

FINAL

DESIGN ANALYSIS REPORT

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

Prepared for

Port of Portland
Portland, Oregon

Prepared by

Anchor Environmental, L.L.C.
6650 SW Redwood Lane, Suite 333
Portland, Oregon 97224

In Association with

NewFields
Ash Creek Associates, Inc.

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List of Acronyms and Abbreviations

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



List of Acronyms and Abbreviations

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



List of Acronyms and Abbreviations

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

List of Acronyms and Abbreviations

ODOT	Oregon Department of Transportation
OERS	Oregon Emergency Response System
OHW	ordinary high water
OLW	ordinary low water
ORS	Oregon Revised Statutes
OSHA	Occupational Safety and Health Administration
OUNC	Oregon Utility Notification Center
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PDM	Precedence Diagram Method
PEC	Probable Effects Concentration
PEL	Permissible Exposure Limit
PFD	personal flotation device
PFRP	Process to Further Reduce Pathogens
PIT	Point Intercept Transect
Port	Port of Portland
Port PM	Port of Portland Project Manager
PPE	personal protective equipment
PSEP	Puget Sound Estuary Program
psf	pounds per square foot
PVC	polyvinyl chloride
QAPP	quality assurance project plan
QA/QC	quality assurance/quality control
RAA	Removal Action Area
RACR	Removal Action Completion Report
RAO	Removal Action Objective
RAWP	Removal Action Work Plan
RI/FS	Remedial Investigation/Feasibility Study
RM	river mile
RMSF	Rocky Mountain Spotted Fever
RNA	regulated navigation area
ROD	Record of Decision
RPD	relative percent difference



List of Acronyms and Abbreviations

RPM	revolution per minute
RTI	Reforestation Technologies International
RTK	real time kinematic
SAP	Sampling and Analysis Plan
SCAE	Source Control Alternatives Evaluation
SIM	selected ion monitoring
SMP	Settlement Monitoring Plan
SM	Standard Method
SOP	standard operating procedure
SOQ	Statement of Qualifications
SOW	Statement of Work
SPSA	Safe Performance Self-Assessment
SQO	Sediment Quality Objective
SVOC	semivolatile organic compound
SZ	support zone
T4	Terminal 4
TAT	turnaround time
TCLP	Toxicity Characteristic Leaching Procedure
TDP	Transportation and Disposal Plan
TEC	Threshold Effects Concentration
TOC	total organic carbon
TPH	total petroleum hydrocarbons
TSS	total suspended solids
UIC	Underground Injection Control
UL	Underwriters Laboratory
ULSD	ultra low-sulfur diesel
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VCP	Voluntary Cleanup Program



List of Acronyms and Abbreviations

VOC	volatile organic compound
WQMCCP	Water Quality Monitoring and Compliance Conditions Plan
WQMP	Water Quality Monitoring Plan



1 INTRODUCTION

1.1 Background

In 2000, the U.S. Environmental Protection Agency (USEPA) added the Portland Harbor Superfund Site to the National Priorities List. The Port of Portland (Port) is one of 10 potentially responsible parties that entered into an Administrative Order on Consent with USEPA for a Remedial Investigation/Feasibility Study (RI/FS) of the Superfund Site in fall 2001. The Administrative Order on Consent allows Early Actions to be conducted to address known contamination at specific locations within the Superfund Site.

Contaminants found in Terminal 4 (T4) sediment samples during a remedial investigation directed by the Oregon Department of Environmental Quality (DEQ) led to a determination that a Removal Action at T4 is warranted. Accordingly, the Port is conducting a Non-Time-Critical Removal Action (NTCRA) under an Administrative Order on Consent for Removal Action (the AOC) executed by the Port and USEPA in October 2003. Figure 1 shows the Removal Action boundary at T4.

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

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



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

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

Phase I of the Removal Action includes the following components:

- Dredging and off-site disposal of sediment exhibiting the highest chemical concentration, providing a permanent solution of contaminant mass removal
- Construction of a nearshore cap to isolate petroleum-contaminated sediments from aquatic receptors and control a potential ongoing source to nearby areas
- Stabilization of the Wheeler Bay bank to minimize contaminant migration to the river
- Dredging and off-site disposal of contaminated sediments in Slip 3 at Berth 410 to support water-dependent maritime use in a manner consistent with the Action

Memo (USEPA 2006a) and in support of overall risk reduction in the Removal Action Area (RAA)

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

1.2 Organization of this Document

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

- **Section 2 – Phase I Removal Action Description** describes the setting of the Phase I work, summarizes the Phase I objectives and performance standards, and details the Phase I activities by subarea.
- **Section 3 – Existing Conditions** summarizes the information and data collected within the Phase I Area that will be used as the basis of the design, including physical conditions, hydrogeologic and geotechnical conditions, hydrodynamic characteristics, sediment quality, and site uses.
- **Section 4 – Dredge and Disposal Plan** provides the conceptual dredge plan for Phase I, including the basis for design, design approach, dredge design surface, volumes, equipment selection, and construction quality control.
- **Section 5 – Capping and Shoreline Stabilization Plan** provides the conceptual cap design at the Head of Slip 3, including the basis for design, design approach, source material description, volumes, and equipment selection. The section also provides the Wheeler Bay shoreline stabilization plan, including design, source material descriptions, volumes, and equipment selection.
- **Section 6 – Water Quality** discusses water quality criteria, contaminant mobility testing, and predicted water quality for the different Removal Action elements.
- **Section 7 – Substantive Requirements of Permits** discusses the regulatory requirements that must be achieved during the implementation of the Removal Action.
- **Section 8 – Construction Schedule and Sequencing** describes the duration and order of the anticipated Phase I Removal Action construction activities.
- **Section 9 – Access and Easement Requirements** provides access and easement information related to implementation of the Phase I Removal Action.

- **Section 10 – Impact Minimization** discusses measures to minimize impacts to the environment and community.
- **Section 11 – Institutional Controls** details the actions required to maintain capped areas.
- **Section 12 – References** summarizes the references used in the document.

The appendices provide the following information:

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