DESIGN STATUS REPORT
TERMINAL 4 PHASE II REMOVAL ACTION
PORT OF PORTLAND, PORTLAND, OREGON

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

Prepared for

Port of Portland

Prepared by

Anchor QEA, LLC

In Association with

NewFields

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TABLE OF CONTENTS

List of Tables

List of Figures

List of Appendices

LIST OF ACRONYMS AND ABBREVIATIONS

2-D	two-dimensional
AFT	Abiotic Fate and Transport
AOC	Administrative Order on Consent
ARAR	Applicable or Relevant and Appropriate Requirements
BiOp	Biological Opinion
CDF	Confined Disposal Facility
City	City of Portland
CMPP	Conceptual Mitigation Plan Proposal
COPCs	chemicals of potential concern
CWA	Clean Water Act
DAR	Design Analysis Report
DDT	dichloro-diphenyl-trichloroethane
DEQ	Oregon Department of Environmental Quality
DSR	Design Status Report
EE/CA	Engineering Evaluation/Cost Analysis
ESA	Endangered Species Act
iAOPCs	initial areas of potential concern
IDR	informal dispute resolution
IMRP	Interim Monitoring and Reporting Plan
LWG	Lower Willamette Group
MET	modified elutriate test
MNR	monitored natural recovery
NGVD	National Geodetic Vertical Datum
NMFS	National Marine Fisheries Service
NTCRA	Non-Time-Critical Removal Action
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
Port	Port of Portland
PRGs	Preliminary Remediation Goals
RAA	Removal Action Area

RAOs	Remedial Action Objectives
RI/FS	Remedial Investigation/Feasibility Study
RM	River Mile
ROD	Record of Decision
SAP	sampling and analysis plan
SBLT	sequential batch leachate test
SMA	Sediment Management Area
T4	Terminal 4
TCLP	toxicity characteristic leaching procedure
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service

1 INTRODUCTION

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 2003). 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 T4 that included a combination of monitored natural recovery (MNR), 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 is taking more time than what was anticipated when the Action Memo was issued. 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 Early Action project with the harbor-wide RI/FS schedule. The Port also prepared an Abatement Measures Proposal in October 2007 (Anchor 2007a) to detail specific components of the Removal Action that could be implemented as Phase I to address conditions at T4 that posed an imminent threat to human health and the environment. In November 2007, USEPA approved the schedule realignment request on condition that the Port implement the abatement measures in the Abatement Measures Proposal, which split the project into two phases (letter dated November 15, 2007 from Deborah Yamamoto, USEPA, to Tom Imeson, Port of Portland; Appendix A). A Phase I final design was completed and implemented in 2008. 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 completed once that information is available. This report provides a status update for the design of Phase II.

1.1 Selected Terminal 4 Removal Action

The T4 Removal Action, as described in the Action Memo (USEPA 2006) and the 60 Percent Design Analysis Report for the full Removal Action (DAR; Anchor 2006a), includes the following activities (Figure 2):

- Construction of a CDF in Slip 1
- Dredging in Slip 3 and north of Berth 414 with placement into the CDF
- MNR north of Berth 414, under the pier area at Berth 410 (below the finger pier) in Slip 3; within a majority of Wheeler Bay; and near Berth 401
- Capping within Slip 3—the area directly adjacent to and under the former Pier 5, the nearshore slopes under Pier 4 at Berth 411, and at the head of Slip 3 and in front of the pinch pile bulkhead; in Wheeler Bay; north of Berth 414; and on the downstream side of Berth 401
- Relocation of Berth 405 to the main river channel in front of Slip 1

1.1.1 Phase I of the Removal Action

Phase I of the Removal Action consisted of the following activities, as shown on Figure 3:

- Dredging and off-site disposal of sediment from within three areas exhibiting the highest chemical concentration at T4. Specifically, these areas were immediately adjacent to Berth 411, adjacent to Pier 5, and north of Berth 414. A portion of the dredge areas identified above could not be designed to achieve the planned removal depth due to the concern over slope stability and waterfront structures. Therefore, after completion of dredging, these select areas were covered with a thin layer of sand.
- Dredging and off-site disposal of contaminated sediment in an area adjacent to Berth 410 within Slip 3 to support water-dependent maritime use in a manner consistent with the Action Memo (USEPA 2006). Material was removed down to navigational depths of between -39.3 to -41.3 feet National Geodetic Vertical Datum (NGVD).
- Construction of a nearshore cap at the head of Slip 3 in front of and behind the existing timber bulkhead to isolate petroleum-contaminated sediment from aquatic receptors and control a potential ongoing source to nearby areas.
- Stabilization and capping of the Wheeler Bay shoreline to minimize contaminant migration to the river.

As mentioned in Section 1.1, these activities were all planned as part of the overall Removal Action at T4 as described in USEPA's Action Memo (USEPA 2006). The activities were implemented as part of Phase I because they addressed areas within the site that exhibited some of the highest concentrations, presented potential ongoing sources, and/or were not expected to be significantly impacted by the outcome of the harbor-wide RI/FS process. The remainder of the Removal Action will be implemented as Phase II after the information needed from the harbor-wide RI/FS process is obtained.

1.1.2 Phase II of the Removal Action

Phase II of the Removal Action consists of a combination of CDF construction, dredging, capping, and MNR in areas not completely addressed by Phase I. The head of Slip 3 cap and the Wheeler Bay shoreline stabilization activities are intended to be the final Removal Action for these areas, consistent with the Action Memo (USEPA 2006). The areas that were dredged as part of Phase I will be reassessed and, if necessary, addressed as part of Phase II along with the remaining areas at T4 including Slip 3, Slip 1, north of Berth 414, and Berth 401.

1.2 Phase II Design Status

Before the Removal Action was divided into two phases, the Port had submitted the 60 Percent Design for the full Removal Action to USEPA (Anchor 2006a). The Port received comments from USEPA in January 2007 and it was evident that additional collaboration needed to occur before the design could progress. Therefore, between January and November 2007, the Port and USEPA teams worked collaboratively through technical questions and issues associated with the 60 Percent Design for the full Removal Action as part of an informal dispute resolution (IDR) process. A summary of the documents that resulted from this process and the status of each technical issue are provided in Table 1.

Table 1
Status of Key Terminal 4 Removal Action Documents and Outstanding Issues from the IDR Process

Document Name/ Subject of Outstanding Issue	Date of Document Submittal	Description	Status[1]
Long-Term Groundwater Model			
Physical Model Parameters (K, TOC, porosity, density)	3/30/2007	Specification of physical input parameters for characterizing groundwater flow and chemical exchange properties of import material (berm, cap, dikes) and CDF fill material from T4 and Portland Harbor.	Resolved: Initial agreement on physical model parameters and sensitivity ranges occurred in 3/30/07 Groundwater Modeling Meeting (see meeting notes). Organic carbon content of import material was subsequently verified with analytical data from local quarries (see *Borrow Source Analytical Results,* below). Existing permeability measurements were determined to be representative of Portland Harbor sediments (see *Dredged Material Permeability Evaluation,* below).
Explanation of Effective Dispersion (NewFields 2007c)	4/20/2007	Compares the use of a steady-state versus transient groundwater flow solutions in long-term contaminant transport predictions. Similarities of approach are compared to previous CDF modeling studies, including St. Paul Waterway, Tacoma, Terminal 91, Seattle, and Blair Slip 1, Tacoma.	Resolved: Use steady state approach for long-term model. This approach was approved by USEPA during the 5/17/07 meeting (see meeting notes).
Dredged Material Permeability Evaluation (Anchor 2007b)	5/4/2007	Provide hydraulic conductivity (permeability) values for the long-term groundwater model for Portland Harbor material after it has been placed within the CDF and allowed to consolidate.	Resolved; 6/12/07 email from Sean Sheldrake.
Metal Partitioning Coefficients for Berm (NewFields and Anchor 2007)	6/20/2007	Provide partitioning coefficients for the berm for long-term and short-term groundwater model.	Resolved; final comments from USEPA on 7/12/07 via email from Sean Sheldrake.
SAP for Terminal 4 SBLT (Palermo and Anchor 2007b)	6/15/2007	Sampling and analysis plan to obtain more representative leachate testing of Terminal 4 dredge prism.	Resolved; USEPA approval of SAP on 6/19/07.
Portland Harbor Stats Summary	6/11/2007	Provides source concentrations for COPCs for Portland Harbor.	Resolved; PH concentrations settled on during 6/8/07 meeting. Concentrations for COPCs will be updated with new LWG bulk sediment data from AOPCs.
Portland Harbor Leachate Evaluation (Metals)	6/11/2007	Partitioning coefficients for metals derived from paired sediment porewater data (Portland Harbor Site Investigation, Weston 1998) for Portland Harbor sediment for groundwater model.	Unresolved: Port responded to USEPA's 6/20/07 comments on 7/19/07 during an IDR meeting. Concentrations will be updated with new LWG SBLT and bulk sediment data from AOPCs.
Portland Harbor Leachate Evaluation (Organics)	6/11/2007	Partitioning coefficients for organics derived from Region 10 leachability test data for organic constituents for Portland Harbor sediment for groundwater model.	Unresolved: Port responded to USEPA's 6/20/07 comments on 7/19/07 during an IDR meeting. Concentrations and partitioning coefficients will be updated with new LWG SBLT and bulk sediment data from AOPCs.
Response to USEPA June 20 Comments_PH Values	7/19/2007	Responses to USEPA's comments on metals and organics leachate values for Portland Harbor.	Unresolved. Concentrations will be updated with new LWG SBLT and bulk sediment data from AOPCs.
Biodegradation Rate Summary	7/17/2007	Input parameter for long-term groundwater model.	Unresolved: (From July 19, 2007 Meeting Summary): Port will review the references provided by USEPA (in 7/18/07 email) as well as degradation rates agreed upon for use in Portland Harbor (e.g., abiotic fate and transport model), and will update table as necessary. Proposed updated values will be provided in CDF Groundwater Input Memo.
T4 Biodegradation Comments	7/18/2007	Comments from USEPA on Biodegradation Values (not the same values as in the 7/17/07 document).	
Points of Compliance and Criteria	11/15/2007	Points of compliance and criteria necessary for evaluating model output.	Addressed by the comment resolution table attached to the November 15, 2007 letter from USEPA to the Port in Appendix A; see DAR Comment Nos. 24, 67, 96, 130, 133; and SACM Comment Nos. 31, 32. Final resolution dependent on harbor-wide RI/FS process.
Short-Term Groundwater Model			
Explanation of Effective Dispersion (NewFields 2007c)	4/20/2007	See description in Long-Term Groundwater Model.	Resolved: Use transient approach for short-term model. This approach was approved by USEPA during the 5/17/07 meeting (see meeting notes).
Short-term CDF Hydraulic Boundary Condition (NewFields 2007a)	4/30/2007	Methodology to estimate the short-term hydraulic head boundary condition during and following the CDF filling operation; boundary condition is input to short-term water quality model.	Resolved; 5/1/07 meeting.
SAP for Additional MET (Palermo and Anchor 2007a)	5/25/2007	Sampling and analysis plan to obtain more representative elutriate testing of Terminal 4 dredge prism.	Resolved; USEPA approval of SAP on 6/8/07.
Estimated Source Concentrations for Short-Term GW Model (Anchor and Palermo 2007)	4/27/07 revised 7/9/2007	Provide source concentrations for short-term groundwater model; subsequently updated with new MET data.	Resolved: USEPA sent the Port comments on the MET test results on 7/12/07; comments do not change the values provided.
T4 Kd Comments; New MET Comments	7/12/2007	USEPA's comments on Kd values and Short-term GW Source (MET).	
Metal Partitioning Coefficients for Berm (NewFields and Anchor 2007)	6/20/2007	See description in Long-Term Groundwater Model.	Resolved; final comments from USEPA on 7/12/07 via email from Sean Sheldrake.
Borrow Source Analytical Results	6/8/2007	TOC values from material collected at potential borrow source sites that could be used to construct the CDF berm to confirm model input parameter.	Resolved: During the 6/8/07 IDR meeting, Port proposed a mean value of 0.06% TOC and a minimum value of 0.02% TOC based on sampling results; USEPA agreed to proposed values.
Short-Term Water Quality Modeling (NewFields 2007d)	7/30/2007	Summary report of short-term model results.	Sent to USEPA on 7/30/07. Model will be updated if there are significant revisions to dredge volumes, dredge methods or production rates, or training dike geometries.

Document Name/ Subject of Outstanding Issue	Date of Document Submittal	Description	Status[1]
CDF Construction			
Chemical acceptance criteria for berm fill and verification testing frequency		To inform development of chemical criteria for cap and berm fill acceptance.	Partially unresolved: Port needs to provide a table of berm fill acceptance criteria. Verification testing frequency was resolved during the April 5, 2007 IDR meeting and includes initial testing of berm material once per 10,000 cy. If the first two sample results are consistent with the borrow source data, frequency would be reduced to one sample per 20,000 cy.
Import fill material placed in the CDF must meet same chemical acceptance criteria as established for cap material and berm select fill		Import fill material is the material to be placed in the CDF above the saturated zone of contaminated sediment.	Unresolved: During the May 1, 2007 IDR meeting, USEPA clarified that it is not the intent of the CDF that the import fill layer be a disposal facility for contaminated upland soils or contaminated dredged sediments. USEPA further required the Port to show that material being placed in this layer is protective of human health and the environment. Port contends that if material passes for upland disposal, it could be used as fill layer.
Weir Overflow Evaluation			
Estimates of Potential Weir Overflow (NewFields 2007b)	6/20/2007	Predict conditions under which no discharge will occur to inform construction management and scheduling.	Unresolved: Port submitted Technical Memorandum to USEPA on 6/21/07. Model analysis will be updated with new Phase II dredge inflow rates to determine conditions for no discharge.
Weir Discharge Evaluation WP (MFA 2007a)	6/8/2007	Provide a work plan for the approach to evaluating the CDF weir discharge.	Resolved: No discharge evaluation will be necessary as the Port will manage the dredging during Phase II to result in no weir discharge to the river.
Terminal 4 Early Action Weir Discharge WP (MFA 2007b)	6/18/2007	Supplemental information to the Weir Discharge Work Plan.	
T4; Weir Work Plan Comments	7/13/2007	USEPA comments on the Weir Discharge Evaluation Work Plan.	
Short-term Water Quality Monitoring			
Laboratory Turnaround Times	6/18/2008	Amount of time within which the lab must analyze water quality parameters and report results.	Resolved during Phase I design; USEPA approval of the Water Quality Monitoring Plan as Appendix B of the Final Phase I DAR (Anchor 2008) on June 18, 2008.
Background WQ Monitoring Conditions	6/18/2008	Details related to how background water quality data is collected and applied before the project begins.	Resolved during Phase I design; USEPA approval of the Water Quality Monitoring Plan as Appendix B of the Final Phase I DAR (Anchor 2008) on June 18, 2008.
Water quality monitoring compliance points and criteria for dredging and capping	6/18/2008	Specific location of water quality monitoring compliance points for laboratory parameters and field parameters.	Resolved during Phase I design; USEPA approval of the Water Quality Monitoring Plan as Appendix B of the Final Phase I DAR (Anchor 2008) on June 18, 2008.
COCs to monitor for ponded water seepage through the berm during filling of the CDF	11/15/2007	COCs to monitor for ponded water seepage through the berm during filling of the CDF.	Addressed by the comment resolution table attached to the November 15, 2007 letter from USEPA to the Port in Appendix A; see DAR Comment No. 96.
Frequency and intensity of monitoring during construction	6/18/2008	Frequency and intensity of monitoring during construction.	Resolved during Phase I design; USEPA approval of the Water Quality Monitoring Plan as Appendix B of the Final Phase I DAR (Anchor 2008) on June 18, 2008.
COCs to monitor dredging and capping activities	6/18/2008	COCs to monitor dredging and capping activities.	Resolved during Phase I design; USEPA approval of the Water Quality Monitoring Plan as Appendix B of the Final Phase I DAR (Anchor 2008) on June 18, 2008.
Long-term Monitoring			
Monitoring of groundwater that moves through the berm after filling and during the dormant period--points of compliance and criteria	11/15/2007	Monitoring of groundwater that moves through the berm after filling and during the dormant period--points of compliance and criteria.	Addressed by the comment resolution table attached to the November 15, 2007 letter from USEPA to the Port in Appendix A; see DAR Comment Nos. 24, 67, 96, 130, 133; and SACM Comment Nos. 31, 32. Final resolution dependent on harbor-wide RI/FS process.
Cap monitoring criteria	11/15/2007	Cap monitoring criteria.	Addressed by the comment resolution table attached to the November 15, 2007 letter from USEPA to the Port in Appendix A; see DAR Comment No. 87. Final resolution dependent on harbor-wide RI/FS process.
Dredging			
Dredge Plan Approach	6/18/2008	Dredge cut depths, sequencing, etc.	Resolved during Phase I design; USEPA approval of the Final Phase I DAR (Anchor 2008) on June 18, 2008.
Dredging BMPs (including overwater conventional bucket dewatering)	6/18/2008	BMPs to be implemented during dredging activities.	Resolved during Phase I design; USEPA approval of the Final Phase I DAR (Anchor 2008) on June 18, 2008.
Dredging performance standards		Determining when additional removal in dredging areas will be necessary during construction (i.e., confirmation sampling results versus dredging criteria/performance standards).	It was agreed at the April 5, 2007 IDR meeting that the general rule will be to complete sampling after dredging is completed and that if the surface exceeds PEC criteria then additional dredging will be completed unless a compelling argument/justification can be made for why alternative factors/measures other than additional dredging should be considered or implemented. At the May 10, 2007 IDR meeting, USEPA and DEQ requested a revision to the footnote on the flow chart (Figure 11 from the DAR) defining "other considerations" for determining whether an additional removal action (dredging, capping, MNR) is necessary after post-dredging confirmation sampling. Specifically, USEPA and DEQ requested the "other considerations" to include the DEQ Guidance for Assessing Bioaccumulative Chemicals of Concern in Sediment (January 31, 2007, updated April 3, 2007). At the May 10, 2007 IDR meeting the Port Team could not agree to the request, but stated they would evaluate the suggestion and get back to USEPA.
Capping			
Cap design criteria	11/15/2007	Cap design criteria.	Addressed by the comment resolution table attached to the November 15, 2007 letter from USEPA to the Port in Appendix A. See DAR Comment No. 87.
Chemical acceptance criteria and verification testing requirements	6/18/2008	To verify quality of import material to be used for capping.	Resolved during Phase I design; USEPA approval of the Construction Quality Assurance Plan as Appendix A of the Final Phase I DAR (Anchor 2008) on June 18, 2008.

Document Name/ Subject of Outstanding Issue	Date of Document Submittal	Description	Status[1]
Sediment Acceptance Criteria			
Limitations on treatment methods that destroy or remove contaminants from sediment	11/15/2007	Limitations on treatment methods that destroy or remove contaminants from sediment.	Addressed by the comment resolution table attached to the November 15, 2007 letter from USEPA to the Port in Appendix A; see SACM Comment No. 16. Final resolution dependent on harbor-wide RI/FS process.
Habitat Mitigation			
Third Party Agreement	11/15/2007	Comment from USEPA stated that agreement needs to be reached between USEPA, the Port, and a third party where a third party will be responsible for the construction and long term monitoring and maintenance before USEPA can approve the Mitigation Plan. Additionally, the agreement details need to allow USEPA to comment on the final design (complete plans and specs) to ensure that ARARs are being met.	Addressed by the comment resolution table attached to the November 15, 2007 letter from USEPA to the Port in Appendix A; the Port and USEPA agreed to defer resolution of mitigation comments until a final mitigation project has been defined for the realigned project.
Mitigation Project Timing	11/15/2007	Comment from USEPA stated that timing of the habitat loss versus timing of implementation of the mitigation project should be considered in determining how much mitigation is sufficient.	
Monitoring Timeframe	11/15/2007	Comment from USEPA stated that performance standards should be in force throughout the habitat mitigation lifetime, i.e., maximum invasive species percent cover that applies regardless of the monitoring year. At a minimum, annual monitoring over the first 5 years and every 5 years thereafter should occur.	
Performance Criteria for Fish Presence	11/15/2007	Comment from USEPA stated that the Port should include the following language in the text of the Mitigation Plan: After absence of fish over three consecutive seasons, USEPA may require corrective actions to be taken.	

Note:

1. Status information was obtained from the T4 EA IDR Action Item Tracking spreadsheet dated July 10, 2007, IDR Meeting Summaries, the comment resolution table attached to the November 15, 2007 letter from USEPA to the Port, and project emails.

Through the IDR process, a number of design issues had been resolved. When the Removal Action was divided into two phases, the remaining design issues were put on hold. Now that Phase I has been completed, USEPA requested a report documenting the status of the design for Phase II.

This Design Status Report (DSR) summarizes the status of the Phase II design considering the resolution of technical issues from the 2007 IDR process, the progress made in the harbor-wide RI/FS process, and implementation of Phase I activities. The status of key components supporting the Phase II design, as recommended by USEPA, is discussed in this document as listed below:

- New data
- CDF groundwater modeling
- Weir discharge evaluation
- Data gaps
- Habitat mitigation approach
- Potential Applicable or Relevant and Appropriate Requirements (ARAR) changes resulting from harbor-wide RI/FS process
- Substantial cost changes

2 NEW DATA AND INPUT TO DESIGN

New data and other information that will be used in the design of the Phase II Removal Action includes:

- Phase I Removal Action post-construction surface sediment sampling results (Anchor QEA 2009). These results will be used to inform the Phase II dredge prism design.
- Phase I Removal Action background water quality data (Anchor QEA 2008, Appendix M). These data will be used to update 90th percentile ambient background water quality concentrations.
- Phase I Removal Action construction water quality data (Anchor QEA 2008, Appendix D1). These data will be used to inform design of Phase II water quality monitoring protocols and evaluation of needed best management practices (BMPs).
- Phase I pre-construction modified elutriate test (MET) results. These results will be used to inform the short-term CDF groundwater model as described in Section 3. These data were provided to USEPA during the IDR process and will be summarized in the CDF Groundwater Model Input Parameter Memorandum, which is scheduled for submittal to USEPA on November 1, 2009. Further discussion is provided in Section 2.1, below.
- Phase I pre-construction sequential batch leachate test (SBLT) results. These results will be used to inform the long-term CDF groundwater model as described in Section 3. These data will be summarized in the CDF Groundwater Model Input Parameter Memorandum. Further discussion is provided in Section 2.1, below.
- Portland Harbor leachability (SBLT, toxicity characteristic leaching procedure [TCLP]) and elutriate (MET) data. These data will be used to inform the long-term CDF groundwater model as described in Section 3. These data are currently scheduled to be reported to USEPA by the Lower Willamette Group (LWG) in June 2009, and will be summarized in the CDF Groundwater Model Input Parameter Memorandum. Further discussion is provided in Section 2.2, below.
- Phase I Removal Action pre-construction column settling test results. These data will be used to inform the CDF design, specifically to assess short-term bulking and

settlement of the dredge slurry solids in the CDF (see Phase I Final DAR [Anchor 2008]).

- Portland Harbor Preliminary Remediation Goals (PRGs) for the FS. The PRGs may be used to inform the dredging, capping, and MNR design.
- New in-water and upland survey data. In June 2009, the Port is planning to collect multi-beam bathymetry of submerged areas including areas proposed for Phase II Removal Action design. Additionally, multi-beam shoreline surveys will be completed of the upland areas at T4 for proposed areas of Phase II design. This up-to-date survey information will be incorporated into the Phase II design.

Section 2.1 provides additional discussion on the pre-construction MET and SBLT data collected from T4, and whether those data are representative of current conditions at T4 following the Phase I Removal Action. Section 2.2 provides additional discussion on the availability and use of Portland Harbor contaminant mobility data, including SBLT, MET, and TCLP data from representative initial areas of potential concern (iAOPCs) in potential remediation areas. Section 2.3 discusses the role of Portland Harbor FS PRGs in the T4 Phase II design.

2.1 Representativeness of Terminal 4 MET and SBLT Data

Following the submittal of the 60 Percent Design documents (Anchor 2006a) for the full Removal Action, and prior to the implementation of the Phase I Removal Action, updated MET and SBLT tests were conducted using sediments representative of the dredge prism in Slip 3 and parts of Berth 414. Although elutriate and leachate testing had previously been performed during the Engineering Evaluation/Cost Analysis (EE/CA; BBL 2005), those earlier tests were conducted before the T4 Removal Action Area (RAA) had been fully defined, and as a result, the composite sediment sample used for testing included significant areas outside the dredge prism. The sampling and analysis plans (SAPs) for the updated (2007) MET and SBLT tests were presented in Palermo and Anchor (2007a and 2007b, respectively), and were subsequently approved by USEPA on June 8 and June 19, 2007, respectively.

Since the updated MET and SBLT tests were performed, the Phase I Removal Action was completed. The Phase I Removal Action targeted the most highly contaminated sediments at

T4, and may, therefore, have affected the overall sediment quality of the remediation areas remaining to be addressed during Phase II. A comparison of dredge prism quality before and after the Phase I Removal Action is necessary to determine whether the 2007 MET and SBLT test results are still representative of the remaining Phase II Removal Action areas.

For this comparison, we used the database that was available at the time the 2007 MET and SBLT SAPs were prepared to establish pre-Phase I conditions. For post-Phase I conditions, several samples located within the Phase I Removal Area were removed from the database (including T4-B411-02, T4-B414-01, T4-S3-04, and T4-VC24), and the mean concentrations of the remaining samples were recalculated (see Palermo and Anchor 2007a, Appendix B for the methodology). The results are summarized below for several chemicals of potential concern (COPCs) in Portland Harbor.

Chemical	Units	Pre-Phase I Average Conc.	Post-Phase I Average Conc.	Difference
Pyrene	µg/kg	7,450	5,180	-30%
Benzo(a)pyrene	µg/kg	6,150	4,690	-24%
Total PAHs	µg/kg	50,850	35,530	-30%
Lead	mg/kg	184	186	NC
Copper	mg/kg	43	44	NC
Zinc	mg/kg	250	254	NC
4,4'-DDT	µg/kg	9.8	11.7	ND
4,4'-DDE	µg/kg	3.7	4.1	(NC)
4,4'-DDD	µg/kg	6.8	8.1	(NC)
Aroclor-1248	µg/kg	18	20	ND
Aroclor-1254	µg/kg	34	40	(NC)
Aroclor-1260	µg/kg	78	94	(NC)

NC = No discernible change in dredge prism concentration

(NC) =No substantive change in concentration is apparent, based on more limited dataset

ND = Not detected in the elutriate

Based on this comparison, the average polycyclic aromatic hydrocarbon (PAH) concentration in the remaining Phase II dredge areas has decreased by approximately 24 to 30 percent as a result of the Phase I Removal Action. This difference is within the range of analytical error, and not severe enough to invalidate the MET and SBLT results, although it should be

understood that the PAH results from these tests are likely conservative (i.e., overestimated). No discernible differences were observed in metals concentrations. Although there is more limited analytical data to evaluate dichloro-diphenyl-trichloroethane and its degradation products (DDTs) and polychlorinated biphenyls (PCBs), the difference between pre- and post-Phase I concentrations does not appear to be significant. Further, there is no reason to believe DDTs or PCBs would be unusually concentrated in the Phase I areas; i.e., PCBs and DDTs did not drive the Phase I Removal Action.

In summary, the MET and SBLT tests performed in 2007 are still considered representative of the Phase II remediation areas, although the elutriate and leachate results for PAHs are likely to be conservative (i.e., somewhat overestimated) because average sediment concentrations have been reduced as a result of the Phase I Removal Action.

2.2 Portland Harbor Contaminant Mobility Data

The LWG collected and tested composite sediment samples from 11 iAOPCs within Portland Harbor, as described in Anchor (2008). MET, SBLT, and TCLP tests were conducted on the iAOPCs listed below.

iAOPC	River Mile	Bank	Site Vicinity
1	2.2	E	Oregon Steel Mills
3	3.8	E	Schnitzer Slip
6	4.8	W	BP West Coast
7	5.7	E	Marcom
11	6.3	W	Gasco
13	6.8	E	Willamette Cove
14	7.1	W	Arkema
19	8.8	W	Gunderson
21	8.2	E	Portland Shipyard
23	9.0	E	Swan Island Lagoon
24	9.7	W	Fireboat Cove

E = East bank; W = West bank

It is anticipated that the harbor-wide FS will indicate that the iAOPCs listed above are the sites most likely to be addressed via active remediation, including dredging. These iAOPCs

provide a representative cross-section of contaminated sites throughout Portland Harbor because they are from River Mile (RM) 2.2 to RM 9.7; half are from the east bank and half from the west bank of the river, and they include a wide spectrum of COPCs. Therefore, sediments expected to be dredged from these iAOPCs represent potential fill material for the CDF at T4, Slip 1.

Analytical data from these iAOPCs (primarily SBLT results, as discussed below) will be used to help establish a representative range of leaching characteristics for the contaminated fill material in the CDF. It is anticipated that validated analytical results from this investigation will be submitted to USEPA by the LWG in June 2009. The Port will then evaluate the LWG data and present the CDF-specific modeling results in the CDF Groundwater Model Input Parameter Memorandum, which is expected to be submitted to USEPA on November 1, 2009 based on the current schedule.

At the same time, consideration of these anticipated candidate sediment cleanup locations, and possibly others, within the Portland Harbor Superfund Site (both Port-related and non-Port related) for eventual placement in the T4 CDF will need to be initiated. It is important to initiate this consideration at this time for two reasons:

- First, USEPA acknowledged in its 2006 Action Memo that the T4 CDF will be designed in a manner such that the majority of its volume capacity will be for contaminated sediments from non-T4 locations (USEPA 2006). In addition, USEPA has indicated that the T4 CDF design must be consistent with the harbor-wide FS (e.g., deemed to be protective, effective, cost-effective, and implementable from the harbor-wide perspective). Early coordination between USEPA and the Port regarding potential other users is critical to ensure that the T4 CDF receives adequate consideration in the harbor-wide FS analysis, and ultimately, the Record of Decision (ROD).
- Second, one of the factors the Port and USEPA recognized in realigning the T4 CDF schedule with the harbor-wide schedule was reducing the financial risks to the Port as the owner, including eliminating the potential for the CDF to sit open and partially filled for several years until other sediment cleanups are at their final implementation state (i.e., after the harbor-wide ROD and detailed design phase). The Port, as a

public entity, needs a high level of assurance that there will be an adequate number of users of the CDF prior to commencing construction.

SBLT Results. The SBLT data will provide an estimate of the porewater concentrations that are expected to equilibrate with contaminated sediments in the CDF. These data describe the maximum "source strength" of groundwater in the CDF and are a key input parameter for the long-term groundwater model. The ratio of the iAOPC bulk sediment concentration to the SBLT leachate concentration will be used to develop a site-specific sediment-to-groundwater partitioning coefficient. The partitioning coefficient describes how readily contaminants are desorbed from the sediments, dissolved in groundwater, and available for transport through the CDF.

MET Results. MET results are used to characterize the behavior of hydraulically dredged sediment slurry being discharged into an enclosed pond, typically regulated by a weir structure, during the filling of a CDF. Most of the iAOPCs in Portland Harbor are located too far from T4 (RM 4.3), and many are on the opposite bank of the river, for hydraulic dredging to be practicable. The Schnitzer Slip is located about a half mile downstream of Slip 1, but the next nearest iAOPCs on the east side of the river are about 1.4 miles upstream and 2.1 miles downstream of the CDF. As a result, it is expected that mechanical methods, rather than hydraulic, will be the preferred methods for dredging the ultimately-defined Sediment Management Area (SMA) and placement of the material into the CDF, and, therefore, the MET results will not be relevant to the T4 CDF project.

TCLP Results. TCLP results from Portland Harbor will be used to determine whether any of the sediment dredged from the iAOPCs will be excluded from the CDF if they are classified as hazardous waste on the basis of toxicity characteristics, unless treated or otherwise managed in a manner that eliminates the hazardous waste characteristic and as determined through the harbor-wide FS process. Aside from this specific regulatory application, TCLP results will not be used directly in the groundwater model.

In summary, SBLT data from the 11 iAOPCs in Portland Harbor will provide a representative cross-section of contaminants and leaching characteristics for potential fill sediments for the Slip 1 CDF. These data will be sufficient to characterize the chemical mobility of the

contaminated fill layer in the long-term groundwater model. Bulk sediment concentrations and chemical partitioning coefficients derived from the SBLT data will be used as input parameters in the long-term groundwater model. These data will be analyzed and presented in the CDF Groundwater Model Input Parameter Memorandum.

2.3 Preliminary Remediation Goals

USEPA and LWG will be refining the Remedial Action Objectives (RAOs) and developing related PRGs for use in the FS. The concept is that the FS will present a comparative analysis of alternatives based on agreed-upon PRGs. USEPA and LWG intend to resolve refined RAOs and PRGs for purposes of the FS evaluation this summer. During development of the T4 60 Percent Design for the full Removal Action presented to USEPA in December 2006, the harbor-wide RAO and PRG processes were not as far along, and as such, the T4 design analysis and delineation of contaminated areas defaulted to utilizing conservative screening values (Anchor 2006a). To be consistent and integrated with the harbor-wide FS, the T4 Phase II design must incorporate the FS PRGs for sediment and surface water into the analysis. Although the Removal Action may not be the final remedy for T4, this will help ensure consistency with the final harbor-wide ROD. Currently, the schedule for submitting the Phase II 100 Percent Design coincides with the USEPA-approved FS.

3 CONFINED DISPOSAL FACILITY GROUNDWATER MODELING

This section discusses the groundwater modeling status and the next steps necessary to support the T4 Phase II design. The groundwater flow modeling is being conducted to support the CDF design by providing projections of chemical concentrations in groundwater moving through the CDF fill sediments and berm, and the potential effects on surface water quality in the Willamette River.

The following discussion provides a brief summary of the groundwater modeling that has been completed to date for the CDF, including model input parameters, approaches, and results that were completed as part of the 60 Percent DAR for the full Removal Action (Anchor 2006a) and various follow-on discussions and technical memoranda generated during the IDR process. The discussion is organized in the following sections: Previous T4 CDF Modeling, Current Modeling Approach, and Next Steps.

3.1 Previous Terminal 4 CDF Modeling

This section summarizes the groundwater flow and contaminant transport modeling work performed in support of the T4 CDF design.

3.1.1 Engineering Evaluation/Cost Analysis

The hydrogeology of T4 is described in detail in the T4 Early Action Characterization Report (BBL 2004). BBL (2005) summarizes the hydrogeology of T4 and the groundwater flow and contaminant transport model developed to support the EE/CA. The EE/CA selected the CDF as the preferred Removal Action alternative. The CDF alignment is coincident with the general groundwater flow direction. Therefore, BBL used a two-dimensional (2-D) cross-sectional modeling approach to conservatively estimate COPC concentrations in groundwater at the outside edge of the CDF berm. The EE/CA modeling analysis received few comments.

3.1.2 60 Percent Design Analysis Report for the Full Removal Action

Following the EE/CA (BBL 2005), contaminant transport modeling was performed as part of the 60 Percent DAR for the full Removal Action (Anchor 2006a). The modeling approach

was an extension of the BBL (2005) approach. A 2-D cross-sectional model was aligned along critical groundwater flow path to conservatively predict (i.e., tend to overestimate) COPC concentrations in groundwater at the point of entry to the Willamette River.

The 60 Percent DAR (full Removal Action; Anchor 2006a) model was expanded to include revised input parameters based on additional empirical data, including laboratory and field measurements. Model improvements included use of more accurate hydraulic conductivity values, media-specific partitioning coefficients, more representative river and upland hydraulic head boundaries, more conservative recharge (unpaved), an increased simulation timeframe, and an increased sediment fill elevation. A number of conservative revisions were made at the request of USEPA to minimize the chance that concentrations at points of compliance would be underestimated. As a result, the 60 Percent DAR (full Removal Action) modeling analysis resulted in more conservative predictions of COPC concentrations in groundwater compared to predictions in the EE/CA (BBL 2005). Anchor (2006a) concluded that short-term (initial filling operation) and long-term COPC concentrations at the point of groundwater discharge from the berm to the Willamette River were not likely to exceed acute or chronic water quality criteria.

3.1.3 Informal Dispute Resolution Process

In comments received on the 60 Percent DAR for the full Removal Action (Anchor 2006a) related to the groundwater modeling effort, USEPA questioned the appropriateness of most of the model assumptions and input parameters that were used in both the EE/CA (BBL 2005) and the 60 Percent DAR for the full Removal Action models. The disparity between the agency comments received during the EE/CA versus the 60 Percent DAR for the full Removal Action was a contributing factor leading to the IDR process, which involved technical discussions between USEPA (including its federal, state, and tribal partners) and the Port, and development of supporting technical memoranda regarding model input parameters and procedures.

Significant progress was made during the IDR process. Table 1 lists the various work products that were developed in consultation with USEPA to provide detailed explanations of specific data input parameters or modeling approaches and document resolution of issues.

Many of the input parameters and modeling approaches were approved for use by USEPA, as summarized in the table.

3.2 Current Modeling Approach

This section summarizes the current CDF modeling approach for the Phase II design, including a process overview and discussion of both short-term and long-term modeling.

3.2.1 CDF Modeling Process Overview

Figure 4 is a flow chart illustrating the CDF modeling process. The CDF modeling process is based on the progression of previous T4 CDF modeling efforts (BBL 2005; Anchor 2006a, Appendix I) and the resolutions achieved during the IDR process. As shown in Figure 4, short- and long-term modeling are the two primary steps in the modeling process.

Short-term modeling addresses the initial CDF filling operation. The short-term model will be implemented if hydraulic dredging is used to convey dredged material to the CDF. Hydraulic dredging entrains large quantities of water and creates a dilute dredge slurry. When discharged into the CDF, the dredge slurry is temporarily ponded behind the berm, but dredge elutriate water will eventually exit the CDF either through the berm or through an overflow weir.

Short-term modeling consists of three modeling analyses: CDF Hydraulic Boundary Condition (NewFields 2007a), Weir Outflow Analysis (NewFields 2007b), and Short-Term Groundwater Quality Modeling (NewFields 2007d). The CDF Hydraulic Boundary Condition has been approved for use, as summarized in Table 1. The Weir Overflow Analysis and Short-Term Groundwater Quality Modeling memoranda were submitted to USEPA but did not receive agency approval before the cessation of the IDR process. Short-term modeling analyses are described in more detail in Section 3.2.2.

Long-term modeling addresses groundwater flow and contaminant transport for conditions following the consolidation of sediment placed in the CDF. Under long-term conditions, groundwater entering the CDF from upgradient and lateral sources would flow through the CDF materials, and out through the berm. The focus of the long-term modeling is to

evaluate the potential for contaminants in sediments in the CDF to be carried in groundwater through the fill sediments and the berm and finally to the Willamette River. Several aspects of the long-term modeling analysis were resolved through the IDR process, including the following:

- Use of steady-state long-term modeling approach (NewFields 2007c)
- Permeability of dredge fill material (Anchor 2007b)
- Metal partitioning coefficients in berm material (NewFields and Anchor 2007)

Other issues remain unresolved, as listed in Table 1. New leaching test data from representative iAOPCs in Portland Harbor will help to resolve many of the outstanding issues regarding the source strength of the porewater in the CDF. Long-term modeling is described in more detail in Section 3.2.3.

Where concentrations predicted by short- or long-term modeling exceed applicable criteria (not yet determined, see Section 5), the modeling process provides a feedback loop to augment the analysis and/or incorporate design or operational modifications to reduce contaminant concentrations at key locations (see Figure 4).

3.2.2 Short-Term Modeling

Short-term modeling addresses the initial CDF filling operation if hydraulic dredging is used. It is expected that T4 is the only iAOPC located close enough to the CDF for hydraulic dredging to be practicable. However, if others determine that hydraulic dredging would be practicable, additional short-term modeling would be necessary prior to placement into the CDF. Short-term modeling consists of three modeling analyses: CDF Hydraulic Boundary Condition, Weir Outflow Analysis, and Short-Term Groundwater Quality Modeling. The following subsections describe each short-term modeling analysis for the T4 filling event.

3.2.2.1 CDF Hydraulic Boundary Condition

NewFields (2007a) describes the methodology to estimate the short-term hydraulic head boundary condition during and after the CDF filling operation. The methodology was responsive to USEPA comments requiring: 1) the duration of short-term water quality predictions to be extended (relative to the 60Percent DAR for the full Removal Action

modeling analysis [Anchor 2006a]) to account for the recovery period (dewatering) after dredging stops, and 2) the use of resulting short-term predictions to be used as input to long-term water quality predictions. The transient CDF boundary condition provides the rationale for short-term simulation duration and an estimate of CDF ponded water elevation during and following the filling operation. Figure 5 (top) illustrates conceptual groundwater flow conditions represented in the short-term model. Data requirements for the analysis include dredge operation rate, duration, on-off cycle, and the Willamette River stage at the time of filling. USEPA approved the methodology described in NewFields (2007a).

3.2.2.2 Weir Outflow Analysis

NewFields (2007b) described the methodology to estimate the potential rate and duration of weir overflow during filling of the CDF. The analysis is similar to the CDF Hydraulic Boundary Condition analysis. The analysis revealed that overflow of the weir is highly unlikely at typical hydraulic dredge pumping rates, especially since fill rates are under control of the operators. However, extreme assumptions were applied to conservatively estimate (i.e., overestimate) weir overflow rates and durations in the unlikely event that overflow were to occur. Conservative data inputs (i.e., worst case scenario) for the analysis include a high dredge pumping rate, low dredging efficiency (i.e., high water content), long work days (i.e., 20 hours) and project duration, and a low hydraulic conductivity estimate for berm materials. This analysis was originally intended to support an evaluation of potential receiving water quality impacts and permitting requirements for CDF construction. USEPA approved the methodology described in NewFields (2007b).

Under the unlikely combination of conditions assumed, the water balance model indicated the pond might overtop the weir on Day 9 of an 11-day dredging project, and discharge to the river for about one and a half days. Using more reasonable and likely assumptions, overflow would not be predicted to occur at all. Further, the remaining dredge volume in Slip 3, and thus the duration of hydraulic dredging, should be reduced with the removal of the Phase I portion of the dredge prism. All things considered, it is reasonable to expect the hydraulic dredge slurry can be fully contained behind the weir, with no discharge, by appropriately managing dredge filling rates and construction work schedules if necessary. As a result, the weir overflow analysis will be redirected to determining any needed

construction modifications that may be required to prevent overflow of the weir, and the Port will no longer be pursuing regulatory authorization for a surface water discharge from the CDF for the T4 filling event (see Section 4 for further discussion).

3.2.2.3 Short-Term Groundwater Quality Modeling

NewFields (2007d) described the methodology, data input, and results of the short-term groundwater quality predictions for the placement of hydraulically dredged T4 sediment in the CDF. This technical memorandum was submitted to USEPA on July 30, 2007. The methodology and results were not approved by USEPA prior to the cessation of the IDR process (see Table 1).

As an input to the short-term groundwater quality model, the concentrations of sediment contaminants in CDF ponded water (dredge inflow) were estimated based on the dissolved fraction (plus 0.5 percent of total suspended sediment concentration to account for possible colloidal transport) of the MET. Lead, copper, total DDT, and total PCBs were selected as COPCs for short-term water quality analyses. COPC selection and methods to estimate COPC concentrations in CDF ponded water were developed cooperatively with USEPA. The following paragraphs summarize data input and results for the short-term groundwater quality model.

To estimate transport of COPCs through the berm, literature-based values for metal partitioning coefficients (K_d) were agreed upon with USEPA as described in NewFields and Anchor (2007). Organic carbon-based partitioning coefficients (K_{oc}) for organic compounds had previously been agreed upon with USEPA. The mean fraction of organic carbon (f_{oc}) in samples from potential quarry sites was assumed for the berm select fill.

The total simulation time for the short-term flow and transport model was 40 days, which corresponded to the time when the CDF ponded water elevation reached steady state following filling (i.e., the analysis described in Section 3.2.2.1, above). Based on this analysis, projected COPC concentrations in groundwater at the downgradient edge of the berm, adjacent to the Willamette River, did not exceed chronic water quality criteria. The

distribution of COPCs in the berm represents initial conditions for the long-term groundwater quality model.

3.2.3 Long-Term Modeling

Long-term modeling addresses groundwater flow and contaminant transport for conditions following the filling, capping, and consolidation of sediment placed in the CDF. Long-term modeling consists of two modeling analyses: Sediment Fill Elevation and Long-Term Groundwater Quality Modeling. The following sections describe each long-term modeling analysis.

3.2.3.1 Sediment Fill Elevation

One design goal of the CDF is to ensure that contaminated sediment layers in the CDF remain under saturated conditions. The goal of the fill elevation analysis is to identify the maximum elevation of contaminated fill in the CDF that corresponds to a minimum potential for this material to dewater during extended drought conditions. The analysis used conservative assumptions, including a relatively high value for hydraulic conductivity in sediment fill, zero recharge from precipitation, and annual low water levels (i.e., late summer – early fall) in the Willamette River. The analysis established an upper design elevation of +9.5 feet NGVD for placement of contaminated fill material under these relatively conservative assumptions. The 60 Percent DAR for the full Removal Action (Anchor 2006a, Appendix I) describes the analysis in more detail.

It should be noted that the physical properties of sediments in representative iAOPCs from Portland Harbor (averaging 12 percent clay and 2.3 percent organic carbon) are very similar to the physical properties of the sediments used to estimate the permeability of contaminated fill material for this analysis (i.e., fill material permeabilities were based on sediments containing 9 to 15 percent clay and 1.5 to 3.0 percent organic carbon). Thus, the model input assumptions and the resultant upper design elevation are still valid.

3.2.3.2 Long-Term Groundwater Quality Modeling

Long-term groundwater quality modeling addresses groundwater flow and contaminant transport for conditions following the consolidation of sediment placed in the CDF. Similar

to the short-term model, the long-term model is a 2-D cross-sectional model aligned along the groundwater flow path through the center of the CDF structure. The model alignment is coincident with the critical groundwater flow path, and represents the maximum groundwater COPC concentrations expected within the berm and at the point of entry to the Willamette River. Figure 5 (bottom) illustrates conceptual groundwater conditions represented in the long-term model.

Inputs for the long-term model were initially established in the 60 Percent DAR for the full Removal Action (Anchor 2006a) based on site-specific analyses from T4, other sites in Portland Harbor and Region 10, and appropriately conservative literature values. Several aspects of the long-term modeling analysis were further refined during the IDR process, including the following:

- Use of steady-state long-term modeling approach (NewFields 2007c)
- Permeability of dredge fill material (Anchor 2007b)
- Metal partitioning coefficients in berm material (NewFields and Anchor 2007)

In addition, new leaching test data from representative iAOPCs in Portland Harbor will help to resolve many of the outstanding issues regarding the source strength of the porewater in the CDF. The next steps in identifying specific inputs to the long-term model are described in Section 3.3, below.

3.3 Next Steps

Two modeling-related deliverables will follow the DSR:

CDF Groundwater Model Input Parameter Memorandum. This technical memorandum is expected to be submitted to USEPA on November 1, 2009, based on the current schedule, and will summarize all of the proposed input parameters that were previously agreed upon with USEPA, as well as proposed values for those input parameters that were not agreed upon during the IDR process. Development of proposed input values will be performed in consideration of prior USEPA comments, as well as new leaching test data from the Portland Harbor and T4. Table 2 summarizes the modeling input data requirements for both the short-term and long-term modeling efforts.

Development of this memorandum is contingent on: 1) receipt of the validated data from the Portland Harbor SBLT tests, and 2) resolution of input parameters related to the Abiotic Fate and Transport (AFT) modeling effort between the LWG and USEPA, to ensure consistency between the T4 Phase II Removal Action and related evaluations for the Portland Harbor RI/FS.

CDF Groundwater Modeling Results Memorandum. This technical memorandum will summarize the short- and long-term modeling results. Development of this memorandum is contingent on USEPA approval of the CDF Groundwater Model Input Parameter Memorandum. Interpretation of groundwater modeling results is contingent on selection of appropriate compliance criteria, their basis for implementation (i.e., spatial and temporal scales of exposure), and points of compliance.

Table 2

CDF Groundwater Modeling Input Data Requirements Summary

Input Parameter		Short-Term Modeling			Long-Term Modeling	References
		Transient CDF Boundary Condition	Weir Discharge Analysis	Groundwater Quality Modeling	Groundwater Quality Modeling	
Material Properties						
K, porosity, f_{oc}, bulk density	Cap	NA	NA	NA	☒	Anchor (2007a, 2007c) NewFields (2007d)
	Sediment Fill	NA	NA	NA	☒	Anchor (2007b)
	Aquifer	☒	☒	☒	☒	Anchor (2006a) NewFields (2007d)
	Berm Select Fill	☒	☒	☒	☒	Anchor (2007a, 2007c) NewFields (2007d)
	Quarry Spall	☒	☒	☒	☒	Anchor (2006a) NewFields (2007d)
Boundary Conditions						
Hydraulic Head or Flow	Recharge	NA	NA	NA	☒	Anchor (2006a)
	Upland Head	☒	☒	☒	☒	Anchor (2006a) NewFields (2007d)
	Willamette River	☒	☒	☒	☒	Anchor (2006a) NewFields (2007a, 2007b, 2007d)
	CDF Ponded Water	☒	☒	NA	NA	NewFields (2007a, 2007b)
Contaminant Transport Parameters						
COPCs		NA	NA	☒	☐	Anchor (2006a) NewFields (2007d) LWG (in prep)
Source Concentration	Constant: MET+0.5%TSS	NA	NA	☒	NA	NewFields (2007d)
	Initial: SBLT Leachate	NA	NA	NA	☐	Anchor (2006a) LWG (in prep)

Input Parameter		Short-Term Modeling			Long-Term Modeling	References
		Transient CDF Boundary Condition	Weir Discharge Analysis	Groundwater Quality Modeling	Groundwater Quality Modeling	
Chemical Properties	K_{oc}	NA	NA	☒	☐	Anchor (2006a) LWG (in prep)
	K_d	NA	NA	☒	☐	Anchor (2006a) NewFields and Anchor (2007)
	Degradation	NA	NA	NA	☐	LWG (in prep)
Dispersivity		NA	NA	NA	☒	NewFields (2007c)

☒ Input data assumptions and/or data analysis approach resolved during 60 Percent DAR for the full Removal Action (Anchor 2006a) or IDR process.

☐ Proposed data values to be presented in CDF Groundwater Model Input Parameter Memorandum.

NA Not applicable.

4 WEIR DISCHARGE EVALUATION

A Draft Weir Discharge Evaluation Work Plan (MFA 2007a) was prepared before re-alignment of the project into two phases. It was expected that this document would be reviewed and updated consistent with current data for Willamette River ambient water quality, estimates for potential weir overflow rates, and USEPA comments (July 13, 2007). It also anticipated that a mixing zone study and reasonable potential analysis would be performed as part of the weir discharge evaluation, and that both the mixing zone study and reasonable potential analysis would be provided to USEPA. In addition, it was anticipated that the information provided and developed during the weir discharge evaluation would be utilized to establish weir discharge compliance criteria for the T4 filling event.

During review of the design status, the Port determined that completion of the Weir Discharge Evaluation is not needed based on the technical analysis to date. A cost-benefit analysis supported the determination that completion of the Weir Discharge Evaluation based on an unlikely future discharge scenario was not a worthwhile expenditure of financial and technical resources. Rather, it would be more cost-effective to commit to no discharge over the weir, and manage the ponded water by controlling the dredge activities as necessary. USEPA concurred with this recommendation on April 24, 2009.

As stated in Section 3.2.2.2, NewFields (2007b) described the methodology to estimate the potential rate and duration of weir overflow during filling of the CDF. The weir overflow analysis is based on an improbable combination of conservative assumptions (i.e., worst-case scenario), including high dredge inflow rates, inefficient dredge production rates (i.e., higher than expected water content in the dredge slurry), long work days (i.e. 20 hours), low hydraulic conductivity in the berm material, and no management intervention of construction activities. Under this unlikely combination of conditions, the water balance model indicated the pond might overtop the weir on Day 9 of an 11-day dredging project, and discharge to the river for about one and a half days. Using more reasonable and likely assumptions, overflow would not be predicted to occur at all. Further, the remaining dredge volume in Slip 3, and thus the duration of hydraulic dredging, should be reduced with the removal of the Phase I portion of the dredge prism. All things considered, it is reasonable to expect the hydraulic dredge slurry can be managed behind the berm with no discharge over

the weir, by appropriately controlling dredge filling rates and construction work schedules, if necessary.

While this analysis applies to hydraulic filling of the CDF with remaining sediment from T4, additional analysis of future filling events could be required as part of the CDF material acceptance evaluation if hydraulic dredging is the proposed method of placement in the CDF.

4.1 Determine Conditions for No Overflow

To support the project design and determine any needed construction modifications that will prevent any potential overflow of the weir, an analysis to determine conditions for no overflow will be performed. The analysis will follow the USEPA-approved methodology presented in NewFields (2007b) (see also Section 3.2.2.2). This analysis will provide input into design and construction parameters (i.e., inflow rates, production rates, work schedules, and other construction management approaches) that will result in no overflow of the weir, along with an adequate margin of safety to mitigate any unforeseen circumstances. A weir will be included in the design, however, as a contingency for emergency situations.

5 DATA GAPS

Potential data gaps related to the Phase II Removal Action design and groundwater modeling activities are summarized below.

5.1 Phase II Removal Action Design Data Gaps

The following potential data gaps are identified for the Phase II Removal Action design:

- **Portland Harbor FS RAOs and PRGs**. The FS-based PRGs will be used to refine the limits and methods of dredging, capping, and MNR. This input to the design will be developed as part of the harbor-wide process. Currently, the schedule for the Phase II 100 Percent Design coincides with the USEPA-approved Portland Harbor FS.
- **Additional Sediment Quality Characterization of Phase II Removal Action Areas**. Additional sediment quality characterization data may be needed in advance of Phase II final design to refine the limits and depths of the Phase II Removal Action areas. The need for additional sediment characterization data will be evaluated in light of new information made available during the design process, including the planned bathymetric and topographic surveys of T4 and developments in Portland Harbor PRGs. If additional sediment quality work is proposed, the data would need to be collected, analyzed, and validated by the end of 2009 to allow sufficient time to be incorporated into the Phase II 60 Percent Design.

5.2 Groundwater Modeling Data Gaps

The following data gaps are identified for the groundwater modeling effort:

- **Portland Harbor FS-based RAOs and PRGs**. The FS-based PRGs will be used to interpret the results of the long-term groundwater model for the CDF. This input to the design will be developed as part of the harbor-wide process. Currently, the schedule for the Phase II 100 Percent Design coincides with the USEPA-approved Portland Harbor FS.
- **Final List of Portland Harbor COPCs**. The list of COPCs for the long-term groundwater model will be consistent with the list of COPCs being evaluated in fate and transport models for Portland Harbor.
- **Biodegradation Rates**. Final biodegradation rates were not resolved at the conclusion of the IDR process. Biodegradation rates will be updated in consideration of

additional references provided by USEPA, and in consideration of the values being used in fate and transport models in Portland Harbor. Updated biodegradation rates will be provided in the CDF Groundwater Model Input Parameter Memorandum.

- **Training Dike Geometries**. Training dikes are comprised of extremely permeable riprap or quarry spalls and, therefore, control to a large degree preferential contaminant transport pathways and travel times through the berm. Both short-term and long-term groundwater model simulations will be very sensitive to the size and geometry of training dikes specified in the final design.

Another unknown input to the groundwater model is the exact configuration of contaminated fill layers in the CDF. The construction sequencing of fill events may not be known for several years. However, with the new Portland Harbor SBLT data, a range of leachate characteristics for a representative cross-section of remediation sites in Portland Harbor will be available for use in the model. Once the model is set up with generalized fill characteristics from Portland Harbor, it can be adapted if necessary to evaluate differential fill scenarios, for example, placement of the more contaminated material in the front versus the back of the CDF, or in the bottom versus the top of the CDF.

6 HABITAT MITIGATION APPROACH

As part of the Removal Action, habitat mitigation is required under the Clean Water Act (CWA) Section 404(b)(1) to offset permanent habitat impacts related to the discharge of fill material into aquatic areas, as well as under the Endangered Species Act (ESA) to offset permanent negative impacts to critical habitat. The Port's overall approach for compensatory mitigation is to adequately replace the habitat functions that will be lost in a manner that is consistent with statutory requirements. To the extent practicable, the mitigation will also be consistent with regional mitigation and restoration strategies for the Lower Willamette River. Consistent with discussions with the National Marine Fisheries Service (NMFS) and USEPA personnel (see Agency Habitat Meeting Minutes [June 12, 2006] in Appendix D of the Conceptual Mitigation Plan Proposal [CMPP; Anchor 2006b]), mitigation options will be identified based on qualitative characterization of habitat functions associated with candidate projects, rather than strict quantification and replacement of existing habitat characteristics in Slip 1 and replacement ratios. Currently, there is no standardized method for quantifying aquatic habitat for mitigation purposes, such as that available for wetland mitigation. Given this approach, the emphasis is to look for opportunities that create and/or restore shallow water off-channel habitat, since that is a well-established critical habitat that is limiting in the Willamette River system and is the focus of regional restoration planning documents. Habitat for other important fish species, such as sturgeon, pan fish, and other resident species, will be considered, but not necessarily targeted, as those species prefer deeper aquatic habitats that are plentiful in the Willamette River. The mitigation approach also includes following criteria provided in USEPA's Action Memo (USEPA 2006) and working cooperatively with stakeholders, including personnel from state and federal resource agencies, tribes, and local river stewards, to ensure an adequate mitigation project is selected that will replace lost habitat functions.

A summary of habitat mitigation requirements for Phase I of the Removal Action, along with the Port's approach for addressing habitat mitigation requirements as a part of Phase II, are provided below.

6.1 Phase I Removal Action Requirements

Through the Phase I ESA formal consultation process, NMFS determined that placement of armor rock, as part of the Wheeler Bay shoreline stabilization activities, over approximately 13,300 square feet (0.31-acre) of shoreline between elevation +10 and +30 NGVD would result in an adverse affect on the existing habitat and would, therefore, require compensatory mitigation. A portion of the 13,300-square foot (0.31-acre) area did not contain armor rock prior to implementation of Phase I; this amount was 7,000 square feet (0.16-acre). The Biological Opinion (BiOp; NMFS 2008) contains the following description of the Port's mitigation requirement for Phase I:

"*The Port will plan, carry out, and manage compensatory mitigation activities using performance standards and criteria described in 40 CFR Part 230 to compensate for the degradation or loss of 0.33 acres of shallow water habitat and other aquatic resources that will be adversely affected by the proposed removal action. Among other things the compensatory mitigation plan will be based on: 1)measureable, enforceable ecological performance standards, including a mitigation ratio of 1.5: 1.0 to offset resource losses due to the time lag between permitted impacts and completion of the compensatory mitigation actions; 2)regular monitoring to ensure completion; 3)assurances of long-term protection of compensation sites; 4)financial assurances; and 5)identification of the parties responsible for specific project tasks. The Port will submit the Plan to NMFS for approval or disapproval within 2 years of the start of operations, and complete all actions necessary to mitigate the adverse effects of operations within 5 years of Plan approval. 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.*

The Port will also place sand and gravel over the riprap surface of the Wheeler Bay bank stabilization and cap to create a more natural habitat. The Port recognizes that the long-term viability of sand placement over a riprap surface depends on site-specific conditions such as wave action, the shape of the shoreline, nearby river activities, and river dynamics. The Port will place the sand at this location because the Wheeler Bay conditions may be conducive to sand staying in place. The Port will monitor the area as a pilot project to

determine whether the site-specific conditions are conducive to maintaining a sand habitat layer over the riprap. If monitoring demonstrates that a sandy surface can be maintained long-term, this may be considered by NMFS and EPA when determining the appropriate mitigation project for the Wheeler Bay bank stabilization and cap."

As stated in the BiOp (NMFS 2008), the Port is required to submit a Mitigation Plan to NMFS and USEPA by August 5, 2010, which is 2 years from the start of Phase I construction. Prior to development of a Mitigation Plan, the Port plans to monitor the sand and gravel placed over the armor rock as part of the Interim Monitoring and Reporting Plan (IMRP; Anchor 2008, Appendix C) to determine if the conditions within Wheeler Bay are conducive to the sand and gravel staying in place. Monitoring will occur annually in October. After monitoring results are available in 2009, the Port will coordinate with NMFS and USEPA to determine if an appropriate level of mitigation to offset the Phase I impacts to habitat can be determined, or if additional sand and gravel monitoring results will be necessary to make that decision.

6.2 Phase II Removal Action Approach

The Port's approach to mitigation for Phase II is expected to be consistent with the approach described above that was used for the full Removal Action project prior to the project realignment. Through the EE/CA (BBL 2005) and design of the full Removal Action project (Anchor 2006a), USEPA determined that the sediment discharges associated with the CDF and capping were necessary to mitigate long-term effects of sediment contaminants, and that compensatory mitigation was necessary to replace the habitat function lost as a result of the filling of Slip 1. Capping and dredging activities will temporarily impact the existing benthic invertebrate communities. However, based on studies completed in the Columbia River estuary, the capping and dredging areas will quickly (within months after the Removal Action) re-colonize with benthic invertebrates (Morton 1977 and McCabe et al. 1996; both as cited in NMFS 2005). Additionally, the long-term result of providing a clean sediment surface offsets the temporary impacts to the sediment. Therefore, no compensatory mitigation is required to compensate for short-term habitat impacts in dredging and capping areas.

As part of the full Removal Action 30 and 60 Percent Design phases, the Port completed and submitted a CMPP (Anchor 2006b) as well as a Draft Mitigation Plan (Anchor 2006c) to USEPA and its federal, state, and tribal partners. The CMPP represented the initial step in identification and documentation of compensatory mitigation activities proposed by the Port, and the Draft Mitigation Plan presented the proposed mitigation package, including on-site actions and the off-site project selected from the options presented in the CMPP. Additional details related to the mitigation activities the Port has completed to date related to Phase II are provided below.

6.2.1 Summary of Mitigation Activities through 60 Percent Design of Full Removal Action

The Port conducted mitigation activities through the 60 Percent Design phase of the full Removal Action project following the approach described previously, as well as the steps for identifying appropriate mitigation project(s) that was described in Appendix Q (Section Q-7.2.1) of the EE/CA (BBL 2005). The steps the Port followed and the results are described below:

1. **Conduct a habitat assessment of the RAA.** This was done to refine the characterization of affected habitat provided in Appendix Q of the EE/CA (BBL 2005) based on the design of the Removal Action by describing the biological and physical characteristics of the habitat in the RAA. The results of the habitat assessment identified that 13.98 acres of aquatic habitat would be lost in Slip 1 from construction of the CDF. Of the 13.98 total acres of aquatic habitat, only 1.09 acres, or approximately 8 percent of the total aquatic habitat, would be in the less than 6-foot depth range, which is the most important depth stratum for juvenile salmonids. Within this 1.09 acres, over 85 percent is steep sloped, armored with large riprap, and/or covered with overwater structures. Additionally, a total of 2.19 acres would be within the 6- to 20-foot depth stratum, which represents about 16 percent of the total aquatic habitat impacted in Slip 1. Within this 2.19-acre area, there is a similar trend whereby approximately 85 percent of the area is either steep sloped, armored with large riprap, and/or covered with overwater structures. A total of approximately 10.7 acres, or about 75 percent of the total aquatic habitat that could be impacted at

T4 from construction of the CDF is in the greater than 20-foot depth range, which is plentiful habitat in the Lower Willamette River.

2. **Identify options for proposed mitigation project(s) and determine feasibility of each option.** After meeting with USEPA and its federal, state, and tribal partners, three projects were identified as potential compensatory mitigation projects, including Swan Island; Ramsey Lake Refugia, Phase II (financial contribution); and Miller Creek (mitigation bank). In addition to the off-site options, on-site mitigation actions were also selected for inclusion in the proposed mitigation package. On-site actions included creating a habitat bench along the outer edge of the CDF berm face that would create shallow water habitat; removing approximately 1,800 treated wood piles covering 3 acres within Wheeler Bay and Slip 3; creating a small amount of shallow water habitat through capping; placing a sand and gravel layer over the armor layer of the cap in Wheeler Bay; and vegetating the slope in Wheeler Bay and placing large woody debris.
3. **Prepare a CMPP, which describes the identified off-site mitigation options listed above and evaluates the feasibility of each option.** The Port prepared and submitted a CMPP (Anchor 2006b) as part of the 30 Percent Design documents for the full Removal Action project.
4. **Identify the off-site mitigation project**. A project was selected based on a comparison of options that considered both habitat and programmatic details. As part of this step, the Port met with USEPA and its federal, state, and tribal partners. During the meeting, the Port presented conceptual details of the potential mitigation projects, including drawings and limited engineering characterization needed to support approval of a preferred project. Based on the results of the project comparison exercise, the stakeholder group discussed the scores and selected the Ramsey Refugia, Phase II project. This project will re-establish hydrologic connectivity to the Lower Columbia Slough over 5-acres to reclaim and improve floodplain wetland functions (forested wetland and soft bottom, mud backwater sloughs) and to increase the amount and quality of off-channel rearing and refuge habitat. For this project, the Port would make a financial contribution to the City of Portland (City) to fund 2.5 acres of the 5-acre project.

The Ramsey Refugia, Phase II project was selected based on the habitat and scale of the project relative to the habitat that would be lost from Slip 1, the implementability of the project, the demonstrated success of the Ramsey, Phase I project in attracting a variety of fish species, including juvenile salmonids, and the desired characteristics previously communicated by resource agency personnel, particularly NMFS and the U.S. Fish and Wildlife Service (USFWS). In addition, the group of stakeholders asked the Port to further evaluate the feasibility of a second project, Miller Creek, since some members of the group favored Miller Creek over the Ramsey Refugia, Phase II project. In response, the Port initiated discussions with the landowner, but the landowner was unwilling to use the land as a mitigation site.

5. **Prepare a Draft Mitigation Plan.** This document (Anchor 2006c) was prepared after the mitigation project had been identified and was submitted to USEPA as part of the 60 Percent Design documents for the full Removal Action project (Anchor 2006a). The plan identified the on-site and off-site proposed mitigation actions, the potential benefits to salmon and other aquatic species, project logistics, and timing. As the selected project involves the Port providing a certain amount of funding for the implementation of the project, no specific design details were provided in the Draft Mitigation Plan. As part of the submittal, the Port provided semi-quantitative documentation of how the proposed on-site and off-site mitigation options offset losses of habitat in Slip 1, as requested by USEPA.
6. **Prepare a Final Mitigation Plan (100 Percent Design) once the Draft Mitigation Plan has been approved.** It is anticipated that the Final Mitigation Plan will be submitted along with the 100 Percent Design documents for Phase II of the Removal Action. The nature of this 100 Percent mitigation design submittal may vary depending on whether the mitigation action is a stand-alone Port project, or if the Port is contributing to another project in the region, like the Ramsey Refugia, Phase II project.

The CMPP document (Anchor 2006b) addressed steps 1 through 3 and the Draft Mitigation Plan (Anchor 2006c) addressed steps 4 and 5 in the process outlined above. The Port and USEPA and its federal, state, and tribal partners convened for a meeting in December 2006 to discuss the Draft Mitigation Plan. Comments discussed during this meeting resulted in the removal of the on-site mitigation activities, except for the vegetation planting and placement

of large woody debris in Wheeler Bay. In addition, the Port received comments on the Draft Mitigation Plan in January 2007 as part of USEPA's 60 Percent Design comments for the full Removal Action. The comments received in meetings and on the Draft Mitigation Plan are summarized below:

- Final agreement between the Port, USEPA, and a third party needs to be reached before USEPA can approve the Mitigation Plan. Additionally, the agreement details need to allow USEPA to comment on the design to ensure that ARARs are being met.
- Consider the timing of the habitat loss versus the timing of implementation of the mitigation project.
- Include complete plans and specifications for construction in the Final Mitigation Plan.
- Address the temporal loss of habitat in dredging and capping areas.
- Consider species other than salmon.
- Address the replacement of the berth structure.
- Eliminate piling removal and habitat bench along CDF berm from the mitigation package.
- Refine performance criteria related to the acreage created as part of the project, topography, and fish presence.
- Update monitoring timeframes beyond 5 years.

6.2.2 Next Steps

To mitigate for the Phase II activities, which are expected to include construction of a CDF in Slip 1, the Port plans to continue with the process outlined in Section 6.2.1. If the Ramsey Refugia, Phase II project has already been implemented at the time the Phase II design activities are re-initiated, the Port will resume the process at an earlier stage to identify a new project that will meet the mitigation requirements summarized in this section.

In addition, it is important to the Port to have agreement on the habitat mitigation requirements related to CWA 404(b)(1) and ESA compliance well in advance of the Phase II construction start date to avoid last-minute requirements, delays, and expenses.

7 POTENTIAL ARAR CHANGES

USEPA requested a summary of potential changes to ARARs from the harbor-wide process, if any. The LWG provided USEPA with a table of potential ARARs on March 19, 2009, and a table of proposed Points of Compliance on March 26, 2009. The LWG and USEPA (including its partners) met on April 13, 2009 to discuss the water quality ARARs. Currently, USEPA and LWG are focused on resolving the RAOs, from which the chemical-specific ARARs follow. USEPA has indicated that they will provide comments on the ARARs table by the end of May 2009. Once RAOs and potential chemical-specific ARARs are identified, discussions regarding action-specific ARARs will then commence. Therefore, discussions regarding ARARs that will be presented in the harbor-wide RI/FS are ongoing and no resolution or change has been made.

8 COST CHANGES

Costs were presented in an Engineering Cost Estimate document that was based on the 60 Percent Design for the full Removal Action in December 2006. This document was submitted by the Port to USEPA at the same time as the 60 Percent Design Submittal for the full Removal Action, but under separate cover as Confidential Business Information. The Port provided USEPA with an updated cost estimate in August 2007 (letter dated August 22, 2007 from Cheryl Koshuta, Port of Portland, to Deborah Yamamoto, USEPA), which showed that the cost estimate had increased by approximately 60 percent since the time of the EE/CA (BBL 2005) and Action Memo (USEPA 2006). This estimate did not include design changes discussed during the IDR process; however, a range of potential additional costs were presented that could result from resolution of the 60 Percent Design issues for the full Removal Action. Costs are not expected to be updated again until further into the Phase II Design when particular variables can be reduced or resolved. Without doing further design evaluations, there is no rationale for changing the basis on which the prior cost estimates were generated, except for changes in unit prices. It is anticipated that unit prices will continue to fluctuate between now and the Phase II 100 Percent Design; therefore, it is prudent to wait until closer to that milestone before updating costs.

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FIGURES

SCHNITZER STEEL PRODUCTS CO.

I.R.M.

KINDER MORGAN

FORMER GRAIN FACILITY

BERTH 405

BERTH 408

SLIP 1

PIER 1

PIER 2

PIER 4

BERTH 411

PIER 5

TOYOTA

SLIP 3

REMOVAL ACTION AREA BOUNDARY

WHEELER BAY

BERTH 410

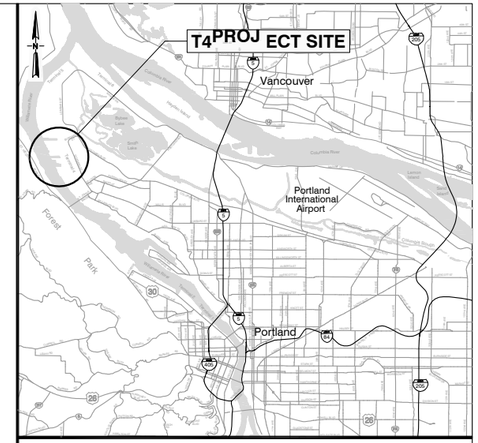
BERTH 401

HARBOR LINE

BERTH 414

HARBOR LINE

WILLAMETTE RIVER



VICINITY MAP
SCALE: N.T.S.

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Figure 1
Site Plan and Vicinity Map
Terminal 4 Removal Action - Design Status Report
Portland, Oregon

ANCHOR QEA

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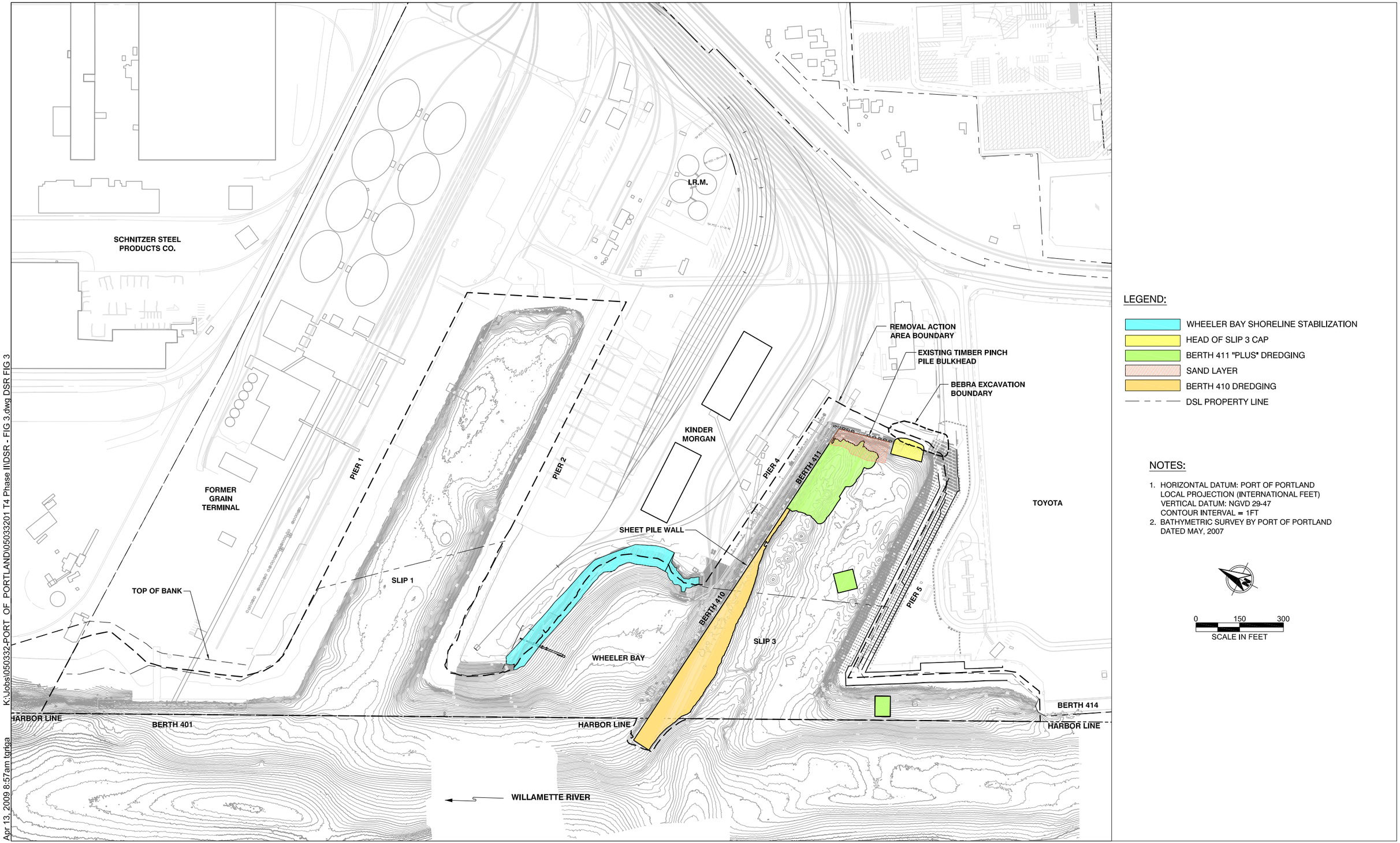
ANCHOR QEA

Figure 2
Summary of Removal Action
Terminal 4 Removal Action - Design Status Report
Portland, Oregon



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ANCHOR QEA

Figure 3
Summary of Phase I Removal Action
Terminal 4 Removal Action - Design Status Report
Portland, Oregon

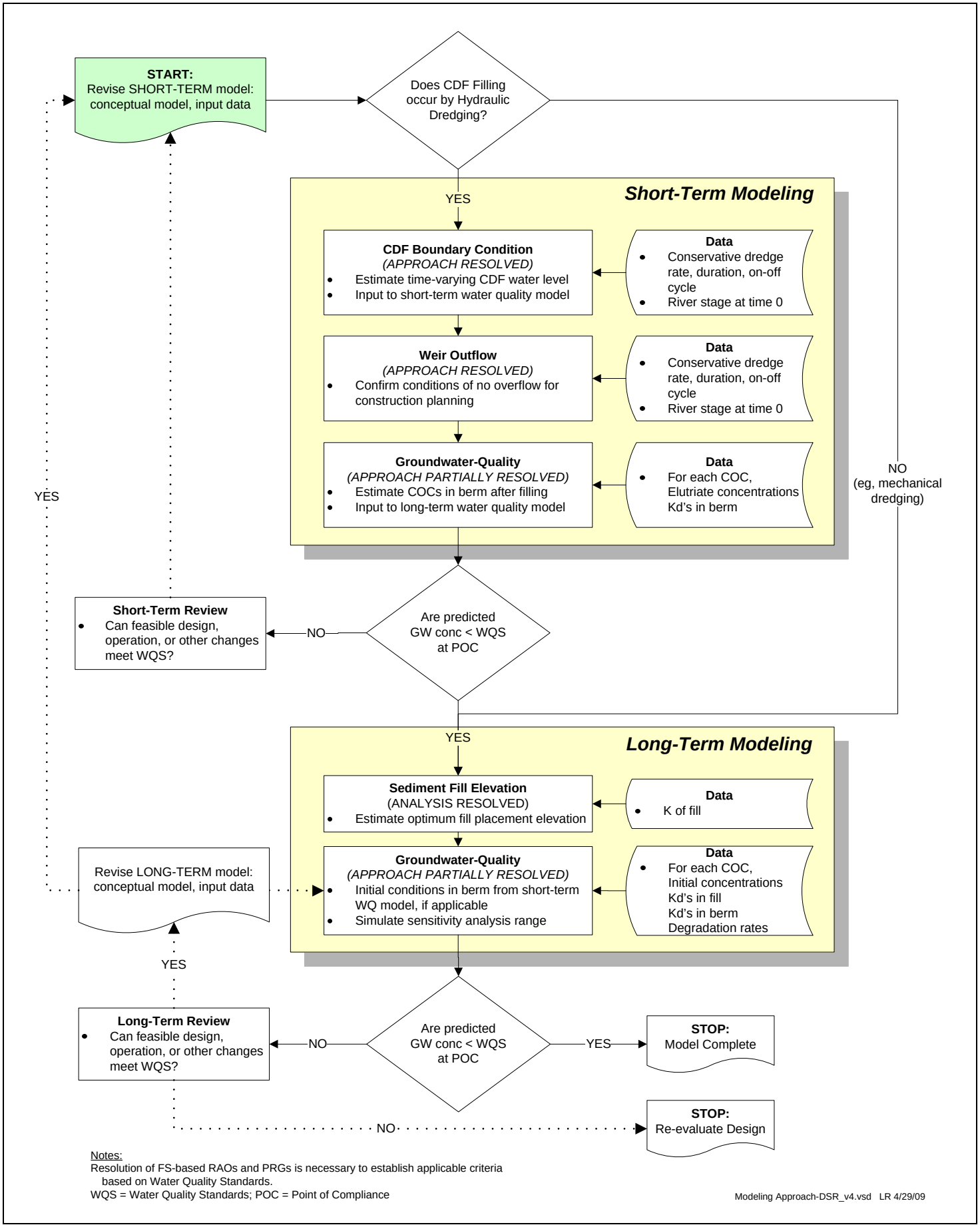
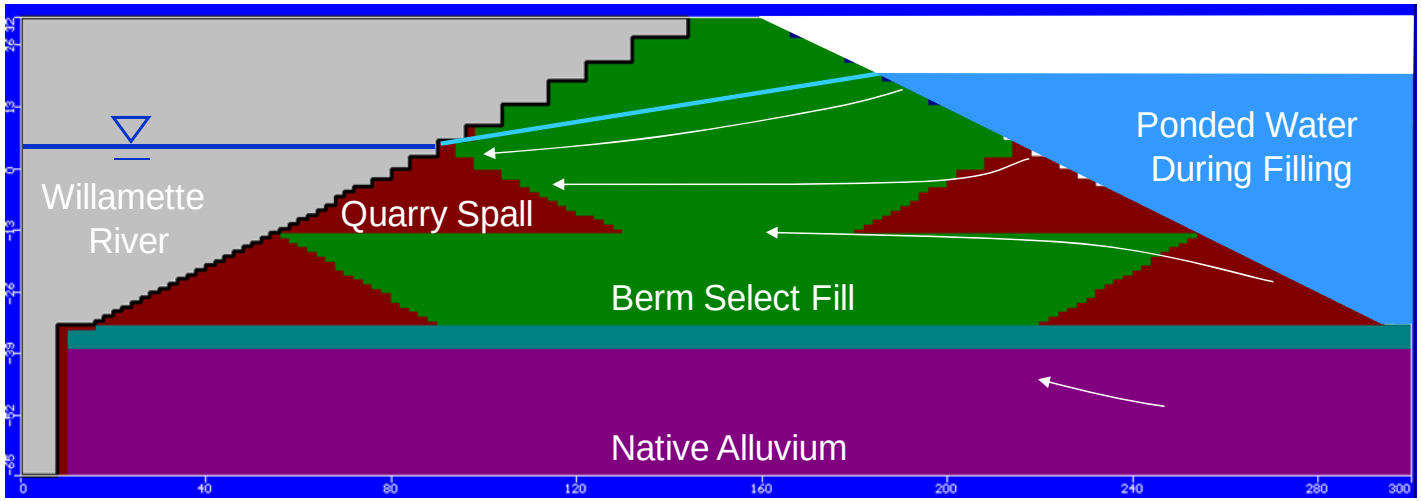
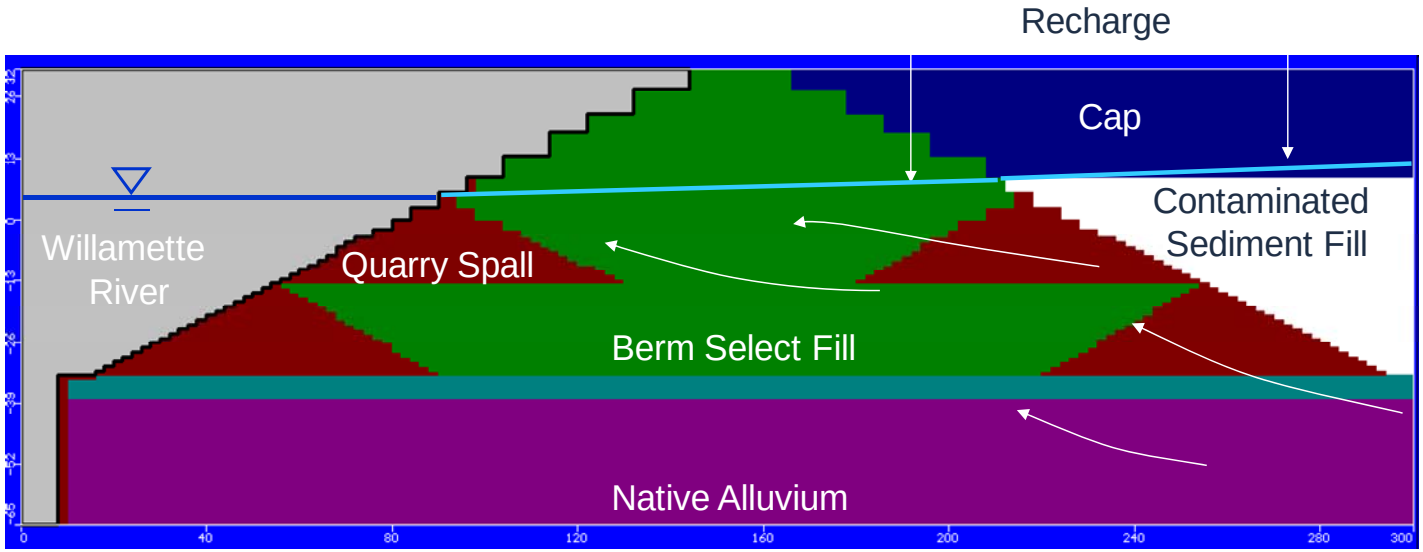


Figure 4
CDF Groundwater Modeling Process
Terminal 4 Removal Action Design Status Report

Short-term Model



Long-term Model



ANCHOR QEA

NEWFIELDS

Figure 5

Conceptual Groundwater Conditions Represented in the Short- and Long-Term Models

Terminal 4 Removal Action Design Status Report

APPENDIX A
USEPA LETTER TO PORT NOVEMBER 15, 2007

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 900
Seattle, Washington 98101-3140

November 15, 2007

Reply to
Attn of: ECL-115

Tom Imeson, Director
Public Affairs
Port of Portland
121 NW Everett
P.O. Box 3529
Portland, OR 97209

Re: August 22, 2007 Request for Realignment of T4 Removal Schedule; Resolution of 60% Design Disputed Comments; Administrative Order on Consent for Removal Action (AOC), Docket No. 10-2004-0009.

Dear Mr. Imeson:

EPA has reviewed the Port of Portland's (the Port) request for a delay of removal action implementation. As referenced in your August 22 request, this delay may afford more information from the Harborwide RI/FS process to ensure the Terminal 4 confined disposal facility design incorporates actual leachability data from harborwide sediments, and is designed consistently with Harborwide performance standards. EPA agrees to extend the schedule for implementation of the T4 removal action, with the following requirements:

- The Port shall continue design work, with the 100% design of the May 11, 2006 Action Memorandum completed by the third quarter of 2009 or before, or as otherwise approved by EPA in the schedule referenced below;
- The Port shall work with the LWG to gather necessary disposal option data is collected for the RI/FS.
- The Port shall ensure Slip 1 CDF data needs are obtained either through the Harborwide RI/FS and/or through this removal action;
- Acceptance of EPA's November 9, 2007 spreadsheet with resolutions of the 60% Design disputed comments;
- The Port shall implement an abatement action to reduce risks present at the T4 site during the 2008 fish window or as otherwise approved by EPA in the schedule referenced below, and with the Port's acceptance of the attached comments on the Port's October 25, 2007 proposal which were discussed with Port representatives on November 6, 2007;

- The Port shall deliver a comprehensive schedule for this deferral agreement including, but not limited to, the abatement work, and the selected removal action design and construction, for EPA review and approval within 20 days of this letter, based on the attached general schedule deadlines; and
- Upon request by EPA, the Port shall provide data necessary to evaluate the effectiveness of the abatement action taken and, if determined necessary by EPA, provide additional abatement measures pending completion of the May 2005 Action Memorandum .

EPA may revoke its agreement to the realigned schedule at any time if the above requirements are not met. In addition, if at any time EPA or the Port receives new information that may lead EPA to re-evaluate this realigned schedule or the May 2005 Action Memorandum, EPA may require a reassessment of alternatives for the Terminal 4 removal action area, including a revised EE/CA for public review.

If you have any questions on this extension, do not hesitate to contact me at (206) 553-7216, or Sean Sheldrake of my staff at (206) 553-1220.

Sincerely,

Deborah J. Yamamoto, Unit Manager
Site Cleanup Unit 2
Office of Environmental Cleanup

Enclosure

cc: Anne Summers, Port of Portland
Krista Koehl, Port of Portland
Sean Sheldrake, EPA
Lori Cora, EPA

Comment No.	Page No.	Document	Section No.	Directed Comment	Comment Category	Comment	Port's Specific Concern with Comment (1)	Description of Solution
24		DAR		Yes	1	Design the CDF to achieve confinement of all hazardous substances disposed of in the facility through the groundwater pathway so that the CDF does not contribute any discharge and/or release of contaminants above applicable and relevant and appropriate requirements under federal or state law for surface water in the lower Willamette River. To meet this design criteria, the CDF shall be designed such that the quality of groundwater exiting the CDF will meet USEPA's national recommended chronic water quality criteria for both aquatic organisms and fish consumption by humans (17.5 g/day), Oregon water quality criteria, Region 9 PRGs, and relevant, promulgated drinking water criteria (otherwise known as Maximum Contaminant Levels). The LTMRP shall include monitoring for this design standard. If the existing design cannot meet performance standards in pore water of the exterior of the berm, the Port shall evaluate design changes that would meet the performance standards for the CDF at the compliance point. The Port shall report conceptual design and cost information of at least two approaches that would meet the performance standards that have been approved by EPA for complete analysis. Design changes could include reactive barrier technologies. Examples of barrier technologies could include an organoclay mat on the inside of the berm, an appetite layer, or some combination of these or other treatment material.	1. "Groundwater exiting the CDF" 2. Use of Region 9 PRGs as standards for design and monitoring 3. Comment refers to the OMMP/LTMRP 4. Preserving spatial/temporal averaging/scale that is associated with application of water quality standards pending outcome through harborwide RI/FS; also note potential issue with detection levels.	**1. Definition:** The Port and EPA understand that "groundwater exiting the CDF" is intended to mean "one foot into the berm as measured from the berm face," consistent with the other EPA statements throughout the comments, for example: a) "porewater of the exterior of the berm" (directed comment #24) b) "porewater" (directed comment #133) c) "in the face of the berm" (directed comment #138) d) "berm porewater (1 foot into berm face)" (EPA Table 1) e) "water/sediment interface (twelve inches inside berm)" (EPA Position Paper for T4). The fundamental intent is that the CDF design analyses and monitoring methods consider the quality of groundwater within the berm before dilution with surface water from the river. Detection limit and long-term monitoring and compliance issues remain to be resolved. **2. Criteria--PRGs:** Region 6 Tapwater PRGs replace Region 9 Tapwater PRGs. These PRGs are not ARARs; they may be used for a limited list of chemicals as a "To Be Considered" after the following factors have been evaluated: • Is there a promulgated MCL for a compound? if not, use the PRG as a TBC; • Are other applicable water quality standards for a compound lower than the PRGs? If not, use the PRG as a TBC; and • If a site specific risk-based standard for ingestion is developed as part of the RI/FS and selected in the Record of Decision, the ROD standard would be applied. **3. OMMP/LTMRP:** The long-term operation, maintenance and monitoring plan (OMMP) for the CDF is not due to be submitted until after the design is complete. EPA and the Port agree that the Port has the right to dispute comments and directions that EPA may make or give regarding the OMMP/LTMRP. **4. RI/FS & Application of Water Quality Standards:** EPA and the Port agree that the Port reserves the right to engage in further discussions related to incorporating appropriate temporal/spatial averaging/scales in applying certain water quality standards as part of the harbor-wide RI/FS process, and that the outcome of these discussions will then be applied to T4, as appropriate. The Port and EPA also agree that currently available laboratory quantification limits and their ability to achieve all standards (especially human health criteria) is an issue that needs to be resolved as part of the 100% Design, OMMP/LTMRP and QAPP. 5. The Port accepts the performance standards specified in Comment 24 (Federal and State Water Quality Standards, MCLs) for design and function of the CDF except (1) as otherwise addressed in this written resolution, and (2) if specific CDF performance standards are updated or replaced by the harbor-wide Record of Decision.

Comment No.	Page No.	Document	Section No.	Directed Comment	Comment Category	Comment	Port's Specific Concern with Comment (1)	Description of Solution
67.	48	DAR	5.1.1	Yes	1	Language in this section makes it unclear what the performance standards for CDF performance are – the language only refers to "CDF design performance standards are..." Language shall be changed to reflect that the performance standards are for design and facility monitoring purposes as well. Include the following, "The CDF will be designed and will be required to meet performance standards outlined here throughout its life, except as updated/replaced through the Harbor wide ROD process."	1. Same issues as above for Comment 24 2. Reference to "facility monitoring throughout its life"	Same proposed solutions as for comment #24 above. Port agrees with the phrase "except as updated/replaced through the Harborwide ROD process."
87.	81	DAR	6	Yes	1	It needs to be made clear that cap pore water monitoring needs to meet chronic water quality criteria, at a minimum, pending promulgation of the Harborwide ROD requirements that may supersede these requirements for monitoring long-term cap effectiveness both in terms of sediment concentration and porewater	1. Clarification needed as to what criteria are being required for cap design and function, and relationship to OMMP.	The applicable criteria for design and function of the T4 cap is chronic water quality criteria in the porewater in sediment that supports an active benthic zone. The harbor-wide process may develop cap performance criteria which, if different, would then apply to T-4. The long-term monitoring will be addressed as part of the OMMP/LTMRP EPA and the Port agree that the Port has the right to dispute comments and directions that EPA may make or give regarding the OMMP/LTMRP.
96		DAR	7 – General	Yes	1	WQ conditions defined in this section are not consistent with conditions defined in the WQMCCP (as clarified in Table 1, attached). Review the entire section for compliance with the WQMCCP, and include specific references to sections of the WQMCCP. Please be specific regarding any deviations from the WQMCCP to identify specific issues that remain to be resolved. EPA has prepared a summary (see attached Table 1) to clarify the monitoring to be performed for the CDF (berm and weir). EPA will update the WQMCCP to reflect the requirements in Table 1 (attached). Reference elsewhere in these comments to the WQMCCP shall be understood to include Table 1 requirements.	1. Weir discharge point of compliance at the end of pipe 2. COCs for weir discharge and ponded water seepage through the berm--all applicable T4 COCs > PEC, including pthalates, plus PCBs, DDT, and copper 3. Criteria includes Region 9 PRGs for dormant period and long-term monitoring and long-term monitoring points of compliance 4. Clarification as to how the dormant period monitoring specifics will be addressed	**1. Weir Discharge Point of Compliance**: EPA requested additional information from the Port related to the water quality of potential weir discharge. To this end, the Port prepared and submitted a "Weir Discharge Evaluation Work Plan" to EPA on June 8, 2007, and EPA has provided comments. This evaluation process will determine if and how a mixing zone would apply. The weir discharge evaluation will be completed as part of the 100% design of the berm, because berm design may have impacts on weir discharge assumptions. For example, treatment layers on the berm face have the potential to affect berm permeability, which in turn affects weir discharge (i.e. volumes and duration). Conversely, berm design changes that improve the quality of water discharged over the berm may be feasible. Please provide a schedule for completing work on the Weir Discharge Evaluation. **2. COCs**: The COCs will be derived from PEC exceedances at depths within the sediments that are likely to be disturbed by the EA construction activities, plus copper and additional parameters as identified and agreed to by EPA and the Port. Regarding the CDF COCs, in the April 20, 2007 IDR Meeting Summary, EPA clarified that for the long-term monitoring, footnote 3 in Table 1 is a list of potential COCs to be considered in long-term monitoring, depending upon what is ultimately disposed of in the CDF, not a fixed list of non-negotiable monitoring analytes. **3. Criteria and Points of Compliance:** EPA and the Port agree that relevant resolution of issues from Comment #24 apply to this issue.

Comment No.	Page No.	Document	Section No.	Directed Comment	Comment Category	Comment	Port's Specific Concern with Comment (1)	Description of Solution
								4. Dormant Period Monitoring: Relevant resolution of compliance criteria issues from Comment #24 apply to the dormant period monitoring, and the monitoring details will be resolved at a later date, potentially as part of the OMMP/LTMRP or as part of an interim monitoring plan.
130.	104	DAR	7.1.2.1	Yes	1	Water quality criteria should be consistent with criteria defined in the WQMCCP as clarified by comments herein and Table 1 (attached), and the text should provide specific references (section/subsection) to the WQMCCP.	1. Same issues as above for Comments 24 and 96	EPA and the Port agree that relevant resolution of compliance criteria in Comment 24 apply to this issue.
133.	105	DAR	7.1.2.2	Yes	1	The compliance point will not be out in the river, rather in pore water to limit the dilution/mixing of the river itself. EPA will provide specific text to the Port for inclusion in the 100% DAR regarding this issue. See also attached Table 1.	1. Same issues as above for Comments 24 and 96.	EPA and the Port agree that relevant resolution of compliance criteria in Comment 24 apply to this issue.

Comment No.	Page No.	Document	Section No.	Directed Comment	Comment Category	Comment	Port's Specific Concern with Comment (1)	Description of Solution
226.	11	DAR	Appendix B, Section 3.1.1.4	Yes	1	The 4-day period should apply as after 4 days for the duration of the project. Otherwise, this requirement will cause an incentive for short-duration high volume discharges to avoid triggering chronic criteria.	1. The Port agrees with the concept presented in the comment in that we do not want to create an incentive for short duration high volume discharges in order to avoid triggering chronic criteria. However we are concerned that over a several week period there could be multiple short-term exceedances of chronic criteria that cumulatively add up to more than 4 days. If some of these periods are reasonably short (less than 96 hours) and separated by several days, then a cumulative 96 hour exceedance will not be reflective of a typical chronic exposure nor consistent with the intent of State water quality regulations. 2. Inconsistent with EPA's Table 1 (Summary of T4 CDF Water Quality Monitoring Requirements).	**Use of Chronic Criteria:** As indicated in Table 1, acute criteria will be used to evaluate compliance, and chronic criteria will be used to guide the implementation of low-cost practical BMPs during construction activities. However, this does not preclude engineering controls/treatment from being considered during design. Given this resolution, comment 226 is no longer applicable.
384.		DAR	Appendix D, 5.2	Yes	1	Lab turn around times. As specified by EPA in the draft WQMCCP, lab turnaround times are from the time of sample collection to delivery to EPA. Samples that take longer than 72 hours from collection to verbal or electronic delivery to EPA will be considered out of compliance with this requirement.	1. 72-hour TAT from the *time of sample collection* to EPA. A 72-hour TAT from the time of sample collection is effectively a 48 hour TAT for the analytical lab. The shortest TAT that any reputable analytical laboratory has indicated they can provide is a 72-hour TAT from the *time they receive the sample*. This TAT is based on the assumption that there are no issues or problems related to the sample matrix, concentration, interferences, instrumentation, etc. Issues such as these commonly arise. A 72-hour TAT from the *time of sample collection* would be a challenge for any analytical laboratory despite the best advance planning, coordination, and management. Given the fact that missing a TAT may result in fines that the analytical laboratory may be responsible for, it is possible that no reputable laboratories would agree to accept the project. Conversly, while there may be an analytical laboratory that agrees to accept the project under these terms, the Port may still not have the confidence that the analytical laboratory will be able to meet the required TAT.	1. For the abatement action, the Port and EPA will have further discussions to establish a reasonable and appropriate TAT. The Port proposes a 72 hour TAT from the time the lab receives the sample. The Port will provide a memo to EPA that documents the basis for the 72-hour proposed TAT for EPA's consideration. The Port has generated a TAT memo and EPA has reviewed and commented on it. Final protocols for lab turn around times will be resolved through EPA's approval of the TAT memo. .The Port will work with the lab and EPA to establish a practical means to provide interim information to EPA to assist EPA with field management decisions during construction. 2. For subsequent removal action work, the appropriate TAT will be negotiated based on currently commercially available labs and techniques. The Port will consider the costs/benefits of using an on-site versus off-site laboratory.
1		Draft Mitigation Plan		Yes	2a	b. Before EPA can approve the Mitigation Plan that includes any project where a third-party will be responsible for the construction and long-term operation and maintenance, a final agreement between EPA, the Port, and the third party must be reached.	1. Final agreement needs to be reached between EPA, the Port, and the third party before EPA can approve the Mitigation Plan.	The Port and EPA agree to defer resolution of mitigation comments until a final mitigation project has been defined for the re-aligned project.

Comment No.	Page No.	Document	Section No.	Directed Comment	Comment Category	Comment	Port's Specific Concern with Comment (1)	Description of Solution
1		Draft Mitigation Plan		Yes	2a	c. Also, the timing of when the Ramsey refugia project is constructed and completed, in relation to when the habitat is lost will be a factor in how much mitigation is sufficient to compensate for lost habitat. The Port's schedule for dredging and filling at T4 is within the next year or two, when will the city complete construction of the refugia?		The Port and EPA agree to defer resolution of mitigation comments until a final mitigation project has been defined for the re-aligned project.
1		Draft Mitigation Plan		Yes	2a	d. The final mitigation plan design needs to be included as an element of the 100% DAR, and must include complete plans and specifications for construction.		The Port and EPA agree to defer resolution of mitigation comments until a final mitigation project has been defined for the re-aligned project.
11		Draft Mitigation Plan		Yes	2a	PERFORMANCE MEASURES: Ending performance standards at year 5 is unacceptable. The Port shall propose performance standards that are in force throughout the habitat mitigation project lifetime, i.e. maximum invasive species percent cover that applies regardless of the monitoring year. Maximum invasive percent cover performance standards shall be developed. Minimum percent cover shall be specified for native species. A full list of quantitative performance standards are listed in the Action Memo. At a minimum, annual monitoring over the first five years and every five years thereafter shall occur. EPA will re-Evaluate the monitoring schedule periodically.	1. Mandatory monitoring for the lifetime of the project with no opportunity to end the monitoring if performance standards are consistently being achieved.	The Port and EPA agree to defer resolution of mitigation comments until a final mitigation project has been defined for the re-aligned project.
12		Draft Mitigation Plan	Section 5.4.2.2	Yes	1	Include the following language in the text, "After absence of fish over 3 consecutive seasons EPA may require corrective actions to be taken."	1. Performance standard based on fish presence.	The Port and EPA agree to defer resolution of mitigation comments until a final mitigation project has been defined for the re-aligned project.

Comment No.	Page No.	Document	Section No.	Directed Comment	Comment Category	Comment	Port's Specific Concern with Comment (1)	Description of Solution
16	8	SACM	Section 3.2.1	Yes	2a	Treatment methods that destroy or remove contaminants from sediments may be acceptable; however, treatment methods that immobilize contaminants are not acceptable. Please revise the text accordingly.	1. The limitation presented in this comment is premature until the Harbor-wide process is further evolved.	The Port and EPA agree that the Harbor-wide process is the appropriate venue for determining acceptable treatment methods.
31		SACM	3.4.2.2	Yes		The text asserts that fish consumption criteria (i.e., fish consumption AWQC) "should be applied to conditions in the receiving water in consideration of the spatial and temporal scales of interest". The text also says 1) the "bioaccumulation-based discharge criteria would be temporally averaged over a 70-year human lifetime"..., and 2) that fish consumption criteria would be achieved 10 cm above the face of the berm...,, and 3) "achieving chronic water quality criteria at the point of groundwater release from the CDF will be implicitly protective of bioaccumulation exposures in the receiving water". To date, there is not general agreement for the Portland Harbor project that "spatial & temporal scales of interest" approach is reasonable and defensible. Retaining this approach in the T4 document potential establishes a precedence for the broader Portland Harbor project, which is premature at this time. Additionally, the approach may not be fully protective of benthic receptors. EPA has provided Table 1 attached to the DAR to clarify applicable requirements for the CDF discharge. This comment applies to Section 7.1.2.2 as well.	1. Need to preserve issue of spatial/temporal averaging pending outcome through harborwide RI/FS.	EPA and the Port agree this issue is resolved through relevant components of the resolution reached on comment #24.
32		SACM	Section 3.4.2.3.	Yes	1	Shall be completely rewritten. EPA directed the Port to use tap water PRGs, MCLs, and other levels as performance standards. This section is not written consistent with that directed comment and it is not relevant whether ICs will limit the use of groundwater in the area of the CDF. EPA will provide specific text to the Port for inclusion in the 100% DAR regarding this issue.	1. Use of Region 9 PRGs (see comment #24)	EPA and the Port agree this issue is resolved through relevant components of the resolution reached on comment #24.

Notes:

(1) The Port and EPA have been engaged in an Informal Dispute Resolution (IDR) process since January 2007 related to EPA's directed comments on the Port's 60% Design Submittal. Through the IDR, some comments required further clarification and information, while others required a discussion to resolve disagreements between the Port and EPA. Through the IDR process, the Port and EPA were able to resolve a majority of the directed comments. This table represents the remaining directed comments that were not resolved through the IDR process.

(2) The resolutions in the table are specific to the T4 Removal Action, and do not represent positions of the Lower Willamette Group.

(3) The Port has made a recommendation to EPA to realign the T4 Removal Action schedule with the harbor-wide Remedial Investigation/Feasibility Study (RI/FS) before completing the T4 Design (Letter to EPA from Port, August 22, 2007). Information from the RI/FS could then be incorporated into the T4 design, and vise versa. The Port's recommended path forward would also be a means to settle the current Informal Dispute Resolution (IDR) process. This table provides the Port's specific concerns with the 60% Design directed comments, based on the assumption that EPA accepts the Port's recommendation to realign the T4 project with the harbor-wide process. If EPA does not accept the Port's recommendation, the Port reserves its rights to re-evaluate its position on the directed comments.