be monitored through initial and continuing calibration of instruments. In addition, reference standards, MS, blank spikes, LCS, and surrogate standards will be used to assess the accuracy of the analytical data. Accuracy measurements on MS samples will be carried out at a minimum frequency of one in 20 samples per matrix analyzed. Because MS/MSDs measure the effects of potential matrix interferences for a specific matrix, the laboratory will perform MS/MSDs only on project-specific samples. Surrogate recoveries will be determined for every sample analyzed for organics.

Laboratory accuracy will be evaluated against laboratory control limits established under the USEPA method for that analysis. Accuracy can be expressed as a percentage of the true or reference value, or as a percent recovery in those analyses where reference materials are not available and spiked samples are analyzed. The equation used to express accuracy is:

$$\text{Percent Recovery} = \frac{A-X}{B} \times 100$$

Where:

A = Value measured in spiked sample or standard

X = Value measured in original sample

B = True value of amount added to sample or true value of standard

6.3.4 Representativeness

Representativeness is the degree to which sampling data accurately and precisely represent conditions in, for this project, the Removal Action Area. Representativeness is dependent on sampling and analytical variability and the variability of environmental media. The SAP (Appendix H to the DAR) has been designed to assess the presence of

the chemical constituents at the time of sampling and presents the rationale for sample quantities and sampling locations. In addition, the use of the prescribed field and laboratory analytical methods, with their associated holding times and preservation requirements, is intended to provide representative data.

6.3.5 Comparability

Comparability is the degree of confidence with which one data set can be compared to another. Comparability will be maintained through consistent use of the sampling and analytical methodologies set forth in this QAPP and through the use of established QA/QC procedures and appropriately trained personnel.

6.3.6 Completeness

Completeness is defined as a measure of the amount of valid data obtained from an event or investigation compared to the total amount that was obtained. Completeness will be calculated as follows:

C = [(number of acceptable data points) x 100]/(total number of data points collected)

The DQO for completeness for all components of this project is 90 percent. Data 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.

6.4 Field Quality Control Checks

Field QC samples will be analyzed to identify possible problems resulting from sample collection or sample processing in the field. All field QC samples will be documented in the field logbook and verified by the Project QA Manager or designee.

6.4.1 Field Equipment Blanks

Field equipment blanks are used to determine whether cross contamination has occurred during sampling. A minimum of one rinsate blank of the coring or grab

sample device will be submitted for each 20 cores or grabs collected. No rinsate blank will be required for surface water samples because dedicated equipment will be used.

6.4.2 Field Duplicates

For sediment samples, a minimum of one field duplicate will be collected per 20 samples submitted for analysis. Field duplicates for surface water samples will be collected at the same frequency.

6.5 Analytical Laboratory Quality Control Checks

Internal laboratory QC checks will be used to monitor data integrity. These checks will include method blanks, MSs (and MSDs), LCSs (and LCSDs), spike blanks, internal standards, surrogate samples, calibration standards, and reference standards. Laboratory control limits will be used to evaluate MS/MSD, LCS/LCSD, and surrogate recoveries. Laboratory control charts will be used to determine long-term instrument trends.

Results of 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 whether control limits have been exceeded. If control limits are exceeded in the sample group, the Project QA Manager will be contacted immediately, and corrective action (e.g., method modifications followed by reprocessing of the affected samples) will be initiated prior to processing a subsequent group of samples.

All primary chemical standards and standard solutions used in this project will be traceable to the National Institute of Standards and Technology, Environmental Resource Associates, National Research Council of Canada, or other documented, reliable, commercial sources. Standards will be validated to determine their accuracy by comparison with an independent standard. Any impurities found in a standard will be documented.

6.5.1 Method Blanks

Sources of contamination in the analytical process, whether specific analyses or interferences, need to be identified, isolated, and corrected. The method blank is useful

in identifying possible sources of contamination within the analytical process. For this reason, it is necessary that the method blank be initiated at the beginning of the analytical process and encompass all aspects of the analytical work so that the method blank can assist in accounting for any potential contamination attributable to glassware, reagents, instrumentation, or other sources. One method blank will be analyzed with each analytical series associated with no more than 20 samples.

6.5.2 Laboratory Control Samples

LCS will be used; they will either be developed and spiked by the laboratory, or laboratory standards will be used.

6.5.3 Matrix Spike/Matrix Spike Duplicate

Site-specific MS/MSDs will be used to measure the accuracy of analyte recovery from the sample matrices. Matrix spike duplicate pairs will be analyzed at a frequency of 5 percent (every 20 samples or once every week, whichever comes first).

When MS recoveries are outside QC limits, associated control sample and surrogate spike recoveries will be evaluated, as applicable, to attempt to verify the reason for the deviation and determine the effect on the reported sample results.

6.5.4 Surrogate Spikes

Surrogates are compounds that are unlikely to occur under natural conditions and that have properties similar to the analytes of interest. Surrogates are added to the samples prior to purging or extraction and are primarily used for organic samples analyzed by gas chromatography/mass spectrometry and gas chromatography methods. The surrogate spike provides broader insight into the proficiency and efficiency of an analytical method on a sample-specific basis. This control reflects analytical conditions that may not be attributable to the sample matrix. All project samples analyzed for organic compounds will be spiked with appropriate surrogate compounds as defined in the analytical methods.

If surrogate spike recoveries exceed specified QC limits, then the analytical results will be evaluated thoroughly in conjunction with other control measures. In the absence of other control measures, the integrity of the data may not be verifiable and reanalysis of the samples with additional control may be necessary.

Surrogate spike compounds will be selected on the basis of guidance provided in the analytical methods.

6.5.5 Laboratory Duplicates

For inorganic analyses, laboratory duplicates will be analyzed to assess laboratory precision. A laboratory duplicate is defined as a separate aliquot of an individual sample that is analyzed as a separate sample.

6.5.6 Calibration Standards

Calibration check standards analyzed within a particular analytical series provide insight regarding instrument stability. A calibration check standard will be analyzed at the beginning and end of an analytical series and periodically throughout a series that contains a large number of samples.

In general, calibration check standards will be analyzed after every 12 hours, or more frequently as specified in the applicable analytical method. If results of the calibration check standard exceed specified tolerances, then samples analyzed since the last acceptable calibration check standard will be reanalyzed.

6.5.7 Reference Standards/Control Samples

Reference standards are standards of known concentration and are independent in origin from the calibration standards. Reference standard analysis provides insight into analytical proficiency within an analytical series, including the preparation of calibration standards, the validity of calibration, sample preparation, instrument setup, and the premises inherent in quantitation. Reference standards will be analyzed at the frequencies specified within the analytical methods.

For samples that are analyzed for metals by graphite furnace, an analytical spike will be analyzed after each sample analysis.

7 DATA MANAGEMENT

All data will undergo two levels of QA/QC evaluation: one at the laboratory and one by a qualified independent data validator. Initial data reduction, evaluation, and reporting at the laboratory will be carried out as described in the appropriate analytical protocols and the laboratory's QA manual. QC data resulting from methods and procedures described in this document will also be reported.

7.1 Sample Management

All laboratory analytical batches will be assigned a unique number and tracking identifier at the laboratory. All data reports will include this tracking number. The laboratory will use a laboratory information management system to track all samples throughout the analytical stream.

7.2 Data Reporting

Analytical chemistry results will be provided by the laboratory in both digital and hard-copy formats. Upon receipt of each analytical package, the original COC form will be placed in the project files. The data packages will be examined to ensure that the correct analyses were performed for each sample submitted and that all of the analyses requested on the COC form were performed. If discrepancies are noted, the Project QA Manager will be notified and will promptly follow up with the laboratory to resolve any issues.

Any data that does not meet the specified standards will be flagged pending resolution of the issue. The flag will not be removed from the data until the issue associated with the sample results is resolved. Although flags may remain for certain data, the use of that data may not necessarily be restricted.

Following completion of data validation, the digital files will be used to generate the appropriate report tables. The format for the electronic data deliverable (EDD) specifies one data record for each constituent for each sample analyzed. Specific fields include:

- Sample identification number
- Date sampled

- Date analyzed
- Parameter name
- Analytical result
- Units
- Detection limit
- Qualifiers

The individual EDDs will be supplied by the laboratory in the EQuIS electronic format. Laboratory data, which is electronically provided 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. All manually entered data will be backchecked by a second party. Data tables and reports are exported from EQuIS to Microsoft Excel tables.

Any analytical data that cannot be provided by the laboratory in electronic format will be entered manually. After entry into the database, the EDD data will be compared to the field information previously entered into the database to confirm that all requested analytical data have been received.

7.3 Data Management Procedures

A record of all field documentation, as well as analytical and QA/QC results, will be maintained to ensure the validity of the data. To effectively execute such documentation, carefully constructed sample tracking and data management procedures will be used throughout the sampling program.

Sample tracking will begin with the completion of COC forms, as described in the SAP (Appendix H to the DAR) and summarized in Section 5 of this QAPP. Copies of all completed COC forms will be maintained in the field office. The laboratory shall verify receipt of the samples electronically (via fax) on the following day.

When analytical data are received from the laboratory, the Project Chemist will review the incoming analytical data packages against the information on the COCs to confirm that the correct analyses were performed for each sample, and that results were received for all samples submitted for analysis. Any discrepancies noted will be promptly followed up by the Project Chemist.

7.3.1 Laboratory Turnaround Time

Laboratory turnaround time for water quality monitoring samples is described in detail in the Water Quality Monitoring Plan (Appendix B to the DAR). Turnaround times for dredge confirmation sampling will be determined during the next phase of design.

7.3.2 Archival/Retention Requirements

Archival sediment samples will be stored in the dark at -20 ± 10°C. After analysis is performed and prior to the 14 days from the time of collection, samples will be frozen for possible reanalysis. Samples will be frozen at -20 ± 10°C. Samples will be retained for one year after collection date. The laboratory will notify the Project QA Manager prior to disposing of any samples.

8 DATA ASSESSMENT PROCEDURES

Once the data are received from the laboratory, a number of QC procedures will be followed to accurately evaluate data quality and assess data precision, accuracy, and completeness.

8.1 Data Quality Control Review

Chemistry data will be subject to multilevel review by the selected analytical laboratory. The group leader will review all data reports prior to their release for final data report generation. The laboratory QA manager will review the final data reports, and the laboratory project manager will review a cross section of the final data reports prior to shipment to Anchor.

If discrepancies or deficiencies exist in the analytical results, then corrective action will be taken, as discussed in Section 9.

8.2 Data Evaluation and Verification

Ten to 20 percent of the data will undergo Level IV data validation, and the remainder of the data will undergo Level III data validation, in accordance with the USEPA's Functional Guidelines (USEPA 1999 and 2002). The data validation classifications of Level III and Level IV are derived from the USEPA Contract Laboratory Program (CLP; USEPA 1987). Level III data validation consists of reviewing COC forms; holding times; field, trip, and method blanks; surrogate, MS/MSD, and LCS/LCSD recoveries; field duplicate, laboratory duplicate, MS/MSD, and LCS/LCSD RPDs; and reporting limits. Level IV data validation consists of a full data validation, including a review of raw data.

Level III data validation is comparable to the Puget Sound Dredge Disposal Analysis quality assurance 1 (QA1) data review, and Level IV data validation is comparable to the Puget Sound Dredge Disposal Analysis quality assurance 2 (QA2) data review (Washington State Department of Ecology 1989). For consistency with the chemistry analytical work that will be performed in accordance with CLP protocols, data collected as part of the Phase I Removal Action construction phase will also be validated in accordance with the CLP (i.e., Level III and Level IV data validation will be performed).

Initially, 10 percent of the data will undergo a Level IV data validation. If the USEPA recommends that more than 10 percent of the data undergo a Level IV data validation following its review of the first sediment data package, the Port will discuss additional Level IV data validation with the USEPA at that time.

The contract analytical laboratory will deliver complete data packages for all chemical analyses. The data will be evaluated in accordance with the QAPP.

The third-party, independent data validator will perform data validation on all chemistry data generated using the USEPA's Functional Guidelines (USEPA 1999 and 2002). These procedures and criteria may be modified as necessary to address project-specific and method-specific criteria, control limits, and procedures. Data evaluation will consist of data screening, checking, reviewing, editing, and interpretation to document analytical data quality and to determine whether the quality is sufficient to meet the DQOs. Data evaluation will include a review of completeness and compliance.

Any deviations from analytical methods or any special reporting requirements apart from those specified in this QAPP will be detailed on COC forms. The data validator will verify that reduction of laboratory measurements and laboratory reporting of analytical parameters are in accordance with the procedures specified for each analytical method and/or as specified in this QAPP.

The results of the data validation, including text assigning qualifiers in accordance with the USEPA's Functional Guidelines (USEPA 1999 and 2002) and a tabular summary of qualifiers, will be generated by the data validator.

Deficiencies discovered as a result of the data validation, as well as the corrective actions implemented in response, will be documented and submitted in the form of a written report addressing the following topics, as applicable to each method:

- Assessment of the data package

- Description of any protocol deviations
- Failures to reconcile reported and/or raw data
- Assessment of any compromised data
- Overall appraisal of the analytical data
- Table of site name, sample quantities, matrix, and fractions analyzed.

It should be noted that qualified data are not necessarily invalid if they are of sufficient quality to meet the intended use. The goal of producing the best possible data does not necessarily mean producing data without QC qualifiers. Qualified data can provide useful information.

Resolution of any issues regarding laboratory performance or deliverables will be handled between the laboratory and the Project Chemist. During that process, the Project QA Manager may make suggestions for reanalysis.

Data validation reports will be kept in the project file at the Anchor office in Seattle, Washington.

9 LABORATORY AUDITS AND CORRECTIVE ACTIONS

Laboratory and field performance audits and corrective action procedures are described in this section.

9.1 Laboratory and Field Performance Audits

Laboratory and field performance audits consist of onsite reviews of QA systems and equipment for sampling, calibration, and measurement. Laboratory audits will not be conducted for the construction phase; however, all laboratory audit reports will be made available to the Project QA Manager upon request. All laboratories are required to have written procedures addressing internal QA/QC; these procedures will be submitted and will be reviewed by the Project QA Manager to ensure compliance with this QAPP. All laboratories must ensure that personnel engaged in sampling and analysis tasks have appropriate training.

The laboratory will, as part of the audit process, provide written details of any and all planned modifications for Anchor's review.

9.2 Corrective Action Procedures

9.2.1 Corrective Action for Field Sampling

The Field Coordinator will be responsible for correcting equipment malfunctions during the field sampling effort. The Project QA Manager will be responsible for resolving situations in the field that may result in non-compliance with the QAPP. All corrective measures will be immediately documented in the field logbook.

9.2.2 Corrective Action for Laboratory Analyses

The laboratory is required to submit and comply with its SOPs. The laboratory project manager will be responsible for ensuring that appropriate corrective actions are initiated as required for conformance with the QAPP. All laboratory personnel will be responsible for reporting problems that may compromise the quality of the data.

The Project QA Manager will be notified immediately if any QC sample exceeds the laboratory control limits. The analyst will identify and correct the anomaly before continuing with the sample analysis. The laboratory project manager will document the corrective action taken in a memorandum submitted to the Project QA Manager within 3 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.

10 REFERENCES

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TABLES

Table 1
Analytical Extraction/Cleanup Methods, Test Methods, and Reporting Limit Goals for Sediment Samples

Chemical Parameter	Extraction/Cleanup Method	Analytical Method	Reporting Limit Goal
Metals (µg/kg)			
Cadmium	USEPA Method 3050	USEPA Method 6000/7000	20
Lead	USEPA Method 3050	USEPA Method 6000/7000	100
Zinc	USEPA Method 3050	USEPA Method 6000/7000	600
Semivolatile Organic Compounds (µg/kg)			
PAHs (µg/kg)			
Naphthalene	USEPA Method 3541	USEPA Method 8270C-SIM	20
Acenaphthylene	USEPA Method 3541	USEPA Method 8270C-SIM	20
Acenaphthene	USEPA Method 3541	USEPA Method 8270C-SIM	20
Fluorene	USEPA Method 3541	USEPA Method 8270C-SIM	20
Phenanthrene	USEPA Method 3541	USEPA Method 8270C-SIM	20
Anthracene	USEPA Method 3541	USEPA Method 8270C-SIM	20
2-Methylnaphthalene	USEPA Method 3541	USEPA Method 8270C-SIM	20
1-Methylnaphthalene	USEPA Method 3541	USEPA Method 8270C-SIM	20
Biphenyl	USEPA Method 3541	USEPA Method 8270C-SIM	20
2,6-Dimethylnaphthalene	USEPA Method 3541	USEPA Method 8270C-SIM	20
2,3,5-Trimethylnaphthalene	USEPA Method 3541	USEPA Method 8270C-SIM	20
Fluoranthene	USEPA Method 3541	USEPA Method 8270C-SIM	20
Pyrene	USEPA Method 3541	USEPA Method 8270C-SIM	20
Benzo(a)anthracene	USEPA Method 3541	USEPA Method 8270C-SIM	6.7
Chrysene	USEPA Method 3541	USEPA Method 8270C-SIM	6.7
Benzo(b)fluoranthene	USEPA Method 3541	USEPA Method 8270C-SIM	6.7
Benzo(k)fluoranthene	USEPA Method 3541	USEPA Method 8270C-SIM	6.7
Benzo(a)pyrene	USEPA Method 3541	USEPA Method 8270C-SIM	6.7
Ideno(1,2,3-cd)pyrene	USEPA Method 3541	USEPA Method 8270C-SIM	6.7
Dibenz(a,h)anthracene	USEPA Method 3541	USEPA Method 8270C-SIM	6.7
Benzo(g,h,i)perylene	USEPA Method 3541	USEPA Method 8270C-SIM	6.7
Benzo(e)pyrene	USEPA Method 3541	USEPA Method 8270C-SIM	20
Perylene	USEPA Method 3541	USEPA Method 8270C-SIM	20
Phthalates (µg/kg)			
Dimethyl phthalate	USEPA Method 3541	USEPA Method 8270C-SIM	20
Diethyl phthalate	USEPA Method 3541	USEPA Method 8270C-SIM	20
Di-n-butyl phthalate	USEPA Method 3541	USEPA Method 8270C-SIM	20
Butyl benzyl phthalate	USEPA Method 3541	USEPA Method 8270C-SIM	20
Bis(2-ethylhexyl)phthalate	USEPA Method 3541	USEPA Method 8270C-SIM	20
Di-n-octyl phthalate	USEPA Method 3541	USEPA Method 8270C-SIM	20
TPH (mg/kg)			
Diesel-range petroleum hydrocarbons	Acid/silica gel	NWTPH-D	0.25
Heavy oil-range petroleum hydrocarbons	Acid/silica gel	NWTPH-D	0.5
Conventionals (%)			
Total Solids	--	USEPA Method 160.3	0.01

Notes:

All units are in dry weight.

Actual reporting limits may vary depending on sample moisture content and possible matrix interference.

Table 2
Analytical Test Methods and Reporting Limit Goals for Water Samples

Chemical Parameter	Analytical Method	Reporting Limit Goal
Metals (mg/L)		
Cadmium	USEPA Method 200.8	20
Lead	USEPA Method 200.8	20
Zinc	USEPA Method 200.8	10
Semivolatile Organic Compounds (µg/L)		
PAHs (µg/L)		
Naphthalene	USEPA Method 8270C-SIM	10
Acenaphthylene	USEPA Method 8270C-SIM	10
Acenaphthene	USEPA Method 8270C-SIM	10
Fluorene	USEPA Method 8270C-SIM	10
Phenanthrene	USEPA Method 8270C-SIM	10
Anthracene	USEPA Method 8270C-SIM	10
2-Methylnaphthalene	USEPA Method 8270C-SIM	10
1-Methylnaphthalene	USEPA Method 8270C-SIM	10
Biphenyl	USEPA Method 8270C-SIM	10
2,6-Dimethylnaphthalene	USEPA Method 8270C-SIM	10
2,3,5-Trimethylnaphthalene	USEPA Method 8270C-SIM	10
1-Methylnaphthalene	USEPA Method 8270C-SIM	10
Fluoranthene	USEPA Method 8270C-SIM	10
Pyrene	USEPA Method 8270C-SIM	10
Benzo(a)anthracene	USEPA Method 8270C-SIM	10
Chrysene	USEPA Method 8270C-SIM	10
Total benzofluoranthenes	USEPA Method 8270C-SIM	10
Benzo(a)pyrene	USEPA Method 8270C-SIM	10
Ideno(1,2,3-cd)pyrene	USEPA Method 8270C-SIM	10
Dibenz(a,h)anthracene	USEPA Method 8270C-SIM	10
Benzo(g,h,i)perylene	USEPA Method 8270C-SIM	10
Benzo(e)pyrene	USEPA Method 8270C-SIM	10
Perylene	USEPA Method 8270C-SIM	10
Phthalates (µg/L)		
Dimethyl phthalate	USEPA Method 8270C-SIM	10
Diethyl phthalate	USEPA Method 8270C-SIM	10
Di-n-butyl phthalate	USEPA Method 8270C-SIM	10
Butyl benzyl phthalate	USEPA Method 8270C-SIM	10
Bis(2-ethylhexyl)phthalate	USEPA Method 8270C-SIM	10
Di-n-octyl phthalate	USEPA Method 8270C-SIM	10
TPH (mg/L)		
Diesel-range petroleum hydrocarbons	NWTPH-D	250
Heavy oil-range petroleum hydrocarbons	NWTPH-D	500
Conventionals (mg/L)		
TSS	USEPA Method 160.2	1

Table 3
Sediment Sample Container, Preservation, and Holding Times

Chemical Analysis	Sample Container	Preservative	Holding Time
Metals[a]	1 8 oz. G	R	6 months
SVOC	1 16 oz. G	R	14 days/40 days[b]
TPH	1 8 oz. G	R	14 days/40 days[b]

Notes:

G=Glass, P=Plastic, R=Refrigerate at 4°C

a Metals include cadmium, lead, and zinc.

b Holding times are days until analytical extraction/days until extraction analysis

APPENDIX J

DRAFT
HEALTH AND SAFETY PLAN

TERMINAL 4 PHASE I REMOVAL ACTION
PORT OF PORTLAND, PORTLAND OREGON

DRAFT DOCUMENT: DO NOT QUOTE OR CITE
This document has not been reviewed or approved by USEPA and its federal, state and tribal partners and is subject to change in whole or in part.

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January 2008

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1 INTRODUCTION

1.1 General

This health and safety plan (HASP) has been prepared as an appendix to the Port of Portland (Port) Terminal 4 Phase I Removal Action Design Analysis Report (DAR). The objective of the project is to conduct environmental investigation activities at the Terminal 4 Phase I Removal Action Area during the construction phase as described in the DAR, the Sampling and Analysis Plan (SAP; Appendix H to the DAR), and the Quality Assurance Project Plan (QAPP; Appendix I to the DAR). The purpose of the investigation activities is to collect chemical data to be used to monitor and verify construction activities during the Removal Action, as required by an Administrative Order on Consent (the AOC) between the U.S. Environmental Protection Agency (USEPA) and the Port. Field activities will include the following tasks:

- Mobilization
- Surface water sampling
- Soil sampling
- Contingent sediment sampling
- Contingent dive operations
- Decontamination
- Demobilization

The objective of this HASP is to provide a mechanism for establishing safe working conditions during field activities within the Phase I Removal Action Area. Note that only surface water and soil sampling are currently scoped for the Phase I Removal Action Project. This HASP also includes sediment sampling and dive operations as contingent components, as these activities may be performed before, during, or after the Phase I work due to spills or other unforeseen reasons. The safety organization, procedures, and protective equipment have been established based on an analysis of potential physical, chemical, and biological hazards. Specific hazard control methodologies have been evaluated and selected to minimize the potential of injury, illness, or other hazardous incident.

1.2 Removal Action Area Description

The Terminal 4 Phase I Removal Action Area encompasses sediments within Terminal 4 at 11040 North Lombard, Portland, Oregon. The Removal Action Area extends west from the ordinary high water line on the northeast bank of the lower Willamette River to the edge of the navigation channel and south from the downstream end of Berth 414 to the downstream end of Wheeler Bay, including Slip 3.

The only tenant associated with these areas of Terminal 4 is Kinder Morgan. Kinder Morgan operates a bulk loading facility at Slip 3 for export of soda ash and/or unloading of bulk cargo from rail. In addition, tugboats occasionally moor at structures north of Berth 414 while they are waiting to assist vessels in Slip 3.

1.3 Policy Statement

This HASP prescribes the procedures that must be followed during activities at the Removal Action Area. Operational changes that could affect the health and safety of personnel, the community, or the environment will not be made without prior approval of the Project Manager and the Health and Safety Officer (HSO). This document will be reviewed periodically to confirm that it is current and technically correct. Any changes in conditions at the Removal Action Area and/or the scope of work will require a review of and modification to this HASP. Such changes will be completed in the form of an addendum or a revision to the HASP.

The provisions of this HASP are mandatory for all Anchor personnel and Anchor subcontractors assigned to the project. Subcontractors may prepare their own site-specific HASPs that must meet the basic requirements of this HASP. All visitors to Anchor work areas must abide by the requirements of this HASP.

This HASP complies with applicable state and federal Occupational Safety and Health Administration (OSHA) and USEPA regulations. This plan follows the guidelines established in the references listed in Section 9.

1.4 Definitions

The following definitions (listed alphabetically) are applicable to this HASP:

- Contamination-Reduction Zone (CRZ) – Area between the exclusion zone and support zone that provides a transition between contaminated and clean areas. Decontamination stations are located in this zone.
- Exclusion Zone (EZ) – Any portions of the site where hazardous substances are present, or are reasonably suspected to be present, and pose an exposure hazard to on-site personnel.
- Incident – All losses, including first-aid cases, injuries, illnesses, near misses, spills/leaks, equipment and property damage, motor vehicle accidents, regulatory violations, fires, and business interruptions.
- Near Miss – An incident in which no injury, illness, motor vehicle accident, equipment or property damage, etc., occurred, but in which, under slightly different circumstances, such injury could have occurred.
- On-site Personnel – All Anchor and subcontractor personnel involved with the project.
- Project – All on-site work performed under the scope of work.
- Site – The area described in Section 1.2, Removal Action Area Description, where the work is to be performed by Anchor personnel and subcontractors.
- Support Zone (SZ) – All areas of the site, except the EZ and CRZ. The SZ surrounds the CRZ and EZ. Support equipment and break areas are located in this zone.
- Subcontractor – Includes contractor personnel hired by Anchor.
- Visitor – All other personnel, except the on-site personnel.
- Work Area – The portion of the site where work activities are actively being performed. This area may change daily as work progresses and includes the SZ, CRZ, and EZ. If the work area is located in an area on site that is not contaminated or suspected of being contaminated, the entire work area may be an SZ.

2 ROLES AND RESPONSIBILITIES

2.1 All Personnel

All Anchor and subcontractor personnel must adhere to the procedures outlined in this HASP during the performance of their work. Each person is responsible for completing tasks safely and for reporting any unsafe acts or conditions to his/her supervisor. No person may work in a manner that conflicts with these procedures. After due warnings, the Project Manager will dismiss from the site any person or subcontractor who violates safety procedures.

All Anchor and subcontractor personnel will receive training in accordance with applicable regulations and be familiar with the requirements and procedures contained in this HASP prior to initiating site activities. In addition, all personnel will attend an initial hazard briefing prior to beginning work at the site.

The roles of Anchor personnel and subcontractors are outlined in the following subsections. Table 1 summarizes key project personnel and their contact information.

2.2 Anchor Personnel

Key health and safety personnel and their responsibilities are described below. These individuals are responsible for the implementation of this HASP.

Project Manager—Tom Schadt: The Project Manager has overall responsibility for the successful outcome of the project. The Project Manager will ensure that adequate resources and budget are provided for the health and safety staff to carry out their responsibilities during fieldwork. The Project Manager, in consultation with the HSO, makes final decisions concerning implementation of the HASP.

Field Coordinator—Ben Hung: Mr. Hung or a designee will serve as the Field Coordinator (FC). The FC will support field sampling activities and coordinate the technical and the health and safety components of the field program and has the responsibility to ensure that work is performed according to the SAP (Appendix H to the DAR). The FC also has the

authority to stop work if conditions arise that pose an unacceptable health and safety risk to field crew. The FC will also be responsible for ensuring the implementation of this HASP on board the sampling vessel. The FC is responsible for initiating changes to the HASP, which must be approved by the HSO. The FC or designee shall be present during field reconnaissance and any sampling operations.

Project Health and Safety Officer—Dennis Hanzlick: The HSO has overall responsibility for preparation, approval, and revisions of this HASP. The HSO will not necessarily be present during fieldwork, but will be readily available, if required, for consultation regarding health and safety issues during fieldwork.

Sampling Vessel Captain—Anchor Personnel: The vessel captain and the FC will coordinate health and safety oversight of operations aboard the vessel. The captain will also have stop work authority for safety reasons. Work will be resumed after the captain and the FC agree that the situation that precipitated a stop work decision has been corrected.

Field Crew: All field crew have the responsibility to report any potentially unsafe or hazardous conditions to the captain or FC immediately.

Table 1
Key Personnel

Role	Name	Address/Telephone No.
Port of Portland Key Personnel		
Project Manager	Anne Summers	121 NW Everett Portland, Oregon 97209 (503) 944-7508
Anchor Key Personnel		
Project Manager	Tom Schadt	1423 Third Avenue, Suite 300 Seattle, Washington 98101 (206) 287-9130
Health and Safety Officer	Dennis Hanzlick	1423 Third Avenue, Suite 300 Seattle, Washington 98101 (206) 287-9130
Field Coordinator	Ben Hung	6650 SW Redwood Lane, Suite 333 Portland, Oregon 97224 (503) 670-1108
Subcontractor Personnel		
Laboratory Analytical Services	TBD	TBD
Sediment Sampling	TBD	TBD
Others	TBD	TBD
AINW/Archeological Oversight	John Fagan	2632 SE 162nd Avenue Portland, OR 97236 (503) 761-6605 (Office)

3 PROJECT HAZARDS AND CONTROL MEASURES

3.1 Introduction

Field activities will include the following tasks:

- Mobilization/site survey
- Field activities including:
  - Surface water sampling
  - Soil sampling
  - Contingent sediment sampling
  - Contingent dive operations
- Decontamination
- Demobilization

The following sections identify potential health, safety, and environmental hazards associated with each type of field activity listed above. Because of the complex and changing nature of field projects, supervisors must continually inspect the site to identify hazards that may affect on-site personnel, the community, or the environment.

Each field activity is described below, along with a discussion of potential hazards and control measures for each activity.

3.2 Mobilization

Site mobilization will include the following activities:

- Establishing sampling locations
- Determining the location of utilities and other installations
- Establishing work areas

Surface water sampling activities and contingent sediment sampling and dive operation activities will take place on a vessel in the Willamette River at the project site. These activities will also take place on a vessel from the water at the location of the upland transloading facility. Soil sampling will take place at the location of the upland transloading facility. Break areas will be on the vessel, as well as at the mobilization and demobilization

areas. Site mobilization will also include establishing sampling locations, determining the location of utilities and other installations, and establishing upland work areas. Mobilization may also include setting up equipment and establishing a temporary site office. A break area will be set up outside of regulated work areas. Mobilization may involve clearing areas for the SZ and CRZ. During the initial phase, project personnel will inspect the vessel and the sampling areas, confirm the existence of anticipated hazards, and identify safety and health issues that may have arisen since this HASP was written.

3.2.1 Hazards

The potential hazards of this phase of activity are:

- Work aboard a boat
- Heavy equipment operation
- Manual materials handling
- Installation of temporary on-site facilities
- Manual site preparation

Manual materials handling and manual site preparation may cause blisters, sore muscles, and joint and skeletal injuries. Manual materials handling may also present eye, contusion, and laceration hazards. Installation of temporary field office and support facilities may expose personnel to electrical hazards, underground and overhead utilities, and physical injury due to the manual lifting and moving of materials. The work areas may present slip, trip, and fall hazards from scattered debris and irregular walking surfaces. Rainy weather may cause wet, muddy, or slick walking surfaces and unstable soil. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Environmental hazards include:

- Weather, such as sunburn, lightning, rain, and heat- and cold-related illnesses
- Plants, such as poison ivy and poison oak
- Aggressive fauna, such as ticks, fleas, wasps, spiders, and snakes
- Waterborne biological hazards, such as coliform

- Pathogens, such as rabies and blood-borne pathogens

3.2.2 Control of Hazards

Control procedures for these hazards are presented in Section 4, General Safety Practices.

3.3 Field Activities

Field activities to be undertaken during the project include:

- Surface water sampling
- Soil sampling
- Contingent sediment sampling
- Contingent dive operations

Hazards and control measures and procedures for each sampling activity are discussed in the following subsections.

3.3.1 Surface Water Sampling, Soil Sampling, and Contingent Sediment Sampling

Surface water, soil, and sediment sampling involves collecting samples for subsequent field and laboratory analysis. The physical hazards of sediment surface water, soil, and sediment sampling are primarily associated with the sample collection methods, procedures used, and the environment itself. Working on or near water also presents the risk of drowning, if proper procedures are not instituted.

3.3.1.1 Hazards

The most significant hazard is that of working in or over water. Inhalation and absorption of chemicals of potential concern (COPCs) are also potential hazards due to the manipulation of sample media and equipment, manual transfer of media into sample containers, and proximity of operations to the breathing zone. During this project, several different sampling methodologies may be used depending on equipment accessibility and the types of materials to be sampled. These sampling methods may include sampling probes, sediment traps, or sampling poles. The

primary hazards associated with these specific sampling procedures are not potentially serious; however, other operations in the area or the conditions under which samples must be collected may present chemical and physical hazards. The hazards directly associated with sediment sampling procedures are generally limited to strains or sprains and potential eye hazards. Potential chemical hazards may include contact with media containing site COPCs and potential contact with chemicals used for equipment decontamination. In addition to the safety hazards specific to sample collection, hazards associated with working over the water or from a boat or barge will be a concern.

Biological hazards include bacteria and viruses potentially present due to waste materials and waste residue. The work area presents slip, trip, and fall hazards from irregular walking surfaces. Rainy weather may cause wet, muddy, and slick walking surfaces. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

3.3.1.2 Controls

Control procedures for environmental and general hazards are discussed in Section 4. Levels of protection for personal protective equipment (PPE) are defined in Section 5.1. To control dermal exposure during sediment sampling activities, a minimum of Modified Level D protection will be worn.

The following sections provide general safety procedures for boat-based sampling, wader use, and working near water.

3.3.1.3 Hazards of Working from a Boat or Barge

Boats or barges may be utilized for sediment sampling activities. This section outlines the precautions that will be taken by Anchor personnel and subcontractors.

Working from a boat or barge presents the obvious hazard of drowning, but several other hazards exist. Powered craft carry a fuel supply, with the potential for fire or

explosion if vapors accumulate and reach an ignition source. Weather, currents, and other watercraft may also pose significant hazards to the crew. In the event that a small craft advisory is issued by the National Weather Service, all work from a vessel will be halted and the vessel will return to shore. If a small craft advisory is issued before work commences, work will be rescheduled following lifting of the advisory. At all other times, on-water work is at the discretion of the vessel captain.

At a minimum, each employee working from a boat or barge is required to participate in a boating safety training session conducted prior to beginning field operations. The training session shall provide instruction on the following topics: proper boat and safety equipment inspections; content and frequency of equipment safety inspections; proper use of onboard safety equipment, including fire extinguisher, radio or cellular phone, flares, horn, etc.; proper procedures on the completion and filing of a float plan; appropriate boating "rules-of-the-road;" emergency procedures in the event of capsizing or being thrown overboard; and different types of personal flotation devices (PFD) and their proper inspection and use.

Anchor personnel working over, adjacent, or near water, where the danger of drowning exists, must wear U.S. Coast Guard (USCG)-approved life jackets or buoyant work vests. Prior to and after each use, the buoyant work vests or life preservers must be inspected for defects that would alter their strength and buoyancy. Defective units must be removed from service. Ring buoys with at least 90 feet of line must be provided and readily available for emergency rescue operations. Distance from ring buoys shall not exceed 200 feet. At least one boat must be immediately available at locations where employees are working over or adjacent to water.

Prior to each day or shift of operations, a vessel inspection must be conducted by the vessel operator. This inspection shall be conducted in accordance with accepted USCG inspection procedures and any applicable state boating safety inspection

procedures. The inspection must verify that necessary safety equipment is aboard and functioning properly and that all members of the crew are aware of proper procedures that are to be followed while on the water. In addition, this information shall be reviewed during the daily tailgate safety meeting to ensure the procedures have been followed and all crew members are satisfied as to their completion.

The following safety procedures shall be observed at all times:

- Vessels shall not be overloaded with equipment or personnel.
- Two personnel shall be on board at all times.
- Loads shall be distributed evenly throughout the vessel.
- PFD Types I, II, or III shall be worn at all times when working on or adjacent to the water.
- All PFDs shall be properly inspected to verify that appropriate USCG approvals and ratings information are available.
- At least one Type IV PFD (seat cushion, ring buoy) shall be available on board.
- An audible signal/alarm (capable of being heard up to ½ mile away) shall be maintained in each vessel.
- Each vessel shall be equipped with a ship-to-shore radio, cellular phone, and/or "walkie-talkie" capable of contacting the USCG, marine police, or another onshore station for help in an emergency.
- Each vessel shall be equipped with some type of visual display signal/device (e.g., flares or appropriate distress flag).
- All powerboats shall have a valid state registration. This registration shall be maintained on the boat and, as necessary, be made available for USCG or marine police inspection.
- At a minimum, each powerboat shall be equipped with a Type 4-A, 10-B, C-rated fire extinguisher.
- Boats shall not be operated at night without proper lighting and the capability for making visual distress signals.

In addition to PFDs, personnel who are working from a boat or barge when water temperatures are below 50°F must be equipped with thermal protective clothing/equipment (wet suits, dry suits, etc.). The thermal protective clothing must be adequate to protect personnel from hypothermic effects of immersion in water at the temperatures encountered.

3.3.2 Contingent Dive Operations

Subcontracted divers will carry out a number of sampling and data collection tasks. The purpose of these sections is to provide general requirements for all diving operations on the project. The specific dive procedures will be defined and implemented by the subcontractor.

In 1982, OSHA exempted scientific diving from commercial diving regulations (29 CFR Part 1910, Subpart T) under certain conditions, which are met by the work planned for this project. All diving performed on this project is considered scientific diving, as opposed to commercial diving. The tasks of a scientific diver are those of an observer and data gatherer. Construction and troubleshooting tasks traditionally associated with commercial diving are not included within scientific diving and are not included in the scope of work for this project. Scientific divers, based on the nature of their activities, must use scientific expertise in studying the underwater environment and, therefore, are scientists or scientists in training.

3.3.2.1 Diving Safety Manual

A diving safety manual must be prepared by the subcontractor. The manual must present procedures covering all diving operations specific to the project, including criteria for diver training and authorization, safe diving procedures, equipment specifications, and procedures for emergency care, recompression, and evacuation. The manual must include:

- Training and medical surveillance requirements for scientific divers
- Safety procedures and checklists for diving operations
- Assignments and responsibilities of the dive team members

- Equipment procedures and checklists
- Emergency procedures

3.3.2.2 General Diving Safety Requirements

General diving safety requirements are summarized in the following section. Complete safety requirements and procedures should be presented in the subcontractor's diving safety manual.

- All diving activities must be conducted with two comparably equipped divers (SCUBA or surface-supplied air) in the water in constant communication.
- All diving will be conducted with similar equipment.
- No diving will be conducted in enclosed or physically confining spaces.
- No diving will be conducted against currents exceeding 1 knot unless line-tended.
- No diving will take place if visibility is less than 200 feet at the given location.
- The diver must terminate a dive while there is still sufficient cylinder pressure remaining to permit the diver to safely reach the surface, including required in-water decompression time, if applicable.

The following subsections summarize requirements for training and medical surveillance, dive planning, dive site preparation, pre-dive briefing, equipment inspections, water entry and exit, and emergency procedures.

3.3.2.3 Training and Medical Surveillance

Each diver must possess a nationally recognized diving certificate. Tasks must be assigned in accordance with the experience and training of the diver. Each diver must be trained, qualified, and authorized for the diving mode and specialized equipment being used, the diving activity to be performed, and the depths at which the dive is to be conducted.

Tasks may be assigned to an employee who has not previously performed the specific task, provided that these tasks are performed under the direct supervision of an experienced dive team member.

All dive team members must be trained in cardiopulmonary resuscitation (CPR) and first aid (American Red Cross standard course or equivalent) and have current certification in these areas.

3.3.2.4 Dive Planning

Planning of each diving operation will include an assessment of the safety and health aspects of each task. Planning elements include:

- Diving mode
- Vessel use of waterway (use of ship's safe procedure checklist if dive operations are conducted while a ship is in port)
- Surface and underwater conditions and hazards
- Breathing gas supply (including reserves)
- Thermal protection
- Decontamination procedure
- Diving equipment and systems
- Dive team assignments and physical fitness of dive team members

To minimize hazards to the dive team, diving operations must be coordinated with other activities in the vicinity that could potentially interfere with the diving operation. To the extent possible, diving activities will be scheduled when vessels are not in port.

3.3.2.5 Dive Site Preparation

For field efforts that require using divers for river bottom observations, appropriate protocols, such as notifying the USCG Marine Safety Office of the upcoming activity and dive flagging will be used to alert boaters where diving operations are under way.

When diving from surfaces other than vessels in areas capable of supporting marine traffic, a rigid replica of the international code flag "A" at least 1 meter in height must be displayed at the dive location in a manner that allows all-around visibility. The flag must be illuminated during night-diving operations.

3.3.2.6 Pre-Dive Briefing

All dive team members must be briefed on the following topics:

- Tasks to be undertaken
- Safety procedures for the diving mode
- Any unusual hazards or environmental conditions likely to affect the safety of the diving operation
- Any modifications to operating procedures necessitated by the specific diving operation

3.3.2.7 Equipment Inspection

The procedures listed below must be followed when conducting equipment inspection.

- Each diver must conduct a functional check of his/her diving equipment. Each diver must ensure that his/her equipment is in proper working order, and that the equipment is suitable and sufficient for the type of diving operation planned.
- Each diver must have a submersible pressure gauge for monitoring SCUBA cylinder pressure that is capable of being monitored by the diver during the dive or a surface monitor air regulator.
- Each diver must have the capability of achieving and maintaining positive buoyancy on the surface.
- Each diver must have the capability to execute a controlled neutrally buoyant ascent, through the use of an approved buoyancy control device.
- The entire dive apparatus for each diver must be inspected by the diver prior to the dive.

- Critical inspection points include the breathing gas supply system, masks, thermal protection, and weights.
- The proper function of the cylinder pressure gauge must be inspected by each SCUBA diver.

3.3.2.8 Water Entry and Exit

The procedures listed below must be followed when entering and exiting the water.

- A means capable of supporting the diver will be provided for entering and exiting the water, unless the entry is in water of wading depth. The means provided for exiting the water must extend below the water surface.
- A means will be provided to assist an injured diver from the water.

3.3.2.9 Emergency Procedures

The procedures listed below must be followed in the event of an emergency during underwater operations.

- A standby diver must be available any time a diver is in the water.
- Divers must be in contact with the surface or accompanied by another diver in the water in continuous visual contact during the diving operations.
- A diver must be stationed at the underwater point of entry when diving is conducted in enclosed or physically confining spaces.
- A diver-carried reserve breathing gas supply must be provided for each diver. The reserve must be either a manual reserve (J valve) or an independent reserve cylinder with a separate regulator or connected to the underwater breathing apparatus.
- The valve of the reserve breathing gas supply must be in the closed position prior to the dive.

3.4 Equipment Decontamination

All equipment is to be decontaminated before leaving the site. In addition, all operations that have the potential to generate or release hazardous material will be conducted in a controlled area using the appropriate engineering controls. Specific decontamination techniques will be established based on site conditions. Decontamination procedures will

be reviewed with all personnel on site. A decontamination pad on a suitable surface (concrete or paved area) with polyethylene sheeting or other appropriate containment system will be established. Pressure washing with manual scrub brushing as needed will be used to decontaminate equipment. COPC-impacted equipment will be determined "clean" through visual inspection of all equipment.

Personnel involved in decontamination activities may be exposed to skin contact with contaminated materials and chemicals brought to the site as part of the project work. All personnel will review the operating procedures and PPE prior to decontamination. Personnel involved in decontamination activities must wear PPE that is appropriate for the task and no more than one level below the level worn by personnel working in the EZ.

3.5 Demobilization

Demobilization involves removing all tools, equipment, supplies, and vehicles brought to the site. The hazards of this phase of activity are associated with heavy equipment operation and manual materials handling.

3.5.1 Hazards

Manual materials handling may cause blisters, sore muscles, and joint and skeletal injuries and may present eye, contusion, and laceration hazards. Heavy equipment operation presents noise and vibration hazards and hot surfaces to operators. Personnel in the vicinity of heavy equipment operation may be exposed to physical hazards resulting in fractures, contusions, and lacerations and may be exposed to high noise levels. The work area presents slip, trip, and fall hazards from scattered debris and irregular walking surfaces. Rainy weather may cause wet, muddy, and slick walking surfaces and unstable soil. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Environmental hazards include plants, such as poison ivy and poison oak; aggressive fauna, such as ticks, fleas, mosquitoes, wasps, spiders, and snakes; weather, such as

sunburn, lightning, rain, and heat- or cold-related illnesses; and pathogens, such as rabies and blood-borne pathogens.

3.5.2 Control

Control procedures for these hazards are discussed in Section 4.

3.6 Chemical and Biological Hazards

3.6.1 Chemical Hazards

The chemical hazards associated with site operations are related to inhalation, ingestion, and skin exposure to site COPCs.

Site COPCs may include metals (cadmium, lead, and zinc) and polycyclic aromatic hydrocarbons (PAHs). Exposure to these materials is possible by inhaling vapors or contacting sediments or dusts containing COPCs. Sediment or other media contaminated with COPCs may be ingested or may come in contact with exposed skin. Excessive dermal exposure to these materials may cause dermatitis, hyperpigmentation of the skin, and skin irritation. Excessive inhalation exposure to these metals may cause respiratory tract irritation, headache, dizziness, and nausea. Ingestion may cause abdominal pain, nausea, vomiting, and diarrhea.

The potential for ingesting COPCs, sediment, or other impacted media is low. The potential for inhaling impacted media is also low. The potential for dermal exposure is moderate.

3.6.2 Biological Hazards

Diving poses risks of exposure to biological contaminants such as coliform bacteria. Numerous forms of pollution are present in almost every body of water in the United States. Non-point source pollution includes any biological waste that flows with the runoff from rain into lakes, streams, rivers, and oceans. One of the major problems with diving in polluted water is that the contaminants are frequently suspended in the water and therefore surround the diver. Some chemicals may float on the surface and others

may sink to the bottom, but biological hazards are in suspension and can enter through any weak point in the diver's gear.

Protection against these contaminants involves isolation of the diver during the dive and careful decontamination upon leaving the water. Ingestion of and dermal contact with water must be avoided. The best protection is to totally encapsulate the diver with either a full face mask or a full coverage diving helmet, a vulcanized rubber dry suit, and dry gloves. This type of gear affords excellent protection from virtually all biohazards, as well as from many chemicals.

4 GENERAL SAFETY PRACTICES

4.1 General Safety Rules

General safety rules for site activities include, but are not limited to, the following:

- At least one copy of this HASP must be in a location at the project site that is readily available to personnel, and all project personnel must review the plan prior to starting work.
- Food, beverages, chewing gum, and tobacco products may be consumed or used only in the SZ or other designated area outside the EZ and CRZ. Cosmetics must not be applied in the EZ or CRZ.
- Wash hands before eating, drinking, smoking, or using toilet facilities.
- Wear all PPE as required and stop work and replace damaged PPE immediately.
- Secure disposable coveralls, boots, and gloves at the wrists and legs and confirm closure of the suit around the neck.
- Upon skin contact with materials that may be impacted by COPCs, remove contaminated clothing and wash the affected area immediately. Contaminated clothing must be changed.
- Practice contamination avoidance. Avoid contact with surfaces either suspected or known to be impacted by COPCs, such as standing water, mud, or discolored soil. Equipment must be stored on elevated or protected surfaces to reduce the potential for incidental contamination.
- Remove PPE as required in the CRZ to limit the spread of COPC-containing materials.
- At the end of each shift, or as required, dispose of all single-use coveralls, soiled gloves, and respirator cartridges in receptacles designated for this purpose.
- Do not remove soil containing site COPCs from protective clothing or equipment with compressed air, shaking, or any other means that disperses contaminants into the air.
- Inspect all non-disposable PPE for contamination in the CRZ. Any PPE found to be contaminated must be decontaminated or disposed of appropriately.
- Recognize emergency signals used for evacuation, injury, fire, or other hazards.
- Report all injuries, illnesses, near misses, and unsafe conditions or work practices.

- Use the "buddy system" during all operations requiring Level C PPE and, when appropriate, during Modified Level D operations.
- Obey all warning signs, tags, and barriers. Do not remove any warnings unless authorized to do so.
- Use, adjust, alter, and repair equipment only if trained and authorized to do so and in accordance with the manufacturer's directions.
- Personnel are to perform only tasks for which they have been properly trained and must advise their supervisor if they have been assigned a task for which they are not trained.
- The presence or consumption of alcoholic beverages or illicit drugs during the workday, including breaks, is strictly prohibited. Do not take prescription or over-the-counter drugs when assigned to tasks with the potential for absorption, inhalation, or ingestion of hazardous substances, unless given written approval by an appropriate health care professional.
- Remain upwind during site activities whenever possible.

4.2 Buddy System

On-site personnel must use the "buddy system" as required by operations. Use of the buddy system is required during all operations requiring Level C to Level A PPE and, when appropriate, during Level D operations. Crew members must observe each other for signs of chemical exposure and heat or cold stress. Indications of adverse effects include, but are not limited to:

- Changes in complexion and skin coloration
- Changes in coordination
- Changes in demeanor
- Excessive salivation and pupillary response
- Changes in speech pattern

Crew members must also be aware of the potential exposure to possible safety hazards, unsafe acts, or non-compliance with safety procedures.

Field personnel must inform their partners or fellow crew members of non-visible effects of exposure to toxic materials that they may be experiencing. The symptoms of such exposure may include, but are not limited to:

- Headaches
- Dizziness
- Nausea
- Blurred vision
- Cramps
- Irritation of eyes, skin, or respiratory tract

If protective equipment or noise levels impair communications, pre-arranged hand signals must be used for communication. Personnel must stay within line of sight of another team member.

4.3 Heat Stress

Heat stress is caused by several interacting factors, including environmental conditions, clothing, and workload, as well as the physical and conditioning characteristics of the individual. Since heat stress is one of the most common illnesses associated with heavy outdoor work conducted with direct solar load and, in particular, because wearing PPE can increase the risk of developing heat stress, workers must be capable of recognizing the signs and symptoms of heat-related illnesses. Personnel must be aware of the types and causes of heat-related illnesses and be able to recognize the signs and symptoms of these illnesses in both themselves and their co-workers.

4.3.1 Heat Rashes

Heat rash is one of the most common problems in hot work environments. Commonly known as prickly heat, a heat rash is manifested as red papules and usually appears in areas where the clothing is restrictive. As sweating increases, these papules give rise to a prickling sensation. Prickly heat occurs in skin that is persistently wetted by unevaporated sweat, and heat rash papules may become infected if they are not treated.

In most cases, heat rashes will disappear when the affected individual returns to a cool environment.

4.3.2 Heat Cramps

Heat cramps are usually caused by performing hard physical labor in a hot environment. These cramps have been attributed to an electrolyte imbalance caused by sweating. It is important to understand that cramps can be caused both by too much and too little salt.

Cramps appear to be related to a lack of water replenishment. Because sweat is a hypotonic solution (plus or minus 0.3 percent NaCl), excess salt can build up in the body if the water lost through sweating is not replaced. Thirst cannot be relied on as a guide to the need for water; instead, water must be taken every 15 to 20 minutes in hot environments.

Under extreme conditions, such as working for 6 to 8 hours in heavy protective gear, a loss of sodium may occur. Drinking commercially available carbohydrate electrolyte replacement liquids is effective in minimizing physiological disturbances during recovery.

4.3.3 Heat Exhaustion

Heat exhaustion occurs from increased stress on various body organs due to inadequate blood circulation, cardiovascular insufficiency, or dehydration. Signs and symptoms include:

- Pale, cool, moist skin
- Heavy sweating
- Dizziness
- Nausea
- Headache
- Vertigo
- Weakness

- Thirst
- Giddiness

Fortunately, this condition responds readily to prompt treatment.

Heat exhaustion should not be dismissed lightly, however, for several reasons. One is that the fainting associated with heat exhaustion can be dangerous because the victim may be operating machinery or controlling an operation that should not be left unattended; moreover, the victim may be injured when he or she faints. Also, the signs and symptoms seen in heat exhaustion are similar to those of heat stroke, which is a medical emergency.

Workers suffering from heat exhaustion should be removed from the hot environment, given fluid replacement, and be encouraged to get adequate rest.

4.3.4 Heat Stroke

Heat stroke is the most serious form of heat stress. Heat stroke occurs when the body's system of temperature regulation fails, and the body's temperature rises to critical levels. This condition is caused by a combination of highly variable factors and its occurrence is difficult to predict.

Heat stroke is a medical emergency. The primary signs and symptoms of heat stroke are:

- Confusion
- Irrational behavior
- Loss of consciousness
- Convulsions
- A lack of sweating (usually)
- Hot, dry skin
- An abnormally high body temperature (e.g., a rectal temperature of 41°C [105.8°F])

If body temperature is too high, it causes death. The elevated metabolic temperatures caused by a combination of workload and environmental heat load, both of which contribute to heat stroke, are also highly variable and difficult to predict.
If a worker shows signs of possible heat stroke, professional medical treatment should be obtained immediately. The worker should be placed in a shady area and the outer clothing should be removed. The worker's skin should be wetted and air movement around the worker should be increased to improve evaporative cooling until professional methods of cooling are initiated and the seriousness of the condition can be assessed. Fluids should be replaced as soon as possible. The medical outcome of an episode of heat stroke depends on the victim's physical fitness and the timing and effectiveness of first-aid treatment.

Regardless of the worker's protestations, no employee suspected of being ill from heat stroke should be sent home or left unattended unless a physician has specifically approved such an order.

Proper training and preventive measures will help avert serious illness and loss of work productivity. Preventing heat stress is particularly important because once someone suffers from heat stroke or exhaustion, that person may be predisposed to additional heat injuries.

4.3.5 Heat Stress Safety Precautions

Heat-stress monitoring and work-rest cycle implementation should commence when the ambient adjusted temperature exceeds 72°F. A minimum work-rest regimen and procedures for calculating ambient adjusted temperature are described in Table 2.

Table 2
Work/Rest Schedule[1]

Adjusted Temperature[2]	Work/Rest Regimen Normal Work Ensemble[3]	Work/Rest Regimen Impermeable Ensemble
90ºF (32.2ºC) or above	After each 45 minutes of work	After each 15 minutes of work
87.5º-90ºF (30.8º-32.2ºC)	After each 60 minutes of work	After each 30 minutes of work
82.5º-87.5ºF (28.1º-30.8ºC)	After each 90 minutes of work	After each 60 minutes of work
77.5º-82.5ºF (25.3º-28.1ºC)	After each 120 minutes of work	After each 90 minutes of work
72.5º-77.5ºF (30.8º-32.2ºC)	After each 150 minutes of work	After each 120 minutes of work

1 For work levels of 250 kilocalories/hour (light to moderate type of work)
2 Calculate the adjusted air temperature (ta adj) by using this equation: ta adj oF = ta oF + (13 x % sunshine). Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100% sunshine = no cloud cover and a sharp, distinct shadow; 0% sunshine = no shadows.)
3 A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

Source: The information presented above was generated using the information provided in the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values [TLV] Handbook.

To determine whether the work-rest cycles are adequate for the personnel and specific site conditions, additional monitoring of individual heart rates will be conducted during the rest cycle. To check the heart rate, count the radial pulse for 30 seconds at the beginning of the rest period. If the heart rate exceeds 110 beats per minute, shorten the next work period by one-third and maintain the same rest period.

Additionally, one or more of the following control measures can be used to help control heat stress and is mandatory if any site worker has a heart rate (measure immediately prior to rest period) exceeding 115 beats per minute:

- Site workers will be encouraged to drink plenty of water and electrolyte replacement fluids throughout the day.
- On-site drinking water will be kept cool (50 to 60°F).
- A work regimen provides adequate rest periods for cooling down will be established, as required.
- All personnel will be advised of the dangers and symptoms of heat stroke, heat exhaustion, and heat cramps.

- Cooling devices, such as vortex tubes or cooling vests, should be used when personnel must wear impermeable clothing in conditions of extreme heat.
- Employees should be instructed to monitor themselves and co-workers for signs of heat stress and to take additional breaks as necessary.
- A shaded rest area must be provided. All breaks should take place in the shaded rest area.
- Employees must not be assigned to other tasks during breaks.
- Employees must remove impermeable garments during rest periods. This includes white Tyvek®-type garments.
- All employees must be informed of the importance of adequate rest, acclimation, and proper diet in the prevention of heat-stress disorders.

4.4 Cold Stress

Cold stress normally occurs in temperatures at or below freezing or under certain circumstances in temperatures of 40°F. Extreme cold for a short time may cause severe injury to exposed body surfaces or result in profound generalized cooling, causing death. Areas of the body that have high surface area-to-volume ratio, such as fingers, toes, and ears, are the most susceptible. Two factors influence the development of a cold-weather injury: ambient temperature and the velocity of the wind. For instance, 10°F with a wind of 15 miles per hour (mph) is equivalent in chilling effect to still air at 18°F. An equivalent chill temperature chart relating the actual dry-bulb temperature and wind velocity is presented in Table 3.

Table 3
Chill Temperature Chart

	Actual Temperature Reading (ºF)											
Estimated Wind Speed (in mph)	**50**	**40**	**30**	**20**	**10**	**0**	**-10**	**-20**	**-30**	**-40**	**-50**	**-60**
	Equivalent Chill Temperature (ºF)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect.)	Little Danger Maximum danger of false sense of security.				Increasing Danger Danger from freezing of exposed flesh within 1 minute.			Great Danger Flesh may freeze within 30 seconds.				
	Trench foot and immersion foot may occur at any point on this chart.											

This chart was developed by the U.S. Army Research Institute of Environmental Medicine, Natick, MA.
[Source: ACGIH TLV Handbook]

4.4.1 Frostbite

Local injury resulting from cold is included in the generic term "frostbite." There are several degrees of tissue damage associated with frostbite. Frostbite of the extremities can be categorized into:

- Frost Nip or Incipient Frostbite — Characterized by sudden blanching or whitening of skin.
- Superficial Frostbite — Skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
- Deep Frostbite — Tissues are cold, pale, and solid; extremely serious injury.

Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperature. It can be fatal. Its symptoms are usually exhibited in five stages:

1. Shivering

2. Apathy, listlessness, sleepiness, and (sometimes) rapid cooling of the body to less than 95°F
3. Unconsciousness, glassy stare, slow pulse, and slow respiratory rate
4. Freezing of the extremities
5. Death

4.4.2 Hypothermia

Trauma sustained in freezing or sub-zero conditions requires special attention because an injured worker is predisposed to secondary cold injury. Special provisions must be made to prevent hypothermia and secondary freezing of damaged tissues in addition to providing for first-aid treatment. To avoid cold stress, site personnel must wear protective clothing appropriate for the level of cold and physical activity. In addition to protective clothing, preventive safe work practices, additional training, and warming regimens may be used to prevent cold stress.

4.4.3 Cold Stress Safety Precautions

The following safety precautions should be followed to prevent cold stress:

- For air temperature of 0°F or less, mittens should be used to protect the hands. For exposed skin, continuous exposure should not be permitted when air speed and temperature results in a wind chill temperature of -25°F.
- At air temperatures of 36°F or less, field personnel who become immersed in water or whose clothing becomes wet must be immediately provided with a change of clothing and be treated for hypothermia.
- If work is done at normal temperature or in a hot environment before entering the cold, the field personnel must confirm that their clothing is not wet as a consequence of sweating. If clothing is wet, field personnel must change into dry clothes prior to entering the cold area.
- If the available clothing does not give adequate protection to prevent hypothermia or frostbite, work must be modified or suspended until adequate clothing is made available or until weather conditions improve.

- Field personnel handling evaporative liquid (e.g., gasoline, alcohol, or cleaning fluids) at air temperatures below 40°F must take special precaution to avoid soaking of clothing or gloves with the liquids because of the added danger of cold injury due to evaporative cooling.

4.4.4 Safe Work Practices

The following safe work practices must be employed to prevent cold stress:

- Direct contact between bare skin and cold surfaces (less than 20°F) should be avoided. Metal tool handles and/or equipment controls should be covered by thermal insulating material.
- For work performed in a wind chill temperature at or below 10°F, workers should be under constant protective observation (buddy system). The work rate should be established to prevent heavy sweating that will result in wet clothing. For heavy work, rest periods must be taken in heated shelters and workers should be provided with an opportunity to change into dry clothing if needed.
- Field personnel should be provided the opportunity to become accustomed to cold-weather working conditions and required protective clothing.
- Work should be arranged in such a way that sitting or standing still for long periods is minimized.
- During the warming regimen (rest period), field personnel should be encouraged to remove outer clothing to permit sweat evaporation or to change into dry work clothing. Dehydration, or loss of body fluids, occurs insidiously in the cold environment and may increase susceptibility to cold injury due to a significant change in blood flow to the extremities. Fluid replacement with warm, sweet drinks and soups is recommended. The intake of coffee should be limited because of diuretic and circulatory effects.

4.5 Flora/Fauna Hazards

Hazards may include poisonous plants, snakes, ticks, spiders, and mosquitoes.

4.5.1 Poisonous Plants

4.5.1.1 Hazards

Poisonous plants may be present in the work area. Personnel should be alerted to their presence and instructed on methods to prevent exposure.

4.5.1.2 Control

The main control is to avoid contact with the plant, cover arms and hands, and frequently wash potentially exposed skin. Particular attention must be given to avoiding skin contact with objects or protective clothing that have touched the plants. Treat every surface that may have touched the plant as contaminated and practice contamination avoidance. If skin contact is made, the area should be washed immediately with soap and water and observed for signs of reddening.

4.5.2 Snakes

4.5.2.1 Hazards

The possibility of encountering snakes exists, specifically for personnel working in wooded or vegetated areas. Snake venoms are complex and include proteins, some of which have enzymatic activity. The effects produced by venoms include:

- Neurotoxic effects with sensory, motor, cardiac, and respiratory difficulties
- Cytotoxic effects on red blood cells, blood vessels, heart muscle, kidneys, and lungs
- Defects in coagulation
- Effects from local release of substances by enzymatic actions.

Other noticeable effects of venomous snakebites include swelling, edema, and pain around the bite and the development of ecchymosis (the escape of blood into tissues from ruptured blood vessels).

4.5.2.2 Control

To minimize the threat of snakebites, all personnel walking through vegetated areas must be aware of the potential for encountering snakes and the need to avoid actions that may result in encounters, such as turning over logs. If a snakebite occurs, an

attempt should be made to identify the snake via markings and size. The victim must be transported to the nearest hospital within 30 minutes; first aid consists of applying a constriction band and washing the area around the wound to remove any unabsorbed venom.

4.5.3 Ticks

4.5.3.1 Hazards

Rocky Mountain Spotted Fever (RMSF) is a disease that is transmitted via the bite of an infected tick. The tick must be attached 4 to 6 hours before the disease-causing organism (*Rickettsia rickettsii*) becomes reactivated and can infect humans. The primary symptom of RMSF is the sudden appearance of a moderate-to-high fever. The fever may persist for 2 to 3 weeks. The victim may also have a headache, deep muscle pain, and chills. A rash appears on the hands and feet on about the third day and eventually spreads to all parts of the body. For this reason, RMSF may be confused with measles or meningitis. The disease may cause death, if untreated, but if identified and treated promptly, death is uncommon.

4.5.3.2 Control

Tick repellant containing diethyltoluamide (DEET) should be used when working in tick-infested areas, and pant legs should be tucked into boots. In addition, workers should search the entire body every 3 or 4 hours for attached ticks. Ticks should be removed promptly and carefully without crushing, since crushing can squeeze the disease-causing organism into the skin. A gentle and steady pulling action should be used to avoid leaving the head or mouth parts in the skin. Hands should be protected with surgical gloves when removing ticks.

4.5.4 Spiders

4.5.4.1 Hazards

Personnel may encounter spiders during work activities. Two spiders of concern are the black widow and the brown recluse. Both prefer dark sheltered areas such as basements, equipment sheds and enclosures, and woodpiles or other scattered

debris. The black widow is shiny black, approximately 1 inch long, and found throughout the United States. There is a distinctive red hourglass marking on the underside of the black widow's body. The bite of a black widow is seldom fatal to healthy adults, but effects include respiratory distress, nausea, vomiting, and muscle spasms. The brown recluse is smaller than the black widow and gets its name from its brown coloring and behavior. The brown recluse has a distinctive violin shape on the top of its body. The bite of the brown recluse is painful, and the bite site ulcerates and takes many weeks to heal completely.

4.5.4.2 Control

To minimize the threat of spider bites, all personnel walking through vegetated areas must be aware of the potential for encountering these arachnids. Personnel need to avoid actions that may result in encounters, such as turning over logs and placing hands in dark places such as behind equipment or in corners of equipment sheds or enclosures. If a spider bite occurs, the victim must be transported to the nearest hospital as soon as possible; first aid consists of applying ice packs and washing the area around the wound to remove any unabsorbed venom.

4.5.5 Mosquitoes

4.5.5.1 Hazards

Personnel may be exposed to mosquitoes during work activities. Typical exposure to mosquitoes does not present a significant hazard. However, if West Nile virus is prevalent in the area, exposure to this virus is increased. West Nile virus results in flu-like symptoms and can be serious if not treated or in individuals with compromised immune systems.

4.5.5.2 Control

To minimize the threat of mosquito bites, all personnel working outside must be aware of the potential for encountering mosquitoes and implement the basic precautions listed below:

- Avoid working at dawn or dusk when mosquitoes are most active.

- Prevent accumulation of standing water at the work site.
- Apply an insect repellent that contains DEET to exposed skin and to clothing.
- Wear light-colored clothes, preferably with long sleeves and full-length pants.
- Do not touch any dead birds or animals that are encountered.

If dead birds are detected near the site, report them to the local County Health Department. If flu-like symptoms are present, contact your doctor or the HSO for more information.

4.6 Noise

4.6.1 Hazards

Exposure to noise over the appropriate action level can cause temporary impairment of hearing; prolonged and repeated exposure can cause permanent damage to hearing. The risk and severity of hearing loss increase with the intensity and duration of exposure to noise. In addition to damaging hearing, noise can impair voice communication, thereby increasing the risk of accidents on site.

4.6.2 Control

All personnel must wear hearing protection, with a noise reduction rating (NRR) of at least 20 dBA, when noise levels exceed 85 dBA. When it is difficult to hear a co-worker at normal conversation distance, the noise level is approaching or exceeding 85 dBA and hearing protection is necessary. All site personnel who may be exposed to noise must also receive baseline and annual audiograms and training as to the causes and prevention of hearing loss.

Whenever possible, equipment that does not generate excessive noise levels will be selected. If the use of noisy equipment is unavoidable, barriers or increased distances will be used to minimize worker exposure to noise, if feasible.

4.7 Spill Control

All personnel must take every precaution to minimize the potential for spills during site operations.

Spill control equipment and materials will be located on site in the areas that present the potential for discharge. All sorbent materials used to clean up spills will be containerized and labeled appropriately. In the event of a spill, the emergency provisions in Section 8 will be followed to contain and control released materials and to prevent their spread to off-site areas.

4.8 Sanitation

Site sanitation will be maintained according to appropriate federal, state, and local requirements as described in the following sections.

4.8.1 Break Area

Breaks must be taken in the SZ or on the vessel, away from the active work area, after site personnel go through decontamination procedures. There will be no smoking, eating, drinking, or chewing gum or tobacco in any area other than the SZ.

4.8.2 Potable Water

The following rules regarding potable water apply to all field operations:

- An adequate supply of potable water will be provided at each project site. Potable water must be kept away from hazardous materials or media and contaminated clothing or equipment.
- Portable containers used to dispense drinking water must be capable of being tightly closed and must be equipped with a tap dispenser. Water must not be consumed directly from the container (drinking from the tap is prohibited) or removed from the container by dipping.
- Containers used for drinking water must be clearly marked and must not be used for any other purpose.

Disposable drinking cups must be provided. A sanitary container for dispensing cups and a receptacle for disposing of used cups is required.

4.8.3 Sanitary Facilities

Access to facilities for washing before eating, drinking, or smoking, or alternative methods such as waterless hand cleaner and paper towels, will be provided.

4.8.4 Lavatory

If permanent toilet facilities are not available, an appropriate number of portable chemical toilets will be provided.

This requirement does not apply to mobile crews or to normally unattended site locations as long as employees at these locations have transportation immediately available to nearby toilet facilities.

4.9 Emergency Equipment

Adequate emergency equipment for the activities being conducted on site and as required by applicable sections of 29 CFR 1910 and 29 CFR 1926 will be on site prior to commencing project activities. Personnel will be provided with access to emergency equipment including, but not limited to, the following:

- Fire extinguishers of adequate size, class, number, and location as required by applicable sections of 29 CFR 1910 and 1926
- Industrial first aid kits of adequate size for the number of personnel on site
- Emergency eyewash and/or shower if required by operations being conducted on site

4.10 Electrical Safety

Electricity may pose a particular hazard to site workers due to the use of portable electrical equipment. If wiring or other electrical work is needed, a qualified electrician must perform it.

General electrical safety requirements include:

- All electrical wiring and equipment must be of a type listed by Underwriters Laboratory (UL), Factory Mutual Engineering Corporation (FM), or other recognized testing or listing agency.
- All installations must comply with the National Electrical Safety Code, the National Electrical Code, or USCG regulations.
- Portable and semi-portable tools and equipment must be grounded by a multi-conductor cord having an identified grounding conductor and a multi-contact polarized plug-in receptacle.
- Tools protected by an approved system of double insulation, or its equivalent, need not be grounded. Double-insulated tools must be distinctly marked and listed by UL or FM.
- Live parts of wiring or equipment must be guarded to prevent persons or objects from touching them.
- Electric wire or flexible cord passing through work areas must be covered or elevated to protect it from damage by foot traffic, vehicles, sharp corners, projections, or pinching.
- All circuits must be protected from overload.
- Temporary power lines, switchboxes, receptacle boxes, metal cabinets, and enclosures around equipment must be marked to indicate the maximum operating voltage.
- Plugs and receptacles must be kept out of water unless of an approved submersible construction.
- All extension cord outlets must be equipped with ground-fault-circuit interrupters.
- Attachment plugs or other connectors must be equipped with a cord grip and be constructed to endure rough treatment.
- Extension cords or cables must be inspected prior to each use and replaced if worn or damaged. Cords and cables must not be fastened with staples, hung from nails, or suspended by bare wire.
- Flexible cords must be used only in continuous lengths without splice, with the exception of molded or vulcanized splices made by a qualified electrician.

4.11 Lifting Safety

Using proper lifting techniques may prevent back strain or injury. The fundamentals of proper lifting include:

- Consider the size, shape, and weight of the object to be lifted. A mechanical lifting device or additional persons must be used to lift an object if it cannot be lifted safely alone.
- The hands and the object should be free of dirt or grease that could prevent a firm grip.
- Gloves must be used and the object inspected for metal slivers, jagged edges, burrs, or rough or slippery surfaces.
- Fingers must be kept away from points that could crush or pinch them, especially when putting an object down.
- Feet must be placed far enough apart for balance. The footing should be solid and the intended pathway should be clear.
- The load should be kept as low as possible, close to the body with the knees bent.
- To lift the load, grip firmly and lift with the legs, keeping the back as straight as possible.
- A worker should not carry a load that he or she cannot see around or over.
- When putting an object down, the stance and position are identical to that for lifting; the legs are bent at the knees, and the back is straight as the object is lowered.

5 PERSONAL PROTECTIVE EQUIPMENT

5.1 Levels of Protection

PPE is required to safeguard site personnel from various hazards. Varying levels of protection may be required depending on the levels of COPCs and the degree of physical hazard. This section presents the various levels of protection and defines the conditions of use for each level. Table 4 summarizes the available levels of personal protection.

5.1.1 Level D Protection

The minimum level of protection that is required of Anchor personnel and subcontractors at the site is Level D, which is worn when site conditions present minimal dermal exposure hazard and no inhalation hazard. Level D protection includes the following equipment:

- Work clothing as prescribed by weather
- High-visibility safety apparel when working in active areas at Terminal 4, around vehicle traffic, and during times of low visibility (darkness and inclement weather) (ANSI/ISEA 107-2004)
- Steel-toed work boots, meeting American National Standards Institute (ANSI) Z41
- Safety glasses with side shields or goggles, meeting ANSI Z87
- Hard hat, meeting ANSI Z89, when falling object hazards are present
- Hearing protection (if noise levels exceed 85 dBA, then hearing protection with a USEPA NRR of at least 20 dBA must be used)
- PFD if working over or near water

5.1.2 Modified Level D Protection

Modified Level D will be used when airborne contaminants are not present at levels of concern, but site activities present an increased potential for skin contact with contaminated materials. Modified Level D consists of:

- Nitrile gloves worn over nitrile surgical gloves
- Latex/polyvinyl chloride (PVC) overboots when contact with COPC-impacted media is anticipated

- Steel-toed work boots, meeting ANSI Z41
- High-visibility safety apparel when working in active areas at Terminal 4, around vehicle traffic and during times of low visibility (darkness and inclement weather) (ANSI/ISEA 107-2004)
- Safety glasses or goggles, meeting ANSI Z87
- Face shield in addition to safety glasses or goggles when projectiles or splash hazards exist
- Hard hat, meeting ANSI Z89 when falling object hazards are present
- Hearing protection (if noise levels exceed 85 dBA, then hearing protection with a USEPA NRR of at least 20 dBA must be used)
- Tyvek® suit (polyethylene coated Tyvek® suits for handling liquids) when body contact with COPC-impacted media is anticipated
- PFD if working on or near the water

5.1.3 Level C Protection

Level C protection will be required when the airborne concentration of COPCs reaches one-half of the OSHA Permissible Exposure Limit (PEL) or American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value. The following equipment will be used for Level C protection:

- Full-face, National Institute for Occupational Safety and Health- (NIOSH-) approved air-purifying respirator with appropriate cartridges for site COPCs
- Tyvek® suit with ankles and cuffs taped to boots and gloves
- Nitrile outer gloves worn over nitrile surgical gloves
- Steel-toed work boots, meeting ANSI Z41
- High-visibility safety apparel when working in active areas at Terminal 4, around vehicle traffic, and during times of low visibility (darkness and inclement weather) (ANSI/ISEA 107-2004)
- Chemical-resistant boots with steel toes or latex/PVC overboots over steel-toe boots
- Hard hat, meeting ANSI Z89

- Hearing protection (if noise levels exceed 85 dBA, then hearing protection with a USEPA NRR of at least 20 dBA must be used)
- PFD if working on or near the water

5.2 PPE Selection

PPE will be selected based on the potential for contact, site conditions, ambient air quality, and the judgment of supervising site personnel and health and safety professionals. The PPE used will be chosen to be effective against the COPCs present on site.

The PPE selection matrix is presented in Table 4. This matrix is based on information available at the time this plan was written.

Table 4
PPE Selection Matrix

Task	Anticipated Level of Protection
Mobilization	Level D
Field Sampling	Modified Level D
Decontamination	Modified Level D
Demobilization	Level D/Modified Level D

5.3 Site Respiratory Protection Program

Respiratory protection is an integral part of employee health and safety at the site due to potentially hazardous concentrations of airborne COPCs. The site respiratory protection program will consist of the following elements (at a minimum):

- All on-site personnel who may use respiratory protection will have an assigned respirator.
- All on-site personnel who may use respiratory protection will have been fit-tested and trained in the use of a full-face air-purifying respirator within the past 12 months.
- All on-site personnel who may use respiratory protection must, within the past year, have been medically certified as being capable of wearing a respirator.

Documentation of the medical certification must be provided to the HSO or a designee prior to commencing site work.

- Only cleaned, maintained, NIOSH-approved respirators will be used.
- If respirators are used, the respirator cartridge is to be properly disposed of at the end of each work shift or when load-up or breakthrough occurs.
- Contact lenses are not to be worn when a respirator is worn.
- All on-site personnel who may use respiratory protection must be clean-shaven. Mustaches and sideburns are permitted, but they must not touch the sealing surface of the respirator.
- Respirators will be inspected and a negative-pressure test performed prior to each use.
- After each use, the respirator will be wiped with a disinfectant, cleansing wipe. When used, the respirator will be thoroughly cleaned at the end of the work shift. The respirator will be stored in a clean plastic bag, away from direct sunlight in a clean, dry location in a manner that will not distort the face piece.

5.4 Using PPE

Depending on the level of protection selected, specific donning and doffing procedures may be required. The procedures presented in this section are mandatory if Modified Level D or Level C PPE is used. All personnel entering the EZ must don the required PPE in accordance with the requirements of this HASP. When leaving the EZ, personnel will remove the PPE in accordance with the doffing procedures to minimize the spread of COPCs.

5.4.1 Donning Procedures

These procedures are mandatory only if Modified Level D or Level C PPE is used on site:

- Remove bulky outerwear. Remove street clothes and store in clean location.
- Put on work clothes or coveralls.
- Put on the required chemical-protective coveralls.
- Put on the required chemical-protective boots or boot covers.

- Tape the legs of the coveralls to the boots with duct tape.
- Put on the required chemical-protective gloves.
- Tape the wrists of the protective coveralls to the gloves.
- Don the required respirator and perform appropriate fit check (Level C).
- Put hood or head covering over head and respirator straps and tape hood to face piece (Level C).
- Don remaining PPE, such as safety glasses or goggles and hard hat.

When these procedures are instituted, one person must remain outside the work area to confirm that each person entering has the proper protective equipment.

5.4.2 Doffing Procedures

The following procedures are only mandatory if Modified Level D or Level C PPE is required for the site. Whenever a person leaves the work area, the following decontamination sequence will be followed:

- Upon entering the CRZ, rinse contaminated materials from the boots or remove contaminated boot covers.
- Clean reusable protective equipment.
- Remove protective garments, equipment, and respirator (Level C). All disposable clothing should be placed in plastic bags that are labeled with contaminated-waste labels.
- Wash hands, face, and neck (or shower if necessary).
- Proceed to clean area and dress in clean clothing.
- Clean and disinfect respirator for next use.

All disposable equipment, garments, and PPE must be bagged in plastic bags labeled for disposal. See Section 6 for detailed information on decontamination stations.

6 WORK ZONES AND DECONTAMINATION

6.1 Work Zones

6.1.1 Authorization to Enter

Only personnel with the appropriate training and medical certifications (if respirators are required) will be allowed to work at the project site.

6.1.2 Site Orientation and Hazard Briefing

No person will be allowed in the work area during site operations without first being given a site orientation and hazard briefing. This orientation will be presented by the HSO, or designee, and will consist of a review of this HASP. This review must cover the chemical, physical, and biological hazards; protective equipment; safe work procedures; and emergency procedures for the project. Following this initial meeting, safety meetings will be held each day before work begins.

6.1.3 Entry Log

A log-in/log-out sheet will be maintained on site by the FC. Personnel must sign in and out on a log sheet as they enter and leave the work area, and the FC may document entry and exit in the field notebook.

6.1.4 Entry Requirements

In addition to the authorization, hazard briefing, and certification requirements listed above, no person will be allowed in any work area unless they are wearing the minimum PPE as described in Section 5.

6.1.5 Emergency Entry and Exit

People who must enter the work area on an emergency basis will be briefed of the hazards. All activities will cease in the event of an emergency. People exiting the work area because of an emergency will gather in a safe area for a head count.

6.1.6 Contamination-Control Zones

Contamination-control zones are maintained to prevent the spread of contamination and to prevent unauthorized people from entering hazardous areas.

6.1.6.1 Exclusion Zone

An EZ may consist of a specific work area or may be the entire area of potential contamination. All employees entering an EZ must use the required PPE and must have the appropriate training and medical clearance for hazardous waste work. The EZ is the defined area where there is a possible respiratory and/or contact health hazard. Cones, caution tape, or a site diagram will identify the location of each EZ.

6.1.6.2 Contamination-Reduction Zone

The CRZ or transition area will be established, if necessary, to perform decontamination of personnel and equipment. All personnel entering or leaving the EZ will pass through this area to prevent any cross-contamination. Tools, equipment, and machinery will be decontaminated in a specific location. All personnel will be decontaminated on site adjacent to the EZ. Personal protective outer garments and respiratory protection will be removed in the CRZ and prepared for cleaning or disposal. This zone is the only appropriate corridor between the EZ and the SZ.

6.1.6.3 Support Zone

The SZ is a clean area outside the CRZ located to prevent employee exposure to hazardous substances. Eating and drinking will be permitted in the support area only after proper decontamination. Smoking may be permitted in the SZ, subject to site requirements.

6.2 Decontamination

6.2.1 Personnel Decontamination

All personnel wearing Modified Level D or Level C protective equipment in the EZ must undergo personal decontamination prior to entering the SZ. The personnel decontamination area will consist of the following stations, at a minimum:

- Station 1 — Personnel leaving the contaminated zone will remove the gross contamination from their outer clothing and boots.
- Station 2 — Personnel will remove their outer garment and gloves and dispose of them in properly labeled containers. Personnel will then decontaminate their hard hats and boots with an aqueous solution of detergent or other appropriate cleaning solution. These items are then hand-carried to the next station.
- Station 3 — Personnel will thoroughly wash their hands and face before leaving the CRZ. Respirators will be sanitized and then placed in a clean plastic bag.

6.2.2 Equipment Decontamination

All vehicles that have entered the EZ will be decontaminated at the decontamination pad prior to leaving the zone. If the level of vehicle contamination is low, decontamination may be limited to rinsing tires and wheel wells with water. If the vehicle is significantly contaminated, steam cleaning or pressure washing of the vehicle and equipment may be required.

6.2.3 PPE Decontamination

Where and whenever possible, single-use, external protective clothing must be used for work within the EZ or CRZ. This protective clothing must be disposed of in properly labeled containers. Reusable protective clothing will be rinsed on site with detergent and water. The rinsate will be collected for disposal.

When removed from the CRZ, the respirator will be thoroughly cleaned with soap and water. The respirator face piece, straps, valves, and covers must be thoroughly cleaned at the end of each work shift and ready for use prior to the next shift. Respirator parts may be disinfected with a solution of bleach and water or by using a spray disinfectant.

7 TRAINING

7.1 General

All on-site project personnel who work in areas where they may be exposed to site contaminants must be trained as required by OSHA Regulation 29 CFR 1910.120 (HAZWOPER). Field employees also must receive a minimum of 3 days of actual field experience under the direct supervision of a trained, experienced supervisor. Personnel who completed their initial training more than 12 months prior to the start of the project must have completed an 8-hour refresher course within the past 12 months. The site supervisor must have completed an additional 8 hours of supervisory training and must have current first aid and CPR certificates.

7.2 Basic 40-Hour Course

The following is a list of the topics typically covered in a 40-hour HAZWOPER training course:

- General safety procedures
- Physical hazards (fall protection, noise, heat stress, cold stress)
- Names and job descriptions of key personnel responsible for site health and safety
- Safety, health, and other hazards typically present at hazardous waste sites
- Use, application, and limitations of PPE
- Work practices by which employees can minimize risks from hazards
- Safe use of engineering controls and equipment on site
- Medical surveillance requirements
- Recognition of symptoms and signs that might indicate overexposure to hazards
- Worker right-to-know (Hazard Communication OSHA 1910.1200)
- Routes of exposure to contaminants
- Engineering controls and safe work practices
- Components of a health and safety program and a site-specific HASP
- Decontamination practices for personnel and equipment
- Confined-space entry procedures
- General emergency response procedures

7.3 Supervisor Course

Managers and supervisors must receive an additional 8 hours of training, which typically includes:

- General site safety and health procedures
- PPE programs
- Air monitoring techniques

7.4 Site-Specific Training

Site-specific training will be accomplished by having on-site personnel read this HASP or through a thorough site briefing on the contents of this HASP before work begins. The review must include a discussion of the chemical, physical, and biological hazards; protective equipment and safety procedures; and emergency procedures.

7.5 Daily Safety Meetings

Daily safety meetings will be held to cover the work to be accomplished, hazards anticipated, PPE and procedures required to minimize site hazards, and emergency procedures. No work will be performed in an EZ before the daily safety meeting has been held. The daily safety meeting must also be held prior to new tasks and repeated if new hazards are encountered.

7.6 First Aid and CPR

At least one employee current in first aid and CPR will be assigned to the work crew and will be on site during operations. Refresher training in first aid (triennially) and CPR (annually) is required to keep the certificate current. These individuals must also receive training regarding the precautions and protective equipment necessary to protect against exposure to blood-borne pathogens.

8 EMERGENCY PROCEDURES

8.1 General

Prior to the start of operations, the work area will be evaluated for the potential for fire, contaminant release, or other catastrophic events. Unusual conditions or events, activities, chemicals, and conditions will be reported.

The HSO will establish evacuation routes and assembly areas for the site. All personnel entering the site will be informed of these routes and assembly areas.

8.2 Emergency Response

If an incident occurs, the following steps will be taken:

- Evaluate the incident and assess the need for assistance and/or evacuation.
- Call for outside assistance as needed.
- Confirm that the Project Manager is notified promptly of the incident.
- Take appropriate measures to stabilize the incident scene.

8.2.1 Fire

In the case of a fire on site, site personnel will attempt to extinguish the fire with available extinguishers, if safe to do so. In the event of a fire that site personnel are unable to safely extinguish with one fire extinguisher, the local fire department will be summoned.

8.2.2 Contaminant Release

In the event of a contaminant release, the following steps will be taken:

- Evacuate immediate area of release.
- Conduct air monitoring to determine needed level of PPE.
- Don required level of PPE and prepare to implement control procedures.

8.3 Medical Emergency

All employee injuries must be promptly reported to the HSO, who will:

- Confirm that the injured employee receives prompt first aid and medical attention.

- In emergency situations, see that the worker is transported by appropriate means to the nearest urgent care facility (normally a hospital emergency room).

8.3.1 Emergency Care Steps

Upon entering an accident area, site personnel must follow these emergency care steps:

- Survey the scene. Determine whether it is safe to proceed. Try to determine whether the conditions that caused the incident are still a threat. Protect yourself from exposure before attempting to rescue the victim.
- Do a primary survey of the victim. Check for airway obstruction, breathing, and pulse. Assess likely routes of chemical exposure by examining the eyes, mouth, nose, and skin of the victim for symptoms.
- Phone Emergency Medical Services (EMS). Give the location, telephone number used, caller's name, what happened, number of victims, victim's or victims' condition, and help being given.
- Maintain airway and perform rescue breathing as necessary.
- Perform CPR as necessary.
- Do a secondary survey of the victim. Check vital signs and do a head-to-toe exam.
- Treat other conditions as necessary. If the victim can be moved, take him/her to a location away from the work area where EMS can gain access.

8.4 First Aid — General

All persons must report any injury or illness to their immediate supervisor or the site supervisor. Trained personnel will provide first aid. Injuries and illnesses requiring medical treatment must be documented. The site supervisor and HSO must conduct an incident investigation as soon as emergency conditions no longer exist and first aid and/or medical treatment has been confirmed. Incident investigations must be completed and submitted to the Project Manager within 24 hours after the incident.

If first aid treatment is required, first aid kits are kept at the CRZ. If treatment beyond first aid is required, the injured person(s) should be transported to the medical facility. If the

injured person is not ambulatory, or shows any sign of not being in a comfortable and stable condition for transport, then an ambulance and/or paramedics should be summoned. If there is any doubt as to the injured worker's condition, it is best to let the local paramedic or ambulance service examine and transport the worker.

8.4.1 First Aid — Inhalation

Any employee complaining of symptoms of chemical overexposure as described in Section 4 will be removed from the work area and transported to the designated medical facility for examination and treatment.

8.4.2 First Aid — Ingestion

Call EMS and consult a poison control center for advice. If available, refer to the Material Safety Data Sheets (MSDS) for treatment information. If the victim is unconscious, keep him/her on his/her side and clear the airway if vomiting occurs.

8.4.3 First Aid — Skin Contact

Project personnel who have had skin contact with contaminants will, unless the contact is severe, proceed through the CRZ to the wash area. Personnel will remove any contaminated clothing and then flush the affected area with water for at least 15 minutes. The worker should be transported to the medical facility if he/she shows any sign of skin reddening, irritation, or if he/she requests a medical examination.

8.4.4 First Aid — Eye Contact

Project personnel who have had contaminants splashed in their eyes or who have experienced eye irritation while in the EZ must immediately proceed to the eyewash station in the CRZ. Do not decontaminate prior to using the eyewash. Remove whatever protective clothing is necessary to use the eyewash. Flush the eye with clean running water for at least 15 minutes. Arrange prompt transport to the designated medical facility.

8.5 Reporting Injuries, Illnesses, and Near-Miss Incidents

Injuries and illnesses, however minor, will be reported to the HSO immediately. The HSO will complete an injury report and submit it to the Project Manager within 24 hours.

Near-miss incidents are situations in which no injury or property damage occurred, but under slightly different circumstances an injury or property damage could have occurred. Near misses are caused by the same factors as injuries; therefore, they must be reported and investigated in the same manner. A Safe Performance Self-Assessment (SPSA) must be done immediately after an injury, illness, near miss, or other incident to determine whether it is safe to proceed with the work.

8.6 Emergency Information

The means to summon local public response agencies such as police, fire, and ambulance will be reviewed in the daily safety meeting. These agencies are identified in Table 5.

Table 5
Emergency Contacts

Emergency/Contingency Contact Telephone List	
Emergency Contacts	**Phone Number**
Local Contacts	
Coast Guard	911 or 206-220-7001 or Channel 16 on VHF-FM radio
Fire Department	911
Local Police	911
Sheriff	911
State Police:	911
Hospital: Legacy Emanuel Children's Hospital 2801 N Gantenbein Avenue, Portland	503-413-2500
Project Contacts	
Anchor Project Manager: Tom Schadt	(206) 287-9130
Anchor Health and Safety Officer: Dennis Hanzlick	(206) 287-9130
Anchor Site Supervisors:	
Ben Hung	(503) 670-1108

8.6.1 Directions to Hospital

Direction to Legacy Emanuel Children's Hospital from Terminal 4 site:

1. Turn right out of the Terminal onto Lombard.
2. Continue on Lombard until North Ivanhoe, bear right.
3. Turn right on to St. Helens and cross St. Johns Bridge.
4. At the end of the bridge, bear left and then bear right onto US 30.
5. Take left ramp onto I-405 toward The Dalles/Seattle.
6. Stay straight toward Kerby Avenue, turn right onto Kerby.
7. Turn left onto North Graham, continue on until Gantenbein.

Direction to Closest Hospital from Upland Transloading Facility site:

RESERVED

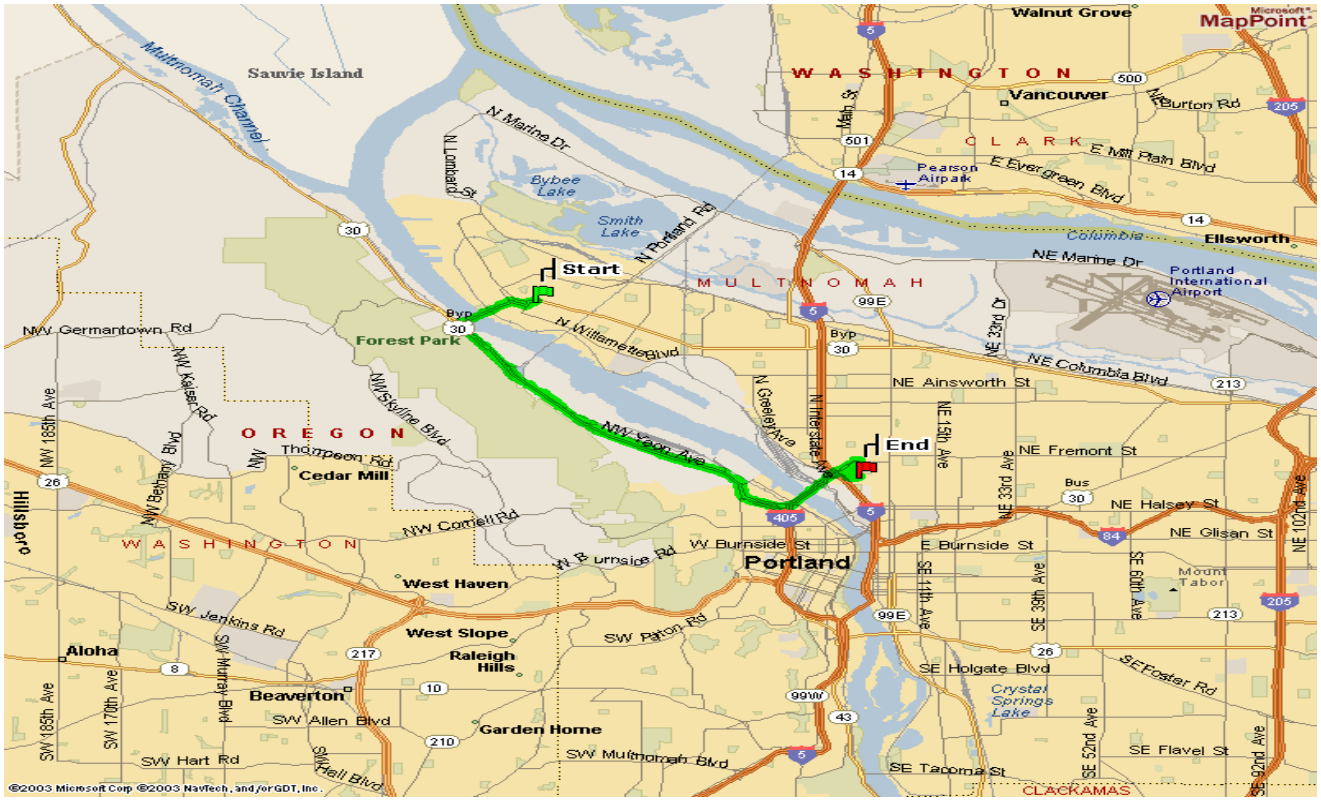

Figure 1
Map to Legacy Emanuel Children's Hospital

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