FINAL REMOVAL ACTION COMPLETION REPORT
TERMINAL 4 PHASE I REMOVAL ACTION
PORT OF PORTLAND, PORTLAND, OREGON

Prepared for

Port of Portland

Portland, Oregon

Prepared by

Anchor QEA, LLC

6650 SW Redwood Lane, Suite 333

Portland, Oregon 97224

In Association with

Ash Creek Associates, Inc.

Hickey Marine Enterprises, Inc.

June 2009

FINAL
REMOVAL ACTION COMPLETION REPORT

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

Prepared for

Port of Portland

Portland, Oregon

Prepared by

Anchor QEA, LLC

6650 SW Redwood Lane, Suite 333

Portland, Oregon 97224

In Association with

Ash Creek Associates, Inc.

Hickey Marine Enterprises, Inc.

June 2009

Table of Contents

List of Tables

List of Figures

List of Appendices (on DVD)

μg/kg	micrograms per kilogram
μg/L	micrograms per liter
$\mu g/m^3$	micrograms per cubic meter
ACA	Ash Creek Associates, Inc.
Anchor	Anchor QEA, LLC
AOC	Administrative Order on Consent for the Removal Action
Apex	Apex Laboratories, LLC
ARARs	Applicable or Relevant and Appropriate Requirements
ARI	Analytical Resources Inc.
BEBRA	Bank Excavation and Backfill Replacement Area
Bernert	Bernert Barge Lines
BES	Portland Bureau of Environmental Services
BMP	best management practice
CAS	Columbia Analytical Services
CC	Construction Change
CDF	Confined Disposal Facility
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CHASP	Contractor Health and Safety Plan
City	City of Portland
COC	constituents of concern
CQAP	Construction Quality Assurance Plan
CQC	Construction Quality Control
CQCP	Construction Quality Control Plan
CRD	Columbia River Datum
cy	cubic yards
DAR	Design Analysis Report
DDT	dichloro-diphenyl-trichloroethane
DEA	David Evans and Associates, Inc.
DEQ	Oregon Department of Environmental Quality
DGPS	differential global positioning system
DO	dissolved oxygen
DRET	dredging elutriate test
DSL	State of Oregon Department of State Lands

EE/CA	Engineering Evaluation/Cost Analysis
Envirocon	Envirocon, Inc.
EPP	Environmental Protection Plan
ESA	Endangered Species Act
ESPC	erosion, sediment, and pollution control
GPS	global positioning system
H:V	horizontal to vertical
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HME	Hickey Marine Enterprises, Inc.
HP	horsepower
HSO	Health and Safety Officer
IMRP	Interim Monitoring and Reporting Plan
ISE	imminent and substantial endangerment
LDC	Laboratory Data Consultants, Inc.
LWD	large woody debris
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mg/m^3	milligrams per cubic meter
MHz	megahertz
MS/MSD	matrix spike/matrix spike duplicate
NCP	National Contingency Plan
NGVD	National Geodetic Vertical Datum
NH	Northwest Hydro
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NTCRA	Non-Time-Critical Removal Action
NTU	Nephelometric Turbidity Units
NUC	Northwest Underwater Construction, LLC
ODOT	Oregon Department of Transportation
OSHA	Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl

PEC	Probable Effects Concentration
Port	Port of Portland
PPE	personal protective equipment
PRGs	Preliminary Remediation Goals
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
RAOs	Removal Action Objectives
RAWP	Removal Action Work Plan
RFI	Request for Information
RI/FS	Remedial Investigation/Feasibility Study
RM	river mile
RNA	regulated navigation area
RPD	relative percent difference
SAP	Sampling and Analysis Plan
SCAE	Source Control Alternatives Evaluation
SLVs	screening level values
SOW	Statement of Work
T4	Terminal 4
TCLP	Toxicity Characteristic Leaching Procedure
TDP	Transportation and Disposal Plan
TPH	total petroleum hydrocarbons
TSS	total suspended solids
ULSD	ultra-low sulfur diesel
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USEPA	U.S. Environmental Protection Agency
VCP	Voluntary Cleanup Program
WQMCCP	Water Quality Monitoring and Compliance Conditions Plan
WQMP	Water Quality Monitoring Plan

CERTIFICATION STATEMENTS

The Phase I Removal Action has been constructed in accordance with the final design and specifications in the matter of the Portland Harbor Superfund Site, Terminal 4 Facility, Portland, Oregon. U.S. Environmental Protection Agency, Region X, Comprehensive Environmental Response, Compensation, and Liability Act Docket No. CERCLA 10-2004-0009. Port of Portland Respondent.

John R. Verduin III, P.E.
Anchor QEA, LLC
Date: 6/16/09

Nicole LaFranchise
Port of Portland
Date: 6/16/09

REGISTERED PROFESSIONAL ENGINEER
77473PE
6/16/09
OREGON
NOV. 8, 2005
JOHN RICHARD VERDUIN
EXPIRATION DATE: 6/30/2010

As required by Section VIII.24 of the Administrative Order on Consent for Removal Action at the Terminal 4 Facility, Portland, Oregon, the following statement certifies the contents of this document:

"Under penalty of law, I certify that to the best of my knowledge, after appropriate inquiries of all relevant persons involved in the preparation of the report, the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

John R. Verduin III, P.E., Anchor QEA, LLC
Partner

Date: 6/16/09

1 INTRODUCTION

1.1 Regulatory Background

The Port of Portland (Port) entered into an Administrative Order on Consent (AOC) with the U.S. Environmental Protection Agency (USEPA) in October 2003 to perform a Non-Time-Critical Removal Action (NTCRA) at the Terminal 4 (T4) site on the Willamette River in Portland, Oregon (Figure 1) (USEPA 2003a). The AOC requires the Port to perform an Early Action to address known contamination found in T4 sediment samples during a remedial investigation directed by the Oregon Department of Environmental Quality (DEQ). USEPA, in consultation with its federal, state, and tribal partners, evaluated and selected a Removal Action for the Port's T4 that included a combination of monitored natural recovery, capping, and dredging with placement of contaminated sediment in a Confined Disposal Facility (CDF) to be built on site. The USEPA-selected Removal Action was detailed in an Action Memorandum prepared by USEPA in 2006 (Action Memo; USEPA 2006).

Implementation of the Action Memo (USEPA 2006) is occurring in phases because many of the design issues required for full implementation are linked to the overall Portland Harbor-wide Remedial Investigation/Feasibility Study (RI/FS) process, which has been delayed. For this reason, in a letter to USEPA dated August 22, 2007, the Port requested that USEPA revise the schedule for implementation of the T4 Removal Action to realign the project with the harbor-wide RI/FS schedule. The Port's project realignment request acknowledged that the Port would work collaboratively with USEPA to identify and evaluate work (abatement measures) that could be initiated in the near term to reduce risk and address the imminent and substantial endangerment (ISE) at T4. To this end, the Port prepared an Abatement Measures Proposal in October 2007 (Anchor 2007a) to detail specific components of the Removal Action that the Port would implement as Phase I to address conditions at T4 that pose an imminent threat to human health and the environment. USEPA approved the Abatement Measures Proposal in November 2007. These abatement measures are described below and are considered the first phase (Phase I) of the Removal Action at T4:

- 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 sediment from aquatic receptors and control a potential ongoing source to nearby areas.

- Stabilization of the Wheeler Bay shoreline to minimize contaminant migration to the river.
- Dredging and off-site disposal of contaminated sediment in Slip 3 at Berth 410 to support water-dependent maritime use in a manner consistent with the Action Memo (USEPA 2006) and in support of overall risk reduction in the Removal Action Area (RAA).

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 once that information is available.

The Port initiated Phase I construction of the Removal Action in August 2008 and completed this first phase in October 2008. This Removal Action Completion Report (RACR) summarizes the Phase I Removal Action design and construction activities conducted to implement the design. This RACR was developed by Anchor QEA, LLC (Anchor) and is submitted to USEPA pursuant to Section VIII.24 of the AOC (USEPA 2003a). This RACR conforms to the requirements set forth in Section 300.165 of the National Contingency Plan (NCP) entitled "OSC Reports" and provides a majority of the information as required by the Statement of Work (SOW), which is an attachment to the AOC. The only item not included in this document that is detailed in the SOW is an appendix containing all the relevant documentation (e.g., manifests, invoices, bills, contracts, etc.) generated during the Removal Action. Although this information will not be included in this document, it will be available to USEPA if ever requested. In addition, the RACR also provides the reporting documentation required by the Water Quality Monitoring and Compliance Conditions Plan (WQMCCP; USEPA 2008 and Appendix R) and the Biological Opinion (NMFS 2008 and Appendix S). See Table 1 for a summary of major events and milestones, beginning with the signing of the AOC and through the completion of the Phase I Removal Action.

1.1.1 Removal Action Objectives

Removal Action Objectives (RAOs) for Phase I were jointly developed by the Port and USEPA as described in the Abatement Measures Proposal (Anchor 2007a). The objectives are listed below:

- Activities should be effective in abating ISE posed to aquatic life that may have direct contact with sediment within the RAA.
- Activities should be consistent with USEPA's selected Removal Action detailed in the Action Memo (USEPA 2006).
- Activities should not unduly impede or disrupt the designated use of T4 for water-dependent maritime use.

1.1.2 Roles and Responsibilities

USEPA designated Sean Sheldrake as the project coordinator to oversee implementation of the final design and work plan. Anchor and the Port jointly prepared the design documents with review and input from Ash Creek Associates, Inc. (ACA) and Hickey Marine Enterprises, Inc. (HME) throughout the design finalization. The Port was responsible for completing the Phase I Removal Action in conformance with the AOC, Applicable or Relevant and Appropriate Requirements (ARARs), approved Design Analysis Report (DAR; Anchor 2008a) (including plans and specifications), approved Removal Action Work Plan (RAWP; Anchor 2008b), Biological Opinion (NMFS 2008 and Appendix S), WQMCCP (USEPA 2008 and Appendix R), and other applicable documents. As described in detail in Section 4, the Port contracted with HME to implement in-water construction activities at T4 and to transport the material by barge to the transloading facility, offload the material into trucks, and transport the material by truck from the transloading facility to the landfill for disposal. HME was also contracted by the Port to implement the nearshore capping construction activities at the site. ACA was hired by the Port to complete the Wheeler Bay shoreline stabilization work. ACA subcontracted to Envirocon, Inc. (Envirocon) to implement the shoreline stabilization construction activities. In addition, the Port hired Anchor to perform environmental monitoring and to support the Port's construction management and oversight activities throughout Phase I of the project.

1.2 Organization of this Document

The remainder of this document provides detailed information on the Phase I Removal Action design and construction activities conducted to implement the design as follows:

- **Section 2 – Site Background** provides a description of the RAA and describes previous site investigations that were completed to characterize the sediment at T4 and used to inform the Phase I Removal Action design.
- **Section 3 – Summary of the Phase I Removal Action Design and Construction Planning** provides site background information used to inform the Phase I design, summarizes the Phase I objectives and performance standards, and details the Phase I design activities and environmental protection measures by subarea.
- **Section 4 – Dredging and Capping Construction Activities** describes the project timeline, details the mobilization and demobilization process, and summarizes dredging and capping activities and construction deviations from design.
- **Section 5 – Wheeler Bay Shoreline Stabilization Construction Activities** describes the project timeline, details the mobilization and demobilization process, and summarizes Wheeler Bay shoreline stabilization activities and construction deviations from design.
- **Section 6 – Summary of Monitoring and Construction Quality Assurance Activities** describes monitoring and construction quality assurance activities that were performed during implementation of the removal action to confirm compliance with the design and attainment of performance standards.
- **Section 7 – Summary of Activities Conducted in Accordance with the WQMCCP and the Biological Opinion** details activities that were conducted to comply with the WQMCCP (USEPA 2008 and Appendix R) and Biological Opinion (NMFS 2008 and Appendix S) and provides required reporting information.
- **Section 8 – Documentation of Performance Standards Attainment** summarizes the specific verification activities used to attain performance standards.
- **Section 9 – Field Monitoring Quality Assurance/Quality Control Documentation** provides a summary of the quality assurance/quality control (QA/QC) activities conducted during the field activities associated with the construction phase.
- **Section 10 – Certifications and Institutional Controls** details the actions required to maintain capped areas.
- **Section 11 – Construction Costs** details the costs associated with implementation of the Phase I project.

- **Section 12 – Lessons Learned** provides a list of lessons that were learned throughout the implementation of the Phase I project that will be helpful to refer to during the design stages of the Phase II project.
- **Section 13 – Phase I Removal Action Contact Information** summarizes the contact information for private and public representatives involved with the Phase I project.
- **Section 14 – References** summarizes the references used in the document.

2 SITE BACKGROUND

2.1 Terminal 4 Removal Action Area

The T4 facility itself is within or adjacent to the Portland Harbor Superfund Site. The RAA is defined in the AOC for the Removal Action as "that portion of the site adjacent to and within the Port's T4 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" (USEPA 2003a).

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 also currently owns a portion of the submersible and submerged lands in Slip 1 and Slip 3 located within the RAA. 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).

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

2.2 Summary of Site Investigations

A summary of the physical and chemical characterization information that was collected at T4 to characterize the existing site conditions and used to inform the design and develop the Phase I Removal Action is discussed below.

2.2.1 Physical Characterization

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

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 sediment overlying the grey, loose to medium-dense sands consist predominantly of very soft organic silt and clay with liquid limits ranging from about 70 to nearly 100 percent, and moisture contents ranging from 67 to 106 percent. The fines content of this sediment generally ranges from 51 to 96 percent, with average fines content ranging from 75 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 was expected that these soils would be normally consolidated and have very low undrained shear strengths. The undrained strength of the very soft sediment was estimated to be on the order of about 20 to 140 pounds per square foot (psf). The material dredged in Slip 3 was expected to consist of very soft to soft, slightly sandy to sandy organic silt and clay. Areas of higher density sediment were expected to be encountered during dredging and more likely with deeper depths where native soils are encountered. The sediment dredged at Berth 414 was expected to consist of very soft to soft, clayey, fine sandy silt with occasional wood chunks. In addition, debris was anticipated to be encountered during the dredging.

2.2.2 Elutriate Testing

The dredging elutriate test (DRET) is used to help assess water quality at the point of dredging. As reported in the Final DAR (Anchor 2008a), the DRET results for a composite dredge prism sample showed that water quality effects from toxic constituents resuspended by dredging were expected to be negligible (DAR Table 8, Anchor 2008a). 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 milligrams per liter (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 the DAR (Table 8, Anchor 2008a) 9 μg/L is the DEQ suggested default background concentration for copper in freshwater (DEQ 2002). Only a few polycyclic aromatic hydrocarbons (PAHs) were detected, and the few detected PAHs were two or more orders of magnitude below their acute water quality guidance values (USEPA 2003b).

No dichloro-diphenyl-trichloroethane (DDT) isomers, polychlorinated biphenyls (PCBs), or petroleum compounds were detected.

2.2.3 Disposal Suitability

The results of the analyses of samples from sediment cores collected from the Slip 3 dredge area in December 2007, including Toxicity Characteristic Leaching Procedure (TCLP) tests, were presented in Appendix G to the DAR (Anchor 2008a). The concentrations of TCLP constituents were below the regulatory levels; therefore, the sediment was not characteristically toxic. Because the sediment did not meet any of the other regulatory definitions of hazardous waste, the sediment was managed at the Wasco County Landfill as nonhazardous waste. The characterization data were also provided to Wasco County Landfill and used to characterize the sediment for disposal. USEPA Region 10, Office of Compliance and Enforcement, confirmed in an e-mail from Xiangyu Chu to Timothy Brincefield and Sean Sheldrake that the Wasco County Landfill was operating in compliance with their permit and was acceptable to receive waste from a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) action under the Off-Site Rule (Code of Federal Regulations, Title 40, Part 300.440).

2.2.4 Slip 3 General Chemical Characterization

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. Federal and state agencies, including the U.S. Army Corps of Engineers (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 2004). Most recently, sediment chemistry data were collected as part of the T4 Early Action design (Anchor 2006).

The primary source of sediment chemistry data that was used for the design of the Phase I Removal Action was the data collected during development of the T4 Early Action Engineering Evaluation/Cost Analysis (EE/CA; BBL 2005). Other historical reports containing data with acceptable quality assurance and documentation that was considered included:

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

Based on a review of the existing data, Table 2 of the DAR (Anchor 2008a) presents the constituents of concern (COCs) at Slip 3 that exhibited exceedances of Probable Effects Concentration (PEC) values in the EE/CA or in prior investigations. These COCs are listed in Table 2 of the DAR (Anchor 2008a) 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 Sections 4 and 5 of the DAR (Anchor 2008a).

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. The head of Slip 3 adjacent to the Bank Excavation and Backfill Replacement Area (BEBRA) work (BBL et. al. 2005) was also a target area for the Phase I Removal Action due to observations of sheens in that area.

Additional pre-construction samples were collected in the RAA in December 2007. As described in the Sampling and Analysis Plan (SAP) 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 depth and extent of Phase I dredging areas.

The results are presented in the Pre-construction Sampling Data Report, which is provided as Appendix G to the DAR (Anchor 2008a). The results were incorporated into the existing sediment quality dataset for use in the design of the Phase I Removal Action.

2.2.5 Wheeler Bay General Chemical Characterization

Composite surface soil samples were collected along the bank of Wheeler Bay. The composite samples were analyzed for total petroleum hydrocarbons (TPH), PAHs, PCBs, pesticides, metals, and phthalates. TPH, PAHs, pesticides, metals, and phthalates were detected in one or more of the samples, summarized as follows.

- PAHs were detected in the samples at concentrations that exceeded the preliminary screening levels.
- None of the pesticide concentrations exceeded industrial Preliminary Remediation Goals (PRGs). With the exception of 4,4-DDT at two locations, no pesticides exceeded terrestrial screening level values (SLVs) in the riverbank samples.
- The composite samples detected metals (arsenic, cadmium, copper, lead, and zinc) above regional background concentrations and the preliminary screening levels.
- Bis(2-ethylhexyl)phthalate was detected in one sample but was below the preliminary screening level.

3 SUMMARY OF THE PHASE I REMOVAL ACTION DESIGN AND CONSTRUCTION PLANNING

This section summarizes the Phase I Removal Action design details as described in the DAR (Anchor 2008a) and the construction planning details for implementation of the design as described in the Final RAWP (Anchor 2008b).

The Phase I Removal Action design was developed in accordance with the USEPA Action Memo (USEPA 2006). The design incorporated USEPA comments on the EE/CA (BBL 2005) and on the overall T4 Removal Action 30 and 60 percent design submittals and provides the specific details for the Removal Action activities. The RAWP (Anchor 2008b) presented the construction planning details for the implementation of the design with significant input from the contractors. Together, these documents provided the specific details for what the Removal Action activities are, and a plan for implementing those activities. These details are summarized below for dredging; transportation, transloading, and disposal; capping; and shoreline stabilization activities.

3.1 Dredging

As part of the Phase I Removal Action, dredging was 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 that are immediately adjacent to Berth 411, adjacent to Pier 5, and north of Berth 414. Dredge elevations in this area were controlled by the chemistry data.
- Berth 410 – An area adjacent to Berth 410, which was being removed down to navigational depths at an elevation of between -39.3 to -41.3 feet National Geodetic Vertical Datum (NGVD).

The basis of the dredge design relates to dredging performance standards and design objectives and criteria that are discussed in detail in the DAR (Anchor 2008a). The design details based on this information, as well as construction planning details, are summarized in this section for the Berth 411 "Plus" and Berth 410 dredge areas. The sampling locations used in the Phase I dredge area design are depicted on Figure 2 and are summarized in Table 2.

3.1.1 Design Details

3.1.1.1 Berth 411 "Plus" Areas

The lateral boundaries of the Slip 3 and North of Berth 414 dredge prism were developed by determining the extent of surface sediment exceeding 20 times the PEC ratio. This boundary was predetermined based on a core-by-core analysis of PEC exceedances as shown and discussed in detail in Section 4.2.2 of the DAR (Anchor 2008a). The depth and elevation of dredging within the Slip 3 and north of Berth 414 dredge prism were predetermined based on a core-by-core analysis of PEC exceedances. The depth of contamination was predetermined for each core location using compaction-corrected sampling intervals and chemical analytical results. 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 as detailed in the DAR (Anchor 2008a). A paid allowable overdepth thickness of 12 inches was set for the contractor based on dredging equipment tolerances and other constructability considerations. The maximum allowed depth the contractor could dredge to was 12 inches below the paid overdredge allowance described above. The total volume of dredged material from the Berth 411 "Plus" area was expected to be approximately 4,750 cubic yards (cy) without overdredge, to approximately 6,800 cy including payable overdredge.

A portion of the dredge footprint would not have full removal down to a PEC exceedance ratio of 10 due to the concern over slope stability and waterfront structures. After completion of dredging, these select areas would have a sand layer placed. The area of partial removal was 13,300 square feet. Six inches of the sand layer would equate to 400 tons of sand (assuming 1.65 tons per cy for the sand). To ensure adequate coverage, the contractor was required to place 600 tons (roughly 50 percent above the 6-inch target).

3.1.1.2 Berth 410 Area

The dredge design for the Berth 410 area was 150 feet wide extending from the Berth 411 "Plus" dredge area towards the navigational channel to provide safe navigation for vessels calling on Berth 410/411 to a required depths of -39.3 feet NGVD. Therefore, areas above elevation -39.3 feet NGVD were identified for removal. As with the Berth 411 "Plus" dredge design, a paid allowable overdepth thickness of 12 inches was given to the contractor based on dredging equipment tolerances and other constructability considerations. In addition, the maximum allowed depth the contractor could dredge to was 12 inches below the paid overdredge allowance described above. Therefore, for Berth 410, the maximum allowed dredge depth was -41.3 feet NGVD. The total volume of dredged material expected from the Berth 410 area was about 3,650 cy without overdredge, to about 6,300 cy including payable overdredge.

3.1.2 Construction Planning

Construction planning for the dredging activities (including sand layer placement) is discussed in detail in Section 2 of the RAWP (Anchor 2008b), and highlights including sequencing and the planned dredge and sand layer placement methods are summarized below. This section also discusses the planned method for containing the water that drained out of the dredge material on the transport barges.

The following construction sequence was anticipated for the dredging and sand layer placement work:

- Dredging would begin after completion of the mobilization and setup of the transloading facility at The Dalles, Oregon. The first dredge location would be at the small area just north of Berth 414. This work was expected to be completed in 1 day.
- The offloading derrick (Sea Vulture), the transport barge containing sediment dredged from the first dredge area, and the barges to be used for the spill containment at the transloading facility would be towed together up river to The Dalles transloading facility.
- The Berth 411 "Plus" area would be dredged from the head of the slip towards the mouth. The duration of the work was anticipated to be 10 days. Transport (haul) barges would be loaded one day and offloaded the next, requiring 2 days to complete the dredge, haul, offload, and return cycle.

- Offloading at The Dalles transloading facility would occur concurrently with the dredging operation.
- A short shutdown would occur at the completion of the Berth 411 "Plus" dredging before the Berth 410 dredging occurred ("Shutdown Dredging Event 1"). During the shutdown, the dredge plant, material barges, upland transload equipment, and on-highway haul trucks would demobilize. The on-water transload equipment would not demobilize.
- After remobilization of the equipment, the sand layer would be placed following the completion of the Berth 411 "Plus" dredging during the Shutdown Dredging Event 1 time period.
- The Berth 410 dredging would be completed in a similar sequencing as described above for Berth 411 "Plus". The work would occur for 3 days and then Shutdown Dredging Event 2 would occur.
- During this second shutdown, the capping work at the head of Slip 3 would occur.
- Remobilization for additional dredging to address remaining high spots, if any, would then occur, and the final dredging would require up to 4 days.

3.1.2.1 Dredge Method

The planned dredge method for the Berth 411 "Plus" and Berth 410 areas was to use a mechanical bucket. Specifically, the contractor was planning to perform the dredging using a 20-cy Cable Arm clamshell bucket and if sediment could not be dredged due to a denser river bottom, a 10-cy heavy-duty Atlas round-nose clamshell bucket would be used to reach final grade.

3.1.2.2 Barge Water Containment Method

As the material was dredged and placed into a barge, water from the dredge material was collected and contained as described in this section. Each flat-deck material barge was to have up to 6-foot-high fully enclosed watertight welded steel bin walls, and all scupper holes were to be closed off and secured. The barge was to be loaded in a manner to prevent listing, and material was to be loaded with special care to fill no more than 1-foot from the top of the bin walls.

Temporary barrier walls were to be secured at a 45-degree angle in all four corners of the transport barges to facilitate sediment dewatering. The barriers were to have seepage holes cut along the base with screens secured at the openings to retain the solids and allow water to flow behind the barrier for pumping to the lash combo barge. Slotted 55-gallon drums were to be set behind the temporary barrier for water gathering and pump placement. There were to be pumps stationed on each corner of the material barge during dredging operations with two to three workers dedicated for transfer of water to the lash barge. The lash barge was to be made up of four compartments and have approximately 450,000 gallons of total liquid capacity.

The lash barge was to be hauled to Berth 408 and offloaded to the designated upland sanitary sewer manhole at T4 (see DAR Figure 1 for location, Anchor 2008a). The Port obtained a permit from the City of Portland Bureau of Environmental Services (BES) (Batch Discharge Number 2008-027). The estimated water discharge volume was up to 1.5 to 2 million gallons. The discharge rate was to be kept below 100 gallons per minute as monitored with a flow meter. If water removal was required from the lash barge prior to the first scheduled shutdown, the barge would be transported to Cascade General, located on Swan Island, to be pumped into large holding tanks without any discharge flow restriction. This work would be done at night with no impact on the dredging operation. Additionally, if the water did not meet the BES compliance requirements, the lash barge would have also been transported to Cascade General to be pumped into holding tanks and treated prior to discharge.

3.1.2.3 Sand Layer Placement Method

For the placement of the sand layer in Berth 411, a grid pattern of cells would be drafted and downloaded to the computer in the dredge cab. HME planned to use a 10-cy Atlas re-handle bucket with a width of 8 feet. Placement of 1 ton (approximately 0.8 cy) of the sand layer per 22 square feet of area would be accomplished by determining the weight of sand layer material required for each grid (8 feet by 25 feet +/- 200 square feet) with a full bucket. Each cell would require approximately 7.3 cy (5.8 tons) of sand layer material. HME determined that filling the bucket a minimum of 75 percent full before placement would assure at least the minimum coverage of 1 ton per 22 square feet.

Positioning the floating crane to start placement of the sand layer would be done in a manner to prevent the spuds of the barge from settling into any of the placed layer. All work would begin near shore and work offshore, covering 60 to 75 feet of width before repositioning the floating crane.

To spread the sand layer evenly, the bucket would be lowered to the water surface and then cracked open. The operator would then swing throughout the cell until all of the material was removed from the bucket. The operator would then position the bucket at the center of the covered cell and push the capping target button located near the swing control lever. The capping target button would fill the cell selected with color and store the position to a saved file. Usage of this feature would allow the operator to keep track of the area that had been covered. Figure 6 of the RAWP (Anchor 2008b) illustrates the Base Cap Type 3 capping placement grid.

3.2 Transportation, Transloading, and Disposal

Dredged sediment transportation, transloading, and disposal activities are described in the DAR (Anchor 2008a) and RAWP (Anchor 2008b). The design details, as well as construction planning details, are summarized in this section for the disposal of the dredged sediment.

3.2.1 Design Details

The primary design detail related to transportation, transloading, and disposal was that the material would be disposed of at an upland disposal facility. The specific details related to this activity were to be developed by the contractor as part of the construction planning process. The Transportation and Disposal Plan (TDP) presented in the DAR (Anchor 2008a) as Appendix F, along with the Construction Specifications (Appendix E of the DAR, Anchor 2008a), detail the requirements for transporting and disposing of dredged sediment to the landfill. In general, the intent during design was that dredged sediment would be loaded into haul barges and taken to a transloading facility, where the material would be transferred from the barges to trucks or rail cars for transportation to disposal facilities. Upland soils and other wastes were expected to be loaded directly onto trucks for transport to disposal facilities or for transfer to rail cars for transport. The waste materials were to be delivered to the disposal facilities by truck or rail. If rail transport was used, the contractor was to transload the waste from rail cars to trucks within the disposal facility for final delivery of the material to the landfill.

3.2.2 Construction Planning

Construction planning for transportation, transloading, and disposal activities is discussed in detail in Appendices D1 and E of the RAWP (Anchor 2008b) as part of HME's dredging, transportation, and disposal plan. In general, HME determined that the dredged sediment would be placed into sealed haul barges, and hauled to the Port of The Dalles for offloading. The material would be disposed of at the Wasco County Landfill (Appendix D1 of the RAWP contains the offloading facility permit from DEQ). Planning details determined for hauling material by barge, transloading and disposal of material at the landfill, and hauling material by truck are summarized below.

3.2.2.1 Hauling Material by Barge

Sediment barges were to be transported to the Bernert Barge Lines (Bernert) Terminal located in The Dalles (see RAWP Figure 7 for barge haul route map, Anchor 2008b). The transport started at Willamette RM 4, with movement initially downstream to Willamette RM 0/Columbia RM 101.5. The upstream transport was to initiate at Columbia RM 101.5 to the Bernert facility in The Dalles at Columbia RM 189.

The 2,500- to 3,000-ton sediment barges were to be attached to the *Sea Vulture* with fleeting facilitated by a winch affixed to the *Sea Vulture* for offload. The material was to be offloaded with a 14-cy Cable Arm environmental clamshell bucket. Two drip containment barges were to be strategically located with fabricated drip plate(s) placed as shown on Figure 9. The two drip containment barges, with 20-foot by 8-foot watertight open-top containers, and the watertight sediment transfer box were to be placed at dock's edge. The placement of the drip containment was to be in the path of the *Sea Vulture's* offload swing radius to eliminate the potential of spilling sediment into the river, onto the dock, and on the ground upland (see RAWP Figure 8, Anchor 2008b).

Prior to the departure of any loaded sediment barge from Portland Harbor, an extended weather forecast was to be researched for the transit to The Dalles transloading facility. Results of these weather checks are included in Appendix L1. As stated in the DAR (Anchor 2008a) and the RAWP (Anchor 2008b), the barges were to be covered if weather warranted. Weather with high winds and hot, dry weather would trigger the need for covering.

3.2.2.2 Transloading and Disposal of Sediment and Debris at Subtitle D Landfill

The initial activity for this portion of the T4 project was the development of the upland transloading facility, which included pavement improvements, stormwater management berms, watertight transload box installation, drying agent storage, truck lining station, truck covering station, and dry decontamination station (see RAWP Figure 8, Anchor 2008b).

Pavement improvements were to include subgrade preparation and paving of the existing gravel area along the east side of the property. In addition to the new pavement in this area, existing joints and transitions were to be sand seal coated. Extruded asphalt curbing was to be installed to corral precipitation and add a redundant mechanism to isolate potential spillage (if any) in the re-handle/transloading process.

Ecology blocks were to be used to develop the drying agent containment area within reach of the load-out excavator. The drying agent was to be stockpiled at the landfill and was to be backhauled to the Bernert yard as needed to maintain a sufficient quantity to supplement the sediment moisture reduction program. The drying agent was to be stockpiled on both the barge and the ground adjacent to the excavator.

A custom, fully-welded, watertight steel fabricated box was to facilitate a large target for the clamshell bucket to transfer the sediment for rehandle to on-highway 8-axle truck and trailers. The walls of the box were to be of sufficient height to eliminate the potential of splattering sediment outside of the containment as the clamshell bucket opened.

Prior to load-out in the trucks, each bed was to be fully lined with plastic. Concurrently, bed liners were to be shipped/stored, the lining and truck bed covering stations were to be constructed, and the truck haul routes (temporary pavement markers) were to be established. Upon completion of loading the trucks, each truck bed was to be covered prior to departure to the landfill. If sediment spillage occurred at the transfer point, the material was to be immediately hand-shoveled, swept up, and incorporated into the load.

Dust suppression was to be handled with water misting of the sediment via the water pumps on the *Sea Vulture*. A widespread water misting system was to be strategically placed to moisten the exposed sediment and completely eliminate airborne particulates. In addition, dust was to be fully suppressed at the surge/transload box. This was to be accomplished in the same manner as described above, with water sourced from either one of the pumps on the *Sea Vulture* or the upland fire hydrant located at the entrance to the Bernert facility. All water used for dust suppression was to be contained within the barge.

The truck loading procedure was to be as follows:

- Truck beds were to be lined at the bed lining station.
- Trucks were to pull into the loading zone.
- Sediment offloaded by the *Sea Vulture* was to be placed in the surge/transload box.
- The 70,000-pound excavator was to supplement and mix the drying agent with the sediment as needed to absorb any moisture prior to loading in the truck.
- Trucks were to be loaded with special care to direct the material for transport to the Wasco County Landfill. On-board axle scales were to facilitate loads to legal limits.
- The loaded truck was to be inspected for any residual spillage of sediment and immediately cleaned off.
- The loaded truck was to then move to the tarping station for load coverage prior to disembarking to the landfill.

- Concurrently with the offload of sediment, submersible pumps were to be available to pump off any free liquids generated in the process either in the transport barges or surge box. Water generated was to be allowed to settle and the water was to be pumped off to a water hauler for disposal at the Wasco County Landfill. During pumping operations, all connections were to be visually monitored for signs of leakage.
- Housekeeping was imperative and personnel were to be dedicated to maintain drip pans, haul routes, and truck decontamination through the entire cycle of operations.

As a precaution, two Baker/Frak tanks were to be permanently stationed on one of the drip containment barges and the upstream end of the *Sea Vulture* to facilitate free liquids (if any) pumped off of the sediment transport barges. During pumping operations, all connections were to be visually monitored for signs of leakage.

3.2.2.3 Hauling Material by Truck

The trucks were to haul on the designated haul route shown on RAWP Figure 9 (Anchor 2008b). Trucks were to weigh in, generating certified scale weights of each load for detailed recording. The load was to be dumped and trucks were to exit and return to the Bernert yard to start another round of the cycle.

The approved landfill was the Subtitle D Wasco County Landfill facility in The Dalles. The drying agent was a landfill-approved material produced at the Camas, Washington, Georgia-Pacific paper plant. This material was an ash-based byproduct generated in the process of paper production.

3.3 Head of Slip 3 Capping

As part of the Phase I Removal Action, a cap was required to be placed at the head of Slip 3. This cap was designed to consist of two layers. The lower layer is the base cap, which serves to isolate the contaminants. The DAR (Appendix E, Anchor 2008a) describes two types of the base cap:

- Base Cap Type 2 – This material is a sandy gravel to gravelly sand. The coarser gradation allows the material to be placed on steeper slopes.

- Base Cap Type 3 – This material has the same gradation as the Base Cap Type 2 material but it has organoclay amended at 10 percent by weight.

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 armor layer is referred to as Type 3 Armor. The basis of the head of Slip 3 cap design relates to capping performance standards and design objectives and criteria that are discussed in detail in the DAR (Anchor 2008a). The design details based on this information, as well as construction planning details, are summarized in this section for the head of Slip 3 cap.

3.3.1 Design Details

The head of Slip 3 cap consists of two unique parts. In front of the timber bulkhead, the cap serves to confine contaminated sediment 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 serves to confine contaminated sediment from receptors and also control sheens.

The DAR (Anchor 2008a) provides a detailed summary of the analyses that were performed to determine the appropriate thickness of the cap based on the following considerations:

- Chemical isolation and sheen control
- Erosion (i.e., from wind-induced waves, vessel-induced waves, currents, and/or propeller wash
- Slope stability
- Bioturbation
- Consolidation
- Operation

Based on the results of these analyses, the cap design consists of two components as shown on Figure 9 of the DAR (Anchor 2008a):

- Behind the timber bulkhead – at least 18 inches of Base Cap Type 3 overlain with 18 inches of Base Cap Type 2 overlain with Armor Type 3.

- In front of the timber bulkhead – 18 inches of Base Cap Type 3 overlain with Type 3 Armor rock buttress.

3.3.2 Construction Planning

Construction planning details for the head of Slip 3 cap area are summarized in the RAWP (Section 4, Anchor 2008b). Figure 10 in the RAWP shows a cross section through the cap at the head of Slip 3. The cap section was to consist of 870 tons of Base Cap Type 3 material (sand and gravel mixed with organoclay) below 90 tons of Base Cap Type 2 material (to be placed behind the timber bulkhead only) and 2,450 tons of Type 3 Armor material. The cap was to first be placed in front of the timber bulkhead to increase the stability.

The following sequencing was anticipated for the placement of the head of Slip 3 cap:

- First, the Base Cap Type 3 material was to be placed offshore. Then the wedge would be placed on top of the Base Cap Type 3 material against the timber bulkhead to increase the stability.
- After the wedge was placed, the work behind the sheetpile wall would begin. First, the existing armor and filter blanket material would 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 armor material would be stockpiled for reuse.
- Organoclay-amended fill material would 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 needed to be addressed with the new organoclay-amended fill was the bench excavated into the silt at the time of the BEBRA installation. That bench would be entirely covered with organoclay/sand under the design as shown on Figure 9 of the DAR (Anchor 2008a) (with the only excavation being removing a small portion of armor/gravel placed during the BEBRA; there was to be no silt excavation). Visual observations during excavation were to indicate if the bottom elevation of the new excavation and fill needed to be lowered. Unnecessarily taking the new excavation and fill down to the timber bulkhead would be difficult due to access and would compromise the integrity of the bulkhead.

- After the organoclay-amended fill was placed, 18 inches of Base Cap Type 2 material was placed, and then a layer of filter material followed by armor placed on top.

3.3.2.1 Capping Methods

The in-water portion of the Base Cap Type 3 material at Slip 3 was to be placed by the same method as discussed for the sand layer placement (see Section 3.1.2.3). As with the sand layer, the capping target button, upon depression, was to fill the cell selected with color and store the completed location in the computer file. Armor was to be placed with a skip box either by the *Sea Hawk* or *Sea Horse* on the water side of the existing wall at the head of Slip 3.

Placement of the material for the land component of the cap was to be performed in combination with the walking excavator and Base Cap Type 3 and Base Cap Type 2 materials fed by a water crane via skip box for surgical placement and dressing in the sloped area. Initially, the walking excavator, equipped with a winch to tie off to a much heavier piece of mobile equipment at the top, was to carefully remove the Class 100 armor in the area(s) of placement. The processed Base Cap Type 3 material on the barge was to be skip-placed in the segment to be capped within reach of the walking excavator. Cap material was to then be spread from the base of the slope upward in each segment. Upon completion of the cap placement and inspection, the Base Cap Type 2 was placed, followed by the filter blanket. The armor was to be rehandled and carefully replaced over the filter blanket. The plan was to completely finish a section, across the total width, in three to four 30- to 40-foot lengths, then move to the next segment. By not opening the entire upland area, overall stability of the upper slopes would be better maintained, greatly reducing the potential for needing movement in and out of the easily damaged existing planting areas.

3.4 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 Wheeler Bay river bank area was identified as requiring a source control measure for stabilization. Potentially erodible river bank soil in the vicinity of Wheeler Bay contains concentrations of PAHs, metals, and/or pesticides above screening levels for human and ecological receptors. A Source Control Alternatives Evaluation (SCAE) was completed to select a source control measure for the Wheeler Bay bank (Ash Creek/NewFields 2007). In the SCAE, general approaches for source control of the soil on the Wheeler Bay bank were identified and assessed. Based on the results of that evaluation, the recommended source control alternative for the potentially erodible river bank soils in Wheeler Bay was armoring with regrading/revegetation of the upper slope. Additionally, in USEPA's Action Memo for the Removal Action at T4 (USEPA 2006), the remedy identified for a portion of the Wheeler Bay bank slope was a sediment cap based on higher PAH concentrations in one surface sample location.

The basis of the shoreline stabilization design relates to performance standards and design objectives and criteria that are discussed in detail in the DAR (Anchor 2008a). The design details based on this information, as well as construction planning details, are summarized in this section for the Wheeler Bay shoreline stabilization.

3.4.1 Design Details

The DAR (Anchor 2008a) provides a detailed summary of the analyses that were performed to determine the appropriate design of the shoreline stabilization treatment in Wheeler Bay based on the following considerations:

- Geotechnical
- Erosion (i.e. from wind-induced waves, vessel-induced waves, currents, and/or propeller wash

Based on this information, Figures 10 and 11 of the DAR (Anchor 2008a), as well as sheets C-1, C-2, C-3, L-1 and L-2 in Appendix D of the DAR, detail the design and construction of the Wheeler Bay shoreline stabilization. Each of the different components of the shoreline work has a different total thickness. Figure 11 of the DAR presents a detail showing how the different components would be tied together to produce an even surface down the slope.

As shown in the sections, the existing slope along the shoreline is typically 2 horizontal to 1 vertical (2H:1V), or steeper. To increase the stability of the shoreline area, one of two measures would be completed:

- From Stations 0 to 7+42, the slope would be graded back to 3H:1V. The surface of the new slope above elevation 15 feet NGVD would be planted to resist erosion. The surface of the new slope below elevation 15 feet NGVD would be armored.
- From Station 7+42 to the south, the slope would be graded back by filling to 2H:1V with armor. The presence of upland structures and pavements adjacent to the slope prevent cutting the slope back. Building the slope out into the water would cause loss of habitat and impact the existing outfall in the area. The existing slope shows no indications of instability.

The portion of the slope above elevation 15 feet NGVD would 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) would require granular erosion resistance. Based on the erosion analysis, an armor layer with cobbles would be required. This corresponds to an Oregon Department of Transportation (ODOT) Type 100(E) armor. This layer would need to be placed on a filter layer of sandy gravel to gravelly sand. In addition, placement of a layer of habitat material would be placed over the armor layer and large woody debris with rootballs (salvaged and new) would be placed and/or anchored along the shoreline between elevations 10 and 15 feet NGVD.

3.4.2 Construction Planning

Construction planning details for the Wheeler Bay shoreline stabilization are summarized in the RAWP (Section 5, Anchor 2008b).

3.4.2.1 Earthwork and Landscaping Sequence and Methods

The methods for the Wheeler Bay shoreline stabilization earthwork and landscaping are summarized below. This work was to be completed from shore with land-based equipment.

- **Erosion Control.** Erosion control would be installed prior to beginning any site earthwork. At a minimum, silt fence would be installed on the sides and downslope of the project area. Construction fencing would delineate the project area along the railroad.

- **Dust Control.** Dust control would be provided at all times during onsite activities. Primary dust control would be by water truck and fire hose. Operational procedures would be adjusted during periods of high wind to maintain optimal dust control.
- **Debris Removal.** Large woody debris within the project site would be removed from the beach and stockpiled on-site for future reuse. All other debris within the project area (generally consisting of concrete, asphalt, and treated wood but also including miscellaneous refuse) would be removed for recycling or disposal.
- **Grade Control.** Prior to the start of excavation, the area would be surveyed and staked by a third-party Professional Land Surveyor (PLS). Surveying and grade control performed during the excavation and fill process would be performed by Envirocon's in-house surveyor with oversight from the third-party PLS.
- **Clearing and Grubbing.** Clearing and grubbing would take place the first week onsite following installation of the erosion-control measures. The work would be performed with an excavator and articulated truck.
- **Subgrade Cut and Fill.** Subgrade cut and fill would begin the end of the first week onsite and would be performed with two excavators, an articulated truck, a water truck, and compaction equipment.
- **Installation of Surface Materials (Elevation 10 feet to 15 feet).** The installation of the fill materials would commence following verification that the subgrade is at the appropriate elevation. The demarcation layer, select fill, armor stone, habitat cover, large woody debris, and habitat logs would be placed as depicted on the Drawings and described in the Construction Specifications (DAR Appendices D and E, respectively, Anchor 2008a). Installation would be performed with an excavator, backhoe, dozer, articulated truck, water truck, and compaction equipment.
- **Installation of Surface Materials (Elevation 15 feet to 30 feet).** Installation of the fill materials would take place once the toe had been constructed to elevation 15 feet. Installation of the demarcation layer, topsoil, and coir fabric would be conducted per the plans and specifications. Installation would be performed with an excavator, backhoe, dozer, articulated truck,

and water truck. Mulch would be installed between elevation 15 and 20 feet using a pneumatic blower to the depth specified in the Drawings and Construction Specifications (DAR Appendices D and E, respectively, Anchor 2008a).

- **Planting and Seeding.** The installation of plant materials would begin in the end of the fourth week onsite. Planting would occur following the topsoil placement and would be performed under the supervision of a qualified landscaping professional. Willows would be planted between elevation 15 feet and 20 feet. Cottonwoods would be planted at elevation 20 feet. Hydroseeding and jute matting would be placed per the Drawings and Construction Specifications (DAR Appendices D and E, respectively, Anchor 2008a) above elevation 20 feet.

3.4.2.2 Methods for Transportation and Disposal of Excess Materials

Materials generated for removal from the site included vegetation free of soil, rootballs, and other grubbing materials containing soil, concrete debris, asphalt concrete debris, miscellaneous debris, and excess soil from subgrade cut and fill. Practices for on-site handling and off-site transportation of these materials are discussed in the Environmental Protection Plan (EPP) and the TDP in the RAWP (Appendices C2 and D2, respectively, Anchor 2008b). These materials would be handled, transported, and recycled or disposed of in accordance with the following guidelines.

Handling. All materials bound for off-site recycling or disposal would be either direct-loaded into trucks for transportation to the landfill or stockpiled on-site pending loading and transport. If stockpiled outside the boundary of grading activities, waste materials (materials bound for off-site disposal at a landfill) would be placed on plastic. These stockpiles would be covered and secured with plastic if stockpiled for more than 1 day.

Materials bound for off-site recycling would be cleaned of soil using the following approach:

- Loading and hauling of debris for recycling would be subject to inspection and approval of USEPA.
- Debris would be gripped by the excavator and soil shaken loose at the point of removal.
- Debris would be stockpiled for inspection/cleaning prior to loading.
- Each debris piece would be inspected for attached soil. Attached soil would be removed by dry sweeping as necessary until free of visible soil (maximum of 5 percent of surface area covered with soil). After inspection, clean debris would be loaded for off-site transport.

Transportation. Materials would be transported by truck in accordance with U.S. Department of Transportation requirements. Trucks would weigh in, generating scale weights of each load for detailed recording.

Recycling or Disposal. Materials removed from the site would be recycled or disposed of in accordance with the following:

- Vegetation free of soil would be sized and transported to an approved wood waste recycler. The identified recycler was Waste Connections' Wasco County Landfill.
- Concrete and asphalt concrete free of soil would be sized appropriately and transported to an approved recycling facility. The identified recycler was Porter W. Yett Co. of Portland, Oregon.
- Rootballs and other grubbing materials containing soil, miscellaneous debris, and excess soil from subgrade cut and fill would be transported as waste to Waste Connections' Wasco County Landfill.

4 DREDGING AND CAPPING CONSTRUCTION ACTIVITIES

The Phase I Removal Action dredging and capping construction activities began on August 12, 2008, and were completed on October 1, 2008. Activities associated with this work were detailed and documented in daily reports prepared by the field construction QA representatives. The daily reports were compiled into weekly reports, and copies of the weekly reports are provided in Appendix A. Photographs were taken throughout the project and are provided in Appendix K.

All work was conducted in accordance with the project Drawings and Construction Specifications (Appendices D and E, respectively, to the DAR, Anchor 2008a) or approved revisions to those requirements, which are also discussed in this section. All changes to or clarifications of the project design were documented with a Construction Change (CC) and/or a Request for Information (RFI), reviewed, and approved by the Port and USEPA. Table 4 provides a complete list of all CCs and RFIs for the dredging and capping portion of the project (see Table 9 for Wheeler Bay CCs and RFIs). Figure 3 depicts the post-dredge bathymetry, before the sand layer was placed in the Berth 411 area at the head of Slip 3. Figures 4, 4a, 4b, 4c, and 4d show the as-built configuration of the post-dredge surface. Figure 5 shows approximate coverage of the Base Cap Type 3 material in-water and behind the bulkhead as well as the extent of the upland excavation. Figures 6 and 6a show the as-built configuration of the head of Slip 3 cap. A complete set of as-built drawings signed by a registered professional engineer is provided in Appendix Q. A final site inspection was completed with a representative of USEPA (Andrew Somes of Parametrix) on October 10, 2008, and no outstanding issues were identified.

The remainder of this section provides details related to the dredging and capping construction schedule, activities, and deviations from the design.

4.1 Project Schedule

The original schedule for the T4 dredging and capping project (RAWP Figure 5a, Anchor 2008b) had a planned timeline of approximately 9 weeks to reach completion (August 11 through October 3, 2008). Actual completion was achieved in approximately 10 weeks (August 12 through October 10, 2008). Descriptions of significant changes in the planned project timeline are summarized as follows:

- Dredging in the Berth 411 "Plus" areas was essentially completed on August 25, 2008, and dredging began in Berth 410 on August 25, 2008, before the first dredge shutdown to facilitate a resumption of Kinder Morgan Terminal operations. Dredging in Berth 410 resumed during the second Kinder Morgan Terminal shutdown period until September 6, 2008. Dredging of identified remaining high-spots within the Berth 411 "Plus" areas was completed on August 26 and 28, 2008, and September 10, 2008. Dredging of the remaining high-spots at Berth 410 was completed on September 8, 2008.
- Placement of the sand layer in the Berth 411 "Plus" dredging area occurred after dredging was completed in Berth 410 on September 12, 2008, rather than between Berth 411 "Plus" and Berth 410 dredging activities. This schedule change was discussed with USEPA during the August 20, August 27, and September 3, 2008 Weekly Construction Meetings.
- While dredging and capping were completed by October 1, 2008, the final barge load was held on the barge and not unloaded at the transloading facility until October 10, 2008. The transloading facility was being utilized for another project during the interim period, which led to unloading of the final barge load with T4 material being delayed until completion of transloading and decontamination activities related to the other project.

4.2 Mobilization

Mobilization primarily occurred between August 4 and 15, 2008, at T4 and the transloading facility. Specific details associated with mobilization activities at each location are described in detail below.

4.2.1 Terminal 4

Mobilization activities at T4 included installation of the fish diversion net, setup of the site office and field gear locker, and preparation for dredging and capping. The fish diversion net was set as described in Section 7.3 of the DAR (Anchor 2008a) on August 4, 2008, and installation was completed on August 5, 2008. Mobilization of dredging equipment to T4 occurred on August 12, 2008. A turbidity curtain and oil-absorbent boom were installed around the derrick and barge before dredging began.

Capping equipment was mobilized to the site on September 12, 2008. The Slip 3 cap component was constructed with the water crane *Sea Hawk* and a low-impact walking excavator (spider hoe) on the steep bank dry section for the Base Cap Type 3. The *Sea Horse* is a Manitowoc Vicon3900B pedestal-mounted unit on a 110-foot by 48-foot by 8-foot-high barge. The barge has two spuds for stability.

4.2.2 Transloading Facility

Development of the upland transloading facility included pavement improvements, stormwater management berms, installation of a watertight transload box, drying agent storage, truck lining station, truck covering station, and dry decontamination station (see RAWP Figure 8, Anchor 2008b).

Pavement improvements included subgrade preparation and paving of the existing gravel area along the east side of the property. In addition to the new pavement in this area, existing joints and transitions were sand seal coated. Extruded asphalt curbing was installed to corral precipitation and add a redundant mechanism to isolate potential spillage (if any) in the re-handle/transloading process.

Ecology blocks were used to develop the drying agent containment area within reach of the load-out excavator, and the drying agent was stockpiled at the landfill. A custom, fully-welded, watertight steel fabricated box was placed at the site. Concurrently, bed liners were shipped/stored, the lining and truck bed covering stations were constructed, and the truck haul routes (temporary pavement markers) were established. "Trucks entering and leaving" signs were to be installed on both sides of the road accessing the Bernert yard to establish notice to the public. Mobilization was completed the morning of August 12, 2008.

4.2.3 Pre-construction Surveying

A pre-construction bathymetric survey of the Berth 411 "Plus" and Berth 410 dredge areas and head of Slip 3 cap area was performed by David Evans and Associates, Inc. (DEA) on July 24, 2008. This survey served as the baseline condition for the dredging and capping areas and was compared to progress surveys conducted during the Removal Action to verify that design elevations had been attained.

4.3 Dredging

4.3.1 Summary of Dredging Activities

Dredging in Slip 3 began on August 12, 2008, and continued through September 10, 2008 and the sand layer was placed between September 12 and 16, 2008, as follows:

- Dredging was started and completed (with the exception of dredging to remove some identified remaining high-spots on September 10, 2008) in the area north of Berth 414 on August 12, 2008. Approximately 280 cy of material were dredged in this area using a 20-cy clamshell bucket.
- Dredging started in the center square dredge area within Slip 3 on August 13, 2008, and was completed on August 14, 2008. Approximately 1,070 cy of material were dredged in this area using a 20-cy clamshell bucket.
- After dredging was completed in the center square dredging area, HME demobilized the dredging equipment from the T4 site until August 18, 2008.
- Dredging began in Berth 411 on August 18, 2008, using a 20-cy Cable Arm bucket. However, a 10-cy digging bucket was used for dredging on August 24 and 25, 2008, when armor and/or hard native sediment were encountered. Dredging in Berth 411 was completed (except for dredging to remove some identified remaining high-spots performed on August 26 and 28, 2008) on August 25, 2008.
- Dredging began in Berth 410 on August 25, 2008, using the 10-cy digging bucket. A dredging shutdown in Berth 410 began on the afternoon of August 29, 2008, to facilitate Kinder Morgan operations. Dredging in Berth 410 resumed again on September 2, 2008, and continued through September 6, 2008, using the 20-cy Cable Arm bucket.
- Dredging to remove some identified remaining high-spots occurred in Berth 410 on September 8, 2008, and in the area north of Berth 414 on September 10, 2008, using the 20-cy Cable Arm bucket.
- A portion of the sand layer was placed on September 12, 2008. HME placed additional sand layer material on September 13 and 16, 2008. A summary table of the quantities of material placed each day is provided in Table 5. The sand layer survey report is provided in Appendix F.

A detailed log summary of dredging activities is provided as Table 6. A total of 12,819 cy of sediment were removed during the project. 262,830 gallons of dredge elutriate was pumped from the sediment scows into the lash barge during the project. Documentation related to dredging elutriate discharge permitting (City of Portland BES permit letter), as well as the final batch discharge report provided to BES are provided in Appendix N.

4.4 Transportation, Transloading, and Disposal

Transportation, transloading, and disposal activities occurred from August 18, 2008, through October 10, 2008. Summary logs of sediment and elutriate water offloaded at the transloading facility and transported to the landfill are provided in Tables 7 and 8, respectively. A total of 12,819 cy of sediment were dredged. At total of 20,070 tons of sediment were offloaded and hauled to the Wasco County Landfill during the project. Approximately 400 tons of additional material from the excavation of the cap area at the head of Slip 3 was also offloaded and hauled to the landfill. Documentation (weight tickets provided by the landfill) of disposal material amounts, as well as the special waste permit are provided in Appendix L1. Documentation related to weather checks performed to determine wind velocity (and whether covering of barges would be required) is also provided in Appendix L1.

4.5 Capping

Capping began September 12, 2008 and continued through October 1, 2008. HME began placing Base Cap Type 3 material on the water side of the pinch pile bulkhead at the head of Slip 3 on September 13, 2008. HME finished placement of the Base Cap Type 3 material on September 16, 2008. A log summary of capping material placement each day is provided in Table 5. HME began placing Type 3 Armor material on the water side of the pinch pile bulkhead at the head of Slip 3 on September 16, 2008, and continued placement on September 17, 18, 30, and October 1, 2008.

Landside of the pinch pile bulkhead, HME removed the existing surficial armor and excavated the subgrade down to the BEBRA on September 22, 2008. HME then placed approximately 325 tons of Base Cap Type 3 material on the slope on September 23 and 24, 2008 (850 tons total for the entire head of Slip 3 cap), and 405 tons of Base Cap Type 2. A geotextile was placed between the two layers as shown on the project Drawings (Appendix D of the DAR, Anchor 2008a). On September 25, 2008, HME placed back about 115 tons of the armor removed on September 22, 2008. The armor was placed up to elevation 5 feet Columbia River Datum (CRD). The remainder of the armor behind the bulkhead was placed on September 30 and October 1, 2008.

Survey data completed after construction indicated that the height of the rock buttress in front of the timber bulkhead was lower than shown on the construction drawings. A technical memorandum was generated to detail the assessment of the head of Slip 3 cap after construction and is provided in Appendix O. The memorandum reviews the cap design and interim monitoring requirements, summarizes the cap construction activities and results, and concludes with a recommended path forward. The recommended path forward is to implement and continue monitoring the head of Slip 3 cap in accordance with the Interim Monitoring and Reporting Plan (IMRP; Appendix C of the DAR, Anchor 2008a). Overall, stability has been improved relative to the pre-construction condition. However, long-term performance of the timber bulkhead is unknown as the piles age. Therefore, monitoring under the IMRP could indicate a need for additional rock in the low area to reduce the stress on the timber bulkhead.

4.6 Demobilization

4.6.1 Terminal 4

HME demobilized dredging equipment from the T4 site after dredging the Slip 3 center square on August 14, 2008. HME then re-mobilized dredging equipment back to the site before beginning dredging in Berth 411 on August 18, 2008. A dredging shutdown occurred to facilitate Kinder Morgan operations the afternoon of August 29 through September 1, 2008. HME demobilized during this time. Dredging resumed September 2, 2008, until Berth 411 and Berth 410 dredging was complete, after which dredging equipment was again demobilized from the site on September 10, 2008. Capping equipment was mobilized to the site on September 12, 2008, and then demobilized on October 1, 2008, when capping was completed.

4.6.2 Transloading Facility

There were two sets of demobilization activities that occurred at the transloading facility. Upon substantial completion of the T4 Phase I Removal Action project, the first round of demobilization and decontamination procedures occurred on September 12, 2008. This first set of activities included performing hand cleanup on the *Sea Vulture* and associated drip containment barges affixed to the Bernert Terminal. The upland equipment was thoroughly inspected and swept clean of residual sediment (if any). This equipment consisted of an excavator, rubber-tired loaders for barge cleanup, and on-highway end-dump trucks and trailers. All residual material was loaded and hauled to the designated landfill for proper disposal. Complete demobilization of the site did not occur until October as the offloading facility was being used for another project.

The barge transload facility underwent additional dismantling and cleanup on October 10, 2008. The splash pans were scraped and swept of any residual sediment and the transfer/surge box was swept by hand. The transfer box was then pressure-washed and vacuumed of the rinsate by West Coast Marine Services. Containment linings were gathered up for consolidation in a dump truck for disposal at the landfill. The entire site was swept of residual debris.

4.6.3 Haul and Lash Barge Decontamination

Construction equipment decontamination procedures were observed on six occasions by Anchor monitoring personnel. The decontamination events observed are summarized in Section 6.7. The construction equipment decontamination observation reports are provided in Appendix G1.

4.7 Construction Deviations from the Design for Dredging, Transportation, Transloading, Disposal, and Capping

Overall, a majority of the T4 Phase I Removal Action project was completed in accordance with the design documents as described in the DAR (Anchor 2008a). However, some portions of the project were constructed differently than had been described in the design documents to more efficiently achieve the RAOs. These deviations generally fall into two categories: changes to the final design, or additions to the final design. In all cases, deviations were approved by the Port and USEPA through the use of CCs or RFIs. In addition, there were cases where clarification to the design occurred during construction and was documented with an RFI. Relevant clarifications, even if no deviation occurred, are documented in this section along with the deviations as described below:

- CC#4 Piling Removal at the Head of Slip 3 – Ten piles were identified in the area of construction of the head of Slip 3 cap. The piles were not identified in the design survey. The piles were cut off above the water. The upper sections were recycled, and the lower sections were pulled and disposed of at an appropriate landfill.
- RFI#12 Filter Fabric Material Used in the Head of Slip 3 Cap – The Construction Specifications (Appendix E of the DAR, Anchor 2008a) did not identify which geotextile should be used. A polypropylene, needle-punched non-woven geotextile such as Mirafi 160N or equivalent was specified by the design engineer.
- CC#5 Head of Slip 3 Cap Armor Elevation – Survey data completed after construction indicated that the height of the rock buttress in front of the timber bulkhead was lower than shown on the construction drawings. This deviation is summarized in Section 4.5.1 and a technical memorandum that provides an assessment of the as-built cap and rock buttress is provided in Appendix O. The memorandum reviews the cap design and interim monitoring requirements, summarizes the cap construction activities and results, and concludes with a recommended path forward.

5 WHEELER BAY SHORELINE STABILIZATION CONSTRUCTION ACTIVITIES

The Wheeler Bay shoreline stabilization project began on August 5, 2008, and was completed on October 14, 2008. Activities were documented in daily reports. The daily reports were compiled into weekly reports, and copies of the weekly reports are provided in Appendix A. Photographs were taken throughout the project and are provided in Appendix K.

All work was conducted in accordance with the project Drawings and Construction Specifications (Appendices D and E, respectively, to the DAR, Anchor 2008a) or approved revisions to those requirements, which are also discussed in this section. All changes to or clarifications of the project design were documented with a CC and/or a RFI, reviewed, and approved by the Port and USEPA. A complete list of all CCs and RFIs for the Wheeler Bay portion of the project is provided in Table 9 (see Table 4 for dredging and capping CCs and RFIs). Figures 7 and 7a show the as-built configuration of the Wheeler Bay shoreline stabilization area. A complete set of as-built drawings signed by a registered professional engineer is provided in Appendix Q.

A final site inspection was completed with a representative of USEPA (Andrew Somes of Parametrix). A preliminary final inspection was completed on October 10, 2008. Only one item was identified: replace portions of the silt fence removed as part of demobilization. The missing silt fence was replaced on October 10, 2008. A final inspection was completed on October 22, 2008. No issues were identified except that USEPA wanted to verify installation and operation of the irrigation system. Mr. Andrew Somes visited the site on November 6, 2008, and verified operation of the irrigation system.

5.1 Project Schedule

The original schedule for the Wheeler Bay shoreline stabilization project (see Appendix P) had a planned timeline of approximately 5 weeks to reach completion (August 4 through September 10, 2008). Actual completion was achieved in 10 weeks (August 5 through October 14, 2008). One to two weeks of the increase in the project timeline resulted from inevitable delays associated with construction (e.g., delays caused by suppliers or subcontractors, demands of other projects, etc.). The remaining 3- to 4-week increase resulted from project changes or product availability (discussed in Section 5.6), summarized as follows:

- Relocation of electrical and telephone utilities was added to the project after notice to proceed (CC-1.1). These utilities and storm water facilities were located along the top of the bank where excavation was planned, so much of the project earthwork could not begin until utility work was completed. Utility relocation work was completed concurrently with site earthwork. However, work that was originally planned to be completed within about 2 weeks of the start of the project (site clearing and grading) was not completed until about 5 weeks after the start of the project.
- The original Habitat Cover delivered to the project site consisted of angular rock, which technically met the Construction Specifications (Appendix E of the DAR, Anchor 2008a). However, habitat cover consists of rounded rock. Rounded rock meeting the specification was not readily available and had to be produced for the project. The delay resulting from delivery of the habitat cover extended the project schedule 1 to 2 weeks.
- Miscellaneous contract changes (CC-3, Remove Fire Boat Pier; CC-7, Place Port Topsoil; CC-8, Grade Top of Bank) added nearly 1 week to the project schedule.

5.2 Mobilization

Mobilization primarily occurred between August 5 and August 7, 2008, and included delivery of equipment, setup of temporary facilities, pre-construction surveying, erosion/sedimentation control, and construction of temporary access roads. Some activities such as erosion/sedimentation control continued throughout the project.

5.2.1 Equipment

Primary equipment mobilized and generally on-site during the project included a water truck, PC300 excavator, JD450 dozer, HM300 off-road dump truck, and a Bomag 66-inch roller. Other equipment used included a front-end loader and second excavator.

5.2.2 Temporary Facilities

Temporary facilities were set up between August 5 and August 7, 2008. Temporary facilities included a fenced enclosure and a container for on-site storage of equipment and materials located outside the exclusion zone; a break area with covered tables, restroom, washing facilities, and a decontamination station; and temporary fencing (CC-2) around the exclusion zone (except along the river).

5.2.3 Pre-construction Surveying

On August 11 and 12, 2008, a pre-construction survey was completed to identify existing ground surface contours and to lay out temporary stations for grade checking throughout the project. The survey was used to set final grades to as closely as possible balance cut and fill after removal of debris and unsuitable soil.

5.2.4 Erosion/Sedimentation Control

Erosion and sedimentation control consisted of a silt fence surrounding the entire project on the river side and a rock construction access pad at the exit to the paved road. The silt fence was installed on August 6 and 7, 2008. The construction access pad was constructed adjacent to the paved road at the east edge of the project on August 12, 2008. The silt fence was inspected daily and repaired/replaced as needed. Daily reports documented silt fence repair/maintenance activities on 13 separate occasions between August 13 and October 10 (generally once every 3 working days).

5.2.5 Temporary Access

On August 6, 2008, two railroad crossings were constructed (using crushed rock) to provide truck access to the project site (see Appendix P).

5.3 Summary of Wheeler Bay Shoreline Stabilization Activities

This section discusses construction of the various elements of the Wheeler Bay shoreline stabilization project. The project layout is discussed using the following terminology:

- Station – The project begins at Station 0+00 and ends at Station 8+20. The first number in the station designation represents 100 feet along the baseline. The baseline for the project generally corresponds to the top of bank for the finished project. The second number represents the number of feet past the station number. For example, Station 3+50 represents the point 350 feet along the baseline from the beginning of the project.
- Elevation – Elevations provided use the NGVD 29-47 datum. In addition to station, project feature locations are described based on the target finish grade elevation at the location. The project had three primary elevation zones based on the primary mechanism to resist erosive forces: elevation 10 to 15 feet features armor rock;

elevation 15 to 20 feet features deep topsoil, heavy-duty erosion-control fabric, and cottonwood/willow trees; and elevation 20 feet to top of slope (generally between elevation 29 and 33 feet) features topsoil with native grasses covered by jute matting for temporary erosion control.

In general, the project consisted of reshaping the Wheeler Bay shoreline to a more stable configuration (flatter slopes), capping existing soil to prevent direct contact by potential receptors, and surface materials to improve resistance to erosive forces.

Figure 7 shows a plan view of the as-built configuration of the Wheeler Bay shoreline. Finish grade slopes between Stations 0+00 and 7+00 range from 3H:1V to 4.2H:1V, equal to or flatter than the goal of 3H:1V. From Stations 7+00 to 8+20, finish grades slopes are 2H:1V, equal to the goal. Figure 7a shows typical cross sections for the finished construction.

5.3.1 Clearing, Grubbing, and Grading

Site grading was completed between August 6 and October 4, 2008. Primary site grading was completed by September 11, 2008. However, touch-up grading of the subgrade was completed on September 17 and 27, 2008, and grading to remove the temporary access road was completed on October 4, 2008. Grading activities generally proceeded as follows:

- A temporary access road was constructed to the bottom of the slope generally between Stations 1+50 to 2+50.
- The excavator was used to clear vegetation, small debris, and associated soil. This material was loaded into the off-road dump truck, transported via the access road to a stockpile at the top of slope, and subsequently loaded into trucks for off-site disposal (see Section 5.4).
- Large concrete debris was cleaned of soil and stockpiled separately at the top of the slope. This material was subsequently loaded into trucks for off-site recycling (see Section 5.4).
- Existing large woody debris (LWD) within the project area was cleaned of soil and removed and stockpiled on site for later replacement within the project area.
- Subgrade was achieved by a combination of excavation, hauling, dozing, and compaction. Subgrade was achieved with primarily cut between Stations 0+00

and 3+00, primarily fill between Stations 3+00 and 6+00, and a combination of cut and fill from Stations 6+00 to 7+00. From Stations 7+00 to 8+20, subgrade preparation consisted primarily of clearing of vegetation. Minor excavation occurred on the upper 10 feet of the slope to achieve a maximum finish slope of 2H:1V.

- In fill areas, subgrade was compacted with the roller. In cut areas to receive topsoil, subgrade was loosened using the ripping tool on the dozer.
- Subgrade cut and fill were controlled on a daily basis with slope staking and progress surveys.

5.3.2 Armor

Armor was placed in two areas on the project. Betweens Station 0+00 and 7+00, armor was placed from elevation 10 to 15 feet. Between Stations 7+00 and 8+20, armor was placed between elevation 10 to 25 feet.

Stations 0+00 to 7+00. The armor section within this area consists of a demarcation layer (orange construction fencing), filter fabric (see Appendix P), 18 inches of select fill, and 18 inches of Type 3 Armor (Class 100 armor). The top of the armor section was completed 1 foot below finish grade to accommodate 1 foot of Habitat Cover (see Section 5.3.3). Figure 7a shows the armor installation for this area. Armor section layer thickness and grade were controlled on a daily basis with slope staking and progress surveys.

The armor section (demarcation layer, filter fabric, select fill, and armor) was placed in three phases. From August 26 to September 4, 2008, the armor section was placed between Stations 0+00 to 1+50 and between Stations 6+50 to 7+00. From September 11 to 19, 2008, the armor section was placed between Stations 2+50 and 6+50. On October 3, 2008, after removal of the temporary access road, the armor section was placed between Stations 1+50 to 2+50.

Stations 7+00 to 8+20. The subgrade in this area was covered with existing armor up to elevation 25 feet. The design called for Class 100 armor to be added to the slope to stabilize areas of erosion and flatten the overall slope to 2H:1V. The existing armor between Stations 7+00 to approximately 7+50 consisted primarily of concrete debris. This debris was removed during clearing, exposing the subgrade. Consequently, filter fabric and 18 inches of select fill were placed prior to armor within this area. From Stations 7+50 to 8+20, armor was placed directly on existing armor. Figure 7a shows the armor installation for this area. Armor section layer thickness and grade were controlled with slope staking and progress surveys on a daily basis.

Armor placement was completed between Stations 7+00 and 8+20 primarily between August 27 and September 4, 2008. The transition area from Station 7+00 to 7+50 (as revised by CC-5) was completed on September 19, 2008.

Table 10 lists material import quantities for the project. The total quantity of select fill and armor rock delivered to the project was 1,200 and 1,250 tons, respectively. These quantities are consistent with the design quantities required for the armor section.

5.3.3 Habitat Cover

Habitat cover was placed between Stations 0+00 and 7+00 to a depth of 1 foot over the armor between elevation 10 and 15 feet. Habitat cover thickness and grade were controlled on a daily basis with slope staking and progress surveys. Habitat cover was initially placed in early September between Stations 0+00 and 1+50. However, the material used consisted of crushed angular rock. This angular material was spread thin to fill the armor voids, and material meeting the requirement for rounded rock was ordered (RFI #14; see Section 5.6). Habitat cover was placed from September 30 to October 6, 2008. Figure 7a shows the habitat cover installation for the project.

Table 10 lists material import quantities for the project. The total quantity of Habitat Cover delivered to the project was 2,076 tons, the minimum order quantity. Approximately 650 tons of habitat cover was placed over the armor section, consistent with the design quantity required. Approximately 900 tons of the material was used to fill the low area upland from the top of slope (CC-8). The remainder is stockpiled for the Port's use.

5.3.4 Top Soil

Topsoil was placed as follows:

- Stations 0+00 to 7+00, elevation 15 to 20 feet – In this area, the section consisted of a demarcation layer on the subgrade (orange construction fencing), 2 feet of topsoil, and coir erosion-control fabric (anchored in trenches and staked in place). See Figure 7a.
- Stations 0+00 to 7+00, elevation 20 feet to Top of Slope (elevation 29 to 33 feet) – In this area, the section consisted of a demarcation layer on the subgrade (orange construction fencing), 1 foot of topsoil, and jute matting (anchored in a top trench and stapled in place). See Figure 7a.
- Stations 7+00 to 8+20, elevation 25 feet to Top of Slope (elevation 33 to 34 feet) – In this area, the section consisted of 1 foot of topsoil and jute matting (anchored in a top trench and stapled in place). See Figure 7a.

Topsoil was delivered to the site in trucks equipped with a conveyor delivery system. Topsoil thickness and grade were controlled on a daily basis with slope staking and progress surveys. Topsoil was placed between September 22 and October 8, 2008. Jute matting was not completed until after hydroseeding (see Section 5.3.5).

Table 10 lists material import quantities for the project. The total quantity of topsoil delivered to the project was 1,740 cy, consistent with the design volume required for the project.

5.3.5 Planting

Landscaping work included tree planting, mulch placement, hydroseeding, and irrigation installation, as follows:

- Trees – Trees were planted between elevation 15 and 20 feet from Stations 0+00 to 7+00 (see Figure 7a and Appendix P). Black Cottonwood were planted at 10 feet on center along the 20-foot elevation contour (approximately 70 total). An equal mix of Scouler Willow and Hooker Willow were planted at approximately 4 feet on center between elevation 18 to 20 feet (approximately 320 total). Columbia River Willows were planted at approximately 4 feet on center between elevation 15 to 18 feet (approximately 320 total). The trees were delivered to the site on September 25, 2008 (see Appendix P). The trees were planted between October 4 and 8, 2008. A representative from the nursery was on-site to oversee planting methodology.

- Mulch – Mulch, consisting of medium fir bark, was placed after trees were planted in the same area as the trees (see Figure 7a). The mulch was placed to a depth of at least 4 inches and typically about 6 inches. Mulch was placed on October 8 and 9, 2008, using the same conveyor trucks used for topsoil delivery.
- Hydroseed – Hydroseed consisted of a mix of grass seed (native grasses for long-term sustainable coverage and a sterile wheat for short-term erosion control; see Appendix P), fertilizer, wood fiber, and a binding agent. It was applied by spraying to the areas with 1 foot of topsoil (elevation 20 feet to top of bank between Stations 0+00 to 7+00, and elevation 25 feet to top of bank above Station 7+00 – see Figure 7a). The hydroseed was applied on October 9, 2008. After hydroseeding, the jute matting was rolled over the hydroseeded area and stapled in place. Stapling was completed on October 10, 2008. Steel fence posts with twine/flagging were installed at the top of slope as a temporary fence to protect the newly planted areas from accidental intrusion. On October 22, 2008, grass was observed extending about 1 inch above the jute matting throughout the project area.
- Irrigation – The irrigation system was installed by the Port between October 14 and October 27, 2008. The system is an above-ground, 5-year temporary irrigation system. It generally consists of a 2-inch polyvinyl chloride (PVC) header line along the top of the bank with three 1.5-inch laterals down the bank to the trees. Further laterals feed impulse-head sprinklers on 3-foot risers spaced at 30-foot centers. Sprinklers at 30-foot centers were also installed on the 2-inch header. This system provides overlapping coverage of all areas planted with trees or hydroseeded. A timer on the system will turn on the water on alternate days when the weather is dry. The system was started and successfully tested on October 27 and 28, 2008.

5.3.6 Habitat Logs and Large Woody Debris

Habitat logs and LWD were placed on the finished surface of the Habitat Cover (Stations 0+00 to 7+00) between elevation 10 and 15 feet. Figure 7a shows the location of the habitat logs and LWD. LWD consisted of natural wood removed from the project area during clearing and grubbing that was stockpiled for reuse. This material generally consisted of "driftwood" such as large limbs and trunks of trees with diameters typically in the range of 4 to 24 inches and lengths of 10 to 20 feet. As the habitat cover material was placed, the LWD was scattered on the surface without anchoring. LWD was placed from September 27 to October 3, 2008.

Habitat logs consisted of Douglas fir logs with an intact root wad. The logs were obtained from forest land in the northern Oregon Coast Range (see Appendix P). A total of 12 logs were placed in four groups of 3 logs arranged in a triangular pattern. Habitat log groups were located between elevation 10 and 15 feet, nominally at Stations 0+15, 2+40, 4+90, and 6+90. Each log is anchored to a concrete block by a galvanized chain. The concrete blocks are buried completely below the subgrade elevation. The anchor blocks were buried prior to installation of the armor layer at each location (between August 26 and September 11, 2008). Habitat logs were placed and chained in place between September 27 and October 3, 2008.

5.4 Transportation, Recycling, and Disposal

Two material streams were exported off site for recycling or disposal: concrete and asphalt debris for recycling and vegetation/soil/debris for landfill disposal.

Large concrete debris was cleaned of attached soil (less that 5 percent of surface covered with soil based on visual assessment), loaded into trucks, and transported to Construction Material Exchange in Portland, Oregon, for recycling. Material was hauled to the recycler on August 14 and September 9, 2008. Table 11 lists material quantities transported to the recycler. Appendix L2 includes copies of the truck tickets. A total of 406 tons of concrete were transported for recycling.

Clearing debris consisting of incidental vegetation, rubble and small debris, and soil was loaded into trucks and transported to the Wasco County Landfill for disposal. Material was hauled to the landfill between August 14 and September 19, 2008. Table 12 lists the material quantities transported to the landfill. The approved special waste application (see

Appendix P) and the truck tickets are included in Appendix L2. A total of 1,200 tons of material were transported to the landfill for disposal.

Haul trucks were decontaminated prior to leaving the landfill. Decontamination reports are included in Appendix G2.

5.5 Demobilization

Demobilization included removal of equipment and temporary facilities and cleanup of the project site. These activities are summarized as follows:

- October 10, 2008 – Removed east railroad crossing
- October 13, 2008 – Removed break area
- October 14, 2008 – Removed west railroad crossing
- October 15, 2008 – Removed temporary fence surrounding exclusion zone and storage area; completed fire hydrant use (dust control water); and graded temporary fence line
- October 16, 2008 – Removed storage container from site
- November 13, 2008 – Removed silt fence at elevation 10 prior to river rising

Construction equipment was decontaminated prior to demobilization. Decontamination reports are included in Appendix G2.

5.6 Construction Deviations from the Design for Wheeler Bay Shoreline Stabilization

The project was completed in accordance with the design documents. Some portions of the project were constructed differently than the design documents to more effectively achieve the RAOs. These deviations generally fall into two categories: changes to the final design, or additions to the final design. In all cases, deviations were approved by the Port and USEPA through the use of CCs or RFIs. In addition, there were cases where clarification to the design occurred during construction and was documented with an RFI. Relevant clarifications, even if no deviation occurred, are documented in this section. Deviations and clarifications from the original design are discussed below:

- CC-1.1, Relocate Electrical and Telephone Utilities at Top of Bank – The original design did not identify the presence of utilities along the top of the bank within the project area. This change included removing and replacing the existing telephone and electrical lines to locations outside the project grading area. Electrical product specifications were included in the submittals as listed in Appendix P. The utility relocation work was completed between August 18 and September 10, 2008. On October 15, a 12-inch riser was added to the telephone handhole to accommodate placement of the Port-supplied topsoil (see CC-7, below).

- CC-3, Remove Fire Boat Access Structure – The original design called for removal of only the first section of walkway from the fire boat access structure. Upon removal of the walkway, the remaining structure was visibly unstable. CC-3 called for removal of all walkways and the removal of all piles located above elevation 10 feet. Removal of the pier progressed as follows:
  - The Fire Boat Pier at Wheeler Bay consisted of a five-span (designated for the purpose of this report as Spans 1 through 5 from the shore outward) walkway structure extending from the top of the bank out into Wheeler Bay (about 150 feet from the top of the bank). The first four spans were each about 20 feet. The walkway was constructed of concrete with a wooden railing. The final span (the "ramp") was about 70 feet and consisted of a wooden walkway pinned at the shore end to allow the walkway to pivot, rising and falling with changes in the river level. The dock had long been removed, so the river end of the ramp was simply supported by resting on a loop of cable. The walkway was supported at the top of the bank and by five wooden pile bents with two piles per bent (designated for the purpose of this report as Bents 1 through 5 from the shore outward). Bents 1 and 2 were located above elevation 10 feet. Bent 3 was near elevation 8 feet, and Bent 4 was near elevation 5 feet. Bent 5 was located in the water below elevation 0 feet. All piles and wood structures appeared to be pressure-treated.
  - Span 1 had partially collapsed prior to beginning construction. In accordance with the original design, it was removed during the week of August 11, 2008.
  - The remainder of the structure was removed on August 18, 2008, between 07:45 and 11:30. At the time of the work, the water was near elevation 3 feet.
  - Spans 2 through 4 and Bents 1 and 2 were demolished and removed using the large excavator. The piles for each bent were pulled using the large excavator.
  - To remove Span 5 (the ramp), two excavators were used reaching from the shore. No equipment entered the water. During setup, the subcontractor determined

that the ramp could not be removed without destabilizing Bents 3 and 4. The piles for these bents were removed.

- After removal of Bent 4, the land end of Span 5 was resting on the ground (the water end continued to rest on the cable loop). The subcontractor positioned the two excavators on either side of the ramp and attempted to remove it intact. However, as the ramp was pulled toward land, it broke apart, fell, and caught the support cable in its descent. The force of this fall broke the two piles of Bent 5. The ramp fell at the water line, shoreward of a row of piles near elevation 0 feet, and the broken piles from Bent 5 landed in the water several feet from the water line. The ramp and broken piles were immediately removed to the shore. After removal of the broken piles, a slight sheen (originating where the broken ends of the piles contacted the water) and turbidity were visible in the water at the point of the ramp's fall. No sheen was observed at the location of Bent 5. An absorbent boom and absorbent pads were laid to contain the sheen (see Section 7.1.1.4).
- The Port was immediately notified of the activities. Anchor was on-site shortly thereafter and took water quality measurements (see Section 7.1.1.4).
- On the afternoon of August 18, 2008, at low tide, absorbent pads were used to remove observed spots of sheen on the sand. No turbidity was observed.
- At 0700 on August 19, 2008, no sheen or turbidity was observed at the location of the former Fire Boat Pier. No sheen was observed thereafter.

- CC-5, Revise Grading in Slope Transition Area Near Station 7+36 – The original design called for a rapid transition from a 3H:1V slope to a 2H:1V slope in the vicinity of Station 7+36. However, a manhole and storm drain are present near the top of slope between Stations 7+00 and 7+36, and the top of slope between Stations 7+36 and 8+20 was steeper than 2H:1V. The transition area was revised as follows:
  - The slope above Station 7+36 was flattened to 2H:1V
  - The 3H:1V slope ends at Station 7+00 and the transition to the 2H:1V slope occurs gradually between Stations 7+00 and 7+36
- CC-7, Place Port-Supplied Topsoil Along Top of Bank – Prior to the project, the Port removed existing topsoil and landscaping from the top of the bank along Wheeler Bay. The topsoil was stockpiled off the project site. During the project, the Port requested that the Wheeler Bay stabilization contractor replace the Port's topsoil

along the top of the bank after completion of the stabilization project. On October 10, 2008, the topsoil was placed between Stations 0+00 to 8+20, from the top of the bank back 20 feet. The Port then re-installed plantings in this area.

- CC-8, Grade Top of Bank – After placement of the Port-supplied topsoil, a low area existed between the topsoil and the railroad. The Port requested that excess material imported for Habitat Cover be used to fill the low area. On October 13 and 14, 2008, the low area was filled so that the finished grade slopes approximately one-half percent away from the railroad.
- RFI#12, Select Fill Did Not Meet Specification – The select fill proposed for the project was low on sand-size particles and, therefore, it did not meet the specification (Appendix E of the DAR, Anchor 2008a). However, the only loss of function from this deficiency was the capacity to effectively retain the underlying subgrade sand. As documented in RFI#12, the select fill was suitable for use provided a geotextile fabric was placed between the subgrade and select fill. The use of a geotextile was added to the project.
- RFI#14, Initial Habitat Material Did Not Meet Specification – Approximately 150 lineal feet of the project was completed with material meeting the Habitat Cover specification (Appendix E of the DAR, Anchor 2008a) except that the material was angular rather than rounded. The angular material was graded to the top of the armor prior to placing Habitat Cover meeting the specification. Angular material originally intended for Habitat Cover was approved for use as select fill.
- RFI#17, Jute Matting Installation – The project Drawings and Construction Specifications (DAR Appendices D and E, respectively, Anchor 2008a) had contradicting instructions for installation of the jute matting. This RFI was used to clarify that the method indicated on the Drawings (jute matting overlapping 12 inches and held in place with 12-inch staples) was the correct method.
- RFI#18, Demarcation Layer Below Trees – The Construction Specifications (Appendix E of the DAR, Anchor 2008a) called for cutting an "X" in the demarcation layer beneath each tree. This specification originated under the premise that a fabric would be used as the demarcation layer and cutting the fabric would be necessary to allow free growth of the tree roots. However, the actual demarcation layer has a net-like structure with 1.75-inch by 1.75-inch holes. These holes provide sufficient

openings in the demarcation layer for roots to penetrate freely into the underlying soil, so cutting the demarcation layer at each tree was not required.

6 SUMMARY OF MONITORING AND CONSTRUCTION QUALITY ASSURANCE ACTIVITIES

Monitoring and construction QA activities were conducted during the Phase I Removal Action construction according to the RAWP (Anchor 2008b) and DAR (Construction Quality Assurance Plan [CQAP], Appendix A, Anchor 2008a). Specific monitoring and QA activities and results are described below. These results were used to verify that the construction design had been implemented as described in the DAR and RAWP and that Removal Action performance standards were attained, as described in Section 8. The water quality monitoring activities conducted in accordance with the WQMCCP (USEPA 2008 and Appendix R) and Water Quality Monitoring Plan (WQMP; Appendix H of the RAWP, Anchor 2008b), as well as activities required by the Biological Opinion (NMFS 2008 and Appendix S), are described in Section 7.

6.1 Visual Monitoring Results

Because all of the Wheeler Bay construction activities occurred out of the water in the dry, a number of visual monitoring activities occurred. Visual monitoring was conducted at least daily for ongoing project activities. In all cases, visual monitoring either confirmed compliance with the project specifications or corrections were made to bring the issue into compliance. Visual monitoring included the following:

- Site Conditions – Visual monitoring was used to verify that erosion-control features were installed prior to site work. The perimeter fence and signage were observed at least daily to verify that they were in working order or corrected if necessary.
- Shoreline Stabilization – Earthwork activities were controlled with progress surveys. In addition, visual monitoring included checks of slope grades with a hand level, verification of material layer thicknesses with a tape measure, verification of general material characteristics of each fill type, and qualitative confirmation of compaction using a hand probe. Visual monitoring was used to verify that debris removed from the site was free of soil.
- Vegetation and Groundcover – Mulch thicknesses were verified with a tape measure. Placement of erosion-control fabrics, habitat logs, LWD, and hydroseed were visually verified. Spacing of trees was spot-checked using a tape measure.
- Environmental Protection Measures – The silt fence was observed at least daily and repaired as needed (see Section 5.2.4). The project site, stockpiles, and the adjacent paved road were observed at least daily and after rain events for evidence of erosion

or tracking of sediment. No substantive erosion events were observed throughout the project. The adjacent Wheeler Bay was observed for turbidity or sheen on at least a daily basis. Except for the incident associated with removal of the Fire Boat Pier (see Section 5.6), there were no incidences of observed sheen or turbidity. Equipment was observed constantly for evidence of leakage, excessive noise, or excessive exhaust. Dust monitoring is discussed in Section 6.9.

6.2 Bathymetry Surveys

6.2.1 Dredging

Daily bathymetry surveys were performed by HME to compare to the design dredge depths and determine progress made by dredging. A final post-dredge survey of the Berth 411 "Plus" area was completed by DEA on August 26, 2008, to confirm HME's progress surveys. The survey results showed minimal additional dredging was needed in Berth 411 and in the area north of Berth 414 to meet target design elevations. The Port and USEPA agreed to leave the remaining material above design grade in Berth 411 (approximately 30 cy) because the sediment was dense and appeared to be native material due both to the gradation (sandy with gravels) observed and the fact that it was standing at an angle steeper than 2H:1V. A post-dredge survey of the Berth 410 area was completed by DEA on September 8, 2008. The survey showed additional dredging needed in the Berth 410 area. Another post-dredge survey was performed by DEA on October 10, 2008, after dredging to remove identified high-spots was performed in Berth 410 and the area north of Berth 414, and the results indicated that the target design elevations had been attained.

6.2.2 Capping

HME performed a pre-cap survey on September 12, 2008. Daily progress bathymetry surveys were also performed by HME. HME performed a bathymetric survey on September 12, 2008, after placement of the organoclay was completed and on October 1, 2008, after the armor installation was completed. DEA performed a bathymetric survey of the in-water portion of the cap on October 10, 2008. As discussed in Section 4.5.1, due to the fact that some areas of rock buttress in front of the timber bulkhead were lower than shown on the construction drawings, an additional survey was performed by DEA on October 21, 2008, in part to confirm short-term stability of the timber bulkhead.

6.3 Borrow Source Material Characterization Documentation

6.3.1 Terminal 4 Sand Layer and Capping Material

Borrow source materials from the sand layer and capping activities were tested for grain size and chemical quality by HME and compared to criteria specified in Table 2 of the RAWP (Anchor 2008b). Results are listed in Appendix B1. Analytical laboratory reports and data validation reports are included in Appendices I1 and J1, respectively. The initial chemistry testing results for the sand layer and Base Cap Type 3 materials were incomplete—missing analysis for oxychlordane. The Port decided to go ahead with placement of the material. All other related chemicals of concern were non-detect or below the criteria. USEPA concurred with placing the material, noting that the Port would need to assume the risk if the oxychlordane results were above the criteria. The sample was reanalyzed and oxychlordane was not detected.

6.3.2 Wheeler Bay Shoreline Stabilization Material

The soil materials imported for the armor section were select fill (3-1/2-inch-minus crushed gravel and sand and 1-1/2-inch-minus crushed gravel and sand) and Class 100 armor (approximately 3-inch to 10-inch rock). Based on visual observation, the armor met the project specifications. The select fill was tested for grain size and chemical quality (see Appendix P). Results are listed in Appendix B2. Based on the grain size results, the select fill was slightly deficient of sand-size particles, but the material was approved for use on the project provided filter fabric was placed between the subgrade and the select fill (RFI #12; see Section 5.6). The select fill met the chemical quality criteria in the project specifications.

The habitat cover consisted of a well-graded mix of sand and rounded gravel with no silt and a maximum particle size of 2 inches. The habitat cover was tested for grain size and chemical quality (see Appendix P). Results are listed in Appendix B2. Based on the results, the habitat cover met the grain size and chemical quality criteria in the project specifications.

Topsoil consisted of a 2:1 ratio (by volume) mix of sandy loam and compost. The topsoil was tested for grain size and chemical quality (see Appendix P). Topsoil chemical quality met all criteria in the project specifications except for butylbenzylphthalate: the detected concentration was 21 micrograms per kilogram (μg/kg) versus the criterion of 20 μg/kg. USEPA approved use of this topsoil (Submittal No. 7). The grain size results indicated that the soil portion of the topsoil did not meet specifications. Additional sand was needed to bring the results within specifications. Sand used in the Habitat Cover (already chemically tested and approved for use on the project) was added to the topsoil mix and a sample was tested for grain size (see Appendix P). The resulting material met project specifications and was approved for use. Results for approved materials are listed in Appendix B2.

6.4 Transloading Facility Soil Monitoring Results

In accordance with the TDP (Appendix D1 of the RAWP, Anchor 2008b), soil samples were collected at and near the transloading facility before operations began (August 18, 2008), during operations (September 2 and 8, 2008), and after operations were completed (September 12, 2008). The six sampling locations are shown on Figure 10. Location S-01 represents conditions at the entrance to the transloading facility. Existing fine sandy silt and crushed stone was sampled at Location S-01. Locations S-02 and S-03 represent conditions near the exit of the facility. Surrogate sample locations were set up at these locations per the sampling plan because the facility is paved right up to the retaining wall. The surrogate sample locations were glass baking pans filled with purchased "All Purpose Sand." Location S-04 was intended to represent background conditions at the facility and was located well off the truck route used for the transloading operations. Bernert's Barge Maintenance uses this unpaved portion of the property for staging material and equipment but, as planned, this location was as removed as possible from transloading operations. Locations S-05 and S-06 were located south of the entrance to the transloading facility, in the direction of travel for the loaded trucks. Sampling Locations S-05 and S-06 were at the bottom of the ditch adjacent to the road. Existing fine sandy silt and crushed stone were sampled at Locations S-04 through S-06. Transloading facility soil sampling data sheets are provided in Appendix C3.

Based on the results of the soil sampling, the operation of the transloading facility resulted in no tracking of contamination on-site or from the site to River Road. The analytical data are summarized in Table 16. Scattered detections of low concentrations of PAHs were reported in the two locations near the exit from the transloading facility (S-02 and S-03). Low concentrations of phthalates (mostly flagged as associated with laboratory blank contamination) were also reported in these two samples. TPHs were not detected in any of the samples from these locations. The highest concentrations of PAHs were found on the side of River Road (S-05) in the background sampling round, before operations began at the transloading facility. The second and third highest concentrations were found at the on-site background location (S-04) and the other River Road location (S-06) before operations began. At all three of these locations, concentrations remained the same or dropped as the project progressed.

The concentrations of metals (cadmium, lead, and zinc) remained mostly consistent over the course of the project. Exceptions to this generalization are that concentrations of lead dropped from 39.9 to 16.9 milligrams per kilogram (mg/kg) at the background location (Location S-04) and rose from 36.2 to 82.3 mg/kg at one of the locations on River Road (S-05). All of the concentrations measured for cadmium, lead, and zinc are well below health-based criteria (USEPA Region 6 residential soil screening levels).

6.5 Transportation and Disposal Documentation

Monitoring of transportation and disposal included documentation of these activities throughout the construction process. Daily Construction Reports were used to document visual observations of operations at the transloading facility, and a disposal log was maintained throughout operations. The Daily Construction Reports and the updated disposal log were provided to USEPA throughout the project and the final disposal logs for sediment/debris and water are provided as Tables 7 and 8, respectively.

The operation of the transloading facility was performed in accordance with the TDP (Appendix D1 of the RAWP, Anchor 2008b). Sediment and debris were offloaded from transfer barges into a steel mixing box using a crane-mounted dredge bucket, and dried sediment was transferred from the mixing box to trucks using an excavator. Free water was pumped from the transfer barge to a tank on the support barge and then removed from the tank in vacuum trucks for disposal by Waste Connections. Cellulose-based drying agent was added to the sediment to absorb residual free water on the transfer barge and in the mixing box. Trucks and pups were lined with sheet plastic prior to loading sediment and were covered prior to leaving the transloading facility. On the first day of offloading, water was observed dripping from one truck; however, it was raining heavily that day and is unclear if the water was related to the rain event or the consistency of the material. As an added safety measure, additional truck lining and drying agent were used as necessary. No truck leakage was observed throughout the remainder of the project.

The entire operating area of the transloading facility was paved, and all truck-loading operations were performed on a disposable geotextile. An attendant removed any incidental spilled sediment (spills of small quantities, between 1 and 25 cubic centimeters, of material generally resulted from splashing if a large rock or piece of debris was loaded into a truck holding soft sediment) from the geotextile and the sides of the truck and pup before the truck left the loading area. Additional inspections of the exterior of the truck bed and pup were typically performed by the driver and by Anchor. HME removed additional material if any was found.

Although no tracking of contaminated materials was observed, trucks unloading clean drying agent would generally drive over some of the clean material while unloading and get drying agent on the rear tires. The tracking of this material on-site was noted, and the material was removed using a street sweeper kept on-site for this purpose.

6.6 Batch Discharge Sample Monitoring Results

Dredged sediment that was placed on sealed barges during construction generated elutriate that was dewatered into a water management lash barge for future batch discharge into a City sanitary sewer manhole. The water management barge was a four-module lash unit consisting of four watertight compartments. Eight water samples were taken from the compartments on four days prior to discharge and submitted for laboratory analysis of parameters specified by BES. Each compartment was sampled twice, with BES performing analysis on one set of samples and HME performing analysis on the other set of samples. Concentration limits of analytes were specified by BES. The batch discharge water sample results and BES batch discharge criteria are provided in Table 17. No exceedances of criteria were observed.

6.7 Construction Equipment Decontamination Observation Results

6.7.1 Terminal 4 Dredging and Capping

Construction equipment decontamination procedures were observed on six occasions by Anchor monitoring personnel. The decontamination events observed are summarized below. The construction equipment decontamination observation reports are provided in Appendix G1:

- *Chetco* barge decontamination: Decontamination was observed and documented on September 9, 2008. The *Chetco* barge was swept using a street sweeper and subsequently power-washed. Rinsate and sediment were collected and disposed of appropriately.
- *Umpqua* barge decontamination: Decontamination was observed and documented on September 12, 2008. The *Umpqua* barge was swept using a street sweeper and subsequently power-washed. Rinsate and sediment were collected and disposed of appropriately.
- *Reedsport* barge decontamination: Decontamination was observed and documented on September 29, 2008. The *Reedsport* barge was swept using a street sweeper and subsequently power-washed. Rinsate and sediment were collected and disposed of appropriately.
- Transloading facility transloading box decontamination: Decontamination of the transloading box occurred on October 10, 2008, during demobilization of the transloading facility in The Dalles. The transloading box was scraped and power-washed. Sediment and rinsate were pumped into 55-gallon drums for future disposal.
- Water management lash barge decontamination: Decontamination of the lash barge occurred over 4 days, from October 14 to 17, 2008. Anchor monitoring personnel were on site on October 16, 2008, to observe decontamination procedures. HME reported that all four holds of the lash barge were power-washed and rinsate was pumped to vacuum trucks for future disposal.
- Barge 47 decontamination: Decontamination was observed and documented on October 22, 2008. Barge 47 was swept using a street sweeper and subsequently power-washed. Rinsate and sediment were collected and disposed of appropriately.

6.7.2 Wheeler Bay Shoreline Stabilization

Construction equipment was decontaminated prior to demobilization. Decontamination reports are included in Appendix G2.

6.8 Cultural Resources Monitoring

Archeological Investigations Northwest, Inc. reviewed the Port's T4 Archaeological Monitoring Protocol dated December 2006 and determined that there would be specific coordination and monitoring requirements for the proposed Phase I Removal Action if native soil would be removed within archaeological sensitivity areas in Slip 3 and Wheeler Bay. Further evaluation of Phase I Removal Action activities within Slip 3 and Wheeler Bay concluded that no native soils would be disturbed within the archaeological sensitivity areas as part of the construction activities, as described below:

- Dredging in Slip 3 within the archaeological sensitivity area will not encounter native material. This conclusion was based on the cores taken in the Phase I dredging areas as summarized in Appendix G of the DAR (Anchor 2008a). The core logs for cores collected within the Berth 410 dredging area that overlaps with the archaeological sensitivity area indicated that only fill material would be dredged (dredging to -39.3 feet NGVD with 2 feet of allowable overdredge to -41.3 feet NGVD). This area is within the Port's regular maintenance dredging area. Based on the cores taken in the dredge area on the south side of the Slip that overlaps the archaeological sensitivity area (T4-PI-08), only fill material was expected to be dredged (dredging to -42 feet NGVD with 1 foot of allowable overdredge to -43 feet NGVD).
- Excavation associated with the Wheeler Bay shoreline stabilization work was not expected to encounter native soil in areas that overlapped with the archaeological sensitivity area. Based on information provided in the Slip 1 upland RI, the fill beneath the Wheeler Bay area is greater than 25 feet thick. All of the work occurred above elevation 10 feet NGVD with the top of bank at approximately elevation 30 feet NGVD, so all of the excavation work was approximately 20 feet deep or less within the fill.

Based on this information, no archaeological monitoring was planned for the Phase I Removal Action construction activities, unless it was determined in the field that dredging to additional depths extending into the native soils was necessary to complete the dredging activities.

There were no instances where dredging or excavation depths were altered in the field during construction that extended into native soils within the archaeological sensitivity areas. Therefore, archaeological monitoring was not required or conducted during the Phase I construction.

6.9 Health and Safety Monitoring Results

Primary health and safety concerns during the project were physical hazards (e.g., slips, falling into the water, or construction equipment). Procedures to address these concerns were identified in the Health and Safety Plan (HASP; Appendix J of the DAR, Anchor 2008a), and reinforced with daily safety meetings at the beginning of the work shift.

6.9.1 Wheeler Bay Health and Safety

Monitoring of health and safety concerns was addressed as follows according to the Wheeler Bay (ACA) HASP (Appendix A2 of the RAWP, Anchor 2008b):

- Observation for compliance with personal protective equipment (PPE) requirements – The Contractor's Project Manager verified that these requirements were addressed at all times. Compliance was documented in the Construction Weekly Progress Reports (see Appendix A).
- Documentation of incidents – Each daily report included documentation of health and safety incidents, if any. On August 18, 2008, lightning struck on or near the Wheeler Bay shoreline stabilization work site. No one was injured and the subcontractor implemented their lightning response strategy—all personnel remained inside a motor vehicle until 30 minutes had passed after the last thunder was heard.
- Observation for dust – For the Wheeler Bay shoreline stabilization work, throughout the project all contractor personnel observed for indicators of potential dust hazards. These indicators included visible drying of previously wetted surfaces, activities known to cause dust generation (e.g., soil excavation, grading, etc.), or presence of visible dust in the air. Any time that any one of these indicators was observed, the water truck was used to wet the soil surface.

Use of the water truck for dust control during Wheeler Bay shoreline stabilization work was documented in the Construction Weekly Progress Reports (see Appendix A). Overall, there were no substantive observations of visible dust in the air, as described by the monitoring results below. Dust monitoring stations were established at two locations for the Wheeler Bay shoreline stabilization work to verify that dust levels were within action levels. One station was located near the west end of the work area at Station -0+23. A second station was located at the edge of the project site adjacent to the Kinder Morgan Bulk Terminals facility, the nearest neighbor to the project site, at Station 7+48. In general, the monitors were operated during working hours when weather permitted (e.g., the monitors were not deployed during periods of rain or fog that interfere with or invalidate results). In some cases, the monitors malfunctioned and data were not collected. The air monitoring logs were included with the daily reports, and copies are included in Appendix H2. The particulate action level identified in the Wheeler Bay site-specific HASP (Appendix A2 of the RAWP, Anchor 2008b) was 500 micrograms per cubic meter ($\mu g/m^3$) and was not exceeded. Detected particulate levels were typically less than 100 $\mu g/m^3$ and ranged from 0.7 to 485 $\mu g/m^3$.

6.9.2 Terminal 4 Dredging and Capping Health and Safety

Monitoring of health and safety concerns was addressed as follows according to the Dredging and Capping (HME) HASP (Appendix A1 of the RAWP, Anchor 2008b):

- Observation for compliance with PPE requirements – The Contractor's Project Superintendent verified that these requirements were addressed at all times. Compliance was documented in the Construction Weekly Progress Reports (see Appendix A).
- Documentation of incidents – Each daily report included documentation of health and safety incidents, if any. No incidents were reported throughout the duration of the project associated with the dredging and capping activities.
- Dust monitoring was performed according to the Dredging and Capping Contractor Health and Safety Plan (CHASP; Appendix A1 of the RAWP, Anchor 2008b). Monitoring was performed before and during dredging activities on August 12, 2008. Monitoring was also performed before and during transloading

activities at the transloading facility on August 18 and 21, 2008 (see Appendix H1). Monitoring results confirmed that dust levels during the construction activities were not significantly different that background dust levels and were substantially less than the action level of 1.50 milligrams per cubic meter (mg/m^3) specified in the CHASP. This monitoring and compliance was documented in the Construction Weekly Progress Reports (see Appendix A).

6.9.3 Terminal 4 Post-Dredging Dive Operation Health and Safety

A diving operation was conducted on September 17, 2008. Subcontract divers from Northwest Underwater Construction, LLC (NUC) performed a visual survey of the sand layer placed after dredging in Berth 411. Diving operations were performed according to the requirements in Section 3.3.2 of the HASP (Appendix J of the DAR, Anchor 2008a) and Dive Plan, except for the one deviation noted below. In addition to the HASP, a Diving Safety Manual and Dive Plan were prepared by the diving subcontractor and submitted to USEPA and the U.S. Coast Guard (USCG) for review and comment prior to dive operations.

There was one deviation from the Dive Plan that occurred during the dive event. Neoprene gloves were used in addition to (over) the specified nitrile gloves to provide additional protection from chafing of the dry suit. The neoprene gloves were disposed of after the dive, which is the same decontamination procedure specified in the Dive Plan decontamination standard operating procedure (SOP) as the procedure for the nitrile gloves.

7 SUMMARY OF ACTIVITIES CONDUCTED IN ACCORDANCE WITH THE WQMCCP AND THE BIOLOGICAL OPINION

This section details the activities that were conducted during the Phase I Removal Action to comply with the terms and conditions outlined in the WQMCCP (USEPA 2008) and the Biological Opinion (NMFS 2008), as well as any approved deviations. These documents, along with documentation of the approved deviations, are provided in Appendices R (WQMCCP) and S (Biological Opinion). This section also provides the reporting requirements for each document.

7.1 WQMCCP Compliance

Water quality field and laboratory parameter monitoring at T4 and the transloading facility was conducted during dredging, offloading, and capping activities in accordance with the WQMCCP (USEPA 2008 and Appendix R) and WQMP (Appendix H of the RAWP, Anchor 2008b). Discrepancies between the two documents and a resulting protocol to use as a path forward were documented in a memorandum that the Port sent to EPA on August 5, 2008. This memorandum is provided in Appendix R and relates to water quality monitoring depths, water quality frequency, background water quality monitoring, and water quality monitoring locations.

The Wheeler Bay shoreline stabilization component of the Removal Action did not include in-water work, so no routine water quality monitoring other than visual observation was conducted. The exception being CC3, Remove fire Boat Access Structure, described in Section 5.6. Throughout the project, monitoring protocols were evaluated based on the field and laboratory results, and the intensity of monitoring was adjusted as authorized by USEPA.

A background water quality survey was conducted prior to construction on June 26 and 30, 2008, and July 2, 2008, according to procedures specified in the WQMP (Appendix H of the RAWP, Anchor 2008b). During this survey, three independent measurements (at the top, middle, and bottom water depths) were made at four stations on each of the 3 days. The background water quality results and 90th percentile calculations of those results are summarized in Tables 13 and 14. Details related to the pre-construction monitoring are provided in the Background Water Quality Data Report which is provided as Appendix M of this report. During construction at the T4 site, the 90th percentile calculations were updated with new data as they became available.

7.1.1 Terminal 4 Water Quality Monitoring Activities

Consistent with the WQMP (Appendix H of the RAWP, Anchor 2008b), field parameter monitoring (i.e., turbidity, temperature, DO, and pH) and laboratory parameters monitoring (i.e., total suspended solids [TSS], dissolved metals [cadmium, lead, and zinc] and PAHs [priority pollutant list]) were performed at T4. Figure 8 shows the locations of the water quality monitoring stations at the site. Field and laboratory parameter measurements were generally collected at three depths—3 feet below the surface, mid-depth, and 3 feet above the bottom. The water quality monitoring collection forms for T4 are provided in Appendix C1. These forms provide details of field observations including sampling times, weather conditions, water conditions, silt plumes, distressed or dying fish, and any other relevant anecdotal or unusual observations. Instrument calibration documentation for equipment used to collect water quality monitoring data is provided in Appendix R.

7.1.1.1 Sampling Frequency

Frequency of compliance monitoring was dependent on the implementation of either Tier I (high intensity) or Tier II (low intensity) sampling regimens, as summarized below for field and laboratory parameters:

Field Parameters:

- Tier I: Four rounds of compliance station sampling starting 1 hour after construction activities begin. If no exceedances detected during the first four rounds, reduce to one round of sampling for each 4-hour period of construction.
- Tier II: One round of sampling for each day of construction.

Laboratory Parameters:

- Tier I: Collection of daily water samples for laboratory analysis.
- Tier II: Collection of weekly water samples for laboratory analysis.

7.1.1.2 Field Parameters

A summary of the sampling approach for collection of field parameters is provided below. This sampling approach did not change throughout the duration of the construction activities. Sample station descriptions are provided in Table 15 and are shown on Figure 8. At each sample station, parameters were taken at three depths – 3 feet from the surface, mid-depth, and 3 feet from the bottom.

- Background Station Sampling – Field parameters at the upstream background station were collected daily during construction activities. Data collected from this station were added to the pre-construction background dataset and were used to calculate a 90th percentile turbidity value that was updated daily and used as a basis for the trigger during construction.
- Compliance Monitoring – Field parameters were taken at three compliance stations (100 meters from the center of construction) and one 50-meter early warning station (50 meters from the center of construction) during all in-water construction activities. Exceedance of a trigger value for any field parameter except for turbidity at the 100-meter compliance stations resulted in implementation of additional best management practices (BMPs) as described in the WQMP (Appendix H of the RAWP, Anchor 2008b). In the event that turbidity values were greater than the trigger value at one or more of the three 100-meter compliance stations, field parameters were taken at the turbidity compliance stations (S3M-S, S3M-M, S3M-N) and one early warning station (S3M-E). Turbidity compliance stations S3M-S, S3M-M, and S3M-N were located 100 meters from the harbor line into the channel (Figure 8). Station S3M-E served as a turbidity early warning station and was located 50 meters from the harbor line. An exceedance of the turbidity trigger value at S3M-S, S3M-M, or S3M-N resulted in the implementation of the response action flow chart described in Figure 4 of the WQMP (Appendix H of the RAWP, Anchor 2008b). Because Berth 414 is located in the main channel of the Willamette, the 100-meter compliance stations also served as turbidity compliance stations in place of the S3M stations.

Results

The Tier I monitoring specified at the site included four rounds of field parameters sampling beginning 1 hour after the start of construction activities. Turbidity results at the 100-meter sampling locations exceeded the trigger values on a number of occasions during dredging. Therefore, additional monitoring at the turbidity compliance locations was required. As such, soon after the project began, the Port and USEPA agreed that only three rounds of field parameters would be required within the first 4-hour period, due to the length of time needed to complete each round.

Results from the field parameter monitoring conducted during construction are provided in Appendix D1 and are compared to the triggers (Table 3). Additionally, the field parameter results and comparisons to triggers are also provided in Appendix A. No exceedances were identified for DO, temperature, or pH throughout the duration of the Phase I Removal Action project. Turbidity values exceeded the trigger value on two occasions during dredging activities, as described below:

- On August 12, 2008, a slight turbidity exceedance (0.8 Nephelometric Turbidity Units [NTU]) occurred 100 meters from the Berth 414 dredging operation. The exceedance was confirmed by retaking the measurement at the location of the exceedance and by re-checking the turbidity at the background station. The confirmed exceedance was reported at 14:30. At that time, Port representative Nicole LaFranchise and Anchor representative John Verduin were notified. In addition, the water quality monitoring field crew conferred with USEPA representative Andrew Somes. The group discussed additional field measurements that could be taken to confirm whether the exceedance was construction-related. Dredging in Berth 414 was completed at 14:40 and water quality monitoring was concluded at that time. Per USEPA's request, Anchor staff spoke with HME to determine what additional BMPs could be employed, or what BMPs could be implemented more effectively moving forward to prevent exceedances such as the one observed on that day. Based on discussions with HME, the following additional BMP was to be implemented moving forward during the project:

  - Reduce the amount of material in each bucket load. The design dredge depth at Berth 414 was essentially the depth at which HME would reach using the dredging bucket, provided that a relatively full "bite" was taken each time. In the future, despite the engineering constraints, the dredge operator would be instructed to take smaller "bites" with the dredging bucket. Subsequent monitoring that occurred on August 13, 2008 demonstrated no turbidity exceedances.

- Elevated turbidity readings were also reported on September 10, 2008, at the end of a monitoring round conducted after to remove some identified remaining high-spots occurred in Berth 414. The elevated turbidity readings were due to tug activity occurring outside of the RAA.

No field parameter trigger values were exceeded during capping activities throughout the entire project.

7.1.1.3 Laboratory Parameters

A summary of the sampling approach for collection of laboratory samples is provided below. This sampling approach did not change throughout the duration of the construction activities except in instances where laboratory sample collection was not required per agreements negotiated between the Port and USEPA.

When laboratory sampling was required, a total of four samples were collected daily: one from the background station (BG-01 or BG-01R) at the depth with the highest measured turbidity, and one sample from each of three depths at the compliance station 100 meters from the center of construction with the highest turbidity. During Tier I sampling, samples were taken from the station with the highest turbidity during a prescribed monitoring round. The specific round designated for sampling rotated on a daily basis to prevent sample collection from the same round on any two consecutive days, and to achieve more representative results. Sample station locations are depicted on Figure 8 and sample station descriptions are provided in Table 15. Due to very low and/or undetectable results for project COCs, sampling protocols were modified on a case-by-case basis with the approval of USEPA.

Results

There were no exceedances of criteria for laboratory parameters during the Phase I Removal Action construction activities as shown in the results presented in Appendix D1.

All laboratory results were provided to the Port within very strict turnaround times as described in the Laboratory Communication Plan submitted to EPA on July 28, 2008. No issues with laboratory turnaround times occurred throughout the duration of the Removal Action.

7.1.1.4 Visual Monitoring

Visual monitoring was conducted in accordance with the WQMCCP (USEPA 2008 and Appendix R) and WQMP (Appendix H of the RAWP, Anchor 2008b) for turbidity plumes. No turbidity plumes were observed during dredging activities. Visual monitoring only detected two turbidity plumes during organoclay capping activity in Slip 3. These plumes dissipated rapidly and no exceedances of criteria were observed at the 100-meter compliance boundary.

One visual observation associated with removal of the Fire Boat Pier resulted in water quality monitoring in Wheeler Bay (see Section 5.6). When removing the pier, the ramp fell at the water line, shoreward of a row of piles near elevation 0 feet, and the broken piles from Bent 5 landed in the water several feet from the water line. The ramp and broken piles were immediately removed to the shore. After removal of the broken piles, a slight sheen (originating where the broken ends of the piles contacted the water) and turbidity were visible in the water at the point of the ramp's fall. No sheen was observed at the location of Bent 5. An absorbent boom and absorbent pads were laid to contain the sheen. The Port was immediately notified of the activities. Anchor was on-site shortly thereafter and took water quality measurements. Water quality field parameters were measured at 50 meters and 100 meters from the location of the construction activity. No exceedances for field parameter criteria were noted at either location.

7.1.1.5 Approved Deviations to the WQMCCP

- On August 19, 2008, USEPA approved the Port's proposal to reduce the monitoring frequency to once every 4 hours if no exceedance was identified following four consecutive hourly events. Furthermore, if the same construction activity occurred the next day, the sampling frequency would be maintained at once every 4 hours. The rationale being that when work started in a new area or construction activities changed, the Port would perform hourly sampling at the start, but then if no exceedances were observed, monitoring could be reduced to once per 4 hours for the duration of that activity, even if that activity continued for more than 1 day. This protocol was discussed at length with USEPA, and is consistent with other water quality certifications and similar past projects in Anchor's experience.
- On August 26, 2008, USEPA approved a reduction in water quality monitoring to the Tier II level for the Slip 3 dredging activities. This approval was based on 12 days of field parameter and 9 days of grab sample laboratory results, which demonstrated that there were no adverse impacts to water quality due to dredging activities. Monitoring remained on a Tier II schedule until capping began at the head of Slip 3, which required monitoring to revert to the Tier I schedule.
- On September 18, 2008, the Port requested to reduce the monitoring frequency to Tier II after receiving three analytical reports with results below project criteria for capping activities at the head of Slip 3. USEPA approved the monitoring frequency reduction on the same day and monitoring continued for the duration of the project at the Tier II frequency.
- The background station used during construction was changed mid-way through the project. The details and rationale for this change are provided below. From August 12 to 21, 2008, BG-01 was used as the background station. BG-01 is shown on Figure 8 and was located 300 meters upstream of Slip 3 and 10 meters channel-ward of the Toyota pier and harbor line. The depth at BG-01 was approximately 43 feet. On August 21, 2008, turbidity at

the bottom depth of BG-01 was recorded at 4.9 NTU. Concurrently, the turbidity at the bottom depth of the south (upstream) turbidity compliance station was recorded at 11.0 NTU. The depth at this station was approximately 58 feet. Due to a downstream current, it is unlikely that the elevated turbidity readings were related to the construction activity. The Port recommended to USEPA that the background station be relocated 100 meters channel-ward of the Toyota pier to better represent the depths present at the turbidity compliance stations. USEPA accepted the Port's recommendation, and on August 22, 2008, the background station was relocated to station BG-01R located 300 meters upstream of Slip 3 and 100 meters channel-ward of the Toyota pier and harbor line (Figure 8). The approximate depth at the revised background station, BG-01R, was 72 feet.

- On August 15, 2008, USEPA directed the Port to select chemistry sampling times randomly throughout the day as dredging occurred, not just during the first round of monitoring. USEPA also directed that the samples could be selected subjectively to occur when elevated turbidity (e.g., a turbidity exceedance at the point of compliance) was observed during one of the monitoring events. The Port and USEPA agreed that the chemistry sampling would occur such that the monitoring round during which the chemistry sample was taken would be moved back one round for each subsequent day of dredging (i.e., on the first day of dredging, the chemistry sample would be taken during the first round of monitoring; on the second day of dredging, the chemistry sample would be taken during the second round of monitoring, etc.). Once the sample was taken from the last monitoring round (typically the fourth round), the rotation would move back to selecting the chemistry sample during the first round of monitoring.
- On August 19, 2008, USEPA approved the Port's proposal to remove the requirement to analyze for metals during work in the Berth 410 dredge area. The proposal was made based on the fact that in the WQMP (Appendix H of the RAWP, Anchor 2008b), the Port had selected parameters for each subarea to monitor based on the extent of exceedances of the PEC criteria in the sediment at each subarea. Metals concentrations in the Berth 414 and Berth 410 subareas were lower than in the other subareas.

7.1.2 Transloading Facility Water Quality Monitoring Activities

Consistent with the WQMP (Appendix H of the RAWP, Anchor 2008b), field parameters (i.e., turbidity, temperature, DO, and pH) were collected during offloading at the transloading facility. Figure 9 shows the location of each water quality monitoring station at the site. The water quality monitoring forms for the transloading facility are provided in Appendix C2. Similar to the forms for T4, these forms provide details of field observations including sampling times, weather conditions, water conditions, silt plumes, distressed or dying fish, and any other relevant anecdotal or unusual observations. Instrument calibration documentation for equipment used to collect water quality monitoring data is provided in Appendix R.

7.1.2.1 Monitoring Frequency

Similar to the T4 site, monitoring frequency at the transloading facility was dependent on the implementation of either Tier I (high intensity) or Tier II (low intensity) sampling regimens, as summarized below for field parameters:

- Tier I: Four rounds of compliance station sampling starting 1 hour after construction activities begin. If no exceedances detected during the first four rounds, reduce to one round of sampling for each 4-hour period of construction.
- Tier II: One round of sampling for each day of construction.

7.1.2.2 Field Parameters

A summary of the sampling approach for the collection of field parameters is provided below. This sampling approach did not change throughout the duration of the construction activities. Sample station descriptions are provided in Table 15. At each sample station, parameters were taken at three depths – 3 feet from the surface, mid-depth, and 3 feet from the bottom. Pre-construction water quality sampling was not conducted at the transloading facility. Trigger criteria for related parameters were determined using the daily background station field parameter results.

- Background Station Sampling – Field parameters were collected at the upstream background station, located 50 meters upstream from the offloading barge during construction activities. Data collected from this station was used to calculate trigger criteria for downstream results.

- Compliance Monitoring – Field parameters were taken at three 100-meter compliance stations (100 meters from center of the off-loading barge) during all in-water construction activities at the transloading facility. The frequency of compliance monitoring rounds was dependent on the implementation of either Tier I (high intensity) or Tier II (low intensity) sampling regimens as described below:

Results

The field parameter results at the 100-meter compliance locations did not exceed trigger criteria at any point during the monitoring program.

Results for field parameters collected during construction are provided in Appendix D2 and are compared to the triggers (Table 3). Additionally, the field parameter results and comparisons to triggers are also provided in Appendix A. No exceedances were identified for DO, temperature, pH, or turbidity during the monitoring events for the duration of the transloading portion of the project. One variance did occur on August 21, 2008, when the rope attached to the Van Dorn sampler was caught in the boat's propeller and the Van Dorn sampler was lost. Monitoring was suspended for 4 hours and depth 3 at the Middle Station and all depths at the North Station were not taken until a new Van Dorn sampler was delivered later that day.

7.1.2.3 Approved Deviations from the WQMCCP

- On August 20, 2008, after 3 days without exceedances at the compliance stations, monitoring was reduced to a Tier II schedule. Monitoring was further reduced to one round per week after USEPA approval on August 26, 2008. This approval was based on 8 days of field parameter sampling, where water quality results demonstrated that there were no adverse impacts to water quality due to transloading activities.

7.1.3 Best Management Practices Employed During Phase I

The WQMCCP (USEPA 2008 and Appendix R) requires the Port to provide a list of the BMPs that were used during project implementation, when and why the BMPs were used, and an assessment of the effectiveness of those BMPs. General BMPs and activity-specific BMPs were used on a daily basis as determined through the design process and development of the RAWP (Anchor 2008b). A description of additional BMPs that were implemented in addition to the general and activity-specific BMPs is also provided below where appropriate. A complete list of all the BMPs and environmental protection measures that were used during the Phase I Removal Action are provided in a Summary of Relevant Environmental Protection Measures and BMPs memorandum provided in the Final RAWP.

7.1.3.1 General BMPs

- All diesel-powered off-road vehicles and equipment over 50 horsepower (HP) used on the project sites for 3 consecutive days or more were fueled with ultra-low sulfur diesel (ULSD). Five thousand five hundred thirty six (5,536) gallons of ULSD with no more than 15 ppm sulfur were used by the contractor during the Removal Action. The use of ULSD rather than the standard diesel with 500 ppm of sulfur resulted in an 85% reduction in sulfur released to the air.
- Drip pans were used under stationary equipment and at points of liquid transfer.
- Fuel transfers were performed in accordance with USCG Oil Transfer Procedures aboard each derrick barge.
- Diesel fuel was stored in fuel tanks aboard the derrick barges. Unleaded gasoline was stored in double-wall fuel tanks aboard the derrick barges.
- All fuel transfer hoses were inspected, tested, marked, and maintained in accordance with USCG requirements.
- Flammable or combustible materials were stored in flammable storage cabinets in either the manufacturer's original shipping container or in portable fire safety containers.
- All containers were kept tightly closed and sealed when not in use.
- All containers were clearly labeled as to contents and capacity.

- Oil-sorbent pads and/or sweep were used to cleanup deck spills.
- All equipment maintenance was performed aboard the derrick or materials barges.
- Equipment such as fuel hoses, oil drums, oil or fuel transfer valves, and fittings were checked regularly for drips or leaks, and were maintained to prevent spills to the river.
- Construction barges were situated in areas of sufficient depth so as to not ground out during low water conditions.
- Prior to entering the water, all equipment was checked for leaks and completely cleaned of any external petroleum products, hydraulic fluid, coolants, and other deleterious materials.
- A spill containment and control plan was kept on site during construction activities and contained notification procedures, specific cleanup and placement instructions for different products, quick response containment and cleanup measures that were available, proposed methods for placement of spilled materials, and employee training for spill containment.
- Materials such as booms and sorbent pads were available on-site, and were available for use to contain and clean up petroleum products if spilled or released as a result of project activities. The booms were deployed in Slip 3 prior to and during work at the head of Slip 3.

No additional general BMPs were implemented during the Phase I Removal Action as no need was identified during the water quality monitoring activities.

7.1.3.2 Dredging BMPs

- Sediment barges were sealed on all four sides to prevent any leakage of sediment or liquid.
- A majority of the Berth 411 "Plus" dredging was completed before the Berth 410 dredging began.
- Dredge passes generally proceeded from the head of the slip towards the mouth. Levels of contamination in the dredge material were typically higher towards the head. Depths of required cuts were also typically thicker towards the head of Slip 3.

- The contractor completed a horizontal dredge pass across the dredge surface before moving to the next deeper pass. A dredge pass is defined as a horizontal dredge cut consisting of up to two "bites" of the dredge bucket—one "bite" occurred as the derrick worked from one side of each reach to the other and the second "bite" occurred as the derrick worked back in the other direction.
- The contractor began dredging at the highest elevation of material to be removed and worked toward the lowest elevation. "Glory holing"did not occur.
- The contractor sequenced their work such that there was one last pass across the entire Berth 411 "Plus" dredge area.
- Overfilling of the bucket was not allowed.
- The contractor paused the dredge bucket as it broke the surface of the water and allowed the bucket to drain free water prior to swinging and placing dredge material on the haul barge. This bucket dewatering activity was conducted behind a silt curtain. No water quality monitoring exceedances were documented as a result of this activity; therefore, USEPA did not direct the contractor to avoid overwater bucket dewatering.
- No bottom stockpiling or multiple bites of the clamshell bucket occurred.
- The contractor sealed off barge scuppers on haul barges and repaired any holes in fences to prevent water or sediment from draining off a haul barge.
- Barges were not overfilled.
- No grounding of construction barges occurred.
- Overdredging at the base of a slope did not occur.
- Dragging of the dredged surface to level the mudline did not occur.
- Experienced dredge operators were used.
- Contractor vessel draft and movement was controlled within dredge areas during construction to limit the potential for scour.
- Slopes were generally dredged beginning with the highest elevation of material to be removed and working toward the lowest elevation.
- Slopes were dredged between cuts and adjacent to slopes as designed (i.e., slopes were not oversteepened during dredging).

- A global positioning system (GPS) was used to ensure material removal from the proper locations.
- Standard barge loading controls were observed including no barge overfilling (less than 85 percent capacity). The barges were loaded so that enough freeboard remained to allow for safe movement of the barges and their material on their planned routes.
- A Closed or Environmental Bucket was used where feasible. This technology consists of specially constructed dredging buckets designed to reduce turbidity from suspended solids from entering the water. The Closed or Environmental bucket was not suitable in certain situations, including situations with sediment of medium or greater density. During dredging, the Port notified USEPA and received approval to use the digging bucket when the type of material precluded the use of the Closed or Environmental Bucket.
- All digging passes of the bucket were completed without any material being returned to the wetted area. Dumping of partial or full buckets of dredged material back into the project area did not occur. Dredging of holes or sumps below the maximum depth, and redistribution of sediment by dredging, dragging, or other means also did not occur.

Additional dredging BMPs were implemented beginning on August 13, 2008, and August 18, 2008, in response to elevated turbidity measurements identified during water quality monitoring activities. These additional BMPs were identified by the Port, HME, and USEPA's contractor after observing dredging operations for a few days and included the following:

- The amount of material in each bucket load was reduced.
- The operator closed the bucket as slowly as possible on the bottom.
- The operator paused before hoisting the bucket off of the bottom to allow any overage to settle near the bottom.
- The operator hoisted the bucket through the water column more slowly.
- The operator made sure all the material had been placed into the barge from the bucket before returning the bucket to the water to take another bite of material.

- The operator "slammed" open the bucket after material was dumped to dislodge any additional material that was clinging to the bucket.

Follow-up monitoring activities that occurred after these additional BMPs were implemented demonstrated no turbidity exceedances that were attributed to the dredging activity.

7.1.3.3 Capping BMPs

- An absorbent containment boom was installed around the head of Slip 3 capping area and sand layer area prior to placement of sand or capping materials.
- In general, capping did not begin until after a majority of the dredging was completed. Debris of concern in cap areas was properly removed and disposed of prior to capping. Debris of concern was any debris that extended above the mudline grade more than half the total thickness of the cap section in that area.
- All caps on slopes were placed from the toe of the slope up towards the crest.
- The base cap layer was placed in a manner to minimize disturbance and mixing of cap material and sediment.
- The entire base cap layer was placed prior to placing the armor layer.
- The armor layer was placed in a manner that did not damage the base cap layer. Damage includes penetration of the armor layer material into the base cap layer.
- Use of spuds did not occur in areas previously capped.
- The contractor did not drag cap areas to even out cap overplacements.
- To ensure proper cap placement, in-situ cap materials were placed in a controlled and accurate manner, slowly releasing the material from a clamshell bucket rather than dropping it in larger amounts. The placement occurred starting at lower and working to higher elevations.
- Surface booms, oil-absorbent pads, and similar materials were on site for any sheens that occurred on the surface of the water during construction.
- Cap material was from an approved upland source.

No additional capping BMPs were implemented during the Phase I Removal Action as there were no exceedances of field or chemistry parameters that were identified by the water quality monitoring activities.

7.1.3.4 Transport, Offloading, and Disposal BMPs

- The sediment barges were monitored continuously by the Site Superintendent at T4 and the Site Supervisor at The Dalles for any sign of leakage or spillage during loading, offloading, and transporting from the offload site to the landfill. If any leakage or spillage was detected, the operations were terminated until repairs and/or a remedy was in place. All leakage or spillage of dredged materials were cleaned up promptly and transported to the landfill for disposal.
- Drip pans, steel plates, open-top containers, and sediment screens were used at all points of transfer of dredged material to prevent leakage from contacting the surrounding soils or water. All containment structures were bermed to contain sediment and prevent runoff.
- During transport and handling of sediment, adequate containment measures and inspections were employed to minimize spillage.
- Bin-barges or flat-deck barges with watertight sideboards were used and were covered as weather warranted.
- No material leaked from the bins or overtop the walls of the barge.
- Metal spill aprons, upland spill control curbing and collection systems, and other spill control measures were used when transferring material from the haul barges to the transloading facility. A dribble apron was used to catch and collect any material dropped during offloading operations. No material re-entered the river at the offloading facility.
- No water was created or discharged. Any free liquid remaining in the haul barge was removed and contained for appropriate disposal.
- Dock curbing was used to prevent any potential spill material and rainwater from entering the river.
- Routine visual inspections of the loading area and access routes were performed. Caution was exercised so that material did not leak out of the

haul trucks, slosh over the tops, or blow out of the trucks during transport from the offloading facility to the final disposal site.
- The transfer area and all equipment used in transfer activities was cleaned and decontaminated.
- Dewatering of sediment occurred either in a barge or at an approved upland facility. The elutriate that was dewatered in a barge was released into a municipal sanitary sewer system, pursuant to applicable discharge requirements.
- No release of either sediment or water back into the Willamette River or Columbia River from the transport barge was allowed.
- The sediment was covered during transport on the barge to prevent it from blowing back into the river if winds were predicted to be greater than 20 miles per hour during transport.

No additional BMPs were implemented during transport, offloading, and disposal activities as no water quality monitoring parameters were ever exceeded.

7.1.3.5 Wheeler Bay Slope Stabilization and Capping BMPs

- Visual monitoring took place whenever construction was actively underway.
- 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 were open or stockpiled for periods longer than 2 weeks were employed.
- Construction entrances, exits, and parking areas were graveled or paved to reduce the tracking of sediment onto public or private roads, and maintained for the duration of the project.
- Unpaved roads on the site were graveled or under other effective erosion and sediment control measures, either on the road or downgradient, to prevent sediment and sediment-laden water from leaving the site.
- Existing vegetation was preserved where practicable, and open areas were revegetated after grading or construction as necessary.

- Soil stockpiles were continuously secured or protected from runoff and erosion with temporary soil stabilization measures or protective cover throughout the project.
- Ongoing maintenance, repair, and restoration of erosion, sediment, and pollution control (ESPC) measures were provided to keep them continually functional.
- Any use of toxic or other hazardous materials included proper storage, application, and disposal.
- When trucking saturated soils from the site, either watertight trucks were used or loads were drained on-site until dripping had been reduced to minimize spillage on roads and streets.
- Construction equipment did not enter the water.
- Generally, erosion control measures were selected and implemented according to DEQ's *Sediment and Erosion Control Manual* (GeoSyntec 2005) and remained in place during all of the shoreline activities to prevent material from entering the waterway. During removal of the fire boat pier, equipment operated to the water's edge without a silt fence, as approved by USEPA. When piling broke, a boom was deployed to contain sheen.
- Cap material was from an approved upland source.

No additional BMPs were implemented during the Wheeler Bay work as no water quality monitoring results indicated a need to alter construction activities.

7.1.4 River Velocity Monitoring Results

In accordance with the WQMCCP (USEPA 2008 and Appendix R), river water velocity measurements were taken at the background sampling locations at the transloading facility and at T4. River velocity measurements taken at the beginning of the project at both locations were much less than the trigger of 1.0 feet/second. Monitoring of river velocity was discontinued in The Dalles shortly after the beginning of the project because variation in river velocity was minimal from day to day. In addition, the action triggered by exceedance of this parameter (stop operations and secure silt curtains and other containment barriers) did not apply in The Dalles since in-water silt curtains and other containment devices were not being used.

Monitoring of river velocity was also discontinued at the T4 site in Portland shortly after the beginning of the project because variation in river velocity was minimal from day to day, and the center of construction activities for dredging and capping was predominantly within and at the head of Slip 3 during the course of the project. As a result, the turbidity curtain deployed by HME was generally not impacted by the flow of the river. In addition, all silt curtains deployed at the Wheeler Bay shoreline stabilization area of the site were well above the water line. Finally, the water quality monitoring program was designed to demonstrate compliance without the need to determine velocity or flow direction. Hence, velocity measurements were discontinued.

7.2 Compliance with the Biological Opinion

The reporting requirements outlined in the Biological Opinion (NMFS 2008 and Appendix S) state that the Port will provide the following information:

- All monitoring items, including turbidity measurements: this information is provided in Section 7.1.
- Size of the dredged area (amount and aerial extent), depth of sand cap, and dates of initiation and completion of work: this information is provided in Sections 4 and 5.
- Discussion of the implementation of the terms and conditions for reasonable and prudent measure #1: Minimize the incidental take from project related activities by applying permit conditions to the proposed action that avoid or minimize adverse impacts to water quality and the ecology of aquatic systems: This discussion is provided in Section 7.2.1, below.

7.2.1 Implementation of Terms and Conditions

The terms and conditions of the Biological Opinion (NMFS 2008 and Appendix S) were incorporated into the construction documents by reference, and a summary of the conditions was provided in the "Summary of Relevant Environmental Protection Measures and BMPs" memorandum provided in the Final RAWP (Anchor 2008b). A brief discussion of each condition is given below, except for the water quality monitoring activities, which are described in detail in Section 7.1.

7.2.1.1 General Conditions

- Work Window: The Port conducted all Phase I Removal Action activities within the summer in-water work window between July 1 and October 31, 2008.
- Notice to Contractors: Prior to the beginning of work, all contractors working on site were given a complete list of reasonable and prudent measures, and terms and conditions listed in the Biological Opinion (NMFS 2008 and Appendix S).
- Minimize Impact Area: As documented in Section 4, the dredging impacts were confined to the minimum area necessary to complete the project.

7.2.1.2 Dredging Conditions

- No fallback or redistribution: All digging passes of the bucket were completed without any material being returned to the wetted area. Dumping of partial or full buckets of dredged material back into the project area was not allowed. Dredging of holes or sumps below the maximum depth, and redistribution of sediment by dredging, dragging, or other means was not allowed.
- Cycling time: Clamshell cycling times were slowed, as indicated by water quality monitoring results, to reduce turbidity and sediment drift to adjacent areas.
- A closed-lip environmental bucket was used as much as possible. When the material type precluded the use of this type of bucket, the Port notified USEPA.
- Debris: All large anthropogenic debris was removed from dredged sediment and transported to an appropriate disposal site.
- Materials such as booms and sorbent pads were available on-site, and were used as necessary to contain and clean up petroleum products spilled or released as a result of project activities. The booms were deployed in Slip 3 prior to and during work at the head of Slip 3.
- No release of either sediment or water back into the Willamette or Columbia Rivers from the transport barge was allowed.

7.2.1.3 Capping Conditions

- The Wheeler Bay upland cap over contaminated soil received a demarcation layer at the base of the cap with an orange construction fencing barrier.
- Institutional controls for the caps are discussed in Section 10.
- Contaminated soil or sediment was capped in place with a minimum of 12 inches of clean cover material.

7.2.1.4 Fish Diversion Net

A fish diversion net was deployed at the mouth of Slip 3 on August 4 and 5, 2008, to divert fish from entering the slip during dredging and capping activities. The net extended 180 feet at a 45-degree downstream angle to the harbor line. The diversion net spanned from the surface to a depth of 20 feet, was held in place with a system of lead lines and anchors, and consisted of 3/16-inch-diameter nylon mesh. Lighted, flashing buoys were placed at the surface of the net to prevent inadvertent collisions. USCG was notified of the presence of the diversion net.

The net remained in place and intact until it was removed on October 2, 2008, following the completion of in-water construction activities at T4. The net was observed on a daily basis during in-water construction activities. No fish or other aquatic organisms were observed to be caught in the net during in-water construction activities or at the time of removal.

7.2.1.5 Habitat Measures

- Vegetation Cover in Wheeler Bay: The Port must achieve 80 percent aerial coverage by established (i.e., not newly planted) vegetation at year 5. Invasive plants species do not count toward the 80 percent cover. This condition has been incorporated into the Interim Monitoring and Reporting Plan for Wheeler Bay.
- The Port will submit its proposed compensatory mitigation plan to the National Marine Fisheries Service (NMFS) for approval or disapproval within 2 years of the start of operations under the Biological Opinion (NMFS 2008 and Appendix S), and complete all actions necessary to carry out the plan within 5 years after the date the plan is approved. As described in 40

CFR 232.3(f)(2), NMFS will consider any time lag between commencement of sediment removal and the start of compensatory mitigation activities that exceeds 2 years to be an additional temporal loss of aquatic resource function when determining whether to approve or disapprove the proposed mitigation ratio.

7.2.1.6 Fish Visual Monitoring

Daily monitoring for distressed fish was performed during construction activities. One dead salmon floating in the SE corner of the head of Slip 3 adjacent to the capping area was identified at 13:10 on September 16, 2008; however, it was determined that the fish's death was not related to the construction activity at T4. The fish was discovered about 15 to 20 minutes after capping activities (placement of the organoclay layer) had ended, so no construction activities were occurring at the time of the discovery. The fish was an approximately 12- to 18-inch hatchery fish (coho) and was in a deteriorated state, indicating that the fish had been dead for some time. Additionally, an HME representative reported seeing a dead fish in the middle of the river adjacent to T4 earlier that morning. The water quality monitoring crew collected samples in the area where the fish was found. The water samples were analyzed for DO and total sulfides. The analytical and field parameter results for September 16, 2008, are provided in Appendix E. The field parameters showed DO levels between 8.6 and 8.8 mg/L throughout the water column. The analytical results showed DO levels of 8.8 mg/L at the surface. Sulfides were non-detect with a reporting limit of 0.05 mg/L. Based on all of these factors, the Port concluded that the construction activities did not cause the fish's death and that the fish washed into the slip area long after it had died. The USEPA and NMFS were immediately notified of these details. Later, NMFS reported that it was appropriate to dispose of the fish and it did not need to be kept (Munn 2008), and the fish was subsequently released back into the river approximately 1 mile downstream of the construction site on the opposite side of the river.

No other dead or distressed fish were observed at T4 or the transloading facility before, during, or after construction activity.

7.2.1.7 Transport and Upland Disposal Conditions

- Weather Conditions: If weather conditions were unsuitable to monitor the dredging operations, then in-water operations were required to stop until conditions were suitable for monitoring again. This occurred once, when lightning struck the upland portion of the T4 site.
- Transport: To prevent it from blowing back into the river, the sediment was covered during transport on the barge if winds were predicted to be greater than 20 miles per hour during transport. Documentation of the predicted wind speeds is provided in Appendix L1.
- Upland Disposal Site: The upland disposal site was to be large enough to accommodate the quantity of material and water to be placed there to allow adequate settling. This condition was not applicable as the material was dewatered on the disposal barge and then barged to the transfer facility. At the transfer facility, the material was mixed with a drying agent and placed onto trucks to be taken to the landfill. No discharge of water from the upland disposal site to waterways with Endangered Species Act (ESA)-listed salmonids occurred.

7.2.2 Approved Deviations from the Biological Opinion

A few deviations from the Biological Opinion (NMFS 2008 and Appendix S) were requested by the Port and USEPA prior to implementation of the Phase I Removal Action. NMFS-approved deviations from the Biological Opinion are described in detail below:

- Term and Condition 1(e)(i): A geobarrier was required for all caps, which would include the Slip 3 in-water cap. USEPA requested that this be changed to only require the geobarrier for the Wheeler Bay (upland) cap. The cap requirement for in-water caps was not practicable or desirable (i.e., it would be difficult to place and would not serve an IC purpose). NMFS approved this change on July 29, 2008 (see email documentation in Appendix S).
- Term and Condition 1(h)(vii): The turbidity trigger was limited to 3 NTU over background, whereas the WQMCCP (USEPA 2008 and Appendix R) set the trigger at 5 NTU over background. USEPA requested the turbidity trigger be

changed to 5 NTU over background. NMFS approved this change on July 29, 2008 (see email documentation in Appendix S).

- Term and Condition 1(d)v: This requirement stated that "post-dredge sampling would include a full suite of parameters, including metals, SVOC, PCBs and TOC." The Port requested that this requirement be changed to be consistent with the Interim Monitoring and Reporting Plan, which stated that pb, zn, cd; PAHs; TPH would be analyzed and 4 composite samples would be analyzed for PCBs and DDTs. The 4 composite samples would come from North of B414 dredge area, Pier 5 dredge area, sand cover area within B411 dredge area, and B411 dredge area outside of the sand cap area. NMFS approved of this change on August 8, 2008 (see email documentation in Appendix S).
- Term and Condition 1(g)i: This requirement stated that "Cable and concrete would not be used to anchor large wood into the bankline in Wheeler Bay". The Port requested that this condition be removed. If the large wood could not be anchored in place, the Port was not willing to place them in Wheeler Bay because of the concern of placing unanchored logs and having them move around and damage the toe of the slope and placed cap. NMFS approved of this change on August 8, 2008 (see email documentation in Appendix S).
- On Page 9 of the Biological Opinion under Conservation Measures, it stated that "The dredge bucket will be swung directly to the haul barge after it breaks the surface, using the minimal swing distance. The contractor will not pause the bucket as it breaks the surface of the water." The Port requested that this conservation measure be changed to be consistent with the Final RAWP and Final DAR, which stated that: "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. Note that USEPA may direct the contractor to avoid overwater bucket dewatering as a contingency BMP if water quality exceedances are documented." NMFS agreed to this change only if the bucket dewatering occurred within the confines of a silt curtain and if the water quality sampling and analysis meets the agreed upon criteria on August 8, 2008 (see email documentation in Appendix S).

8 DOCUMENTATION OF PERFORMANCE STANDARDS ATTAINMENT

As mentioned previously, USEPA and the Port identified performance standards for each Phase I Removal Action activity during the design process. The CQAP (Appendix A of the DAR, Anchor 2008a) provides specific details about the QA/QC and responsibilities necessary to accurately evaluate achievement of the performance standards for each construction activity. These verification and monitoring activities were performed throughout the implementation of the Phase I Removal Action as described in the previous section. Attainment of performance standards, as verified through construction QA/QC activities, are described below by activity.

8.1 Dredging

8.1.1 Performance Standards

Performance standards were developed for the Berth 411 "Plus" and Berth 410 dredging to govern design and construction. Each of the standards is discussed below.

Berth 411 "Plus" Dredging – Remove sediment that poses the highest ecological and human health risk. Removal of the highest risk sediment will provide a permanent solution of contaminant mass removal from the river. Specifically, the dredging will meet the following performance standards:

- Remove contaminated sediment defined as those with surface sediment 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 minimum 6-inch-thick sand layer to be determined by quantity measures (i.e., volume of cap material placed per surface area).
- Reduce contaminant levels in the Berth 411 "Plus" dredging area.
- Conduct the work consistent with the BMPs listed in the Dredging, Transportation, and Disposal specification (Appendix E of the DAR; Section 352023, Anchor 2008a) 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 (Appendix E of the DAR; Section 352023, Anchor 2008a), in order to minimize dredging residuals and minimize recontamination of adjacent sediment.

- Conduct the work consistent with the WQMP (Appendix H of the RAWP, Anchor 2008b) and the WQMCCP (USEPA 2008 and Appendix R) in order to minimize water quality impacts outside the compliance boundary.
- Conduct the work consistent with the Biological Opinion developed by NMFS (2008) (Appendix S).

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 2006). 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 (Appendix E of the DAR; Section 352023, Anchor 2008a), in order to minimize the impacts to surrounding sediment and the "leave" surface of the dredge area.
- Conduct the work consistent with the WQMP (Appendix H of the RAWP, Anchor 2008b) and the WQMCCP (USEPA 2008 and Appendix R) in order to minimize water quality impacts outside the compliance boundary.
- Conduct the work consistent with the Biological Opinion developed by NMFS (2008) (Appendix S).

8.1.2 Quality Assurance Documentation

As described in the CQAP (Appendix A of the DAR, Anchor 2008a), construction QA activities for the Berth 411 "Plus" and Berth 410 dredging included pre- and post-construction bathymetry surveys to confirm the depth and extent of dredging, observation of dredging to confirm compliance with specified dredge sequencing to minimize impacts to nearby areas, and water quality monitoring to confirm compliance with the WQMCCP (USEPA 2008 and Appendix R) and WQMP (Appendix H of the RAWP, Anchor 2008b). QA documentation (e.g., laboratory reports, field notes, photographs, bathymetry, and water quality monitoring results) have verified that the Slip 3 dredging meets all of the performance standards. Compliance with the performance standards is summarized below.

8.1.2.1 Final Design Elevations Attained

The primary QA activity for the Berth 411 "Plus" and Berth 410 dredging was to verify that HME achieved compliance with the final design elevations. The final design elevations for the Berth 411 "Plus" areas were determined to reduce contaminant concentrations by removing contaminated sediment with surface concentrations greater than 20 PEC exceedance ratio and to be at an elevation coinciding with PEC exceedance ratios of 10 or less as predetermined by sediment core data. The final design elevations for the Berth 410 area were determined to allow vessels to safely access berthing areas in Slip 3. It is important to note that there were no chemical-based performance standards for the removal.

Attainment of these elevation-defined performance standards was verified through bathymetry surveys (single-beam surveys using integrated Hypack software and a differential global positioning system [DGPS] unit for horizontal control) were conducted frequently to monitor changes in bottom elevation throughout dredging. Following each progress survey, HME, the Port, and Anchor reviewed the elevation data to determine what areas of the dredge prism required further dredging to achieve the design elevations. This process continued until the HME progress survey indicated the entire dredge prism satisfied the design elevations.

To ensure that the survey was accurate, DEA performed an independent bathymetry survey throughout the RAA using multi-beam equipment. The HME and DEA surveys were compared and, in coordination with USEPA, it was determined that both were very similar to each other, indicating a few small areas that required minimal additional dredging of identified hot-spots. Following this additional dredging, DEA conducted surveys to verify that grade deficiencies indicated in the final bathymetry surveys had been addressed by the final dredge passes. All survey information was reviewed in coordination with USEPA's consultant to verify completion of the removal. Surveys were performed in Berth 411 after dredging was complete, and again after the sand layer was placed. Post-dredge (pre-sand layer) bathymetry is provided in Figure 3. The plan and cross-section locations and cross-sections showing the as-built post-dredge surface relative to the design elevations are shown in Figures 4 through 4d.

Review of the cross-section comparisons of as-built to design elevations in Figures 4a through 4d indicate that the performance elevations were met over a majority of the dredge areas. There were two instances where performance elevations were not met. A description of each instance and resolution of the discrepancy is provided below:

- HME began doing dredging to remove identified high-spots in Berth 411 on August 26 and August 28, 2008, based on the DEA post-dredge survey. HME removed roughly 160 feet of the "slope transition" area identified in the DEA survey. There was about 30 cy remaining in the transition area between the higher elevation dredge cell against the sheetpile wall and the deeper area further from the bulkhead toward the middle of the slip. The sediment was dense and appeared to be native material due both to the gradation (sandy with gravels) observed, and the fact that it was standing at an angle steeper than 2H:1V. This material would have required the heavier digging bucket to remove. The Port requested that this 30 cy of material not be removed as part of Phase I since the remainder of the area identified for dredging to remove identified high-spots appeared to be dense native sediment. USEPA concurred with this request.
- The Port identified a few isolated locations within the Berth 410 area that were slightly above the neat line elevation. The areas were adjacent to the sheetpile wall. The Port felt that these areas would not impact navigation and requested to USEPA that they not be further dredged. USEPA concurred with this request.

8.1.2.2 Work Conducted was Consistent with the BMPs Listed in the Dredging, Transportation, and Disposal Specification (Appendix E of the DAR; Section 352023)

Dredging work was consistent with the BMPs listed in the Dredging, Transportation, and Disposal Specification (Appendix E of the DAR; Section 352023, Anchor 2008a) as verified by construction monitoring and documented in the Construction Weekly

Progress Reports provided in Appendix A. The BMPs that were followed are listed below:

- The Berth 411 "Plus" dredging was substantially completed before the Berth 410 dredging began.
- Dredge passes proceeded from the head of the slip towards the mouth. Levels of contamination in the dredge material were typically higher towards the head. Depths of required cuts were also typically thicker towards the head of Slip 3.
- The contractor completed a horizontal dredge pass across the dredge surface before moving to the next deeper pass. A dredge pass is defined as a horizontal dredge cut consisting of up to two "bites" of the dredge bucket—one "bite" would occur as the derrick worked from one side of each reach to the other, and the second "bite" would occur as the derrick worked back in the other direction.
- The contractor began dredging at the highest elevation of material to be removed and work toward the lowest elevation. "Glory holing" was not allowed.
- The contractor sequenced their work such that there was one last pass across the entire Berth 411 "Plus" dredge area.
- Overfilling of the bucket was not allowed.
- The contractor paused the dredge bucket as it broke the surface of the water and allowed the bucket to drain free water prior to swinging and placing dredged material on the haul barge.
- No bottom stockpiling or multiple bites of the clamshell bucket was allowed.
- The contractor sealed off barge scuppers on haul barges and repaired any holes in fences to prevent water or sediment from draining off a haul barge.
- Barges were not overfilled.
- No grounding of construction barges occurred.
- Overdredging at the base of a slope did not occur.
- Dragging of the dredged surface to level the mudline did not occur.

8.1.2.3 Work Conducted was Consistent with the WQMP, WQMCCP, and Biological Opinion

The water quality monitoring program that was implemented during the Phase I Removal Action at T4 was developed based on the WQMP (Appendix H of the RAWP, Anchor 2008b) and the WQMCCP (USEPA 2008 and Appendix R). Water quality monitoring occurred throughout the duration of the dredging activities, as described in Section 7.1 of this report, to confirm consistency the WQMP and WQMCCP.

Before dredging operations began, HME and all construction monitoring personnel were given the Biological Opinion (NMFS 2008 and Appendix S) to review. As a result, HME adjusted their implementation plans, as necessary, to comply with all the terms and conditions described in the Biological Opinion. Additionally, all monitoring personnel were aware of the specific terms and conditions detailed in the Biological Opinion and were directed to notify the Construction Manager if a construction activity was identified that did not comply, so that action could be taken to bring the activity back into compliance.

Specific details related to activities implemented to comply with the WQMCCP (USEPA 2008 and Appendix R) and the Biological Opinion (NMFS 2008 and Appendix S) are provided in Section 7.

8.2 Head of Slip 3 Capping

8.2.1 Performance Standards

Performance standards identified for the head of Slip 3 capping activities included:

- 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 the Capping specification of Appendix E of the DAR; Section 352025, Anchor 2008a).

- Conduct the work consistent with the BMPs listed in the Capping specification (Appendix E of the DAR; Section 352025, Anchor 2008a), in order to minimize mixing of cap material with underlying contaminated sediment.
- Conduct the work consistent with the WQMP (Appendix H of the RAWP, Anchor 2008b) and the WQMCCP (USEPA 2008 and Appendix R), in order to minimize water quality impacts outside the compliance boundary.
- Conduct the work consistent with the Biological Opinion developed by NMFS (2008) (Appendix S).

8.2.2 Quality Assurance Documentation

As described in the CQAP (Appendix A of the DAR, Anchor 2008a), QA for the cap construction included chemical and physical testing of import materials, observation of material placement to verify cap thickness and extent, verification of material quantities used, pre- and post-construction bathymetry surveys to confirm design elevations were achieved, and water quality monitoring to confirm compliance with the WQMCCP (USEPA 2008 and Appendix R) and WQMP (Appendix H of the RAWP, Anchor 2008b). QA documentation (e.g., laboratory reports, field notes, photographs, material quantity measures, bathymetry, and water quality monitoring results) have verified that the head of Slip 3 cap meets all of the performance standards. Compliance with the performance standards is summarized below.

8.2.2.1 Cap Designed to Contain Sheens and to Resist Erosive Forces

The entire cap behind the timber bulkhead was designed to include an 18-inch layer of Base Cap Type 3 material, which contains 10 percent organoclay capable of adsorbing sheen prior to entering surface water. This cap was placed on September 23 and 24, 2008, as detailed in the Construction Weekly Progress Report for the week of September 22 to 28, 2008 (Appendix A). In addition, the cap was designed to include an 18-inch layer of Type 3 Armor material to resist erosive forces. This type of material was selected based on erosion analyses performed during the development of the design. This armor was placed over the caps both in front of and behind the timber bulkhead. On September 16, 2008, HME placed a layer of Type 3 Armor material over the entire cap in front of the bulkhead. From September 23 through October 1, 2008, HME place a geotextile, Base Cap Type 2 sand, and Type 3

Armor layer over the cap behind the timber bulkhead. Placement of the cap as designed was verified by field observation.

8.2.2.2 Cap Material Design Elevations were Achieved

Attainment of the capping design elevations for the portion of the cap on the river side of the timber bulkhead was verified through progress bathymetry surveys (single-beam surveys using integrated Hypack software and a DGPS unit for horizontal control) that were conducted during capping to monitor changes in bottom elevation. Progress surveys were conducted during placement of the cap material and the cap armor material to ensure the design elevations for each layer were achieved. Following each progress survey for these layers, HME, the Port, and Anchor reviewed the elevation data to determine what areas required further capping to achieve the design elevations. This iterative process continued until the most recent survey indicated design elevations were achieved in the cap areas. DEA performed an independent bathymetry survey throughout the RAA to verify the HME survey findings.

For the portion of the cap on the land side of the timber bulkhead, attainment of the capping design elevation was verified through placement of stakes on the slope to identify how much material was necessary to meet the cap thickness requirements for the Base Cap Type 3 and Base Cap Type 2 materials. The attainment of the design thicknesses was initially verified in the field as documented in the Construction Daily Reports.

As-built cap elevations are provided in Figures 5 and 6, and 6a. Review of these figures indicates that capping achieved the performance standard thicknesses over the areas addressed, except for the height of the rock buttress in front of the timber bulkhead as part of the head of Slip 3 cap. As described in Appendix O, the performance standards are still achieved for this activity despite the difference in cap elevation.

8.2.2.3 Cap Import Material Met Defined Chemical Goals and Physical Characteristics

Attainment of this performance standard was achieved through comparison of the chemical and physical characteristics of the proposed borrow materials (i.e., base cap material and cap armor material) to the chemical and physical characteristics identified in Table 2 of the RAWP (Anchor 2008b). To confirm that the imported material was environmentally acceptable, USEPA requested the design include the following text excerpted from the specifications established for the McCormick & Baxter Superfund capping project, "cap material 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" (Ecology and the Environment 2003).

Borrow source materials from the sand layer and capping activities were tested for grain size and chemical quality by HME and compared to criteria specified in Table 2 of the RAWP (Anchor 2008b). Results are listed in Appendix B1. Analytical laboratory reports and data validation reports are included in Appendices I1 and J1, respectively. The initial chemistry testing results for the sand layer and Base Cap Type 3 materials were incomplete—missing analysis for oxychlordane. The Port decided to go ahead and place the material. All other related chemicals of concern were non-detect or below the criteria. USEPA concurred with placing the material, noting that the Port would need to assume the risk if the oxychlordane results were above the criteria. The sample was reanalyzed and oxychlordane was not detected.

8.2.2.4 Work Conducted was Consistent with BMPs Listed in the Capping Specification (Appendix E of the DAR; Section 352025)

The head of Slip 3 capping work was consistent with the BMPs listed in the Capping Specification (Appendix E of the DAR; Section 352025, Anchor 2008a) to minimize mixing of the cap material with the underlying contaminated sediment as verified by construction monitoring activities and documented in the Construction Weekly Progress Reports provided in Appendix A. The BMPs that were followed are listed below:

- The base cap layer was placed in a manner to minimize disturbance and mixing of cap material and sediment.

- Use of spuds was not allowed in areas previously capped.
- The contractor was not allowed to drag cap areas to even out cap overplacements.
- The contractor installed and maintained absorbent booms around the head of the Slip 3 cap construction area.

8.2.2.5 Work Conducted was Consistent with the WQMP, WQMCCP, and Biological Opinion

The water quality monitoring program that was implemented during the Phase I Removal Action at T4 was developed based on the WQMP (Appendix H of the RAWP, Anchor 2008b) and the WQMCCP (USEPA 2008 and Appendix R). Water quality monitoring occurred throughout the duration of the head of Slip 3 capping activities, as described in Section 7.1 of this report, to confirm consistency with the WQMP and WQMCCP.

Before capping operations began, HME and all construction monitoring personnel were given the Biological Opinion (NMFS 2008 and Appendix S) to review. As a result, HME adjusted their implementation plans, as necessary, to comply with all the terms and conditions described in the Biological Opinion. Additionally, all monitoring personnel were aware of the specific terms and conditions detailed in the Biological Opinion and were directed to notify the Construction Manager if a construction activity was identified that did not comply, so that action could be taken to bring the activity back into compliance.

Specific details related to activities implemented to comply with the WQMCCP (USEPA 2008 and Appendix R) and the Biological Opinion (NMFS 2008 and Appendix S) are provided in Section 7.

8.3 Transportation, Transloading, and Disposal

8.3.1 Performance Standards

The performance standards for transportation and disposal activities included the following:

- Documentation of no loss of material from the trucks during transport from the transfer station to the landfill
- Documentation of no off-site tracking of the material from the transfer station through collection of pre- and post-construction soil samples at the transfer station
- Conduct the work consistent with the BMPs listed in the Dredging, Transportation, and Disposal specification (Section 352023; Appendix E of the DAR, Anchor 2008a) in order avoid losses of dredged material during the hauling and disposal process.

8.3.2 Quality Assurance Documentation

As described in the CQAP (Appendix A of the DAR, Anchor 2008a), construction QA activities for the transportation, transloading, and disposal work included observation of the transloading operation to document no loss of material from the trucks before leaving the transfer facility and pre- and post-soil chemistry monitoring to verify no off-site tracking of material. QA documentation (e.g., laboratory reports, field notes, and photographs) have verified that the transportation, transloading, and disposal activities met all of the performance standards. Compliance with the performance standards is summarized below.

8.3.2.1 No Material Lost During Transport from Transfer Station to the Landfill

To document that no loss of material occurred during transportation of the material to the landfill from the transfer station, Anchor tracked each truck that transported sediment, debris, or liquid and verified that the truck number for each truck carrying sediment and debris leaving the transloading facility matched the records provided by the landfill. The weight records for all loads of waste received at the landfill are summarized in Tables 7 and 8. In addition, observation during truck loading occurred and was documented in the Construction Weekly Progress Reports (Appendix A).

8.3.2.2 No Off-Site Tracking Occurred

To document that no off-site tracking of contaminants occurred from the transfer station, and in accordance with the TDP (Appendix D1 of the RAWP, Anchor 2008b), soil samples were collected at and near the transloading facility before operations began, during operations, and after operations were completed. Based on the results of the soil sampling, the operation of the transloading facility resulted in no tracking of contamination on-site or from the site to River Road. Additional details related to the soil sampling results are provided in Section 6.4.

8.3.2.3 Work Conducted was Consistent with the BMPs Listed in the Dredging, Transportation, and Disposal Specification (Appendix E of the DAR; Section 352023)

The transportation, transloading, and disposal work was performed consistent with the BMPs listed in the Dredging, Transportation, and Disposal specification (Section 352023; Appendix E of the DAR, Anchor 2008a) in order to avoid losses of dredged material during the hauling and disposal process, as verified by construction monitoring activities documented in the Construction Weekly Progress Reports provided in Appendix A.

8.4 Wheeler Bay Shoreline Stabilization

8.4.1 Performance Standards

Specific performance standards for the Wheeler Bay shoreline stabilization work included the following:

- To the extent feasible, regrade banks to slopes that will be stable under long-term conditions.
- 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.
- Eliminate direct contact with contaminated river bank soils.
- Use import material for fill and grading that meets defined chemical goals (presented in Appendix E of the DAR; Site Clearing, Earthwork and Shoreline Stabilization specification; Section 312000, Anchor 2008a).
- Conduct the work consistent with the WQMP (Appendix H of the RAWP, Anchor 2008b) and the WQMCCP (USEPA 2008 and Appendix R) in order to minimize water quality impacts outside the compliance boundary.

- Conduct the work consistent with the Biological Opinion developed by NMFS (2008) (Appendix S).

8.4.2 Quality Assurance Documentation

As described in the CQAP (Appendix A of the DAR, Anchor 2008a), QA for the shoreline stabilization (cap) construction included chemical and physical testing of import materials, observation of material placement to verify material placement thickness and extent, verification of material quantities used, pre- and post-construction surveys to confirm design elevations were achieved, and water quality monitoring to confirm compliance with the WQMCCP (USEPA 2008 and Appendix R) and WQMP (Appendix H of the RAWP, Anchor 2008b). QA documentation (e.g., laboratory reports, field notes, photographs, material quantity measures, and surveys) have verified that the shoreline stabilization area meets all of the performance standards. Compliance with the performance standards is summarized below.

8.4.2.1 Design Shoreline to be Stable, Resist Erosive Forces, and Eliminate Direct Contact with Contaminated River Bank Soils

To increase the stability of the shoreline, the design determined that a majority of the shoreline could be graded back to a 3H:1V slope and planted to resist erosion in the upper elevations, and protected with an armor layer in the lower elevations. Where the slope could not be graded back, additional armoring was necessary to stabilize the shoreline. Based on the erosion analyses conducted during the design phase, an armor layer of large rock was necessary to withstand erosive forces. In addition, the cap material consisting of 18 inches of select fill was placed on top of the graded surface to eliminate direct contact with contaminated river bank soil. An orange construction fabric was also placed between the graded surface and the cap material to mark the transition between cap material and the river bank soil. For the toe portion (from elevation 15 feet NGVD down to the bottom of new grading), an armor layer was placed over the filter layer. The armor was covered with 1 foot of habitat material, large woody debris, and habitat logs. Documentation of the placement of the shoreline stabilization materials is provided in the Construction Weekly Progress Reports for Wheeler Bay in Appendix A.

8.4.2.2 Shoreline Stabilization Design Elevations were Achieved

On August 11 and 12, 2008, a pre-construction survey was completed to identify existing ground surface contours and to lay out temporary stations for grade checking throughout the project. The survey was used to set final grades to as closely as possible balance cut and fill after removal of debris and unsuitable soil. Subgrade cut and fill were controlled on a daily basis with slope staking and progress surveys. Armor section layer thickness and grade were controlled on a daily basis with slope staking and progress surveys. Top soil layer thickness and grade were controlled on a daily basis with slope staking and progress surveys. In addition, visual monitoring included checks of slope grades with a hand level, verification of material layer thicknesses with a tape measure, verification of general material characteristics of each fill type, and qualitative confirmation of compaction using a hand probe.

8.4.2.3 Cap Import Material Met Defined Chemical Goals and Physical Characteristics

Attainment of this performance standard was achieved through comparison of the chemical and physical characteristics of the proposed borrow materials (i.e., base cap material and cap armor material) to the chemical and physical characteristics identified in Table 2 of the RAWP (Anchor 2008b). To confirm that the imported material was environmentally acceptable, USEPA requested the design include the following text excerpted from the specifications established for the McCormick & Baxter Superfund capping project, "cap material 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" (Ecology and the Environment 2003).

The soil materials imported for the armor section were select fill (3-1/2-inch-minus crushed gravel and sand) and Type 3 Armor (Class 100 armor; approximately 3-inch to 10-inch rock). Based on visual observation, the armor met the project specifications. The select fill was tested for grain size and chemical quality (see Appendix P). Results are listed in Appendix B2. Based on the grain size results, the select fill was slightly deficient of sand-size particles, but the material was approved for use on the project provided filter fabric was placed between the subgrade and the select fill (RFI #12; see Section 5.6). The select fill met the chemical quality criteria in the project specifications.

The habitat cover consisted of a well-graded mix of sand and rounded gravel with no silt and a maximum particle size of 2 inches. The Habitat Cover was tested for grain size and chemical quality (see Appendix P). Results are listed in Appendix B2. Based on the results, the Habitat Cover met the grain size and chemical quality criteria in the project specifications.

Topsoil consisted of a 2:1 ratio (by volume) mix of sandy loam and compost. The topsoil was tested for grain size and chemical quality (see Appendix P). Topsoil chemical quality met all criteria in the project specifications except for butylbenzylphthalate: the detected concentration was 21 μg/kg versus the criterion of 20 μg/kg. USEPA approved use of this topsoil. The grain size results indicated that the soil portion of the topsoil did not meet specifications. Additional sand was needed to bring the results within specifications. Sand used in the Habitat Cover (already chemically tested and approved for use on the project) was added to the topsoil mix and a sample was tested for grain size (see Appendix P). The resulting material met project specifications and was approved for use. Results for approved materials are listed in Appendix B2.

8.4.2.4 Work Conducted was Consistent with the WQMP, WQMCCP, and Biological Opinion

The water quality monitoring program that was implemented during the Phase I Removal Action at T4 was developed based on the WQMP (Appendix H of the RAWP, Anchor 2008b) and the WQMCCP (USEPA 2008 and Appendix R). Visual water quality monitoring occurred throughout the duration of the shoreline stabilization activities as described in this report to confirm consistency with the WQMP and WQMCCP.

Before shoreline stabilization activities began, ACA and all construction monitoring personnel were given the Biological Opinion (NMFS 2008 and Appendix S) to review. As a result, ACA adjusted their implementation plans, as necessary, to comply with all the terms and conditions described in the Biological Opinion. Additionally, all monitoring personnel were aware of the specific terms and conditions detailed in the Biological Opinion and were directed to notify the Construction Manager if a construction activity was identified that did not comply, so that action could be taken to bring the activity back into compliance.

Specific details related to activities implemented to comply with the WQMCCP (USEPA 2008 and Appendix R) and the Biological Opinion (NMFS 2008 and Appendix S) are provided in Section 7.

9 FIELD MONITORING QUALITY ASSURANCE/QUALITY CONTROL DOCUMENTATION

The following sections provide a summary of the field monitoring QA/QC activities conducted during the construction activities to ensure the collection of high quality data.

9.1 Bathymetry Surveys

The HME surveyor (Northwest Hydro [NH]) and the Port's surveyor (DEA) utilized state-of-the-art automated hydrographic survey systems onboard their survey vessels. Both survey systems were comparable and were comprised of the computer-based data acquisition software system Hypack (v6.2b) and a Trimble DGPS. However, NH utilized a single-beam acoustical echosounder and DEA used a multi-beam echosounder. Calibration and verification of the survey system was completed prior to each day's survey work. The horizontal positioning system was verified with known control points established from existing project survey control. The depth sounding equipment was verified through a combination of bar-checks and velocity casts with a digital velocity meter. All of the quality control steps were completed prior to any survey work being initiated to verify that all soundings would exceed the accuracy standards required by the project specification.

The bathymetry survey throughout the RAA was conducted on a 15-foot line spacing interval. The Hypack hydrographic survey software confirmed this line spacing facilitated complete coverage of the survey area. Quality control check-lines were also surveyed, orientated perpendicular to the main survey lines to verify proper calibration of the hydrographic survey system and to provide additional survey coverage to verify dredging performance.

NH installed a tide staff (affixed to a fender pile) at T4 prior to initiation of the project. The elevations on the tide board were marked in 0.2-foot increments and were surveyed to a known benchmark. These data were recorded in a hand-written logbook approximately every half-hour during the survey. DEA used the same tide staff with similar recording intervals to maintain consistency between the two datasets.

9.2 Water Quality Monitoring

QA/QC procedures were followed during the collection of both field and laboratory parameters according to procedures described in the WQMP and Quality Assurance Project Plan (QAPP; Appendices H and J of the RAWP, respectively, Anchor 2008b). For field parameters, monitoring equipment was calibrated prior to its use following the manufacturer's instructions. Calibrations for the water quality meters were conducted once per day at the beginning of each sampling day and were noted in the meter's calibration tracking notebook. In addition, calibration checks were performed on the turbidity probes at the end of each day and as necessary throughout the day and logged in the calibration tracking notebook.

For laboratory parameters, duplicate samples were collected at a single depth during the dredging and capping activities to assess the heterogeneity of the chemical analytical results at a single station and depth. Duplicates were conducted once for every 20 samples collected. In addition, matrix spike and matrix spike duplicate (MS/MSD) samples were collected at the background station each day laboratory samples were collected.

9.3 Transloading Facility Soil Monitoring

QA/QC procedures consistent with the QAPP (Appendix J of the RAWP, Anchor 2008b) were followed during the collection of transloading facility soil samples. The results of a field duplicate sample collected at Location S-06 on September 2, 2008 (the second round of soil sampling) were somewhat different from the primary sample. Eight of the 19 PAHs (i.e., benz(a)anthracene, benzo(a)pyrene, benzo(b&k)fluoranthene [total], benzo(g,h,i)perylene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, and pyrene) were detected in both the primary and duplicate samples. The other 11 PAHs were not detected in either of the samples. Oil-range TPH was also detected in both samples. The concentrations in the field duplicate were consistently higher than the concentrations in the primary sample (the relative percent difference [RPD] in PAH concentrations between the two samples ranges from approximately 30 to approximately 50 percent) for these few constituents. The concentrations of metals (cadmium, lead, and zinc) were essentially the same in the primary sample and the field duplicate. RPDs noted above between primary and field duplicate samples were not unexpected given the heterogeneity of soil on a roadside. Small deposits of automotive lubricants, partially burnt fuel, or bits of pavement mixed with soil can greatly affect the concentrations of these PAHs and TPH in a fraction of the sample collected.

9.4 Monitoring Laboratory Data Quality Assurance/Quality Control

9.4.1 Laboratory Quality Control Criteria

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

All primary chemical standards and standard solutions used in this project were traceable to documented, reliable, commercial sources. Standards were validated to determine their accuracy by comparison with an independent standard. Any impurities found in the standard were documented.

Apex Laboratories, LLC (Apex), Analytical Resources Inc. (ARI), and Columbia Analytical Services (CAS) conducted initial and continuing calibrations, and prepared and analyzed laboratory duplicates, MS/MSDs, and method blanks in accordance with the QAPP (Appendix J of the RAWP, Anchor 2008b).

9.5 Data Validation

Laboratory data were validated by Laboratory Data Consultants, Inc. (LDC) of Carlsbad, California. The data validations were performed under the functional guidelines (USEPA 1999, 2004) and following criteria outlined in the WQMP and QAPP (Appendices H and J of the RAWP, respectively, Anchor 2008b). The data validation verified the analytical accuracy and precision of the chemical analyses performed during this monitoring effort. The data may have been qualified as estimated for a particular analysis based on method or technical criterion. Data qualified with a "J" indicates that the associated numerical value is the approximate concentration of the analyte. Data qualified with a "UJ" indicates the approximate reporting limit below which the analyte was not detected. Consequently, these data qualifications are not expected to alter the data quality objectives defined in the WQMP and the QAPP. Validation reports are provided in Appendix J.

Borrow source material samples were collected by ACA and HME and analyses of these samples were performed by CAS. Data validations were not conducted on these datasets.

10 CERTIFICATIONS AND INSTITUTIONAL CONTROLS

10.1 Final USEPA Approval

Through USEPA's acceptance of the Draft RACR and subsequent revisions addressing comments on the draft document, USEPA has approved the contents of the Final RACR. Formal written documentation of this acceptance is expected after the Final RACR is submitted. It should be noted that USEPA approved the completion of the dredging, capping, and shoreline stabilization operations sufficient for equipment to be removed from the site.

10.2 Institutional Controls

Institutional controls for the site, which cover the period of time between the Phase I and Phase II actions, are described below. 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 sediment remains 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, easements or restrictive covenants regarding the cap areas will be executed 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 and Wheeler Bay cap areas were submitted to USCG on March 31, 2009. A copy of the RNA request memorandum was also sent to USEPA for documentation purposes and is included as Appendix T. Specific activities that will be limited in each capped area are listed below:

- Head of Slip 3: anchoring, dragging, trawling, or other activities that may disrupt the function or affect the integrity of the cap, such as prop scour limitations.

- Wheeler Bay: anchoring, dragging, trawling, or other activities that may disrupt the function or affect the integrity of the cap, such as prop scour and/or vessel transit limitations of capped areas at flood stage.

The coordinates for the boundaries of the capped areas were given to USCG in the RNA designation request, which will be placed onto their nautical maps and made available to boaters.

Update the Terminal 4 Base-map – The location of the capped area will be placed on the electronic 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 – As appropriate, 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

Currently, there are no tenants who have leaseholds or rights of use in the cap areas; however, T4 tenants will be notified regarding the restrictions in the cap areas through the RNA notification process.

Additionally, lease language protecting the integrity of the capped area will be provided for any new tenants that occupy Port property at T4 to the extent the lease permits use of areas on, over, or in the direct vicinity of the capped areas. Similar provisions will be implemented for existing tenants upon occurrence of lease expiration and renewal.

Easement or Covenant – An easement or restrictive covenant will be filed in the property record documenting the cap locations and the interim monitoring requirements as stated in the IMRP (Appendix C of the DAR, Anchor 2008a). The Port will file the restrictive covenant when the final cap area is known and complete and there are long-term monitoring and maintenance plan requirements to include with the filing. This will be completed as part of Phase II. All of the Slip 3 area is owned by the Port, and only a small portion of the Wheeler Bay bank is owned by DSL. The Port has an application pending with DSL to acquire this area at the time the full size Wheeler Bay cap is known, and DSL has no plans for this area. There is no risk that this area would be leased or sold prior to implementation of Phase II. However, if before Phase II there are any plans to lease or sell the areas where the caps are located, a restrictive covenant will be placed at that time.

11 CONSTRUCTION COSTS

This section presents a summary of Phase I Removal Action implementation costs for dredging, disposal, capping, and shoreline stabilization work at T4. These costs also include project change orders, staging and access, construction management, construction monitoring, and projected interim monitoring. Costs for investigation, design, and permitting are not included. All costs are in 2008 dollars.

Contractor Costs – Wheeler Bay	$761,272	
Mob/demob		$44,488
Work plans		$5,832
Wheeler Bay Shoreline Stabilization		$495,148
Construction Debris Haul and Dispose		$6,577
Construction Management		$84,610
Construction change orders*		$124,618
Contractor Costs – HME Construction (Dredging and Capping)	$3,758,230	
Mob/demob		$570,000
Work plans		$62,000
Dredging (transportation & disposal incl)		$1,773,373
Sand layer		$58,450
Head of Slip 3 cap		$734,250
Unsuitable soil haul		$188,280
Incentive pay awarded for WQ		$50,000
Construction change orders^		$321,877
Survey—David Evans and Associates	$61,189	
Port Internal Costs	$693,503	
Landscaping		$24,285
Project Management		$166,519
Implementation		$345,266
Construction		$157,433
Anchor Costs	$850,882	
Project Planning and Pre-construction Preparation		$221,122
Dredging and Capping Construction Oversight and Engineering Support		$182,700
Construction Environmental Monitoring and Lab Fees		$234,862
Preparation of the Removal Action Completion Report		$58,300
Wheeler Bay Coordination		$7,105
Interim Monitoring and Reporting (Projected Costs)		$146,793

Agency Oversight	
EPA Oversight	$216,286
DEQ Oversight	$14,964
Total	**$6,295,137**

*Construction Change Orders
#1 Utility Relocation
#2 Temporary Construction Fence
#3 Remove Fire Boat Structure
#4 Habitat Rock
#5 - #8 Additional Grading/Filling

^CC-s:
Batch discharge testing for sanitary sewer
Pile removal at head of Slip 3
Accelerated construction schedule
Turbidity curtain
Head of Slip 3 cap

12 LESSONS LEARNED

This section provides a summary of lessons that were learned throughout the implementation of Phase I of the Removal Action that may be important to refer to during subsequent Phase II construction activities.

Design, Plans, and Specifications

- A more detailed pre-design survey of utilities and other features in the project area would have avoided schedule delays and the need for additional coordination with USEPA and NMFS when pre-existing site conditions were encountered during construction.
- More specific material specifications would aid the contractor in providing the correct material (i.e., habitat mix material).
- When it was identified that not all stations could be monitored in a 1-hour period, the Port and USEPA came up with a solution quickly that did not compromise the intent of the requirement. USEPA believes that better planning of implementation issues related to water quality sampling would have avoided the surprise that the requirements of the WQMCCP (USEPA 2008 and Appendix R) could not be implemented due to time constraints. The Port believes that having a WQMCCP that is flexible and able to be adjusted to accommodate actual field conditions while still efficiently and effectively meeting the intent of the requirement is equally important.
- Involving the primary and secondary analytical laboratories prior to the beginning of the construction activities and explaining the importance of meeting the specified turnaround times facilitated coordination efforts after samples were submitted and led to consistently reliable turnaround time results.
- Requiring the contractor to submit borrow source analytical results well in advance of planned capping activities would have avoided material approval delays due to issues with the outstanding analytical results.
- It was beneficial to allow flexibility in the plans and specifications to provide room for contractor input on construction means and methods. The contractor's use of a Spider-hoe to perform precision excavation and material placement work along the steep bank where the head of Slip 3 upland cap was constructed is an example of this flexibility.
- It is important to complete all permits, substantive requirements, and ESA consultations well in advance of the construction start date to avoid last-minute delays and expenses,

to have adequate time to resolve any inconsistencies between Biological Opinion requirements and other substantive requirements, and to ensure that all requirements are incorporated into contractor specifications. Last-minute issues did arise related to the Biological Opinion that could have resulted in construction delay and significant unplanned expense. Since Phase II will have a considerably more aggressive schedule due to the work planned during a limited in-water work period, the Port feels some additional resolution will be necessary to mitigate this significant risk for future work.

- It was beneficial to consider "what ifs" to the extent practicable. The improvements to The Dalles transloading facility were an example of this, where despite the usually dry summer months during which this construction took place, USEPA made the recommendation that a contingency plan for rain events be practically applied at the facility. This was good because there were days with considerable rain during transloading.
- The background monitoring station should be placed in an area representative of the compliance locations. Midway through the project, the Port determined that the background station was too close to shore and in too shallow of water compared to the location and depth of the turbidity points of compliance. This determination was based on turbidity readings at the turbidity points of compliance that were not attributed to ongoing dredging operations. The Port recommended re-establishing the background station at a more representative location and USEPA agreed. Flexibility within future water quality monitoring plans with respect to re-establishing the background station and/or establishing multiple background stations representative of each construction activity subarea is recommended.
- Water quality monitoring points of compliance and early warning locations should be realistic to account for site configuration, operations, and material characteristics. Based on analysis of the dredging operation, site physical constraints, and water quality model predictions (Anchor 2008c), the compliance boundary for turbidity was set at 100 meters from the mouth of Slip 3. This point of compliance for turbidity was realistic and protective of the environment, as supported by a review of water quality field and laboratory analytical results for turbidity, TSS, and constituents of concern, as described in the next section.

Water Quality

- A scatterplot of turbidity and TSS results indicates that a relatively weak relationship exists between these two parameters, as shown in Figure 11. Monitoring data with less than 15 mg/L TSS exhibits consistently low turbidity; however, monitoring data with greater than 15 mg/L TSS is associated with a wide range of turbidity values, resulting in a poorer correlation.
- A scatterplot of laboratory analytical results compared to turbidity indicates that little or no relationship exists between these parameters at the detected concentrations, as shown in Figure 12a. The majority of the analytical results were below detection limits, so this analysis was necessarily limited to comparisons with detected zinc and total PAH concentrations. The lack of a correlation indicates that dredging-induced turbidity and suspended solids were well controlled and did not cause appreciable increases in either zinc or total PAH concentrations in the water column.
- A scatterplot of dissolved zinc compared to TSS results indicates that little or no relationship exists between these parameters at the detected concentrations, as shown in Figure 12b. Given a TSS of 20 mg/L and a sediment total zinc concentration of 250 mg/kg, the expected water quality concentration would be 5.0 mg/L, which is below the values shown on the figure. Hence, any dredging impacts are obscured by the average background concentration, which is greater than the expected concentration.
- A scatterplot of total PAHs compared to TSS results indicates that a weak relationship exists between these parameters at the detected concentrations, as shown in Figure 12c. A best fit line was added in order to compare reported results to the expected concentration. Given a TSS of 20 mg/L and a sediment total PAH concentration of 50,000 μg/kg, the expected water quality concentration would be 1.0 μg/L. Comparison of the best fit line to the expected concentration line indicates that reported total PAH concentrations were less than expected, which supports the conclusion that dredging-induced suspended solids were well controlled.
- No exceedances of acute water quality criteria and/or ambient background concentrations were observed at the compliance monitoring stations regardless of which dredging bucket was used (i.e., clamshell or digging). Summary statistics of water quality monitoring data (minimum, median, and maximum concentrations, and percent detections) at background and compliance stations are presented in Table 18.

- Water quality analytical results were compared to the model predicted concentrations presented in the DAR (Anchor 2008a). Compliance monitoring data for zinc were comparable to ambient background concentrations, and both the background and compliance data were well above model predictions, so the model predictions for zinc could not be reliably evaluated. Compliance monitoring data for PAHs are compared to model predicted concentrations in Table 19 for those infrequent cases when PAHs were detected. This table shows that detected PAH concentrations were usually within a factor of two of model predictions (i.e., less than 100 percent difference) in a majority of cases. However, the large majority of PAH data were undetected (i.e., PAHs were only detected 10 to 20 percent of the time) at detection limits similar to model-predicted concentrations. This comparison is consistent with the model results presented in the DAR.
- Batch water discharge results were compared to acute water quality standards and guidelines in Table 20 to assess the viability of discharging elutriate water directly to the river in future dredging events. PAH concentrations were well below their acute guidelines. All other organic parameters, including pesticides, PCBs, volatile and semivolatile organics, were undetected in the batch water. One lead value and four out of eight zinc values were above their acute criteria. Copper was above its acute criteria but below ambient background levels. All other metals were below their acute criteria. It should be noted, however, that metals analyses were performed on a total basis rather than a dissolved basis (per BES guidelines), whereas most of the acute criteria for metals are expressed in a dissolved basis. Additional settling time might further reduce metals concentrations in the elutriate water. Direct discharge of elutriate water may deserve further evaluation as an alternative to the sanitary sewer in future actions.

Dredging and Capping

Dredging Precision. The precision of the dredging operations was evaluated by calculating the total dredge volume, the volume between the neatline and allowable overdredge depth, and the volume between the allowable overdredge depth and below. Approximately 26 percent of the overall dredged volume was dredged from between the neatline and allowable paid overdredge depth. Approximately 8 percent of the total dredged volume was dredged from below the allowable paid overdredge depth. The contractor's target depth was the allowable paid overdredge depth. Hence, the contractor was able to meet the overdredge allowance at a frequency of 92 percent.

Turbidity Control. Effective methods for reducing turbidity levels resulted from a combination of the following operational BMPs that were implemented as a result of elevated turbidity levels during the project:

- The amount of material in each bucket load was reduced.
- The operator closed the bucket as slowly as possible on the bottom.
- The operator paused before hoisting the bucket off of the bottom to allow any overage to settle near the bottom.
- The operator hoisted the bucket through the water column more slowly.
- The operator made sure all the material had been placed into the barge from the bucket before returning the bucket to the water to take another bite of material.

Overwater bucket dewatering was used throughout the project. This activity caused no adverse impact to the receiving water because no exceedances of water quality standards or guidelines were observed (see Table 18).

Sediment Quality Verification. Per the DAR (Anchor 2008a), Section 2.3, Item 1, first bullet, the performance standard used to guide the design of the Phase I Removal Action construction and verification/monitoring activities with respect to sediment was to:

> "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."

Post-construction analytical chemistry results from two of the 10 sample locations (06 and 09) in the Berth 411 "Plus" dredging area were above an exceedance ratio of 10 times PEC for several PAHs. In particular, elevated levels of benzo(a)anthracene in locations 06 and 09 caused the average concentration for the Berth 411 "Plus" dredge area to slightly exceed the 10 times PEC goal, by approximately 4 percent. Additionally, the analytical chemistry result for one of the 10 sample locations (09) in the Berth 411 "Plus" dredging area was above an exceedance ratio of 10 times PEC for lead.

Given the exceedances noted above, the Phase I design process was assessed to determine whether these residual concentrations could have been improved if different design processes or decisions had been followed. In retrospect, the design process was appropriate for meeting the objectives of the abatement action. This conclusion is based on the following:

- There is always some degree of uncertainty in our understanding of contaminant distributions based on inherent physical/chemical variability in the environment. Dredge prism design must manage this uncertainty in a cost-effective manner.
- Additional overdredging beyond the specified 1-foot overdredge allowance could have been specified; however, this would have resulted in more unnecessary dredging of lower concentration materials that would not otherwise require action during Phase I.
- It was recognized during the design process that this was an interim action, and that there was going to be a follow-up phase of remediation (Phase II) to address remaining contamination at T4.
- Post-dredge bathymetric survey data show target dredge elevations were effectively achieved by the contractor.
- Dredging is an imperfect technology, and some amount of residual contamination is expected and nearly always observed (Bridges et al. 2008).
- Nevertheless, sediment verification goals were met 80 percent of the time on an individual sample basis, and nearly 100 percent of the time on an average concentration basis.

13 PHASE I REMOVAL ACTION CONTACT INFORMATION

The Port of Portland Representatives

Nicole LaFranchise, Project Manager
121 NW Everett Street
Portland, OR 97218
(503) 944-7323

Krista Koehl, Assistant General Counsel
Port of Portland
121 NW Everett Street
Portland, OR 97209
(503) 944-7062

USEPA Project Manager

Sean Sheldrake
USEPA, Region 10
1200 6th Avenue, Suite 900
Seattle, WA 98101-3140
(206) 553-1220

Terminal 4 Project Manager

Tom Schadt
Anchor QEA, LLC
1423 3rd Avenue, Suite 300
Seattle, WA 98101
(206) 287-9130

Terminal 4 Engineer and Construction Manager

John Verduin, Overall Terminal 4 Engineer, CQAO
Anchor QEA, LLC
1423 3rd Avenue, Suite 300
Seattle, WA 98101
(206) 287-9130

Transloading Facility Engineer and Construction Manager

Rick Schwarz, Transloading Facility Engineer, CQAO
Anchor QEA, LLC
6650 SW Redwood Lane, Suite 110
Portland, OR 97224
(503) 670-1108

Dredging and Capping Contractor

Greg Speyer, Project Superintendent
Hickey Marine Enterprises, Inc.
6801 NW Old Lower River Road
Vancouver, WA 98660
(360) 695-4553

Darrell Jamieson, Site Superintendent
Hickey Marine Enterprises, Inc.
6801 NW Old Lower River Road
Vancouver, WA 98660
(360) 695-4553

Wheeler Bay Shoreline Stabilization Contractor/Subcontractor

Herb Clough, Project Manager
Ash Creek Associates, Inc.
9615 SW Allen Boulevard, Suite 106
Beaverton, OR 97005-4814
(503) 924-4704

Skip Simpson, Project Superintendent
Envirocon, Inc.
3330 NW Yeon Ave, Suite 240
Portland, OR 97210
(503) 285-6164

Analytical Laboratories

Darwin Thomas, Laboratory Project Manager
Apex Laboratories, LLC
12232 SW Garden Place
Tigard, OR 97223
(503) 718-2323

Lynda Huckestein, Laboratory Project Manager
Columbia Analytical Services
1317 S. 13th Avenue
Kelso, WA 98626
(360) 577-7222

Sue Dunnihoo, Laboratory Project Manager
Analytical Resources, Inc. (ARI)
4611 S. 134th Place
Tukwila, WA 98168-3240
(206) 695-6200

14 REFERENCES

Anchor. 2006. Design Analysis Report (Prefinal 60 Percent Design Deliverables): Terminal 4 Early Action, Port of Portland, Portland, Oregon. Prepared for the Port of Portland by Anchor Environment, L.L.C. December 2006.

Anchor. 2007a. Abatement Measures Proposal: Terminal 4 Removal Action Project. Prepared for the Port of Portland, by Anchor Environmental, L.L.C. October 25, 2007.

Anchor. 2007b. Sampling and Analysis Plan for Additional Sediment Quality: Characterization for Phase I of the Removal Action, Port of Portland, Terminal 4, Removal Action and Maintenance Dredging T4 Slip 3. Prepared for the Port of Portland by Anchor Environmental, L.L.C. November 30, 2007.

Anchor. 2007c. Biological Assessment: Phase I of the Terminal 4 Removal Action. Prepared for the Port of Portland, by Anchor Environmental, L.L.C.. December 2007.

Anchor. 2008a. Final Design Analysis Report: Terminal 4 Phase I Removal Action. Prepared for the Port of Portland by Anchor Environmental, L.L.C. June 2008.

Anchor. 2008b. Final Removal Action Work Plan: Terminal 4 Phase I Removal Action. Prepared for the Port of Portland by Anchor Environmental, L.L.C. August 2008.

Anchor. 2008c. Memorandum re: Supplemental Analysis and Rationale for the Proposed Turbidity Point of Compliance (100 Meters from the Mouth of Slip 3), Port of Portland—Terminal 4 Phase I Removal Action. March 21, 2008.

Ash Creek/NewFields. 2007. Source Control Alternative Evaluation, Terminal 4 Slip 1 Upland Facility, Operable Unit 2. Port of Portland, Oregon. February 2007.

BBL. 2004. Characterization Report, Terminal 4 Early Action, Port of Portland, Oregon. Blasland, Bouck & Lee, Inc. September 17.

BBL. 2005. Terminal 4 Early Action Engineering Evaluation/Cost Analysis, Port of Portland, Portland Oregon. Public Review Draft. Blasland, Bouck & Lee, Inc.

BBL et. al. 2005. Construction Completion Report – Bank Excavation and Backfill Remedial Action, Terminal 4 Slip 3 Upland Facility. Blasland, Bouck & Lee, Inc., Ash CreekAssociates, Inc., and Newfields. March 1, 2005.

Bridges, T.S., S. Ells, D. Hayes, D. Mount, S.C. Nadeau, M.R. Palermo, C. Patmont, and P. Schroeder. 2008. The Four Rs of Environmental Dredging: Resuspension, Release, Residual, and Risk. ERDC/EL TR-08-4. Final Report. U.S. Army Corps of Engineers, Engineer Research and Development Center, Washington, D.C.

DEQ. 2002. Default Background Concentrations for Metals, Memorandum dated October 28, 2002. Oregon Department of Environmental Quality.

Ecology and the Environment. 2003. Technical Plans and Specification—Sediment Cap McCormick & Baxter Creosoting Company, Portland, Oregon.

GeoSyntec. 2005. Erosion and Sediment Control Manual. Prepared for Oregon State Department of Environmental Quality by GeoSyntec Consultants. April 2005.

Hart Crowser. 2000. Remedial Investigation Report, Terminal 4, Slip 3 Sediment (Volume I with tables, figures, and Appendices A through E, Port of Portland, Portland, Oregon (available in hard copy and electronically). April 18, 2000.

NMFS. 2008. Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the U.S. Environmental Protection Agency and Port of Portland Terminal 4 Superfund Phase I of the Removal Action, Willamette River (HUC 17090012), Multnomah County, Oregon. National Marine Fisheries Service, No. 2007/08174. July 22, 2008.

Munn. 2008. Email from Nancy Munn, National Marine Fisheries Service, to Elizabeth Appy, Anchor Environmental, regarding dead fish found in Slip 3. September 17, 2008.

USACE. 1999. Willamette River Sediment Data—1997 CRCD Project. U.S. Army Corps of Engineers.

USEPA. 1999. USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review. U.S. Environmental Protection Agency, Office of Emergency Response. EPA 540/R-99/008. October.

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. U.S. Environmental Protection Agency, Office of Research and Development, USEPA-600-R-02-013.

USEPA. 2004. USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation (OSRTI). EPA 540-R-04-004. October.

USEPA. 2006. Action Memorandum for Removal Action at the Port of Portland Terminal 4 site within the Portland Harbor Superfund Site, Portland, Multnomah County, Oregon. U.S. Environmental Protection Agency. May 11, 2006.

USEPA. 2008. Water Quality Monitoring and Compliance Conditions Plan for Port of Portland Terminal 4 Non-Time Critical Removal Action Abatement Measures, Phase I. Prepared by Parametrix for the U.S. Environmental Protection Agency. July 2, 2008.

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

Weston. 1998. Portland Harbor Sediment Investigation Report, Multnomah County, Oregon. Roy F. Weston Inc.

TABLES

Table 1
Summary of Major Events and Milestones – Phase I Removal Action

Event or Milestone	Date
Administrative Order on Consent Signed	October 2, 2003
Design Characterization Sampling	
Pre-Design Submittal	
Engineering Evaluation/Cost Assessment Submittal	February 23, 2004
Final Removal Action Design Submitted to EPA	June 30, 2008
Installation of Fish Diversion Net Complete	August 12, 2008
Dredge and Cap Mobilization and Site Preparation	August 12, 2008
Wheeler Bay Mobilization and Site Preparation	August 5 - August 13, 2008
Air Monitoring Station Installed	August 6, 2008
Dredge and Cap In-water Construction Begins	August 12, 2008
Wheeler Bay Shoreline Stabilization Begins	August 13, 2008
EPA Acceptance of Modified Wheeler Bay Fireboat Pier Removal Plan	August 13, 2008
Berth 414 Square Area Dredging	August 12, 2008 and September 10, 2008
Additional Dredging BMPs Instituted	August 13, 2008
Slip 3 Center Square Area Dredging	August 13 - August 14, 2008
Berth 411 "Plus" Area Dredging	August 18 - August 25, 2008
Berth 410 Area Dredging	August 26 - September 8, 2008
Transfer and Disposal of Dredge and Cap Material	August 18 - October 10, 2008
Head of Slip 3 Cap Placement	September 12 - October 1, 2008
Wheeler Bay Shoreline Stabilization	August 13 - October 14, 2008
EPA Acceptance of Final Dredge/Cap Elevations	
Dredging and Capping Demobilization	October 1, 2008
Wheeler Bay Demobilization	October 13 - October 20, 2008
Equipment Decontamination Activity Complete	October 22, 2008
Removal Action Complete	October 22, 2008
Year 0 sampling for Interim Monitoring	

Table 2
Dredging Design Sample Station Geographic Coordinates

Sampling Station	X-Coordinate	Y-Coordinate
Phase I Area		
T4-B414-01	7,619,646	712,872
T4-PI-01	7,620,427	713,374
T4-PI-02	7,620,431	713,286
T4-PI-03	7,620,288	713,361
T4-PI-03-2	7,620,379	713,391
T4-PI-04	7,620,315	713,395
T4-PI-04-2	7,620,385	713,332
T4-PI-07	7,620,195	713,407
T4-PI-08	7,620,002	713,186
T4-PI-09	7,619,690	712,894
T4-B411-02	7,620,179	713,442
T4-B411-03	7,620,278	713,432
T4-B411-04	7,620,364	713,415
T4-S3-04	7,620,195	713,383
T4-VC24	7,620,329	713,376
SD032	7,620,406	713,381
HC-S-01	7,620,434	713,396
HC-S-02	7,620,436	713,324
HC-S-03	7,620,451	713,237
HC-S-08	7,620,378	713,302
HC-S-09	7,620,394	713,392
HC-S-19	7,620,233	713,429
Berth 410 Maintenance Dredging Area		
T4-01-01	7,619,348	713,577
T4-01-02	7,619,602	713,532
T4-01-03	7,619,825	713,492
T4-B411-01	7,620,075	713,462
T4-MD-01	7,619,744	713,501
T4-MD-02	7,619,498	713,519
HC-S-30	7,619,828	713,461
HC-S-35	7,619,621	713,487
HC-S-37	7,619,426	713,527

Notes:

Coordinates in Oregon State Plane-North (International Feet)

Table 3
Water Quality Triggers for Additional Environmental Controls

Parameter	Unit	Location	Trigger[a]	Action Triggered
Conventional Parameters				
Turbidity	Nephelometric Turbidity Units (NTU)	- Berth 414 activity: 100m from construction. - All other activity: 100m from mouth of Slip 3.	>5 NTU over background (where background <50 NT)[c] >10% over background (where background >50 NTU)[c] >50 NTU over background[c]	(1) Inspect construction and select an additional control(s) that focus on cause of exceedance. (2) If >50 NTU over background, also cease work and select additional controls
Total Suspended Solids	mg/L	All stations	No trigger.	No trigger.
Dissolved Oxygen	mg/L	100m from construction activity	<6.5 modify operations <6.0 cease operations	Inspect construction and select an additional control(s) that focus on cause of exceedance.
pH	Standard units	100m from construction activity	<6.5 or >8.5	Inspect construction and select an additional control(s) that focus on cause of exceedance.
Temperature	Degrees Centigrade	All Stations	No trigger.	No trigger.
Water Velocity	fps	100m from construction activity	1.0 fps	Stop operations and secure silt curtains and other containment barriers.
Visual Parameters				
Distressed or Dead Fish	Visual Observation	At or in vicinity of Site.	Any distressed, dying, or dead fish.	Stop all operations, collect fish, determine species, notify Services if listed species present, apply controls required by Biological Opinion and/or additional controls for non-listed species.
Turbidity plume	Visual Observation, NTU	At or in vicinity of Site.	(1) Plume attributed to construction activity. (2) Sufficient extent (Plume extends width of compliance zone) (3) Sufficient duration (1 hour or more) (4) Exceedance of turbidity trigger	(1) Inspect construction and select an additional control(s) that focus on cause of exceedance. (2) If >50 NTU over background, also cease work and select additional controls
Metals				
Cadmium	µg/L	100m from construction activity	Chronic: 0.09 Acute: 0.5	For chronic, confirm standard controls and increase monitoring to once per day (see text for exceedances of more than four consecutive days). For acute, inspect construction and select an additional control(s) that focus on cause of exceedance.
Lead	µg/L	100m from construction activity	Chronic: 0.54 Acute: 14	
Zinc	µg/L	100m from construction activity	Chronic: 36 Acute: 36	
Polycyclic Aromatic Hydrocarbons (PAHs)				
Acenaphthene	µg/L	100m from construction activity	Chronic: 56 Acute: 233	For chronic, confirm standard controls and increase monitoring to once per day (see text for exceedances of more than four consecutive days). For acute, inspect construction and select an additional control(s) that focus on cause of exceedance.
Acenaphthylene	µg/L	100m from construction activity	Chronic: 307 Acute: 1277	
Anthracene	µg/L	100m from construction activity	Chronic: 21 Acute: 87	
Benzo(a)anthracene	µg/L	100m from construction activity	Chronic: 2.2 Acute: 9.2	
Benzo(a)pyrene	µg/L	100m from construction activity	Chronic: 0.96 Acute: 4.0	
Benzo(b)fluoranthene	µg/L	100m from construction activity	Chronic: 0.68 Acute: 2.8	
Benzo(g,h,i)perylene	µg/L	100m from construction activity	Chronic: 0.44 Acute: 1.8	
Benzo(k)fluoranthene	µg/L	100m from construction activity	Chronic: 0.64 Acute: 2.7	
Chrysene	µg/L	100m from construction activity	Chronic: 2.0 Acute: 8.3	For chronic, confirm standard controls and increase monitoring to once per day (see text for exceedances of more than four consecutive days). For acute, inspect construction and select an additional control(s) that focus on cause of exceedance.
Dibenzo(a,h)anthracene	µg/L	100m from construction activity	Chronic: 0.28 Acute: 1.2	
Fluoranthene	µg/L	100m from construction activity	Chronic: 7.1 Acute: 30	
Fluorene	µg/L	100m from construction activity	Chronic: 39 Acute: 162	
Ideno(1,2,3-cd)pyrene	µg/L	100m from construction activity	Chronic: 0.28 Acute: 1.2	
Naphthalene	µg/L	100m from construction activity	Chronic: 194 Acute: 807	
Pheneanthrene	µg/L	100m from construction activity	Chronic: 19 Acute: 79	
Pyrene	µg/L	100m from construction activity	Chronic: 10 Acute: 42	

Notes:

a If field parameter monitoring results exceed trigger, then the same field parameter will be measured within 30 minutes of the determination of the exceedance. If the exceedance continues, the additional controls discussed in Section 3 will be implemented.

b Sampling will occur at the specified distance from the edge of the primary (silt curtain) containment barrier. Although flow reversals due to tidal fluctuations are rare, if such reversals are observed, sampling will be conducted up current (background) and down current for field parameters, as appropriate.

c Trigger is exceeded where downstream conditions exceed the specified amounts relative to both the event-specific daily background and the daily updated preconstruction background survey 90th percentile value.

Table 4
Dredging and Capping CCs and RFIs – Phase I Removal Action

Contract Changes				
CO	**CC**	**Issue Encountered**	**Action Required**	**Directive Language**
	1	Accelerated Construction Schedule – In order to accommodate our Tenants, schedule monitoring surveys, and provide overall operational flexibility the schedule needs to be modified from what was originally proposed.	The schedule noted 6.24.08 shows double shifts working between 8.18.08 and 8.26.08.	Enclosed is the revised Hickey Marine Enterprises, Inc.'s (HME) schedule, dated June 24, 2008, which was included in the "Draft" Removal Action Work Plan and accepted by the Port. The schedule reflects shutdowns and double-shift work at Terminal 4, which were not originally anticipated in the original contract documents. HME's cost proposal shall address all cost changes associated with this revised schedule.
	2	Turbidity Curtain – NMFS required additional BMP's in order to dredge at T4	Provide Turbidity Curtain as directed. – Force Account -	
1	3	Costs Associated with Testing for the Sanitary Sewer Discharge – At the time of the bid it was unknown how much water was to be discharged into the City Sanitary Sewer.	Provide the labor and permit information including testing in order to discharge to the Sanitary Sewer at T4	Provide the additional permit testing and information required to discharge the contained dredging water into the sanitary sewer at Terminal 4.
2	4	Piling Removal at the Head of Slip 3 – Several (10) piling are in the general area of the slip 3 capping effort currently under way. In order to perform the capping, the pilings need to be removed.	Pull the piling as a complete unit if possible. If not, cut the piling off at the mud line. Dispose of the muddy side of the pile in an appropriate landfill. Provide tickets showing the tipping fees and that the material was properly disposed.	At the head of Slip 3 at Terminal 4, pull the existing piling (estimated at 10) in the general area of the capping work in order to perform the capping. Dispose of the muddy side of the pile in an appropriate landfill. Provide tickets showing the tipping fees, and that the material was properly disposed.
	5	Head of Slip 3 Organoclay Cap –		

Requests for Information					
RFI	**Subject**	**Contractor Question**	**Anchor**	**Port Engineer**	**Port Construction**
1	Request for a Control Point at Terminal 4	Hickey Marine requests the installation and location of a fixed survey control point in the vicinity of Terminal 4 by the Port of Portland. Please identify elevation and Datum.	For information only. Port will establish control point for HME.	See the attached drawing. A 3" Brass Disk, Elevation 31.92 CRD is available at the head of slip 3 in the location shown. The Disk is stamped "T-4-2".	Concur with Port Engineering
2	Dredging grade plan converted from NGVD to CRD	RE: 25 June meeting with the Port. As a follow up to discussions @ the above referenced meeting, please provide a copy of the converted dredge grades from NGVD29 to CRD displayed at the meeting.	For information only. Port will provide HME with dredging grade plan conversion.	The plans for the project are in NGVD29 (Vert) and POP local projection (horizontal coordinates). Since on-going surveying will be done utilizing Columbia River Datum (elevations), by both HMI to control dredging (QC) and DEA to monitor and document bathymetry (QA) we are providing you (attached to this RFI) with a hard copy of the plans converted to CRD from NGVD29 for your use. Since when collecting the data, both DEA and HMI will both collect data in State Plane Coordinates (SPC), we will provide for you later this week, a AutoCAD drawing showing the plan view of slip 3 translated into SPC for use as a background when collecting and displaying spatial data related to dredging.	Concur with Port Engineering
3	RTK	Contract specs for the T-4 Removal Action Section 352023-3 N states the following: The contactor is required to use Real Time Kinematic (RTK) for survey control work. Will Hickey Marine be required to use RTK for the daily progress surveys?. Our subcontactors performing the daily progress surveys have stated that using a single beam echosounder for conducting surveys, DGPS is a more common method for survey control. Will the usage of DGPS be sufficient for our daily progress surveys?.	DGPS is sufficient for daily progress surveys.	I concur.	Refer to above responses.

Table 4
Dredging and Capping CCs and RFIs – Phase I Removal Action

Requests for Information					
RFI	**Subject**	**Contractor Question**	**Anchor**	**Port Engineer**	**Port Construction**
4	Double SHFT/Kimber Morgan dock opening schedule	In the 25 June Port of Portland planning meeting, the Port declared a letter to request time and cost impacts associated with the above referenced project and revised approach to accommodate Kinder-Morgan ship loading windows (3 EA) would be forth coming. Hickey Marine has yet to receive the above referenced request for cost impact and time change letter from the Port. To perform the project as depicted on the above referenced schedule incorporated in the RAWP and submitted 25 June costs include but are not limited to: *Provide, mobilize and prepare the fourth material transport barge "Shasta". *Accelerate to double shift operation with supplemental oversight and personnel. *Demobilize and remobilize for the three Kinder Morgan ship loadout periods. Please provide this letter to facilitate finalization of costs associated with this subject to reach resolution. As stated in the 25 June meeting, HME will require a month to prepare the Shasta for usage on the project.	For information only. Port will prepare the requested letter.	Please contact John Durst with respect to the timing of the letter dealing with the accelerated schedule costs.	The Port has issued CC-1 (cost change request) to HME today (7/3/08) to address the schedule change cost impacts.
5	Addendum 1 for CHASP	Hickey Marine requests to change from TYVEK to a reusable cloth coverall as sufficient PPE. Attached is Addendum #1.	N/A	Overalls are acceptable as long as they are laundered regularly. A minimum of once a week would be sufficient. FYI, EPA staff have been consulted and concur with this answer.	Concur with Port Engineering
6	Atlas 10 yard clamshell	HME encountered a hard bottom 12 - 18 inches above neatline grade along the fender pile line and at the center cell at the head of slip 3 (cell #4) during dredging operations with the 20 yd Cable Arm. To achieve neatline grade we request the usage of our 10 yard HD roundnose clamshell as stated in the RAWP 2.6.1 Dredging Location Control and Appendix E Hickey Marine's Dredging Transportation and Disposal Plan pages 4-5.	As noted in the RAWP, the use of a digging bucket was anticipated for this project in some select locations if the cable arm bucket was not heavy enough. We will need to inform EPA and they may require that the water quality monitoring intensity increase.	The use of the Atlas 10 Clamshell is approved. When using the Atlas 10 Clamshell, please employ the following BMPs: -Move the bucket quicker to the barge once the bucket has surfaced. - Raise the bucket more slowly from through the water column. -Tier 1 monitoring would be needed.	Concur with Port Engineering and Consultant
7	Berth 410 Dredging	It is requested that HME is allowed to start dredging in Berth 410 upon completion of Berth 411 before the first scheduled shut down. Dredging would begin inshore and working out towards the mouth of the slip. We are anticipating that we will complete Berth 411 at end of shift Monday 8/25, if possible we would then set up to dredge Berth 410 until the DEA post dredge survey of Berth 411 in the afternoon on Tuesday 8/26. Dredging of Berth 410 could resume on Wednesday 8/26 while waiting for the post survey results of Berth 411.	Anchor recommends that this approach be accepted to give us more float at the end of the project. This will need to be approved by EPA before we can move forward with it.	This acceptable to the Port.	Concur with Port Engineering.
8	Head of slip 3 pile Removal	Hickey Marine Enterprises requests approval to remove the existing pile at the head of slip 3 capping area. The subject pile are deteriorated and are situated in the cap area, which could result in difficult placement of material. If not removed pile may be negatively impacted by capping activity.	Waiting on EPA approval. Nicole forwarded Anchor's attachment on a proposed approached for removal.	Please continue with the Pile removal as discussed. Several comments were made by EPA, I will reiterate them here: -Please remove the complete pile if possible -Utilize Tier 1 water quality monitoring during and for one hour after pile removal occurs -Ensure seep/sheen response measures are in pace and ready to employ -Coordinate removal with Andrew Somes to observe the removal Lastly, please provide ticket information associated with landfill disposal of piling and tipping fees.	Concur with Port Engineering and Consultant

Table 4
Dredging and Capping CCs and RFIs – Phase I Removal Action

Requests for Information					
RFI	**Subject**	**Contractor Question**	**Anchor**	**Port Engineer**	**Port Construction**
9	Berth 410 Dredging	Hickey Marine requests approval to continue dredging in berth 410 while ship is at berth during the time of August 29th thru September 3rd.	For information only to Anchor. Port needs to coordinate with Kinder Morgan as well as EPA for approval.	The Port approves this request and has concurrence from EPA.	Concur with Port Engineering and Consultant
10	Import Material Mix Design	For your information the attached document contains the Organoclay mix design criteria for type 2 and type 3 import materials for the T-4 project as provided via email by Ross Island Sand and Gravel. Please contact HME if you have any issues with this criteria.	It appears that they will be adding 9% organoclay by weight which is equivalent to 10 parts Type 2 material to 1 part organoclay by dry weight. See attached email for clarification. We need to review a grain size distribution plot of the Type 2 material to see if it meets the required gradation. This will need EPA review and approval as well.	I concur	Concur with Port Engineering and Consultant
11	Turbidity Curtain/Bucket Decanting	During cleanup dredging, if HME elects not to decant the digging bucket, resulting in bucket retrieval to the barge without stopping, can the turbidity curtain be eliminated.	This proposal is approved. EPA will also need to approve of this change.	EPA has responded. The proposal is approved.	Concur with Port Engineering and Consultant
12	Armor rock, Type 3 and Type 2 Sand above bulkhead	RE: Call out for Filter Fabric Plan Sheet C-6 not required As a follow up to the conference call with Nicole LaFranchise POP, John Verduin Anchor ENV and Greg Speyer & Mark Riem HME, the understanding is Armor rock (rip rap) placed above the sheet pile bulkhead at the head of Slip 3 will be placed on an 18" minimum thickness of Type 3 Cap material with the supplement of Type 2 Sand at the toe (bulkhead end) as needed. Filter Fabric is not a component of this section of armoring with the Type 3 Cap supplemented with Type 2 sand placed beneath.	After reviewing the drawings again, Anchor is recommending that a filter fabric be used as shown on the drawings. The specifications do not specify which material should be used. We recommend a polypropylene, needlepunched nonwoven geotextile such as Mirafi 160N or equivalent be used.	I concur.	Concur with Port Engineering and Consultant

Table 5
Terminal 4 Removal Action Capping Material Placement Log Summary

Date	Material Barge	Material Wt in Tons (1)		Material Volume in CY (2)		Total Work Hours		Placement Area
		Day	Total	Day	Total	Day	Total	
12-Sep-08	RI 14	648	648	480	480	10.0	10.0	Sand Layer
13-Sep-08	RI 14	270	918	200	680			Sand Layer
	RI 15	147	1,065	109	789	8.0	18.0	Type 3 Cap material
15-Sep-08	RI 15	380	1,445	281	1,070	11.5	29.5	Type 3 Cap material
16-Sep-08	RI 14	230	1,675	170	1,240			Sand Layer
	Chetco	179	1,854	112	1,352	11.0	40.5	Type 3 Armor Placement
17-Sep-08	Chetco	1,000	2,854	625	1,977	11.0	51.5	Type 3 Armor Placement
18-Sep-08	Chetco	716	3,570	448	2,425	11.5	63.0	Type 3 Armor Placement
24-Sep-08	RI 15 (3)	324	3,894	240	2,665			Type 3 Cap material
	RI 15	257	4,150	190	2,855	8.0	71.0	Type 2 Sand
25-Sep-08	RI 15	149	4,299	110	2,965			Type 2 Sand
	#47	115	4,414	72	3,037	9.5	80.5	Removed slope riprap replaced on Type 2 Sand
30-Sep-08	Reedsport	450	4,864	281	3,318	9.5	90.0	Type 3 Armor Placement
1-Oct-08	Reedsport	360	5,224	225	3,543	9.0	99.0	Type 3 Armor Placement

Notes:

(1) Estimated from barge displacement and bucket counts

(2) Estimated assuming 1.35 tons/cy and barge displacement tonnage

(3) Type 3 Cap material placed 9/23 and 9/24.

Sand layer in tons	1,148
Type 3 cap quantity in tons	851
Type 3 armor quantity in tons	2,705
Type 2 cap quantity in tons	405
Reused riprap in tons	115

Table 6
Terminal 4 Removal Action Dredging Log Summary

Date	Scow	Sediment Wt in Tons (1)		Dredge Volume in CY (2)		Lash Barge Water in Gal (3)		Total Work Hours		Actual Dredge Hours		Daily Dredging Production Rate in cy/hr		Bucket (4)	Area Dredged
		Day	Total	Day	Total	Day	Total	Day	Total	Day	Total	Dredge Hours	Total Hrs		
12-Aug-08	Chetco	391	391	277	277	0	0	10.0	10.0	2.3	2.3	123	28	C	Berth 411 414 Square
13-Aug-08	Chetco	1,144	1,535	811	1,088	10,724	10,724	12.5	22.5	6.8	9.0	120	65	C	Berth 411 Slip 3 Square
14-Aug-08	Chetco	360	1,895	255	1,343	5,360	16,084	9.0	31.5	2.5	11.5	102	28	C	Berth 411 Slip 3 Square
18-Aug-08	Umpqua	849	2,744	602	1,945	10,724	26,808	16.0	47.5	6.8	18.3	89	38	C	Berth 411 Sta 12-24
19-Aug-08	Umpqua	984	3,728	698	2,643		26,808							C	
	Reedsport	565	4,293	372	3,015	5,362	32,170	16.0	63.5	9.2	27.4	117	67	C	Berth 411 Sta 10-40 outside; Sta 12-18 inside
20-Aug-08	Reedsport	760	5,053	539	3,554	26,811	58,981	16.0	79.5	12.3	39.7	44	34	C	Berth 411 Cell 1, 2, 3, 4, 5
21-Aug-08	Reedsport	624	5,677	442	3,996									C	
	Chetco	442	6,119	395	4,391	18,500	77,481	16.0	95.5	10.3	49.9	82	52	C	Berth 411 Cells 2, 3, 5, 6, and 9--grade pass
22-Aug-08	Chetco	1,270	7,389	875	5,266	16,087	93,568	16.0	111.5	13.0	62.9	67	55	C	Berth 411 Cells 7, 8, 9, 10
23-Aug-08	Chetco	675	8,064	465	5,731	32,710	126,278	16.0	127.5	10.8	73.7	43	29	C	Berth 411 Cells 1, 6, 10, 11 and side slopes
24-Aug-08	Umpqua	411	8,475	283	6,014	15,638	141,916	12.0	139.5	5.3	78.9	54	24	D	Berth 411 Cells 4, 2, and 3
25-Aug-08	Umpqua	500	8,975	344	6,358	29,493	171,409	12.0	151.5	6.8	85.7	51	29	D	Berth 411 Cells 2-7; Berth 410 Sta 41-51
26-Aug-08	Umpqua	611	9,586	421	6,779	24,130	195,539	9.5	161.0	5.0	90.7	84	44	D	Berth 410 Sta 42-68
27-Aug-08	Umpqua	466	10,052	323	7,102										
	Reedsport	570	10,622	393	7,495	8,847	204,386	12.0	173.0	9.0	99.7	80	60	C	Berth 410 Sta 68-82
28-Aug-08	Reedsport	766	11,388	543	8,038	12,869	217,255	12.5	185.5	5.8	105.4	94	43	C	Berth 410 Sta 82-90; Berth 411 Sta 42-32 CU
29-Aug-08	Reedsport	652	12,040	462	8,500	5,362	222,617	8.0	193.5	3.0	108.4	154	58	C	Berth 410 Sta 100-105
2-Sep-08	Chetco	920	12,960	635	9,135	2,681	225,298	12.0	205.5	6.3	114.7	102	53	C	Berth 410 Sta 115-125
3-Sep-08	Chetco	1,427	14,387	1,019	10,154	16,087	241,385	11.0	216.5	8.0	122.7	127	93	C	Berth 410 Sta 125-135
4-Sep-08	Umpqua	1,074	15,461	761	10,915	5,362	246,747	12.0	228.5	8.0	130.7	95	63	C	Berth 410 Sta 90-100 & 88-95
5-Sep-08	Umpqua	1,095		776											
	Reedsport	424	16,980	300	11,991	13,405	260,152	12.0	240.5	8.5	139.2	127	90	C	Berth 410 Sta 95-108 & 105-110
6-Sep-08	Reedsport	1,045	18,025	741	12,732	2,681	262,833	12.0	252.5	8.3	147.4	90	62	C	Berth 410 Sta 108-125
8-Sep-08	Reedsport	49	18,074	35	12,767	0	262,833	8.0	260.5	1.5	148.9	NA	NA	C	Berth 410 Cleanup (7 buckets)
10-Sep-08	Reedsport	73	18,147	52	12,819	0	262,833	3.0	263.5	0.3	149.3	156	17	C	Berth 414 Square Cleanup

Notes:
(1) Estimated from barge displacement
(2) Estimated assuming 1.41 tons/cy and barge displacement tonnage
(3) Estimated by stick
(4) C=cable arm; D=digging bucket

Running gallons effluent per cubic yard dredged	20.5	10.2%
Overall Running production rate (cy/total work hours)	49	
Overall Running production rate (cy/actual dredge hours)	86	
Cable Arm production rate (cy/total work hours)	50	
Digging bucket production rate (cy/total work hours)	31	
Running efficiency (dredge hours/total work hours)	57%	
Percent of B411 "Plus" net line volume removed	135%	
Percent of B410 net line volume removed	176%	

Table 7
Summary of Truckloads of Material Transported from Transloading Facility to Landfill

Recorded at Transfer Station					Recorded at Landfill		Daily Total (tons)	Barge Total (tons)
Load	Date	Time Out	Truck No.	Barge	TICKET #	Tons		
1.	8/18	11:00	N/A	Chetco	12349	33.17		
2.	8/18	N/A	N/A	Chetco	12353	33.07		
3.	8/18	N/A	N/A	Chetco	12357	23.12		
4.	8/18	12:10	N/A	Chetco	12359	32.50		
5.	8/18	N/A	N/A	Chetco	12362	32.00		
6.	8/18	12:28	N/A	Chetco	12364	32.72		
7.	8/18	N/A	N/A	Chetco	12366	33.03		
8.	8/18	13:30	N/A	Chetco	12371	26.14		
9.	8/18	13:45	N/A	Chetco	12374	33.65		
10.	8/18	N/A	N/A	Chetco	12379	31.68		
11.	8/18	14:25	N/A	Chetco	12384	32.99		
12.	8/18	14:47	N/A	Chetco	12389	32.45		
13.	8/18	15:43	N/A	Chetco	12391	30.29		
14.	8/18	15:58	8508	Chetco	12392	34.00	**440.81**	
1.	8/19	6:43	51	Chetco	12400	31.53		
2.	8/19	6:58	41	Chetco	12402	34.07		
3.	8/19	7:08	20	Chetco	12403	32.39		
4.	8/19	7:21	10	Chetco	12407	34.22		
5.	8/19	7:35	19	Chetco	12408	36.22		
6.	8/19	7:48	46	Chetco	12409	33.55		
7.	8/19	8:27	51	Chetco	12413	32.32		
8.	8/19	8:53	41	Chetco	12420	33.26		
9.	8/19	9:05	20	Chetco	12421	32.70		
10.	8/19	9:40	10	Chetco	12425	37.34		
11.	8/19	9:57	19	Chetco	12430	32.56		
12.	8/19	10:15	51	Chetco	12432	34.10		
13.	8/19	10:44	41	Chetco	12436	32.61		
14.	8/19	10:58	46	Chetco	12439	32.58		
15.	8/19	11:12	20	Chetco	12441	32.80		
16.	8/19	11:29	10	Chetco	12444	27.86		
17.	8/19	11:45	19	Chetco	12448	33.18		
18.	8/19	12:49	41	Chetco	12461	34.89		
19.	8/19	13:03	20	Chetco	12463	32.24		
20.	8/19	13:28	10	Chetco	12465	29.46		
21.	8/19	13:41	51	Chetco	12466	32.83		
22.	8/19	13:56	19	Chetco	12469	32.60		
23.	8/19	14:11	46	Chetco	12470	33.20		
24.	8/19	14:31	41	Chetco	12475	31.42		
25.	8/19	14:55	20	Chetco	12479	32.27		
26.	8/19	15:13	10	Chetco	12483	33.33		
27.	8/19	15:28	51	Chetco	12485	35.32		
28.	8/19	15:42	19	Chetco	12488	33.15	**924.00**	
1.	8/20	6:28	51	Chetco	12494	33.23		
2.	8/20	6:45	46	Chetco	12497	32.13		
3.	8/20	6:58	41	Chetco	12498	32.87		
4.	8/20	7:15	20	Chetco	12504	32.31		
5.	8/20	7:31	10	Chetco	12506	22.86		
6.	8/20	8:05	51	Chetco	12509	33.03		
7.	8/20	8:48	41	Chetco	12517	32.48		
8.	8/20	9:00	20	Chetco	12522	32.97		
9.	8/20	9:17	10	Chetco	12541	32.70		
10.	8/20	9:37	46	Chetco	12540	32.31		
11.	8/20	10:22	41	Chetco	12545	32.64		

Table 7
Summary of Truckloads of Material Transported from Transloading Facility to Landfill

Recorded at Transfer Station					Recorded at Landfill		Daily Total (tons)	Barge Total (tons)
Load	Date	Time Out	Truck No.	Barge	TICKET #	Tons		
12.	8/20	10:30	51	Chetco	12550	27.52		
13.	8/20	10:49	20	Chetco	12555	34.05		
14.	8/20	11:06	10	Chetco	12554	32.58		
15.	8/20	11:42	46	Chetco	12559	32.85		
16.	8/20	11:58	51	Chetco	12560	33.70		
17.	8/20	12:08	41	Chetco	12562	32.83		
18.	8/20	12:16	20	Chetco	12565	32.97		
19.	8/20	12:25	19	Chetco	12572	33.66		
20.	8/20	12:43	10	Chetco	12578	33.46		
21.	8/20	13:26	51	Chetco	12579	32.62		
22.	8/20	13:59	41	Chetco	12591	32.21		
23.	8/20	14:08	20	Chetco/Umpqua	12587	33.05		**2,105.84**
24.	8/20	14:26	46	Umpqua	12588	27.90		
25.	8/20	14:42	19	Umpqua	12590	34.56		
26.	8/20	14:54	10	Umpqua	12595	35.35		
27.	8/20	15:03	51	Umpqua	12597	33.63		
28.	8/20	15:38	41	Umpqua	12599	32.81		
29.	8/20	15:47	20	Umpqua	12602	34.86		
30.	8/20	16:17	19	Umpqua	12604	32.26		
31.	8/20	16:35	51	Umpqua	12603	31.35		
32.	8/20	16:50	46	Umpqua	12606	24.78		
33.	8/20	17:10	41	Umpqua	12605	32.82	**1,061.35**	
1.	8/21	6:13	46	Umpqua	12607	33.15		
2.	8/21	6:25	51	Umpqua	12611	34.88		
3.	8/21	6:40	41	Umpqua	12614	34.15		
4.	8/21	6:46	19	Umpqua	12615	31.75		
5.	8/21	7:05	20	Umpqua	12620	34.03		
6.	8/21	7:17	10	Umpqua	12621	31.38		
7.	8/21	7:40	46	Umpqua	12623	33.04		
8.	8/21	7:50	51	Umpqua	12624	34.82		
9.	8/21	8:14	41	Umpqua	12627	33.16		
10.	8/21	8:24	19	Umpqua	12629	31.85		
11.	8/21	8:58	10	Umpqua	12635	26.87		
12.	8/21	9:28	46	Umpqua	12637	33.31		
13.	8/21	9:36	51	Umpqua	12639	33.46		
14.	8/21	9:51	22	Umpqua	12644	33.41		
15.	8/21	10:00	20	Umpqua	12643	35.34		
16.	8/21	10:09	41	Umpqua	12646	34.80		
17.	8/21	10:33	19	Umpqua	12648	33.50		
18.	8/21	10:44	10	Umpqua	12651	32.77		
19.	8/21	10:53	46	Umpqua	12654	32.91		
20.	8/21	11:07	51	Umpqua	12659	33.17		
21.	8/21	11:24	20	Umpqua	12664	34.30		
22.	8/21	11:37	22	Umpqua	12670	32.96		
23.	8/21	11:53	41	Umpqua	12671	32.40		
24.	8/21	11:59	19	Umpqua	12674	24.97		
25.	8/21	12:26	10	Umpqua	12676	33.99		
26.	8/21	12:40	51	Umpqua	12681	34.12		
27.	8/21	13:16	20	Umpqua	12683	32.66		
28.	8/21	13:40	46	Umpqua	12685	33.64		
29.	8/21	14:05	22	Umpqua	12688	32.93		
30.	8/21	14:25	41	Umpqua	12689	33.26		
31.	8/21	14:38	19	Umpqua	12692	33.40		

Table 7
Summary of Truckloads of Material Transported from Transloading Facility to Landfill

Recorded at Transfer Station					Recorded at Landfill		Daily Total (tons)	Barge Total (tons)
Load	Date	Time Out	Truck No.	Barge	TICKET #	Tons		
32.	8/21	14:53	51	Umpqua	12693	33.60		
33.	8/21	15:02	10	Umpqua	12695	32.05		
34.	8/21	15:25	20	Umpqua	12697	33.60		
35.	8/21	15:40	46	Umpqua	12703	34.71		
36.	8/21	16:03	22	Umpqua	12700	33.90	**1,188.24**	
1	8/22	6:15	46	Umpqua	12704	32.66		
2	8/22	6:31	51	Umpqua	12708	31.32		
3	8/22	6:42	41	Umpqua	12712	33.08		
4	8/22	7:05	22	Umpqua	12715	34.59		
5	8/22	7:12	20	Umpqua	12718	32.91		
6	8/22	7:22	10	Umpqua	12719	27.30		
7	8/22	8:10	51	Umpqua	12723	32.89		
8	8/22	8:18	46	Umpqua	12725	33.33		
9	8/22	8:47	41	Umpqua	12732	33.75		
10	8/22	9:02	20	Umpqua	12734	32.85		
11	8/22	9:26	26	Umpqua	12736	33.61		
12	8/22	9:35	10	Umpqua	12739	32.33		
13	8/22	9:49	51	Umpqua	12741	34.25		
14	8/22	9:56	46	Umpqua	12743	33.58		
15	8/22	10:24	41	Umpqua	12748	34.02		
16	8/22	10:35	20	Umpqua/Reedsport	12749	33.16		**2,034.19**
17	8/22	11:04	22	Reedsport	12755	35.41		
18	8/22	11:15	51	Reedsport	12757	33.95		
19	8/22	11:55	46	Reedsport	12765	32.97		
20	8/22	12:06	41	Reedsport	12770	32.52		
21	8/22	12:28	21	Reedsport	12773	33.06		
22	8/22	12:40	22	Reedsport	12780	35.54		
23	8/22	12:55	51	Reedsport	12785	35.10		
24	8/22	13:05	21	Reedsport	12786	32.47		
25	8/22	13:20	46	Reedsport	12789	32.44		
26	8/22	13:45	26	Reedsport	12793	32.67		
27	8/22	14:30	22	Reedsport	12804	37.11		
28	8/22	14:37	51	Reedsport	12805	33.31		
29	8/22	14:49	41	Reedsport	12808	33.08		
30	8/22	15:15	21	Reedsport	12822	32.80		
31	8/22	15:44	46	Reedsport	12829	32.16		
32	8/22	15:53	51	Reedsport	12830	33.77		
33	8/22	16:05	22	Reedsport	12831	36.32		
34.	8/22	16:22	41	Reedsport	12832	31.96	**1,132.27**	
1	8/23	6:10	46	Reedsport	12842	32.62		
2	8/23	6:21	51	Reedsport	12843	34.09		
3	8/23	6:43	41	Reedsport	12845	32.35		
4	8/23	6:57	22	Reedsport	12846	36.00		
5	8/23	7:34	46	Reedsport	12850	32.04		
6	8/23	7:46	51	Reedsport	12852	34.56		
7	8/23	8:13	41	Reedsport	12854	33.36		
8	8/23	9:05	51	Reedsport	12859	32.65		
9	8/23	9:30	46	Reedsport	12863	33.00		
10	8/23	9:57	41	Reedsport	12866	33.31		
11	8/23	10:19	51	Reedsport	12868	34.51		
12	8/23	10:30	22	Reedsport	12870	32.64		
13	8/23	10:47	46	Reedsport	12871	32.67		
14	8/23	11:27	41	Reedsport	12872	32.13		

Table 7
Summary of Truckloads of Material Transported from Transloading Facility to Landfill

Recorded at Transfer Station					Recorded at Landfill		Daily Total (tons)	Barge Total (tons)
Load	Date	Time Out	Truck No.	Barge	TICKET #	Tons		
15	8/23	11:48	51	Reedsport	12874	34.87		
16	8/23	12:04	22	Reedsport	12875	32.49		
17	8/23	12:12	46	Reedsport	12876	33.21		
18	8/23	12:57	41	Reedsport	12881	33.43	**599.93**	
1	8/25	6:30	41	Reedsport	12891	35.66		
2	8/25	6:39	22	Reedsport	12894	38.09		
3	8/25	6:55	9519	Reedsport	12895	33.23		
4	8/25	7:03	20	Reedsport	12896	33.82		
5	8/25	7:24	46	Reedsport	12907	32.44		
6	8/25	8:04	41	Reedsport	12910	32.95		
7	8/25	8:26	22	Reedsport	12916	32.57		
8	8/25	8:37	20	Reedsport	12923	32.67		
9	8/25	8:47	9519	Reedsport	12927	32.23		
10	8/25	9:01	51	Reedsport	12930	34.13		
11	8/25	9:19	46	Reedsport	12931	28.78		
12	8/25	9:41	41	Reedsport	12933	32.46		
13	8/25	10:00	22	Reedsport	12937	32.72		
14	8/25	10:10	20	Reedsport	12939	33.89		
15	8/25	10:20	9519	Reedsport	12940	32.33		
16	8/25	10:35	51	Reedsport	12945	32.57		
17	8/25	11:10	46	Reedsport	12954	33.42		
18	8/25	11:27	41	Reedsport	12957	33.66		
19	8/25	11:34	22	Reedsport	12959	34.40		
20	8/25	11:43	20	Reedsport	12962	32.85		
21	8/25	11:55	9519	Reedsport	12965	29.75		
22	8/25	12:31	46	Reedsport	12971	28.49		
23	8/25	12:45	41	Reedsport	12972	33.26		
24	8/25	13:11	22	Reedsport	12977	36.17		
25	8/25	13:17	20	Reedsport	12978	32.21		
26	8/25	13:30	9519	Reedsport	12981	32.59	**857.34**	**2,063.91**
1	8/26	6:50	41	Chetco	13004	32.92		
2	8/26	7:15	46	Chetco	13011	33.98		
3	8/26	7:30	22	Chetco	13057	31.23		
4	8/26	7:36	9519	Chetco	13015	32.95		
5	8/26	7:42	20	Chetco	13019	33.79		
6	8/26	8:32	41	Chetco	13026	33.02		
7	8/26	8:40	51	Chetco	13028	32.22		
8	8/26	8:53	46	Chetco	13030	31.97		
9	8/26	9:04	22	Chetco	13033	32.93		
10	8/26	9:14	20	Chetco	13034	32.67		
11	8/26	9:24	9519	Chetco	13036	30.83		
12	8/26	10:03	41	Chetco	13048	32.93		
13	8/26	10:15	51	Chetco	13045	33.15		
14	8/26	10:23	46	Chetco	13051	31.05		
15	8/26	10:40	22	Chetco	13054	31.28		
16	8/26	10:46	20	Chetco	13056	33.04		
17	8/26	10:55	9519	Chetco	13058	31.85		
18	8/26	11:36	51	Chetco	13069	32.86		
19	8/26	11:50	41	Chetco	13071	32.09		
20	8/26	12:00	46	Chetco	13074	35.23		
21	8/26	12:10	22	Chetco	13077	33.34		
22	8/26	12:24	20	Chetco	13079	34.12		
23	8/26	12:42	9519	Chetco	13086	32.90		

Table 7
Summary of Truckloads of Material Transported from Transloading Facility to Landfill

Recorded at Transfer Station					Recorded at Landfill		Daily Total (tons)	Barge Total (tons)
Load	Date	Time Out	Truck No.	Barge	TICKET #	Tons		
24	8/26	13:08	51	Chetco	13096	33.23		
25	8/26	13:25	41	Chetco	13098	31.59		
26	8/26	13:47	22	Chetco	13099	33.81		
27	8/26	13:54	20	Chetco	13101	33.62		
28	8/26	14:16	46	Chetco	13106	33.73		
29	8/26	14:33	9519	Chetco	13112	33.82		
30	8/26	14:43	51	Chetco	13109	30.13		
31	8/26	15:10	41	Chetco	13117	33.56		
32	8/26	15:18	22	Chetco	13119	33.20		
33	8/26	15:26	20	Chetco	13120	34.05		
34	8/26	15:37	46	Chetco	13122	30.55		
35	8/26	15:58	9519	Chetco	13123	31.79		
36	8/26	16:37	41	Chetco	13124	32.68		
37	8/26	16:45	22	Chetco	13125	32.17		
38	8/26	16:51	20	Chetco	13126	32.26	**1,242.54**	
1	8/27	6:26	51	Chetco	13129	34.93		
2	8/27	6:33	41	Chetco	13131	34.00		
3	8/27	6:41	46	Chetco	13132	35.41		
4	8/27	6:46	22	Chetco	13135	29.75		
5	8/27	6:53	20	Chetco	13137	32.19		
6	8/27	7:02	9519	Chetco	13138	31.30		
7	8/27	7:53	51	Chetco	13145	31.91		
8	8/27	8:00	41	Chetco	13146	34.81		
9	8/27	8:10	22	Chetco	13149	31.89		
10	8/27	8:18	20	Chetco	13151	33.37		
11	8/27	8:25	46	Chetco	13153	33.17		
12	8/27	8:32	9519	Chetco	13155	30.24		
13	8/27	9:02	51	Chetco	13158	33.35		
14	8/27	9:23	41	Chetco	13161	33.74		
15	8/27	9:37	13	Chetco	13165	33.32		
16	8/27	9:45	22	Chetco	13170	29.59		
17	8/27	9:49	20	Chetco	13171	32.85		
18	8/27	10:00	46	Chetco	13174	34.37		
19	8/27	10:13	9519	Chetco	13178	31.41		
20	8/27	10:28	51	Chetco	13180	34.07		
21	8/27	10:50	41	Chetco	13182	33.22		
22	8/27	10:57	13	Chetco	13185	34.59		
23	8/27	11:08	22	Chetco	13186	31.64		
24	8/27	11:16	20	Chetco	13187	33.13		
25	8/27	11:26	46	Chetco	13189	33.85		
26	8/27	11:42	9519	Chetco	13192	30.22		
27	8/27	11:55	51	Chetco	13194	32.47		
28	8/27	12:16	41	Chetco	13203	32.89		
29	8/27	12:25	13	Chetco	13206	34.37		
30	8/27	12:34	22	Chetco	13207	32.74		
31	8/27	12:40	20	Chetco	13208	33.91		
32	8/27	12:47	46	Chetco	13211	33.25		
33	8/27	13:27	9519	Chetco	13218	32.66		
34	8/27	13:35	51	Chetco	13219	33.00		
35	8/27	14:02	22	Chetco	13225	34.87		
36	8/27	14:10	20	Chetco	13227	33.22		
37	8/27	14:25	41	Chetco	13231	33.55		
38	8/27	14:43	46	Chetco	13234	33.09		

Table 7
Summary of Truckloads of Material Transported from Transloading Facility to Landfill

Recorded at Transfer Station					Recorded at Landfill		Daily Total (tons)	Barge Total (tons)
Load	Date	Time Out	Truck No.	Barge	TICKET #	Tons		
39	8/27	14:52	51	Chetco	13239	33.33		
40	8/27	15:01	9519	Chetco	13241	32.83	**1,318.50**	**2,561.04**
1	8/28	6:45	51	Umpqua	13255	33.46		
2	8/28	6:57	41	Umpqua	13259	33.30		
3	8/28	7:20	46	Umpqua	13264	33.28		
4	8/28	7:26	20	Umpqua	13268	34.06		
5	8/28	7:44	22	Umpqua	13277	34.15		
6	8/28	8:12	51	Umpqua	13278	33.05		
7	8/28	8:23	9519	Umpqua	13281	34.29		
8	8/28	8:39	41	Umpqua	13285	32.94		
9	8/28	8:56	46	Umpqua	13289	32.76		
10	8/28	9:10	20	Umpqua	13292	33.20		
11	8/28	9:19	22	Umpqua	13297	30.23		
12	8/28	9:50	9519	Umpqua	13300	33.13		
13	8/28	10:15	41	Umpqua	13301	33.09		
14	8/28	10:25	46	Umpqua	13304	33.44		
15	8/28	10:33	20	Umpqua	13306	32.97		
16	8/28	10:40	51	Umpqua	13308	30.08		
17	8/28	10:52	22	Umpqua	13315	31.96		
18	8/28	11:00	13	Umpqua	13318	32.38		
19	8/28	11:30	9519	Umpqua	13321	32.76		
20	8/28	11:46	46	Umpqua	13323	32.44		
21	8/28	11:53	20	Umpqua	13326	34.57		
22	8/28	12:06	41	Umpqua	13329	32.14		
23	8/28	12:14	51	Umpqua	13333	31.25		
24	8/28	12:25	22	Umpqua	13336	32.94		
25	8/28	12:33	13	Umpqua	13340	32.71		
26	8/28	13:20	46	Umpqua	13356	32.01		
27	8/28	13:29	9519	Umpqua	13359	33.96		
28	8/28	13:54	20	Umpqua	13361	33.87		
29	8/28	14:03	41	Umpqua	13363	33.37		
30	8/28	14:15	51	Umpqua	13365	35.61		
31	8/28	14:24	22	Umpqua	13366	33.73		
32	8/28	14:34	13	Umpqua	13368	29.91		
33	8/28	15:00	9159	Umpqua	13373	31.76		
34	8/28	15:15	46	Umpqua	13374	35.56		
35	8/28	15:22	20	Umpqua	13378	34.05		
36	8/28	15:39	41	Umpqua	13379	33.63		
37	8/28	15:55	22	Umpqua	13381	35.32		
38	8/28	16:28	46	Umpqua	13382	33.89	**1,257.25**	
1	8/29	6:19	51	Umpqua	13390	33.89		
2	8/29	6:31	41	Umpqua	13391	34.19		
3	8/29	6:40	46	Umpqua	13394	32.57		
4	8/29	6:50	22	Umpqua	13395	32.13		
5	8/29	6:56	9519	Umpqua	13397	31.26		
6	8/29	7:04	20	Umpqua	13398	33.61		
7	8/29	7:46	51	Umpqua	13403	36.79		
8	8/29	8:05	41	Umpqua	13406	32.92		
9	8/29	8:16	46	Umpqua	13408	33.43		
10	8/29	8:24	22	Umpqua	13410	33.62		
11	8/29	8:32	9519	Umpqua	13412	30.73		
12	8/29	8:43	20	Umpqua	13413	33.60		
13	8/29	9:13	51	Umpqua	13421	33.93		

Table 7
Summary of Truckloads of Material Transported from Transloading Facility to Landfill

Recorded at Transfer Station					Recorded at Landfill		Daily Total (tons)	Barge Total (tons)
Load	Date	Time Out	Truck No.	Barge	TICKET #	Tons		
14	8/29	9:22	13	Umpqua	13426	32.89		
15	8/29	9:37	41	Umpqua	13427	33.83		
16	8/29	9:48	46	Umpqua	13430	32.36		
17	8/29	10:03	22	Umpqua	13435	36.61		
18	8/29	10:10	9519	Umpqua	13436	32.97		
19	8/29	10:22	20	Umpqua	13438	33.32		
20	8/29	10:35	51	Umpqua	13440	33.70		
21	8/29	10:40	13	Umpqua	13444	32.60		
22	8/29	11:08	41	Umpqua	13451	33.18		
23	8/29	11:18	46	Umpqua	13448	31.76		
24	8/29	11:34	22	Umpqua	13454	36.31		
25	8/29	11:43	9519	Umpqua	13456	31.79		
26	8/29	11:51	20	Umpqua	13457	32.93		
27	8/29	12:09	51	Umpqua	13461	33.94	**900.86**	
1	9/2	6:38	41	Umpqua	13555	31.69		
2	9/2	6:45	22	Umpqua	13560	29.80		**2,219.60**
3	9/2	7:09	9519	Reedsport	13565	32.51		
4	9/2	7:37	20	Reedsport	13570	33.98		
5	9/2	8:31	9519	Reedsport	13573	32.40		
6	9/2	8:47	41	Reedsport	13577	33.71		
7	9/2	8:57	13	Reedsport	13579	33.51		
8	9/2	9:12	46	Reedsport	13582	33.03		
9	9/2	9:20	20	Reedsport	13584	32.12		
10	9/2	9:56	51	Reedsport	13587	33.17		
11	9/2	10:11	9519	Reedsport	13589	32.62		
12	9/2	10:32	41	Reedsport	13594	32.92		
13	9/2	10:40	13	Reedsport	13596	32.69		
14	9/2	10:56	46	Reedsport	13597	32.82		
15	9/2	11:07	20	Reedsport	13599	32.22		
16	9/2	11:25	51	Reedsport	13601	33.92		
17	9/2	11:43	9519	Reedsport	13608	32.73		
18	9/2	12:15	41	Reedsport	13612	34.19		
19	9/2	12:25	13	Reedsport	13613	33.33		
20	9/2	12:44	46	Reedsport	13616	32.99		
21	9/2	13:01	20	Reedsport	13618	32.84		
22	9/2	13:09	51	Reedsport	13619	35.78		
23	9/2	13:22	9519	Reedsport	13620	31.10		
24	9/2	13:50	41	Reedsport	13626	32.15		
25	9/2	13:59	13	Reedsport	13634	32.68		
26	9/2	14:17	46	Reedsport	13637	33.16		
27	9/2	14:29	20	Reedsport	13638	33.34		
28	9/2	14:48	51	Reedsport	13640	33.63		
29	9/2	15:04	9519	Reedsport	13641	32.03		
30	9/2	15:39	41	Reedsport	13645	32.75		
31	9/2	15:56	46	Reedsport	13648	31.85		
32	9/2	16:12	20	Reedsport	13649	34.28	**1,051.94**	
1	9/3	6:25	51	Reedsport	13652	34.60		
2	9/3	6:35	41	Reedsport	13653	32.99		
3	9/3	6:47	46	Reedsport	13655	33.48		
4	9/3	6:58	9519	Reedsport	13659	28.98		
5	9/3	7:08	22	Reedsport	13660	35.00		
6	9/3	7:15	20	Reedsport	13661	33.62		
7	9/3	8:05	51	Reedsport	13670	33.87		

Table 7
Summary of Truckloads of Material Transported from Transloading Facility to Landfill

Recorded at Transfer Station					Recorded at Landfill		Daily Total (tons)	Barge Total (tons)
Load	Date	Time Out	Truck No.	Barge	TICKET #	Tons		
8	9/3	8:21	46	Reedsport	13672	34.21		
9	9/3	8:30	41	Reedsport	13674	34.34		
10	9/3	8:40	9519	Reedsport	13675	31.99		
11	9/3	8:52	22	Reedsport	13677	33.78		
12	9/3	8:58	20	Reedsport	13679	32.88		
13	9/3	9:14	13	Reedsport	13680	35.72		
14	9/3	9:28	51	Reedsport	13684	34.78		
15	9/3	9:48	46	Reedsport	13687	34.09		
16	9/3	10:15	41	Reedsport	13693	33.67		
17	9/3	10:30	9519	Reedsport	13699	30.54		
18	9/3	10:40	22	Reedsport	13700	34.68		
19	9/3	10:50	20	Reedsport	13701	32.95		
20	9/3	11:08	13	Reedsport	13703	34.63		
21	9/3	11:18	51	Reedsport	13705	35.26		
22	9/3	11:26	46	Reedsport	13708	32.57		
23	9/3	12:00	41	Reedsport	13715	33.92		
24	9/3	12:23	22	Reedsport	13719	36.46		
25	9/3	12:32	9519	Reedsport	13723	29.77		
26	9/3	12:45	20	Reedsport	13726	33.68		
27	9/3	13:05	51	Reedsport	13729	33.24		
28	9/3	13:15	8	Reedsport	13731	33.33		
29	9/3	13:30	46	Reedsport	13733	33.77		
30	9/3	13:42	41	Reedsport	13738	32.58		
31	9/3	13:56	22	Reedsport	13741	33.53		
32	9/3	14:15	20	Reedsport	13745	32.61		
33	9/3	14:32	9519	Reedsport	13749	29.84		
34	9/3	14:40	51	Reedsport	13750	34.20		
35	9/3	15:05	46	Reedsport	13756	30.95	**1,166.51**	
1	9/4	6:54	51	Reedsport	13771	33.44		
2	9/4	7:04	41	Reedsport	13769	33.23		
3	9/4	7:25	46	Reedsport/Chetco	13776	33.44		**2,257.07**
4	9/4	7:40	22	Chetco	13781	35.21		
5	9/4	7:51	9519	Chetco	13783	27.92		
6	9/4	8:00	20	Chetco	13785	33.99		
7	9/4	8:35	41	Chetco	13788	33.18		
8	9/4	9:20	46	Chetco	13794	33.60		
9	9/4	9:31	22	Chetco	13801	32.67		
10	9/4	9:42	51	Chetco	13802	34.40		
11	9/4	9:52	9519	Chetco	13803	33.25		
12	9/4	10:03	20	Chetco	13806	34.14		
13	9/4	10:30	41	Chetco	13810	33.30		
14	9/4	10:52	46	Chetco	13814	32.81		
15	9/4	11:10	22	Chetco	13816	35.24		
16	9/4	11:17	51	Chetco	13817	35.01		
17	9/4	11:45	20	Chetco	13823	33.91		
18	9/4	11:55	9519	Chetco	13827	31.10		
19	9/4	12:25	41	Chetco	13829	34.44		
20	9/4	12:36	46	Chetco	13834	34.47		
21	9/4	13:08	22	Chetco	13841	34.63		
22	9/4	13:22	51	Chetco	13846	33.67		
23	9/4	13:36	20	Chetco	13847	33.65		
24	9/4	13:49	9519	Chetco	13849	31.78		
25	9/4	14:08	41	Chetco	13852	33.90		

Table 7
Summary of Truckloads of Material Transported from Transloading Facility to Landfill

Recorded at Transfer Station					Recorded at Landfill		Daily Total (tons)	Barge Total (tons)
Load	Date	Time Out	Truck No.	Barge	TICKET #	Tons		
26	9/4	14:22	46	Chetco	13853	32.66		
27	9/4	14:50	22	Chetco	13856	34.56		
28	9/4	15:00	51	Chetco	13857	32.64		
29	9/4	15:20	19	Chetco	13861	32.80		
30	9/4	15:30	20	Chetco	13862	34.24		
31	9/4	15:40	9519	Chetco	13863	30.49		
32	9/4	15:58	41	Chetco	13867	33.47		
33	9/4	16:15	22	Chetco	13868	33.28		
34	9/4	16:25	51	Chetco	13869	34.41	**1,134.93**	
1	9/5	6:16	51	Chetco	13873	33.27		
2	9/5	6:36	41	Chetco	13876	34.96		
3	9/5	7:02	19	Chetco	13877	32.88		
4	9/5	7:07	22	Chetco	13880	34.33		
5	9/5	7:35	9519	Chetco	13887	31.07		
6	9/5	7:50	20	Chetco	13890	33.74		
7	9/5	8:05	51	Chetco	13894	35.62		
8	9/5	8:22	41	Chetco	13898	34.38		
9	9/5	8:45	19	Chetco	13901	33.12		
10	9/5	9:00	22	Chetco	13904	31.83		
11	9/5	9:14	9519	Chetco	13906	31.98		
12	9/5	9:30	20	Chetco	13909	33.34		
13	9/5	9:42	51	Chetco	13912	33.62		
14	9/5	10:05	41	Chetco	13915	34.12		
15	9/5	10:20	19	Chetco	13917	32.45		
16	9/5	10:32	46	Chetco	13919	32.56		
17	9/5	10:45	22	Chetco	13923	33.63		
18	9/5	10:53	9519	Chetco	13925	30.90		
19	9/5	11:05	20	Chetco	13927	33.39		
20	9/5	11:25	51	Chetco	13939	33.45		
21	9/5	12:00	41	Chetco	13943	32.45		
22	9/5	12:15	19	Chetco	13945	33.49		
23	9/5	12:25	46	Chetco	13950	34.18		
24	9/5	12:45	22	Chetco	13958	34.44		
25	9/5	13:00	9519	Chetco	13961	34.33		
26	9/5	13:10	20	Chetco	13964	33.61		
27	9/5	13:21	51	Chetco	13967	33.27		
28	9/5	13:44	41	Chetco	13970	31.28		
29	9/5	14:05	19	Chetco	13973	33.55		
30	9/5	14:20	46	Chetco	13975	30.12		
31	9/5	14:31	22	Chetco	13976	32.96		
32	9/5	14:45	9519	Chetco	13979	34.22		
33	9/5	14:55	20	Chetco	13982	33.11		
34	9/5	15:10	51	Chetco	13983	32.47		
35	9/5	15:25	41	Chetco	13986	33.95		
36	9/5	15:46	19	Chetco	139885	32.18		
37	9/5	16:00	46	Chetco	13987	32.16	**1,226.41**	
1	9/8	6:57	22	Chetco	14019	33.38		
2	9/8	7:03	9519	Chetco	14020	30.38		
3	9/8	7:23	41	Chetco	14024	34.04		
4	9/8	7:31	20	Chetco	14025	33.24		**2,392.27**
5	9/8	8:15	19	Umpqua	14033	32.72		
6	9/8	8:32	22	Umpqua	14036	34.95		
7	9/8	8:42	9519	Umpqua	14039	30.90		

Table 7
Summary of Truckloads of Material Transported from Transloading Facility to Landfill

Recorded at Transfer Station					Recorded at Landfill		Daily Total (tons)	Barge Total (tons)
Load	Date	Time Out	Truck No.	Barge	TICKET #	Tons		
8	9/8	9:02	20	Umpqua	14040	33.79		
9	9/8	9:15	41	Umpqua	14043	34.05		
10	9/8	9:26	46	Umpqua	14045	32.17		
11	9/8	9:54	19	Umpqua	14050	32.93		
12	9/8	10:24	9519	Umpqua	14057	31.54		
13	9/8	10:34	22	Umpqua	14058	33.88		
14	9/8	10:51	20	Umpqua	14062	33.67		
15	9/8	10:59	41	Umpqua	14064	34.09		
16	9/8	11:20	46	Umpqua	14065	33.53		
17	9/8	11:32	25	Umpqua	14067	30.47		
18	9/8	11:42	19	Umpqua	14070	36.00		
19	9/8	12:08	9519	Umpqua	14074	30.75		
20	9/8	12:21	22	Umpqua	14075	35.29		
21	9/8	12:40	20	Umpqua	14077	33.86		
22	9/8	12:52	41	Umpqua	14080	33.72		
23	9/8	13:07	46	Umpqua	14084	32.11		
24	9/8	13:26	25	Umpqua	14088	31.87		
25	9/8	13:43	19	Umpqua	14091	33.53		
26	9/8	13:52	9519	Umpqua	14093	30.21		
27	9/8	14:03	22	Umpqua	14095	34.19		
28	9/8	14:20	20	Umpqua	14099	34.35		
29	9/8	14:30	41	Umpqua	14102	33.85		
30	9/8	14:39	46	Umpqua	14104	32.02		
31	9/8	14:58	25	Umpqua	14108	36.32		
32	9/8	15:15	19	Umpqua	14110	32.84		
33	9/8	15:24	9519	Umpqua	14112	33.83		
34	9/8	15:41	22	Umpqua	14114	29.27	**1,123.74**	
1	9/9	6:21	46	Umpqua	14123	32.30		
2	9/9	6:31	41	Umpqua	14124	32.59		
3	9/9	6:40	19	Umpqua	14126	31.60		
4	9/9	6:48	22	Umpqua	14127	33.41		
5	9/9	7:06	9519	Umpqua	14130	30.56		
6	9/9	7:15	20	Umpqua	14132	33.86		
7	9/9	7:30	25	Umpqua	14133	28.91		
8	9/9	7:57	46	Umpqua	14137	31.80		
9	9/9	8:12	41	Umpqua	14140	33.42		
10	9/9	8:32	19	Umpqua	14143	35.69		
11	9/9	8:43	22	Umpqua	14145	31.82		
12	9/9	8:59	9519	Umpqua	14148	31.57		
13	9/9	9:07	20	Umpqua	14149	33.54		
14	9/9	9:16	25	Umpqua	14153	27.59		
15	9/9	9:26	46	Umpqua	14154	33.20		
16	9/9	9:44	41	Umpqua	14155	34.83		
17	9/9	10:03	19	Umpqua	14161	32.69		
18	9/9	10:15	22	Umpqua	14163	32.06		
19	9/9	10:31	9519	Umpqua	14164	32.84		
20	9/9	10:39	20	Umpqua	14168	33.50		
21	9/9	10:51	25	Umpqua	14173	32.49		
22	9/9	11:02	46	Umpqua	14175	32.88		
23	9/9	11:51	41	Umpqua	14185	33.80		
24	9/9	12:02	22	Umpqua	14186	32.60		
25	9/9	12:16	19	Umpqua	14190	32.64		
26	9/9	12:29	9519	Umpqua	14194	30.17		

Table 7
Summary of Truckloads of Material Transported from Transloading Facility to Landfill

Recorded at Transfer Station					Recorded at Landfill		Daily Total (tons)	Barge Total (tons)
Load	Date	Time Out	Truck No.	Barge	TICKET #	Tons		
27	9/9	12:37	20	Umpqua	14198	33.23		
28	9/9	12:46	25	Umpqua	14199	30.47		
29	9/9	13:02	46	Umpqua	14204	33.57		
30	9/9	13:23	41	Umpqua	14209	33.08		
31	9/9	13:39	22	Umpqua	14216	34.56		
32	9/9	14:16	9519	Umpqua	14219	29.33		
33	9/9	14:24	20	Umpqua	14220	33.68		
34	9/9	14:41	46	Umpqua	14227	34.06		
35	9/9	15:03	41	Umpqua	14228	33.07		
36	9/9	15:20	22	Umpqua	14230	35.51	**1,172.92**	
1	9/10	6:18	46	Umpqua	14240	32.35		
2	9/10	6:28	41	Umpqua	14241	33.51		
3	9/10	6:40	19	Umpqua	14242	33.02		
4	9/10	6:51	9519	Umpqua	14244	31.43		
5	9/10	7:03	22	Umpqua	14247	33.64		
6	9/10	7:58	46	Umpqua	14257	33.65		
7	9/10	8:54	41	Umpqua	14267	33.10		
8	9/10	9:04	22	Umpqua	14269	32.62		
9	9/10	9:18	19	Umpqua	14274	32.97		
10	9/10	9:36	9519	Umpqua	14278	31.30		
11	9/10	9:51	46	Umpqua	14279	32.99		
12	9/10	10:26	41	Umpqua	14281	33.61		
13	9/10	10:40	22	Umpqua	14284	32.84	**427.03**	**2,592.65**
1	9/11	7:15	46	Reedsport	14342	32.20		
2	9/11	7:38	19	Reedsport	14347	32.92		
3	9/11	7:54	9519	Reedsport	14349	30.25		
4	9/11	8:04	22	Reedsport	14350	32.14		
5	9/11	8:29	41	Reedsport	14354	34.04		
6	9/11	8:41	46	Reedsport	14355	33.24		
7	9/11	9:05	19	Reedsport	14361	32.47		
8	9/11	9:19	9519	Reedsport	14366	35.21		
9	9/11	9:34	22	Reedsport	14369	31.08		
10	9/11	10:00	41	Reedsport	14374	33.25		
11	9/11	10:14	51	Reedsport	14377	31.32		
12	9/11	10:21	13	Reedsport	14378	33.22		
13	9/11	10:33	46	Reedsport	14380	33.21		
14	9/11	10:49	19	Reedsport	14383	32.52		
15	9/11	11:00	9519	Reedsport	14385	30.13		
16	9/11	11:30	22	Reedsport	14387	32.92		
17	9/11	11:42	41	Reedsport	14390	34.30		
18	9/11	11:52	51	Reedsport	14395	32.96		
19	9/11	12:01	13	Reedsport	14397	31.45		
20	9/11	12:14	46	Reedsport	14401	33.24		
21	9/11	12:25	19	Reedsport	14407	32.30		
22	9/11	12:39	9519	Reedsport	14409	29.86		
23	9/11	13:00	22	Reedsport	14413	33.00	**747.23**	
1	9/12	6:11	46	Reedsport	14434	33.13		
2	9/12	6:27	13	Reedsport	14435	32.58		
3	9/12	6:40	41	Reedsport	14445	32.30		
4	9/12	6:52	19	Reedsport	14448	33.14		
5	9/12	7:01	9519	Reedsport	14449	32.17		
6	9/12	7:12	22	Reedsport	14452	34.47		
7	9/12	7:31	46	Reedsport	14456	32.92		

Table 7
Summary of Truckloads of Material Transported from Transloading Facility to Landfill

Recorded at Transfer Station					Recorded at Landfill		Daily Total (tons)	Barge Total (tons)
Load	Date	Time Out	Truck No.	Barge	TICKET #	Tons		
8	9/12	7:49	51	Reedsport	14459	33.99		
9	9/12	8:12	13	Reedsport	14465	31.82		
10	9/12	8:22	41	Reedsport	14467	33.38		
11	9/12	8:38	19	Reedsport	14472	31.36		
12	9/12	8:50	9519	Reedsport	14544	31.21		
13	9/12	9:01	22	Reedsport	14473	34.35		
14	9/12	9:09	46	Reedsport	14474	33.14		
15	9/12	9:22	51	Reedsport	14478	33.90		
16	9/12	9:35	13	Reedsport	14483	36.21		
17	9/12	10:05	41	Reedsport	14485	37.75		
18	9/12	10:18	19	Reedsport	14486	33.59		
19	9/12	10:27	22	Reedsport	14489	34.05		
20	9/12	10:42	9519	Reedsport	14493	30.99		
21	9/12	10:53	46	Reedsport	14494	32.42		
22	9/12	11:08	51	Reedsport	14496	35.24		
23	9/12	11:20	13	Reedsport	14508	29.91		
24	9/12	11:51	41	Reedsport	14499	31.02		
25	9/12	12:02	19	Reedsport	14510	32.79		
26	9/12	12:12	22	Reedsport	14519	31.10		
27	9/12	12:21	9519	Reedsport	14521	33.33		
28	9/12	12:30	9503	Reedsport	14514	33.01		
29	9/12	12:40	46	Reedsport	14520	33.96		
30	9/12	12:55	51	Reedsport	14524	33.75		
31	9/12	13:30	41	Reedsport	14532	34.55		
32	9/12	13:45	19	Reedsport	14539	33.05		
33	9/12	16:15	46	Reedsport	14553	35.95	**1,096.53**	**1,843.76**
1	10/10	7:32	13	47	16623	32.21		
2	10/10	7:53	20	47	16621	32.61		
3	10/10	8:02	9517	47	16626	31.84		
4	10/10	8:11	9519	47	16628	32.99		
5	10/10	8:21	9713	47	16635	32.20		
6	10/10	8:30	3	47	16638	33.72		
7	10/10	9:02	20	47	16641	32.97		
8	10/10	9:20	9519	47	16643	32.51		
9	10/10	9:38	9517	47	16646	22.80		
10	10/10	9:47	9713	47	16648	32.60		
11	10/10	9:58	3	47	16650	34.35		
12	10/10	10:10	20	47	16652	25.76		
13	10/10	15:07	13	47	16695	27.64	**404.20**	**404.20**
PROJECT TOTALS						**20,474.53**	**20,474.53**	**20,474.53**

Table 8
Summary Truckloads of Water Taken from Transloading Facility to Landfill

Recorded at Transfer Station			Recorded at Landfill		Daily Total (Tons)
Load	Date	Type	TICKET #	Tons	
1	8/20/08	Liq	12570	7.24	
2	8/20/08	Liq	12584	8.13	
3	8/20/08	Liq	12596	8.58	23.95
1	8/22/08	Liq	12737	8.68	
2	8/22/08	Liq	12752	8.47	
3	8/22/08	Liq	12771	8.87	26.02
1	8/26/08	Liq	13024	8.81	
2	8/26/08	Liq	13038	9.05	
3	8/26/08	Liq	13087	9.1	26.96
1	8/27/08	Liq	13154	8.89	
2	8/27/08	Liq	13166	8.8	
3	8/27/08	Liq	13184	9	
4	8/27/08	Liq	13201	8.92	
5	8/27/08	Liq	13226	3.83	39.44
1	8/29/08	Liq	13425	9.02	
2	8/29/08	Liq	13441	9.09	18.11
1	9/2/08	Liq	13625	11.84	
2	9/2/08	Liq	13642	11.85	23.69
1	9/5/08	Liq	13928	10.52	
2	9/5/08	Liq	13946	10.17	20.69
1	9/9/08	Liq	14166	8.01	
2	9/9/08	Liq	14183	8.28	
3	9/9/08	Liq	14202	8.37	
4	9/9/08	Liq	14217	8.26	32.92
			Total Tons:	**211.78**	

Table 9
Wheeler Bay Shoreline Stabilization CCs and RFIs – Phase I Removal Action

Contract Changes				
CO	**CC**	**Issue Encountered**	**Action Required**	**Directive Language**
1	1.1	Miscellaneous Utility Relocations – Pick different location to move Mini Power Zone/Irrigation Controller Backboard so that it is out of the way for work on the bank.	Extend existing duct bank to new backboard location as shown on drawing and as call out in revised note #8. Install new conduit to Trap Wire Warning Lights and install conductors and detailed in revised note #9. Also provide new cable between new PB-5 and utility tunnel as required in revised note #3.	Revise CC-01 as follows: Extend existing duct bank to new backboard location as shown on drawing and as call out in revised note #8. Install new conduit to Trap Wire Warning Lights, and install conductors as detailed in revised note #9. Also, provide new cable between new PB-5 and utility tunnel, as required in revised note #3. Enclosure: Revised Drawings E-1(7/28/08)
1	1.2	Retain Storm Drain Manhole – After excavating the top of bank near station 7+36, it appears that the manhole near that location can stay in place.	Test the Manhole for a watertight seal using the ODOT method: 0.3 gallons per hour per foot of head under ODOT Section 00470.71 (a) Hydrostatic Testing applies to all manhole diameters. Provide a credit to CC 1.	Revise CC-01.1 as follows. Delete the removal/demolition of the existing manhole near Station 7+36 and the installation of a cleanout. Instead, test the existing manhole for a watertight seal using the ODOT method: 0.3 gallons per hour per foot of head under ODOT Section 00470.71 (a). Hydrostatic Testing applies to all manhole diameters. Provide a cost for the testing and a credit for the deleted work. In addition, please provide a credit for the use of the aggregate trench fill in lieu of CDF.
2	2	Temporary Construction Fence – A physical barrier is needed between Longshore labor and other tenants on the terminal as indicated by the use of an exclusion zone noted in the Contractor's Health and Safety Plan.	Install a temporary chain link construction fence around the area to be excavated as directed in the field.	This is to confirm the Port's previous direction to install a temporary chain link construction fence at the top of the bank around the area to be excavated.
2	3	Remove Fireboat Pier – The existing pier, pilings and structure of the Fireboat access structure is weak and in jeopardy of falling down. The Contractor has indicted it is a safety hazard to excavation equipment and Contractor staff	Remove the piling by pulling them out below the mud line. Remove a additional section of concrete walkway and piling as per the sketch provided via RFI#7.	At the existing Fireboat access structure, remove the four piling above Elevation 10 and all of the walkways, in accordance with the enclosed Fireboat Pier Sketch. The piling shall be removed by pulling them out below the mud line. Dispose of the piling and walkway materials at a landfill approved for such materials. Removal equipment shall remain on dry ground. Reference RFI 7. Enclosure: Fireboat Pier Sketch
3	4	Habitat Cover – The specified material for habitat cover was noted in gradation, but a physical description of the rock was not included in the specifications. Crushed aggregate will not meet the expectations of NMFS or EPA. Round rock will be required for this habitat cover over the rip rap.	Utilize the remainder of the 1 1/2" crushed rock product as select fill. Find a source for round rock and use this for the habitat cover called out in section 3 of sheet C-3 of the plan set.	Round rock will be required for the habitat cover over the riprap instead of the 1-1/2" crushed rock provided at the jobsite. Utilize the remainder of the 1-1/2" crushed rock product, previously purchased for habitat cover, as select fill. Find a source for round rock and use this for the habitat cover called out in Section 3 of Sheet C-3 of the plan set. The habit round rock shall meet the contract specified gradation.
4	5	Top of Bank Transition Between Stations 7+00 to 7+36 – The Existing Rip Rap veneer on the top of the bank above the Kinder Morgan Outfall, near stations 7+00 to 7+36, is very thin or non-existent on the top 3rd of the slope. The existing grade is steeper than 2:1. This area will be prone to slide unless treated with some armoring or cut back.	As shown on the drawings, the rip rap in the transition area should be up to at least elevation 25 feet NGVD and tie into the 3H:1V rip rap section. Where rip rap is placed on soil (i.e., not placed on top of existing rip rap) the subgrade should be prepared as shown on detail 3 of sheet C-3: geotextile under 18 inches of select fill under Armor Type 3. This is necessary to prevent piping of the finer grained existing sediments through the riprap. For the area above the new rip rap the slope should be graded to no steeper than 2H:1V and 1 foot of topsoil under jute mat should be placed as shown on detail 3 of sheet C-3. The area will then need to be hydroseeded	As shown on the drawings, the riprap in the transition area should be up to at least elevation 25 feet NGVD and tie into the 3H:1V rip rap section. Where riprap is placed on soil (i.e., not placed on top of existing rip rap) the subgrade should be prepared as shown on Detail 3 of Sheet C-3: geotextile, under 18 inches of select fill, under Armor Type 3. This is necessary to prevent piping of the finer grained existing sediments through the riprap. For the area above the new riprap, the slope should be graded to no steeper than 2H:1V, and 1 foot of topsoil under jute mat should be placed as shown on Detail 3 of Sheet C-3. The area will then need to be hydroseeded.
5	7	Place Port-Supplied Topsoil – The plan was to have Port landscape staff place the topsoil after the work performed by our Contractor, below the top of bank was competed. As we finish up the work it makes sense to have the Contractor place this material, and finish up the grading	Place the topsoils stockpiled by the Port.	Place the Port supplied topsoil at the top of the slope approximately 1.0 ft deep and 20.0 ft wide in accordance with Port direction. (This draft copy is to confirm the Port's verbal direction at the construction meeting on September 24, 2008.
6	8	Additional Grading at Top of Bank – The area bordering the 31' contour line has a 2 foot deep depression. This forms a pond about 50' wide and 300' long during rainy weather. This ponding can then fill and find a way over the top of bank. The erosion cut into the top of the bank is significant when this happens. After filling, riser rings for the electrical Manhole will be needed to match the topsoil grade.	Add material to the top of the facility catching at the RR fill, see sketch. Use the excess habitat rock as a clean fill material. Install riser rings on the Manhole as needed to match grade.	This is to confirm the Port's directions to add material to the top of the facility catching at the Railroad fill, see sketch. Use the excess habitat rock as a clean fill material. Install riser rings on the Manhole, as needed, to match grade. Enclosure: Two Sketches labeled CC#8 Additional Grading @ Top of Bank

Table 9
Wheeler Bay Shoreline Stabilization CCs and RFIs – Phase I Removal Action

Requests for Information					
RFI	**Subject**	**Contractor Question**	**Anchor**	**Port Engineer**	**Port Construction**
1	Existing power pole in project grading area	A power pole is present within the project grading area between Sta 6+00 and 7+00 and is not shown on the drawings. Please identify the grading details in the vicinity of this power pole (e.g., setbacks, subgrade, filling, etc.).	The contractor will need to preserve and protect the power pole. Once the field stakes are placed the design team can evaluate the power pole.	I concur.	Concur with Port Engineering and Consultant.
2	Storm manhole in project grading area	A storm sewer crosses beneath the project grading area between Sta 7+00 and 7+36, as shown on the drawings. Not shown on the drawings is a manhole located approximately at Sta 7+30. Please identify the grading details in the vicinity of this manhole (e.g., setbacks, subgrade, filling, etc.).	The contractor will need to preserve and protect the manhole. Once the field stakes are placed in the field the design team can evaluate the manhole.	I concur.	Concur with Port Engineering and Consultant
3	Locate Port's temporary nursery	Landscaping is present along the top of bank at Wheeler Bay. We understand the Port will remove the landscaping and irrigation system prior to the start of our work, and the plants will be placed in a temporary nursery. The temporary nursery will be in the area identified on the drawings as a contractor laydown area for the Wheeler Bay stabilization, and we further understand that this area will not be available for us. Please identify the location that will be used for the temporary nursery.	Port needs to respond.	The plants have been relocated. The existing topsoil and irrigation system will be salvaged by Port staff as well. We will mark the area in the field for your review. Please contact Port Inspection staff to arrange a field visit.	Concur with Port Engineering
4	Irrigation electric line	Landscaping is present along the top of bank at Wheeler Bay. We understand the Port will remove the landscaping and irrigation system prior to the start of our work. The irrigation controller power is supplied by an underground electrical line that runs from the power pole between Sta 6+00 and 7+00. Will the Port remove the electrical line, and if not, how does the Port want the line addressed and what is its construction?	Port needs to respond.	The electrical line along the top of the bank will be modeled better and a plan for relocation developed in the next week. There are several power lines in play. I have attached the record drawing from the T4 Railyard project for consideration. More to come on the utility issues on the top of the bank.	Concur with Port Engineering
5	Electrical Line Relocate	Because we are so close to beginning work when the electrical line relocate was added to the project, we will not be able to install the new line prior to removing the old line. The installation could be near the end of the project. Therefore, the power for the line to be relocated could be off beginning August 5 for up to 8 weeks. Is this acceptable?	The Port will respond to this RFI	This would have the yard lighting control from Kinder-Morgan non-functional and the power down to warehouse #4. Eight weeks is probably two long for this condition to exist. It would be best to do the electrical first so that it is out of the way for the bank work.	It is the Port's understanding the new line could be installed first without removing the old line with a short power outage to cut the power over to the new line.
6	Habitat Log Anchors	The design calls for the habitat logs to be anchored with chains to concrete blocks. The subcontractor is preparing to order the anchors/chains. Are the anchors and chains still required?	N/A	We are checking with NMFS and EPA on the habitat logs. If they can be anchored, we will proceed. If they cannot, we will omit them from the design. We expect to have an answer early this week.	The habitat logs can be anchored with chains to concrete blocks in accordance with the contract documents.
7	Former Fire Boat Pier	Upon removal of the first section of the pier we discovered the remainder of the pier to be unstable and an overhead hazard. How should the hazard be addressed?	Please see the attached sketch for removal guidance. Piling shall be removed to the existing subgrade or at least 1 foot below the proposed subgrade, whichever is deeper. Work shall be completed with shore based equipment.	I concur. If possible, please remove the piling by pulling the entire piling, rather than cutting them off. A change will be initiated and a price proposal will be requested to perform the work.	Concur with Port Engineering and Consultant. The Port has issued a change request (CC-3) with a revised sketch. The attached sketch in this RFI is incorrect.
8	Construction Debris Haul and Dispose	Information only: We would like to give notification that the amount of concrete/asphalt to be hauled to Porter Yett has increased by approximately 100 TN, for a new total of 400 TN. During the clearing and grubbing portion of we found more than the estimated amount of concrete within our scope of work.	Noted. We assume truck tickets have been supplied to the Port.	I concur. Please proceed.	Concur with Port Engineering and Consultant. Disposal tickets will be required and must be submitted to Port Construction.
9	Construction Debris Haul and Dispose	Information only: We would like to give notification that the amount of concrete/asphalt to be hauled to Porter Yett has increased by approximately 100 TN, for a new total of 400 TN. During the clearing and grubbing portion of we found more than the estimated amount of concrete within our scope of work.	Noted. We assume contractor will supply truck scale tickets.	I concur. Please proceed.	Reference RFI No. 8
10	Clean concrete/asphalt recycler	We would like to request that the concrete recycler be changed from Porter Yett to the Construction Materials Exchange, located in downtown Portland, south side of the memorial coliseum. They are willing to accept the larger pieces of concrete that we are encountering at the site.	Port will respond to this RFI.	This is acceptable. Please provide information as per section 017419 of the project specifications.	Concur with Port Engineering.

Table 9
Wheeler Bay Shoreline Stabilization CCs and RFIs – Phase I Removal Action

Requests for Information					
RFI	**Subject**	**Contractor Question**	**Anchor**	**Port Engineer**	**Port Construction**
11	Chemical Testing of Import	It is our understanding that because of the small quantity, no additional chemical testing of import material will be required beyond the first round of tests. Please confirm.	Correct. However, visual inspection of import material still needs to occur. If there appears to be visual indications of different materials additional chemical testing will be required.	Please see the Anchor response above.	Proceed per direction above.
12	Sieve Test Results for Select Fill and Habitat Material	Sieve test results for Select Fill (3-1/2-inch) and Habitat Material (1-1/2-inch) are attached. These do not quite meet the specification (short on sand size material). Will these materials be suitable for use?	Sample A (1.5" - 0") is sufficient for habitat material. Sample B (3.5" - 0") can be used as select fill provided that a non-woven separation geotextile is placed where ever the select fill is on native sediments. The purpose of the geotextile is to minimize piping of finer grained material into the select fill. ACA indicated that they will provide the separation geotextile at no additional cost to the Port. Will need to get EPA approval for material as well.	I concur. Please see answer by Anchor Environmental above.	Proceed per direction above.
13	Transition to Existing at Station 0+00	The drawings do not detail the transition from finish grade at sta 0+00 to existing grade. Please provide desired transition. Proposed Answer: We propose the following: Cut Areas: slope at 2H:1V or flatter and hydroseed. Fill Areas: Connect constant elevation (e.g., El. 15 finish grade and El. 15 existing grade) such that the maximum resulting slope on the transition is 2H:1V. The surface finish will match the typical section for finish grade at the corresponding elevation (e.g., El. 10 to 15 will be habitat material over rip rap or select fill).	The western edge of the grading plan on shhet C-1 (just west of 0+00) was designed with a 2H:1V tie in to existing grade. The upper portion of the slope is typically a cut up to existing grade. The lower portion of the slope is fill down to existing grade. It appears that ACA's proposed solution is in general agreement with the design intent. The construction will need to carry the design sections full thickness to the tie in. Also recommend that either Phillip B. and/or Anchor field representative look at the area after it is graded.	I concur.	Concur with Port Engineering and Consultant
14	Habitat Fill	The EPA has requested that the habitat material be rounded rock. The specifications did not identify rounded rock so the material initially placed was angular. About 150 feet of the toe has been constructed with the angular rock. Please identify what rock should be used, what should be done with the rock already placed, and what should be done with the approximately 500 tons of angular rock stockpiled on-site. Proposed Answer: We understand the following to be implemented: 1) Rock meeting the current spec but rounded should be used for Habitat Fill. 2) Angular rock already placed should be removed. It can either be removed and reused or simply bladed onto existing rip rap (into the spaces in the rip rap). One foot of rounded rock will be placed on the rip rap/angular rock as originally designed. 3) The existing stockpile of angular rock will be used as Select Fill.	The recommended solution appears correct. We recommend that the angular habitat rock not be removed, but rather bladed onto the existing rip rap.	I concur. Please submit the round rock gradation via the submittal process when it is available.	Concur with Port Engineering and Consultant

Table 9
Wheeler Bay Shoreline Stabilization CCs and RFIs – Phase I Removal Action

Requests for Information					
RFI	**Subject**	**Contractor Question**	**Anchor**	**Port Engineer**	**Port Construction**
15	Transition 3:1 Slope to 2:1 Slope at approx Sta 7+36	Can the transition be moved so that it begins at approx Sta 7+00 (3:1) and ends at approx 7+36? This will allow the MH at Sta 7+30 to remain. Also, the existing slope in the area of Sta 7+50 to 8+00 is steeper than 2:1 near the top (the portion that was planned to remain above the new rip rap), and the lower portion to get rip rap does not have existing rip rap. How should these areas be addressed?	Based on field observations, the relocation of the transition as described above appears appropriate. As shown on the drawings, the rip rap in the transition area should be up to at least elevation 25 feet NGVD and tie into the 3H:1V rip rap section. Where rip rap is placed on soil (i.e., not placed on top of existing rip rap) the subgrade should be prepared as shown on detail 3 of sheet C-3: geotextile under 18 inches of select fill under Armor Type 3. This is necessary to prevent piping of the finer grained existing sediments through the riprap. For the area above the new rip rap the slope should be graded to no steeper than 2H:1V and 1 foot of topsoil under jute mat should be placed as shown on detail 3 of sheet C-3. The area will then need to be hydroseeded.	I concur.	Refer to response above.
16	Chemical Analysis of Import Habitat Material	The new Habitat Fill (round rock) sample is in the lab for chemical analysis. All results will be back by the end of the day 9/5/08 except for the following: cis-Nonachlor Oxychlordane trans-Nonachlor Analysis for these three chemicals will require 1 week minimum and possibly 2 weeks. This will delay the project from 0.5 to 1.5 weeks. Can these three chemicals be dropped from the required list of chemicals?	For information only. Port will make decision with EPA.	The following was EPA's response: EPA will allow placement of habitat fill prior to receipt of import test results for: -cis-Nonachlor -trans-Nonachlor Oxychlordane we would like results for before placement as it is an organochlorine compound that is the most persistent metabolite of Chlordane. It is bioaccumulative and is one of the most toxic of the chlordane compounds. Since it is a metabolite, its concentration can not be correlated with the heptachlor, a- or g- chlordane. However, placement of the material without test results is at the Port's risk. If the material is confirmed to have contaminant concentrations above the levels in Table 1 of the specifications, then, at a minimum, the material may need to be removed. Other actions may also be required to correct the problems. Let me know if you have any questions. Thank you. S Removal of unsuitable material is a unacceptable risk to the Port. The Port therefore denies your request to drop these chemicals from the list. Please forward the results at your earliest convenience. Please be prepared to discuss your new schedule and plan for completing the work after testing has been submitted and approved.	Concur with Port Engineering
17	Installation of Jute Matting	Drawings (Detail 5 on Sheet L-2) shows Jute matting overlapping 12 inches and held in place with 12 staples. Specifications (329119(3.5)) says Jute matting shall be overlapped 4 inches and held in place with wooden stakes. Which is to be followed (or can either approach be used)?	Please use Detail 5 on Sheet L-2 for jute mat construction.	I concur	Concur with Port Engineering and Consultant

Table 9
Wheeler Bay Shoreline Stabilization CCs and RFIs – Phase I Removal Action

Requests for Information					
RFI	**Subject**	**Contractor Question**	**Anchor**	**Port Engineer**	**Port Construction**
18	Demarcation Layer Below Plants	The specifications (329300(3.2)(C)) call for cutting an "X" in the demarcation layer below each plant. Is cutting an "X" required? Proposed Answer: The "X" cut is not required with the demarcation layer being used. We understand this requirement is typical when an underlying layer of fabric is used beneath plants. The cut in the fabric allows the roots to penetrate the underlying soil. However, the demarcation layer being used is plastic fencing material with greater than 50% open space that will allow roots to easily penetrate to the underlying soil. This requirement was discussed with the on-site inspector from Parametrix who relayed a verbal concurrence from EPA that an "X" cut would not be required.	Given the physical nature of the demarcation fabric, we feel that an "X" does not need to be cut.	I concur.	Concur with Port Engineering and Consultant
19	Port supplied topsoil	Regarding Change Order No. 7, Place Port Supplied Topsoil, we have estimated the topsoil stockpile quantity to be lacking approximately 200 LF worth of material given the 1.0' depth and 20.0' wide placement criteria. We would like clarification as to which portion of the top of bank topsoil should be placed. A possible alternative for finishing the entire top of bank would be to purchase the topsoil that has been approved for the Project. This would be for a purchase quantity of 200 CY at $27.90/CY. Including the 15% Envirocon material markup and 8% Ash Creek markup this would total to $6,863.40.	For information only. Port will respond.	Please place the available topsoil material over the entire 20' strip, measured from the top of bank. No additional topsoil is required to bring the fill to a consistant depth of 12". Please space the topsoil over the entire area and avoid walking over the area with heavy equipment and compacting the topsoil material. Areas that have been well compacted by heavy wheel loads and tracked vehicles, may need to be tilled, since we plan to follow closely on your work with planting the area with new landscaping, and installing above ground irrigation.	Concur with Port Engineer
20	Railroad Crossings	Shall the gravel railroad crossings be removed or left in place?	For information only. Port needs to respond.	Please remove the temporary at-grade RR Xings. Restore the walkway aggregate and track ballast. Please take reasonable care when working around the track. Damage can easily done to the track with heavy equipment, and RR track repair is very specialized and expensive. Thank you.	Concur with Port Engineer. Do not damage the rail or ties. The temporary crossings must be removed beyond the walkway, but the remainder may remain. Please coordinate with Philip Bales.
21	Telephone MH Riser	Per field conversation on 10/10/08 between Roger Anderson and Envirocon, the Port requested that a 12" riser be added to the telephone manhole in the area being filled with Port-supplied topsoil. Is this to be purchased and installed by Ash Creek/Envirocon?	For information only. Port to respond.	Risers are needed to accommodate the topsoil depth. Please continue with the purchase and installation as needed.	Concur with Port Engineering. The Port will issue a change request.
22	Potential Ponding Near Kinder Morgan	No real question, just FYI - After placing Port supplied topsoil, it appears that some ponding of surface runoff could occur over near Kinder Morgan (~Sta 7+50). It appears that this occurred historically based on the small erosional feature at the top of bank near Sta 7+80.	Noted. I believe the erosional feature was armored.	See CC8 sketch.	Concur with Port Engineering
23	Plant Irrigation	Envirocon will be completing work today and demobing today/tomorrow. We understand that the Port will begin installing irrigation and planting tomorrow. Will the Port take over responsibility for irrigation of trees beginning tomorrow?	For information only. Port will respond.	We will take responsibility of the trees at substantial completion.	Concur with Port Engineering
24	Leftover Trees	Approximately 100 trees (primarily willow, but including cottonwood and Oregon ash) in containers remain at the site (located near top of slope at Sta 0+00). The trees will be left for the Port.	For information only.	Please contact Phillip Bales to handoff the leftover materials.	Concur with Port Engineering
25	Silt Fence	The silt fence will be left in place as requested by the EPA. Who will be responsble for removing the silt fence?	N/A	ESPC measures installed by the contractor during construction shall be removed when construction and site disturbance activities are complete and permantent soil stabilization is in place, in accordance with Section 015713, 3.2N. This is anticipated to be appoximately in two months prior to the water level exceeding the elevation of the silt fence. Contact the Port (Philip Bales) prior to removal.	Concur with Port Engineering. Ash Creek/Envirocon should monitor the river level and notify the Port Inspector of their intent to remove the silt fence prior to the water exceeding silt fence elevation.

Table 10
Summary of Wheeler Bay Import Material Quantities

Material (units)	Date	Ticket No.	Quantity Delivered	Quantity Required - Design Neat Section
Select Fill (tons)				
3.5-inch-minus	8/15/2008	5037654	31.03	
3.5-inch-minus	8/15/2008	5037626	31.70	
3.5-inch-minus	8/15/2008	5037606	31.56	
3.5-inch-minus	8/15/2008	5037582	32.16	
3.5-inch-minus	8/27/2008	5039322	31.72	
3.5-inch-minus	8/27/2008	5038333	32.18	
3.5-inch-minus	8/27/2008	5038340	32.11	
3.5-inch-minus	8/27/2008	5038353	31.06	
3.5-inch-minus	8/27/2008	5038366	31.66	
1.5-inch-minus	8/27/2008	5038381	30.10	
1.5-inch-minus	8/27/2008	5038392	31.30	
1.5-inch-minus	8/27/2008	5038400	31.33	
1.5-inch-minus	8/27/2008	5038394	32.33	
1.5-inch-minus	8/28/2008	5038545	25.33	
1.5-inch-minus	8/28/2008	5038524	24.60	
1.5-inch-minus	8/28/2008	5038500	24.06	
1.5-inch-minus	8/28/2008	5038482	25.19	
1.5-inch-minus	8/28/2008	5038465	24.58	
1.5-inch-minus	8/28/2008	5038451	24.60	
1.5-inch-minus	8/28/2008	5038441	24.67	
1.5-inch-minus	8/28/2008	5038430	25.26	
1.5-inch-minus	8/28/2008	5038560	25.14	
1.5-inch-minus	8/28/2008	5038433	25.27	
1.5-inch-minus	8/28/2008	5038434	24.15	
1.5-inch-minus	8/28/2008	5038446	24.76	
1.5-inch-minus	8/28/2008	5038453	24.94	
1.5-inch-minus	8/28/2008	5038470	25.07	
1.5-inch-minus	8/28/2008	5038488	25.06	
1.5-inch-minus	8/28/2008	5038503	24.07	
1.5-inch-minus	8/28/2008	5038529	25.45	
3.5-inch-minus	8/29/2008	5038608	29.84	
3.5-inch-minus	8/29/2008	5038637	29.77	
3.5-inch-minus	8/29/2008	5038667	30.37	
3.5-inch-minus	8/29/2008	5038693	30.52	
3.5-inch-minus	8/29/2008	5038707	31.13	
3.5-inch-minus	8/29/2008	5038704	24.27	
3.5-inch-minus	8/29/2008	5038694	24.72	
3.5-inch-minus	8/29/2008	5038680	24.59	
3.5-inch-minus	8/29/2008	5038664	24.75	
1.5-inch-minus	8/29/2008	5038567	29.49	
1.5-inch-minus	8/29/2008	5038586	29.06	
3.5-inch-minus	9/19/2008	5040014	30.56	
3.5-inch-minus	9/19/2008	5040009	32.12	
		TOTAL:	**1,204**	**1,000**

Table 10
Summary of Wheeler Bay Import Material Quantities

Material (units)	Date	Ticket No.	Quantity Delivered	Quantity Required - Design Neat Section
Armor Rock (tons)				
Salvaged	8/6/2008	--	320	
	8/21/2008	3171989	13.86	
	8/27/2008	3172183	14.44	
	8/27/2008	3172197	15.29	
	8/27/2008	3172149	14.63	
	8/27/2008	3172216	15.15	
	8/27/2008	3172166	15.01	
	8/28/2008	3172309	14.63	
	8/28/2008	3172291	14.99	
	8/28/2008	3172272	13.87	
	8/28/2008	3172252	13.84	
	8/28/2008	3172232	14.11	
	8/28/2008	3172233	15.01	
	8/28/2008	3172253	12.56	
	8/28/2008	3172273	14.35	
	8/28/2008	3172290	15.06	
	8/28/2008	3172308	14.74	
	8/28/2008	3172307	15.23	
	8/28/2008	3172289	15.29	
	8/28/2008	3172271	12.37	
	8/28/2008	3172251	14.66	
	8/28/2008	3172231	15.37	
	8/29/2008	3172328	14.32	
	8/29/2008	3172361	14.59	
	8/29/2008	3172351	14.59	
	8/29/2008	3172375	14.55	
	9/2/2008	3172469	14.67	
	9/2/2008	3172423	14.44	
	9/2/2008	3172399	15.07	
	9/2/2008	3172444	15.02	
	9/2/2008	3172498	15.18	
	9/3/2008	3172590	14.64	
	9/3/2008	3172556	14.54	
	9/3/2008	3172533	14.39	
	9/3/2008	3172515	14.94	
	9/3/2008	3172573	14.41	
	9/4/2008	3172696	14.79	
	9/4/2008	3172652	15.24	
	9/4/2008	3172630	14.49	
	9/4/2008	3172673	14.89	
	9/8/2008	3172913	15.16	
	9/8/2008	3172898	14.74	
	9/8/2008	3172885	14.68	
	9/8/2008	3172873	15.68	
	9/8/2008	3172861	15.18	
	9/10/2008	3173030	15.16	
	9/10/2008	3173017	15.00	
	9/10/2008	3173004	15.04	
	9/10/2008	3172991	15.37	

Table 10
Summary of Wheeler Bay Import Material Quantities

Material (units)	Date	Ticket No.	Quantity Delivered	Quantity Required - Design Neat Section
Armor Rock (tons) - continued				
	9/10/2008	3172979	15.48	
	9/11/2008	3173096	15.14	
	9/11/2008	3173081	14.21	
	9/11/2008	3173071	14.33	
	9/11/2008	3173063	14.95	
	9/11/2008	3173057	15.47	
	9/12/2008	3173148	14.93	
	9/12/2008	3173135	15.23	
	9/12/2008	3173121	14.97	
	9/12/2008	3173109	15.13	
	9/15/2008	3173217	15.34	
	9/15/2008	3173213	14.63	
	9/15/2008	3173200	15.52	
	9/15/2008	3173190	14.98	
	9/15/2008	3173176	14.79	
		TOTAL:	**1,250**	**1,240**
Habitat Cover (tons)				
	9/30/2008	97924	14.91	
	9/30/2008	97925	15.18	
	9/30/2008	97927	16.12	
	9/30/2008	97929	15.42	
	9/30/2008	97930	15.72	
	9/30/2008	97931	15.64	
	9/30/2008	97934	15.42	
	9/30/2008	97935	15.22	
	9/30/2008	97936	16.14	
	9/30/2008	97937	15.21	
	9/30/2008	97938	16.06	
	9/30/2008	97939	15.46	
	9/30/2008	97941	15.62	
	9/30/2008	97942	15.71	
	9/30/2008	97943	15.81	
	9/30/2008	97944	15.38	
	9/30/2008	97945	16.14	
	9/30/2008	97946	15.69	
	9/30/2008	97948	16.33	
	9/30/2008	97949	15.08	
	9/30/2008	97950	16.07	
	9/30/2008	97952	14.91	
	9/30/2008	97953	15.74	
	9/30/2008	97954	15.64	
	9/30/2008	97955	16.58	
	9/30/2008	97957	15.58	
	9/30/2008	97958	16.42	
	9/30/2008	97959	15.48	
	9/30/2008	97961	16.09	
	9/30/2008	97962	15.83	
	9/30/2008	97964	15.62	
	9/30/2008	97965	15.33	
	9/30/2008	97967	16.20	

Table 10
Summary of Wheeler Bay Import Material Quantities

Material (units)	Date	Ticket No.	Quantity Delivered	Quantity Required - Design Neat Section
Habitat Cover (tons) - continued				
	9/30/2008	97968	15.08	
	9/30/2008	97969	16.01	
	9/30/2008	97970	15.41	
	9/30/2008	97971	16.44	
	9/30/2008	97972	16.25	
	9/30/2008	97974	15.74	
	9/30/2008	97975	15.49	
	9/30/2008	97976	15.47	
	9/30/2008	97978	16.36	
	9/30/2008	97979	16.41	
	10/1/2008	97981	14.70	
	10/1/2008	97982	14.90	
	10/1/2008	97984	16.88	
	10/1/2008	97986	14.81	
	10/1/2008	97987	15.33	
	10/1/2008	97988	16.02	
	10/1/2008	97990	14.64	
	10/1/2008	97992	14.86	
	10/1/2008	97995	14.81	
	10/1/2008	97997	15.21	
	10/1/2008	97999	14.63	
	10/1/2008	98001	15.50	
	10/1/2008	98002	14.79	
	10/1/2008	98003	15.22	
	10/1/2008	98006	14.50	
	10/1/2008	98008	15.13	
	10/1/2008	98009	15.65	
	10/1/2008	98011	14.77	
	10/1/2008	98013	15.49	
	10/1/2008	98016	15.40	
	10/1/2008	98018	18.85	
	10/1/2008	98020	15.99	
	10/1/2008	98022	15.65	
	10/1/2008	98024	15.43	
	10/6/2008	98111	16.48	
	10/6/2008	98108	16.11	
	10/6/2008	98107	16.08	
	10/6/2008	98105	15.99	
	10/6/2008	98099	16.26	
	10/6/2008	98095	16.01	
	10/6/2008	98091	15.40	
	10/6/2008	98089	15.58	
	10/6/2008	98086	15.98	
	10/6/2008	98082	15.77	
	10/6/2008	98081	16.25	
	10/6/2008	98085	16.03	
	10/6/2008	98088	16.35	
	10/6/2008	98090	15.82	
	10/6/2008	98106	16.45	
	10/6/2008	98108	15.80	
	10/6/2008	98110	16.08	

Table 10
Summary of Wheeler Bay Import Material Quantities

Material (units)	Date	Ticket No.	Quantity Delivered	Quantity Required - Design Neat Section
Habitat Cover (tons) - continued				
	10/7/2008	98127	16.29	
	10/7/2008	98129	16.26	
	10/7/2008	98132	15.81	
	10/7/2008	98134	15.96	
	10/7/2008	98136	15.83	
	10/7/2008	98138	15.78	
	10/7/2008	98133	15.97	
	10/7/2008	98130	15.46	
	10/7/2008	98140	16.32	
	10/7/2008	98142	15.67	
	10/7/2008	98144	15.12	
	10/7/2008	98146	16.30	
	10/7/2008	98148	16.07	
	10/7/2008	98150	16.30	
	10/7/2008	98152	16.72	
	10/7/2008	98151	16.28	
	10/7/2008	98149	15.70	
	10/7/2008	98147	16.21	
	10/7/2008	98153	16.04	
	10/8/2008	98202	17.09	
	10/8/2008	98177	15.23	
	10/8/2008	98182	15.20	
	10/8/2008	98187	14.65	
	10/8/2008	98191	14.87	
	10/8/2008	98194	15.60	
	10/8/2008	98199	14.75	
	10/8/2008	98157	16.28	
	10/8/2008	98160	15.54	
	10/8/2008	98163	15.88	
	10/8/2008	98168	15.54	
	10/8/2008	99171	15.30	
	10/8/2008	98174	15.41	
	10/8/2008	98198	16.44	
	10/8/2008	98195	16.23	
	10/8/2008	98190	15.40	
	10/8/2008	98186	15.91	
	10/8/2008	98183	15.95	
	10/8/2008	98178	15.63	
	10/8/2008	98200	15.88	
	10/8/2008	98196	15.21	
	10/8/2008	98192	15.88	
	10/8/2008	98188	15.87	
	10/8/2008	98184	15.75	
	10/8/2008	98179	14.92	
	10/8/2008	98176	15.42	
	10/8/2008	98172	15.37	
	10/8/2008	98169	15.79	
	10/8/2008	98158	16.57	
		TOTAL:	**2,076**	**630**

Table 10
Summary of Wheeler Bay Import Material Quantities

Material (units)	Date	Ticket No.	Quantity Delivered	Quantity Required - Design Neat Section
Topsoil (cubic yards)				
	9/22/2008	2811	22	
	9/22/2008	2813	44	
	9/23/2008	2123	66	
	9/24/2008	2127	88	
	9/24/2008	2112	44	
	9/25/2008	3459	66	
	9/25/2008	2128	88	
	9/25/2008	2115	88	
	9/26/2008	2116	88	
	9/26/2008	3460	66	
	9/26/2008	2129	66	
	9/26/2008	2816	22	
	9/27/2008	2117	88	
	9/27/2008	3462	110	
	9/27/2008	2130	110	
	9/29/2008	2118	110	
	9/30/2008	2120	66	
	10/1/2008	2121	110	
	10/2/2008	2139	44	
	10/6/2008	2145	44	
	10/6/2008	2698	110	
	10/7/2008	2699	110	
	10/7/2008	2147	22	
	10/8/2008	2700	44	
	10/8/2008	2150	22	
		TOTAL:	**1,738**	**1,600**
Bark Mulch (cubic yards)				
	10/8/2008	2154	45	
	10/9/2008	2702	124	
		TOTAL:	**169**	**130 to 190**

Table 11
Summary of Truckloads of Material Transported from Wheeler Bay to Recycler

Date	Ticket No.	Off-Site Recycling (tons)
8/14/2008	14385	29.00
8/14/2008	14386	29.00
8/14/2008	14386	29.00
8/14/2008	14387	29.00
8/14/2008	14387	29.00
8/14/2008	14387	29.00
8/14/2008	14388	29.00
8/14/2008	14388	29.00
8/14/2008	14388	29.00
8/14/2008	14389	29.00
8/14/2008	14390	29.00
9/8/2008	17594	29.00
9/8/2008	17594	29.00
9/8/2008	17594	29.00
	TOTAL:	**406.00**

Notes:

1. Concrete was delivered to the Construction Materials Exchange for recycling.
2. Recycled concrete weight estimated based on truck volume of 22 cubic yards and an assumed unit weight for concrete rubble of 1.32 ton/truck cubic yard.

Table 12
Summary of Truckloads of Material Transported from Wheeler Bay to Landfill

Date	Ticket No.	Off-Site Disposal (tons)
8/14/2008	12134	31.62
8/14/2008	12133	32.21
8/14/2008	12141	32.96
8/14/2008	12209	33.44
8/14/2008	12196	30.84
8/14/2008	12152	30.69
8/14/2008	12204	32.26
8/14/2008	12154	33.96
8/14/2008	12205	33.76
8/14/2008	12208	31.70
8/14/2008	12139	33.23
8/14/2008	12197	28.56
8/14/2008	12145	31.97
8/14/2008	12198	27.23
8/14/2008	12147	31.95
8/14/2008	12199	31.29
8/14/2008	12137	32.10
8/14/2008	12194	32.74
8/14/2008	12143	31.85
8/14/2008	12203	31.80
8/14/2008	12149	31.57
8/15/2008	12215	32.17
8/15/2008	12214	31.85
8/15/2008	12238	32.90
8/15/2008	12213	31.88
8/15/2008	12250	31.89
8/15/2008	12223	30.80
8/15/2008	12258	31.48
8/15/2008	12252	29.09
8/15/2008	12233	32.50
8/19/2008	12429	26.82
8/20/2008	12493	28.59
8/20/2008	12568	31.85
9/15/2008	14601	27.45
9/19/2008	62216	32.09
9/19/2008	67995	32.87
9/19/2008	68265	32.63
9/19/2008	14941	32.90
	TOTAL:	**1,197**

Table 13
Background Water Quality Results - T4 Site

	Location ID:	BG-1			BG-2			BG-HL			BG-S3			
	Sample ID:	BG-1-C-080626	BG-1-C-080630	BG-1-C-080702	BG-2-C-080626	BG-2-C-080630	BG-2-C-080702	BG-HL-C-080626	BG-HL-C-080630	BG-HL-C-080702	BG-S3-A-080626	BG-S3-A-080626B	BG-S3-A-080702	BG-S3-C-080630
	Sample Date:	6/26/08	6/30/08	7/2/08	6/26/08	6/30/08	7/2/08	6/26/08	6/30/08	7/2/08	6/26/08	6/26/08	7/2/08	6/30/08
Laboratory Parameters	**Fraction**													
Polycyclic Aromatic Hydrocarbons (µg/L)														
1-Methylnaphthalene	N	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
2-Methylnaphthalene	N	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Acenaphthene	N	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Acenaphthylene	N	0.1 UJ	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Anthracene	N	0.1 UJ	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Benzo(a)anthracene	N	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Benzo(a)pyrene	N	0.1 UJ	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Benzo(b)fluoranthene	N	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Benzo(g,h,i)perylene	N	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Benzo(k)fluoranthene	N	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Chrysene	N	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Dibenzo(a,h)anthracene	N	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Fluoranthene	N	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Fluorene	N	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Indeno(1,2,3-c,d)pyrene	N	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Naphthalene	N	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Phenanthrene	N	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Pyrene	N	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Conventional Parameters (mg/L)														
Total suspended solids	N	**3.5**	**4.7**	**7.2**	**6.6**	**6.5**	**4.5**	**3.8**	**4.5**	**9.2**	**5.5**	**5.1**	**3**	**5.8**
Metals (µg/L)														
Cadmium	T	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Lead	T	1 U	1 U	1 U	**3**	1 U	1 U	1 U	1 U	1 U	**1**	**1**	1 U	1 U
Zinc	T	4 U	4 U	4 U	**47**	4 U	4 U	4 U	4 U	4 U	**10**	**7**	4 U	**12**

Table 13
Background Water Quality Results - T4 Site

	Location ID:	BG-1			BG-2			BG-HL			BG-S3			
	Sample ID:	BG-1-C-080626	BG-1-C-080630	BG-1-C-080702	BG-2-C-080626	BG-2-C-080630	BG-2-C-080702	BG-HL-C-080626	BG-HL-C-080630	BG-HL-C-080702	BG-S3-A-080626	BG-S3-A-080626B	BG-S3-A-080702	BG-S3-C-080630
	Sample Date:	6/26/08	6/30/08	7/2/08	6/26/08	6/30/08	7/2/08	6/26/08	6/30/08	7/2/08	6/26/08	6/26/08	7/2/08	6/30/08
Field Parameters	**Depth**													
Dissolved Oxygen (mg/L)	A	**10.94**	**10.53**	**8.51**	**10.84**	**10.64**	**8.30**	**10.96**	**10.86**	**8.23**	**10.83**	**10.94**	**9.05**	--
	B	**10.72**	**9.81**	**8.15**	**10.67**	**9.90**	**8.28**	**10.67**	**70.03**	**8.13**	**10.63**	**10.29**	**8.54**	--
	C	**10.52**	**8.61**	**8.04**	**10.48**	**9.68**	**8.22**	**10.46**	**9.60**	**7.92**	**10.45**	**10.04**	**8.12**	--
Temperature (°C)	A	**15.52**	**17.84**	**18.68**	**15.77**	**18.33**	**18.73**	**15.75**	**18.28**	**17.96**	**15.72**	**18.23**	**18.47**	--
	B	**15.39**	**16.73**	**18.03**	**15.44**	**16.78**	**18.14**	**15.40**	**16.82**	**17.71**	**15.60**	**18.65**	**17.84**	--
	C	**15.26**	**16.40**	**17.84**	**15.32**	**16.18**	**18.03**	**15.19**	**16.00**	**17.31**	**15.45**	**16.49**	**17.32**	--
Turbidity (NTU)	A	**0.8**	**1.4**	**1.2**	**2.6**	**1.2**	**1.5**	**3.1**	**0.5**	**5.4**	**4.0**	**2.5**	**5.0**	--
	B	**0.6**	**1.8**	**1.9**	**1.6**	**2.6**	**2.4**	**2.5**	**2.4**	**3.8**	**3.0**	**2.5**	**1.3**	--
	C	**1.5**	**1.8**	**2.7**	**3.2**	**3.3**	**3.5**	**4.7**	**3.0**	**6.0**	**3.3**	**3.0**	**1.6**	--
pH (Standard Units)	A	**7.48**	**7.68**	**7.57**	**7.43**	**7.76**	**7.57**	**7.47**	**7.99**	**7.45**	**7.45**	**8.60**	**7.74**	--
	B	**7.35**	**7.55**	**7.37**	**7.35**	**7.54**	**7.43**	**7.39**	**7.53**	**7.32**	**7.40**	**7.81**	**7.38**	--
	C	**7.34**	**7.47**	**7.39**	**7.35**	**7.46**	**7.40**	**7.33**	**7.43**	**7.34**	**7.30**	**7.54**	**7.35**	--

Notes:

Bold = Detected result

U = Compound analyzed, but not detected above detection limit

UJ = Compound analyzed, but not detected above estimated detection limit

Table 14
Background Water Quality 90th Percentile Values - T4 Site

Parameters	Preconstruction Monitoring --	N	USGS Historical 10 Year	N	USGS Historical 1 Year	N
Polycyclic Aromatic Hydrocarbons (PAHs; µg/L)						
Acenaphthene	U, <.1	*12*				
Acenaphthylene	U, <.1	*12*				
Anthracene	U, <.1	*12*				
Benzo(a)anthracene	U, <.1	*12*				
Benzo(a)pyrene	U, <.1	*12*				
Benzo(b)fluoranthene	U, <.1	*12*				
Benzo(g,h,i)perylene	U, <.1	*12*				
Benzo(k)fluoranthene	U, <.1	*12*				
Chrysene	U, <.1	*12*				
Dibenzo(a,h)anthracene	U, <.1	*12*				
Fluoranthene	U, <.1	*12*				
Fluorene	U, <.1	*12*				
Indeno(1,2,3-c,d)pyrene	U, <.1	*12*				
Naphthalene	U, <.1	*12*				
Phenanthrene	U, <.1	*12*				
Pyrene	U, <.1	*12*				
Conventional Parameters (mg/L)						
Total suspended solids	**8.6**	*12*	**39.4**	*141*	**48.3**	*20*
Metals (µg/L)						
Cadmium	U, <.2	*12*				
Lead	IN	*12*	*u*	--		
Zinc	**24.9**	*12*	**6.0**	*71*		
Field Parameters						
pH (standard units)	**7.76**	*36*	**7.50**	*36*	**7.49**	*36*
Temperature (°C)	**18.33**	*36*	**22.06**	*36*	**22.28**	*36*
Turbidity (NTU	**4.7**	*36*	**32.0**	*36*	**38.0**	*36*

Notes:

Bold = Detected Result

IN = Statistical calculation not possible: insufficient samples with detectable analyte levels.

U = Compound analyzed, but not detected above detection limit

u = Historical detected levels below current project lab dection limit

[yellow box] = Data Not Available

Table 15
Water Quality Sampling Station Location Descriptions

Sample Station ID	Location Description
BG-01	Daily background station from 8/12 to 8/21 located 300m upstream of Slip 3 and 10m channel ward of the Toyota pier.
BG-01R	Daily background station from 8/22 to 10/1 located 300m upstream of slip 3 and 100m channel ward of Toyota pier and harbor line.
414-E	50m early warning station located 50m from center of Berth 414 construction activity. Berth 414 located upstream of mouth of Slip 3.
414-N 414-M 414-S	100m compliance stations located in a 100m radius arc of Berth 414 construction activity.
410-E	50m early warning station located 50m from center of Berth 410 maintanence dredging within Slip 3.
410-S 410-M 410-N	100m compliance stations located in a 100m radius arc of Berth 410 maintanence dredging activity.
S3C-E	50m early warning station located 50m from S3C dredging and capping activity within center of Slip 3.
S3C-S S3C-M S3C-N	100m compliance stations located in a 100m radius arc of S3C dredging and capping activity.
S3A-E	50m early warning station located 50m from center of S3A dredging and capping activity and North head of Slip 3.
S3A-S S3A-M S3A-N	100m compliance stations located in a 100m radius arc of S3A dredging and capping activity.
S3B-E	50m early warning station located 50m from S3B dredging and capping activity at South head of Slip 3.
S3B-S S3B-M S3B-N	100m compliance stations located in a 100m radius arc of S3B dredging and capping activity.
S3M-E	50m early turbidity compliance warning station located 50m channel-ward of Slip 3 harbor line.
S3M-S S3M-M S3M-N	100m turbidity compliance stations located channel-ward of harbor line and 100m from mouth of Slip 3.

Table 16
Transloading Facility Soil Sample Analytical Results

Station ID	T4-PI-S-01				T4-PI-S-02				T4-PI-S-03				T4-PI-S-04				T4-PI-S-05				T4-PI-S-06				
Round	Round 1	Round 2	Round 3	Round 4	Round 1	Round 2	Round 3	Round 4	Round 1	Round 2	Round 3	Round 4	Round 1	Round 2	Round 3	Round 4	Round 1	Round 2	Round 3	Round 4	Round 1	Round 2	Round 2 Dup	Round 3	Round 4
Sample ID	T4-PI-S-01-080818	T4-PI-S-01-080902	T4-PI-S-01-080908	T4-PI-S-01-080912	T4-PI-S-02-080818	T4-PI-S-02-080902	T4-PI-S-02-080908	T4-PI-S-02-080912	T4-PI-S-03-080818	T4-PI-S-03-080902	T4-PI-S-03-080908	T4-PI-S-03-080912	T4-PI-S-04-080818	T4-PI-S-04-080902	T4-PI-S-04-080908	T4-PI-S-04-080912	T4-PI-S-05-080818	T4-PI-S-05-080902	T4-PI-S-05-080908	T4-PI-S-05-080912	T4-PI-S-06-080818	T4-PI-S-06-080902	T4-PI-S-06-080902-FD	T4-PI-S-06-080908	T4-PI-S-06-080912
Chemical Parameter																									
Metals (mg/kg)																									
Cadmium	0.621	0.558	0.681	0.506	ND>0.126	0.0907	0.0701	0.101	ND>0.121	0.0914	0.11	0.0811	0.783	0.806	0.994	0.878	0.458	0.4	0.639	0.429	0.664	0.545	0.486	0.562	0.730
Lead	23	17.9	44.7	21.9	2.7	2.63	2.35	2.46	2.46	2.36	4.14	2.56	39.9	20.6	17.3	16.9	36.2	41.7	53.2	82.3	82.8	69.6	69.6	58.9	114.0
Zinc	110	103	170	118	34.6	36.6	35.1	34.7	32.6	35.6	33.8	35	100	101	105	99.6	111	112	147	121	172	179	179	159	264
Semivolatile Organic Compounds (µg/kg)																									
PAHs (µg/kg)																									
Naphthalene	ND>248	ND>253	ND>171	ND>67.9	ND>6.77	ND>8.77	ND>6.69	ND>6.74	ND>8.41	ND>7.95	ND>6.54	ND>6.68	ND>41.8	ND>186	ND>134	ND>67.0	ND>363	ND>367	ND>337	ND>133	ND>350	ND>411	ND>421	ND>66.1	ND>328
Acenaphthylene	ND>248	ND>253	ND>171	ND>67.9	ND>6.77	ND>8.77	ND>6.69	ND>6.74	ND>8.41	ND>7.95	ND>6.54	ND>6.68	ND>41.8	ND>186	ND>134	ND>67.0	ND>363	ND>367	ND>337	ND>133	ND>350	ND>411	ND>421	ND>66.1	ND>328
Acenaphthene	ND>248	ND>253	ND>171	ND>67.9	ND>6.77	ND>8.77	ND>6.69	ND>6.74	ND>8.41	ND>7.95	ND>6.54	ND>6.68	ND>41.8	ND>186	ND>134	ND>67.0	ND>363	ND>367	ND>337	ND>133	ND>350	ND>411	ND>421	ND>66.1	ND>328
Fluorene	ND>248	ND>253	ND>171	ND>67.9	ND>6.77	ND>8.77	ND>6.69	ND>6.74	ND>8.41	ND>7.95	ND>6.54	ND>6.68	ND>41.8	ND>186	ND>134	ND>67.0	ND>363	ND>367	ND>337	ND>133	ND>350	ND>411	ND>421	ND>66.1	ND>328
Phenanthrene	ND>248	257	317	100	ND>6.77	ND>8.77	ND>6.69	ND>6.74	ND>8.41	ND>7.95	ND>6.54	ND>6.68	200	ND>186	161	123	1650	1660	1040	861	ND>350	ND>411	ND>421	132	ND>328
Anthracene	ND>248	ND>253	ND>171	ND>67.9	ND>6.77	ND>8.77	ND>6.69	ND>6.74	ND>8.41	ND>7.95	ND>6.54	ND>6.68	ND>41.8	ND>186	ND>134	ND>67.0	ND>363	ND>367	ND>337	187	ND>350	ND>411	ND>421	ND>66.1	ND>328
2-Methylnaphthalene	ND>248	ND>253	ND>171	ND>67.9	ND>6.77	ND>8.77	ND>6.69	9.51	ND>8.41	ND>7.95	ND>6.54	ND>6.68	ND>41.8	ND>186	ND>134	ND>67.0	ND>363	ND>367	ND>337	ND>133	ND>350	ND>411	ND>421	ND>66.1	ND>328
1-Methylnaphthalene	ND>248	ND>253	ND>171	ND>67.9	ND>6.77	ND>8.77	ND>6.69	ND>6.74	ND>8.41	ND>7.95	ND>6.54	ND>6.68	ND>41.8	ND>186	ND>134	ND>67.0	ND>363	ND>367	ND>337	ND>133	ND>350	ND>411	ND>421	ND>66.1	ND>328
Fluoranthene	766	880	1170	389	ND>6.77	ND>8.77	13.3	6.75	ND>8.41	ND>7.95	ND>6.54	ND>6.68	744	623	666	482	4690	3970	2580	2380	949	741	1070	516	ND>328
Pyrene	755	892	1070	390	ND>6.77	ND>8.77	9.56	ND>6.74	ND>8.41	ND>7.95	ND>6.54	ND>6.68	681	584	597	453	4010	3350	2160	2000	853	680	1000	454	ND>328
Benzo(a)anthracene	432	508	661	211	ND>6.77	ND>8.77	ND>6.69	ND>6.74	ND>8.41	ND>7.95	ND>6.54	ND>6.68	404	347	357	251	2190	1790	1290	1080	528	489	663	289	ND>328
Chrysene	678	753	850	328	ND>6.77	ND>8.77	12.9	ND>6.74	ND>8.41	ND>7.95	ND>6.54	ND>6.68	523	464	480	341	2710	2080	1380	1260	711	468	801	368	ND>328
Benzo(b+k)fluoranthene	1570	1950	1980	897	ND>6.77	ND>8.77		ND>6.74	ND>8.41	ND>7.95	ND>6.54	ND>6.68	1160	1010	1020	790	5040	3900	2720	2550	1380	1070	1720	804	ND>328
Benzo(b)fluoranthene							8.15																		
Benzo(k)fluoranthene							ND>6.69																		
Benzo(a)pyrene	759	802	895	334	ND>6.77	ND>8.77	ND>6.69	ND>6.74	ND>8.41	ND>7.95	ND>6.54	ND>6.68	590	507	476	381	2670	2070	1390	1280	798	532	884	349	ND>328
Indeno(1,2,3-cd)pyrene	544	712	784	354	ND>6.77	ND>8.77	ND>6.69	ND>6.74	ND>8.41	ND>7.95	ND>6.54	ND>6.68	358	408	424	327	1910	1410	987	949	558	432	665	244	ND>328
Dibenz(a,h)anthracene	ND>248	ND>253	ND>171	69.4	ND>6.77	ND>8.77	ND>6.69	ND>6.74	ND>8.41	ND>7.95	ND>6.54	ND>6.68	88.1	ND>186	ND>134	ND>67.0	557	ND>367	ND>337	201	ND>350	ND>411		ND>66.1	ND>328
Benzo(g,h,i)perylene	507	778	508	423	ND>6.77	ND>8.77	ND>6.69	ND>6.74	ND>8.41	ND>7.95	ND>6.54	ND>6.68	305	451	337	419	1710	1400	603	1100	532	438	667	172	ND>328
Phthalates (µg/kg)																									
Dimethyl phthalate	ND>739	ND>754	ND>511	ND>203	ND>20.2	ND>26.2	ND>20.0	ND>20.1	ND>25.1	ND>23.7	ND>19.5	ND>20.0	ND>125	ND>556	562 (B)	ND>200	ND>1080	ND>1090	ND>1000	ND>397	ND>1040	ND>1230	ND>1260	ND>197	ND>981
Diethyl phthalate	ND>739	ND>754	ND>511	ND>203	ND>20.2	ND>26.2	ND>20.0	ND>20.1	ND>25.1	ND>23.7	ND>19.5	ND>20.0	ND>125	ND>556	ND>400	ND>200	ND>1080	ND>1090	ND>1000	ND>397	ND>1040	ND>1230	ND>1260	ND>197	ND>981
Di-n-butyl phthalate	ND>739	ND>754	ND>511	ND>203	ND>20.2	ND>26.2	20.7 (B)	22.1 (B)	ND>25.1	ND>23.7	25.0 (B)	26.9 (B)	ND>125	ND>556	ND>400	ND>200	ND>1080	ND>1090	ND>1000(B)	ND>397	ND>1040	ND>1230	ND>1260	ND>197 (B)	ND>981
Butyl benzyl phthalate	ND>739	ND>754	ND>511	ND>203	ND>20.2	39.1	24.8 (B)	ND>20.1	ND>25.1	29.1	25.5 (B)	ND>20.0	ND>125	ND>556	ND>400 (B)	ND>200	ND>1080	ND>1090	ND>1000(B)	ND>397	ND>1040	ND>1230	ND>1260	ND>197 (B)	ND>981
Bis(2-ethylhexyl)phthalate	ND>739	ND>754	ND>511	ND>203	21.5	194	ND>20.0	60.9 (B)	ND>25.1	41.7	20.1 (B)	52.7 (B)	211	ND>556	ND>400	ND>200	ND>1080	ND>1090	ND>1000(B)	ND>397	ND>1040	ND>1230	ND>1260	480 (B)	ND>981
Di-n-octyl phthalate	ND>739	ND>754	ND>511	ND>203	ND>20.2	ND>26.2	ND>20.0	ND>20.1	ND>25.1	ND>23.7	ND>19.5	ND>20.0	ND>125	ND>556	ND>400	ND>200	ND>1080	ND>1090	ND>1000	ND>397	ND>1040	ND>1230	ND>1260	ND>197	ND>981
TPH (mg/kg)																									
Diesel-range petroleum hydrocarbons	24.9	32	59.3	ND>20.0	ND>4.09	ND>4.35	ND>4.02	ND>3.96	ND>4.01	ND>4.90	ND>3.99	ND>3.93	13.4	28.5	43.9	ND>19.7	30.3	ND>42.3	ND>20.2	ND>40.2	ND>44.7	ND>43.2	ND>54.3	ND>39.9	ND>39.4
Heavy oil-range petroleum hydrocarbons	200	338	463	101	ND>8.19	ND>8.70	ND>8.05	ND>7.93	ND>8.01	ND>9.79	ND>7.99	ND>7.85	151	370	379	186	265	697	363	201	506	679	743	913	547

Table 17
Batch Discharge Water Sample Results Compared to Discharge Criteria

Parameter	City Discharge Limit (mg/L)	Screening Values (mg/L)	Prohibited Discharge (> MDL)[1]		Lash Barge Hold #							
					1		2		3		4	
				Sample Date	9/8/2008	9/6/2008	9/3/2008	9/2/2008	9/8/2008	9/6/2008	9/3/2008	9/2/2008
				Organization	BES	HME	BES	HME	BES	HME	BES	HME
				TSS Trigger[2]								
Conventionals (mg/L)												
Ammonia-Nitrogen				--	**3.49**	**2.1**	**5.82**	**3.5**	**4.24**	**3.36**	**3.20**	**5.6**
Sulfide (total)				--	--	**0.146**	--	**0.104**	--	**0.0785**	--	**0.102**
Total suspended solids				350	**18**	**349**	**55**	**253**	**30**	**308**	**78**	**270**
Total Metals (mg/L)												
Arsenic	0.2				**0.00122**	**0.00216**	0.020 U	**0.00283**	**0.00136**	**0.00147**	0.020 U	**0.00194**
Cadmium	0.7				0.0001 U	0.001 U	0.010 U	0.001 U	0.0001 U	0.001 U	0.010 U	0.001 U
Chromium	5.0				**0.00205**	**0.00362**	0.010 U	**0.00197**	**0.00293**	0.001 U	0.010 U	**0.00242**
Copper	3.7				**0.00330**	**0.00586**	0.010 U	**0.00864**	**0.00430**	0.005 U	0.010 U	**0.00779**
Lead	0.7				**0.00271**	**0.00451**	0.010 U	**0.00667**	**0.00234**	**0.00356**	**0.011**	**0.0166**
Mercury	0.010				0.000025 U	0.0001 U	0.0001 U	0.0001 U	0.000025 U	0.0001 U	**0.000011**	0.0001 U
Molybdenum	1.4				**0.00784**	**0.00766**	0.010 U	**0.00803**	**0.00541**	**0.00607**	0.010 U	**0.00601**
Nickel	2.8				**0.00297**	**0.00398**	0.010 U	**0.00314**	**0.00320**	**0.00251**	0.010 U	**0.00342**
Selenium	0.6				0.00050 U	--	0.020 U	--	0.00050 U	--	0.020 U	--
Silver	0.4				0.00010 U	0.002 U	0.010 U	0.002 U	0.00010 U	0.002 U	0.010 U	0.002 U
Zinc	3.7				**0.040**	**0.0359**	**0.023**	**0.106 J**	**0.014**	**0.0205**	**0.064**	**0.206 J**
PCBs (mg/L)												
Aroclor 1016			0.001		0.0005 U	0.001 U	0.000481 U	0.001 U	0.0005 U	0.001 U	0.000481 U	0.001 U
Aroclor 1221			0.001		0.001 U	0.001 U	0.000962 U	0.001 U	0.001 U	0.001 U	0.000962 U	0.001 U
Aroclor 1232			0.001		0.0005 U	0.001 U	0.000481 U	0.001 U	0.0005 U	0.001 U	0.000481 U	0.001 U
Aroclor 1242			0.001		0.0005 U	0.001 U	0.000481 U	0.001 U	0.0005 U	0.001 U	0.000481 U	0.001 U
Aroclor 1248			0.001		0.0005 U	0.001 U	0.000481 U	0.001 U	0.0005 U	0.001 U	0.000481 U	0.001 U
Aroclor 1254			0.001		0.0005 U	0.001 U	0.000481 U	0.001 U	0.0005 U	0.001 U	0.000481 U	0.001 U
Aroclor 1260			0.001		0.0005 U	0.001 U	0.000481 U	0.001 U	0.0005 U	0.001 U	0.000481 U	0.001 U
Organochloride Pesticides (mg/L)												
4,4'-DDD			0.001		0.0001 U	--	0.0000962 U	--	0.0001 U	--	0.0000962 U	--
4,4'-DDE			0.001		0.0001 U	--	0.0000962 U	--	0.0001 U	--	0.0000962 U	--
4,4'-DDT			0.001		0.0001 U	--	0.0000962 U	--	0.0001 U	--	0.0000962 U	--
Aldrin		0.40			0.0001 U	0.00005 U	0.0000962 U	0.00005 U	0.0001 U	0.00005 U	0.0000962 U	0.00005 U
Alpha-BHC			0.001		0.0001 U	0.00005 U	0.0000962 U	0.00005 U	0.0001 U	0.00005 U	0.0000962 U	0.00005 U
Alpha-Chlordane	0.03				0.0001 U	--	0.0000962 U	--	0.0001 U	--	0.0000962 U	--
Beta-BHC			0.001		0.0001 U	0.00005 U	0.0000962 U	0.00005 U	0.0001 U	0.00005 U	0.0000962 U	0.00005 U
Chlordane(tech)	0.03				0.005 U	--	0.00481 U	--	0.005 U	--	0.00481 U	--
Chlordane	0.03				--	0.0005 U	--	0.0005 U	--	0.0005 U	--	0.0005 U
Delta-BHC			0.001		0.0001 U	0.00005 U	0.0000962 U	0.00005 U	0.0001 U	0.00005 U	0.0000962 U	0.00005 U
Dieldrin			0.001		0.0001 U	0.00005 U	0.0000962 U	0.00005 U	0.0001 U	0.00005 U	0.0000962 U	0.00005 U
Endosulfan I			0.001		0.0001 U	0.00005 U	0.0000962 U	0.00005 U	0.0001 U	0.00005 U	0.0000962 U	0.00005 U
Endosulfan II			0.001		0.0001 U	0.00005 U	0.0000962 U	0.00005 U	0.0001 U	0.00005 U	0.0000962 U	0.00005 U
Endosulfan Sulfate			0.001		0.0001 U	0.00005 U	0.0000962 U	0.00005 U	0.0001 U	0.00005 U	0.0000962 U	0.00005 U
Endrin			0.001		0.0001 U	0.00005 U	0.0000962 U	0.00005 U	0.0001 U	0.00005 U	0.0000962 U	0.00005 U
Endrin Aldehyde			0.001		0.0001 U	0.00005 U	0.0000962 U	0.00005 U	0.0001 U	0.00005 U	0.0000962 U	0.00005 U
Gamma-BHC(Lindane)			0.001		0.0001 U	0.00005 U	0.0000962 U	0.00005 U	0.0001 U	0.00005 U	0.0000962 U	0.00005 U
Gamma-Chlordane	0.03				0.0001 U	--	0.0000962 U	--	0.0001 U	--	0.0000962 U	--
Heptachlor			0.001		0.0001 U	0.00005 U	0.0000962 U	0.00005 U	0.0001 U	0.00005 U	0.0000962 U	0.00005 U
Heptachlor Epoxide			0.001		0.0001 U	0.00005 U	0.0000962 U	0.00005 U	0.0001 U	0.00005 U	0.0000962 U	0.00005 U
Methoxychlor					0.0001 U	--	0.0000962 U	--	0.0001 U	--	0.0000962 U	--
Toxaphene			0.001		0.005 U	--	0.00481 U	--	0.005 U	--	0.00481 U	--

Table 17
Batch Discharge Water Sample Results Compared to Discharge Criteria

Parameter	City Discharge Limit (mg/L)	Screening Values (mg/L)	Prohibited Discharge (> MDL)[1]		Lash Barge Hold #							
					1		2		3		4	
				Sample Date	9/8/2008	9/6/2008	9/3/2008	9/2/2008	9/8/2008	9/6/2008	9/3/2008	9/2/2008
				Organization	BES	HME	BES	HME	BES	HME	BES	HME
				TSS Trigger[2]								
VOCs (mg/L)												
1,1,1,2- Tetrachloroethane			0.01		0.0025 U	--	0.0025 U	--	0.0025 U	--	0.0025 U	--
1,1,1-Trichloroethane		1.6			0.0025 U	--	0.0025 U	--	0.0025 U	--	0.0025 U	--
1,1,2,2-Tetrachloroethane		0.40			0.0025 U	--	0.0025 U	--	0.0025 U	--	0.0025 U	--
1,1,2-Trichloroethane			0.005		0.0025 U	--	0.0025 U	--	0.0025 U	--	0.0025 U	--
1,2,4-Trichlorobenzene			0.005			0.005 U		0.005 U		0.005 U		0.005 U
1,1-Dichloroethane		2.3			0.0025 U	--	0.0025 U	--	0.0025 U	--	0.0025 U	--
1,1-Dichloroethene			0.005		0.0025 U	--	0.0025 U	--	0.0025 U	--	0.0025 U	--
1,2-Dichlorobenzene			0.005		0.0025 U	0.0005 U	0.0025 U	0.0005 U	0.0025 U	0.0005 U	0.0025 U	0.0005 U
1,2-Dichloroethane	0.50				0.0025 U	--	0.0025 U	--	0.0025 U	--	0.0025 U	--
1,2-Dichloropropane		3.60			0.0025 U	--	0.0025 U	--	0.0025 U	--	0.0025 U	--
1,3-Dichlorobenzene			0.005		0.0025 U	0.0005 U	0.0025 U	0.0005 U	0.0025 U	0.0005 U	0.0025 U	0.0005 U
1,4-Dichlorobenzene			0.005		0.0025 U	0.0005 U	0.0025 U	0.0005 U	0.0025 U	0.0005 U	0.0025 U	0.0005 U
2-Chloroethylvinyl ether					0.025 U	--	0.025 U	--	0.025 U	--	0.025 U	--
Acrolein			0.1		0.01 U	--	0.01 U	--	0.01 U	--	0.01 U	--
Acrylonitrile			1		0.01 U	--	0.01 U	--	0.01 U	--	0.01 U	--
Benzene		0.14			0.0025 U	0.00025 U	0.0025 U	0.00025 U	0.0025 U	0.00025 U	0.0025 U	0.00025 U
Bromodichloromethane			0.005		0.0025 U	--	0.0025 U	--	0.0025 U	--	0.0025 U	--
Bromoform			0.005		0.0025 U	--	0.0025 U	--	0.0025 U	--	0.0025 U	--
Bromomethane			0.01		0.005 U	--	0.005 U	--	0.005 U	--	0.005 U	--
Carbon tetrachloride		0.03			0.0025 U	--	0.0025 U	--	0.0025 U	--	0.0025 U	--
Chlorobenzene	0.2				0.0025 U	--	0.0025 U	--	0.0025 U	--	0.0025 U	--
Chloroethane			0.05		0.0025 U	--	0.0025 U	--	0.0025 U	--	0.0025 U	--
Chloroform	0.2				0.0025 U	--	0.0025 U	--	0.0025 U	--	0.0025 U	--
Chloromethane			0.005		0.005 U	--	0.005 U	--	0.005 U	--	0.005 U	--
cis-1,3-Dichloropropene					0.0025 U	--	0.0025 U	--	0.0025 U	--	0.0025 U	--
Dibromochloromethane			0.005		0.0025 U	--	0.0025 U	--	0.0025 U	--	0.0025 U	--
Ethylbenzene		1.6			0.0025 U	0.0005 U	0.0025 U	0.0005 U	0.0025 U	0.0005 U	0.0025 U	0.0005 U
Hexachlorobutadiene			0.005			0.005 UJ		0.005 U		0.005 U		0.005 U
m,p- Xylene					0.005 U	--	0.005 U	--	0.005 U	--	0.005 U	--
Methylene Chloride		2.10			0.005 U	--	0.005 U	--	0.005 U	--	0.005 U	--
Naphthalene		2.70				0.005 UJ		0.005 UJ		0.005 UJ		0.005 UJ
o- Xylene					0.0025 U	--	0.0025 U	--	0.0025 U	--	0.0025 U	--
Tetrachloroethene		0.30			0.0025 U	0.0005 U	0.0025 U	0.0005 U	0.0025 U	0.0005 U	0.0025 U	0.0005 U
Toluene		1.40			0.0025 U	0.001 U	0.0025 U	0.001 U	0.0025 U	0.001 U	0.0025 U	0.001 U
Trans-1,2-Dichloroethene		0.30			0.0025 U	--	0.0025 U	--	0.0025 U	--	0.0025 U	--
Trans-1,3-Dichloropropene		0.10			0.0025 U	--	0.0025 U	--	0.0025 U	--	0.0025 U	--
Trichloroethene	0.20				0.0025 U	0.0005 U	0.0025 U	0.0005 U	0.0025 U	0.0005 U	0.0025 U	0.0005 U
Trichlorofluoromethane					0.0025 U	--	0.0025 U	--	0.0025 U	--	0.0025 U	--
Vinyl chloride			0.05		0.0025 U	--	0.0025 U	--	0.0025 U	--	0.0025 U	--

Table 17
Batch Discharge Water Sample Results Compared to Discharge Criteria

Parameter	City Discharge Limit (mg/L)	Screening Values (mg/L)	Prohibited Discharge (> MDL)[1]		Lash Barge Hold #							
					1		2		3		4	
				Sample Date	9/8/2008	9/6/2008	9/3/2008	9/2/2008	9/8/2008	9/6/2008	9/3/2008	9/2/2008
				Organization	BES	HME	BES	HME	BES	HME	BES	HME
				TSS Trigger[2]								
SVOCs (mg/L)												
1,2,4-Trichlorobenzene			0.005		0.005 U	--	0.00481 U	--	0.005 U	--	0.0049 U	--
1,2-Dichlorobenzene			0.005		0.005 U	0.005 U	0.00481 U	0.005 U	0.005 U	0.005 U	0.0049 U	0.005 U
1,3-Dichlorobenzene			0.005		0.005 U	0.005 U	0.00481 U	0.005 U	0.005 U	0.005 U	0.0049 U	0.005 U
1,4-Dichlorobenzene			0.005		0.005 U	0.005 U	0.00481 U	0.005 U	0.005 U	0.005 U	0.0049 U	0.005 U
2,4,6- Trichlorophenol		0.60			0.005 U	0.005 U	0.00481 U	0.005 U	0.005 U	0.005 U	0.0049 U	0.005 U
2,4- Dichlorophenol					0.005 U	--	0.00481 U	--	0.005 U	--	0.0049 U	--
2,4- Dimethylphenol					0.010 U	--	0.00962 U	--	0.010 U	--	0.0098 U	--
2,4- Dinitrophenol					0.025 U	--	0.0240 U	--	0.025 U	--	0.0245 U	--
2,4- Dinitrotoluene			0.13		0.005 U	0.005 U	0.00481 U	0.005 U	0.005 U	0.005 U	0.0049 U	0.005 U
2,6-Dinitrotoluene			0.005		0.005 U	0.005 U	0.00481 U	0.005 U	0.005 U	0.005 U	0.0049 U	0.005 U
2-Chloronaphthalene					0.005 U	--	0.00481 U	--	0.005 U	--	0.0049 U	--
2-Chlorophenol					0.005 U	--	0.00481 U	--	0.005 U	--	0.0049 U	--
2- Nitrophenol					0.005 U	--	0.00481 U	--	0.005 U	--	0.0049 U	--
3,3'- Dichlorobenzidine					0.005 U	--	0.00481 U	--	0.005 U	--	0.0049 U	--
4,6- Dinitro-2-methylphenol		3.50			0.010 U	--	0.00481 U	--	0.010 U	--	0.0098 U	--
4- Bromophenylphenyl ether			0.005		0.005 U	0.005 U	0.00481 U	0.005 U	0.005 U	0.005 U	0.0049 U	0.005 U
4- Chloro-3-methylphenol					0.005 U	--	0.00481 U	--	0.005 U	--	0.0049 U	--
4- Nitrophenol					0.025 U	--	0.0240 U	--	0.025 U	--	0.0245 U	--
2-Methylnaphthalene					0.005 U	--	--	--	0.005 U	--	--	--
Acenaphthene					0.005 U	--	0.00481 U	--	0.005 U	--	0.0049 U	--
Acenaphthylene					0.005 U	--	0.00481 U	--	0.005 U	--	0.0049 U	--
Anthracene					0.005 U	--	0.00481 U	--	0.005 U	--	0.0049 U	--
Azobenzene					0.005 U	--	0.00481 U	--	0.005 U	--	0.0049 U	--
Benzidine					0.060 U	--	0.0577 U	--	0.060 U	--	0.0588 U	--
Benzo(a)anthracene					0.005 U	--	0.00481 U	--	0.005 U	--	0.0049 U	--
Benzo(a)pyrene		10			0.005 U	0.0000440 U	0.00481 U	**0.0000728 J**	0.005 U	0.0000400 U	0.0049 U	0.0000444 U
Benzo(b)fluoranthene					0.005 U	--	0.00481 U	--	0.005 U	--	0.0049 U	--
Benzo(g,h,i)perylene					0.005 U	--	0.00481 U	--	0.005 U	--	0.0049 U	--
Benzo(k)fluoranthene					0.005 U	--	0.00481 U	--	0.005 U	--	0.0049 U	--
Benzyl butyl phthalate					0.005 U	--	0.00481 U	--	0.005 U	--	0.0049 U	--
Bis(2-chloroethoxy) methane			0.01		0.010 U	0.005 U	0.00962 U	0.005 U	0.010 U	0.005 U	0.0098 U	0.005 U
Bis(2-chloroethyl) ether					0.005 U	--	0.00481 U	--	0.005 U	--	0.0049 U	--
Bis(2-chloroisopropyl) ether			0.01		0.010 U	0.005 U	0.00962 U	0.005 U	0.010 U	0.005 U	0.0098 U	0.005 U
Bis(2-Ethylhexyl)phthalate					0.010 U	--	0.00962 U	--	0.010 U	--	0.0098 U	--
Butylbenzylphthalate					0.005 U	--	0.00481 U	--	0.005 U	--	0.0049 U	--
Chrysene		4.7			0.005 U	0.0000440 U	0.00481 U	**0.0000886**	0.005 U	0.0000400 U	0.0049 U	**0.0000550 J**
Dibenzo(a,h)anthracene					0.005 U	--	0.00481 U	--	0.005 U	--	0.0049 U	--
Diethylphthalate					0.005 U	--	0.00481 U	--	0.005 U	--	0.0049 U	--
Dimethylphthalate					0.005 U	--	0.00481 U	--	0.005 U	--	0.0049 U	--
Di-n-butylphthalate					0.005 U	--	0.00481 U	--	0.005 U	--	0.0049 U	--
Di-n-octylphthalate					0.005 U	--	0.00481 U	--	0.005 U	--	0.0049 U	--
Fluoranthene					0.005 U	--	0.00481 U	--	0.005 U	--	0.0049 U	--
Fluorene					0.005 U	--	0.00481 U	--	0.005 U	--	0.0049 U	--
Hexachlorobenzene			0.005		0.005 U	0.005 U	0.00481 U	0.005 U	0.005 U	0.005 U	0.0049 U	0.005 U
Hexachlorobutadiene			0.005		0.010 U	0.005 U	0.00962 U	0.005 U	0.010 U	0.005 U	0.0098 U	0.005 U
Hexachlorocyclopentadiene			0.005		0.010 U	0.005 U	0.00962 U	0.005 U	0.010 U	0.005 U	0.0098 U	0.005 U
Hexachloroethane		0.10			0.010 U	0.005 U	0.00962 U	0.005 U	0.010 U	0.005 U	0.0098 U	0.005 U
Indeno(1,2,3-cd)pyrene					0.005 U	--	0.00481 U	--	0.005 U	--	0.0049 U	--
Isophorone					0.005 U	--	0.00481 U	--	0.005 U	--	0.0049 U	--

Table 17
Batch Discharge Water Sample Results Compared to Discharge Criteria

Parameter	City Discharge Limit (mg/L)	Screening Values (mg/L)	Prohibited Discharge (> MDL)[1]		Lash Barge Hold # 1		2		3		4	
				Sample Date	9/8/2008	9/6/2008	9/3/2008	9/2/2008	9/8/2008	9/6/2008	9/3/2008	9/2/2008
				Organization	BES	HME	BES	HME	BES	HME	BES	HME
				TSS Trigger[2]								
Naphthalene		2.70			0.005 U	0.0000440 U	0.00481 U	0.0000444 U	0.005 U	0.0000400 U	0.0049 U	0.0000444 U
Nitrobenzene	2.00				0.005 U	0.005 U	0.00481 U	0.005 U	0.005 U	0.005 U	0.0049 U	0.005 U
N-Nitrosodimethylamine					0.005 U	--	0.00481 U	--	0.005 U	--	0.0049 U	--
N-Nitroso-di-n-propylamine			0.005		0.010 U	0.005 U	0.00962 U	0.005 U	0.010 U	0.005 U	0.0098 U	0.005 U
N-Nitrosodiphenylamine					0.005 U	--	0.00481 U	--	0.005 U	--	0.0049 U	--
Pentachlorophenol	0.04				0.010 U	0.025 U	0.00962 U	0.025 U	0.010 U	0.025 U	0.0098 U	0.025 U
Phenanthrene					0.005 U	--	0.00481 U	--	0.005 U	--	0.0049 U	--
Phenol					0.005 U	--	0.00481 U	--	0.005 U	--	0.0049 U	--
Pyrene					0.005 U	--	0.00481 U	--	0.005 U	--	0.0049 U	--

Notes:
Bold = Detected result
-- indicates compound not analyzed
J = Estimated value
U = Compound analyzed, but not detected above detection limit
UJ = Compound analyzed, but not detected above estimated detection limit
1 Values assumed to be mg/L.
2 If exceeded, value at which discharge costs are incurred.
[green box] Reporting limit exceeds screening level however, screening level based on MDL.

HME data validated, BES data unvalidated.

Table 18
Summary Statistics of Water Quality Monitoring Data at Background and Compliance Stations

	Back-ground	Acute WQC	Acute Guidance Value	Minimum	Median	Maximum	Count Detects	Count Results	Percent Detected
BACKGROUND STATION									
Dissolved Metals (µg/L)									
Cadmium	<1	0.5	--	0.1	0.1	0.5	0	17	0.0
Lead	13.3	14	--	0.5	0.5	0.5	0	17	0.0
Zinc	38	36	--	6.3	8.8	13.5	17	17	100.0
Total Aromatic Hydrocarbons (µg/L)									
Acenaphthene	--	--	233	0.019	0.019	0.020	0	18	0.0
Acenaphthylene	--	--	1,277	0.019	0.019	0.020	0	18	0.0
Anthracene	--	--	87	0.019	0.019	0.020	0	18	0.0
Benzo(a)anthracene	--	--	9.2	0.019	0.019	0.020	0	18	0.0
Benzo(a)pyrene	--	--	4.0	0.019	0.019	0.020	0	18	0.0
Benzo(b)fluoranthene	--	--	2.8	0.019	0.019	0.020	0	18	0.0
Benzo(g,h,i)perylene	--	--	1.8	0.019	0.019	0.020	0	18	0.0
Benzo(k)fluoranthene	--	--	2.7	0.019	0.019	0.020	0	18	0.0
Chrysene	--	--	8.3	0.019	0.019	0.020	0	18	0.0
Dibenzo(a,h)anthracene	--	--	1.2	0.019	0.019	0.020	0	18	0.0
Fluoranthene	--	--	30	0.019	0.019	0.020	0	18	0.0
Fluorene	--	--	162	0.019	0.019	0.020	0	18	0.0
Indeno(1,2,3-c,d)pyrene	--	--	1.2	0.019	0.019	0.020	0	18	0.0
Naphthalene	--	--	807	0.019	0.019	0.020	0	18	0.0
Phenanthrene	--	--	79	0.019	0.019	0.020	0	18	0.0
Pyrene	--	--	42	0.019	0.019	0.020	0	18	0.0
COMPLIANCE STATION									
Dissolved Metals (µg/L)									
Cadmium	<1	0.5	--	0.1	0.1	0.5	1	55	1.8
Lead	13.3	14	--	0.5	0.5	1.7	1	55	1.8
Zinc	38	36	--	5.4	8.4	13.2	55	55	100.0
Total Aromatic Hydrocarbons (µg/L)									
Acenaphthene	--	--	233	0.019	0.019	0.023	0	58	0.0
Acenaphthylene	--	--	1,277	0.019	0.019	0.023	0	58	0.0
Anthracene	--	--	87	0.019	0.019	0.023	0	58	0.0
Benzo(a)anthracene	--	--	9.2	0.019	0.019	0.114	5	58	8.6
Benzo(a)pyrene	--	--	4.0	0.019	0.019	0.152	5	58	8.6
Benzo(b)fluoranthene	--	--	2.8	0.019	0.019	0.250	5	58	8.6
Benzo(g,h,i)perylene	--	--	1.8	0.019	0.019	0.117	5	58	8.6
Benzo(k)fluoranthene	--	--	2.7	0.019	0.019	0.250	5	58	8.6
Chrysene	--	--	8.3	0.019	0.019	0.122	6	58	10.3
Dibenzo(a,h)anthracene	--	--	1.2	0.019	0.019	0.023	0	58	0.0
Fluoranthene	--	--	30	0.019	0.019	0.194	11	58	19.0
Fluorene	--	--	162	0.019	0.019	0.023	0	58	0.0
Indeno(1,2,3-c,d)pyrene	--	--	1.2	0.019	0.019	0.123	6	58	10.3
Naphthalene	--	--	807	0.019	0.019	0.023	0	58	0.0
Phenanthrene	--	--	79	0.019	0.019	0.084	4	58	6.9
Pyrene	--	--	42	0.019	0.019	0.180	12	58	20.7

Note:

Statistics are based on one-half reporting limit values for undetected results.

Table 19
Compliance Monitoring Data for PAHs Compared to Model Predicted Concentrations

Sample ID	Sample Date	Analyte	Background Value	Modeled Value	Detected Concentration	% Difference between Modeled and Detected Value
T4-S3A-MC-080818	8/18/08	Benzo(a)anthracene	<.1 U	0.035	0.061	75
T4-S3A-NC-WS-080820	8/20/08	Benzo(a)anthracene	<.1 U	0.035	0.049	39
T4-S3A-NB-WS-080821	8/21/08	Benzo(a)anthracene	<.1 U	0.035	0.056	61
T4-S3A-NC-WS-080821	8/21/08	Benzo(a)anthracene	<.1 U	0.035	0.114	226
T4-S3A-MC-080823	8/23/08	Benzo(a)anthracene	<.1 U	0.035	0.054	54
T4-S3A-MC-080818	8/18/08	Benzo(a)pyrene	<.1 U	0.038	0.070	84
T4-S3A-NC-WS-080820	8/20/08	Benzo(a)pyrene	<.1 U	0.038	0.053	40
T4-S3A-NB-WS-080821	8/21/08	Benzo(a)pyrene	<.1 U	0.038	0.065	71
T4-S3A-NC-WS-080821	8/21/08	Benzo(a)pyrene	<.1 U	0.038	0.152	300
T4-S3A-MC-080823	8/23/08	Benzo(a)pyrene	<.1 U	0.038	0.056	48
T4-S3A-MC-080818	8/18/08	Benzo(g,h,i)perylene	<.1 U	0.024	0.056	134
T4-S3A-NC-WS-080820	8/20/08	Benzo(g,h,i)perylene	<.1 U	0.024	0.042	76
T4-S3A-NB-WS-080821	8/21/08	Benzo(g,h,i)perylene	<.1 U	0.024	0.052	117
T4-S3A-NC-WS-080821	8/21/08	Benzo(g,h,i)perylene	<.1 U	0.024	0.117	388
T4-S3A-MC-080823	8/23/08	Benzo(g,h,i)perylene	<.1 U	0.024	0.042	75
T4-S3A-MC-080818	8/18/08	Chrysene	<.1 U	0.034	0.064	87
T4-S3A-N04C-080819	8/19/08	Chrysene	<.1 U	0.034	0.039	15
T4-S3A-NC-WS-080820	8/20/08	Chrysene	<.1 U	0.034	0.051	50
T4-S3A-NB-WS-080821	8/21/08	Chrysene	<.1 U	0.034	0.058	70
T4-S3A-NC-WS-080821	8/21/08	Chrysene	<.1 U	0.034	0.122	259
T4-S3A-MC-080823	8/23/08	Chrysene	<.1 U	0.034	0.050	47
T4-S3C-MC-080813	8/13/08	Fluoranthene	<.1 U	0.053	0.056	5
T4-S3A-MC-080818	8/18/08	Fluoranthene	<.1 U	0.053	0.107	102
T4-S3A-N04C-080819	8/19/08	Fluoranthene	<.1 U	0.053	0.069	30
T4-S3A-NC-WS-080820	8/20/08	Fluoranthene	<.1 U	0.053	0.091	72
T4-S3A-NB-WS-080821	8/21/08	Fluoranthene	<.1 U	0.053	0.098	84
T4-S3A-NC-WS-080821	8/21/08	Fluoranthene	<.1 U	0.053	0.194	266
T4-S3A-MC-080823	8/23/08	Fluoranthene	<.1 U	0.053	0.086	62
T4-S3A-MC-080818	8/18/08	Indeno(1,2,3-c,d)pyrene	<.1 U	0.038	0.066	73
T4-S3A-N04C-080819	8/19/08	Indeno(1,2,3-c,d)pyrene	<.1 U	0.038	0.041	8
T4-S3A-NC-WS-080820	8/20/08	Indeno(1,2,3-c,d)pyrene	<.1 U	0.038	0.053	39
T4-S3A-NB-WS-080821	8/21/08	Indeno(1,2,3-c,d)pyrene	<.1 U	0.038	0.062	63
T4-S3A-NC-WS-080821	8/21/08	Indeno(1,2,3-c,d)pyrene	<.1 U	0.038	0.123	224
T4-S3A-MC-080823	8/23/08	Indeno(1,2,3-c,d)pyrene	<.1 U	0.038	0.055	44
T4-S3A-MC-080818	8/18/08	Phenanthrene	<.1 U	0.026	0.050	90
T4-S3A-NC-WS-080820	8/20/08	Phenanthrene	<.1 U	0.026	0.044	68
T4-S3A-NB-WS-080821	8/21/08	Phenanthrene	<.1 U	0.026	0.043	66
T4-S3A-NC-WS-080821	8/21/08	Phenanthrene	<.1 U	0.026	0.084	222
T4-S3C-MC-080813	8/13/08	Pyrene	<.1 U	0.044	0.060	37
T4-S3C-MC-080813-D	8/13/08	Pyrene	<.1 U	0.044	0.047	8
T4-S3C-MC-080814	8/14/08	Pyrene	<.1 U	0.044	0.056	28
T4-S3A-MC-080818	8/18/08	Pyrene	<.1 U	0.044	0.103	134
T4-S3A-N04C-080819	8/19/08	Pyrene	<.1 U	0.044	0.068	55
T4-S3A-NB-WS-080820	8/20/08	Pyrene	<.1 U	0.044	0.045	2
T4-S3A-NC-WS-080820	8/20/08	Pyrene	<.1 U	0.044	0.086	95
T4-S3A-NA-WS-080821	8/21/08	Pyrene	<.1 U	0.044	0.047	7
T4-S3A-NB-WS-080821	8/21/08	Pyrene	<.1 U	0.044	0.094	115
T4-S3A-NC-WS-080821	8/21/08	Pyrene	<.1 U	0.044	0.180	309
T4-S3A-MC-080823	8/23/08	Pyrene	<.1 U	0.044	0.084	91

Table 20
Batch Water Discharge Sampling Results Compared to Acute Water Quality Standards

Parameter	Acute Water Quality Value	Background Water Quality Value for Metals	Lash Barge Hold #							
			1		2		3		4	
			9/8/2008	9/6/2008	9/3/2008	9/2/2008	9/8/2008	9/6/2008	9/3/2008	9/2/2008
			BES	HME	BES	HME	BES	HME	BES	HME
Conventionals (mg/L)										
Ammonia-Nitrogen			**3.49**	**2.1**	**5.82**	**3.5**	**4.24**	**3.36**	**3.20**	**5.6**
Sulfide (total)			--	**0.146**	--	**0.104**	--	**0.0785**	--	**0.102**
Total suspended solids			**18**	**349**	**55**	**253**	**30**	**308**	**78**	**270**
Total Metals (µg/L)										
Arsenic	340	2	**1.22**	**2.16**	20 U	**2.83**	**1.36**	**1.47**	20 U	**1.94**
Cadmium	0.5	<1	0.1 U	1 U	10 U	1 U	0.1 U	1 U	10 U	1 U
Chromium	183	1	**2.05**	**3.62**	10 U	**1.97**	**2.93**	1 U	10 U	**2.42**
Copper	3.6	9	**3.3**	**5.86**	10 U	**8.64**	**4.3**	5 U	10 U	**7.79**
Lead	14	13.3	**2.71**	**4.51**	10 U	**6.67**	**2.34**	**3.56**	**11**	**16.6**
Mercury	1.4	<0.1	0.025 U	0.1 U	0.1 U	0.1 U	0.025 U	0.1 U	**0.011**	0.1 U
Molybdenum			**7.84**	**7.66**	10 U	**8.03**	**5.41**	**6.07**	10 U	**6.01**
Nickel	145	5.5	**2.97**	**3.98**	10 U	**3.14**	**3.2**	**2.51**	10 U	**3.42**
Selenium		0.2	0.5 U	--	20 U	--	0.5 U	--	20 U	--
Silver	0.3	<1	0.1 U	2 U	10 U	2 U	0.1 U	2 U	10 U	2 U
Zinc	36	38	**40**	**35.9**	**23**	**106 J**	**14.1**	**20.5**	**64**	**206 J**
PCBs (µg/L)										
Aroclor 1016			0.5 U	1 U	0.481 U	1 U	0.5 U	1 U	0.481 U	1 U
Aroclor 1221			1 U	1 U	0.962 U	1 U	1 U	1 U	0.962 U	1 U
Aroclor 1232			0.5 U	1 U	0.481 U	1 U	0.5 U	1 U	0.481 U	1 U
Aroclor 1242			0.5 U	1 U	0.481 U	1 U	0.5 U	1 U	0.481 U	1 U
Aroclor 1248			0.5 U	1 U	0.481 U	1 U	0.5 U	1 U	0.481 U	1 U
Aroclor 1254			0.5 U	1 U	0.481 U	1 U	0.5 U	1 U	0.481 U	1 U
Aroclor 1260			0.5 U	1 U	0.481 U	1 U	0.5 U	1 U	0.481 U	1 U
Organochloride Pesticides (µg/L)										
4,4'-DDD			0.1 U	--	0.0962 U	--	0.1 U	--	0.0962 U	--
4,4'-DDE			0.1 U	--	0.0962 U	--	0.1 U	--	0.0962 U	--
4,4'-DDT	1.1		0.1 U	--	0.0962 U	--	0.1 U	--	0.0962 U	--
Aldrin	3		0.1 U	0.05 U	0.0962 U	0.05 U	0.1 U	0.05 U	0.0962 U	0.05 U
Alpha-BHC			0.1 U	0.05 U	0.0962 U	0.05 U	0.1 U	0.05 U	0.0962 U	0.05 U
Alpha-Chlordane			0.1 U	--	0.0962 U	--	0.1 U	--	0.0962 U	--
Beta-BHC			0.1 U	0.05 U	0.0962 U	0.05 U	0.1 U	0.05 U	0.0962 U	0.05 U
Chlordane(tech)			5 U	--	4.81 U	--	5 U	--	4.81 U	--
Chlordane	2.4		--	0.5 U	--	0.5 U	--	0.5 U	--	0.5 U
Delta-BHC			0.1 U	0.05 U	0.0962 U	0.05 U	0.1 U	0.05 U	0.0962 U	0.05 U
Dieldrin	0.24		0.1 U	0.05 U	0.0962 U	0.05 U	0.1 U	0.05 U	0.0962 U	0.05 U
Endosulfan I (alpha)	0.22		0.1 U	0.05 U	0.0962 U	0.05 U	0.1 U	0.05 U	0.0962 U	0.05 U
Endosulfan II (beta)	0.22		0.1 U	0.05 U	0.0962 U	0.05 U	0.1 U	0.05 U	0.0962 U	0.05 U
Endosulfan Sulfate			0.1 U	0.05 U	0.0962 U	0.05 U	0.1 U	0.05 U	0.0962 U	0.05 U
Endrin	0.086		0.1 U	0.05 U	0.0962 U	0.05 U	0.1 U	0.05 U	0.0962 U	0.05 U
Endrin Aldehyde			0.1 U	0.05 U	0.0962 U	0.05 U	0.1 U	0.05 U	0.0962 U	0.05 U
Gamma-BHC(Lindane)	0.95		0.1 U	0.05 U	0.0962 U	0.05 U	0.1 U	0.05 U	0.0962 U	0.05 U
Gamma-Chlordane			0.1 U	--	0.0962 U	--	0.1 U	--	0.0962 U	--
Heptachlor	0.52		0.1 U	0.05 U	0.0962 U	0.05 U	0.1 U	0.05 U	0.0962 U	0.05 U
Heptachlor Epoxide	0.52		0.1 U	0.05 U	0.0962 U	0.05 U	0.1 U	0.05 U	0.0962 U	0.05 U
Methoxychlor			0.1 U	--	0.0962 U	--	0.1 U	--	0.0962 U	--
Toxaphene	0.73		5 U	--	4.81 U	--	5 U	--	4.81 U	--
VOCs (µg/L)										
1,1,1,2- Tetrachloroethane			2.5 U	--	2.5 U	--	2.5 U	--	2.5 U	--
1,1,1-Trichloroethane			2.5 U	--	2.5 U	--	2.5 U	--	2.5 U	--
1,1,2,2-Tetrachloroethane			2.5 U	--	2.5 U	--	2.5 U	--	2.5 U	--
1,1,2-Trichloroethane			2.5 U	--	2.5 U	--	2.5 U	--	2.5 U	--
1,2,4-Trichlorobenzene			0	5.00 U	0	5.00 U	0	5.00 U	0	5.00 U
1,1-Dichloroethane			2.5 U	--	2.5 U	--	2.5 U	--	2.5 U	--
1,1-Dichloroethene			2.5 U	--	2.5 U	--	2.5 U	--	2.5 U	--
1,2-Dichlorobenzene			2.5 U	0.5 U	2.5 U	0.5 U	2.5 U	0.5 U	2.5 U	0.5 U
1,2-Dichloroethane			2.5 U	--	2.5 U	--	2.5 U	--	2.5 U	--
1,2-Dichloropropane			2.5 U	--	2.5 U	--	2.5 U	--	2.5 U	--
1,3-Dichlorobenzene			2.5 U	0.5 U	2.5 U	0.5 U	2.5 U	0.5 U	2.5 U	0.5 U
1,4-Dichlorobenzene			2.5 U	0.5 U	2.5 U	0.5 U	2.5 U	0.5 U	2.5 U	0.5 U
2-Chloroethylvinyl ether			25 U	--	25 U	--	25 U	--	25 U	--
Acrolein			10 U	--	10 U	--	10 U	--	10 U	--
Acrylonitrile			10 U	--	10 U	--	10 U	--	10 U	--
Benzene			2.5 U	0.25 U	2.5 U	0.25 U	2.5 U	0.25 U	2.5 U	0.25 U
Bromodichloromethane			2.5 U	--	2.5 U	--	2.5 U	--	2.5 U	--
Bromoform			2.5 U	--	2.5 U	--	2.5 U	--	2.5 U	--
Bromomethane			5 U	--	5 U	--	5 U	--	5 U	--
Carbon tetrachloride			2.5 U	--	2.5 U	--	2.5 U	--	2.5 U	--
Chlorobenzene			2.5 U	--	2.5 U	--	2.5 U	--	2.5 U	--
Chloroethane			2.5 U	--	2.5 U	--	2.5 U	--	2.5 U	--
Chloroform			2.5 U	--	2.5 U	--	2.5 U	--	2.5 U	--
Chloromethane			5 U	--	5 U	--	5 U	--	5 U	--
cis-1,3-Dichloropropene			2.5 U	--	2.5 U	--	2.5 U	--	2.5 U	--
Dibromochloromethane			2.5 U	--	2.5 U	--	2.5 U	--	2.5 U	--
Ethylbenzene			2.5 U	0.5 U	2.5 U	0.5 U	2.5 U	0.5 U	2.5 U	0.5 U
Hexachlorobutadiene			0	5 UJ	0	5 U	0	5 U	0	5 U
m,p- Xylene			5 U	--	5 U	--	5 U	--	5 U	--
Methylene Chloride			5 U	--	5 U	--	5 U	--	5 U	--
Naphthalene	807		0	5 UJ	0	5 UJ	0	5 UJ	0	5 UJ
o- Xylene			2.5 U	--	2.5 U	--	2.5 U	--	2.5 U	--
Tetrachloroethene			2.5 U	0.5 U	2.5 U	0.5 U	2.5 U	0.5 U	2.5 U	0.5 U
Toluene			2.5 U	1 U	2.5 U	1 U	2.5 U	1 U	2.5 U	1 U
Trans-1,2-Dichloroethene			2.5 U	--	2.5 U	--	2.5 U	--	2.5 U	--
Trans-1,3-Dichloropropene			2.5 U	--	2.5 U	--	2.5 U	--	2.5 U	--
Trichloroethene			2.5 U	0.5 U	2.5 U	0.5 U	2.5 U	0.5 U	2.5 U	0.5 U
Trichlorofluoromethane			2.5 U	--	2.5 U	--	2.5 U	--	2.5 U	--
Vinyl chloride			2.5 U	--	2.5 U	--	2.5 U	--	2.5 U	--

Table 20
Batch Water Discharge Sampling Results Compared to Acute Water Quality Standards

Parameter	Acute Water Quality Value	Background Water Quality Value for Metals	Lash Barge Hold # 1		2		3		4	
			9/8/2008	9/6/2008	9/3/2008	9/2/2008	9/8/2008	9/6/2008	9/3/2008	9/2/2008
			BES	HME	BES	HME	BES	HME	BES	HME
SVOCs (µg/L)										
1,2,4-Trichlorobenzene			5 U	--	4.81 U	--	5 U	--	4.9 U	--
1,2-Dichlorobenzene			5 U	5 U	4.81 U	5 U	5 U	5 U	4.9 U	5 U
1,3-Dichlorobenzene			5 U	5 U	4.81 U	5 U	5 U	5 U	4.9 U	5 U
1,4-Dichlorobenzene			5 U	5 U	4.81 U	5 U	5 U	5 U	4.9 U	5 U
2,4,6- Trichlorophenol			5 U	5 U	4.81 U	5 U	5 U	5 U	4.9 U	5 U
2,4- Dichlorophenol			5 U	--	4.81 U	--	5 U	--	4.9 U	--
2,4- Dimethylphenol			10 U	--	9.62 U	--	10 U	--	9.8 U	--
2,4- Dinitrophenol			25 U	--	24 U	--	25 U	--	24.5 U	--
2,4- Dinitrotoluene			5 U	5 U	4.81 U	5 U	5 U	5 U	4.9 U	5 U
2,6-Dinitrotoluene			5 U	5 U	4.81 U	5 U	5 U	5 U	4.9 U	5 U
2-Chloronaphthalene			5 U	--	4.81 U	--	5 U	--	4.9 U	--
2-Chlorophenol			5 U	--	4.81 U	--	5 U	--	4.9 U	--
2- Nitrophenol			5 U	--	4.81 U	--	5 U	--	4.9 U	--
3,3'- Dichlorobenzidine			5 U	--	4.81 U	--	5 U	--	4.9 U	--
4,6- Dinitro-2-methylphenol			10 U	--	4.81 U	--	10 U	--	9.8 U	--
4- Bromophenylphenyl ether			5 U	5 U	4.81 U	5 U	5 U	5 U	4.9 U	5 U
4- Chloro-3-methylphenol			5 U	--	4.81 U	--	5 U	--	4.9 U	--
4- Nitrophenol			25 U	--	24 U	--	25 U	--	24.5 U	--
2-Methylnaphthalene	300		5 U	--	--	--	5 U	--	--	--
Acenaphthene	233		5 U	--	4.81 U	--	5 U	--	4.9 U	--
Acenaphthylene	1,277		5 U	--	4.81 U	--	5 U	--	4.9 U	--
Anthracene	87		5 U	--	4.81 U	--	5 U	--	4.9 U	--
Azobenzene			5 U	--	4.81 U	--	5 U	--	4.9 U	--
Benzidine			60 U	--	57.7 U	--	60 U	--	58.8 U	--
Benzo(a)anthracene	9.2		5 U	--	4.81 U	--	5 U	--	4.9 U	--
Benzo(a)pyrene	4		5 U	0.044 U	4.81 U	**0.0728 J**	5 U	0.04 U	4.9 U	0.0444 U
Benzo(b)fluoranthene	2.8		5 U	--	4.81 U	--	5 U	--	4.9 U	--
Benzo(g,h,i)perylene			5 U	--	4.81 U	--	5 U	--	4.9 U	--
Benzo(k)fluoranthene	2.7		5 U	--	4.81 U	--	5 U	--	4.9 U	--
Benzyl butyl phthalate			5 U	--	4.81 U	--	5 U	--	4.9 U	--
Bis(2-chloroethoxy) methane			10 U	5 U	9.62 U	5 U	10 U	5 U	9.8 U	5 U
Bis(2-chloroethyl) ether			5 U	--	4.81 U	--	5 U	--	4.9 U	--
Bis(2-chloroisopropyl) ether			10 U	5 U	9.62 U	5 U	10 U	5 U	9.8 U	5 U
Bis(2-Ethylhexyl)phthalate			10 U	--	9.62 U	--	10 U	--	9.8 U	--
Butylbenzylphthalate			5 U	--	4.81 U	--	5 U	--	4.9 U	--
Chrysene	8.3		5 U	0.044 U	4.81 U	**0.0886**	5 U	0.04 U	4.9 U	**0.055 J**
Dibenzo(a,h)anthracene			5 U	--	4.81 U	--	5 U	--	4.9 U	--
Diethylphthalate			5 U	--	4.81 U	--	5 U	--	4.9 U	--
Dimethylphthalate			5 U	--	4.81 U	--	5 U	--	4.9 U	--
Di-n-butylphthalate			5 U	--	4.81 U	--	5 U	--	4.9 U	--
Di-n-octylphthalate			5 U	--	4.81 U	--	5 U	--	4.9 U	--
Fluoranthene	30		5 U	--	4.81 U	--	5 U	--	4.9 U	--
Fluorene	162		5 U	--	4.81 U	--	5 U	--	4.9 U	--
Hexachlorobenzene			5 U	5 U	4.81 U	5 U	5 U	5 U	4.9 U	5 U
Hexachlorobutadiene			10 U	5 U	9.62 U	5 U	10 U	5 U	9.8 U	5 U
Hexachlorocyclopentadiene			10 U	5 U	9.62 U	5 U	10 U	5 U	9.8 U	5 U
Hexachloroethane			10 U	5 U	9.62 U	5 U	10 U	5 U	9.8 U	5 U
Indeno(1,2,3-cd)pyrene			5 U	--	4.81 U	--	5 U	--	4.9 U	--
Isophorone			5 U	--	4.81 U	--	5 U	--	4.9 U	--
Naphthalene			5 U	0.044 U	4.81 U	0.0444 U	5 U	0.04 U	4.9 U	0.0444 U
Nitrobenzene			5 U	5 U	4.81 U	5 U	5 U	5 U	4.9 U	5 U
N-Nitrosodimethylamine			5 U	--	4.81 U	--	5 U	--	4.9 U	--
N-Nitroso-di-n-propylamine			10 U	5 U	9.62 U	5 U	10 U	5 U	9.8 U	5 U
N-Nitrosodiphenylamine			5 U	--	4.81 U	--	5 U	--	4.9 U	--
Pentachlorophenol			10 U	25 U	9.62 U	25 U	10 U	25 U	9.8 U	25 U
Phenanthrene	79		5 U	--	4.81 U	--	5 U	--	4.9 U	--
Phenol			5 U	--	4.81 U	--	5 U	--	4.9 U	--
Pyrene	42		5 U	--	4.81 U	--	5 U	--	4.9 U	--

Notes:

Bold = Detected result

-- indicates compound not analyzed

J = Estimated value

U = Compound analyzed, but not detected above detection limit

UJ = Compound analyzed, but not detected above estimated detection limit

BES = Portland Bureau of Environmental Services

HME = Hickey Marine Enterprises

1 Acute Criteria for Pesticides obtained from USEPA National Recommended Water Quality Criteria for Freshwater CMCs at http://www.epa.gov/waterscience/criteria/wqctable/

2 Water quality criteria for cadmium, chromium, copper, lead, nickel, silver, and zinc are based on a hardness of 25 mg/L.

3 Acute water quality criteria for metals are based on dissolved metal concentrations, however reported results are based on a total metal concentrations.

(yellow) Value exceeds acute water quality criteria

HME data validated, BES data unvalidated.

FIGURES

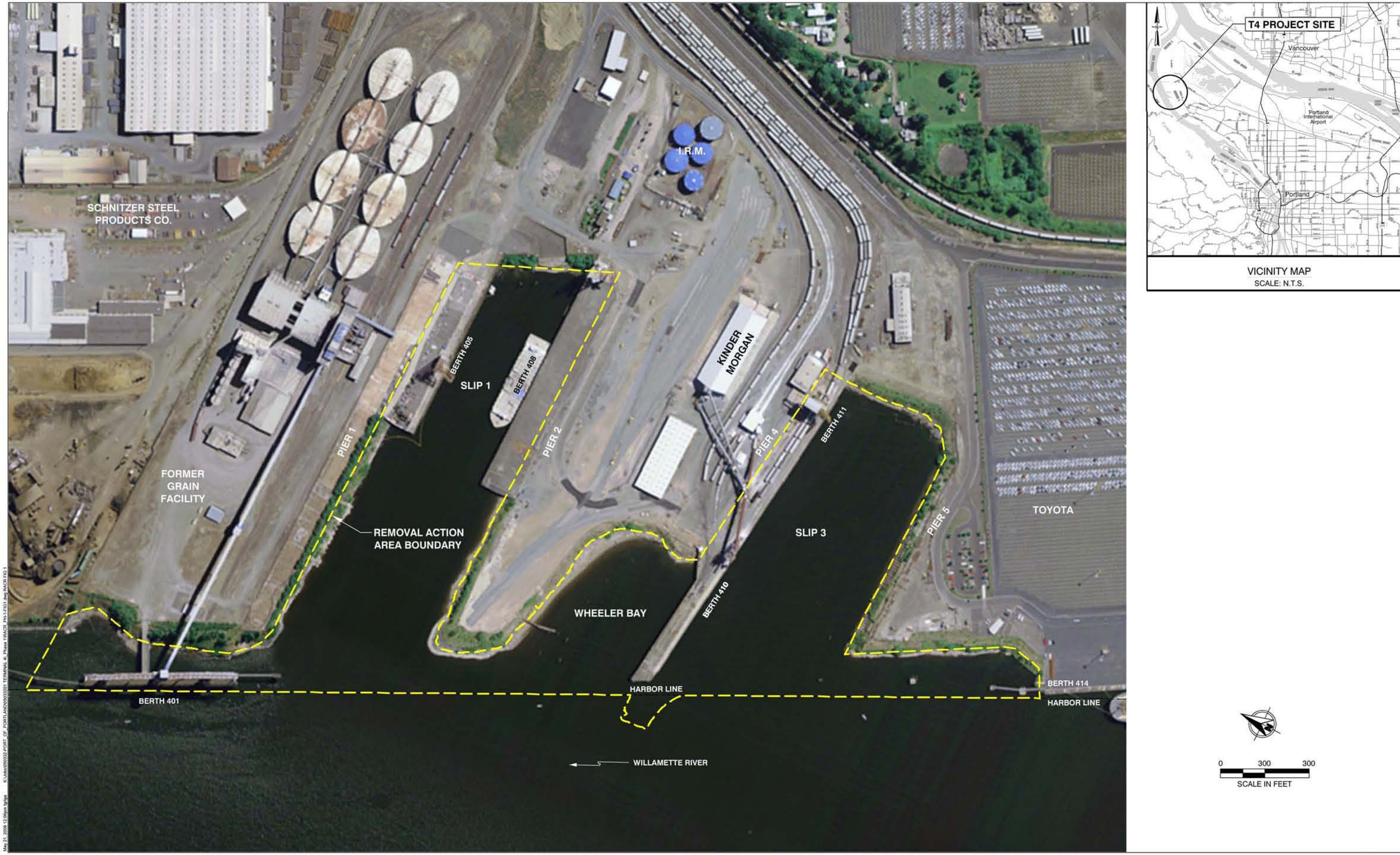
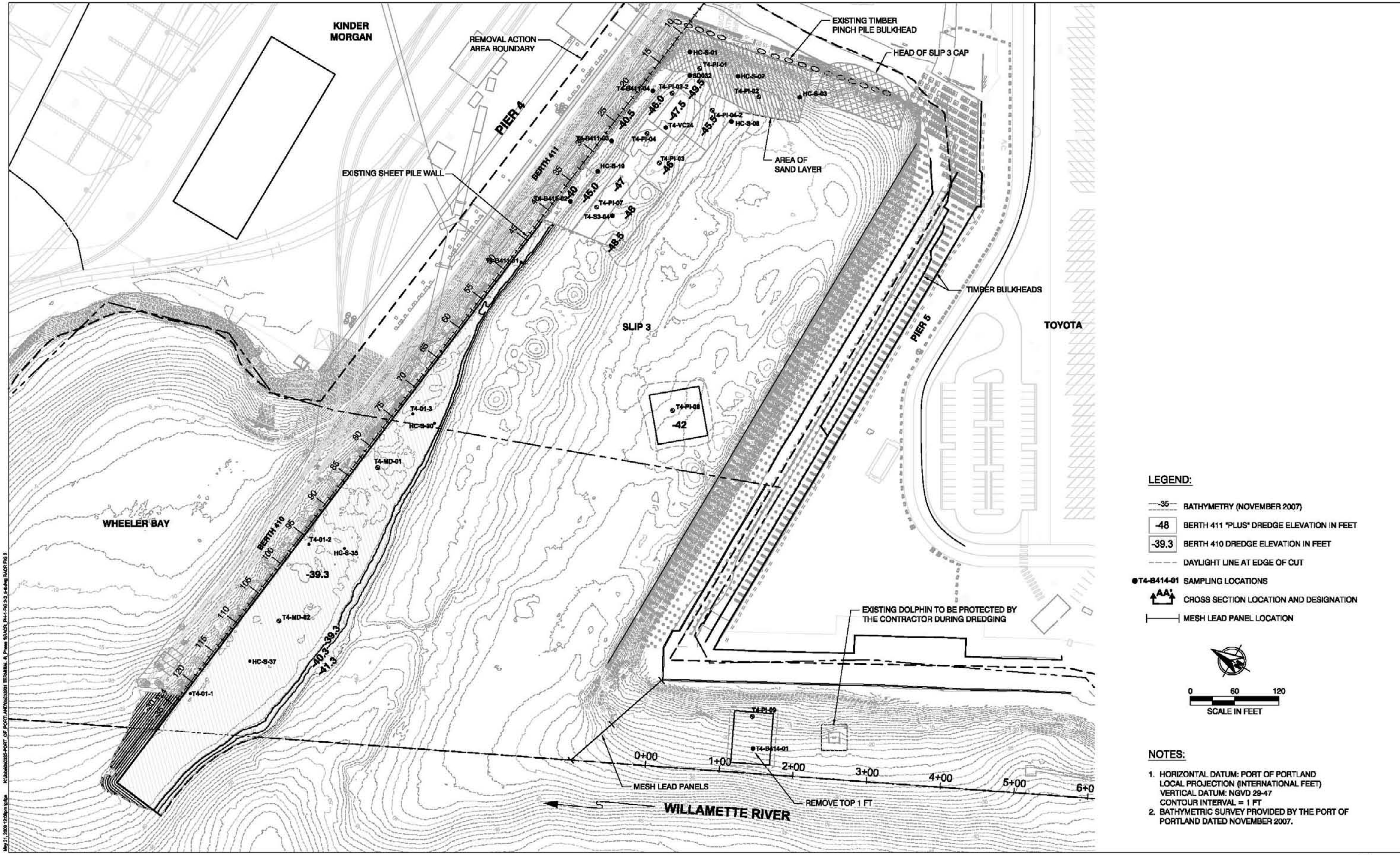


Figure 1
Site Plan and Vicinity Map
Terminal 4 Phase I Removal Action - Removal Action Completion Report
Portland, Oregon

ANCHOR ENVIRONMENTAL, L.L.C.



ANCHOR ENVIRONMENTAL, L.L.C.

Figure 2
Summary of Sampling Locations Used in Phase I Dredge Area Design
Terminal 4 Phase I Removal Action - Removal Action Completion Report
Portland, Oregon

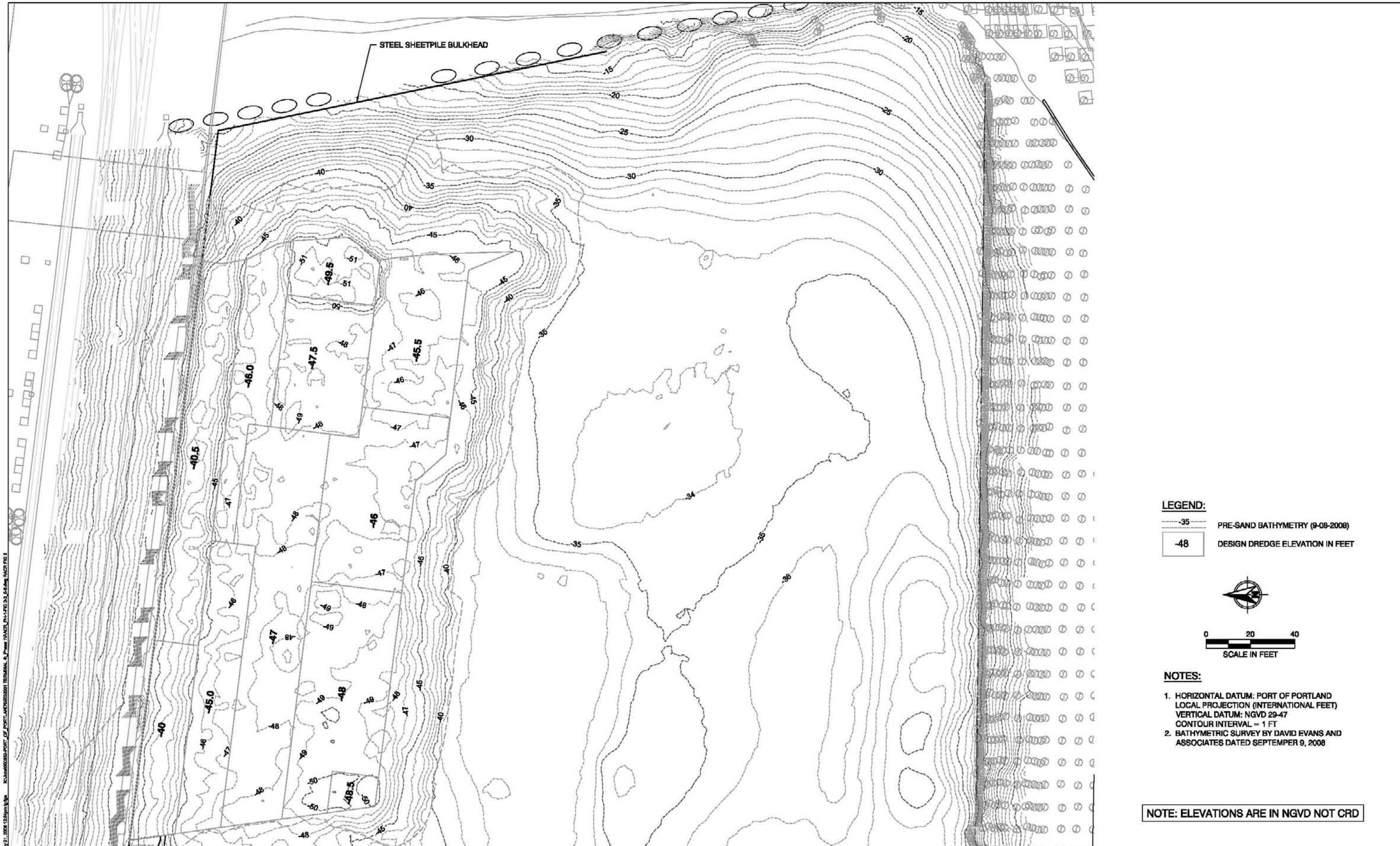
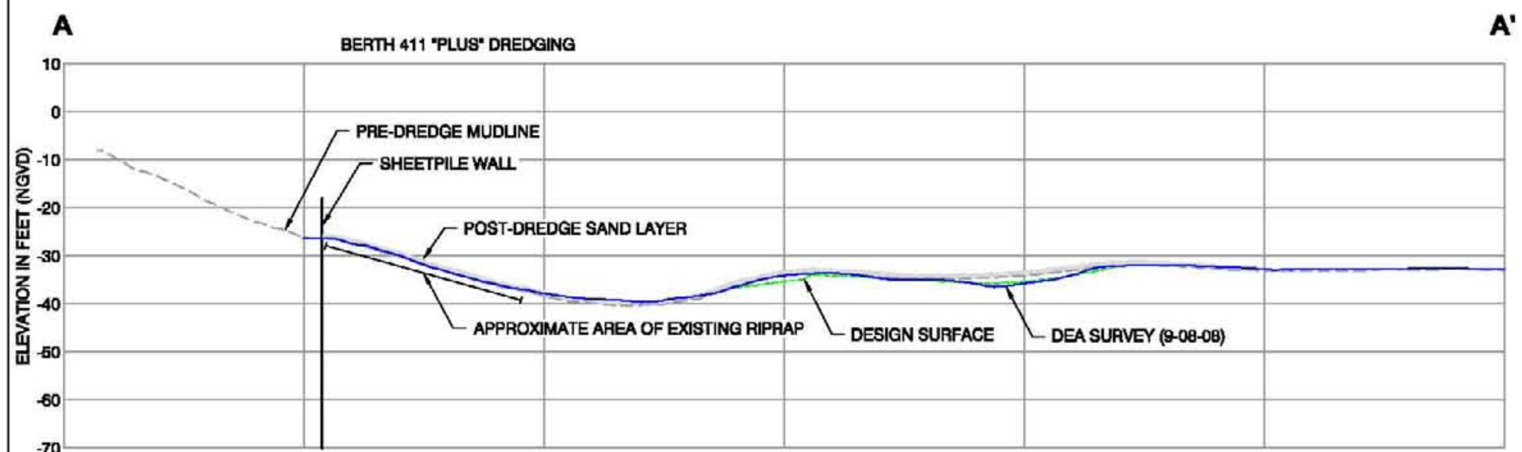
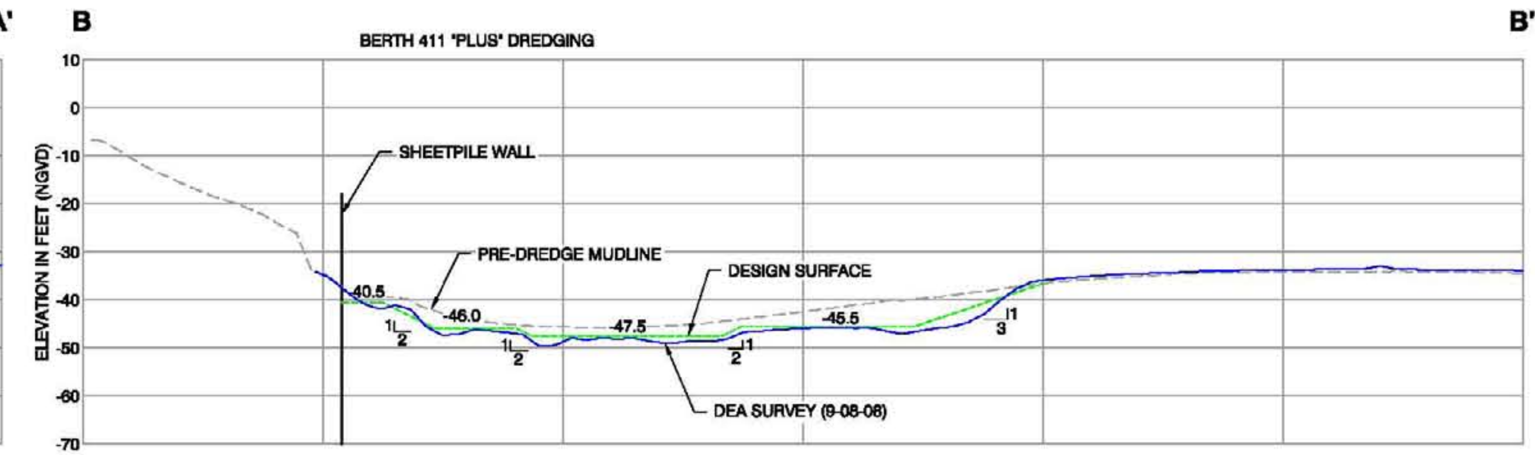


Figure 3
Post Dredge (Pre-Sand Layer) Bathymetry
Terminal 4 Phase I Removal Action - Removal Action Completion Report
Portland, Oregon

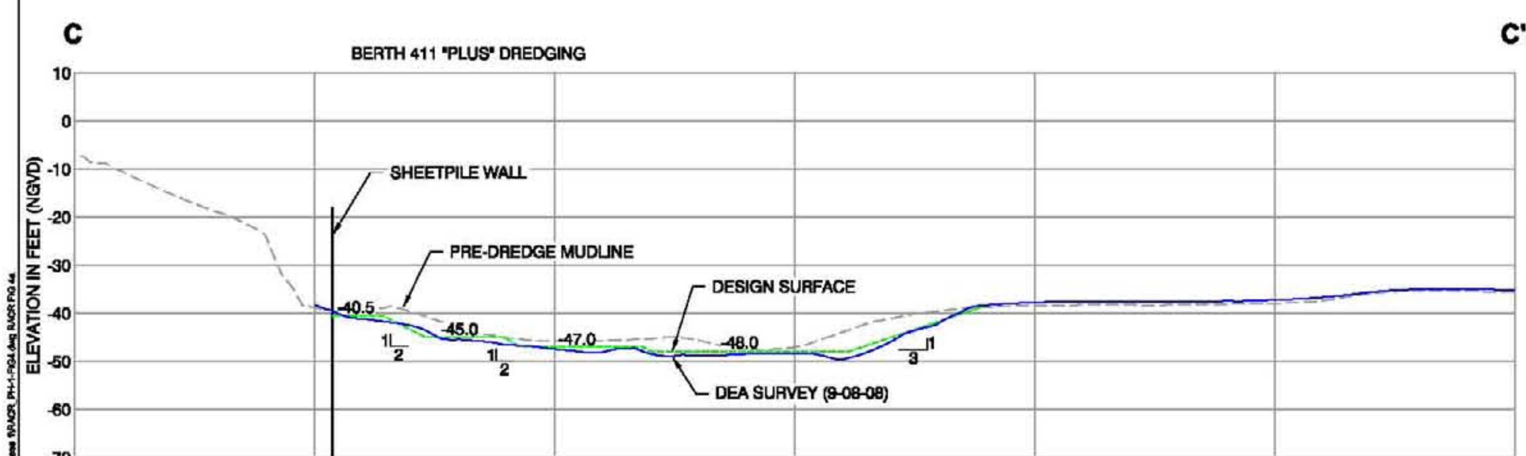
ANCHOR ENVIRONMENTAL, L.L.C.



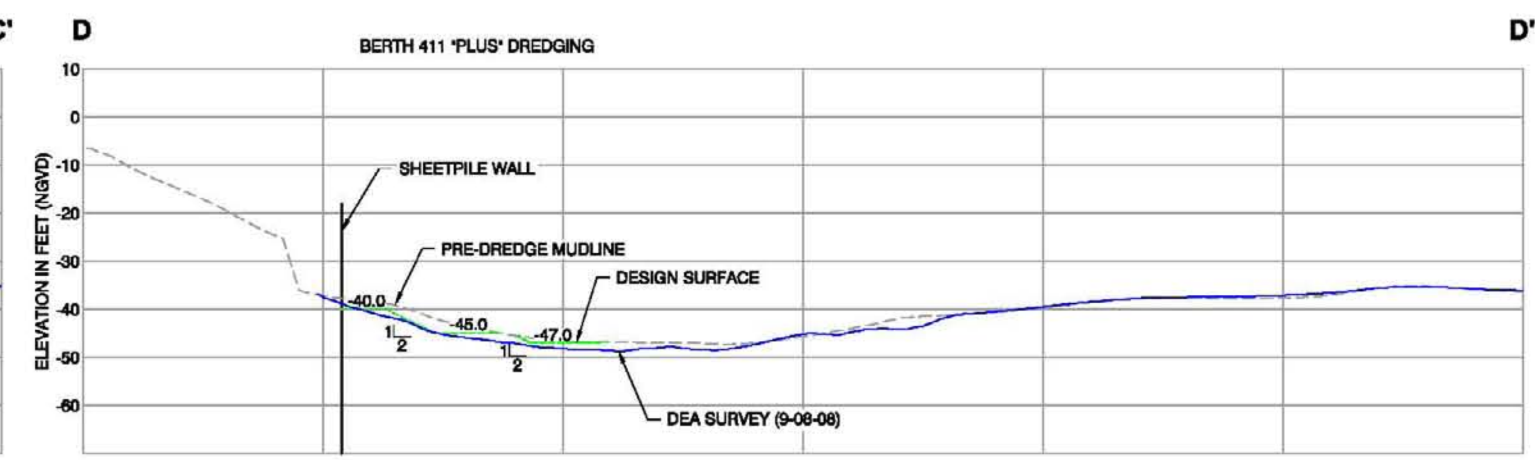
SLIP 3 - BENT 10 - A-A'
No Vert Exag



SLIP 3 - BENT 20 - B-B'
No Vert Exag



SLIP 3 - BENT 30 - C-C'
No Vert Exag



SLIP 3 - BENT 40 - D-D'
No Vert Exag

NOTES:

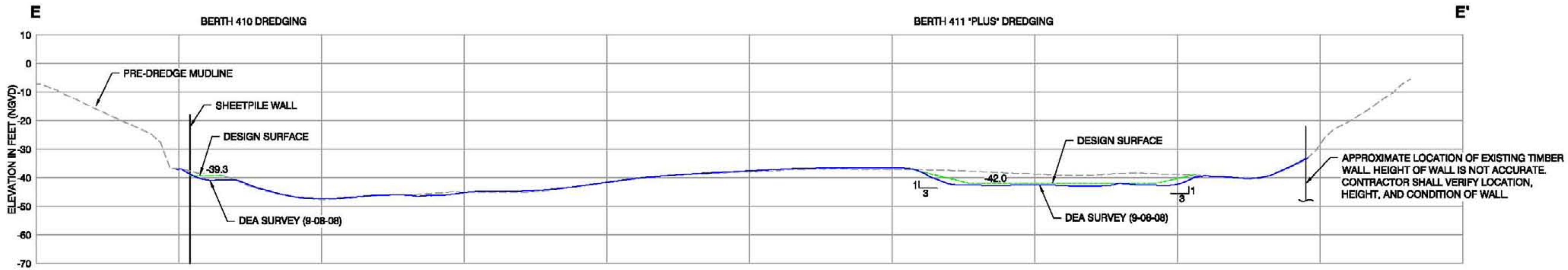
1. HORIZONTAL DATUM: PORT OF PORTLAND LOCAL PROJECTION (INTERNATIONAL FEET)
   VERTICAL DATUM: NGVD 29-47
   CONTOUR INTERVAL = 1 FT
2. POST-DREDGE BATHYMETRY CONTOURS CREATED FROM SURVEY PROVIDED BY DAVID EVANS AND ASSOCITATE, INC. DATED SEPTEMBER 08, 2008 AND AUGUST 28, 2008.

NOTE: ELEVATIONS ARE IN NGVD NOT CRD

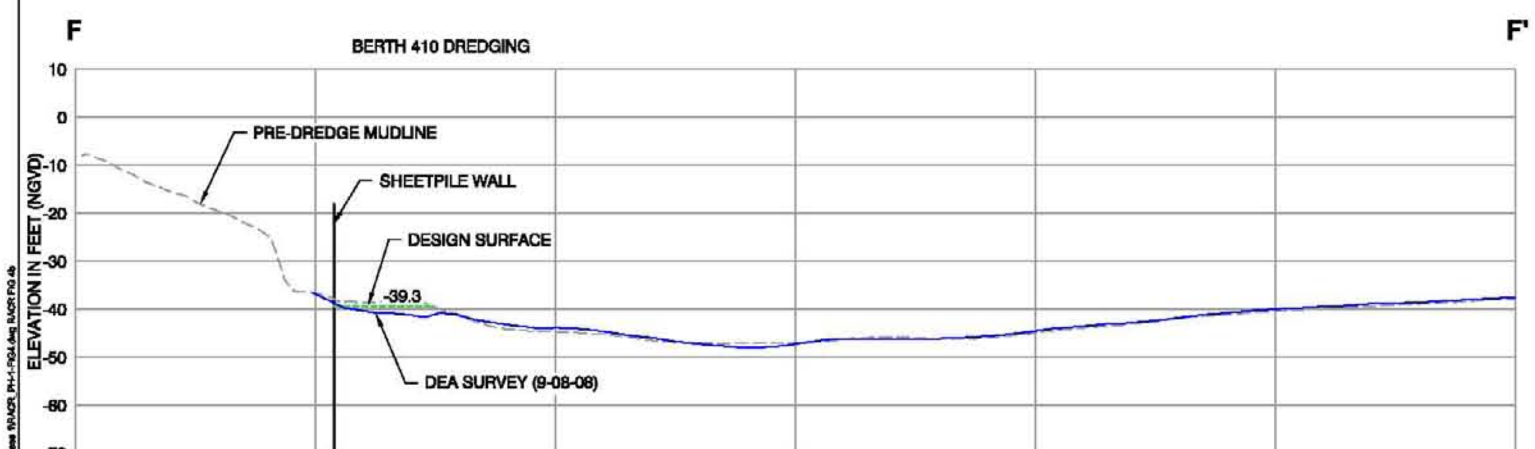
0 20 40
SCALE IN FEET
(HORIZ AND VERT)

ANCHOR ENVIRONMENTAL, L.L.C.

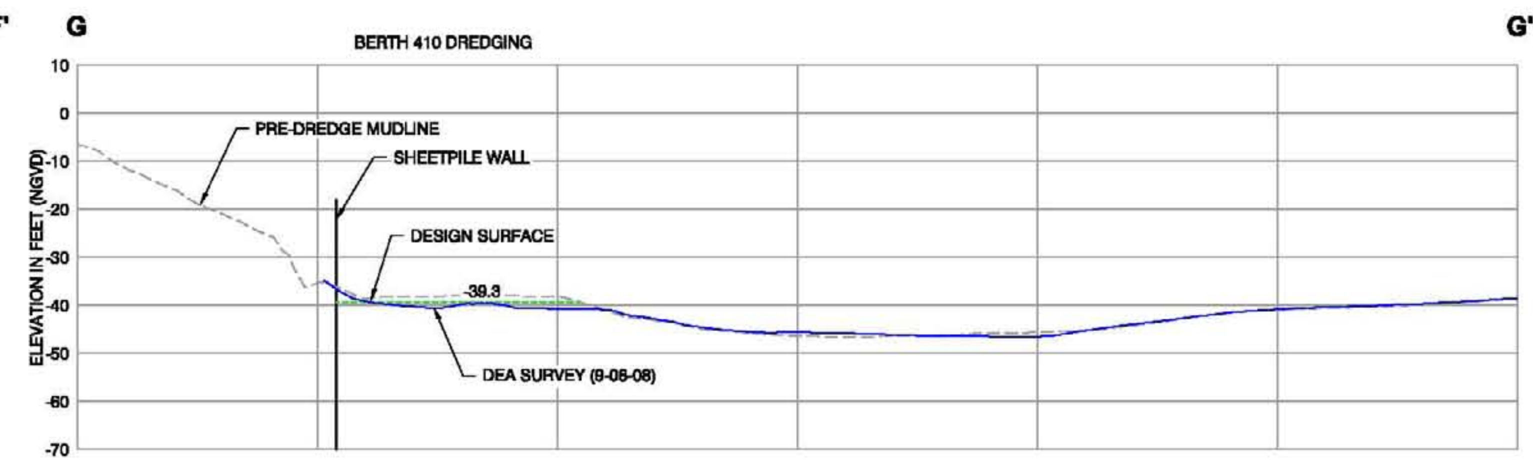
Figure 4a
Post Dredge and Sand Layer Cross Sections
Terminal 4 Phase I Removal Action - Removal Action Completion Report
Portland, Oregon



SLIP 3 - BENT 50 - E-E'
No Vert Exag



SLIP 3 - BENT 60 - F-F'
No Vert Exag



SLIP 3 - BENT 70 - G-G'
No Vert Exag

NOTES:

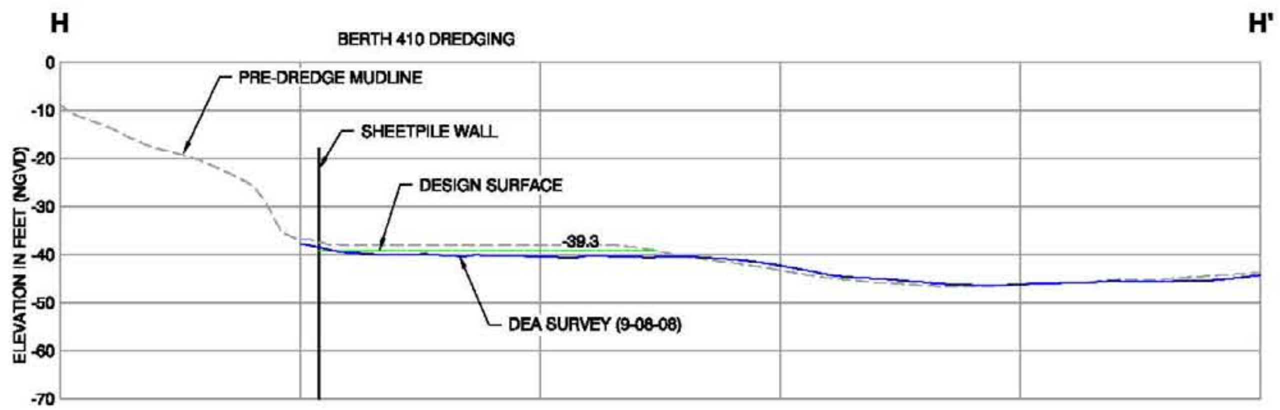
1. HORIZONTAL DATUM: PORT OF PORTLAND LOCAL PROJECTION (INTERNATIONAL FEET)
   VERTICAL DATUM: NGVD 29-47
   CONTOUR INTERVAL = 1 FT
2. POST-DREDGE BATHYMETRY CONTOURS CREATED FROM SURVEY PROVIDED BY DAVID EVANS AND ASSOCITATE, INC. DATED SEPTEMBER 08, 2008 AND AUGUST 28, 2008.

NOTE: ELEVATIONS ARE IN NGVD NOT CRD

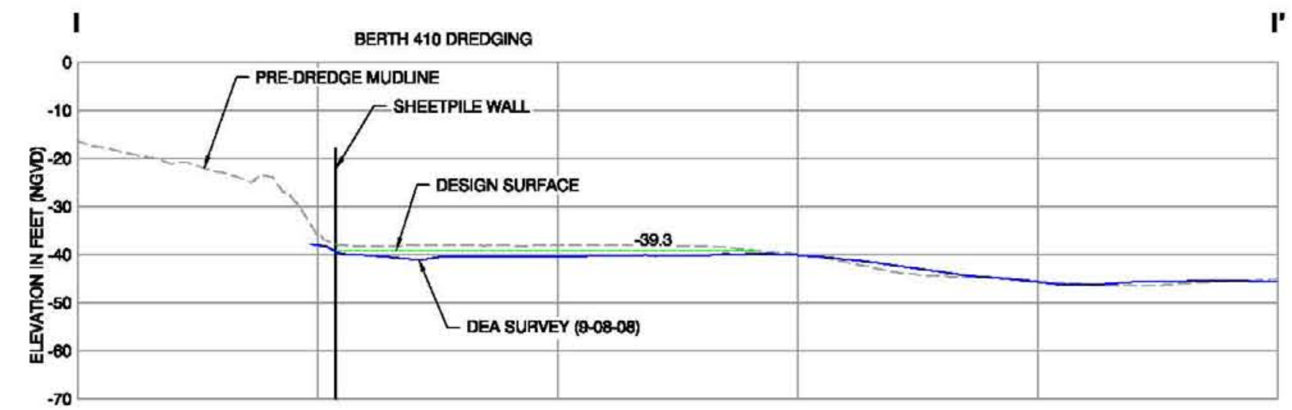
0 20 40
SCALE IN FEET
(HORIZ AND VERT)

ANCHOR ENVIRONMENTAL, L.L.C.

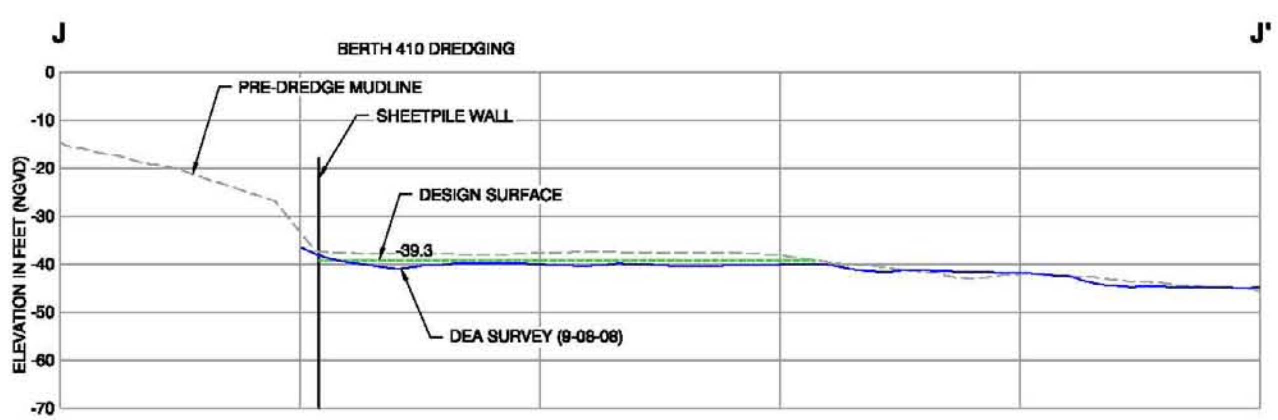
Figure 4b
Post Dredge and Sand Layer Cross Sections
Terminal 4 Phase I Removal Action - Removal Action Completion Report
Portland, Oregon



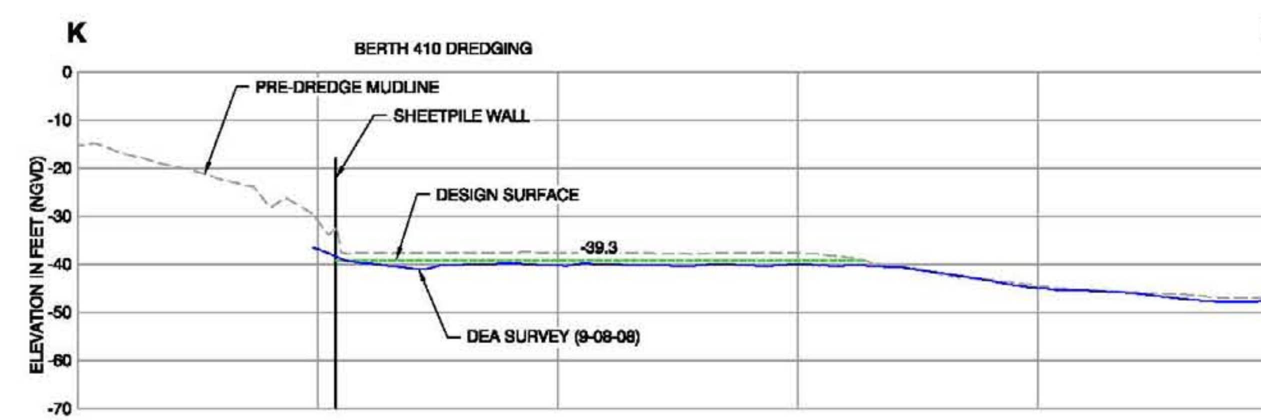
SLIP 3 - BENT 80 - H-H'
No Vert Exag



SLIP 3 - BENT 90 - I-I'
No Vert Exag



SLIP 3 - BENT 80 - H-H'
No Vert Exag



SLIP 3 - BENT 110 - K-K'
No Vert Exag

NOTES:

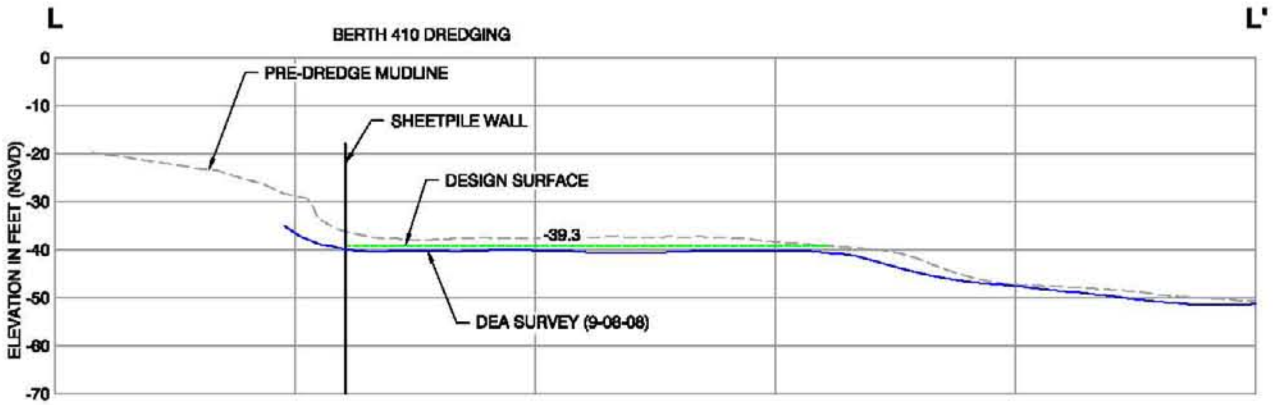
1. HORIZONTAL DATUM: PORT OF PORTLAND LOCAL PROJECTION (INTERNATIONAL FEET)
   VERTICAL DATUM: NGVD 29-47
   CONTOUR INTERVAL = 1 FT
2. POST-DREDGE BATHYMETRY CONTOURS CREATED FROM SURVEY PROVIDED BY DAVID EVANS AND ASSOCITATE, INC. DATED SEPTEMBER 08, 2008 AND AUGUST 28, 2008.

NOTE: ELEVATIONS ARE IN NGVD NOT CRD

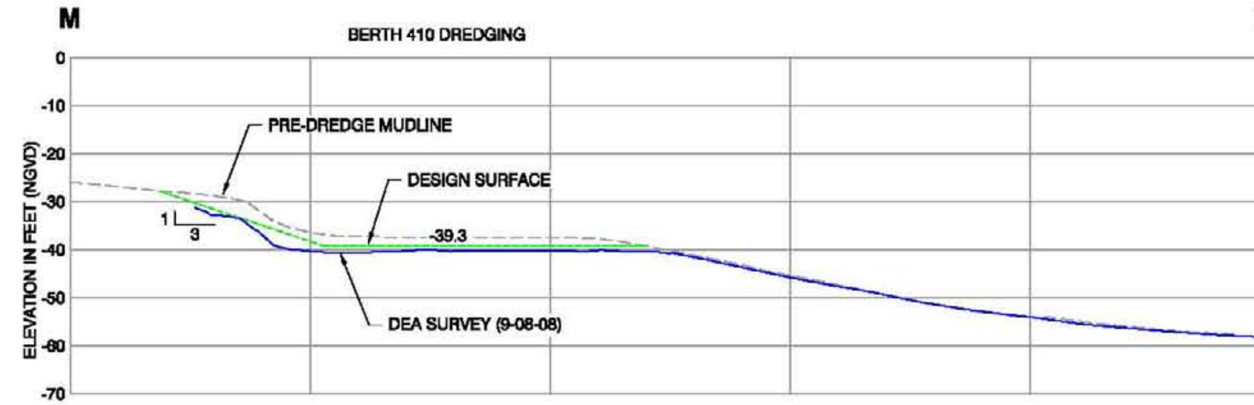
0 20 40
SCALE IN FEET
(HORIZ AND VERT)

ANCHOR ENVIRONMENTAL, L.L.C.

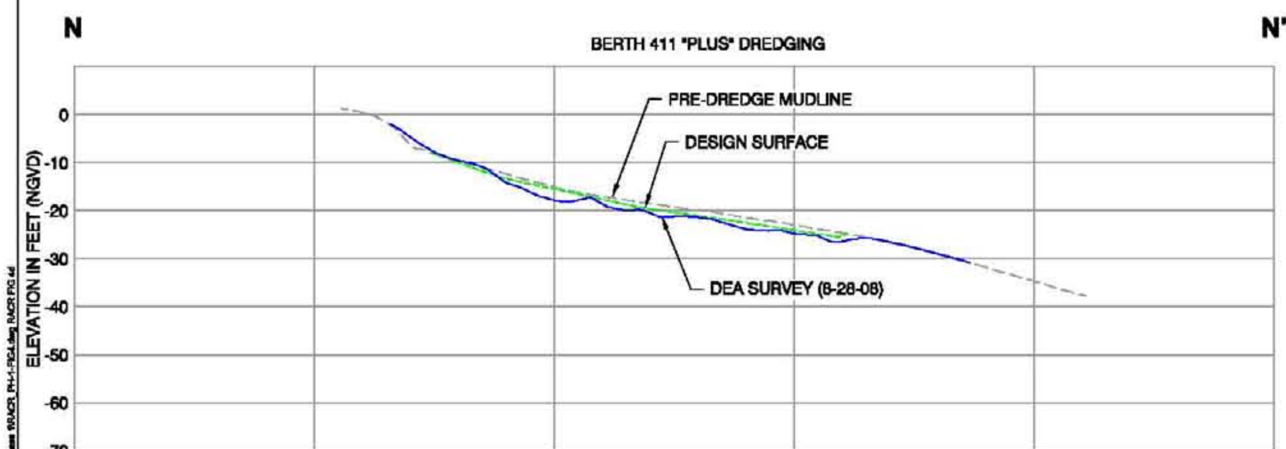
Figure 4c
Post Dredge and Sand Layer Cross Sections
Terminal 4 Phase I Removal Action - Removal Action Completion Report
Portland, Oregon



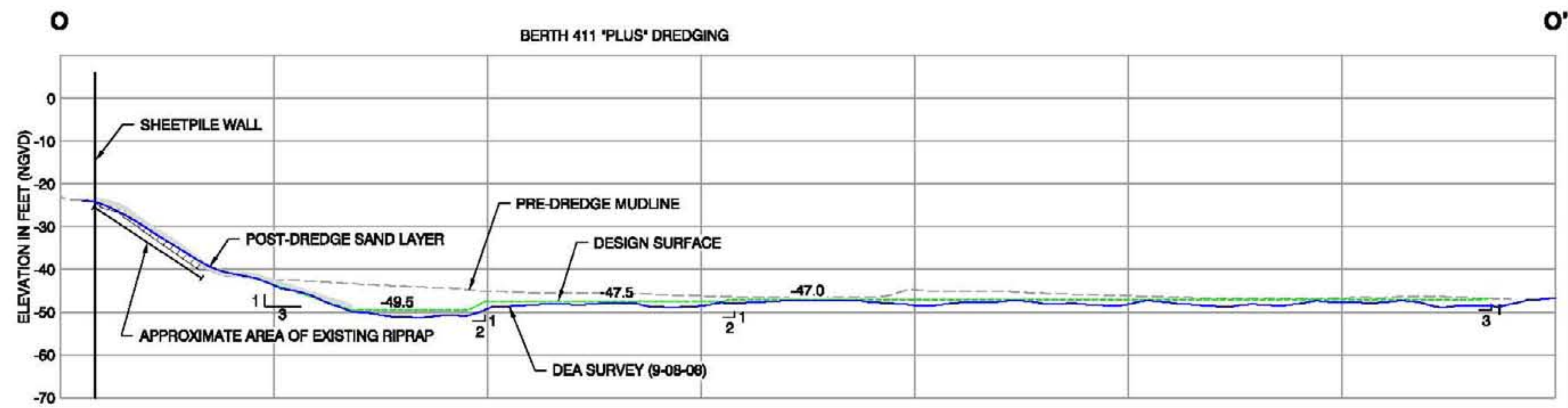
SLIP 3 - BENT 120 - L-L'
No Vert Exag



SLIP 3 - M-M'
No Vert Exag



SLIP 3 - N-N'
No Vert Exag



SLIP 3 - O-O'
No Vert Exag

NOTES:

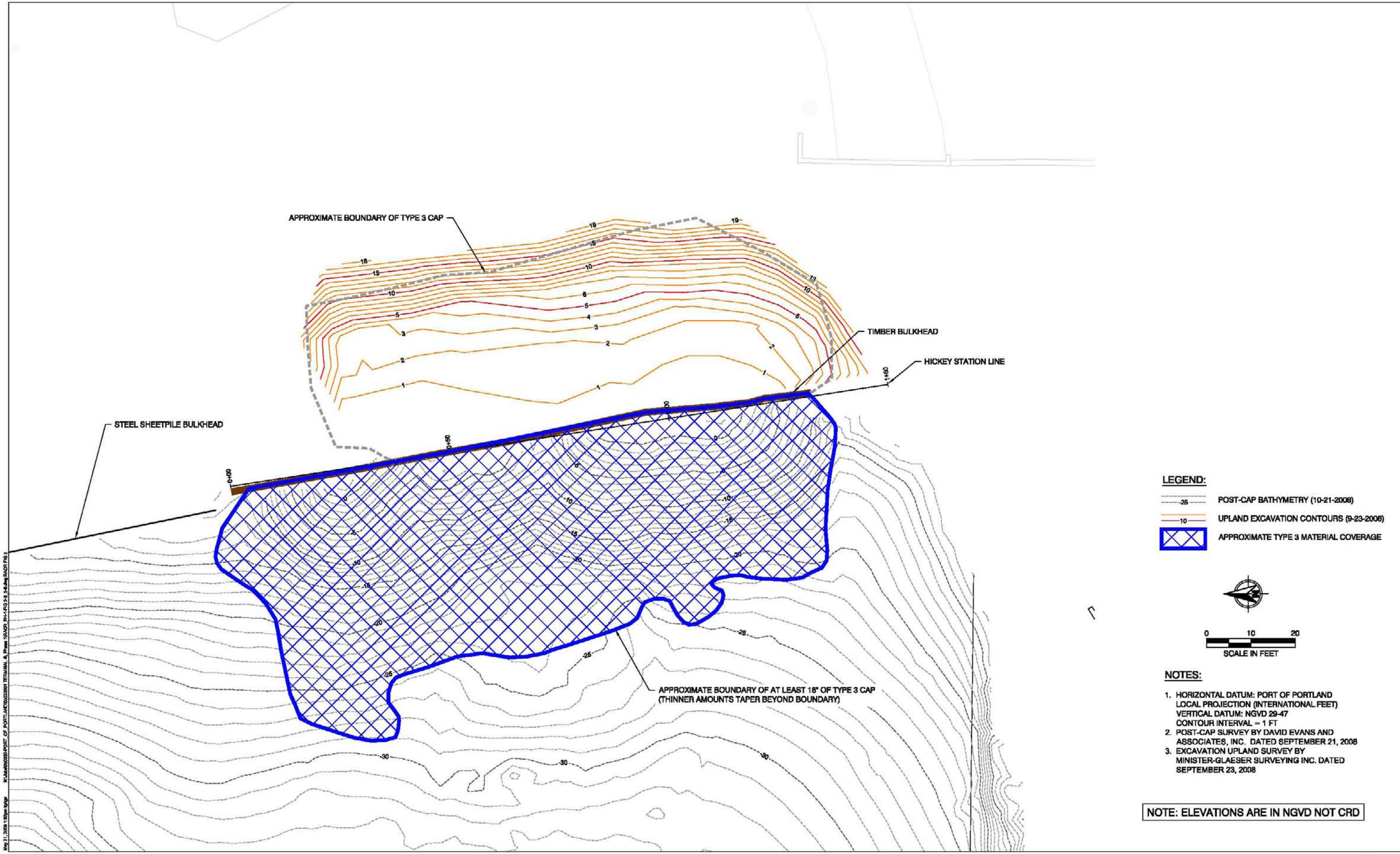
1. HORIZONTAL DATUM: PORT OF PORTLAND LOCAL PROJECTION (INTERNATIONAL FEET)
   VERTICAL DATUM: NGVD 29-47
   CONTOUR INTERVAL = 1 FT
2. POST-DREDGE BATHYMETRY CONTOURS CREATED FROM SURVEY PROVIDED BY DAVID EVANS AND ASSOCITATE, INC. DATED SEPTEMBER 08, 2008 AND AUGUST 28, 2008.

NOTE: ELEVATIONS ARE IN NGVD NOT CRD

0 20 40
SCALE IN FEET
(HORIZ AND VERT)

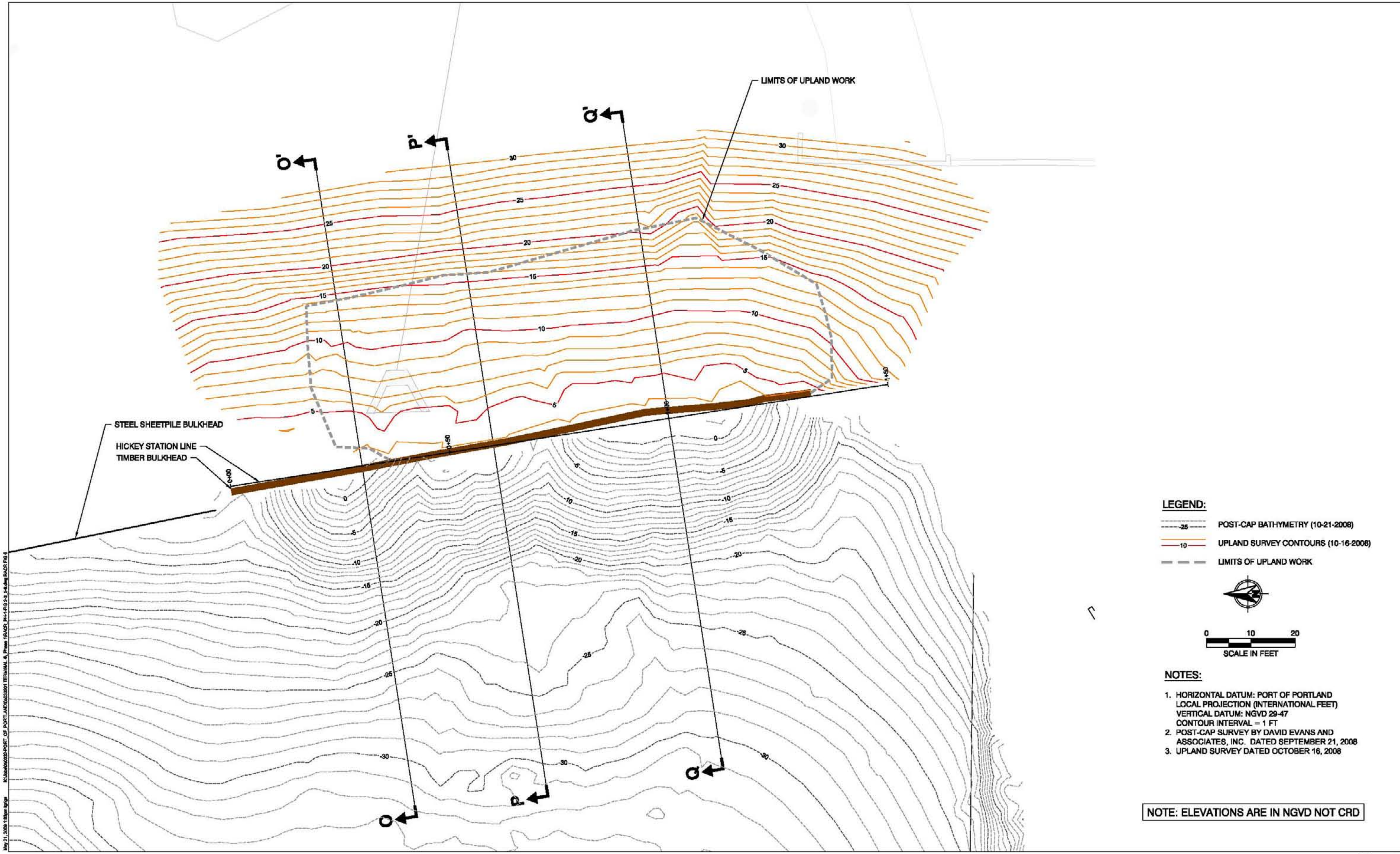
ANCHOR ENVIRONMENTAL, L.L.C.

Figure 4d
Post Dredge and Sand Layer Cross Sections
Terminal 4 Phase I Removal Action - Removal Action Completion Report
Portland, Oregon



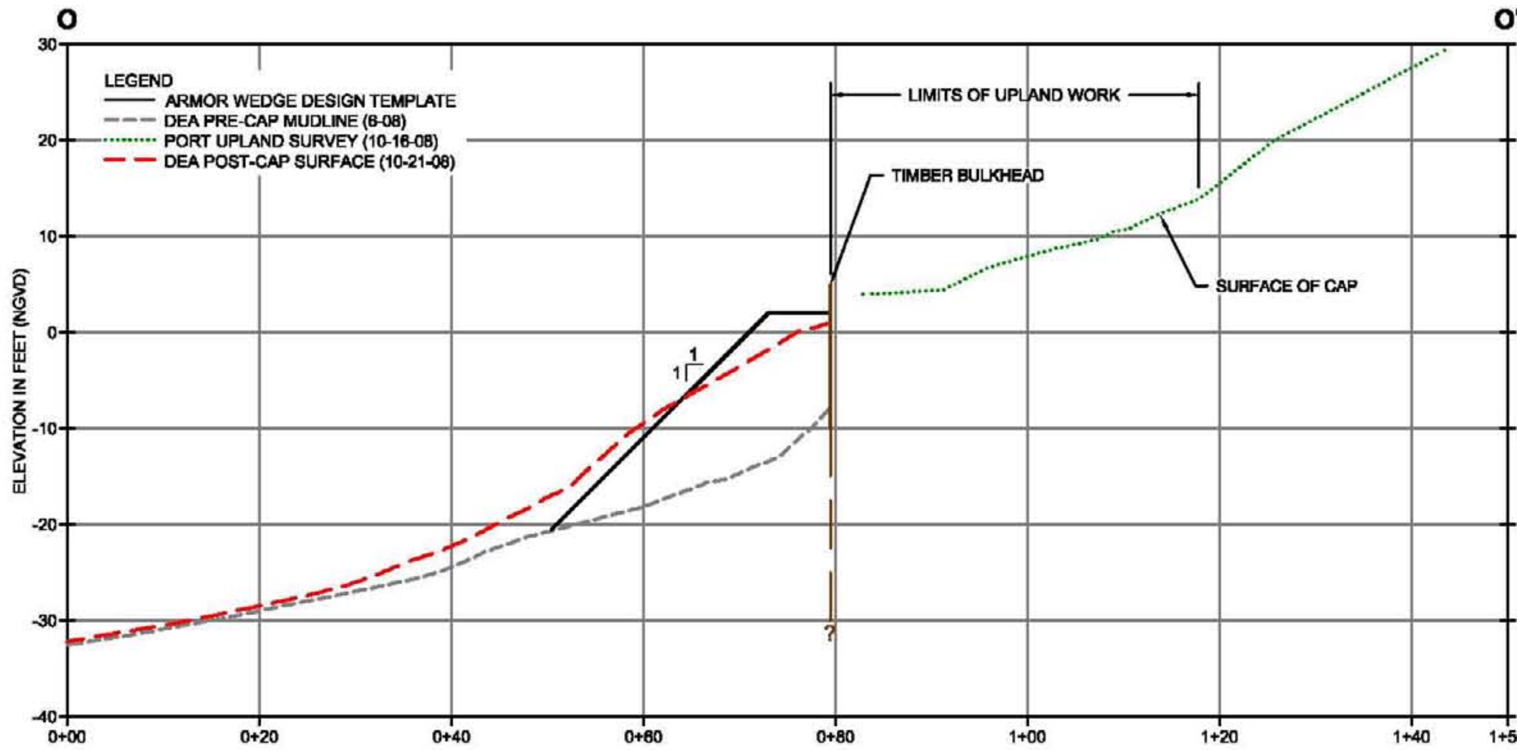
ANCHOR ENVIRONMENTAL, L.L.C.

Figure 5
Extent of Type 3 Cap Placement and Extent of Upland Excavation - Head of 3 Slip
Terminal 4 Phase I Removal Action - Removal Action Completion Report
Portland, Oregon

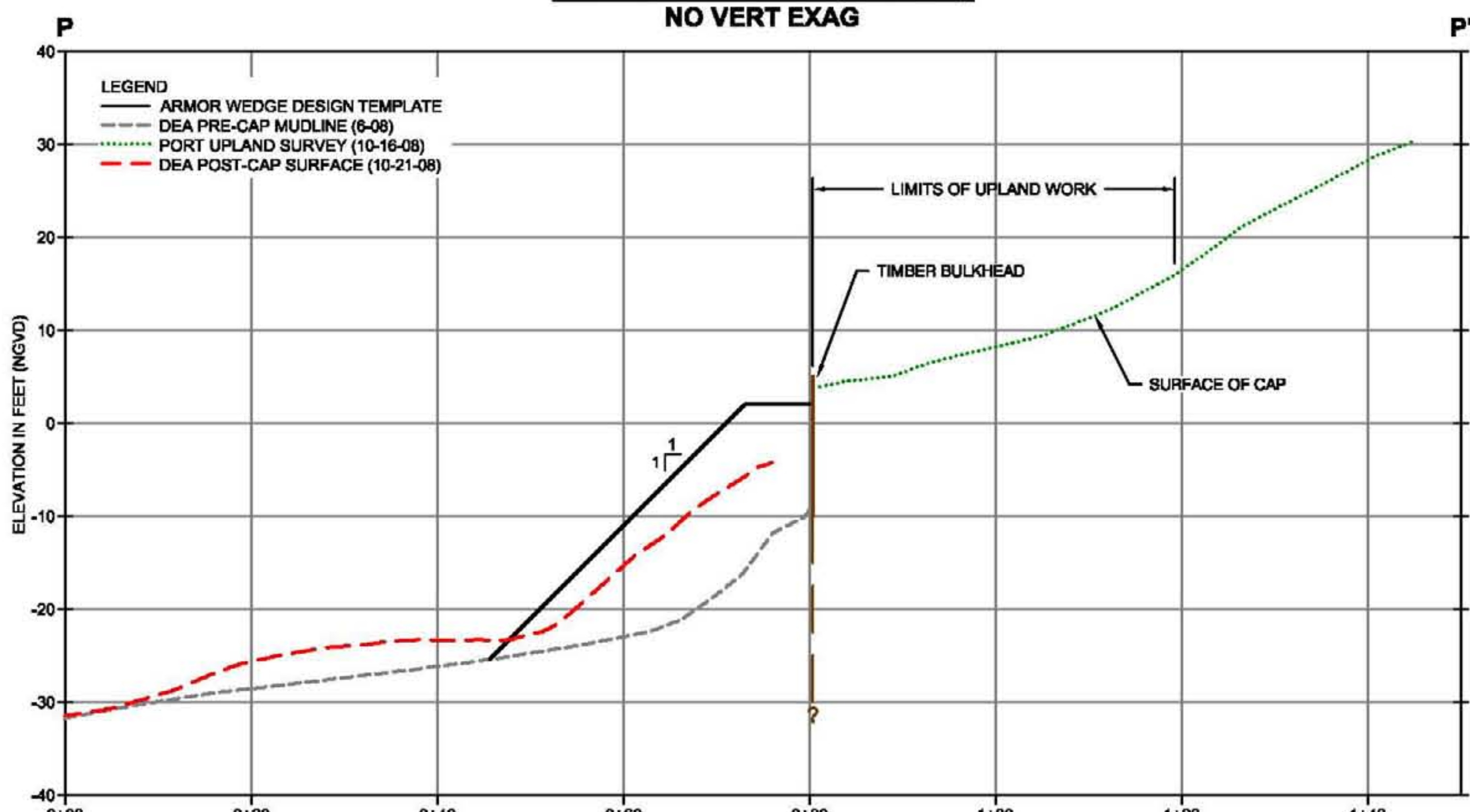


ANCHOR ENVIRONMENTAL, L.L.C.

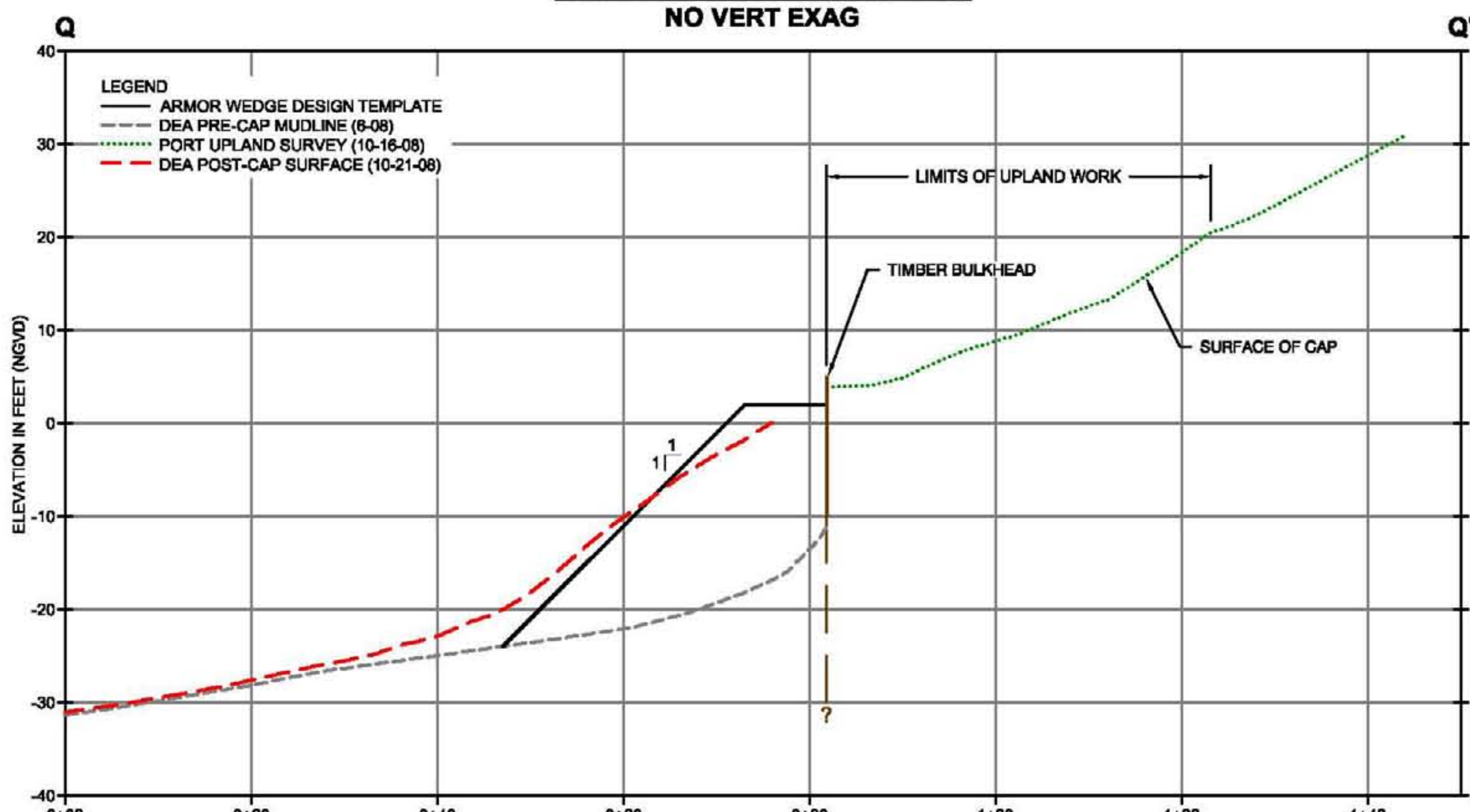
Figure 6
As-built Head of Slip 3 Capping and Upland Plan View and Cross Section Locations
Terminal 4 Phase I Removal Action - Removal Action Completion Report
Portland, Oregon



CROSS SECTION O-O' (STA 0+30)
NO VERT EXAG



CROSS SECTION P-P' (STA 0+60)
NO VERT EXAG



CROSS SECTION Q-Q' (STA 1+00)
NO VERT EXAG

NOTES:

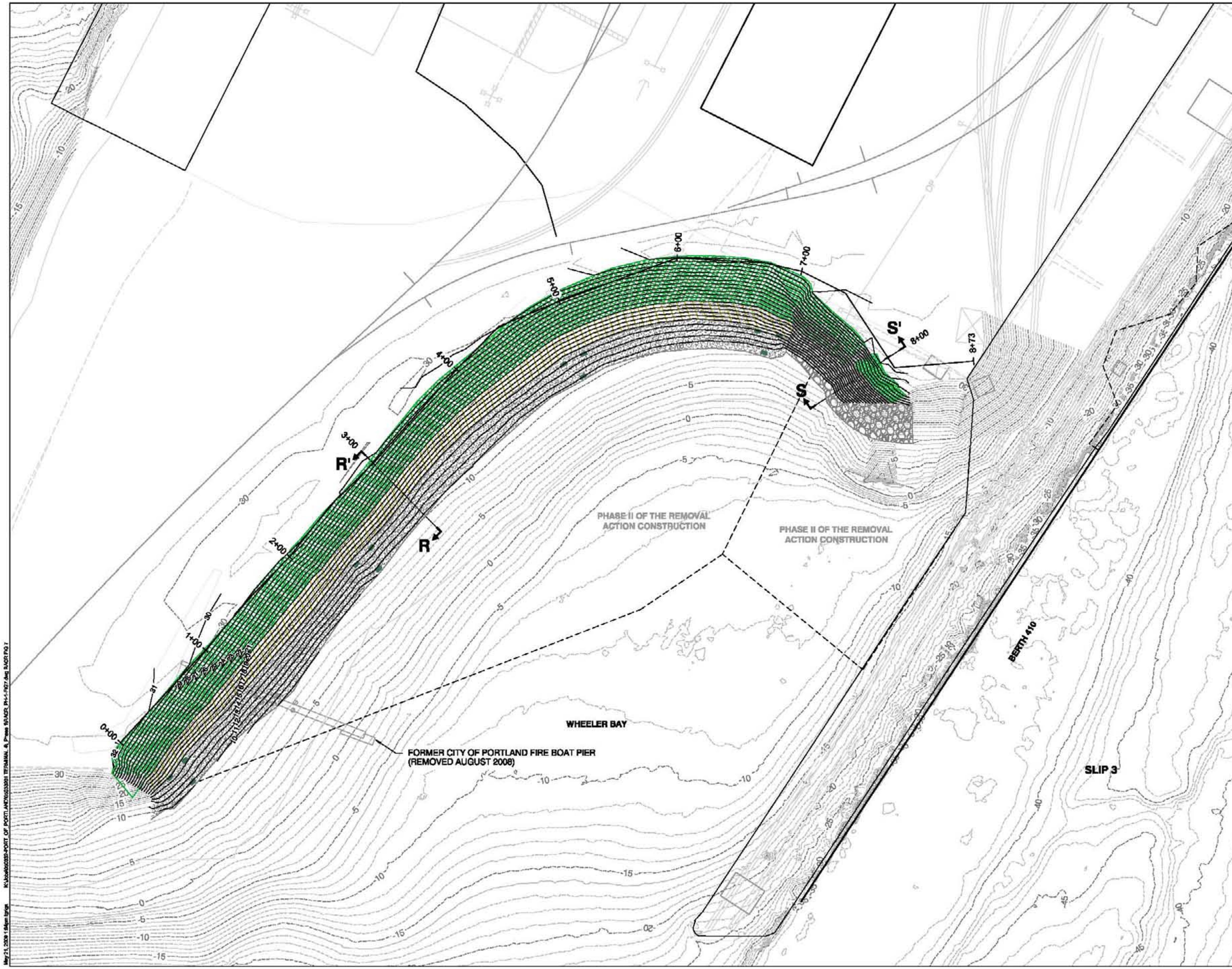
1. HORIZONTAL DATUM: PORT OF PORTLAND LOCAL PROJECTION (INTERNATIONAL FEET) VERTICAL DATUM: NGVD 29-47 CONTOUR INTERVAL = 1 FT
2. POST-CAP SURVEY BY DAVID EVANS AND ASSOCIATES, INC. DATED SEPTEMBER 21, 2008
3. UPLAND SURVEY DATED OCTOBER 16, 2008

0 10 20
SCALE IN FEET
(HORIZ AND VERT)

May 21, 2009 1:03pm tgriga K:\Jobs\050332-PORT_OF_PORTLAND\05033201 TERMINAL 4_Phase 1\RACR_PH-1-FIG 2-3_5-6.dwg RACR FIG 6a

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 6a
As-built Head of Slip 3 Capping Cross Section
Terminal 4 Phase I Removal Action - Removal Action Completion Report
Portland, Oregon



LEGEND:

- HYDROSEED AND JUTE MAT
- COIR FABRIC AND PLANTINGS WITH MULCH
- HABITAT ROCK
- ARMOR ROCK
- ECOLOGY BLOCK LWD ANCHORS (BURIED MINIMUM 4 FEET BELOW FINISH GRADE)
- PRE-CONSTRUCTION CONTOURS
- AS-BUILT CONTOURS
- CROSS SECTION LOCATION AND DESIGNATION

0 40 80
SCALE IN FEET

NOTES:

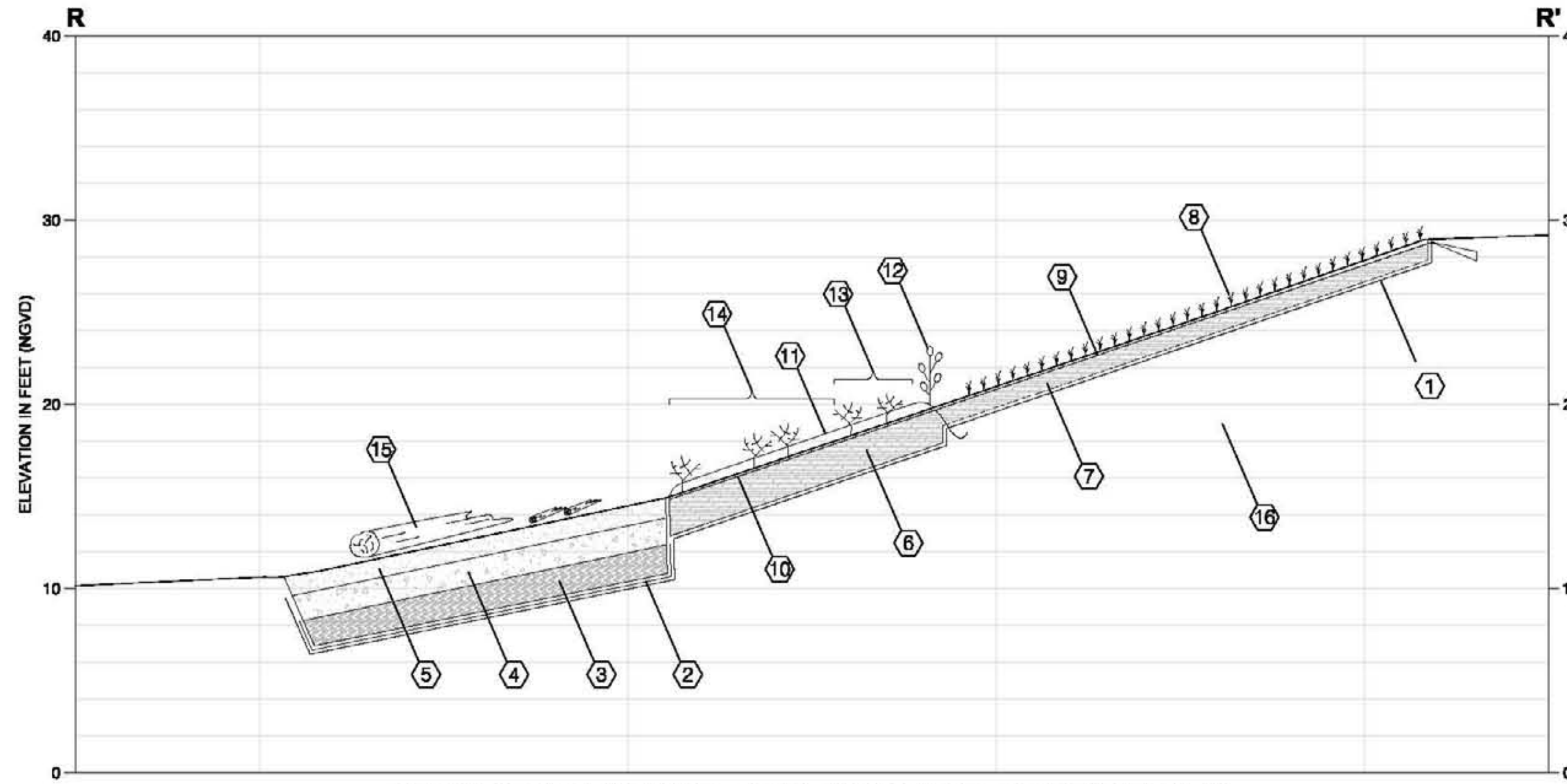
1. HORIZONTAL DATUM: PORT OF PORTLAND LOCAL PROJECTION (INTERNATIONAL FEET) VERTICAL DATUM: NGVD 29-47 CONTOUR INTERVAL = 1 FT
2. PRE-CONSTRUCTION BATHYMETRIC SURVEY BY PORT OF PORTLAND DATED NOVEMBER, 2007
3. PRE-CONSTRUCTION UPLAND SURVEY PROVIDED BY PORT OF PORTLAND DATED JANUARY 2008.
4. AS-BUILT UPLAND SURVEY BY MINISTER-GLASER DATED OCTOBER 13, 2008 AND PROVIDED BY ASH CREEK.

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 7
As-Built Wheeler Bay Shoreline Stabilization Surface Plan View and Cross Section Locations
Terminal 4 Phase I Removal Action - Removal Action Completion Report
Portland, Oregon

AS CONSTRUCTED NOTES:

1. DEMARCATION LAYER. PLASTIC MESH, ORANGE CONSTRUCTION FENCING. 1.75" x 1.75" OPEN SPACES.
2. GEOTEXTILE FILTER FABRIC.
3. SELECT FILL. 1½-INCH-MINUS OR 3½-INCH-MINUS CRUSHED ROCK. LAYER 18 INCHES THICK.
4. ARMOR STONE. 3-INCH TO 10-INCH ROCK. LAYER 18 INCHES THICK.
5. HABITAT COVER. 2-INCH-MINUS ROUND ROCK AND SAND. LAYER 12 INCHES THICK.
6. TOPSOIL. SANDY LOAM, COMPOST MIX. LAYER 24 INCHES THICK.
7. TOPSOIL. SANDY LOAM, COMPOST MIX. LAYER 12 INCHES THICK.
8. HYDROSEEDED GRASS MIX. NATIVE GRASSES AND STERILE WHEATGRASS.
9. JUTE MAT. ANCHORED IN TRENCH AT TOP. STAPLED THROUGHOUT. PLACED OVER TOP OF HYDROSEED.
10. COIR EROSION CONTROL FABRIC. ENDS BURIED TOP AND BOTTOM. STAKED THROUGHOUT.
11. BARK MULCH. MEDIUM FIR. LAYER 4 TO 6 INCHES THICK.
12. BLACK COTTONWOOD. SPACED 10 FEET ON CENTER AT ELEVATION 20 FEET.
13. SCOULER WILLOW AND HOOKER WILLOW. SPACED 4 FEET ON CENTER BETWEEN ELEVATION 18 AND 20 FEET.
14. COLUMBIA RIVER WILLOW. SPACED 4 FEET ON CENTER BETWEEN ELEVATION 15 AND 18 FEET.
15. HABITAT LOGS AND LARGE WOODY DEBRIS.
16. SUBGRADE. CUT/FILL OF EXISTING SLOPE. GENERALLY CONSISTING OF SAND, SILTY SAND, OR GRAVELLY SAND.



CROSS SECTION R-R' (STA 3+00) - TYPICAL STA 0+00 TO STA 7+00
NO VERT EXAG

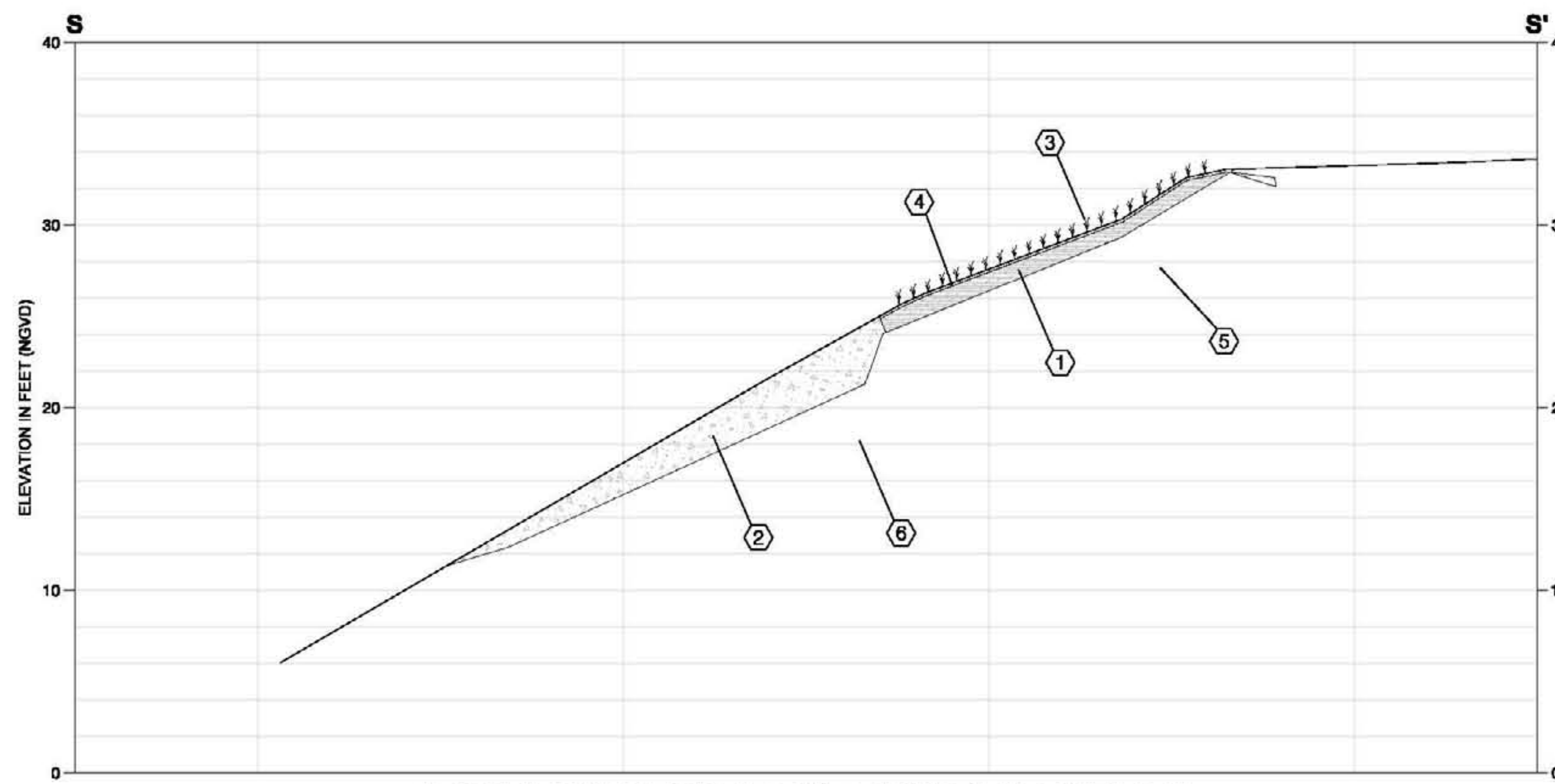
AS CONSTRUCTED NOTES:

1. TOPSOIL. SANDY LOAM, COMPOST MIX. LAYER 12 INCHES THICK.
2. ARMOR STONE. 3-INCH TO 10-INCH ROCK. LAYER UP TO 36 INCHES THICK. AREAS WITHOUT EXISTING ARMOR (GENERALLY BETWEEN STATIONS 7+00 AND 7+50) INCLUDE FILTER FABRIC, SELECT FILL (18-INCH LAYER OF 3½-INCH-MINUS CRUSHED ROCK), AND 18-INCH LAYER ARMOR STONE.
3. HYDROSEEDED GRASS MIX. NATIVE GRASSES AND STERILE WHEATGRASS.
4. JUTE MAT. ANCHORED IN TRENCH AT TOP. STAPLED THROUGHOUT. PLACED OVER TOP OF HYDROSEED.
5. SUBGRADE (BENEATH TOPSOIL). CUT INTO EXISTING SLOPE. GENERALLY CONSISTING OF SAND, SILTY SAND, OR GRAVELLY SAND.
6. SUBGRADE (BENEATH ARMOR). TYPICALLY EXISTING RIP RAP. SOME AREAS BETWEEN STATION 7+00 AND 7+50 CONSISTED OF SAND, SILTY SAND, OR GRAVELLY SAND AFTER REMOVAL OF EXISTING ARMOR CONSISTING OF CONCRETE DEBRIS.

SURVEY NOTES:

1. VERTICAL DATUM: NGVD 29-47

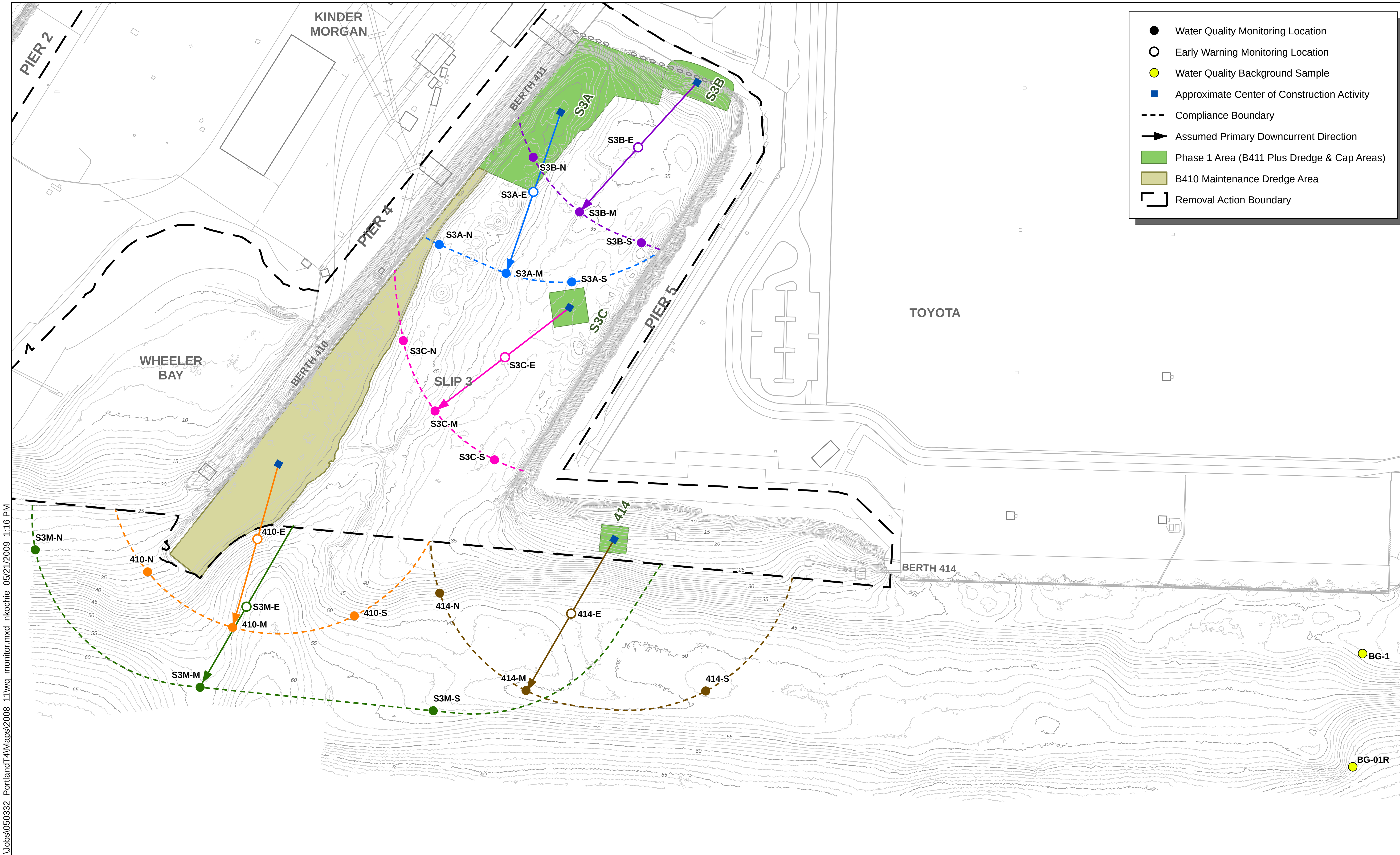
0 5 10
SCALE IN FEET
(HORIZ AND VERT)



CROSS SECTION S-S' (STA 8+00) - TYPICAL STA 7+00 TO 8+20
NO VERT EXAG

Figure 7a
As-Built Wheeler Bay Shoreline Stabilization Cross Sections
Terminal 4 Phase I Removal Action - Removal Action Completion Report
Portland, Oregon

ANCHOR ENVIRONMENTAL, L.L.C.



Q:\Jobs\050332_PortlandT4\Maps\2008_11\wq_monitor.mxd nkochie 05/21/2009 1:16 PM

ANCHOR ENVIRONMENTAL, L.L.C.

0 175
Scale in Feet

Notes:
Slip 3 water quality monitoring (except for turbidity) will occur 100 meters from the actual location of construction activities. Compliance boundaries shown may not be representative of the actual location.
The point of compliance is 100 meters from the center of the construction activities (except for turbidity).

Bathymetry and base map from Port of Portland, 2007.
Bathymetric elevations in feet NGVD.

Figure 8
Water Quality Monitoring - T4 Site
Terminal 4 Phase 1 Removal Action - Removal Action Completion Report
Portland, Oregon

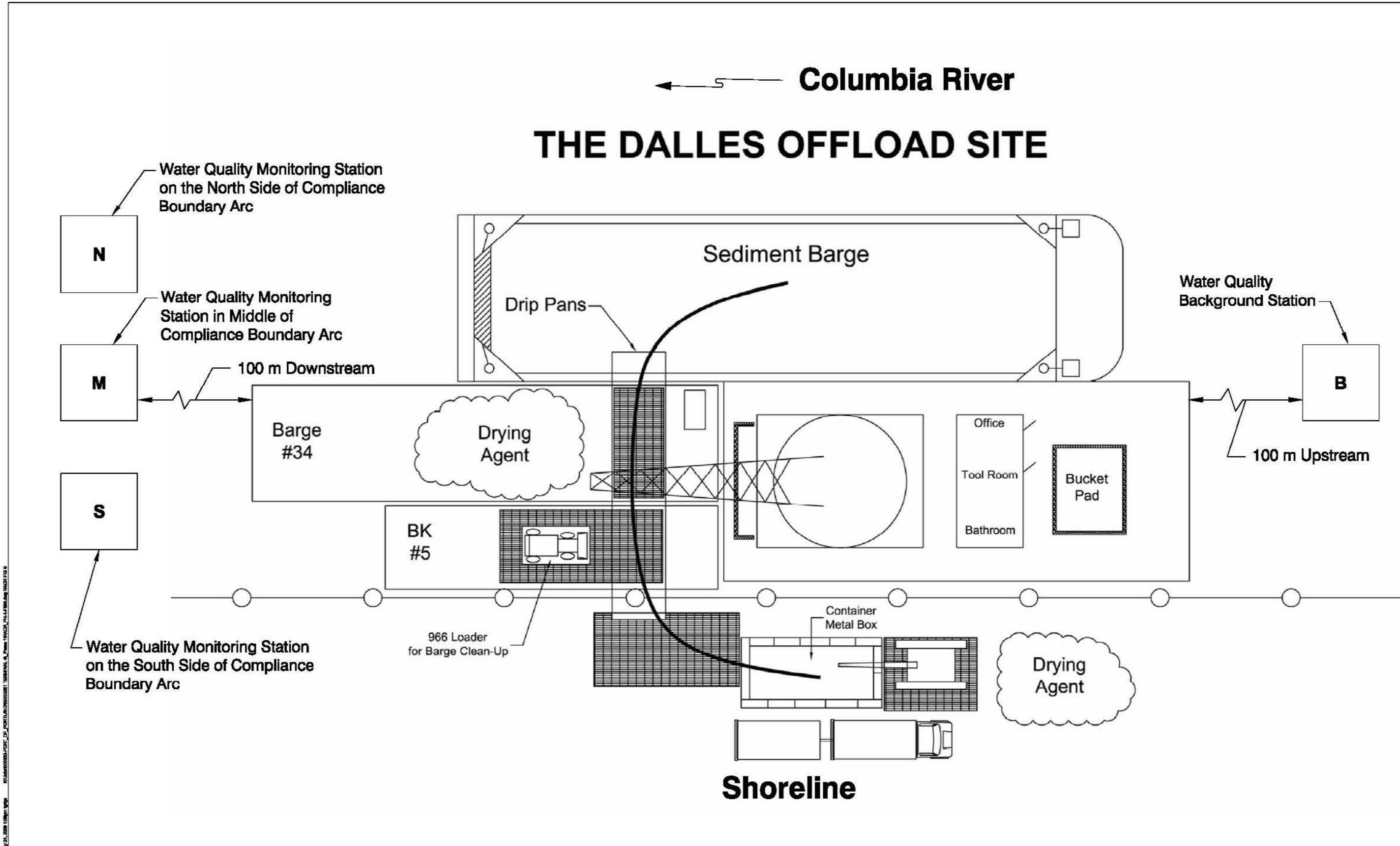
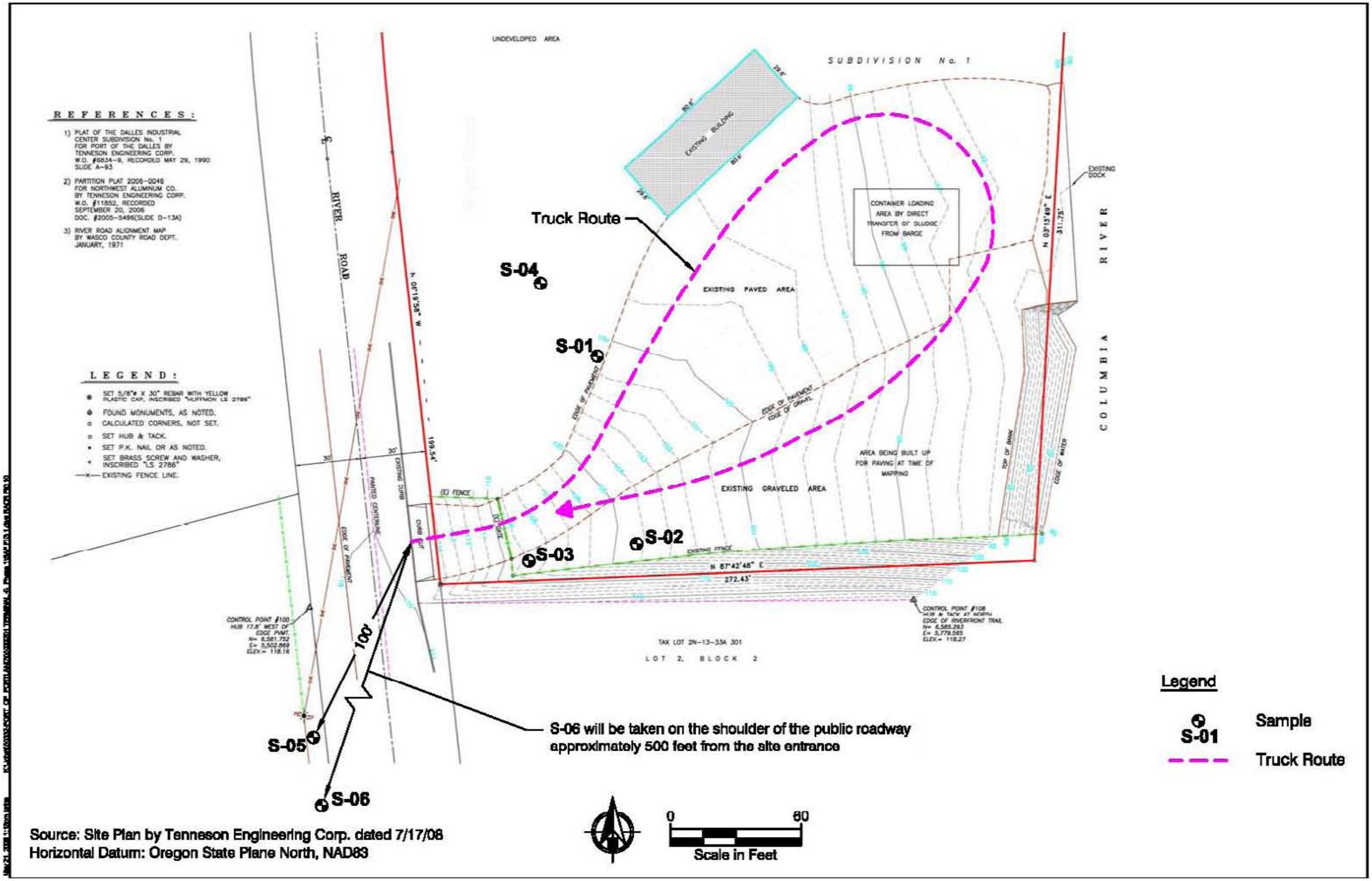


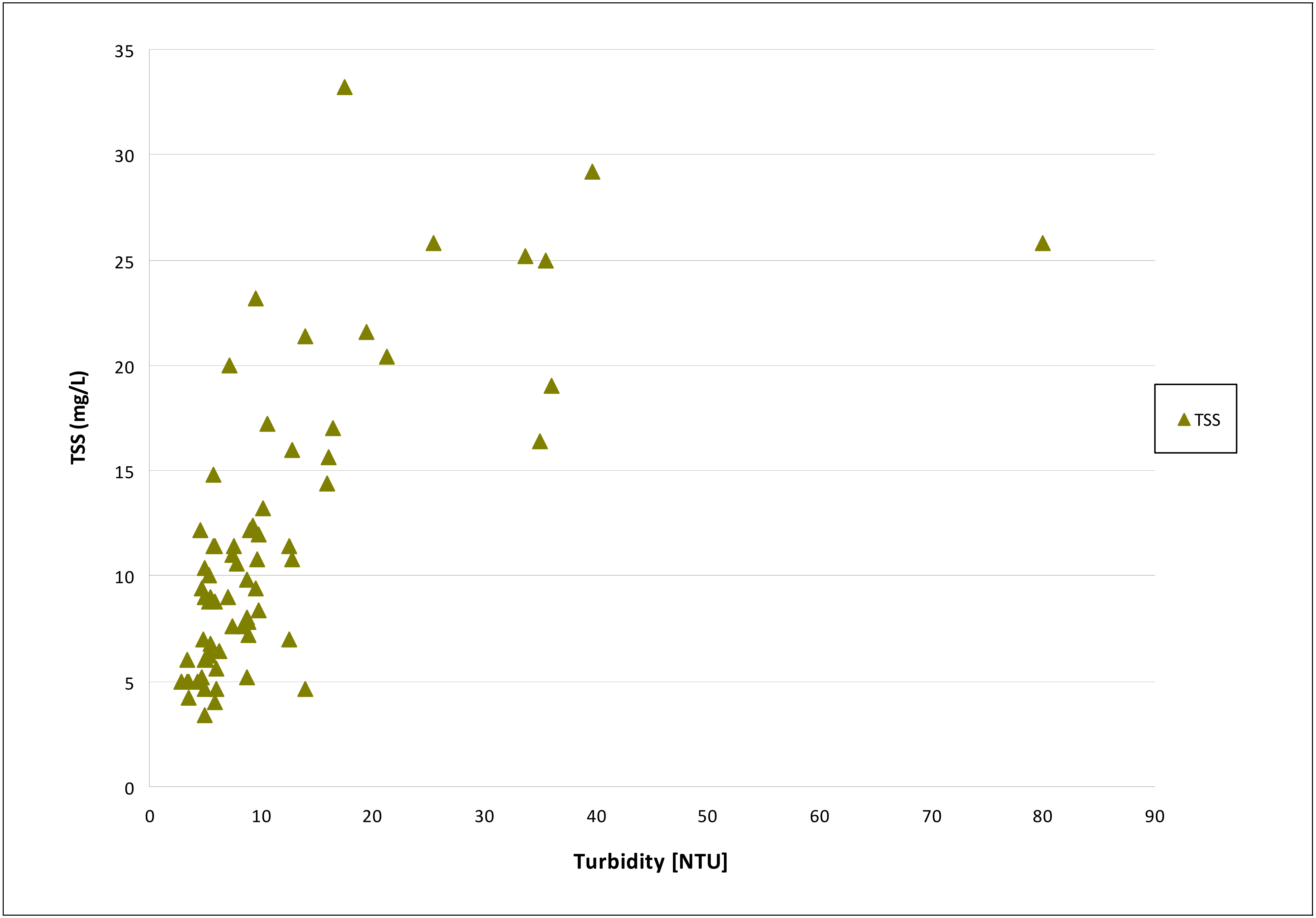
Figure 9
Water Quality Monitoring Locations - Transloading Station
Terminal 4 Phase I Removal Action - Removal Action Completion Report
Portland, Oregon

ANCHOR ENVIRONMENTAL, L.L.C.



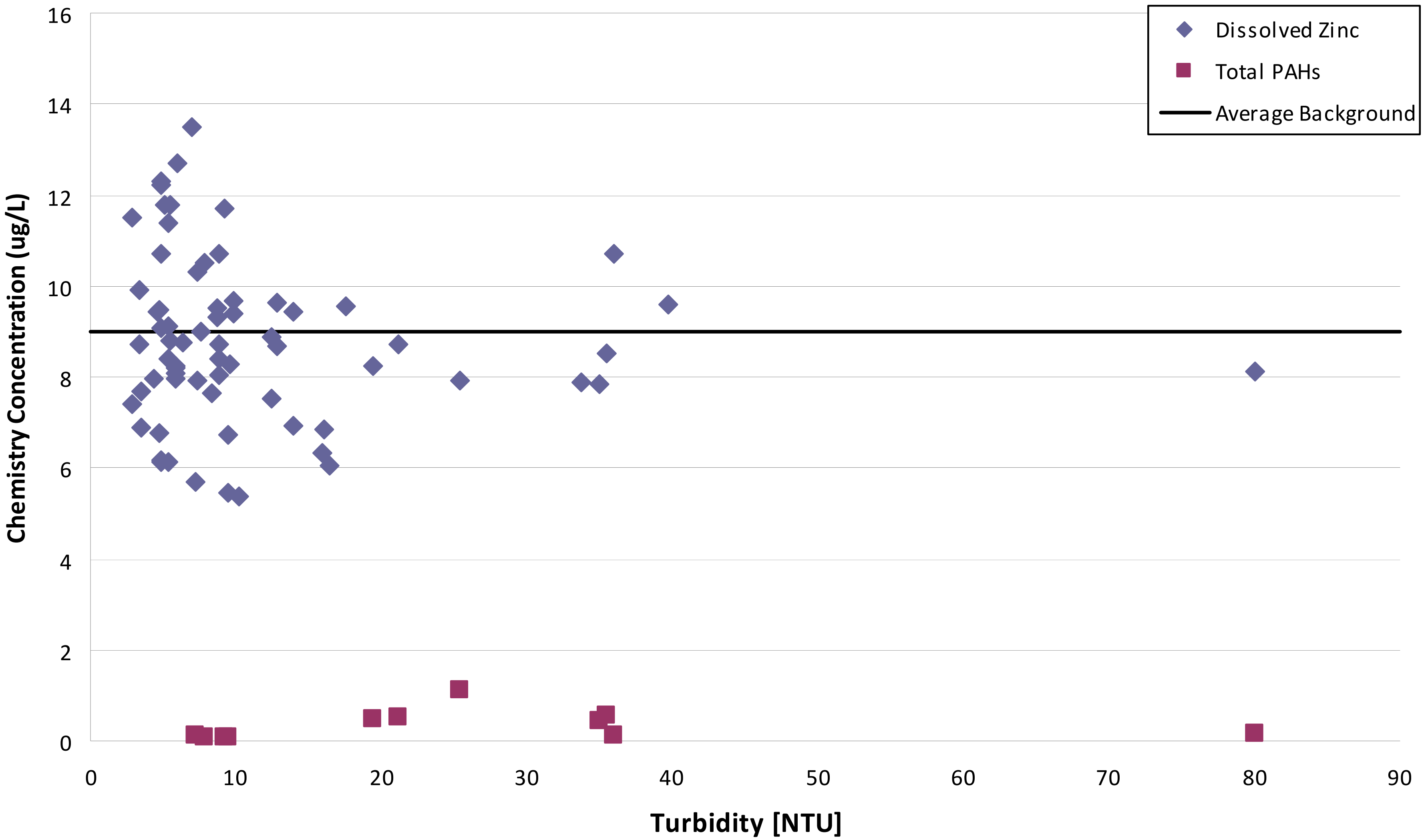
ANCHOR ENVIRONMENTAL, L.L.C.

Figure 10
Soil Sampling Locations - Transloading Station
Terminal 4 Phase I Removal Action - Removal Action Completion Report
Portland, Oregon



ANCHOR ENVIRONMENTAL, L.L.C.

Figure 11
Turbidity versus TSS Results
Terminal 4 Phase I Removal Action Completion Report



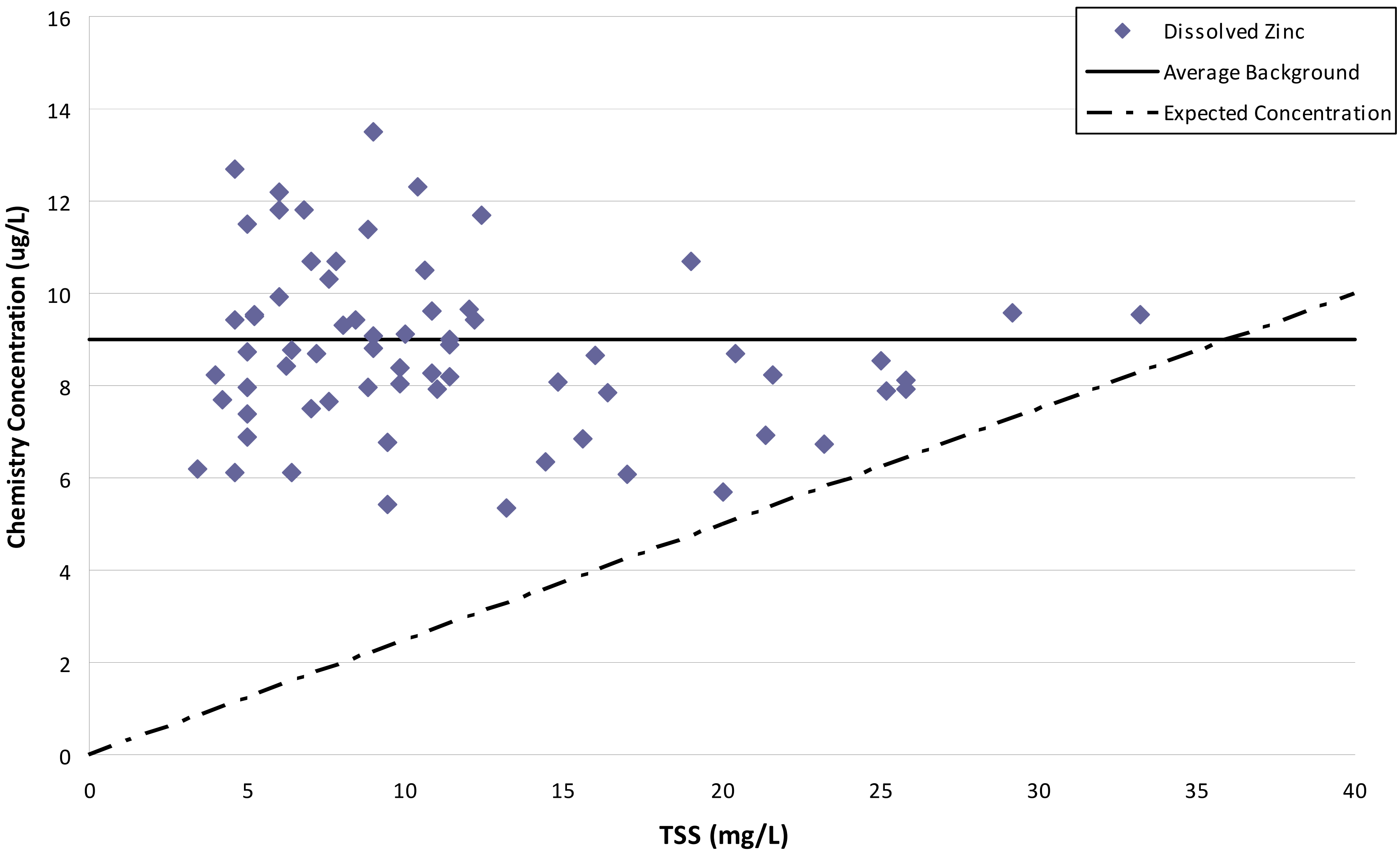
Notes:

For TSS censored concentrations, data point is reported at the detection limit of 5 NTUs.

Expected Concentration based on average dredge prism sediment concentration of 250 mg/kg.

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 12a
Turbidity versus Analytical Results
Terminal 4 Phase I Removal Action Completion Report



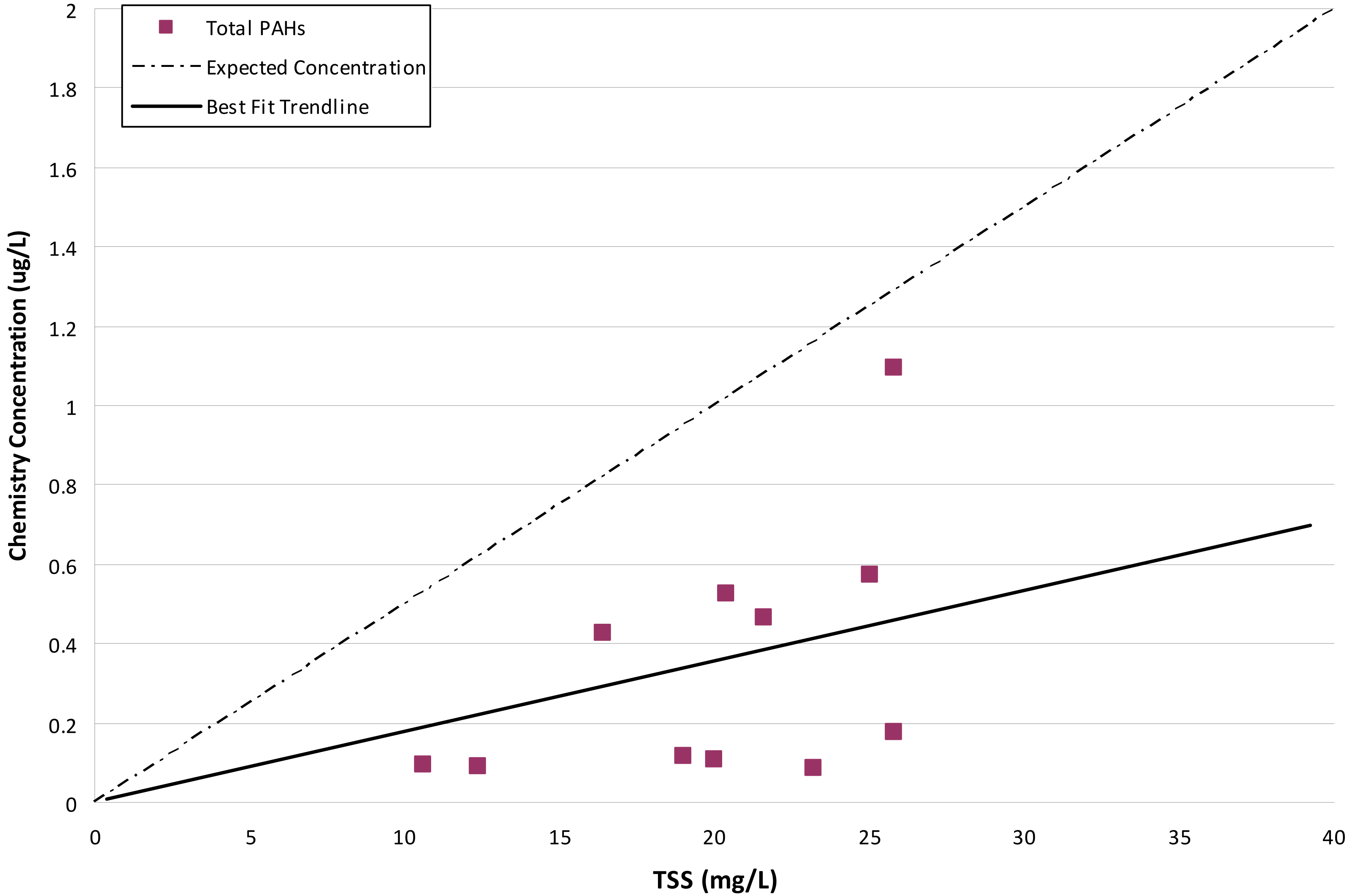
Notes:

For TSS censored concentrations, data point is reported at the detection limit of 5 NTUs.

Expected Concentration based on average dredge prism sediment concentration of 250 mg/kg.

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 12b
TSS versus Analytical Results
Terminal 4 Phase I Removal Action Completion Report



Notes:

For TSS censored concentrations, data point is reported at the detection limit of 5 NTUs.

Expected Concentration based on average dredge prism sediment concentration of 50,000 µg/kg.

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 12c
Total PAHs versus Total Suspended Solids (TSS)
Terminal 4 Phase I Removal Action Completion Report