ABATEMENT MEASURES PROPOSAL

TERMINAL 4 REMOVAL ACTION PROJECT

DRAFT DOCUMENT: DO NOT QUOTE OR CITE

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

Prepared for

The Port of Portland

Prepared by

Anchor Environmental, L.L.C.

6650 SW Redwood Land, Suite 333

Portland, Oregon 97224

October 25, 2007

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1 INTRODUCTION

In 2005, the Environmental Protection Agency (EPA), in consultation with its federal, state, and tribal partners, evaluated and selected a removal action for the Port of Portland's (Port) Terminal 4 (T4) (Figure 1) that included a combination of monitored natural recovery, capping, and dredging with placement of contaminated sediments in a confined disposal facility (CDF) to be built on site. The Port submitted the 60 Percent Design Submittal in December 2006 and, since that time, the Port and EPA teams have been working collaboratively through technical questions and issues associated with the design.

Many of the design issues are linked to the overall harbor-wide Remedial Investigation/ Feasibility Study (RI/FS) process. For this reason, in a letter to EPA dated August 22, 2007, the Port requested that EPA revise the schedule for implementation of the T4 Removal Action to realign the project with the harbor-wide RI/FS schedule. The Port's project realignment request acknowledged that the Port would work collaboratively with EPA to identify and evaluate work (abatement measures) that could be initiated in the near term to reduce risk and address the imminent and substantial endangerment at T4.

The purpose of this Abatement Measures Proposal is to detail specific actions that the Port would implement to address conditions at Terminal 4 that pose an imminent threat to human health and the environment. The abatement measures will significantly reduce ecological and human health risks by:

- Dredging and off-site disposal of sediments exhibiting the highest chemical concentrations
- Construction of a nearshore cap to isolate petroleum contaminated sediments from aquatic receptors and control a potential ongoing source to nearby areas
- Stabilization of the bank to minimize contaminant migration to the river.

These abatement measures are considered the first phase (Phase I) of a more comprehensive removal action at Terminal 4. Final design and implementation of Phase II (the final phase of the Removal Action) is dependent upon information from the harbor-wide investigation and will be conducted once that information is available.

As detailed below, the scope of the abatement measures is consistent with EPA's previously selected removal action for Terminal 4, will significantly reduce risks at the site in a timely manner, will not adversely impact ongoing marine operations, and will accommodate realigning the design and construction of Phase II (including the on-site CDF) with the harbor-wide investigation (which is critical since approximately 80 percent of the CDF capacity will be filled with contaminated sediments from locations other than Terminal 4).

1.1 Purpose of Phase I (Abatement Measures)

The purpose of the proposed phase I measures is to abate imminent and substantial endangerment posed to aquatic life that may have direct contact with sediments within the Removal Action Area. If EPA agrees with the Port's realignment request, the goal would be to initiate and complete the abatement measures in the 2008 in-water work window as phase I of the removal action implementation. To this end, the Port identified potential abatement measures that are either part of the 60 Percent Design that could be implemented early, or abatement measures that address areas containing the highest surface sediment probable effects concentration (PEC) exceedance ratios within the Removal Action Area. The Port and EPA management teams also agreed that abatement measures should be scoped with the following objectives in mind:

- Proposed measures should be consistent with EPA's selected removal action (i.e., CDF in Slip 1)
- Proposed measures should not unduly impede or disrupt the designated use of T4 for water dependent maritime use
- Proposed measures should be effective in addressing an imminent threat.

The abatement measures that meet these criteria and are proposed include:

1. Removal of material with the highest surface sediment PEC exceedance ratios (greater than 20 times the PEC) in Slip 3 and north of Berth 414
2. Placement of a cap at the head of Slip 3 to address petroleum-contaminated sediment
3. Stabilization of the shoreline at Wheeler Bay.

These proposed abatement measures are shown on Figure 2 and described in detail in Section 2. The Head of Slip 3 cap (Figure 3) and the Wheeler Bay shoreline stabilization

(Figures 4 and 5) are intended to be the final removal action for these areas, consistent with the 2005 EPA-selected removal action. The dredge areas (Figure 6) will be reassessed and, if necessary, addressed as part of phase II of the removal action implementation (i.e., final removal action activities) The dredge areas will be reassessed and addressed as part of phase II of the removal action implementation (i.e., final removal action activities), along with the remaining areas within the Removal Action Area (RAA) including Slip 3, Slip 1 and Berth 401.

1.2 Timing of Abatement Measures and Realignment

If the realignment request is accepted by EPA, the anticipated schedule for design and implementation of the abatement measures and the overall removal action project is provided below in Table 1 along with some key dates associated with the harbor-wide study. It should be noted that in order to try to meet the 2008 in-water work window for the abatement measures, adherence to this schedule is imperative. Completing the design and procuring a contractor in order to begin work in August 2008 will be very tight.

Table 1
Schedule for Proposed Phase I and Phase II of the T4 Removal Action Project

Item	Date
Port Submits Abatement Measures Proposal	October 25, 2007
EPA Reviews and Comments on Abatement Measures Proposal	November 5, 2007
EPA Final Approval of Abatement Measures	November 10, 2007
Additional Core Data Obtained by Port	November 2007
Port Summits 60% Design of Phase I (Abatement Measures)	January 2007
EPA Reviews and Comments on 60% Design of Phase I	14 calendar days after Port submission.
Port Submits 100% Design of Phase I	March 2008
EPA/Agency Review of 100% Design of Phase I	April 2008
Implementation of Phase I	August 2008
Harbor-wide RI/FS Data Collection	*Sampling completed January 2008; data posted late Spring 2008*
Harbor-wide Risk Assessment	*Anticipated Submittal by LWG First Quarter 2009; EPA Approval expected Second to Third Quarter 2009*
100% Design of Phase II	*Third Quarter 2009*
Harbor-wide Feasibility Study	*Anticipated Submittal by LWG – Fourth Quarter 2009*
Phase II - CDF Construction	*Third Quarter 2010*
Phase II - Slip 3 Dredging and Placement in CDF	*Third Quarter 2011*

** Italicized items are based on current Harbor-wide RI/FS Schedule.*

The following sections detail the rationale, conceptual specifics, and monitoring activities proposed for each abatement measure.

2 ABATEMENT MEASURES

2.1 Slip 3 and North of Berth 414 Dredging

The Slip 3 and North of Berth 414 Dredging abatement measure will remove surface sediments exhibiting the highest concentrations of chemicals of concern within the RAA and dispose of them at an EPA-approved upland landfill. This will accomplish two key sediment cleanup objectives: 1) eliminate exposure to the highest risk surface sediments within the RAA until Phase II of the Removal Action is implemented; and 2) eliminate a significant mass of contaminated sediments from the RAA. For the purpose of this proposed abatement measure, highest risk surface sediments are defined as those with PEC exceedance ratios greater than 20.

2.1.1 Rationale

The highest risk surface sediments (i.e., surface sediments with PEC exceedance ratios greater than 20) within the RAA are generally located at the head of the slip and at an area North of Berth 414 (see Figure 6). Removal of these highest risk sediments will provide a permanent solution of contaminant mass removal, remove the highest risk surface sediments, and contribute to the future ecological recovery of the RAA.

An interim sand cover was considered for these high risk areas as well. Although the sand cover would reduce short-term risk to aquatic receptors, it was determined to be less desirable than removal and upland disposal for several reasons. First, as an interim measure it would not provide a permanent solution. Second, the sand cover would be vulnerable to redistribution by ship's propeller scour and other in-water dynamic forces, and would be diluted with time. Third, the concept of placing additional material in an area that already poses ongoing maintenance dredging challenges is not consistent with the designated use as a deep water berth. Finally, the sand layer would eventually need to be dredged as part of phase II of the removal action, which would be inefficient, costly, and take up capacity within the CDF. Hence, the placement of an interim sand layer was not selected as the preferable abatement measure.

Selection of the dredging alternative over the sand cover is, however, contingent on several factors. Berth 410/411 is one of the Port's most active berths with approximately

70% occupancy and over 100 vessel calls a year. The terminal serves as an important export center for soda ash (sodium carbonate) used in the manufacture of glass. Glass factories world-wide rely on regular and dependable deliveries to keep their production process going. Consequently, early coordination with tenant and Port marine operations is critical to ensure the feasibility of the dredging as an abatement measure in terms of time limitations, tenant disruption, cost-effectiveness and certainty.

As a second important factor, routine maintenance dredging in Slip 3 has been necessary on an almost annual basis to maintain the berth to required operational depths (-40 CRD). Vessels in the handy-max size category routinely draft up to 39 feet fully loaded at the berth, and require additional underkeel clearances to account for lists and trim during the loading process (the vessel cannot be kept constantly flat during the loading process). Based on the bathymetric surveys in Spring/Summer of 2007, the Port must conduct dredging during the 2008 in-water work window in Slip 3 along Berth 410/411 to meet its operational and contractual requirements, and the Port is proceeding with a maintenance dredging project on this basis. While there is some very minor overlap, the 2008 maintenance dredging area generally does not coincide with the area with the highest concentrations of contaminants. The Port is submitting a separate permit application pursuant to state and federal requirements for the maintenance dredging project.

Given these complexities, the Port evaluated Slip 3 holistically to identify opportunities for synergies between implementing the Port's public mission and contractual obligations to maintain the berth at navigational depths, and the Port and EPA's goal to abate the imminent risk in the Removal Action Area. By combining the two projects as one dredging effort to achieve time and cost efficiencies, the Port believes abatement dredging is feasible and more practicable than placing a temporary sand layer. Likewise, the Port's marine operations team will identify opportunities with the maintenance dredging permit to achieve a more sustainable maintenance dredging program to minimize the overall impacts to the aquatic environment in Slip 3 by reducing the frequency of maintenance dredging. Specifically, the Port believes there is a benefit to ensure the 2008 dredging event relieves the need for annual maintenance

dredging for a least several years until phase II of the removal action is implemented. The Port will provide EPA with the 2008 maintenance dredging area and volumes as soon as it is available.

In addition, the feasibility of abatement dredging is dependent upon having relative certainty as to the amount of time required to implement the dredging in order to minimize tenant disruptions. Mechanical dredging has lower production rates than hydraulic dredging, and therefore requires more time, which means longer shut down times. For this reason, the performance goals for the abatement dredging are based on achieving significant mass removal of the highest concentration sediments based on pre-determined depths using existing and proposed core data (with the understanding that the remaining sediments will be addressed during phase II of the removal action implementation). This would provide adequate certainty as to the amount of time expected for disruption to the soda ash operations so that the Port can work with its tenant to plan around the disruption as much as possible. Secondarily, certainty on volumes and area will also increase the likelihood of achieving timely bidding of the work and help ensure cost-competition by contractors for the project.

In summary, the dredging abatement measure is the preferred alternative over the sand layer abatement measure assuming the following factors: the Port is able to achieve synergies and coordination with the marine operations planned maintenance dredging event, have relative certainty in advance regarding volumes to be dredged, do advance planning with the tenant to minimize the impact to operations, and meet the necessary design and approval schedules to ensure adequate time for competitive bidding of the work.

2.1.2 Design Basis

2.1.2.1 Performance Standards

The following performance standards are established to guide the final design of the proposed abatement measure:

- Remove the highest risk sediments defined as those with surface sediments having a greater than 20 PEC exceedance ratio down to a specified elevation

coinciding with PEC exceedance ratios of 10 or less as predetermined by sediment core data (note that additional cores will be collected to further define the area).

- Conduct the work in a manner that minimizes the movement of material with elevated chemical concentrations into unintended areas.
- Dredge and dispose of sediments in a manner than minimizes dredging residuals and minimizes recontamination of adjacent sediments.
- Conduct the work in a manner that minimizes water quality impacts outside the compliance boundary.

Additionally, the design must consider and avoid the potential for the future phase II removal action work to compromise the integrity of this remedial measure once constructed.

2.1.2.2 Conceptual Design

Figure 6 presents the exceedance ratio of the surface PEC within the Removal Action Area. The abatement measure will focus on the highest risk surface sediments, removing surface materials with PEC exceedance ratios greater than 20. Figure 6 shows the dredge footprints within Slip 3 and the area North of Berth 414. These target footprints will be removed down to dredge elevations established using existing and proposed cores located within the footprints. The dredge elevations will be established to remove materials above a PEC exceedance ratio of 10 within the footprints. Based on current information, the dredge cuts will vary in thickness up to 3 feet within the footprints shown on the drawings. As discussed below, additional cores will be collected within these footprints to provide a higher density of information on which to base the design and refine the dredge elevations.

The dredge prism will be adjusted during the abatement measure design to account for the following issues:

- A small area at the head of the Slip will not be removed due to stability concerns. This area is located in front of the timber bulkhead where the sheet pile wall does not extend. Any dredging in front of the timber bulkhead

could cause the bulkhead to fail. As presented in the 60 Percent Design, this area will be capped as part of phase II of the removal action to avoid instability of the timber bulkhead.

- The eastern edge of the dredge footprint, as depicted on Figure 6, will likely be moved west toward the mouth and away from the pinch-pile bulkhead, beyond the riprap slope. Coring during the 60 Percent Design effort encountered riprap down this slope to an elevation of approximately -30 feet. Clean native sediments exist below the riprap slope making a removal action unnecessary in this area.
- Dredge depths immediately adjacent to the sheet pile wall will be evaluated for wall stability impacts once additional coring information is collected. The sheet pile wall cannot tolerate dredge cuts deeper than elevation -46 feet NGVD for long-term conditions or -52 feet NGVD for short-term conditions (Anchor 2006). Therefore, if the extent of contamination above 10 times the PEC is deeper than -46 feet adjacent to the wall then the dredging would stop at elevation -46 feet and a temporary sand cover would be placed. Deeper materials would be addressed as part of phase II of the removal action.

The final dredge plan of these abatement measures will show the dredge elevations that the contractor will need to remove. The dredge cuts will extend out to the boundary of the dredge prism with temporary side slopes of 3H:1V to 2H:1V up from the design dredge elevation to the daylight line.

Figure 7 shows the locations of additional proposed cores necessary to increase the sample density within the proposed abatement dredge areas. These cores will improve the accuracy of the target dredge elevations. Additional data required at each of the three locations with the highest risk sediments include the following:

- **North of Berth 414.** The existing data at this area with the highest risk sediments provide sufficient information to establish a target elevation for dredging.
- **Pier 5.** Additional data is needed in this area with the highest risk sediments to better establish the target elevation for dredging. A core will be advanced

at this location to determine the elevation where the contaminant concentration is less than 10 times the PEC.

- **Berth 411.** Three additional cores will be advanced within the footprint of this area with the highest risk sediments to increase the sample density and better establish target dredge elevations.

As discussed above, abatement dredging would likely be completed concurrent with Berth 410/411 maintenance dredging by the same contractor. The dredging would be completed using clamshell buckets. The material would be placed on barges equipped to hold dredged material and water and hauled by barge or a combination of barge and truck/train to a landfill for disposal.

2.1.2.3 Construction Quality Control

There are three specific quality control measures that will be implemented to ensure the dredging is completed to meet the design standards: achieving the specified dredging depths and lateral extents, properly disposing of dredged material, and minimizing water quality impacts. To accomplish these measures the Contractor will be required to:

- Submit a construction quality control plan for approval
- Complete bathymetric surveys of dredge cuts to confirm the design lateral extents and elevations have been obtained
- Follow the approved transportation and disposal plan
- Collect and track documentation of transport and disposal during the transportation process. Copies of all project records, including manifests and bills of lading indicating cargo contents, weight, and date, will be collected for each over-land trip transporting waste for disposal and maintained for the project file. The disposal facility will verify receipt of the contents and record the weight and the time that it is received. These records will be tracked during the process.

In addition, the Port will provide independent construction quality assurance of the contractor's work.

2.1.3 Short-term Monitoring Activities

Proposed additional short-term monitoring activities, other than water quality monitoring, include the following:

- **Off-Site Tracking:** Dredged material on a barge will either be directly hauled to a landfill's offloading facility or off-loaded from the barge into trucks/train cars to be transported to an EPA-approved upland landfill. Monitoring of the loading area and unloading area (if not at a landfill's offloading facility) will occur before and after all the transport work is completed to determine if contaminated materials were tracked off-site during transport. During the phase I design, the Port will prepare a dredged and/or stockpiled material handling plan that will include BMPs that will be implemented to minimize the potential for off-site tracking of contaminated sediments during transport to the landfill. The monitoring activities will verify the effectiveness of those BMPs.

Specific water quality monitoring activities for this abatement measure are discussed in Section 3.

2.1.4 Long-term Monitoring Activities

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

The current anticipated phase II removal action schedule has the Slip 1 CDF beginning construction in the third quarter of 2010 with Slip 3 dredging being completed in the third quarter of 2011. If the Slip 3 dredging is delayed past this schedule the Port will re-evaluate the effectiveness of the Slip 3 dredging abatement measure at that time.

2.2 Head of Slip 3 Cap

The proposed location of the Head of Slip 3 cap is shown on Figure 2. This area is adjacent to the location of a previous remediation (Bank Excavation and Backfill Remedial Action [BEBRA; Hart Crowser 2000]) which addressed a historic petroleum seep on the slope. The DEQ upland cleanup was completed in 2004. However, petroleum-contaminated sediments remain in water below elevation 3. The Head of Slip 3 cap will address these impacted sediments and tie into the BEBRA work.

2.2.1 Rationale

The petroleum-contaminated sediments at the head of Slip 3 pose a risk to aquatic receptors from direct contact and are a potential ongoing source for contaminated sediment transport to nearby areas of the slip. Remediating this area early will contribute to the recovery of the Slip. Implementing this abatement measure now will not impact the phase II of the removal action work when it is completed in the future. Similarly, the phase II construction is not expected to disturb the integrity of the Head of Slip 3 cap. This remedial measure was part of the 60 Percent Design Submittal (see details 4 on Sheet C-37 and 1 on Sheet C-38) previously reviewed by the agencies.

2.2.2 Design Basis

2.2.2.1 Performance Standards

The following performance standards adapted from the 60% Design will be used to guide the design of the cap:

- Isolate the surface sediments containing elevated contaminant concentrations from benthic communities and the aquatic environment by addressing appropriate long-term erosive as well as contaminant transport mechanisms by incorporating the organoclay component into the cap.
- The material used for capping shall meet the acceptance criteria that will be established based on the results of the borrow source sampling that the Port conducted during the IDR process as directed by EPA. The acceptance criteria will be developed during the design of phase I of the removal action.
- Place cap materials in a manner that minimizes mixing of cap material with underlying contaminated sediments.

- Conduct the work in a manner that prevents the movement of material with elevated chemical concentrations into unintended areas.
- Conduct the work in a manner that minimizes, to the extent practical, water quality exceedances.

Additionally, the design must consider and avoid the potential for the phase II removal action work to compromise the integrity of this remedial measure once constructed.

2.2.2.2 Conceptual Design

Figure 3 presents the conceptual design of the Head of Slip 3 cap. Prior to doing the work, the contractor will construct the riprap wedge against the outer edge of the existing wooden bulkhead to stabilize it. The wedge will consist of a 12-inch layer of Base Cap Type 1 (fine to medium sand) overlain by Armor Type 3 material (small rip rap). The armor material will be constructed at a 1 horizontal to 1 vertical (1H:1V) slope against the timber bulkhead.

After the bulkhead is stabilized, the contractor will begin working upslope of the bulkhead. First, the contractor will remove the existing riprap and filter blanket at the toe of the BEBRA as needed to expose the existing sand and organoclay unit. Excavated material that is contaminated and cannot be reused will be contained and taken to an appropriate landfill for disposal. Once the bank is exposed, Base Cap Type 3 material will be placed against the existing sand fill/organoclay unit and on the slope down towards the timber bulkhead. The Base Cap Type 3 material will be isolated with a layer of filter material and riprap placed on top. Base Cap Type 3 material is 10 parts Base Cap Type 2 material (sandy gravel to gravelly sand) mixed with 1 part organoclay (dry weight).

2.2.2.3 Construction Quality Control

The following specific quality control measures will be implemented to ensure the cap placement work is completed to meet the design standards: using proper construction materials, achieving the specified grades, properly disposing of

excavated material, avoiding damage to existing structures, and minimizing water quality impacts. To accomplish these measures the contractor will be required to:

- Submit a construction quality control plan for review and approval
- Sample and analyze proposed import construction materials to establish compliance with physical and/or chemical requirements
- Conduct chemical testing at an agreed upon frequency with EPA and visually inspect imported materials upon arrival for compliance.
- Complete bathymetric surveys of the riprap armor wedge to confirm it is constructed to the grades established on the drawings
- Monitor the slope and bulkhead during construction to avoid damaging movements
- Provide grade control during excavation and filling of the upper portions of the slope
- Follow requirements of the transportation and disposal plan
- Inspect and clean haul equipment prior to leaving the site
- Collect and track documentation of transport and disposal during the transportation process. Copies of all project records, including manifests and bills of lading indicating cargo contents, weight, and date, will be collected for each overland trip transporting waste for disposal and maintained for the project file. The disposal facility will verify receipt of the contents and record the weight and the time that it is received. These records will be tracked during the process.

In addition, the Port will provide independent construction quality assurance of the contractor's work and the Port will conduct monitoring as described below and in Section 3.

2.2.3 Short-term Monitoring Activities

The short-term monitoring activities, other than water quality monitoring, proposed for this abatement measure include the following:

- **Off-Site Tracking:** Material excavated from the site may be stockpiled at the site before transporting to an EPA-approved upland landfill. Monitoring of the

loading and unloading areas (if not at a landfill's offloading facility) will occur before and after all the transport work is completed to determine if contaminated materials were tracked off-site. During the phase I design, the Port will prepare a dredged and stockpiled material handling plan that will include BMPs that will be implemented to minimize the potential for off-site tracking of contaminated sediments while stockpiled and during transport to the landfill. The monitoring activities will verify the effectiveness of the BMPs.

Specific water quality monitoring activities for this abatement measure are discussed in Section 3.

2.2.4 Long-term Monitoring Activities

Since this abatement measure is expected to also serve as a final action, the Port is proposing to conduct long-term monitoring activities between the time of phase I and phase II of the removal action construction. This interim long-term monitoring will be geared toward verifying the physical integrity of the cap and that the cap continues to function as designed. The interim long-term monitoring will include bathymetric and visual surveys to evaluate the physical integrity and determine if any erosion of cap material has occurred. The visual survey will also be conducted to look for any sheen coming from the cap area that would indicate the cap is not functioning as expected.

Eventually, the long-term monitoring done in this area will be integrated into the final long-term monitoring for the remedy for phase II of the removal action. Long-term cap monitoring requirements that are built into the phase II remedy will include some type of monitoring to address cap recontamination from below. This type of long-term monitoring approach will not be implemented until the final remedy has been implemented. Interim long-term monitoring activities will occur every 2 years until the phase II removal action work is completed. At that time the monitoring activities will be incorporated into the overall T4 Removal Action long-term monitoring program.

More specific details of the interim long-term monitoring activities will be developed during the design of the abatement measures.

2.3 Wheeler Bay Shoreline Stabilization

The proposed location for the shoreline stabilization measure is along the majority of the Wheeler Bay shoreline (see Figures 2 and 4). As part of the RI/FS and Source Control Measure Voluntary Cleanup Program (VCP) agreement between Oregon Department of Environmental Quality (DEQ) and the Port, the river bank area was identified as requiring a source control measure for stabilization.

2.3.1 Rationale

The Wheeler Bay shoreline area is a potential contaminant source to sediments in Wheeler Bay at T4. Remediating this potential source ahead of the phase II removal action will contribute to the recovery of Wheeler Bay. Stabilization of the shoreline now will not impact the phase II removal action remedial work when it is implemented in the future. Similarly, the phase II removal action construction is not expected to disturb the integrity of the stabilization work. This remedial measure was part of the 60 Percent Design Submittal (Anchor 2006; see Sheets C-36 and C-39) previously reviewed by the agencies.

2.3.2 Design Basis

2.3.2.1 Performance Standards

The following performance standards adapted from the 60% Design will be used to guide the final design of the shoreline stabilization:

- Control the shoreline contaminant source by stabilizing the bank and isolating the surface sediments containing elevated contaminant concentrations from benthic communities and the aquatic environment by addressing appropriate long-term erosive and contaminant transport mechanisms.
- The material used for capping shall meet the acceptance criteria that will be established based on the results of the borrow source sampling that the Port conducted during the IDR process as directed by EPA. The acceptance criteria will be developed during the design of phase I of the removal action.
- Place cap materials in a manner that minimizes mixing of cap material with underlying contaminated sediments.

- Conduct the work in a manner that prevents the movement of material with elevated chemical concentrations into unintended areas.
- Conduct the work in a manner that minimizes to the extent practical water quality impacts.

Additionally, the design must consider and avoid the potential for the phase II removal action work to compromise the integrity of this remedial measure once constructed.

2.3.2.2 Conceptual Design

Figure 4 identifies the location of the shoreline stabilization abatement measure and Figure 5 presents cross sections through the stabilization areas. These figures also identify the aquatic cap that will be constructed at a later date as part of the Phase II Removal Action. The T4 Slip 1 Upland Facility boundary as defined in the VCP Agreement with the Department of Environmental Quality (DEQ) extends down to Ordinary Low Water (OLW), elevation 3.4 feet NGVD. The in-water work boundary defined for the Removal Action extends up to Ordinary High Water (OHW), elevation 16.6 feet NGVD.

For the purpose of this proposal, the portion of the 60 Percent Design above elevation 10 feet NGVD is assumed to encompass the abatement measures work. This elevation was chosen for a number of reasons:

- The current 60 Percent Design used elevation 10 feet NGVD as a break point between the first and second seasons of construction. Use of this elevation minimizes changes to the current design. The rationale for choosing this elevation as the break point is provided below.
- There is a lower likelihood of recontamination of stabilization materials placed above elevation 10 feet NGVD than below this elevation. Contaminated sediments exist in Wheeler Bay that will not be addressed as part of the current abatement measure, but rather during the phase II removal action. Resuspension of these materials during storm events, high currents, or ship activity could recontaminate caps placed below elevation 10 feet NGVD. Slip 3 dredging as part of the phase II removal action could also

potentially cause recontamination of aquatic caps within Wheeler Bay as well. Raising the elevation of the cap boundary as much as possible while still creating stable slopes minimizes the recontamination potential. This was the main reason for the construction break established between the two areas in the 60 Percent Design.

- Constructing the stabilization work down to elevation 10 feet allows for stable slope configurations. A higher toe elevation would force a steeper, less stable slope. A lower toe elevation is generally not required for stability. The potential for scour at the toe of the stabilization will be evaluated as part of the phase I design.

As seen in Figure 5, most of the slope will be regraded to a more stable configuration. Clearing and grubbing will occur on the slope before regrading. Some excess materials may need to be hauled off to a suitable landfill for disposal. Once the slope is graded to the design grade, a final surface treatment of riprap, jute mat, or other materials will be constructed to eliminate erosion (see Figure 5).

2.3.2.3 Construction Quality Control

The following construction quality control measures will be implemented to ensure the stabilization work is completed to meet the design standards: using proper construction materials, achieving the specified grades, properly disposing of excavated material, and minimizing water quality impacts to the extent practical outside of the compliance boundary. To accomplish these measures the contractor will be required to:

- Submit a construction quality control plan for review and approval.
- Sample and analyze proposed import construction materials to establish compliance with physical and/or chemical requirements.
- Conduct chemical testing at an agreed upon frequency with EPA and visually inspect imported materials upon arrival for compliance.
- Complete surveys of the earthwork to confirm the slope is constructed to the grades established on the drawings.
- Follow requirements of the transportation and disposal plan.

- Inspect and clean haul equipment prior to leaving site.
- Collect and track documentation of transport and disposal during the transportation process. Copies of all project records, including manifests, and bills of lading indicating cargo contents, weight, and date, will be collected for each over-land trip transporting waste for disposal and maintained for the project file. The disposal facility will verify receipt of the contents and record the weight and the time that it is received. These records will be tracked during the process.

In addition, the Port will provide independent construction quality assurance of the contractor's work; and will conduct monitoring as described below and in Section 3.

2.3.3 Short-term Monitoring Activities

The short-term monitoring activity that is proposed for the shoreline stabilization work is described below.

- **Off-Site Tracking:** Material excavated from the site may be stockpiled at the site before transporting to an EPA-approved upland landfill. Monitoring of the loading and unloading area (if not at a landfill's offloading facility) will occur before and after all the transport work is completed to determine if contaminated materials were tracked off-site. During the Phase I design, the Port will prepare a dredged and stockpiled material handling plan that will include BMPs that will be implemented to minimize the potential for off-site tracking of contaminated sediments while stockpiled and during transport to the landfill. The monitoring activities will verify the effectiveness of the BMPs.

Because the work will be above the river elevation (elevation 10 feet NGVD and above) water quality monitoring is not required. However, an erosion control plan will be in place.

2.3.4 Long-term Monitoring Activities

Similar to the Head of Slip 3 cap area, the Wheeler Bay shoreline stabilization work is expected to be a final action for that area. This interim long-term monitoring will be

completed in accordance with DEQ requirements for a soil management plan as part of the upland remedy. The monitoring will consist of inspections to evaluate the physical integrity of the stabilized area and determine if any erosion of stabilization material has occurred. Inspections will occur annually. More specific details of the interim long-term monitoring activities will be developed in the soil management plan for the upland remedy.

3 SHORT-TERM WATER QUALITY MONITORING ACTIVITIES

Short-term water quality monitoring activities will be performed during the implementation of the proposed Slip 3 dredging and Head of Slip 3 cap abatement measures. Water quality monitoring activities are not required for the Wheeler Bay shoreline stabilization abatement measure unless the river level rises above the area of construction (elevation 10 feet NGVD). Monitoring activities are based on the Water Quality Monitoring Plan (WQMP) provided as Appendix D of the T4 Removal Action 60 Percent Design (Anchor 2006) as modified through agreements reached during the informal dispute resolution (IDR) process and EPA's Water Quality Monitoring and Compliance Conditions Plan (WQMCCP). All the specific details of the WQMP will be updated and revised as part of the design of phase I of the removal action prior to implementation. A brief summary of the proposed monitoring activities for each abatement measure is discussed below detailed in Tables 2 and 3.

Table 2
Water Quality Monitoring Parameters

			FIELD LAB					ANALYTICAL LAB[1]						
Subarea	Construction Activity	Visual	Turbidity	Temp	pH	DO	TSS	Cadmium	Lead	Zinc	Copper	PAHs	DDTs	PCBs
Slip 3	Capping	X	X	X	X	X	X[2]	X	X	X	X	X		
	Dredging	X	X	X	X	X	X[2]	X	X	X	X	X	X[3]	X[3]
	Transport and transfer of Mechanically Dredged Sediment to Upland transfer location	X	X	X	X	X	X[2]	X	X	X	X	X	X[3]	X[3]
Berth 414	Dredging	X	X	X	X	X	X[2]					X		
	Transfer of Mechanically Dredged Sediment to Upland transfer location	X	X	X	X	X	X[2]					X		

Note:

1 Analytical lab parameters are based on PEC exceedances in sediment at depths that could be exposed during T4 Removal Action construction activities. PEC exceedances at depths that will not be disturbed by the T4 Removal Action construction activities were not included.
2 Contingent field analysis; performed if turbidity criterion is exceeded.
3 DDT/DDD and PCBs exceed PEC in one interval (1-3 foot) at one location only (T4-VC29).

Table 3
Water Quality Monitoring Locations and Schedules

Construction Activity	Compliance Boundary	Standards for Compliance	Monitoring Activity and Frequency						Trigger to Switch from Tier I to Tier II
			Tier I (Intensive Schedule)			Tier II (Routine Schedule)			
			Visual	Field	Chemistry	Visual	Field	Chemistry	
Placement of the Head of Slip 3 Cap Material	Turbidity/TSS: 100 m from mouth of Slip	Acute Water Quality Criteria (Chronic critieria will be used as action levels for additional BMPs, not compliance)	1/ hr	1/hr; 1/ 4 hr[4]	1/ day[1]	1/ hr	1/ day[2, 3]	1/ week[1]	If results indicate no exceedances of chronic or acute criteria for 3 consecutive days Port will propose reduction to EPA
	Other Analytes: 100 m from activity								
Slip 3 Dredging	Turbidity/TSS: 100 m from mouth of Slip	Acute Water Quality Criteria (Chronic critieria will be used as action levels for additional BMPs, not compliance)	1/ hr	1/hr; 1/ 4 hr[4]	1/ day[1]	1/ hr	1/ day[2, 3]	1/ week[1]	If results indicate no exceedances of chronic or acute criteria for 3 consecutive days Port will propose reduction to EPA
	Other Analytes: 100 m from activity								

Notes:

1 Samples will be taken at the surface, middle, and bottom depths

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

3 May be reduced to 1 per week with EPA approval

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

3.1 Slip 3 and Berth 414 Dredging

Monitoring Parameters. Monitoring requirements for the dredging activities will include conventional field parameters (turbidity, DO, pH, and temperature) and laboratory parameters (total suspended solids [TSS] and constituents of concern [COCs]) at the compliance boundary and early warning boundary. COCs for dredging and transport in Slip 3 will be cadmium, lead, zinc, copper, PAHs, DDTs, and PCBs. COCs for dredging and transport at Berth 414 will be PAHs.

Compliance Boundaries. The compliance boundary and early warning boundary for TSS and turbidity for dredging and transport activities in Slip 3 will be 100 meters and 50 meters, respectively, from the mouth of Slip 3. The compliance and early warning boundaries for all other parameters for dredging in Slip 3 will be 100 meters and 50 meters, respectively, from the dredging activity. The compliance and early warning boundaries for dredging and transport activities occurring at Berth 414 for all parameters will be 100 meters and 50 meters, respectively, from the construction activity.

Monitoring Schedule. Conventional parameters (turbidity, DO, pH, and temperature) will be measured at the start of dredging and transport activities or if construction methods drastically change once every hour beginning 1 hour after dredging begins. If no exceedance is identified following 4 consecutive events, sampling frequency will be reduced to every 4 hours (Tier I). If no exceedances occur following 3 consecutive days of Tier I monitoring, the Port will propose to EPA to reduce the sampling frequency to once per day (Tier II).

Chemical monitoring during initial startup will occur once per day for 3 consecutive days (Tier I) and results will be compared to acute water quality criteria. Chronic criteria will be used as an action level to trigger implementation for additional BMPs, not for compliance. If no exceedances of acute or chronic criteria occur for 3 consecutive days, the Port will propose to EPA to reduce chemical monitoring to once per week (Tier II) unless a significant construction modification is made. Chemistry samples will be collected for 3 consecutive days and submitted twice each day to the laboratory for a 72-hour turnaround time from the

time the lab receives the samples (see Laboratory Turnaround Time Specifications (Directed Comment 384) memo dated October 15, 2007 for additional details).

If any chronic or acute exceedances are detected during Tier II monitoring or a significant construction modification is made, monitoring will revert back to Tier I requirements.

3.2 Head of Slip 3 Cap

Monitoring Parameters. Since capping material will be placed in sediments with elevated chemical concentrations, monitoring requirements include collection of conventional field parameters (turbidity, dissolved oxygen [DO], pH, and temperature) and laboratory parameters (TSS and COCs) at the compliance boundary and early warning boundary. The compliance boundary and early warning boundaries for turbidity and TSS will be 100 meters and 50 meters, respectively from the mouth of Slip 3. For all other parameters, the compliance boundary will be 100 meters and the early warning boundary will be 50 meters from the capping activity. For the Head of Slip 3 cap area, COCs will include cadmium, lead, zinc, copper, and PAHs (Table 2).

Monitoring Schedule. The monitoring schedule for the Head of Slip 3 cap is summarized in Table 3. Conventional parameters (turbidity, DO, pH, and temperature) will be measured at the start of capping activities or if construction methods drastically change (i.e., from placement using a mechanical bucket to placement using a conveyor) once every hour beginning 1 hour after capping begins. If no exceedance is identified following 4 consecutive events, sampling frequency will be reduced to every 4 hours (Tier I). If no exceedances occur following 3 consecutive days of Tier I monitoring, the Port will propose to EPA to reduce the sampling frequency to once per day (Tier II).

Chemical monitoring during initial startup will occur once per day for 3 consecutive days (Tier I) and results will be compared to acute water quality criteria. Chronic criteria will be used as an action level to trigger implementation for additional best management practices (BMPs), not for compliance. If no exceedances of acute or chronic criteria occur for 3 consecutive days, the Port will propose to EPA to reduce chemical monitoring to once per week (Tier II) unless a significant construction modification is made (i.e., switch from

placement using a mechanical bucket to placement using a conveyor). Chemistry samples will be collected for 3 consecutive days and submitted twice each day to the laboratory for a 72-hour turnaround time from the time the lab receives the samples (see Laboratory Turnaround Time Specifications (Directed Comment 384) memo dated October 15, 2007 for additional details).

If any exceedances of acute or chronic criteria are detected during Tier II monitoring or a significant construction modification is made (i.e., switch from placement using a mechanical bucket to placement using a conveyor), monitoring will revert back to Tier I requirements.

4 CONSTRUCTION SCHEDULE

If the Port's requested realignment is accepted by EPA, the goal is for the abatement measures construction to occur during the 2008 work window as described below.

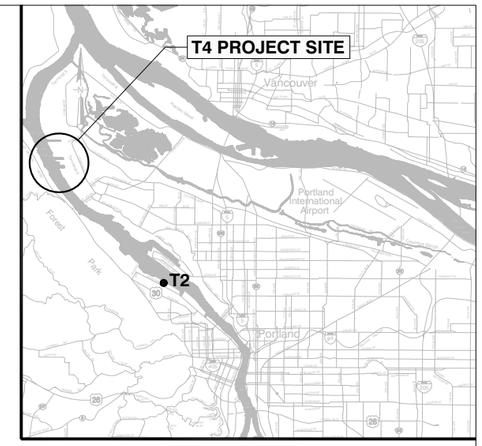
- A majority of the Head of Slip 3 cap and all of the Wheeler Bay shoreline stabilization work will occur from land. The placement of armor on the outside of the existing wood bulkhead in the Head of Slip 3 cap area is expected to occur from a barge rather than from land. These two activities will likely occur sequentially since the same crew will likely complete the work in these areas. The dredging work will occur from the water independently of the capping and shoreline stabilization work.
- The dredging work will be coordinated with the existing Slip 3 tenant to minimize disruptions to ongoing operations.
- The dredging work will be completed in conjunction with other berth maintenance dredging scheduled in 2008 (Berth 410/411 maintenance dredging) to minimize the potential for cross contamination. Utilizing one contractor and sequencing the dredging projects will be important to achieve this goal, and to minimize tenant disruptions.
- Overall expected duration of the construction is approximately 6 weeks, not including the maintenance dredging.
- The Head of Slip 3 cap work is expected to last approximately 2 weeks and to occur simultaneously with the dredging, which is expected to be completed in approximately 3 to 4 weeks.
- The Wheeler Bay shoreline stabilization work is expected to be completed after the Head of Slip 3 cap work within approximately 4 weeks.

5 REFERENCES

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

Anchor Environmental LLC, 2006. Design Analysis Report (Prefinal 60 Percent Design Deliverable). Terminal 4 Early Action. Port of Portland, Portland, Oregon. December 2006.

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



VICINITY MAP
SCALE: N.T.S.

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

0 150
SCALE IN FEET

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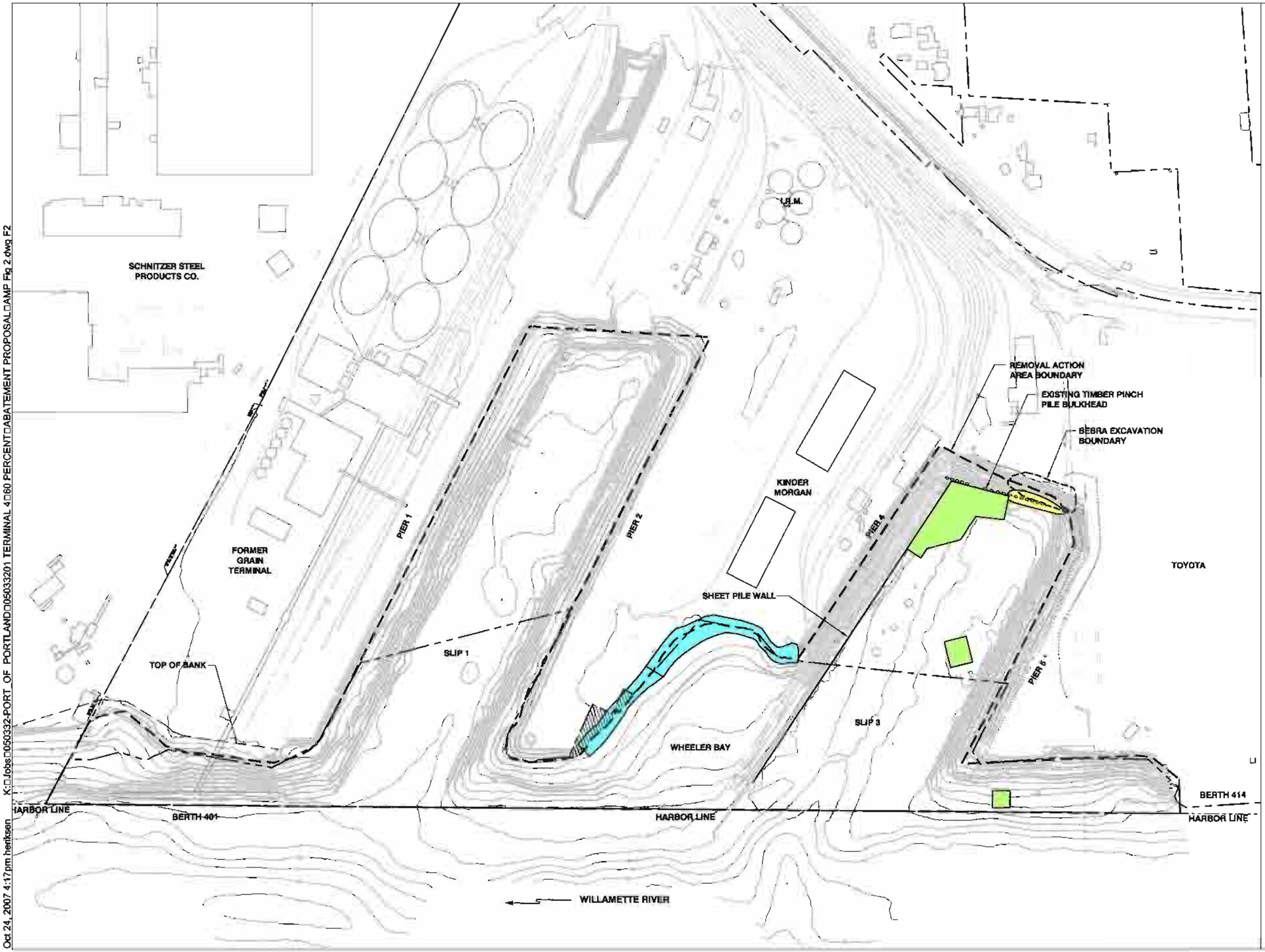
Figure 1
Site Plan and Vicinity Map
Terminal 4 Abatement Measures Proposal
Portland, Oregon



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Oct 24, 2007 4:17pm heriksen

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Figure 2
Summary of Proposed Abatement Measures
Terminal 4 Abatement Measures Proposal
Portland, Oregon

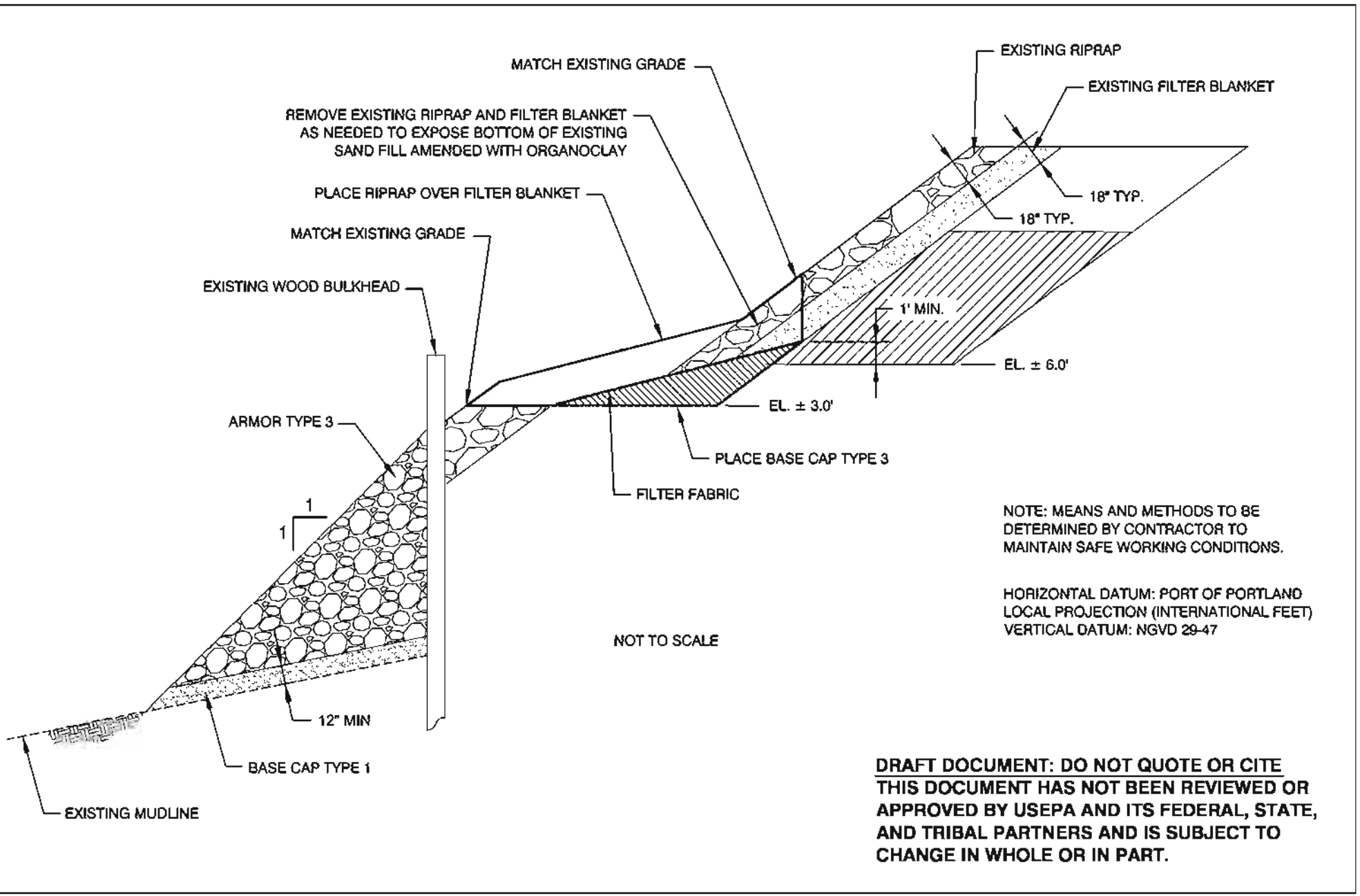

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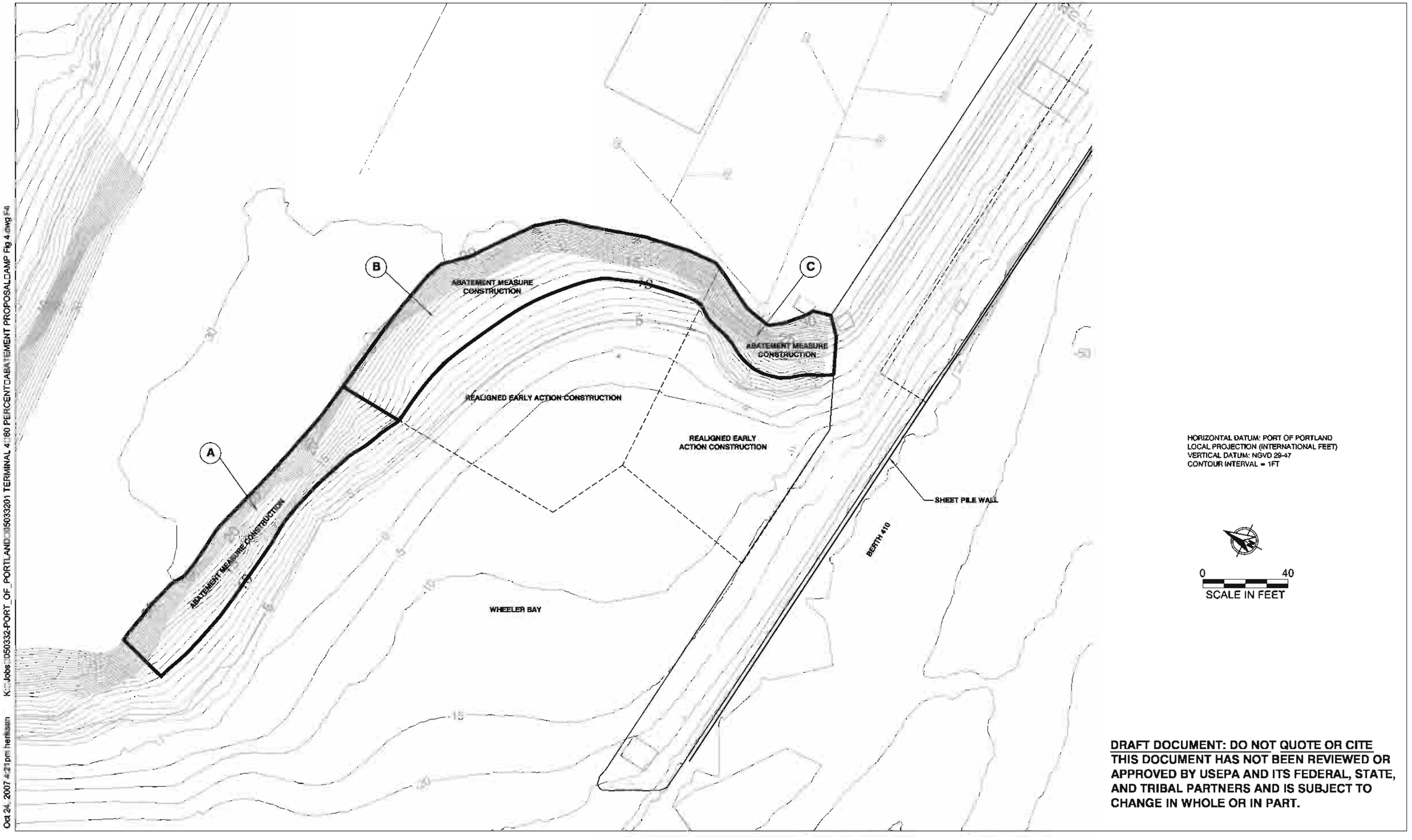
Figure 3
Conceptual Head of Slip 3 Cap Cross Section
Terminal 4 Abatement Measures Proposal
Portland, Oregon



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Oct 24, 2007 4:21pm hemlsen

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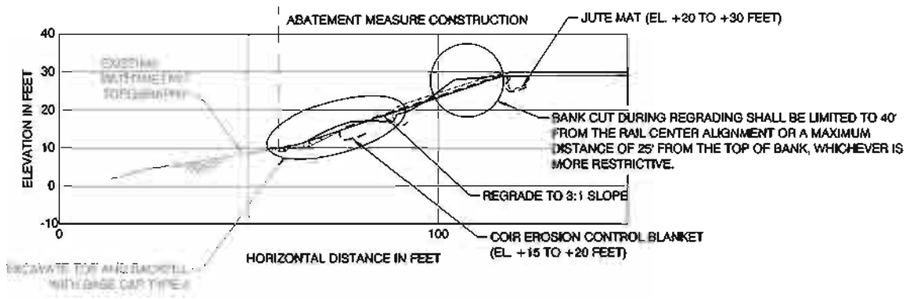
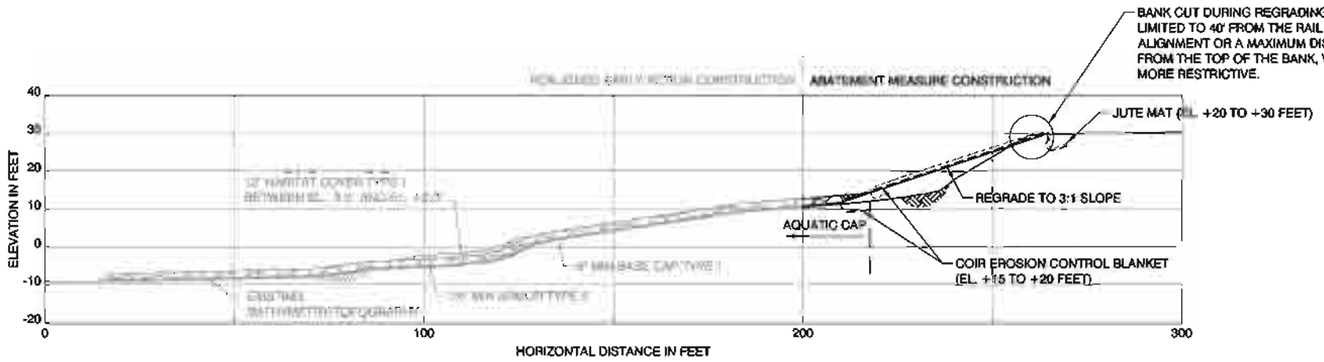
Figure 4
Conceptual Wheeler Bay Shoreline Stabilization Plan
Terminal 4 Abatement Measures Proposal
Portland, Oregon



CAP SECTION A
SCALE: 1" = 20'



CAP SECTION B
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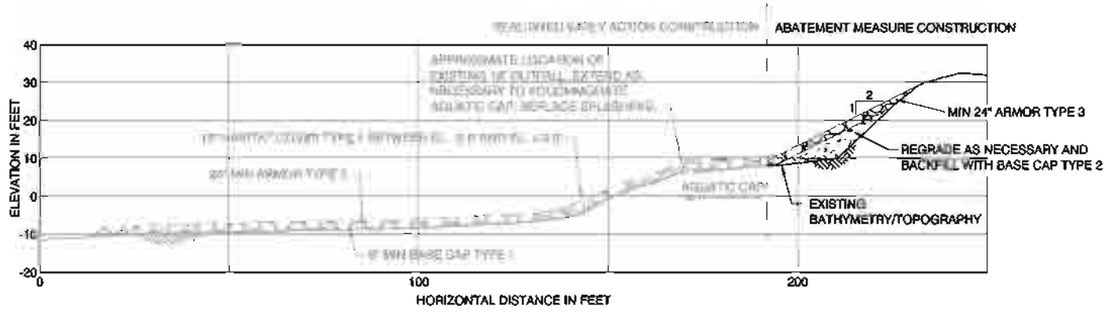

CAP SECTION C
SCALE: 1" = 20'

0 20
SCALE IN FEET

NOTE:

1. ABATEMENT MEASURE CONSTRUCTION EXTENDS DOWN TO ELEVATION +10 FEET.

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

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Figure 5
Conceptual Wheeler Bay Shoreline Stabilization Cross Sections
Terminal 4 Abatement Measures Proposal
Portland, Oregon

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Figure 6
Proposed Slip 3 >20 PEC Dredge Area
Terminal 4 Abatement Measures Proposal
Portland, Oregon

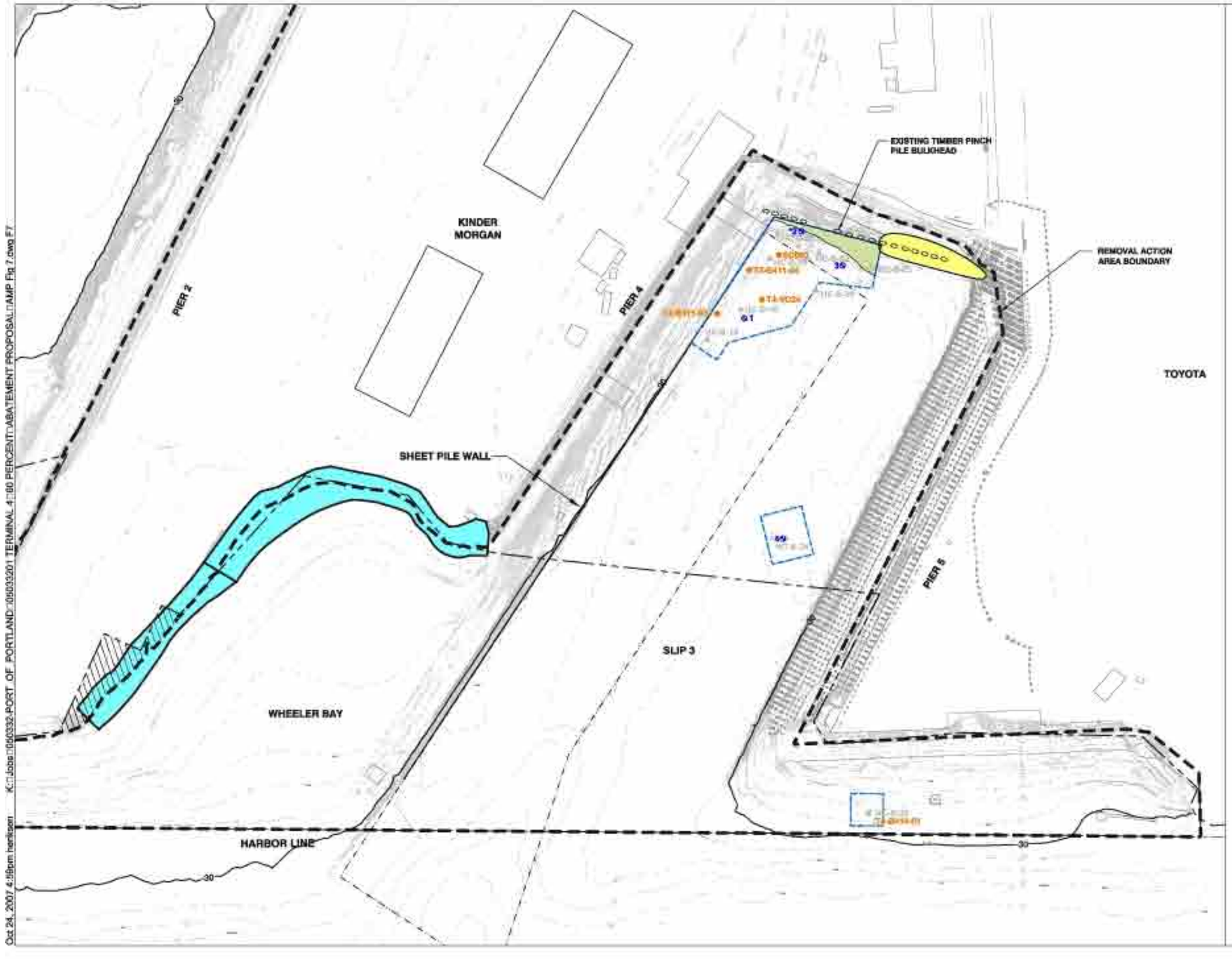

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Figure 7
Proposed Abatement Measure Design Core Locations
Terminal 4 Abatement Measures Proposal
Portland, Oregon

FIGURES