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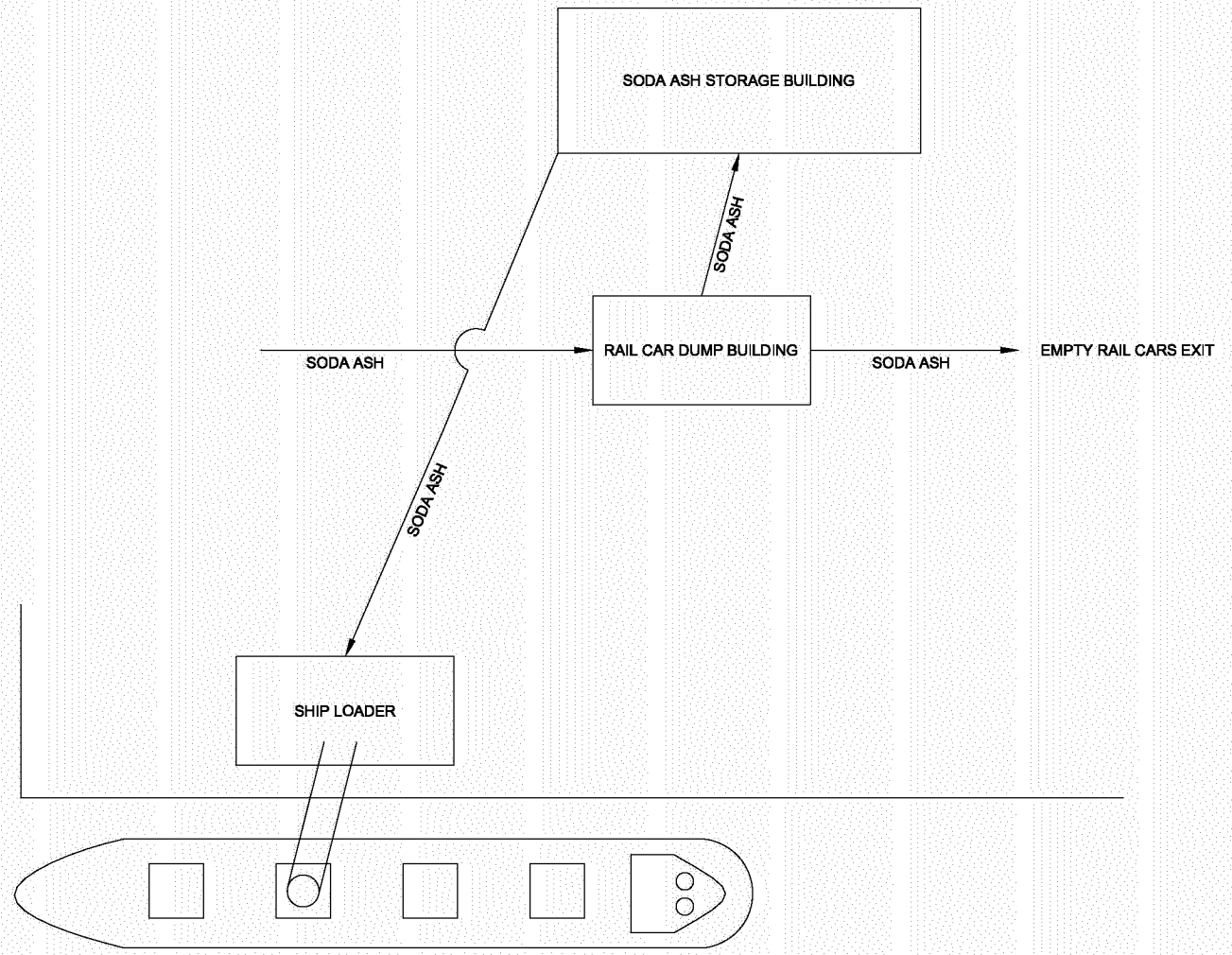


FIGURE 1

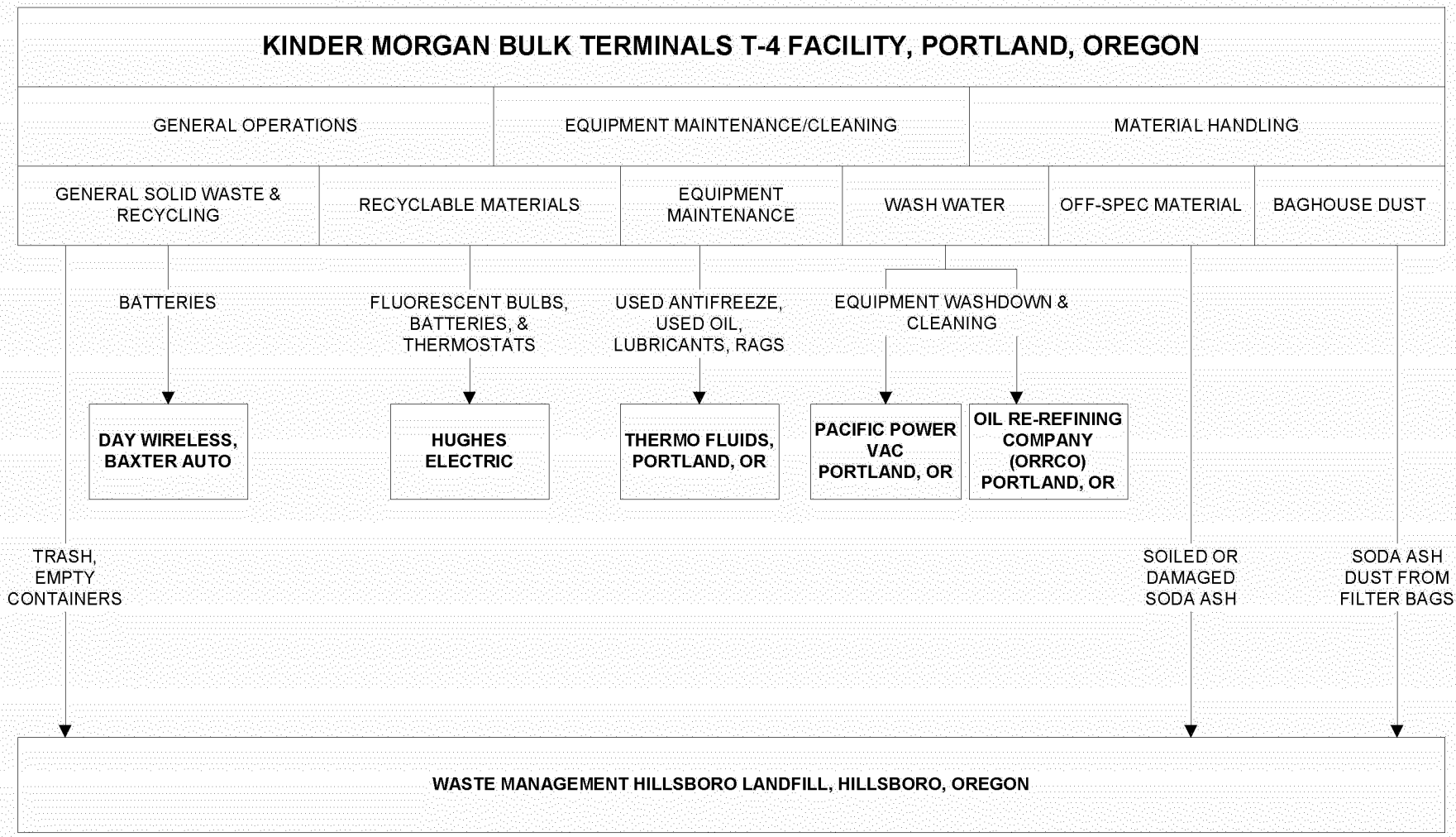
QUESTION 29. PROCESS DIAGRAM

KINDER MORGAN BULK TERMINALS
TERMINAL 4
PORTLAND, OREGON

PROJECT NO.	PREPARED BY	DRAWN BY
PTKM LWG 4.0001	CF	NWH
DATE	REVIEWED BY	FILE NAME
6/8/11	DL	LWG EPA

anteagroup

QUESTION 37: WASTE



QUESTION 37 - WASTE

KINDER MORGAN BULK TERMINALS T-4

T-4 FACILITY
Portland, Oregon

PROJECT NO. EPA 104E	DRAWN BY CRF 5/31/11
FILE NO. BULK TERMINALS	PREPARED BY CRF 5/31/11
REVISION NO. 0	REVIEWED BY NWH 6/1/11

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REPORT

Remedial Investigation Report
Terminal 4 Slip 1 Upland Facility

Port of Portland
Portland, Oregon 97209

August 2007

Ash Creek Associates, Inc.
Environmental and Geotechnical Consultants

NEWFIELDS

Remedial Investigation Report
Terminal 4 Slip 1 Upland Facility

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August 2007

Respectfully submitted,

Michael J. Pickering, R.G.
Senior Project Geologist, Ash Creek Associates

REGISTERED PROFESSIONAL GEOLOGIST
OREGON
AMANDA L. SPENCER
No. 11935

Amanda L. Spencer, P.E., R.G.
Principal Hydrogeologist, Ash Creek Associates

Ash Creek Associates, Inc.
Environmental and Geotechnical Consultants

NEWFIELDS

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Abbreviations/Acronyms

µg/kg	Micrograms per Kilogram
µg/L	Micrograms per Liter
%UCL	Percentile Upper Confidence Limit
ACA	Ash Creek Associates, Inc.
AINW	Archaeological Investigation Northwest
AOCs	Areas of Concern
ATC	ATC Associates, Inc.
AWQC	Ambient Water Quality Criteria
BBL	Blasland, Bouck and Lee
bgs	Below the Ground Surface
BMPs	Best Management Practices
BUD	Beneficial Land and Water Use Determination
CCC	Criterion Continuous Concentration
Century West	Century West Engineering Corporation
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
cfs	Cubic Feet per Second
City	City of Portland
City CPD	City of Portland Commission of Public Docks
cm/day	Centimeters per Day
cm/sec	Centimeters per Second
COIs	Constituents of Interest
COPCs	Constituents of Potential Concern
CPECs	Constituents of Potential Ecological Concern
CRA	Comprehensive Risk Assessment
CRBG	Columbia River Basalt Group
CSM	Conceptual Site Model
DCE	1,2-Dichloroethene
DEQ	Oregon Department of Environmental Quality
EA	Early Action
EE/CA	Engineering Evaluation and Cost Analysis Work Plan

EPA	United States Environmental Protection Agency
ERA	Ecological Risk Assessment
ESA	Environmental Site Assessment
ESL	Ecological Screening Level
Facility	Terminal 4 Slip 1 Upland Facility
FS	Feasibility Study
ft^2	Square Foot
g/day	Grams per Day
HAI	Hahn & Associates, Inc.
HHRA	Human Health Risk Assessment
IH	Heavy Industrial Use
JSCS	Joint Source Control Strategy
L/day	Liters per Day
LOF	Locality of the Facility
MDC	Maximum Detected Concentration
MDL	Method Detection Limit
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Liter
MRL	Method Reporting Limit
MS4	Municipal Separate Storm Sewer System
NAD	North American Datum
NGVD	National Geodetic Vertical Datum
NOAA	National Oceanic and Atmospheric Administration
NOAEL	No Observable Adverse Effect Level
NPDES	National Pollutant Discharge Elimination System
NRWQC	National Recommended Water Quality Criteria
OAR	Oregon Administrative Rule
ODFW	Oregon Department of Fish and Wildlife
Order	Administrative Order on Consent
ORNL	Oak Ridge National Laboratory
OU	Operable Unit
OWRD	Oregon Water Resource Department

PA	Preliminary Assessment
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethene
PCSM	Preliminary Conceptual Site Model
PEC	Probable Effects Concentration
Port	Port of Portland
ppm	Parts per Million
PRG	Preliminary Remediation Goal
RCRA	Resource Conservation and Recovery Act
REC	Recognized Environmental Condition
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
SCMs	Source Control Measures
SCVs	Secondary Chronic Values
SLVs	Screening Level Values
SOW	Scope of Work
SPH	Separate-Phase Hydrocarbons
SVOC	Semi-Volatile Organic Compound
T/E	Threatened and Endangered
T4 ASA	Terminal 4 Auto Storage Area
T4S3	Terminal 4 Slip 3
TCE	Trichloroethene
TMDP	Technical Management Decision Points
TPH	Total Petroleum Hydrocarbons
TRVs	Toxicity Reference Values
USDOE	U.S. Department of Energy
USGS	U.S. Geological Survey
UST	Underground Storage Tank
VCP	Voluntary Cleanup Program
VOC	Volatile Organic Compound
WRIR	Water Resources Investigation Report

1. Introduction

The Port of Portland (Port) is under a Voluntary Cleanup Program (VCP) Agreement with the Oregon Department of Environmental Quality (DEQ) for Remedial Investigation (RI), Source Control Measures (SCMs), and Feasibility Study (FS) at the Terminal 4 Slip 1 Upland Facility (the Facility) in Portland, Oregon (dated December 4, 2003). This RI Report was prepared to meet the RI report requirement of the VCP Agreement and Scope of Work (SOW). A Facility Location map is provided on Figure 1; a Facility Plan is provided on Figure 2.

1.1 Purpose and Scope

The purpose of the RI was to determine the nature and extent of potentially hazardous substances in Facility media and to evaluate constituent migration pathways at the Facility. The RI activities were also completed to evaluate the need for SCMs to address unpermitted discharges or contaminant migration to the lower Willamette River.

The scope of the RI was limited to the upland portion of the Facility. As described in the VCP Agreement, the upland portion of the Facility is that area above the ordinary line of low water of the lower Willamette River at Slip 1 and Wheeler Bay. The Upland Facility boundaries are shown on Figure 3. The scope of the RI did not include the in-water sediments of Slip 1, or the City of Portland's (City's) municipal separate stormwater system that crosses the Facility and discharges at Outfall 52C (the City's outfall does not drain any stormwater from the Facility).

The Facility is within the Portland Harbor Superfund Site study area (River Mile 2.0 to River Mile 11.0). The Port has entered into an Administrative Order on Consent (Order) with the U.S. Environmental Protection Agency (EPA) for a CERCLA Removal Action for the Terminal 4 Removal Action Area sediments (CERCLA 10-2004-0009, executed by the Port and EPA in October 2003). The Terminal 4 Removal Action Area is defined as that portion of the Port of Portland's Terminal 4 Facility extending west from the ordinary high water line on the northeast bank of the lower Willamette River to the edge of the navigation channel, and extending south from the downstream end of Berth 414 to the downstream end of Berth 401, including Slip 1, Slip 3, and Wheeler Bay. The ordinary high water line boundary of the Removal Action Area is shown on Figure 3. As can be seen on Figure 3, the Upland Facility boundary overlaps with the Removal Action Area. As stated in the VCP, the Upland Facility work is to be integrated and coordinated with the Terminal 4 Removal Action. This coordination is currently underway, pending EPA decision on the Removal Action approach.

The RI was conducted in accordance with the RI Work Plan (Hart Crowser, 2004a) and the RI Work Plan Addendum for Phase III Work Scope (RI Work Plan Addendum; BBL/Ash Creek Associates/NewFields, 2005b). This RI Report presents the results of the RI and summarizes the results of a screening level Risk Assessment of the collected data (the complete Risk Assessment is contained in Appendix A). The RI Report was prepared pursuant to the VCP Agreement and Oregon Administrative Rule (OAR) 340-122-0080, and in accordance with guidance from the EPA (EPA,

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1988). DEQ guidance on conducting a Human Health Risk Assessment (HHRA) and an Ecological Risk Assessment (ERA) were also used to prepare the Risk Assessment components of the RI.

1.2 Report Organization

This document is organized in the following manner:

- Section 2 provides background on the Facility, including the physical setting, Facility history, previous investigations and remedial actions, potential areas of concern (AOCs) identified during the RI Proposal/RI Work Plan process, and cultural resources.

- Section 3 summarizes beneficial land and water use on and adjacent to the Facility; Appendix B supplies additional documentation supporting the beneficial use survey.

- Section 4 summarizes the RI activities; details on methods and procedures are contained in Appendix C.

- Section 5 presents the results of the RI, including a description of the geologic and hydrogeologic conditions encountered, and the chemical analytical results of soil and groundwater samples collected during the RI; lithologic logs from borings installed are contained in Appendix D; groundwater elevation maps generated from monthly water level measurement data are contained in Appendix E; hydrogeologic information from the Terminal 4 Removal Action Area Engineering Evaluation and Cost Analysis Work Plan (EE/CA Work Plan) is contained in Appendix F; and the analytical data are archived on a DVD contained in Appendix G. Appendix H provides a discussion of the results for each potential AOC investigated.

- Section 6 summarizes the key data used to develop the Conceptual Site Model (CSM) for risk evaluation.

- Section 7 summarizes the screening level Risk Assessment; the Risk Assessment Report is contained in Appendix A.

- Section 8 presents a Source Control Evaluation, as required by the VCP Agreement and consistent with the December 2005 Joint Source Control Strategy (JSCS) document (DEQ/EPA, 2005).

- Section 9 presents the RI summary, conclusions, and recommendations.

- Section 10 lists the references cited in this RI Report.

2. Background

2.1 Physical Setting

2.1.1 Facility Description

Terminal 4 is located in the NW 1/4 and NE 1/4 of Section 2, Township 1 North, Range 1 West of the Willamette Meridian, Portland, Multnomah County, Oregon. The Facility location is included on the Linnton Oregon U.S. Geological Survey (USGS) 7.5-Minute Quadrangle map (USGS, 1984). The topography of the Facility is relatively flat, with an elevation of approximately 30 feet above mean sea level (MSL). The ground surface of the Facility consists mainly of asphalt or concrete, with areas of gravel and grass interspersed. No surface-water bodies are located on the Facility, but it is located adjacent to the Willamette River.

Terminal 4 comprises approximately 283 acres on the east bank of the lower Willamette River and is downstream from the St. Johns Bridge in North Portland, between River Miles 4.1 and 4.6. The vicinity of the site is shown on Figure 1. The portion of Terminal 4 identified as the Slip 1 Upland Facility is approximately 98 acres in area. The Facility is located at the northern end of the terminal and is bounded to the north by the Schnitzer Steel Products facility property boundary, to the east by the Terminal 4 property boundary, to the south by the Willamette River (Wheeler Bay) and the boundary of the Terminal 4 Slip 3 (T4S3) Upland Facility, and to the west by the ordinary line of low water of the Willamette River at Slip 1 and Wheeler Bay.

The VCP Agreement divides the Facility into two Operable Units (OUs), OU1 and OU2, as shown on Figure 2. OU1 consists of an approximately 53-acre northern portion of the Facility, which encompasses the former Cargill leasehold. OU2 consists of the remainder of the Facility and is approximately 45 acres in area.

2.1.2 Climate

The winters in the area are mild and wet. Summers are moderately warm and dry. According to Oregon State University's Oregon Weather and Climate Data Website, precipitation averages 36 inches per year, with approximately 75 percent of the precipitation occurring between October 1 and March 31. Monthly average temperatures range from a low of approximately 34°F in January to a high of approximately 80°F in July and August.

2.1.3 Surface Hydrology

The Facility is located adjacent to the Willamette River. The ground surface of the Facility consists mainly of asphalt or concrete, although areas of gravel and grass are also present (Figure 4). Surface hydrology at the Facility consists primarily of surface runoff as sheet flow during rainfall events. Much of the sheet flow is captured through a permitted, piped stormwater conveyance system with inlets located as shown on Figure 4. There are also localized areas of potential direct discharge to the Willamette River on the northern bank of Slip 1 and infiltration into the surface soils in the vicinity of

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outfall W3 (Wheeler Bay). These areas are indicated on Figure 4, along with the type of surface material (paved versus gravel) throughout the Facility, and the general direction of surface runoff.

The VCP Agreement (Section II.A.2) requires the Port to address unpermitted releases to the river. Stormwater and the stormwater conveyance systems at the Facility are actively managed by the Port under the Port's National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit Number 101314 and by Port tenants, including IRM and Kinder Morgan, under individual 1200-Z industrial stormwater permits. These permits authorize the release of stormwater to the river subject to specified terms and conditions and also require the implementation of best management practices (BMPs). For example, two BMPs currently employed at the Facility include cleaning of catch basins on an annual basis and installation of filter fabric within catch basins. The Port and its tenants implement the terms and conditions of their permits and report annually to DEQ. Based on a review of records, the Port, IRM, and Kinder Morgan are currently in compliance with their permits.

The river stage is typically between 3.7 and 11.7 feet MSL, based on information from the Morrison Bridge gauge. The diurnal tide range is 2.2 feet at low river stage and becomes progressively less with higher river stages (NOAA, 2003). According to the Federal Emergency Management Agency Flood Insurance Rate Map, City of Portland, Oregon, Map Number 410183-0015C, dated October 19, 1982, the majority of the Facility is located within Zone C, with minor portions adjacent to the river and slips located within Zone B. Zones B and C are described as areas between limits of the 100-year flood and 500-year flood, or certain areas subject to 100-year flooding with average depths less than 1 foot, or where the contributing drainage area is less than 1 square mile, or areas protected by levees from the base flood.

2.2 Facility History

The Port prepared a detailed discussion of the history of Terminal 4 (including the Facility) for the EE/CA Work Plan (Blasland, Bouck & Lee, Inc. [BBL], 2004) and EE/CA Report (BBL, May 2005). Information on Facility operations, former and current tenants, and substances currently or formerly handled at the Facility are detailed in Appendix A of the EE/CA, which is attached as Appendix I to this RI Report.

The Port acquired the property constituting the Facility in 1971 as a result of the Port's merger with the City of Portland Commission of Public Docks (City CPD). The City CPD purchased the property in 1917 as part of the original 117.55-acre site for the St. Johns terminal. This included approximately 36 acres of submerged land around the former Gatton Slough, which entered the river near the head of Slip 1 (Figure 2). Development of the terminal resulted in the filling of Gatton Slough and adjacent areas within the river, and excavation of Slip 1. In 1972, the Port purchased a strip of land along the northern property line from Broadway Holding Company in connection with the relocation of the grain berth to the face of current Berth 401 (Hart Crowser, 1991).

The Port leases portions of the Facility to various tenants. In addition, the City owns a small parcel within the western portion of OU2. Figure 5 shows the location of current and recent tenant-occupied areas at the Facility.

2.3 Summary of Previous Environmental Investigations

2.3.1 Upland Investigations

The following briefly summarizes significant previous investigations and remedial activities that have occurred at the Facility; a more detailed description is provided in the RI Work Plan and in the reports referenced.

1989 Environmental Assessment and Underground Storage Tank Removal at Rogers Terminal. In October 1989, the Port had an environmental review conducted for the buildings, property, and operations at the Rogers Terminal and Shipping facility (Hahn & Associates, Inc. [HAI], 1989a); the Rogers leasehold area is shown on Figure 5. The review consisted of a site survey and a regulatory review of the conditions and operations at the locations that were of environmental concern. The survey identified one unregistered 10,000-gallon gasoline underground storage tank (UST) at the east end of the former Gearlocker building at the Facility and stained soil associated with a former aboveground used oil tank. The 10,000-gallon UST was subsequently removed by HAI (HAI, 1990a). Groundwater was not encountered in the excavation. Two soil samples were collected from the UST excavation. Gasoline was detected in one of the two samples at a concentration of 7 parts per million (ppm). This concentration was below the cleanup standard and no further action was recommended.

Polychlorinated Biphenyl Release at the Pier 4, Berth 411 Electrical Substation. Approximately 35 gallons of polychlorinated biphenyl (PCB)-containing fluid were released at the Pier 4, Berth 411 electrical substation on April 25, 1989. The spill was contained within the transformer room and an underlying utility tunnel. A cleanup was conducted under EPA oversight (HAI, 1989b; HAI 1990b).

Environmental Assessment of Marine Terminal 4. An environmental site reconnaissance of Terminal 4 was conducted in 1990 (Hart Crowser, 1991). The purpose was to assist the Port in developing environmental management plans for the terminal. The reconnaissance focused primarily on a review of hazardous waste management practices, current discharges, and a review of regulatory agency files.

1996 Environmental Review and Soil Sampling - PM Ag Products, Inc. GeoEngineers conducted an environmental review for the PM Ag Products leasehold (GeoEngineers, 1996); the PM Ag Products leasehold area is shown on Figure 5. The report identified three Recognized Environmental Conditions (RECs) at PM Ag's leasehold: a liquid fertilizer spill associated with Tank No. 16; suspected asbestos-containing building materials in the office building; and a 12,000-gallon UST that required integrity testing. DAI Environmental conducted a soil investigation to evaluate the liquid fertilizer release (DAI Environmental, 1996). Eight soil samples were collected from four locations (samples collected at depths of 1 and 5 feet at each location) and analyzed for nitrates. Nitrates were detected only at one location, at concentrations of 0.75 milligram per kilogram (mg/kg) and 0.52 mg/kg at 1- and 5-foot depths, respectively. The investigation report prepared by DAI Environmental also included results of the tightness test of the 12,000-gallon UST. The UST passed the integrity test. In 2001, HAI decommissioned (by removal) a 15,000-gallon UST from the west side of the boiler building and reported that the UST had been used to store boiler fuel (HAI, 2001). The location and historical use of this UST is consistent with the 12,000-gallon UST identified by GeoEngineers in 1996. Hahn reported that no further investigation or cleanup was necessary since the petroleum hydrocarbon concentrations detected in soil were below the DEQ Level 2 Soil Matrix

Cleanup standard of 500 mg/kg. In a letter to the Port (Dated July 18, 2001), the DEQ indicated that the "Department has registered this report and certification and closed its file on the project" (DEQ, 2001a).

1995 Port of Portland Tank Management Manual. On behalf of the Port, Century West Engineering Corporation (Century West) created a Port-wide Tank Management Inventory, including Terminal 4 (Century West, 1995). A site assessment was also completed for each of the terminals, which focused on a tank status assessment. The tank status assessment included ownership identification, location mapping, state of activity/existence, and regulatory compliance. A 1998 DEQ Strategy Recommendation report discussed regulated USTs at the Facility, and generally concluded that any associated releases did not require further evaluation as sources of petroleum product contamination (DEQ, 1998a).

Terminal 4 Track 401 Soil Sampling Project. In 2001, URS conducted limited sampling of the railroad alignment near the IRM Leasehold area (URS, 2001); the IRM leasehold is shown on Figure 5. The shallow soils in this area were to be removed for railroad maintenance work. The sampling found that lead was present in the shallow soils at concentrations that exceeded Resource Conservation and Recovery Act (RCRA) characteristic hazardous waste levels for toxicity. The soil with lead was excavated and properly disposed of by the Port.

2000 Preliminary Assessment of Terminal 4. In 2000, the Port completed a Preliminary Assessment (PA) of Terminal 4, including the Facility, at the request of the DEQ (Port, 2000). The PA provides a history of the Facility, discusses wastes generated at the Facility, and evaluates potential exposure pathways. The PA concludes that impacts to groundwater are not anticipated, and direct contact with hazardous substances is unlikely because there was no evidence of contamination in surface soils, subsurface soils, or groundwater. The DEQ provided comments on the PA in a May 14, 2001 letter to the Port. HAI, on behalf of the Port, responded in a 2003 report and addressed the following DEQ requests: delineation of the Facility boundaries; clarification on the location of certain historical features; documentation of adequate soil removal associated with a former Rogers Terminal aboveground used oil tank (identified by HAI in a 1989 report; see above); more documentation of historical waste generation and management practices; and clarification regarding the absence of a sheen at the Slip 1 groundwater seeps (HAI, 2003a). In November 2002, HAI conducted a limited investigation of groundwater seeps at the east end of Slip 1 (HAI, 2003b). Groundwater seep samples were collected and analyzed for petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), and volatile organic compounds (VOCs). No sheen was observed during the sampling activity. VOCs were not detected. Diesel-range and oil-range petroleum hydrocarbons were detected at one of the three sample locations. PAHs were detected above DEQ Ecological Screening Level Values (SLVs) at two sample locations. PAH detections were attributed to suspended solids within the unfiltered samples.

Terminal 4 Early Action. BBL assembled a history of the Facility, which is included in the Draft EE/CA Work Plan (BBL, 2004). The document contains a discussion of area history and current uses of the Facility, a chronology of ownership and operations at the Facility, historical terminal operations, current terminal operations, dredging and filling history in the vicinity of the Facility, and adjacent property ownership and operations. This comprehensive historical operations review was used by URS in development of potential AOCs at the Facility summarized in the RI Work Plan (Hart Crowser, 2004a).

2003 Environmental Site Assessment of CLD Pacific Grain/Cargill Facility. ATC Associates, Inc. (ATC) conducted an Environmental Site Assessment (ESA) on behalf of Cargill for the Cargill Leasehold (ATC; 2003); the Cargill leasehold is shown on Figure 5. The ESA was performed as an exit activity as part of Cargill terminating their lease at Terminal 4. The activities included standard ESA work performed in accordance with ASTM Practice E 1527. The ESA concluded with findings of six separate RECs at the leasehold: a rail pit sump containing oil and water; surface soil staining along railroad tracks; ground surface staining around two hydraulic pumps; one UST with no documentation of soil testing prior to removal; floating oil within a former well; and potential groundwater impacts associated with off-site facilities. These were each identified as potential AOCs as a part of the RI Work Plan (Hart Crowser, 2004a).

2.3.2 Sediment Investigations

Previous sediment investigations have been conducted at Slip 1, Wheeler Bay, and Slip 3. A summary of existing sediment data is provided in the EE/CA Work Plan (BBL, 2004) and EE/CA Report (BBL, 2005) and is not duplicated in this report. The EE/CA Work Plan identified metals, PAHs, phthalates, total 4,4'-DDT, total PCBs, and petroleum hydrocarbons as general constituents of interest (COIs) for sediment. These COIs were included in the overall COI list for the upland RI.

2.4 Areas of Concern

On behalf of the Port, URS prepared a RI Proposal (URS, 2004) that identified 77 potential AOCs where hazardous substances may have been handled or managed. Available information on each of the AOCs was obtained and each was reviewed to determine whether further investigation was warranted. The RI Proposal recommended 19 of the potential 77 AOCs for investigation of releases of hazardous substances. DEQ reviewed the RI Proposal and, in a February 18, 2004 letter, DEQ requested that the Port revise the list of AOCs to include additional AOCs for investigation during the RI. In accordance with DEQ comments, the RI Work Plan identified 42 AOCs for investigation during the RI; the locations of these AOCs are shown on Figure 6. Further evaluation was found not to be warranted at 35 of the initially identified AOCs (Hart Crowser, 2004b).

Subsequent to the development of the RI Work Plan, six additional AOCs were identified:

- During a site walk with DEQ on April 14, 2005, longshoremen who worked at the former Cargill facility stated that pesticides and hydraulic oils were released and creosote and other wastes were discarded at specified areas at OU1 during former Cargill operations. In a letter to the Port dated April 19, 2005, DEQ requested additional sampling be conducted in these areas (see Appendix B of BBL/Ash Creek/NewFields, 2005b). As described in a letter from the Port to DEQ dated June 1, 2005, two of seven areas identified in the letter had already been sampled during the Phase II activities. The remaining five areas were identified as new AOCs (AOC 78 through AOC 82; Figure 6).

- EPA and DEQ identified erodable riverbank soil as a potential pathway for constituent transport to surface-water in the Portland Harbor (DEQ/EPA, 2005). On April 13, 2005, the banks of the Facility were observed for exposed surface soil that has the potential to be eroded and transported to the river. The areas along Wheeler Bay and the west end of the south side of Slip 1 were

identified as having the potential for surface erosion. These areas are collectively referred to as AOC 83 (Figure 6).

The 48 AOCs identified for further evaluation during the RI are shown on Figure 6 and listed below. A description of each of the AOCs is provided in Table 1. These AOCs constitute potential sources of hazardous substances that could pose a risk to humans or ecological receptors should a complete pathway exist.

Operable Unit 1 (OU1)	Operable Unit 2 (OU2)
AOC 1 – Cargill UST - T-45. AOC 5 – Cargill UST - T-22. AOC 6 – Cargill UST - T-23. AOC 7 – Cargill UST - T-85. AOC 9 – Railroad Track Staining Area. AOC 10 – Cargill Hydraulic Pump Area Staining. AOC 11 – Cargill Former Deep Well. AOC 12 – General Pesticide Usage. AOC 13 – Former Transformer House. AOC 14 – Cargill Basement Level Sumps. AOC 15 – Abandoned Cesspools. AOC 16 – Cargill Malathion Mixing Area. AOC 17 – Cargill Former Millwright Shop and Compressor House. AOC 18 – Cargill Hydraulic Oil Releases. AOC 19 – Former Blacksmith Shop. AOC 20 – Cereal Foods UST - T-19. AOC 21 – Cereal Foods UST - T-20. AOC 22 – Cereal Foods UST - T-21. AOC 24 – Cafeteria Oil-Storage UST. AOC 25 – Waste Pile. AOC 26 – Former Gas Fueling Station. AOC 27 – Former Transformer Handling Area. AOC 28 – Possible Drum Burial Area. AOC 29 – Schnitzer Auto Fluff Area. AOC 69 – Former PCB-Containing Transformer Locations. AOC 76 – Cargill Former Machinery Shop. AOC 77 – Former Cold Storage Plant UST. AOC 78 and AOC 80 – Storm Drain Catch Basins. AOC 79 – Pump at Cargill with Hydraulic Oil Leak. AOC 81 and AOC 82 – Waste Areas (Creosote).	AOC 54 – Hall-Buck UST - T-24. AOC 57 – Kinder Morgan Former Railcar Wash Area. AOC 58 – UST - T-26. AOC 60 – City CPD UST - T-44. AOC 61 – Groundwater Seeps. AOC 62 – Sloped Truck Scale with Sump. AOC 63 – Former Ore/Product Handling and Storage Locations. AOC 64 – Former Leckenby Fumigation Plant. AOC 65 – Former ATS Disinfestation Plant. AOC 67 – Gearlocker and Maintenance Building. AOC 68 – Boiler House. AOC 69 – Former PCB-Containing Transformer Locations. AOC 72 – Railroad Alignments. AOC 73 – Berth 411 Pencil Pitch Handling. AOC 74 – Utility Storage Building. AOC 75 – Former Car Cleaning Pit and Drain. AOC 83 – Erodable Bank Areas.

2.5 Cultural Resources

Archaeological Investigations Northwest (AINW) has conducted a cultural resources survey for Terminal 4 (AINW, 2003). A summary of survey findings is included in Appendix E of the RI Work Plan (Hart Crowser, 2004a). AINW identified the former banks of the Willamette River and Gatton Slough as high-probability areas for archaeological resources associated with American Indian use and occupation of the Terminal 4 area.

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3. Beneficial Land and Water Use Determination

This section presents Beneficial Land and Water Use Determination (BUD) for the T4SI Facility. The BUD was completed in accordance with DEQ guidance documents (DEQ, 1998b and 1998c). The purpose of the BUD is to document historical, current, and reasonably likely future land and water uses at the Facility and adjacent properties. The results of the BUD were used to support development of the CSM for the Facility. The CSM (Section 6) provides the framework for assessing potential exposure pathways to be considered in the risk assessment. Additionally, the Locality of the Facility (LOF) is described in Section 6.3.

3.1 Site Setting

Terminal 4 Slip 1 is located at the northern end of Terminal 4. Please refer to Section 2.0 for a complete discussion of the physical setting and Facility history. The Facility is surrounded by similar industrial and marine land uses, as follows:

- The Schnitzer Steel Products facility, a metal salvage and recycling facility, is located directly north of the Facility.
- Northwest Pipe and Casing, a pipe manufacturing facility, is located just to the northeast of the Facility.
- The remainder of the Terminal 4 property boundary is located east and south of the Facility;
- The area south of the Facility includes the T4S3 Upland Facility, and the Terminal 4 Auto Storage Area (T4 ASA).
- The area east of the Facility, on the top of the bluff, is used for auto storage and other industrial uses.
- The ordinary line of low water of the Willamette River at Slip 1 and Wheeler Bay defines the west Facility boundary.

In general, adjacent land uses are similar to land uses at the Facility. Current zoning information indicates adjacent properties are also designated for heavy industrial (IH) use by the City.

3.2 Facility Land Use

This section describes land use of the Facility and adjacent properties. Future land use at the Facility will remain consistent with current and historical uses.

3.2.1 Historical

The Facility history is discussed in Section 2.2. The Facility has been designated for use or used as a marine facility since 1917. The Port acquired the property constituting the Facility in 1971 via merger with the City CPD. The City CPD purchased the property in 1917 as part of the original 117.55-acre site for the St. Johns terminal.

3.2.2 Current

The Port leases portions of the Facility to various industrial tenants. In addition, the City owns a small parcel within the western portion of OU2. Figure 5 shows the location of current and recent tenant-occupied areas at the Facility.

Current zoning information indicates the entire site is designated for IH use by the City's Bureau of Planning (Title 33, Planning and Zoning, Chapter 33.140). IH zoning provides areas where many industries may locate, including those not desirable in other zones due to their objectionable impacts or appearance. The development standards, as defined by the City, are the minimum necessary to assure safe, functional, efficient, and environmentally sound development. The IH zoning for the western portion of the Facility, including Slip 1 and Wheeler Bay, includes an overlay zone "i", which identifies areas covered by the River Industrial Overlay Zone (City of Portland, 2004a).

3.2.3 Future

Overlay zones help to ensure that specific characteristics of certain portions of the City are maintained. The River Industrial Overlay Zone is one of the overlay zones that fall under the broader category of Greenway Overlay Zones. As defined under the City of Portland Title 33, Chapter 33.440 regulation, Greenway Overlay Zones are intended to protect and maintain the natural, scenic, historical, economic, and recreational qualities of lands along Portland's rivers; establish criteria, standards, and procedures for the development of land, change of uses, and the intensification of uses within the greenway; and increase public access to and along the Willamette River for the purpose of increasing recreational opportunities, providing emergency vehicle access, assisting in flood protection and control, providing connections to other transportation systems, and helping to create a pleasant, aesthetically pleasing urban environment. The River Industrial Overlay Zone specifically encourages and promotes the development of river-related industries while preserving the riparian habitat and providing public access where practical.

The entire site is designated by the Portland Comprehensive Plan Map as industrial sanctuary (City of Portland, 2004b). The Portland Comprehensive Plan Map is not the same as the Zoning Map. The Comprehensive Plan Map is an official description of where and to what level future zoning should be permitted, and presents a pattern for future development that will accomplish the purposes of applicable land use policies. Legally, zoning must comply with the limits set by a comprehensive plan. Thus, the land use designations of a comprehensive plan are superior to those used in the Zoning Map (i.e., the Zoning Map cannot allow land uses which are more intensive than those allowed by the Comprehensive Plan Map). As stated previously, the Comprehensive Plan includes the Facility as part of an industrial sanctuary, which is intended for areas where City policy is to reserve land for existing and future industrial development. A full range of industrial uses is permitted and

encouraged, while non-industrial uses are limited to prevent land use conflicts and preserve land for industry. Therefore, the Facility is currently, and is reasonably expected to remain, zoned for IH use for the foreseeable future.

3.3 Current Understanding of Beneficial water Uses

Water use at Terminal 4 is well-documented. A water use survey was previously completed for Terminal 4 as part of the T4S3 Upland RI Report (Hart Crowser, 2000). According to this survey, a municipal water source supplies the Facility and remainder of Terminal 4 with potable water. No groundwater wells with a beneficial use are located on the Facility. Several well records were identified in the vicinity of the Facility; however, none of these are within the LOF. In addition to the T4S3 water use survey, Ash Creek Associates (ACA) also consulted information from historical water use surveys for the CHEMCENTRAL facility (ACA, 2007), Northwest Pipe (CH2M Hill, 2005), and the Northwest Container Site (Parsons, 2002).

3.3.1 Groundwater

Currently, a municipal water source supplies the Facility with potable water for drinking and other purposes. According to the water use survey for the T4S3 Upland RI (Hart Crowser, 2000), there are no active groundwater supply wells on Terminal 4 Property. Historically, an industrial well was located at the former Cargill grain Leasehold. This well was abandoned in 1992 (Mult 3009). Finally, an Oregon Water Resource Department (OWRD) Well Log Survey was performed for the period of January 1, 2000 through January 1, 2006. No additional water wells were identified at Terminal 4.

According to the water use survey for the T4S3 Upland RI (Hart Crowser, 2000), 12 water well records were found in the vicinity of the Facility. One industrial well is located at Northwest Pipe (No. 1824) and one well is located at Schnitzer Steel (No. 1825). Both are used only in the summer for cooling purposes. Three wells are located at Northwest Container, with one well used part of the year for washing storage containers; the other two wells are inactive. Five wells were installed northeast of the Facility during the 1940s for industrial use; their status is unknown. The remaining two wells were located over 1 mile from the Facility and were used for irrigation purposes only. All of these wells are located cross-gradient or upgradient of the Facility. During the water use survey work for CHEMCENTRAL (ACA, 2007), Northwest Container reported that these wells were capped in the early 2000s. The OWRD Well Log Survey for the period of January 1, 2000 through January 1, 2006 was also conducted for adjacent properties. No additional water wells were identified at Terminal 4.

The T4S3 water use survey indicated that the majority of the adjacent properties were supplied by private water wells until City public water supply became available. Currently, municipal water is the primary water source of water in the site vicinity. The closest water wells identified are the Northwest Pipe well (Mult 1824) and the Schnitzer Steel Well (1825). Both are located approximately 250 feet north of the T4S1 site. The well logs and locations of these wells are included in Appendix B.

3.3.2 Surface Water

The stretch of the Willamette River adjacent to the Facility, to which local groundwater discharges, is used mainly for commercial/industrial and recreational activities. As noted above, the Facility is within the Portland Harbor Superfund Site Study Area (from River Mile 2.0 to River Mile 11.0).

The Willamette River also serves as an active channel for large commercial ships to River Mile 11.7. The U.S. Army Corps of Engineers has dredged portions of the Willamette River in the past in order to facilitate commercial use of the channel. Anadromous and resident fish species, some of which are threatened or endangered, use parts of the Willamette River during various stages in their life cycles. A number of local Native American tribes have fishing rights at usual and customary locations on the lower Willamette River. The lower Willamette River is also used for fishing for sport and consumption, subject to Oregon Department of Fish & Wildlife (ODFW) regulations.

No active surface-water points-of-diversion were identified at locations on or immediately adjacent to the T4S1 site.

3.4 Future Water Use

Anticipated future uses of groundwater within and in the area of the LOF are the same as current uses. All properties and potential users within the LOF are connected to the public water supply system. No current domestic use of groundwater was identified although area groundwater is occasionally used for industrial cooling purposes. Reasonably likely future groundwater use may include industrial uses. The public water supply system is expected to meet future area drinking and other domestic water needs.

3.4.1 Beneficial Water Use Determination

The results of the water use survey indicate area users rely on the municipal water supply to meet drinking water and other domestic needs. Industrial wells located at the Northwest Pipe (No. 1824) and Schnitzer Steel (No. 1825) facilities are used only in the summer for cooling purposes. The entire area is within the limits of the City and is currently served by the City's water supply system. In summary:

- No water supply wells were identified within the LOF;
- Groundwater development within the LOF and near-vicinity for domestic use is unlikely due to its ready availability via the municipal system.
- Groundwater development on adjacent properties (near the vicinity of the Facility) has been documented on a seasonal basis (industrial use for cooling purposes).
- Groundwater development within the LOF for irrigation or industrial uses is not likely.

- No surface-water points-of-diversion were identified at locations on or immediately adjacent to the T4S1 site.

- The Willamette River is considered to provide a beneficial use of water for maintenance of aquatic habitat, recreation, and aesthetic uses.

- Based on these findings, there does not appear to be a beneficial use of groundwater within the LOF for industrial, irrigation, or consumptive purposes. A beneficial use of surface-water for maintenance of aquatic habitat, recreation, and aesthetic uses is considered present.

A beneficial water use checklist, consistent with DEQ guidance, follows:

Beneficial Water Use	Current Use?	Future Use?	Justification
Drinking Water	N	N	The site is served by municipal water.
Irrigation	N	N	The site is served by municipal water.
Livestock	N	N	No livestock are raised in the LOF.
Industrial	N	N	The site is served by municipal water.
Engineering	N	N	The site is served by municipal water.
Aquatic Habitat	Y	Y	The Willamette River provides for the protection of aquatic species.
Recreation	Y	Y	The Willamette River is used for fishing and other recreation.
Aesthetic Use	Y	Y	The Willamette River has aesthetic beneficial uses for the community.

Notes:
Y = Yes
N = No
P = Possible

4. Remedial Investigation Scope of Work

4.1 Remedial Investigation Approach

As described in the RI Proposal (URS, 2004), three phases of field activities were completed at the Facility. The following describes the phases and the work plan under which they were completed.

- Phase I (RI Proposal),
- Phase II (RI Work Plan), and
- Phase III (RI Work Plan Addendum).

The Phase I, Phase II, and Phase III field activities were completed by URS, Hart Crowser, and BBL/ACA/NewFields, respectively. This report presents the findings of all three phases.

Where the location of the AOC was known, surface (for surface features) or subsurface (for underground features) soil sampling was combined with groundwater analysis to evaluate the AOC. Where the exact location of the AOC was not known, grab groundwater sampling was completed in addition to the soil sampling to better assess whether the potential AOC had caused an impact. Tables 2 through 4 present a summary of the samples collected.

4.1.1 Phase I

Phase I field work, which was initiated on March 29, 2004, was conducted to assist in the expedited evaluation of the need for source control measures, and to meet the requirements of the Order issued by EPA for the Terminal 4 Removal Action. The Removal Action is intended to accelerate the characterization and cleanup of contaminated sediment adjacent to Terminal 4, including sediments within Slip 1, Wheeler Bay, Slip 3, and along the majority of the river frontage of the Facility covered by the VCP Agreement. Under the Order, the Port must evaluate the likelihood of sediment recontamination in the Removal Action area by upland or upstream sources of contamination, including potential upland sources at the Facility. In order to meet this goal and to meet the site characterization data requirements needed to support the design of the Removal Action, the Port expedited some components of the RI as Phase I.

The proposed Phase I RI SOW was provided in a March 8, 2004 letter from the Port to DEQ. The Port, DEQ, and URS met on March 18, 2004, to discuss the Phase I RI approach. The proposed Phase I SOW was revised based on verbal comments received from DEQ at the meeting. The revised Phase I SOW was provided to DEQ on March 23, 2004, and was subsequently approved in a letter from DEQ to the Port dated March 25, 2004. The Phase I field work was initiated after DEQ approval of the SOW. Copies of the Phase I scope letter and DEQ approval letter are provided in Appendix D of the RI Work Plan. Results of the Phase I work were reported in the August 2, 2004, Phase I Data Summary Report (Hart Crowser, 2004b) and the Errata for Phase I Data Summary Report (BBL/Ash Creek/NewFields, 2005a).

Sixteen groundwater monitoring wells were installed to assess the likelihood that possible AOCs at the Facility were providing sources of contaminants that could reach the Willamette River via

groundwater migration. In addition, eight push-probe soil borings were completed to collect soil and/or grab groundwater samples. Surface soil samples were collected in three locations in AOC 72.

4.1.2 Phase II

The scope of the Phase II investigation was described in the RI Work Plan (Hart Crowser, 2004a). The Phase II RI investigation activities were completed by Hart Crowser in August/September 2004. The field activities included installation of six groundwater monitoring wells, completion of 78 push-probe soil borings for soil and/or grab groundwater sampling, and surface soil sampling at 14 locations.

4.1.3 Phase III

In accordance with the RI Work Plan, the Phase I and Phase II data were evaluated to identify data gaps where additional information was necessary to support risk assessment and to complete the RI. The data from Phase I and II were compared to screening levels listed in the RI Work Plan to identify areas with the potential for unacceptable risk to human health and the environment. These "Preliminary Screening Levels" consisted of (for soil data):

- Human Health - EPA Region 9 preliminary remediation goals (PRGs) for industrial soils (EPA, 2004a).

- Ecological Receptors - DEQ SLVs for terrestrial receptors (DEQ, 2001b).

Metals also occur naturally in soil; therefore, metals data on soil samples were also compared to typical background concentrations. The RI is utilizing the Washington Department of Ecology's Publication 94-115 for metals in soil in Clark County as representative background for site soil.

For groundwater data, the Preliminary Screening Levels consisted of:

- Human Health - Federal Ambient Water Quality Criteria (AWQC), protection of human health regarding fish consumption (EPA, 2002a,b). The nomenclature "fish consumption SLVs" is used herein to identify these screening values.

- Ecological Receptors - Federal AWQC criterion continuous concentration (CCC) values for the protection of freshwater biota (EPA, 2002a). Where AWQC CCC values were not available for a chemical, DEQ SLVs protective of aquatic biota (DEQ, 2001b) were used. The nomenclature "aquatic SLVs" is used to identify these screening values herein.

Groundwater was screened using the above criteria to assess the potential effects of groundwater discharge to surface-water. Direct exposure of humans or ecological receptors to groundwater at the Facility is unlikely, as groundwater is not used for drinking water, nor can ecological receptors contact groundwater directly. For those samples with concentrations of constituents exceeding the Preliminary Screening Levels, adjacent data were reviewed to identify if the extent of the constituents was adequately defined. If not, that area was targeted for further investigation during the Phase III activities.

The results of a preliminary data evaluation were discussed with the DEQ on April 7, 2005. An RI Work Plan Addendum (BBL/Ash Creek/NewFields, 2005b) was prepared to identify the scope and procedures for Phase III sampling and chemical analysis. The Phase III investigation was based on the following:

1. Identification of data gaps based on Phase I and Phase II data collection;

2. Additional AOCs identified by DEQ based on historical operations information provided by longshoremen who worked at the former Cargill facility at OU1 (AOCs 78 through 82); and

3. An additional AOC identified by DEQ consisting of potentially erodable riverbank soil in OU2 (AOC 83).

The Phase III RI investigation activities were completed by BBL/ACA/NewFields in September 2005. The field activities included installation of two groundwater monitoring wells, completion of eight push-probe soil borings, and surface soil sampling at 32 locations.

4.1.4 Confirmation of AOC-27

During an evaluation of revised site boundaries performed based on a DEQ comment on the Draft RI report, it was noted that the potential source area associated with AOC 27 was represented as being located on the riverbank of the Willamette River and offset from the area sampled during the RI (borings SB-45 through SB-47; Figure 1). This location appeared to be inconsistent with the AOC details (staging of transformers and capacitors in the former Warehouse 5 and soil staining observed at the base of the former loading ramp) presented in the RI Work Plan. Additional historical research was completed to refine the location of the former Warehouse 5 and the ramp area noted in the AOC description. The Port indicated that the former Warehouse 5 was used to temporarily store transformers and capacitors from other areas of the site prior to off-site disposal. Warehouse 5 was demolished in 1999. The warehouse reportedly did not have a floor drain system; however, sampling in the former ramp area was recommended to confirm that an AOC was not present. The Port submitted a sampling plan (dated June 19, 2007) to DEQ and received comments/approval in a letter dated June 28, 2007. Sampling of the area was completed in July 2007.

4.2 Soil and Groundwater Characterization Scope

As described in Section 2.4 and listed in Table 1, DEQ required further evaluation of 48 AOCs during the RI. The RI activities consisted of installation of monitoring wells, drilling of soil borings, and collection of surface soil, subsurface soil, and groundwater samples to identify the presence and evaluate the extent of COIs in soil and groundwater. Details regarding field procedures are discussed in Appendix C; Appendix D contains lithologic logs of soil encountered in the borings and monitoring wells, and construction logs for the monitoring wells.

4.2.1 Operable Unit 1

The RI investigation activities in OU1 included the following:

- Collection of surface and near-surface soil samples at 16 locations;
- Completion of 60 push-probe explorations with associated sampling of soil and/or grab groundwater;
- Installation of 12 groundwater monitoring wells (wells MW-01s through MW-03s, MW-07, MW-08, MW-17, MW-18, MW-19, MW-22, MW-23, MW-24, and MW-26); and
- Collection of groundwater samples from the groundwater monitoring wells for a minimum of three quarters (with the exception of well MW-26 which was installed in September 2005 and only sampled one time).

Exploration and sampling locations are shown on Figure 7.

4.2.2 Operable Unit 2

RI investigation activities in OU2 included the following:

- Collection of surface and near-surface soil samples at 11 locations. In addition, 28 surface soil samples were collected from the riverbank;
- Completion of 35 push-probe explorations with associated sampling of soil and/or grab groundwater;
- Installation of 11 groundwater monitoring wells (wells MW-04s, MW-09 through MW-16, MW-20, and MW-25); and
- Collection of groundwater samples from the groundwater monitoring wells for a minimum of two quarters (with the exception of well MW-25 which was installed in September 2005 and only sampled one time).

Exploration locations are shown on Figure 7. Note: wells MW-05 and MW-06 were installed as a part of Terminal 4 Early Action on the T4S3 Facility and, therefore, are not shown on the figures in this report.

4.3 Soil and Groundwater Characterization Procedures

The RI activities consisted of installation of monitoring wells, drilling of soil borings, and collection of surface soil, subsurface soil, and groundwater samples to identify the presence and evaluate the extent of any COIs in soil and groundwater. Details regarding field procedures are discussed in Appendix C. The work was completed consistent with the SOW and procedures detailed in the RI

Work Plan (Hart Crowser, 2004a) and the RI Work Plan Addendum (BBL/Ash Creek/NewFields, 2005b).

4.3.1 Surface and Near-Surface Soil Sampling

Soil samples were obtained using a stainless steel spoon or hand auger from the ground surface to 2.5 feet below the ground surface (bgs). With the exception of the riverbank sampling area (AOC 83 in OU2), discrete surface soil samples were collected for analysis.

Composite sampling was initially conducted in the riverbank area of OU2. To complete the composite sampling, the riverbank area of OU2 that has potentially erodable soil was divided into eight equal areas, each covering approximately 150 linear feet of riverbank (or slip bank). A four-point composite surface soil sample was collected from each area. The four sub-sample locations within each composite sample area were located at equally spaced distances of approximately 38 feet in a staggered pattern on the face of the slope (i.e., two top, two bottom). The composite sample areas and sub-sample locations are illustrated on Figure 7.

Surface soil was collected from a depth of 0 to 1 foot at the four discrete sub-sample locations within each of the eight composite sample areas. A portion of each of the four discrete samples was combined into a single sample in a pre-cleaned stainless steel bowl. The combined soil was thoroughly mixed then placed in sample jars supplied by the analytical laboratory and labeled (e.g., S-23 through S-30). The discrete samples were maintained in sample jars, individually labeled (e.g., S-23A, S-23B, S-23C, S-23D for the sub-samples collected from composite soil area S-23, etc.) and retained for potential future analysis.

4.3.2 Push-Probe Explorations

Push-probe explorations were completed to collect soil and/or groundwater samples for chemical analysis. The push-probes were completed within the fill and alluvial units to depths between 2.5 and 30 feet bgs.

Soil and Groundwater Sampling. At each location, soil cores were collected continuously to the full depth of the exploration. One or more samples were collected from each of the 5-foot sample cores. Soil samples were described, field-screened, and held for possible chemical analysis. Grab groundwater samples were collected from 48 of the push-probe explorations.

Exploration Location and Abandonment. After sampling activities were completed, the push-probe explorations were abandoned in accordance with OWRD regulations and procedures. The abandonment procedure consisted of filling the exploration with bentonite grout. Improved surfaces were patched to match the existing surface (with an asphalt mix).

4.3.3 Well Installations

Groundwater monitoring wells were installed to determine the groundwater flow direction and to assess groundwater quality discharging to the slips and the Willamette River from adjacent site-specific AOCs. The wells were installed and constructed in accordance with OWRD regulations and approved variances. Specific details regarding well installation/construction and development are discussed in Appendix C. Well construction and survey details are provided in Table C-1. The monitoring well locations are shown on Figure 7. Wells MW-01 through MW-04 consist of well clusters installed as a joint effort with the T4 Early Action Project. At each well cluster location, URS installed the shallow well and BBL installed the intermediate and deep wells.

Construction. Monitoring wells were installed using a push-probe rig and were completed to depths between 25 and 43 feet bgs. The wells were constructed of 2-inch inside-diameter PVC with 10 feet of pre-packed, 0.01-inch well screen placed from the bottom of the boring. A bentonite surface seal was placed above the pre-packed screen to within about 1 foot bgs. A concrete surface seal secures a flush-mounted, traffic-rated monument. A watertight locking cap and lock secures the wellhead, and bolts secure the monument cover. All monuments are permanently marked with well identification numbers.

Development and Surveying. After installation, the monitoring wells were developed by purging groundwater from the well using a submersible pump. Development was considered complete after the discharge water appeared reasonably free of sediment, the field quality parameters (pH, temperature, specific conductance, dissolved oxygen) stabilized to within 10 percent of the previous reading, and turbidity ceased to significantly improve with continued development.

Elevations at the top of each well casing and monument and the locations of each well casing were surveyed by a licensed surveyor. Elevations and locations of the borings were also surveyed. The wells were surveyed horizontally relative to the NAD 83 (98) and vertically to the NGVD 1929 (47) datum.

4.3.4 Groundwater Monitoring

Groundwater monitoring consisted of measuring water levels, purging and sampling groundwater, and measuring groundwater field parameters. Please refer to Appendix C for a detailed discussion of the field and sampling procedures.

Groundwater Level Measurements. Water levels in the monitoring wells were measured for the purpose of determining groundwater elevations and gradients. The wells were opened, and the water levels allowed to equilibrate before measurements were taken. The depth to groundwater was measured to the nearest 0.01 foot using an electronic probe.

Purging and Sampling. After groundwater elevations were measured, the wells were purged using a peristaltic pump. Groundwater pH, electrical conductivity, temperature, dissolved oxygen, and turbidity were measured during purging to assess the effectiveness of the purging. Purging was considered complete when the water quality parameters (pH, temperature, specific conductance, dissolved oxygen, and turbidity) stabilized within 10 percent of the previous readings.

After purging was completed, the wells were sampled. Collected groundwater samples were submitted to Columbia Analytical of Kelso, Washington, or North Creek Analytical of Beaverton, Oregon, for chemical analyses. All samples were collected in laboratory-supplied sample containers, marked with identifying information, and maintained under chain-of-custody protocols.

Sample Handling and Storage. Clean sample containers were provided by the analytical laboratory ready for sample collection. Sample jars were fully filled, leaving no headspace. A label was affixed to each sample container and marked with identifying information. Sample containers were stored in a cooled ice chest until transported to the analytical laboratory. Chain-of-custody was maintained and documented at all times.

Decontamination Procedures. To prevent cross-contamination between sampling events, clean, dedicated sampling equipment (e.g., groundwater sampling tubing) was used when possible for each sampling event and was discarded after use. Cleaning of non-disposable items (e.g., stainless steel spoons) consisted of washing in a detergent (Alconox®) solution, rinsing with tap water, washing with methanol or n-propyl alcohol, rinsing with potable water, washing with nitric acid, and rinsing with deionized water (in order as presented). To reduce the chance for cross-contamination between explorations and well installations, the push-probe was cleaned with a high-pressure washer before and after each exploration. Decontamination water was drummed pending disposal.

4.4 Characterization of Potential Sources to the River

The monitoring well network was installed to determine the groundwater flow direction and to assess groundwater quality discharging to the slips and the Willamette River. Riverbank soil samples in erodable areas were collected as described in Section 4.3.1 to assess quality of soil that could potentially migrate to the river. A stormwater discharge evaluation is currently being conducted to assess potential contributions from the stormwater conveyance system to river sediments, and a report of the results will be provided under separate cover.

4.5 Cultural Resources

As part of the Phase I, Phase II, and Phase III site investigation activities, AINW monitored the installation of seven monitoring wells and 28 soil borings at locations adjacent to the former banks of the Willamette River and Gatton Slough. Monitoring was conducted in accordance with the Draft Archaeological Monitoring Protocol, Terminal 4, Portland, Oregon (AINW, 2004). No evidence of cultural resources was observed. The AINW monitoring report is included in Appendix J.

5. Remedial Investigation Results

The results of the RI, including the geologic and hydrogeologic conditions encountered (Section 5.1) and the analytical results of soil, grab groundwater, and groundwater samples (Section 5.2) are presented below.

5.1 Geology and Hydrogeology

This section presents regional and Facility geology and hydrogeology. Data collected during the RI were consistent with geologic and hydrogeologic data collected in support of the EE/CA Work Plan for the Terminal 4 Removal Action Area (BBL, 2004). Information presented in Section 5.1 is focused on data applicable for the understanding of the RI; additional information on the hydrogeology at the Facility is contained in Appendix D of the EE/CA Work Plan and a copy of this appendix is included in Appendix F of this report.

5.1.1 Regional Geology

The Facility is located along the southwestern margin of the Portland Basin, a regional geologic structure consisting of a lowland bounded by folded and faulted uplands. The Portland Basin is a sub-basin of the Willamette Valley physiographic province. The southwestern margin of the basin is bounded by the Portland Hills, which are a linear topographic feature that rises to an elevation in excess of 1,000 feet MSL, located about 1/2 mile west of the Facility. The Portland Hills are described as an asymmetric anticline, faulted along its northeastern limb by the northwest-trending Portland Hills Fault (Beeson et al., 1985; Yelen and Patton, 1991).

The Portland Basin is filled with up to 1,400 feet of Miocene to Recent alluvial and fluviolacustrine deposits, which are underlain by the Columbia River Basalt Group (CRBG). Most of the low-lying areas adjacent to the Willamette River have been historically filled. Fill materials typically consist of silty sand and sandy dredge material, with pockets of gravel, silt, clay, concrete, and wood debris.

5.1.2 Facility Geology

Shallow soil borings and monitoring well installations (less than 40 feet) were completed at the Facility as part of the RI activities. Additional geologic information for the Facility was gathered from the installation of four well clusters (MW-01 through MW-04) by BBL as part of the T4 Early Action Project. At each well cluster location, URS installed the shallow well (MW-01S through MW-04S) and BBL installed the intermediate and deep wells, as appropriate (Hart Crowser, 2004b). Lithologic observations collected during these field activities were used to prepare the following description of the local geologic conditions. Figure 7 shows the locations of all borings and monitoring wells and the location of geologic cross sections for the Facility. Geologic cross sections are included on Figures 8 through 10. Boring logs for the RI explorations are included in Appendix D.

Three primary geologic units were identified beneath the Facility. These units are the Fill Unit (sand fill), the Alluvial Unit, and the Troutdale Formation. Locally, the alluvial deposits, including the sand

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fill, are about 85 to 150 feet thick. The local thickness of the Troutdale Formation is estimated to be about 100 feet thick (Hart Crowser, 2000).

- **Fill Unit.** Fill material is identified on the boring logs as sand fill. Filling of the Facility began as early as 1906, with the majority of the fill being in place by 1921. This unit is correlative with the "fill unit" (DEQ, 2003a) or "sandy fill" (Hart Crowser, 2003) identified at T4S3. At the Facility, the fill generally increases in thickness towards the river (corresponding to an increasing depth to the alluvial unit; Figures 8 and 9). Explorations at the Facility encountered the Fill Unit, consisting of medium sand, ranging from 10 feet to over 35 feet thick.

- **Alluvial Unit.** This unit underlies the Fill Unit and consists of interbedded silts and sands. Explorations at the Facility identified the Alluvial Unit as consisting of silt, silty sand, and sandy silt. The Alluvial Unit is about 65 to 125 feet thick and appears correlative with the "alluvial unit" (DEQ, 2003a) or "alluvium" (Hart Crowser, 2003) identified at T4S3.

- **Troutdale Formation.** Sandy gravel was identified at a depth of about 85 to 150 feet bgs (Figures 8 to 10). These soils are interpreted to represent the Troutdale Formation.

5.1.3 Facility Hydrogeology

Groundwater level measurements were collected monthly from on-site monitoring wells for a period of 1 year (September 2004 through September 2005). Depth to groundwater and groundwater elevations for the monthly events are summarized on Table 2.

Groundwater was encountered within the Fill Unit and upper portion of the Alluvial Unit at depths of 8.3 to 30 feet bgs (1.1 to 17.4 feet MSL). Seasonal water level fluctuations in the inland wells (MW-19 through MW-23) were generally less than 2 feet (Table 2). The wells along Slip 1 and the Willamette River (MW-01, MW-03, and MW-07 through MW-16) had a seasonal water level fluctuation of approximately 4 feet.

Groundwater elevation contour maps were prepared for each of the monthly water level measurement events. Figure 11 shows the estimated groundwater contours for September 14, 2005, which are typical for the Facility. The groundwater contour maps for the other events are contained in Appendix E. Groundwater flow within the Fill and Alluvial Units at the Facility (and at the T4S3 Upland Facility) is generally toward the Willamette River, Slip 1, or Slip 3 (Figure 11). Because the Slips extend well into the Facility, the shallow groundwater gradient within the Fill and upper Alluvium is relatively flat beneath the western portions of OU1 and OU2. The hydraulic gradient in the central portions of each OU is approximately 0.01 and the gradient again decreases to approximately 0.001 in the eastern portion of the Facility.

Hydraulic conductivity of the sand fill at T4S3 has been recorded in the range of 10^{-2} to 10^{-3} centimeters per second (cm/sec; Hart Crowser, 2000). The sand fill appears to be hydraulically similar to the sand fill at T4S3. Assuming a hydraulic conductivity ranging between 10^{-2} to 10^{-3} cm/sec, an effective porosity of 25 percent (Freeze & Cherry, 1979) and hydraulic gradients ranging between 0.01 to 0.001, the estimated shallow groundwater velocity at the Facility will range between approximately 4 and 400 feet per year in the eastern and central portions of the Facility (e.g., groundwater velocity in the eastern portion will be closer to 4 feet per year and groundwater velocity

will increase to approximately 400 feet per year in the central portions of the OUs as it moves toward Slips 1 or 3). The groundwater gradient appears flat in the western portions of both OU1 and OU2.

Portions of the Alluvial Unit have been identified as fine-grained (i.e., silt) material at thicknesses up to 45 feet (specifically near MW-03 and MW-02). This fine-grained alluvial layer, where present, will minimize vertical groundwater flow.

Groundwater seeps have been observed historically at the east end of Slip 1 at the Facility. Groundwater seeps were also observed at the east end of Slip 3 in the T4S3 Upland Facility. Because groundwater flow is toward the river and predominantly within the Fill Unit, groundwater seeps occur when the river stage is at an elevation below that of the Fill Unit-Alluvial Unit contact. Therefore, it is likely that the seeps observed at Slip 1 correspond to the contact between the sand fill and the underlying silty alluvium (Hart Crowser, 2004a). The contact between the Fill Unit and the underlying Alluvial Unit generally increases in depth towards the river, as was observed at T4S3. Therefore, seeps are less likely to occur farther west within Slip 1 if the geologic contact between the Fill/Alluvium unit is typically below the low river stage.

5.1.3.1 Preferential Flow Pathways

Gatton Slough was formerly located in the eastern portion of the Facility. The slough discharged to the Willamette River in the vicinity of Slip 1. The outline of the former slough is shown on Figures 2 and 7. The lithologic logs from borings and wells completed in the footprint of the former Gatton Slough indicate that the fill across the site is fairly consistent in lithogy (i.e., sandy fill) and thickness. Therefore, the former Gatton Slough is not expected to act as a preferential flow pathway for groundwater.

One of the preliminary geologic cross sections prepared for the RI Work Plan suggested that a channel-like feature in the upper Alluvial Unit was present at the 1927/1930 borings B-2 and B-6 (see Figure 5 of the RI Work Plan). These boring locations were uncertain and are not shown on the cross sections prepared using lithological data from the RI activities (Figures 8 through 10). The geologic cross sections compiled from more recent activities (Figures 8 through 10) indicate that no preferential pathways (e.g., filled channels) were identified at the Facility.

Although several stormwater pipes and other buried utilities are present at the Facility, these utilities were not evaluated further as preferential pathways based on the absence of plumes of impacted groundwater (see Section 5.2.2).

5.2 Analytical Results

A total of 134 surface/shallow soil samples (0 to 3 feet bgs), 49 subsurface soil samples, and 77 grab groundwater samples were collected to investigate the 48 AOCs identified as requiring further assessment during the RI program. In addition, 24 monitoring wells were installed and monitored for 1 year to assess groundwater conditions at the Facility. Tables 3 through 5 detail the chemical analyses performed on the soil, grab, and groundwater samples collected, respectively. A data quality review of the RI is presented in Appendix G with the laboratory data.

The analytical results for the RI have been tabulated and organized as follows:

- Tables 6 through 12 tabulate the analytical results for soil samples for petroleum hydrocarbons, PAHs, semi-volatile organic compounds (SVOCs), VOCs, PCBs, pesticides (organochlorine and organophosphorus), and metals, respectively;

- Tables 13 through 19 tabulate the analytical results for groundwater samples collected from the monitoring wells during the 1-year quarterly monitoring program for petroleum hydrocarbons, PAHs, SVOCs, VOCs, PCBs, pesticides, and metals, respectively; and

- Tables 20 through 26 tabulate the analytical results for grab groundwater samples for petroleum hydrocarbons, PAHs, SVOCs, VOCs, PCBs, pesticides, and metals, respectively.

This section summarizes the results, describing the general soil quality (Section 5.2.1), general groundwater quality (5.2.2), and the results of the investigations conducted during Phase III to fill identified data gaps (Section 5.2.3). Appendix H provides a discussion of analytical results by AOC to document that each area has been adequately characterized.

To evaluate whether the Facility has been sufficiently characterized for the purposes of the RI and Risk Assessment, the data are compared to Preliminary Screening Levels (summarized above in Section 4.1.3 of this report). The results of the RI and comparison of the data with Preliminary Screening Levels support that the Facility has been sufficiently characterized for the purpose of the RI. However, because several COIs exceeded Preliminary Screening Levels (as detailed below), a more formal screening level HHRA/ERA (Appendix A) was performed to determine whether a baseline risk assessment was needed to complete the RI. It should be noted that the screening level Risk Assessment selected screening criteria based on an updated CSM (described in Section 6.0) and DEQ Risk Assessment Guidance. Therefore, the Preliminary Screening Levels used for comparison in this section are just the first step in the evaluation process and may differ from the criteria selected for the Risk Assessment.

As a part of the Preliminary Screening, the Method Reporting Limits (MRLs) were reviewed to assess whether the MRLs were sufficient to characterize the environmental conditions of the site. The results of the review support that the MRLs were sufficiently low for comparison to the Preliminary Screening Levels and completion of the Risk Assessment. For soil sample results, the MRLs were generally below the Preliminary Screening Levels for each of the analyte suites, with exception of PAHs, pesticides, and mercury in a few samples. The MRLs for two PAHs (benzo(a)pyrene and benzo (a,h)anthracene) in surface samples from locations SB-70 through SB-78, located on or near rail lines, were 340 micrograms per kilogram (µg/kg) compared to the PRG of 210 µg/kg. The MRLs for DDT compounds and endrin at surface soil locations S-1 through S-4 were 134 µg/kg, compared to the terrestrial SLVs of 10 µg/kg for DDT compounds and 40 µg/kg for endrin. The MRLs for mercury ranged from 0.114 to 0.16 mg/kg compared to the terrestrial SLV for mercury of 0.1. These slight exceedances in a few soil sampling locations did not affect the ability to characterize the potential AOCs at the Facility and were sufficiently low to complete the Human and Ecological Health Risk Assessment. For groundwater results, the fish consumption SLVs are quite low for some compounds (e.g., several PAHs, pesticides, and PCB Aroclors) and are below the method detection limits (MDLs) achievable by standard EPA Methods. However, review of the dataset as a whole provides sufficient information for characterizing groundwater conditions at the Facility. For example, most of these constituents are relatively insoluble in water. This coupled with the fact that no significant (if any)

sources of these constituents were identified in soil allows for the evaluation of the dataset and confidence that groundwater is not impacted when the analyte concentrations are below the MRLs. The Risk Assessment adopts a conservative approach for evaluation by assuming that constituents listed as "non-detect" are present at one half the MRL.

5.2.1 General Soil Quality

The general soil quality is described below by OU and analytical suites (e.g., total petroleum hydrocarbons [TPH], PAHs, VOCs, PCBs, pesticides, and metals). In general, there are some localized areas of impacted soil and some intermittent detections across both OUs of benzo(a)pyrene and dibenzofuran that exceed terrestrial SLVs (primarily because these SLVs are very low). However, there is no indication of widespread contamination by any of the COIs.

5.2.1.1 General Soil Quality in OU1

With the exception of PAHs and TPH in subsurface soil near the former cesspools in the north-central portion of OU1, and a limited area of PAHs in surface soil in the western portion of the OU, concentrations of COIs were generally low and intermittently detected across OU1. The occurrence of each suite of COIs is detailed below.

Total Petroleum Hydrocarbons. Fifty-nine soil samples (32 surface and 27 subsurface) were analyzed for TPH (using HCID and/or NWTPH). Seven samples contained TPH above MRLs; six additional samples were reported to contain TPH at estimated concentrations below the MRLs but above the MDLs (referred to herein as "trace" concentrations). TPH were not detected in the remaining 46 soil samples (Table 6A).

Two of the seven soil samples containing TPH above the MRLs were subsurface soil samples collected near the four cesspools in the north-central area of OU1 (from borings SB-22 and SB-23). The TPH in these borings are primarily residual-range hydrocarbons (e.g., oil or other higher carbon-range hydrocarbons) and ranged from 2,800 mg/kg in the 13-foot sample from SB-23 to 16,000 mg/kg in the 17-foot sample from SB-22. A 13-foot sample from SB-22 did not contain TPH above the MRLs. Residual-range hydrocarbons were detected in the surface soil samples from SB-14 and SB-31 (Figure 7 shows boring locations) at 780 mg/kg and 1,200 mg/kg, respectively. The remaining detections were also in the residual hydrocarbon range and were either trace or below 80 mg/kg (Table 6A).

Polynuclear Aromatic Hydrocarbons. Forty-eight soil samples (41 surface and 7 subsurface) were analyzed for PAHs. PAHs were detected in the soil samples at low concentrations and, with a few exceptions, were below industrial PRGs. Elevated PAHs were detected in the 17-foot sample from SB-22, located in the former cesspool area in the north-central part of OU1. Concentrations of five of the PAHs exceeded industrial PRGs (Table 7A). Subsurface soil samples collected in adjacent borings or at shallower depths contained significantly lower PAH concentrations and only benzo(a)pyrene exceeded the industrial PRG in one of the adjacent samples. PAH concentrations were below the PRGs in the other nearby soil samples and demonstrate that the PAH-impacted soil in the vicinity of the former cesspools is limited in extent and below a depth of about 13 feet.

Concentrations of several PAHs exceeded industrial PRGs in the surface soil samples from locations S-7, S-12, and S-13. Several additional surface soil samples contained benzo(a)pyrene at concentrations above the industrial PRG or dibenzofuran at concentrations above the terrestrial SLV (the screening levels for these two compounds are very low so that even very low detections will exhibit as exceedances). Figure 12 shows the locations where surface soil samples were collected and analyzed for PAHs, and, for locations with exceedances, lists the PAH and concentration that exceeded the applicable Preliminary Screening Level (i.e., the industrial PRG and/or the terrestrial SLV).

Additional surface soil sampling was conducted around S-12 and S-13 to better assess the extent of PAHs in this area. The results of this additional sampling are presented graphically on Figure 13. As shown on the figure, the PAH concentrations decrease significantly both vertically and laterally from S-12 and S-13, and support that the elevated PAHs are limited locally around these borings and contained within the upper 6 to 12 inches of soil. The area is gravelly and near asphalted areas. It is likely that the elevated PAHs in the surface soil in this area are due to the presence of small pieces of asphalt in the upper soil.

Other Semi-Volatile Organic Compounds. 8 soil samples (4 surface and 4 subsurface) were analyzed for SVOCs (other than PAHs). No other SVOCs were detected above Preliminary Screening Levels (Table 8A).

Volatile Organic Compounds. Seventeen soil samples were analyzed for VOCs. With the exception of low concentrations of carbon disulfide and acetone in a few samples and 1,3-dichlorobenzene in one sample, VOCs were not detected above MRLs (a few trace concentrations were reported below the MRLs). No VOCs exceeded Preliminary Screening Levels (Table 9A).

Polychlorinated Biphenyls. Twenty-two soil samples were analyzed for PCBs. Low to trace concentrations of one or more Aroclors were detected in 12 of the samples. None of the detected PCB concentrations were above the Preliminary Screening Levels (Table 10A)

Pesticides. Twenty-eight soil samples (23 surface and 5 subsurface) were analyzed for pesticides (Table 11A). Trace concentrations of a few pesticides (dieldrin, 4,4'-DDD, 4,4'-DDT, endrin aldehyde, endrin ketone, alpha chlordane) were detected in a few of the surface soil samples; however, none of the detected pesticide concentrations in the surface soil samples were above the Preliminary Screening Levels (Table 11A).

In the 12.5- to 14-foot sample from SB-23 (located in the four cesspools area), 4,4'-DDE and 4,4'-DDD concentrations (54 and 35 µg/kg, respectively) were detected; these are below the industrial PRG but slightly exceed the terrestrial SLVs (although it seems highly unlikely that terrestrial receptors could be exposed to soils from this depth). No other deeper samples, including those in the cesspool areas, contained pesticides above screening levels.

Metals. Twenty-one soil samples (16 surface and 5 subsurface) were analyzed for 13 RCRA metals (Table 12A). None of the detected metals concentrations exceeded industrial PRGs, with the exception of arsenic. However, comparison of the detected arsenic concentrations to representative background supports that the arsenic concentrations detected in OU1 are consistent with background levels. Lead and/or zinc were detected above background concentrations (as represented by Clark County, Washington [Ecology; 1994]) and terrestrial SLVs at 8 locations (Figure 16). At surface soil

location S-7, adjacent to the Schnitzer Auto Fluff area, several other metals were detected above background and exceeded the terrestrial SLVs.

5.2.1.2 General Soil Quality in OU2

With the exception of a localized area of separate-phase hydrocarbons (SPH) at boring SB-67 in OU2 and elevated lead in surface soil near location SB-77, the results of the soil sampling do not indicate that any of the former operations in the identified AOCs have significantly impacted upland soil quality. As described below, there are some localized areas of metals above background concentrations and low, intermittent detections of PAHs, but no indications of widespread areas of soil impacted by COIs. PAHs, pesticides, and metals were detected in riverbank soil, as described below, and these detections are further evaluated in Section 8.0.

Total Petroleum Hydrocarbons. Forty-one soil samples (31 surface and 10 subsurface) were analyzed for TPH (using HCID and/or NWTPH). Six samples contained TPH above MRLs; three additional samples were reported to contain TPH at trace concentrations below the MRLs but above the MDLs. TPH were not detected in the remaining 32 soil samples (Table 6B).

Diesel-range and residual-range hydrocarbons (21,000 mg/kg and 14,000 mg/kg, respectively) were detected in the 18- to 19-foot sample from boring SB-67. SPH were observed on soil at this depth during the installation of this boring. A monitoring well was installed within 5 feet of this boring to better assess for the presence and extent of the hydrocarbons. Soil samples were collected from the wellbore from depth intervals 7.5 to 10, 17.5 to 18.5, and 18.5 to 20 feet bgs and analyzed for TPH. TPH were not detected in any of these soil samples, supporting that the heavy hydrocarbons detected in soil at SB-67 are limited in extent.

TPH were reported in the surface soil sample from S-14 at concentrations up to 600 mg/kg; however, the chromatograph fingerprint did not resemble a petroleum product. The surface sample was collected adjacent to a creosoted utility pole and the TPH detection is likely due to creosote in the surface soil sample. The remaining detections of TPH in OU2 were low (less than 200 mg/kg) to trace (Table 6B).

Polynuclear Aromatic Hydrocarbons. Thirty-one soil samples (27 surface and 4 subsurface) were analyzed for PAHs. Nineteen of the 27 surface soil samples did not contain PAHs above the MRLs (some PAHs were detected at trace concentrations above the MDLs in some locations), and, with the exception discussed below, were below industrial PRGs and terrestrial SLVs (Table 7B; Figure 12).

Elevated PAH concentrations were detected in the 18- to 19-foot sample from SB-67 and several PAH levels exceeded industrial PRGs. PAHs in the soil samples collected from adjacent wellbore MW-25 were present at low concentrations that were below the industrial PRGs, further supporting that the impacted soil in this area is limited in extent.

PAH concentrations were elevated in the surface soil sample from S-14, located near the creosoted utility pole. The area was resampled by collecting another surface soil sample about 5 feet from the utility pole; PAHs were almost two orders of magnitude less and, with the exception of benzo(a)pyrene, were below the industrial PRGs. These results support that the creosote from the

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utility pole is the cause of the elevated PAHs in the initial surface soil sample from this area and indicate that previous operations in the area have not significantly impacted surface soil, if at all.

Analytical results of the composite soil samples collected from the riverbank in the Wheeler Bay area indicated the presence of PAHs exceeding screening levels (Figure 14 and Table 7B) and the discrete soil samples from this area were analyzed for PAHs to better assess the extent. The results of the discrete analysis indicated that one or more PAHs exceeded screening levels at each location.

Other Semi-Volatile Organic Compounds. No other SVOCs were detected above Preliminary Screening Levels (Table 8B).

Volatile Organic Compounds. Twenty soil samples were analyzed for VOCs (Table 9B). With the exception of low concentrations of carbon disulfide and acetone in a few samples, and several fuel-related VOCs in the 18- to19-foot sample from SB-67, VOCs were not detected above MRLs (a few trace concentrations were reported below the MRLs). No VOCs exceeded Preliminary Screening Levels.

Polychlorinated Biphenyls. Fifteen soil samples were analyzed for PCBs. Low to trace concentrations of one or more Aroclors were detected in four of the samples. None of the detected PCB concentrations were above the Preliminary Screening Levels (Table 10B)

Pesticides. Three surface soil samples outside of the riverbank area were analyzed for pesticides (from locations SB-61, SB-62, and MW-16; Figure 15). Low 4,4'-DDT concentrations (5.1 µg/kg or less) were detected in the three samples, and trace concentrations of a few pesticides were reported in the sample from MW-16 (Table 11B). However, none of the detected pesticide concentrations were above the Preliminary Screening Levels (Table 11B).

Composite samples from the riverbank area of Wheeler Bay contained pesticides at concentrations above 1/4 of the screening levels; therefore, the discrete samples from the area were analyzed for the presence of pesticides to assess whether localized areas of pesticides were present. None of the pesticide concentrations exceeded industrial PRGs. With the exception of 4,4'-DDT at two discrete locations, no pesticides exceeded terrestrial SLVs in the discrete riverbank samples (Figure 15; Table 11B).

Metals. Thirty-three soil samples (32 surface and 1 subsurface) outside of the riverbank area were analyzed for 13 RCRA metals (Table 12B). With the exception of the surface sample from SB-77 and arsenic in general, none of the detected metals concentrations exceeded industrial PRGs. Comparison of the detected arsenic concentrations to representative background supports that the arsenic concentrations detected in OU2 are consistent with background levels, with the exception of one location (SB-75). The 1- to 2-foot sample from SB-75 contained arsenic above both industrial PRGs and representative background.

Lead and/or zinc were detected in surface soil samples above background concentrations and terrestrial SLVs at 7 locations (Figure 16).

Lead was detected at 1,060 mg/kg in the 1- to 1.5-foot sample from SB-77. Lead was detected at 189 mg/kg in the 0.5-foot sample and at 37.1 mg/kg in the 2- to 2.5-foot sample at this location, supporting that the vertical extent of elevated lead is limited. Surface soil samples were collected from four borings around SB-77 (S-20, S-21, S-22, SB-78; see Figure 17). As shown on Figure 17,

samples from S-20, S-22, and SB-78 had lead concentrations less than 66 mg/kg, supporting that the lateral extent of elevated lead is limited to an area less than approximately 60 feet by 30 feet.

Composite samples from the riverbank area of Slip 1 detected metals above background concentrations or screening levels (Figure 18 and Table 12). The concentrations of several metals (arsenic, cadmium, copper, lead, zinc) in one of the composite riverbank soil samples from the Wheeler Bay area (S-26) were relatively higher compared to the background and screening levels; the discrete samples from this area were analyzed for metals. The results of the discrete sample analyses suggested that the elevated metals are limited to a localized area of the riverbank soils (S-26D).

5.2.2 General Groundwater Quality

Twenty-two monitoring wells (11 in OU1 and 11 in OU2) were monitored quarterly for 1 year (three to four sampling events at each well) and provided a significant data set on the groundwater quality at the Facility. The results of the monitoring are described below by OU and analyte suite.

5.2.2.1 Overall Groundwater Quality in OU1

As detailed below, quarterly monitoring results of 11 monitoring wells at OU1 for 1 year support that there are no plumes of COIs at OU1, and former operations at OU1 have not impacted groundwater quality significantly, if at all.

Total Petroleum Hydrocarbons (Table 13A) – TPH were not detected above MRLs in groundwater at OU1. Petroleum hydrocarbons were reported as trace concentrations below the MRLs in several locations but not consistently over the four quarters of monitoring.

Polynuclear Aromatic Hydrocarbons (Table 14A) – With the exceptions of one sampling event (February 2005) at wells MW-07 and MW-24, PAHs were not detected above screening levels during the quarterly sampling. Several PAH concentrations slightly exceeded the screening levels from wells MW-07 and MW-24 during the February 2005 sampling event. These exceedances were not repeated in the other quarters of monitoring and are likely related to soil entrained in the samples.

Other Semi-Volatile Organic Compounds (Table 15) – Other SVOCs were not reported above MRLs. Several SVOCs were reported above the MDLs as estimates but none exceeded screening criteria.
Volatile Organic Compounds (Table 16A) – With the exception of chlorinated solvents in upgradient wells and carbon disulfide in several OU1 wells, VOCs were not detected above screening levels.

Chlorinated solvents including tetrachloroethene (PCE) and several degradation products (e.g., trichloroethene [TCE], 1,2-dichloroethene (DCE), and vinyl chloride) were detected above screening levels in the samples from wells MW-22 and MW-23. These wells are located at the upgradient boundary of OU1 (Figure 7). Several of these compounds have been detected at lower concentrations in well MW-03s, located downgradient of well MW-22. PCE was detected above the aquatic SLV in well MW-03s during the second quarter monitoring event. Based on the observed distribution and knowledge of historical Facility operations, the presence of the chlorinated solvents in

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Facility groundwater appears to be due to an upgradient source and is not related to former Facility operations.

Polychlorinated Biphenyls (Table 17A) – No PCBs were detected above the MRL.

Pesticides (Table 18A) – With the exception of three pesticides detected in one well during one sampling event, pesticides have not been detected above screening levels. Trace concentrations of three compounds (heptachlor, heptachlor epoxide, and 4-4'-DDE) exceeded the fish consumption SLV in the sample from well MW-08 from the April 2004 monitoring event. None of these compounds exceeded the screening criteria in the subsequent three sampling events.

Metals (Table 19A) – Low concentrations of some metals were detected in groundwater; however, with a few exceptions, the concentrations were consistently below aquatic screening levels. Exceptions included:

- Total cadmium concentrations slightly exceeded the aquatic SLV in samples from wells MW-19 and MW-23 from May 2005; however, cadmium did not exceed SLVs in the previous three sampling events from these wells and the dissolved cadmium concentrations were consistently below the SLVs; and

- Total chromium concentrations slightly exceeded the aquatic SLV for hexavalent chromium in well MW-08 in one event (May 2005); the total chromium concentration was below the SLVs in the subsequent event and dissolved chromium concentrations in this well are below SLVs.

These results suggest that the total cadmium and chromium concentrations are due to soil entrained in the samples during the May 2005 sampling event and are not representative of the concentrations of these metals in groundwater near these wells.

In addition to the above exceedances, dissolved arsenic concentrations in the monitoring well samples exceeded SLVs for fish consumption. However, these concentrations are low and consistent with arsenic concentrations at other riverfront sites and do not appear to be associated with current or historical Facility operations.

5.2.2.2 Overall Groundwater Quality in OU2

As detailed below, quarterly monitoring of 11 monitoring wells at OU2 for 1 year support that there are no plumes of COIs at OU2, and former operations in OU2 have not impacted groundwater quality significantly, if at all.

Total Petroleum Hydrocarbons (Table 13B) – TPH were not detected above MRLs in groundwater at OU2. Petroleum hydrocarbons were reported as trace concentrations below the MRLs in several locations but not consistently over the four quarters of monitoring.

Polynuclear Aromatic Hydrocarbons (Table 14B) – With the exception of one sampling event (May 2005) at well MW-16, PAHs were not detected above screening levels during the quarterly sampling. Several PAHs slightly exceeded the screening levels from well MW-16 during the February 2005 sampling event. These exceedances were not repeated in the other quarters of monitoring and was likely related to soil entrained in the samples

Volatile Organic Compounds (Table 16B) – One detected VOC (carbon disulfide) slightly exceeded the aquatic SLV in well MW-16 in February 2005. No other exceedances were identified.

Polychlorinated Biphenyls (Table 17B) – No PCBs were detected above the MRL.

Pesticides (Table 18B) – With a few exceptions, pesticides were below the aquatic SLVs. The exceptions were trace concentrations (i.e., below the MRLs, but estimated above the MDLs), intermittent and not consistent between sampling events:

- The trace concentration of 4,4'-DDT exceeded the screening criteria for samples from wells MW-09 (February 2005) and MW-11 (September 2004). The concentrations of 4,4'-DDT were below the screening criteria in the other sampling events.

- The trace concentration of 4,4'-DDD exceeded the screening criteria in well MW-11 in September 2004 but none of the other sampling events.

- The trace concentration of dieldrin exceeded the screening criteria in well MW-10 in April 2004 but none of the other sampling events.

- The trace concentration of aldrin exceeded the screening criteria in well MW-11 in September 2004 but none of the other sampling events.

Metals (Table 19B) – Low concentrations of some metals were detected in groundwater; however, with a few exceptions, the concentrations were consistently below aquatic screening levels. Exceptions included:

- Total cadmium concentrations slightly exceeded the aquatic SLV in well MW-21 in May 2005; however, cadmium did not exceed SLVs in the previous three sampling events from this well and the dissolved cadmium concentrations have consistently been below the SLVs;

- Total chromium slightly exceeded the aquatic SLV for hexavalent chromium in wells MW-12 and MW-15 in one event (May 2005); the total chromium concentration was below the SLVs in the subsequent event and dissolved chromium concentrations in this well are below SLVs;

- Total copper concentrations slightly exceeded the aquatic SLV in wells MW-15 (May 2005) and MW-16 (August 2004); total copper did not exceed the SLVs in samples from these wells during other events and the dissolved copper concentrations have been consistently below SLVs in both wells; and

- Total lead concentration exceeded the aquatic SLV in well MW-15 in May 2005 but did not exceed during any of the preceding sampling events nor have the dissolved lead concentrations in samples from this well exceeded the SLVs.

Similar to the results for OU1, these results support that the intermittent exceedances of a few of the total metal concentrations are due to soil entrained in the samples and are not representative of the concentrations of these metals in groundwater near these wells.

Also similar to OU1, dissolved arsenic concentrations in the monitoring well samples exceeded fish consumption SLVs. However, these concentrations are low and consistent with arsenic concentrations at other riverfront sites, and do not appear to be associated with current or historical Facility operations.

5.2.3 Results of Phase III Investigations

Phase I and II results at six of the original 42 AOCs indicated that further characterization was needed during Phase III of the investigation to adequately characterize the lateral and vertical extent of potentially impacted soil and/or groundwater. In addition, six new AOCs were identified following completion of the Phase I and II activities that were investigated during Phase III. This section describes the results of these investigations.

5.2.3.1 Results of Data Gap Characterizations

The results of the additional investigations in the six AOCs identified as requiring further characterization to fill data gaps show that the investigations were successful in adequately defining the extent of COIs for the purposes of the RI. The results for each AOC are summarized below and are detailed in Appendix H.

- **OU1, AOC 14 (Basement Level Sump) and AOC 15 (Abandoned Cesspool – Central OU1 Area)** – A 12-foot depth soil sample and a grab groundwater sample collected from SB-84 (AOC 15) were analyzed for TPH, PAHs, VOCs, and pesticides. The grab groundwater sample was also analyzed for PCBs. A grab groundwater sample from SB-85 installed at AOC 14 was analyzed for TPH, PAHs, VOCs, and PCBs.

  The grab groundwater sample at SB-84 exceeded screening levels for PAHs, 4,4'-DDT, and metals. TPH and VOCs did not exceed screening levels. Pesticides were not detected above the MRLs in the soil sample from SB-84, and the PAH concentrations were below PRGs.

The grab sample from AOC 14 (SB-85) exceeded screening levels for numerous PAHs. To assess whether PAHs were present in soil at AOC 14, soil boring SB-88 was installed adjacent to the location of SB-85 and a soil sample was collected from a depth of 7.5 to 10 feet for PAH analysis. PAHs were not detected above the PRGs in the soil sample from SB-88.

To better evaluate groundwater quality in this area, a monitoring well (MW-26) was installed directly downgradient of borings SB-84 and SB-85. Groundwater samples from well MW-26 were analyzed for PAHs, metals, and pesticides. PAHs and pesticides were not detected above the MRLs in water samples from this well. Metals concentrations were below the screening levels with the exception of arsenic, which was low and consistent with arsenic concentrations at other riverfront sites.

These results for soil and groundwater indicate that (1) the area has not been significantly impacted, if at all, by the former activities at AOC 14 and AOC 15; (2) the area has been sufficiently characterized for the purpose of the RI and Risk Assessment; and (3) the presence of the constituents in the grab groundwater samples from borings SB-84 and SB-85 was due to sediment entrained in the sample.

- **OU1, AOC 69 (Former Transformer Locations)** – Two surface soil samples (0 to 6 inches) were collected from location S-12 and S-13 and were analyzed for TPH, PAHs, and PCBs. TPH were not detected above the MRL and PCB concentrations were below screening levels. Several PAHs from these surface soil samples exceeded Preliminary Screening Levels. Additional soil samples were collected at S-12 and S-13 from 6 to 12 inches bgs and 2 feet bgs, and at five locations (S-15 through S-19) around S-12 and S-13 to define the lateral and vertical extent of PAHs in this area. The PAH results are shown graphically on Figure 13.

  As can be seen on Figure 13, the area of elevated PAH concentrations is limited both laterally and vertically. The PAH concentrations dropped dramatically between the 0- to 6-inch samples and the 6- to 12-inch samples at both S-12 and S-13, supporting that the elevated PAH concentrations in the 0- to 6-inch samples is likely due to the presence of asphalt in surface soil (and not releases from the former transformers). The PAH results for the surrounding 0- to 6-inch samples (S-15 through S-19) support the conclusion that the elevated PAH concentrations in samples S-12 and S-13 (e.g., where several to numerous PAH compounds exceed PRGs) are limited both laterally and vertically.

- **OU2, AOC 67** – A soil sample collected at a depth of 18 feet bgs in boring SB-67 exhibited visual evidence of SPH (i.e., hydrocarbons were observed on soil). Analytical results show the sample contained TPH in the gasoline, diesel, and oil hydrocarbon range at concentrations of 1,400 mg/kg, 21,000 mg/kg, and 14,000 mg/kg, respectively. TPH concentrations were not detected above the MRL in the grab groundwater sample from this location (groundwater measured at 22 feet bgs at time of drilling). Two PAHs were detected (0.054 µg/L benzo(a)anthracene and 0.11 µg/L chrysene) in the grab groundwater sample at concentrations slightly above human health (fish consumption) or aquatic SLVs (Table 21B).

  A monitoring well (MW-25) was installed adjacent (within 5 feet) to and downgradient of SB-67. A hydrocarbon odor was observed starting at about 17.5 feet bgs during the installation of this well. Three soil samples were collected from the wellbore at depths of 7.5, 17.5, and 18.5 feet below grade and were analyzed for TPH and PAHs. TPH were not detected in these soil samples. Five

PAHs were detected in the 7.5-foot sample above the MRLs but below the industrial PRGs. No PAHs were detected above the MRLs in the samples collected at 17.5 and 18.5 feet bgs.

Well MW-25 was monitored for three months for the presence of SPH on water; SPH was not observed. A groundwater sample was then collected for PAH analysis. PAHs were not detected above MRLs. These results support that the residual hydrocarbons detected in boring SB-67 are not mobile, are very limited in extent, and have not impacted groundwater quality.

- **OU2, AOC 69 (Former Transformer Location)** – One or more PAHs were detected above the screening levels in the surface sample from S-14 located within AOC 69. PCB concentrations were slightly above the MRL but below the screening levels. TPH were detected at 120 mg/kg (diesel range) and 600 mg/kg (residual range); however, the chromatograph indicated that the pattern was not consistent with a fuel product. Field notes indicate the sample was collected from the ground surface within 1 foot from a creosote-treated utility pole. An additional surface sample (S-14B) was collected within 5 feet of the utility pole at a depth of approximately 6 inches to evaluate whether the original sample is representative of surface soil conditions in the sampling area. Although PAHs were detected in the sample collected at S-14B, the concentrations were almost two orders of magnitude lower than at S-14 and all were below industrial PRGs, with the exception of benzo(a)pyrene. These results support that the former transformer in this area did not significantly impact surface soil and that the AOC has been sufficiently characterized.

- **OU2, AOC 74 (Utility Storage Building)** – Lead was detected at 1,060 mg/kg (exceeding the screening levels) in the 1-foot soil sample from boring SB-77 located in AOC 74. Three surface soil (0.5- to 1-foot depth) samples were collected around SB-77 to define the extent of elevated lead in the surface soil. Samples were collected from 0.5 to 1 foot and 2 to 2.5 feet at SB-77 (to define the vertical depth). Figure 17 graphically depicts the results. As shown on the figure, the lead is limited in extent both vertically and laterally. To resample the SB-77 location, a second boring was installed within 2 feet of the first boring location. The results indicated 189 mg/kg in the 0.5- to 1-foot sample (collected slightly above the original sample) and 37.1 mg/kg in the 2- to 2.5-foot sample. The 0.5- to 1-foot samples collected from the borings located 25 feet south and west of SB-77 contained lead at concentrations of 49.8, 548, and 65.4 mg/kg in S-20 through S-22, respectively. SB-78, located 50 feet northeast of SB-77, contained 43 mg/kg lead.

  These results indicate that the presence of the lead impacted soil is limited in horizontal and vertical extent, and has been adequately characterized for the purpose of the RI and risk assessment.

5.2.3.2 Results of Characterizations of the New AOCs

Following completion of the Phase I and Phase II investigations, five additional areas of possible concern (AOC 78 through AOC 82) were identified by longshoremen with knowledge of former operations at the site. In addition, the DEQ requested erodable soil in OU2 be identified as an AOC and be included in the RI. The erodable soils on riverbanks in OU2 were identified and assigned as AOC 83. These AOCs were investigated during the Phase III investigation. Results of the sampling and analysis of soil samples collected from the riverbank areas of OU2 (AOC 83) are discussed in the Source Control Evaluation section (Section 8.0) and are not discussed in this section. A description of

AOCs 78 through 82 and the results of the investigation in these areas are provided below (and detailed in Appendix H).

- **OU1, AOC 78 and AOC 80, Storm Drain Catch Basins** – Two storm drain catch basins (one to the west and one to the east of the north row of the large grain storage tanks) were identified by the longshoremen as having received waste/excess pesticides during Cargill's operations at the Facility. A soil boring was installed adjacent to each storm catch basin (SB-89 and SB-90) and advanced through the pavement to depths of 2.5 and 3 feet, respectively. No field evidence of petroleum sheens or other constituents was observed during the installation of the borings.

  Samples were collected between 1 and 3 feet at each location and analyzed for pesticides, PAHs, and TPH. Diesel-range petroleum hydrocarbons were not detected at either location. Residual-range hydrocarbons were below the MRL at both locations; however, a trace concentration of 55 mg/kg was reported in the sample from SB-89 (Table 6A). PAHs were, in general, not detected above the MRL; detected concentrations were low and below the screening levels (Table 7A). Pesticides were not detected above the MRLs in the two samples; several pesticides (gamma chlordane, alpha chlordane, 4,4'-DDE, 4,4'-DDE, 4,4'-DDT, dieldrin, and endrin ketone) were reported as trace values above the MDL. These trace values and the MRLs were below the screening levels. The results of investigation in AOCs 78 and 80 support that the reported former discharges to the storm drains have not significantly impacted adjacent soil.

- **OU1, AOC 79, Pump at Cargill with Hydraulic Oil Leak** – A pump formerly located in the center of the large grain storage tank area in the former Cargill operating area was identified by the longshoremen as historically leaking hydraulic oil. A soil boring (SB-91) was installed adjacent to the former pump location and advanced to a depth of 2.5 feet. No field evidence of petroleum sheens or other constituents was observed during the installation of the borings. A sample was collected from 0.5 to 2.5 feet and analyzed for diesel-range and residual-range petroleum hydrocarbons. Diesel-range hydrocarbons were not detected above the MRL of 26.3 mg/kg. Residual-range hydrocarbons were detected at 74.3 mg/kg. These results support that the reported leaky pump did not significantly impact Facility soil.

- **OU1, AOC 81 and AOC 82, Creosote Waste Areas** – Two unpaved areas were identified by the longshoremen as "dump" sites (including creosote waste) during Cargill's operations at the Facility. Two borings were installed to depths of approximately 3 feet in each of these areas (SB-92 through SB-95; Figure 7) for soil screening, sampling, and chemical analysis. No field evidence of petroleum sheens or other constituents were observed during the installation of the borings. Soil samples were collected (one from each boring) and analyzed for pesticides, PAHs, TPH, and metals. Diesel-range hydrocarbons were not detected above MRLs in the samples. Residual-range hydrocarbons were not detected above MRLs in the samples from AOC 81; residual-range hydrocarbons were detected slightly above the MRL in both samples from AOC 82 (e.g., at concentrations between 55 and 79 mg/kg). PAH concentrations, where detected, were below industrial PRGs, with the exception of benzo(a)pyrene at locations SB-92 and SB-95 (Table 7A). Lead was detected above the aquatic SLV in borings SB-92, SB-93, and SB-95. Zinc slightly exceeded the aquatic SLV in SB-95. The results do not indicate that these former "dump" areas have significantly impacted Facility soil.

5.2.3.3 Results of AOC-27 (Former Transformer Handling Area) Sampling

One 5-point composite surface sample (0.5 to 2 feet) was collected in July 2007 from location S-31 and was analyzed for TPH and PCBs. TPH and PCBs were not detected above the MRL.

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6. Conceptual Site Model

Information on the Facility historical setting and beneficial water and land use (as detailed in Sections 2 and 3) was assessed to develop a preliminary conceptual model of the site. The preliminary CSM was presented in the RI Work Plan and provided a framework for the RI. The results of the RI were evaluated to further refine the human health and ecological CSMs and identify the locality of the Facility. Figure 19 presents the human health and ecological CSMs.

6.1 Physical Setting

Details of the physical setting for the Facility were provided in Sections 2, 3, and 5.1. In summary, the 98-acre Upland Facility is located adjacent to the Willamette River. The topography is relatively flat, with steep riverbanks in some areas. The ground surface of the Facility consists mainly of asphalt or concrete; although areas of gravel and grass are also present (Figure 4). Structures and railroad track alignments and rail spurs are also present (Figure 2). The Facility is leased to multiple tenants and actively used for various industrial purposes.

Most of the riverbanks are heavily vegetated and/or rip-rapped; however, some areas do contain erodable soil. Surface hydrology at the Facility consists primarily of surface runoff as sheet flow during rainfall events. The sheet flow is captured through a permitted, piped stormwater conveyance system with storm drains, catch basins and outfalls to Willamette River located as shown on Figure 4.

The Port acquired the property in 1971 as a result of the Port's merger with the City CPD. The City CPD purchased the property in 1917. Development of the terminal resulted in the filling of Gatton Slough and adjacent areas within the river, and excavation of Slip 1. Soil underlying the Facility consists of sand fill overlying silty native alluvium. The upper portions of the silty alluvium consist of silty sand; the amount of silt appears to increase with depth and likely presents a confining layer to significant downward flow. Depth to groundwater ranges from 8.3 to 30 feet bgs (1.1 to 17.4 feet MSL). Groundwater flows to the Willamette River or Slips 1 or 3 at a gradient ranging between 0.01 and 0.001. Shallow (first encountered) groundwater is contained primarily in the sand fill or upper silty sand alluvium. Groundwater velocity in the sand fill and upper silty sand alluvium is conservatively estimated to range from 4 feet per year in the eastern parts of the Facility to 400 feet per year as the groundwater nears the slips. (Groundwater gradients are flat on the western portions of OU1 and OU2 and velocity is likely low from these areas towards the river.)

6.2 Nature and Extent of Constituents of Interest

As described in Section 2.0, a number of potential AOCs were identified and investigated for the RI. Section 5.2 described the results of the investigations conducted at the AOCs and assessed whether the investigation of each AOC sufficiently characterized the lateral and vertical extent of COIs in soil and groundwater for the purposes of an HHRA/ERA. The conclusions of Section 5.2 are that the investigation of each AOC was sufficient. The Risk Assessment will look at the general soil and groundwater quality at the Facility to determine whether unacceptable risks may be present due to the presence of constituents in site soil or groundwater and whether risk management tools (e.g., remedial action, media management plans, etc.) are needed to protect human or ecological health.

Therefore, this section summarizes the soil and groundwater conditions in the context of the overall Facility (as opposed to each AOC) to assist in the understanding of Facility-wide soil and groundwater in support of the Risk Assessment.

Soil. With the exception of a few localized areas and along the riverbanks, COIs were detected intermittently in soil at generally low concentrations. The localized areas consist of:

- A limited area of surface soil (upper 6 to 12 inches) containing multiple PAHs exceeding PRGs in the western portion of OU1. The PAHs are likely due to asphalt materials entrained in the surface soil;

- Deeper soil (greater than 13 feet below grade) in the area of four former cesspools in the northern central portion of OU1 contains TPH and PAHs;

- A limited area of lead concentrations in OU2 that exceed industrial PRGs in surface soil (upper 1 foot) near boring SB-77; and

- A limited area of SPH at a depth of approximately 18 feet below grade at boring SB-67 in OU2. The SPH do not appear to be mobile, to extend significantly beyond SB-67, or to have impacted shallow groundwater.

In addition to the above localized areas, two areas of erodable riverbank soil were observed and investigated. The riverbank soil contained PAHs, pesticides, and metals (one localized area of Wheeler Bay riverbank soil). The Risk Assessment (summarized in Section 7.0 and contained in Appendix A) evaluates the potential risk posed due to the presence of these constituents in Facility soil.

Groundwater. No groundwater plumes were identified at the Facility. Intermittent low detections of some COIs (PAHs, pesticides, metals) were observed during the quarterly monitoring program of the monitoring wells. Often, a COI was detected during only one of four quarters of sampling, suggesting that variability in sample turbidity was the reason for the detection and supporting that significant dissolved-phase COIs are not present at the Facility. The Risk Assessment (summarized in Section 7.0 and contained in Appendix A) evaluates the potential risk posed due to the low and intermittent presence of these constituents in Facility groundwater.

6.3 Locality of the Facility

The LOF is any point where a human or an ecological receptor contacts or is reasonably likely to come into contact with chemical constituents from the Upland Facility. The LOF takes into account the likelihood of the chemical constituents migrating over time.

For this project, the entire Facility is considered to be within the LOF for soil contact (due to detections of COIs in Facility soil). As described in Section 5.1.3, groundwater flow at the Facility is toward the slips or the Willamette River. Therefore, the groundwater LOF comprises the Upland Facility (including the adjacent riverbank) and the river. Properties to the north, west, and south are not included in the LOF because groundwater does not flow toward these properties.

6.4 Human Health and Ecological Conceptual Site Models and Exposure Pathways

The CSM integrates constituent source areas, mechanisms of transport, and location and route of potential chemical exposure into exposure pathways that represent site conditions. These pathways provide the foundation for the Risk Assessment. Figure 19 presents the CSMs for Human Health and Ecologic risk pathways. The following describes each of these CSMs.

6.4.1 Human Health Conceptual Site Model and Exposure Pathways

For human health risk evaluation, the CSM identifies pathways relevant to both soil and groundwater in the context of a current and future industrial land use scenario. The source areas for assumed exposure are the affected soil and groundwater that have been characterized in the RI. The CSM provides specific details regarding primary, secondary, and tertiary sources, as well as primary and secondary release mechanisms.

Identification of Exposure Scenarios and Human Receptors. The identification of exposure scenarios is based upon the land use determination that has been identified for the site (Section 3.2). Exposure scenarios consist of descriptions of activities as they relate to users of the site and the means by which exposure is assumed to occur. The potential human receptors (assumed exposed persons) are:

- Occupational worker (worker engaged in full-time operational duties at the Facility);
- Excavation worker (worker engaged in short-term activities specific to sub-surface work, such as trenching for utility lines);
- Construction worker (worker engaged in short-term activities relating to construction of buildings and foundations); and
- Recreational fisherman (person occasionally fishing in the river adjacent to the bank of the terminal).

A recreational visitor to the Facility is not assumed since the Facility is and will be maintained as an operating industrial facility.

Identification of Exposure Routes. The assumption of direct exposure to affected soil will apply only to the occupational, excavation, and construction workers; these pathways will involve the following routes of exposure:

- Inhalation of fugitive dust emissions;
- Incidental ingestion; and
- Dermal contact.

6.4.2 Ecological Conceptual Site Model and Exposure Pathways

Preliminary identification of potential exposure pathways for ecological receptors was outlined in a Preliminary CSM (PCSM) in the RI Work Plan (Hart Crowser, 2004a), and an updated CSM is presented as Figure 19. Modifications include identification of pathway/receptor categories that are being addressed through the Portland Harbor RI/FS risk assessment process. In addition, the pathways related to transport of COIs in erodable soils were added to the CSM. A general evaluation of potential exposure pathways is provided in the Level I Scoping checklists in Attachments A-1 and A-2 of the Risk Assessment Report (Appendix A). The primary contaminant sources and release mechanisms are release of chemicals to soil or impervious surfaces as a result of on-site or off-site operations.

The potentially complete exposure pathways outlined in the CSM include the following:

Direct Exposure Pathways:

- Direct contact with contaminated surface or subsurface soil through contact with external surfaces or ingestion (terrestrial receptors); or

- Direct contact or ingestion of contaminants that have been transported to surface-water or sediments in the Willamette River (aquatic receptors).

Indirect Exposure Pathways:

- Ingestion of terrestrial food sources that have become contaminated through direct or indirect pathways (i.e., food web exposure); or

- Ingestion of aquatic food sources that have become contaminated through direct or indirect pathways (i.e., food web exposure).

As noted above, the Facility is an active industrial area mostly covered by asphalt or barren ground and does not represent a significant ecological resource. Narrow riverbank areas have vegetation, but these areas represent less than 4 percent of the Facility. As a result, wildlife are unlikely to feed at the Facility and ecological exposures to surface soils at the Facility would be limited to occasional contact by birds or mammals that may cross the Facility while in transit (e.g., songbirds or raccoons). The riverbank areas may also be visited occasionally by semi-aquatic birds or mammals (e.g., shorebirds or beaver).

Since the Facility is mostly paved or otherwise covered, and will remain so in the future, terrestrial receptors will have limited contact with any contaminated soils. Inhalation of dust particulates is a minor or insignificant pathway because most surfaces are asphalt- or gravel-covered. The paved surfaces also minimize contaminated soils from being eroded into the Willamette River, with the exception of two riverbank areas with possible erodable slopes (west end of south side of Slip 1, and Wheeler Bay; Figure 7). Thus, direct surface soil exposure pathways for visiting terrestrial receptors at the Facility are possible (although minimal due to limited soil coverage), and subsurface soil exposure is minor or insignificant. Ecological receptors could be exposed as a result of the possible transport of soil contaminants from erodable slopes to surface-water and sediments in the Willamette

River. Thus, potential, significant surface soil exposure pathways are limited to occasional contact by visiting terrestrial receptors and aquatic and aquatic-feeding receptors associated with the river.

No permanent surface-water bodies or sources of sediment are present at the upland portions of the Facility, and long-term use of the Facility calls for it to remain paved or covered by buildings. Surface-water flow from precipitation and runoff on impervious surfaces is collected in seven drainage basins, with subsequent transport to the Willamette River. Thus, potential surface-water and sediment exposure pathways are limited to aquatic and aquatic-feeding receptors associated with the river.

Since the Facility will remain as mostly paved and groundwater is approximately 8 to 30 feet bgs, direct groundwater exposure pathways for burrowing terrestrial receptors at the Facility are incomplete. The only route of transport and exposure relevant to ecological receptors is the possible transport of contaminants in groundwater to surface-water in the Willamette River. Thus, potential exposure to groundwater contaminants is limited to aquatic and aquatic-feeding receptors associated with the river. The Portland Harbor RI/FS is addressing any risk to shorebirds and other ecological receptors to contaminants in beach sediments and risk to aquatic biota and wildlife from exposure to surface-water and sediment, or bioaccumulation of COIs from surface-water or sediments.

7. Summary of Risk Assessment

A screening level HHRA/ERA was conducted on the data collected during the Phase I, Phase II, and Phase III site investigation activities to assess whether a baseline risk assessment was needed to complete the risk assessment process, and to identify areas or media that may require risk management actions to protect human and/or ecological receptors. The results of the HHRA/ERA are summarized in this section and support that a baseline risk assessment is not needed. The HHRA/ERA report is provided in Appendix A.

7.1 Human Health Risk Assessment

The HHRA for the Facility is based upon the process prescribed by DEQ in the Guidance for Conduct of Deterministic Human Health Risk Assessment (DEQ, 2000). The procedures used for the screening process are detailed in Section 3.0 of the Risk Assessment Report contained in Appendix A. The results of the HHRA screening, additional quantitative risk analyses performed to better assess the data, and the HHRA conclusions are summarized below.

7.1.1 Human Health Screening

Potential human receptors at the site are occupational workers, excavation workers, construction workers, and recreational fisherman (fishing in the river near the Facility). Consistent with DEQ risk guidance, the primary benchmarks for screening of soil constituents were obtained from the 2004 update of the EPA Region 9 PRG (EPA, 2004a). These benchmarks apply to COIs (except petroleum fractions) for the pathways that involve direct contact with soil by site workers (operational personnel or construction workers). For gasoline, diesel and residual range petroleum-derived hydrocarbons, benchmarks for the soil pathway for the construction worker were obtained from Appendix A of the Oregon DEQ guidance Risk-Based Decision Making for the Remediation of Petroleum-Contaminated Sites (DEQ, 2003c).

For the recreational fishing pathway, the screening benchmarks were obtained from National Recommended Water Quality Criteria (EPA, 2004b) for Human Health for Consumption of Organisms Only. Incidental contact with groundwater by construction or excavation workers was not evaluated since this pathway is less likely to occur as a result of the observed depths to groundwater throughout the site (approximately 8 to 30 feet bgs); if direct contact were to occur under certain construction scenarios, the pathway would be short-term and should be considered insignificant in terms of human exposure and health risk.

All analytical data were sorted by medium for each OU. For duplicates, the maximum value was selected. The data were summarized by tabulation showing maximum and minimum values; the sampling location of each maximum was identified and frequency of detection was calculated. The 90th percentile upper confidence limit (90%UCL) of each constituent was also calculated; the process for this is described in Section 3.11.3.3 of the Risk Assessment Report (Appendix A).

Concentration values for constituents in soil and groundwater were screened in two phases: (1) comparison of benchmarks to maximum detected concentrations; and (2) comparison of the

benchmark to the 90%UCL of each constituent. Soil data values from 15 feet bgs or less were used. In addition, a hot spot evaluation was performed as detailed in Appendix A.

Results of the soil screening indicate:

- For soil in OU1, benzo(a)pyrene was the only constituent of potential concern (COPC) that remained after comparing maximum detected concentrations to screening criteria;
- For soil in OU2, three COPCs remained after comparing maximum detected concentrations to screening criteria: benzo(a)pyrene, benzo(b)fluoranthene, and dibenz(a,h)anthracene; and
- For both operable units, arsenic falls out of consideration since its 90%UCL value is less than background.
- Four surface samples from OU1 contained benzo(a)pyrene at concentrations exceeding hot spot concentrations (S-12, S-13, S-7, and SB-22), and four locations on the Wheeler Bay riverbank and location S-14 contained benzo(a)pyrene at concentrations exceeding hot spot concentrations; dibenzo[a,h]anthracene was also present at location S-14 at a concentration higher than the hot spot concentration.

Results of the groundwater data screening against fish consumption criteria indicate:

- For groundwater at OU1, arsenic, tetrachloroethylene, five PAHs, and two pesticides were retained for further analysis;
- For groundwater at OU2, arsenic, six PAHs, and four pesticides were retained; and
- Additional constituents were retained because of the lack of a fish consumption criterion; these are listed in Tables 3.10-12 and 3.10-13 of the Risk Assessment Report (Appendix A).

Results of the groundwater data screening for inhalation of volatile constituents indicate:

- For sitewide groundwater at OU1, PCE, TCE, and vinyl chloride were retained based on screens using vapor intrusion criteria. However, as detailed in Section 5.2, the presence of these constituents in OU1 groundwater is due to an upgradient offsite source that has impacted groundwater near on-Facility wells MW-22, MW-23, and MW-03s. Therefore, an additional screen was performed excluding these wells. Based on the additional screen excluding monitoring wells MW-23, MW-22, and MW-03s, it is apparent that the potential inhalation risks from groundwater due to these contaminants are limited to those wells only (Appendix A).
- No COIs are retained for OU1, based on the screen that excludes wells MW-23, MW-22, and MW-03s).
- No COIs were retained for OU2.

Therefore, based on the results of the screening evaluations of the VOCs, potential risk from inhalation of volatiles from Facility groundwater was not considered further in the risk evaluation.

7.1.2 Human Health Technical Management Decision Point

The information gathered during the screening analyses provides a foundation for the Problem Formulation step described in DEQ guidance (DEQ, 2000). Although not specifically identified in the guidance, the synthesis of information at the end of Problem Formulation provides an opportunity for a decision point similar to the TMDP 3 and 4 described for the Level II ERA. A similar set of potential recommendations can be considered: (1) no further characterization investigations at the site are necessary and there exists sufficient information to make a remedial action decision; or (2) continuation of the risk assessment process is recommended to proceed to the next level. Although not explicitly identified in the guidance, the possibility of applying such recommendations to this step in the HHRA was discussed with DEQ personnel prior to embarking on this risk assessment process. The following is a summary of the relevant information and presentation of the conclusions reached as a result of the process.

Soil. To further evaluate the retained COPCs in soil, an exposure assessment and risk characterization were performed to provide a more representative estimate of potential human health risk. This Risk Assessment was conducted by calculating exposure and risk by use of the risk equations and exposure variables provided in the Oregon risk guidance (DEQ, 2000). The reasonable maximum exposure (RME) values for exposure parameters relating to occupational employees and excavation construction workers were used in these calculations (Appendix B of the guidance). Equations for exposure quantitation in the oral, dermal, and inhalation (particulates) pathways were obtained from Appendix A of the guidance. The exposure point concentration for each COPC is the 90%UCL of the constituent derived from the entire database for each operable unit.

For OU1 and OU2, no risk is indicated for the excavation/construction worker based on the RME analysis (Tables 27A and 27B, respectively). Table 28 lists the exposure parameters used in the equations. Potential risk from benzo(a)pyrene and cumulative PAH exposure are greater than 10^{-6}, but less than 10^{-5}, for the occupational worker in OU1. Potential risk from benzo(a)pyrene and dibenz(a,h)anthracene are greater than 10^{-6}, but less than 10^{-5}, for the occupational worker in OU2. Additive risk from PAH exposure is only slightly greater than 10^{-5} for the occupational worker in OU2.

Soil Sub-area Analysis

As described in Section 5.2.1, there are a few "sub-areas" of the Facility which contain higher concentrations of a few PAHs. Therefore, the risk evaluation included an assessment of the relative risk contribution from these sub-areas:

S-12/S-13 Subarea. S-12 and S-13 are two locations with high concentrations of PAHs in surface soil (Figure 13). Additional surface soil sampling was conducted around S-12 and S-13 to better assess the extent of PAHs in this area. As detailed in Section 5.2.1, the results of this additional sampling indicated that PAH concentrations decreased significantly both vertically and laterally from S-12 and S-13, and support that the elevated PAHs are limited locally and contained within the upper 6 to 12 inches of soil.

Former Cesspool Area, OU1. SB-22 and SB-23 are two locations with high concentrations of PAHs in deep soil. Concentrations of five PAHs exceeded industrial PRGs in the 17-foot bgs sample from SB-22 and benzo(a)pyrene exceeded the industrial PRG at 13 ft bgs at the adjacent boring (SB-23). As

detailed in Section 5.2.1, nearby sampling indicates that the PAH-impacted subsurface soil in this subarea is limited in extent (both laterally and vertically) and below a depth of 13 ft bgs.

Location S-14, OU2. S-14 is a location with high concentrations of several PAHs in surface soil. S-14 was located adjacent to a utility pole. The surface soil next to the pole was visibly stained with creosote from the pole. As described in Section 5.2.1, this location was intended to assess former transformer areas (AOC 69); however, the presence of the creosote in the sample did not allow for analysis for PCB-related constituents. The area was resampled by collecting another surface soil sample about 5 feet from the utility pole and still in the former transformer area; PAHs were almost two orders of magnitude less in this surface soil sample location (S-14A). These results support that the creosote from the utility pole is the cause of the elevated PAHs in the initial surface soil sample from this area and indicate that previous operations in the area have not significantly impacted surface soil, if at all.

Wheeler Bay Riverbank, OU2. Erodable bank areas (AOC83) at the west end of OU2 have high PAH concentrations (Figures 14 and 18).

The presence of these PAH concentrations in the subareas would only pose a risk to potential future workers that work extensively in those areas specifically. The risk evaluation based on RME parameters suggested that workers would need to work for 225 days per year, for 25 years, for 8 hours a day in areas with concentration levels equivalent to the 90% UCL in order to experience cancer risks greater than 10^{-6}. None of these four subareas currently experience high-levels of work activity, such as are seen in the administrative areas of the Facility or near Facility buildings.

Groundwater. For groundwater, an elevated number of COPCs were retained due to the conservative nature of the screening process (e.g., comparing groundwater concentrations to a surface-water based benchmark) and to the lack of a fish consumption benchmark for several COIs. To evaluate the groundwater COPCs further, a simplified mixing analysis was performed to estimate the concentrations of groundwater constituent concentrations in surface-water after discharge to the Willamette River. The analysis was based on the following assumptions:

- Groundwater flow velocity at the point of discharge: 100 centimeters per day (cm/day);
- Groundwater discharge area: 1 square foot ($ft^{2;}$ (900 cm^2);
- Groundwater daily flow volume through 1 ft^2: 90 liters per day (L/day); and
- Range of surface-water flow rates (cubic feet per second [cfs]): 0.01, 0.1, and 1.0.

Concentrations were calculated for a range of surface-water flow rates to represent different mixing rates in the river. The resulting concentrations exceed the benchmark only for heptachlor at the lowest flow rate (0.01 cfs; Appendix A). These concentrations are conservatively low because they represent the conditions in a cubic foot of surface-water adjacent to the discharge point of groundwater. Fish consumed by humans are likely to have spent most of their time farther from the groundwater discharge, at points in the river where concentrations would be substantially lower.

This process cannot be used for those COPCs retained due to lack of fish consumption criteria. However, their groundwater concentrations would be attenuated by the same amount and it is reasonable to assume that these constituents as well could be eliminated from further concern regarding human health risk.

7.1.3 Human Health Risk Assessment Conclusions

Screening-level analyses, combined with streamlined, quantitative risk analyses on existing soil data, indicate that risks from direct exposure to COPCs in soil are low. The presence of a few PAHs in surface soil indicated the potential for unacceptable risk. Further evaluation of subareas of the Facility identified two surface soil areas (the S-12/S-13 area at OU1 and the riverbank of Wheeler Bay in OU2) and one subsurface area at OU1 (near the former cesspools) are the primary cause for the potential risk. An evaluation of current site use supports that the presence of the PAHs in the surface or subsurface soil in these three areas will not present an unacceptable risk to potential current human receptors at the Facility (i.e., occupational workers, excavation, or construction workers) based on the current limited use of these areas. The risk assessment concluded that current risk posed by the presence of the PAHs is within the DEQ acceptable range because the areas are not accessed often (if at all, in the case of the deeper soil). There is the potential for unacceptable future risk to occupational workers from surface soil in OU1, if OU1 is redeveloped for typical industrial use. The riverbank at Wheeler Bay is currently oversteepened and is not designed for consistent use by occupational workers. Plans are currently underway to cap and stabilize the riverbank as an SCM (see Section 8.0) in coordination with the Early Action Sediment Removal Action at Terminal 4. The PAHs in the limited area near S-14 were covered by about 2 feet of fill soil during the Rail Modernization Project conducted in OU2 in 2006, and, therefore, exposure to the PAHs at S-14 has been mitigated.

Screening-level analyses support that groundwater contaminants are unlikely to be transported to surface-water at levels that will result in unacceptable risk from fish ingestion.

Based on these results, further investigation or risk assessment does not appear to be necessary to make risk management decisions or evaluate remedial options to protect human health at the Facility.

7.2 Ecological Risk Assessment

The Ecological Risk Assessment (ERA) for the Facility is based upon the process prescribed by DEQ in the Guidance for Ecological Risk Assessment: Levels I, II, III, IV (DEQ, 2001b) and included Level I Scoping and Level II Screening assessments. As detailed in Section 2.0 of the Risk Assessment Report (Appendix A), the results of the Scoping Level Ecological Evaluation indicated that the *potential* for risk exists at the Facility based on the presence of contaminated media and possible contact with receptors. Therefore, a Level II Screening was conducted. The discussion of the Level II Screening process is included as Sections 2.7 to 2.10 in the Risk Assessment Report (Appendix A) and describes the methods of the screening, data available, candidate assessment endpoints, methods of calculating the COI concentrations, frequency of detection and background analysis, and the screening level values used. A hot spot evaluation was also conducted as a part of the Level II Screening. The following summarizes the results and the technical management decision points (TMDPs) derived from the screening process.

7.2.1 Technical-Management Decision Points for the ERA

The Level II TMDPs are steps in the risk assessment process where one of three recommendations is determined: (1) no further ecological investigations at the site; (2) continuation of the risk assessment process to the next level; or (3) undertake a removal or remedial action (DEQ, 2001b). The information gathered during the Level I Scoping and Level II Screening processes is used to evaluate TMDP 3 and TMDP 4.

7.2.1.1 TMDP 3

This TMDP is intended to help determine whether unacceptable ecological risk is *probable*. According to DEQ guidance (DEQ, 2001b), the *potential* for risk exists when constituents of potential ecological concern (CPECs) are present and there are complete exposure pathways between contaminated media and ecological receptors. The Level I scoping indicated that the *potential* for risk exists at the Facility based on the presence of contaminated media and possible contact with receptors. However, the guidance indicates that unacceptable risk is *probable* only if the locality exhibits the following three criteria: (1) contains any individuals of a threatened and endangered (T/E) species, critical habitat of a T/E species, or contains habitat of sufficient size and quality to support a local population of non-T/E species; (2) CPECs were selected on the basis of exceedance of SLVs or because they have a high potential to bioaccumulate; and (3) there appears to be plausible links between CPEC sources and endpoint receptors (DEQ, 2001b).

Based on information gathered during the Level I Scoping and Level II Screening processes, the above criteria are not all exhibited throughout the Facility mainly because this area is an industrial site which lacks habitat of sufficient size and quality to support local populations of non-T/E species. The Facility is currently and is reasonably expected to remain zoned for IH use for the foreseeable future. As a result, terrestrial wildlife receptors are unlikely to spend substantial amounts of time feeding or engaged in other behaviors that would result in substantial contact with contaminated media at the Facility. Likewise, the upland areas of the Facility do not represent significant habitat for rare or important plant communities. Decisions regarding the probability of unacceptable risk from environmental media should include consideration of these factors. The conclusions regarding the probability of risk are discussed separately for upland soils and groundwater.

Upland Soils

CEPCs for soil are summarized in Table 29. The soil risk ratios for plants and invertebrates in OU1 (based on maximum detected concentrations) range up to approximately 10 (for zinc/plants), and up to 66 in OU2 (also zinc/plants). The 90%UCL concentrations reflect much lower maximum risk ratios, approximately 4 and 8 for OU1 and OU2, respectively. Although the risk ratios exceed the value of 5 recommended by DEQ for non-T/E species, the industrial nature of the Facility indicates that these exposures probably do not represent substantial effects on local plant or invertebrate populations, or on ecosystem function provided by these groups.

For mammals and birds in OU1, only the risk ratio for dibenzofuran (36) exposure to mammals exceeds 5. In OU2, the maximum risk ratios for lead (11), zinc (7), and dibenzofuran (58) exceed 5. DEQ developed the SLVs to be conservative screening values, and to represent relatively high exposure rates. Therefore, the risk ratios calculated for the Facility using the SLVs substantially overestimate the potential exposure and ecological risk, especially for terrestrial-feeding birds and

mammals. If relative Facility use was to be considered, the Facility-wide risk ratios for lead and zinc in OU2 would be below 5 when animals used the Facility approximately 50 percent of the time or less. Due to the limited resources at the Facility, most wildlife species are unlikely to spend 50 percent or more of their time at the property. There is one localized area of the Facility with high concentrations of zinc - the riverbank sample location SB-26D. This area could represent unacceptable risk for animals that utilized this area extensively, but risk to local populations is not expected to occur.

For dibenzofuran, concentrations are relatively evenly distributed across the Facility. When relative Facility use by wildlife species is considered, risk ratios would be approximately 5 or less if receptors spent 10 percent or less of their foraging time at the Facility. While some individuals of urbanized species such as pigeons or Norway rats may spend more than 10 percent of their time foraging at the Facility, it is unlikely that other species such as deer, raccoons, or raptors would feed this extensively on the upland areas at the Facility. The relatively high risk ratios are due, in part, to very low SLVs compared to achievable detection limits. Non-detect concentrations are included in 90%UCL calculations using 0.5 of the MRL. The SLV for dibenzofuran (0.002 µg/kg) is less than the MRL observed for samples from the Facility, and the 90%UCL is influenced by locations with non-detected concentrations. Since samples were analyzed using standard, low-detection limit methods, the presence of dibenzofuran at many locations cannot be confirmed, and risk from this CPEC should not warrant remedial action. Further, additional research was performed to evaluate dibenzofuran toxicity to mammals and potential alternative screening levels. The Final Comprehensive Risk Assessment (CRA) Work Plan and Methodology (USDOE, 2005) document summarizes extensive research undertaken by DOE as part of Rocky Flats CRA, approved by EPA Region 8 and other regulatory agencies, to develop ecological screening levels (ESLs). The methods for developing ESLs included: identifying representative receptors and receptor attributes, literature review of toxicity data to derive toxicity reference values (TRVs) for vertebrate receptors, and calculation of NOAEL-based ESLs using appropriate uncertainty factors. If the soil concentration of a contaminant of interest does not exceed the NOAEL-based ESLs, then risk is considered to be negligible to receptors of interest. Based on this work, a range of dibenzofuran ESLs were developed for mammalian receptors. These ESLs range from 21.2 mg/kg for an insectivorous deer mouse to 93.8 mg/kg for an omnivorous coyote, and 2,440 mg/kg for a herbivorous prairie dog. These values are substantially higher than DEQ's SLV, but are demonstrably protective literature-based values underlying ESL development. The maximum detected concentration (MDC) of dibenzofuran at the Facility is 0.2 mg/kg, which is two orders of magnitude lower than the lowest NOAEL-based ESL. This research provides additional evidence that dibenzofuran is not expected to provide unacceptable risk to terrestrial receptors at the Facility.

Overall, little habitat currently exists or will exist for terrestrial receptors at the Facility because of likely future uses of the property. The only persistent patches of riverbank vegetation are located on narrow strips (less than 20 to 40 feet wide in most places). With the exception of the areas sampled for this RI (e.g., the bank of Wheeler Bay and the south side of Slip 1), these areas were previously stabilized through addition of rip rap (below typical river levels) and landscaping improvements, including placement of clean topsoil (above the typical river levels). The Port has recently completed additional rail installations at OU2 as a part of the Berth 408 Rail Yard Modernization Project and further industrial development is planned for OU2. These increased development activities will further minimize potential wildlife movement and potential exposure pathways. Further, SCMs have been proposed and approved for potentially erodable riverbank areas in Wheeler Bay (ACA/Newfields, 2007). The armoring, regrading, and re-vegetation will resist erosion, stabilize the bank, and act as a cap to prevent direct contact by terrestrial ecological receptors.

Relative use of the Facility by terrestrial receptors is minimal and thus potential exposure to CPECs identified in the screening analysis is also low. Localized actions such as removals or covering to attenuate exceptionally high concentrations (e.g., elevated lead, zinc, and cadmium concentrations in the riverbank soil in Wheeler Bay) such as the planned SCM for Wheeler Bay will reduce potential exposure in this area. Based on these results, the probability of unacceptable ecological risk from upland soils is minimal, and does not warrant additional remediation at the Facility.

Groundwater Screen

CPECs for groundwater are summarized in Table 30. The groundwater screening results suggest that although benzo(a)pyrene, benzo(a)anthracene, carbon disulfide, total chromium, heptachlor, total lead, total copper, 4,4'-DDD, and 4,4'-DDT in downgradient monitoring wells represent *potential* risk to aquatic life, these CPECs are unlikely to present significant *probable* risk. For lead, chromium, and copper, only the total (i.e., unfiltered) concentrations of these CPECs exceeded the SLVs. Typically these were one-time exceedances in individual wells and were not confirmed by previous or subsequent sampling. Therefore, these total concentrations probably do not represent the fraction of groundwater that will ultimately be transported to the river. No dissolved (i.e., filtered) MDCs exceeded the SLVs, indicating that those metals in groundwater at the Facility probably do not represent a risk to aquatic life in the Willamette River.

Based on total (i.e., unfiltered) concentrations in OU1, lead, heptachlor, and heptachlor epoxide were identified as CPECs based on risk from multiple COIs. However, the individual risk ratios for these CPECs (0.4, 0.7, and 0.8, respectively) indicate that risk to aquatic receptors from these CPECs would be minimal. In addition, chromium, carbon disulfide, benzo(a)pyrene, and benzo(a)anthracene concentrations were infrequently detected above screening levels, both from a temporal and spatial perspective. These CPECs had risk ratios less than 5 for those point concentrations and the detected concentrations were lower than SLVs during the most recent sampling event. Thus, CPECs identified in the Level II screening analysis lack widespread, substantial, and persistent detections throughout the downgradient monitoring wells in OU1.

In OU2, all CPEC concentrations were also infrequently detected above screening levels, both from a temporal and spatial perspective. The detected concentrations of 4,4'-DDD, 4,4'-DDT, and carbon disulfide had risk ratios less than 2.6 for those point concentrations and the detected concentrations were lower than SLVs during the most recent sampling event. As discussed above, only the total concentrations of lead, chromium, and copper, exceeded the SLVs, not the more bioavailable dissolved fractions of these CPECs. Benzo(a)anthracene and benzo(a)pyrene in MW-16 had detected concentrations above SLVs in the most recent sampling event, yielding risk ratios of 6.8 and 2.8, respectively, at that well. However, these constituents were not detected above MRLs during the previous three sampling events, and the presence of these concentrations in the fourth sampling event is more likely due to soil entrained in the sample.

Organisms may be exposed to contaminants from groundwater after groundwater discharges to the river and mixes with surface water; no aquatic organisms in the Willamette River would be exposed to undiluted groundwater. Exposure concentrations would decrease rapidly with distance from the discharge zone, as groundwater mixes with surface water. Benthic invertebrates or small fish that reside in close association with the submerged riverbank have the highest potential exposure. Such organisms likely remain in close proximity to the substrate, probably within 1 foot (30 cm). Groundwater contaminant concentrations in surface-water within this near-bottom zone depend upon the rate of groundwater flow and river flow. Although neither of these variables is precisely known, conservative estimates of concentrations can be derived based on a range of assumptions. If

groundwater discharge is 100 cm/day (a very conservative assumption), river flow (or rate of mixing) near the groundwater discharge point is 0.1 cfs, and groundwater and surface-water are fully mixed, lead concentrations within 1 foot of the bank would be approximately 96-fold lower than in unmixed groundwater. Concentrations would be substantially lower farther from the discharge point, at higher surface-water flow, or lower groundwater flow velocity.

The groundwater CPEC with the highest risk ratio (6.8) compared to SLVs is benzo(a)pyrene. The highest detected concentration of benzo(a)pyrene was measured at $9.5x10^{-5}$ milligrams per liter (mg/L) in MW-16 in OU2. Assuming this concentration was discharged to the Willamette River, and the flow assumptions stated above, benzo(a)pyrene concentrations within the 1 foot zone would be approximately $9.9x10^{-7}$ mg/L, which is well below the SLV. Even at a groundwater velocity of 100 cm/day and surface-water flow rates as low as 0.001 cfs, benzo(a)pyrene concentrations in the near-bottom zone would still be lower than the SLV. Flows in the river are likely to be substantially higher than this, even in the slips. Therefore, benthic invertebrates and fish that live continuously within 1 foot of the substrate at the discharge point would be unlikely to be exposed to benzo(a)pyrene concentrations above the SLV. Fish or other invertebrates that spend most of their time in the water column farther from the substrate would be exposed to substantially lower concentrations.

Overall, the groundwater CPECs identified in the Level II screening analysis lack widespread, substantial, and persistent detections in downgradient monitoring wells that would lead to significant degradation of water quality in the Willamette River.

7.2.1.2 TMDP 4 and Conclusions from the Ecological Risk Assessment

TMDP 4 assesses whether a remedial action decision is possible based on the existing information and current levels of uncertainty. Specifically, if cleanup would be less costly than further investigation and data are adequate to select and approve a remedial action, then further ecological investigation should be deferred in favor of a response action. The alternative is for the assessment process to proceed to Level III for further evaluation.

Based on information gathered during the Level I Scoping and Level II Screening processes, the existing information is adequate to identify appropriate risk management measures. Neither a baseline risk assessment (i.e., Level III), nor more sampling is necessary to support risk management decisions.

Conclusions. Based on the Level I Scoping and Level II Screening processes, potential ecological risk to terrestrial receptors from upland soils at the Facility is minimal as a result of limited ecological resources at the Facility and few CPECs. While contact with CPECs in soils is possible for some terrestrial receptors, the developed nature of the site results in exposures that are unlikely to reach levels of concern defined in DEQ guidance for non-T/E species.

Potential ecological risk to terrestrial or aquatic receptors as a result of possible exposure to CPECs via groundwater is also low. Overall, the groundwater CPECs identified in the Level II screening analysis lack widespread, substantial, and persistent detections in downgradient monitoring wells that would lead to significant degradation of water quality in the Willamette River.

8. Source Control Evaluations

As required by the VCP Agreement between the DEQ and the Port, the scope of the RI activities included collecting sufficient data to complete an evaluation of the need for SCMs to address unpermitted discharges or migration of hazardous substances to the lower Willamette River. The results of this evaluation are presented in this section.

The DEQ published a JSCS document in December 2005 that provides a framework for identifying and evaluating these potential sources to the Willamette River (DEQ/EPA, 2005). The Source Control Evaluation for the Facility was conducted consistent with the published JSCS guidance document. Upland sources of contamination with potentially complete pathways to the river were screened against JSCS screening criteria (DEQ/EPA, 2005) so that upland sources can be identified and prioritized by DEQ and EPA. Potential Sources evaluated were:

- Potentially erodable soil that could migrate into the river;
- Groundwater containing constituents at concentrations of potential concern discharging into the river; and
- Stormwater runoff containing constituents at concentrations of potential concern from the Facility.

8.1 Potentially Erodable Soil

The EPA and DEQ have identified erodable riverbank soil as a potential pathway for constituent transport to the Willamette River (DEQ/EPA, 2005). On April 13, 2005, the banks of the Facility were examined for exposed surface soil that has the potential to be eroded and transported to the river. The areas along Wheeler Bay and the west end of the south side of Slip 1 (both in OU2) were identified as having the potential for surface erosion. No erodable soils were identified in the riverbank or slip areas of OU1.

The recommended steps for evaluating erodable riverbank soil in accordance with JSCS guidance are:

- Collect soil samples from the erodable or potentially erodable riverbank soils and analyze for COIs;
- Compare the analytical results to JSCS screening levels provided on Table 3-1 of the guidance document (DEQ/EPA, 2005); and
- If exceedances of SLVs are observed, DEQ evaluates the site to determine priority for additional evaluation or SCMs (e.g., medium priority sites perform a weight-of-evidence evaluation to assess whether the exceedances are likely to cause adverse effects to the river and determine if source control measures are necessary).

Composite sampling of surface soils was conducted in the potentially erodable riverbank areas of OU2. There are no potentially erodable riverbank soils in OU1, so sampling was not necessary.

The composite samples consisted of four discrete sub-samples collected from each composite sampling area. The composite sample areas and sub-sample locations are illustrated on Figure 7. The composite samples (S-23 through S-30) were submitted for chemical analysis for TPH, PAHs, metals, pesticides, PCBs, and phthalates.

Analytical data for potentially erodable riverbank soil in OU2 were compared against JSCS screening levels for toxicity and bioaccumulation (Table 3-1 in DEQ/EPA, 2005).

The analytical results for composite samples from locations S-23 through S-30 were greater than JSCS screening levels (e.g., probable effects concentrations [PECs] developed by McDonald et al.; DEQ/EPA, 2005) for some PAHs and so all discrete sub-samples were analyzed for PAHs. The composite sample from location S-26 exhibited elevated metals and so the discrete samples from this composite sample area (i.e., S-26A, S-26B, S-26C, and S-26D) were analyzed for metals. Some pesticides were detected above the JSCS screening levels in the composite samples collected from the Wheeler Bay riverbank area (i.e., S-26 through S-30) and the discrete samples for each of these composite locations were analyzed for pesticides.

The screening level summary tables for riverbank soil are contained in Appendix K (Table K-1). Table 31 summarizes soil COPCs for which the maximum detected concentrations exceeded the toxicity and/or bioaccumulation JSCS screening criteria. The table also lists sampling locations with detected concentrations that exceeded the criteria. There are 20 COPCs identified for riverbank soils in OU2, and there are exceedances at sampling locations S-23 through S-30 (e.g., in riverbank soil in both the slip area and in the Wheeler Bay area).

Evaluation of Soil Exceedances

Exceedance of JSCS screening criteria does not necessarily indicate that an upland source poses an unacceptable risk to human health or the environment (DEQ/EPA, 2005). However, if the exceedances are more than just slightly over the screening criteria (as is the case for some of the COPCs in the OU2 riverbank soil), the DEQ/EPA recommend that a "weight-of-evidence" evaluation be performed to determine the likelihood of adverse effects from migration of soils to sediment surface water and to determine if further characterization or soil SCMs are needed (DEQ/EPA, 2005). The weight-of-evidence evaluation should consider factors such as the extent and proximity to the river, in-water sediment data proximal to the source area, riverbank stability, and characteristics of the constituents (e.g., are the constituents bioaccumulative).

For riverbank soils in OU2, most of the riverbank soil in the Wheeler Bay area contains several COPCs that exceed screening criteria, is proximal to the river, and is not stabilized against erosion. SCMs of the riverbank soil are therefore prudent. An early Removal Action of sediment in Wheeler Bay is planned and will consist of capping beach soil and sediments of the bay. Conducting a SCM in coordination with the sediment Removal Action was therefore recommended (ACA/Newfields, 2007). The SCM for Wheeler Bay was approved by the DEQ on March 8, 2007. Further characterization of the riverbank soil is therefore not needed.

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8.2 Groundwater Discharge to the River or Slips

Similar to erodable soil, the recommended steps in the JSCS process (DEQ/EPA, 2005) for evaluating groundwater discharge to the river are:

- Screen each groundwater data point against ecological and human health JSCS screening levels provided on Table 3-1 of the guidance document (DEQ/EPA, 2005);
- Use appropriate data from "within the plume" and from points as close to the river as possible to assess potential impacts to the river;
- If exceedances of SLVs are observed and prioritization is deemed at a medium level, perform a weight-of-evidence evaluation to assess whether further characterization or Source Control Measures Alternatives Evaluation is necessary.

Consistent with the JSCS document, groundwater data were screened against the ecological and human health JSCS screening levels provided on Table 3-1 of DEQ/EPA (2005). JSCS screening criteria for potential ecological receptors are based on a hierarchy of screening values, including EPA's 2004 National Recommended Water Quality Criteria (NRWQC) chronic criteria, DEQ's 2004 AWQC chronic criteria, and Oak Ridge National Laboratory (ORNL) Tier II secondary chronic values (SCVs). JSCS human health screening criteria are based on EPA's 2004 NRWQC criteria or DEQ's 2004 AWQC criteria for fish consumption at a rate of 17.5 grams per day (g/day). Consistent with Step 2 above, the dataset included in the evaluation consisted of groundwater data from the Facility wells installed along the slips and river because (1) the hydrogeologic model supports that groundwater flows across the Facility and discharges to the Willamette River, to Slip 1 or to Slip 3; and (2) no plumes have been identified; therefore, using data from "within the plume" is not applicable. Tables 32 and 33 summarize the screening results for Facility groundwater against the applicable human health and ecological screening levels, respectively. As shown on the tables:

- For OU1 groundwater, 11 constituents exceeded human health screening levels (Table 32A) and 4 constituents exceeded ecological screening levels (Table 33A).

- For OU2 groundwater, 12 constituents exceeded human health screening levels (Table 32B) and 10 constituents exceeded ecological screening levels (Table 33B).

Tables 31 and 34 summarizes the groundwater COPCs for which the maximum detected concentrations in one or more downgradient monitoring wells exceeded the human health (Table 34) or the ecological (Table 31) JSCS screening criteria. The tables also list sampling locations with detected concentrations that exceeded the criteria. Because the initial screen of all of the data indicated some exceedances, the ERA and HHRA source control evaluation included a stepwise screening and evaluation of the groundwater data.

Evaluation of Groundwater Exceedances

Exceedance of JSCS screening criteria does not necessarily indicate that upland groundwater poses an unacceptable risk to human health or the environment (DEQ/EPA, 2005). In fact, the exceedances in groundwater at the Facility are slight and it is likely that this pathway would be considered a "low priority" under the JSCS document. However, a "weight-of-evidence" evaluation is provided herein to

further assess whether groundwater could possibly adversely affect surface-water or sediment in the river and to support that SCMs are not needed for groundwater.

The location, extent, duration, and magnitude of exceedances at the Facility were analyzed to accomplish this evaluation. The downgradient monitoring wells were the focus of this analysis, as these wells are nearest the point of discharge to the river, and no plumes have been identified upgradient from these wells.

Ecological Evaluation. Figure 20 identifies detected COPC concentrations in groundwater at downgradient monitoring wells that exceed ecological JSCS screening values. The results from all the quarterly groundwater monitoring events are included to assess the frequency of the exceedance of each COPC at each well. Evaluating the data collected during all groundwater monitoring events elucidates whether detections of a constituent appear more likely attributable to sampling variability rather than to an actual representative dissolved-phase concentration in the groundwater.

The steps conducted to evaluate whether constituents in groundwater at the Facility could present a source to the river at concentrations of potential ecological concern included:

- Evaluating the frequency of detection of each COI;
- Comparing maximum detected concentrations and 90%UCLs to Level II surface-water SLVs (Figure 2.8-2 of the Risk Assessment Report illustrates the limited locations and few CPECs that exceeded the Level II SLVs); and
- Evaluating both spatial and temporal variation to assess for a potential source of concern to the river.

The following conclusions can be derived from these temporal and spatial analyses:

- There are no Facility-wide occurrences of any of the COPCs.
- MW-07 (OU1) and MW-26 (OU2) are the only downgradient wells with exceedances of benzo(a)anthracene and/or benzo(a)pyrene. Benzo(a)anthracene and benzo(a)pyrene exceeded their respective SLVs at MW-07 in February 2005, but did not exceed at that location in May 2005. The trace benzo(a)anthracene concentration (0.075 microgram per liter [µg/L]) exceeded the SLV (0.027 µg/L) at MW-26 in May 2005.
- MW-07 is the only downgradient well in OU1 with an exceedance of carbon disulfide. Of four sampling periods throughout 2004 and 2005, there was only one exceedance of this CPEC. The highest concentration of carbon disulfide (0.00094 mg/L) is just slightly over the aquatic SLV (0.00092 mg/L).
- MW-08 is the only downgradient well in OU1 with an exceedance by total chromium. There was a detected exceedance by this CPEC in May 2005, but not in September 2005. The highest concentration of total chromium (0.0146 mg/L) is just slightly above the aquatic SLV (0.011 mg/L).
- For OU2, MW-09 and MW-11 are the only downgradient wells with exceedances of 4,4'-DDT and/or 4,4'-DDD. 4,4'-DDT was detected only once in four quarters of sampling of well MW-09.

4,4'-DDT and 4,4'-DDD were detected only once each in three quarters of sampling at well MW-11. The detected concentrations of 4,4'-DDT (0.0014 mg/L, trace) and 4,4'-DDD (0.0026 mg/L, trace) at MW-11 are just slightly above the aquatic screening levels (0.001 µg/L for each compound). The detected concentration of 4,4'-DDT at MW-9 (0.003 µg/L) is also just slightly above the SLV. The infrequency of detection and the trace concentrations of these compounds supports that they are not representative of dissolved-phase concentrations in groundwater but, rather, are likely due to variability in sample turbidity.

- MW-16 is the only downgradient monitoring well in OU2 with exceedances of benzo(a)anthracene, benzo(a)pyrene, and carbon disulfide. Of four sampling events throughout 2004 and 2005, there was only one exceedance of benzo(a)anthracene and benzo(a)pyrene (in May 2005). Due to a small volume of water in the well, the well was not purged and the sample was collected via a bailer in May 2005; the well was purged and sampled using low-flow techniques during previous events. Therefore, these detections in May 2005 are not representative of dissolved-phase PAH concentrations in the MW-16 area. Carbon disulfide was detected just once during the four quarters of sampling at MW-16 (in February 2005). The highest concentration of carbon disulfide (1.7 µg/L) is just slightly above the aquatic screening level (0.92 µg/L).

- MW-15 is the only downgradient monitoring well in OU2 with exceedances of total lead and total chromium. Of four sampling periods at MW-15 throughout 2004 and 2005, total lead and total chromium exceeded the SLVs only once (in May 2005). The total lead (10.9 µg/L) and chromium (21.9 µg/L) concentrations detected in May 2005 were less than 5 times the SLVs (2.5 µg/L and 11 µg/L, respectively). Dissolved concentrations of these compounds did not exceed the SLVs.

- MW-15 and MW-16 are the only downgradient wells at the Facility with exceedances by total copper. Of four sampling periods at MW-15 and three sampling periods at MW-16 throughout 2004 and 2005, there was only one exceedance by total copper for each well. Both exceedances (9.23 µg/L at MW-15 and 14.3 µg/L at MW-16) were just slightly above the SLV of 9 µg/L. The dissolved concentrations did not exceed the SLVs.

To further evaluate the groundwater COPCs, a simplified analysis was performed to estimate the concentrations of groundwater constituent concentrations in surface water after discharge to the Willamette River (i.e., at the point of exposure). Exposure concentrations would decrease rapidly with distance from the discharge zone, as groundwater mixes with surface water. Benthic invertebrates or small fish that reside in close association with the submerged riverbank have the highest potential exposure. Such organisms likely remain in close proximity to the substrate, probably within 1 ft (30 cm). Groundwater contaminant concentrations in surface water within this near-bottom zone depend upon the rate of groundwater flow and river flow. Although neither of these variables is known, conservative estimates of concentrations can be derived based on a range of assumptions. If groundwater discharge is 100 cm/day, river flow (or rate of mixing) near the groundwater discharge point is 0.1 cubic feet per second (cfs), and groundwater and surface water are fully mixed, concentrations within 1 foot of the bank would be approximately 96-fold lower than in unmixed groundwater. The concentration would be substantially lower further from the discharge point, at higher surface water flow, or lower groundwater flow velocity.
Table 35 summarizes the results of the mixing evaluation. The groundwater CPEC with the highest risk ratio (6.8) compared to SLVs is benzo(a)pyrene. The highest detected concentration of benzo(a)pyrene was measured at 9.5×10^{-5} mg/L in MW-16 in OU2. Assuming this concentration was discharged to the Willamette River, and the flow assumptions stated above, benzo(a)pyrene

concentrations within the 1 foot zone would be approximately $3.6x10^{-8}$ mg/L, which is well below the SLV. Even at a groundwater velocity of 100 cm/day and surface water flow rates as low as 0.01 cfs, benzo(a)pyrene concentrations in the near bottom zone would still be lower than the SLV. Flows in the river are likely to be substantially higher than this, even in the slips. Therefore, benthic invertebrates and fish that live continuously within 1 foot of the substrate at the discharge point would be unlikely to be exposed to benzo(a)pyrene concentrations above the SLV. Fish or other invertebrates that spend most of their time in the water column further from the substrate would be exposed to substantially lower concentrations.

In addition, the Risk Assessment Report (Appendix A) provides additional analysis of groundwater CPECs at the Facility. In the ERA, groundwater COI concentrations at downgradient monitoring wells (i.e., nearest the point of discharge to the river) were compared to Level II surface-water SLVs for aquatic life. Appendix B-2 of the Risk Assessment Report presents the results of toxicity screening for aquatic receptors for each OU. The ERA concluded that CPECs identified in the Level II screening analysis lack widespread, substantial, and persistent detections in downgradient monitoring wells that would pose unacceptable risk to mobile or immobile receptors in the Willamette River.

Thus, the screening evaluation of groundwater monitoring results and a "weight-of-evidence" evaluation support that there are no COPCs at the Facility at concentrations that could cause significant, if any, unacceptable risk to mobile or immobile receptors within the river.

Human Health Evaluation. Figure 21 identifies detected COPC concentrations in groundwater at downgradient monitoring wells that exceed human health JSCS screening values (except arsenic). Also included are the four quarters of sampling results to assess the frequency of the exceedance of each COPC at each well. Evaluating the results spatially, temporally, and by frequency of detection, the following conclusions can be derived:

- There are no Facility-wide occurrences of any of the COPCs, with the exception of arsenic; as detailed in Section 5.2.2, arsenic is detected at concentrations consistent with other riverfront sites and is not due to historical operations at the Facility.

- MW-07 and MW-16 are the only downgradient wells with exceedances of PAHs. Spatially, these wells are at opposite ends of the Facility and no wells in-between reported exceedances of PAHs. The exceedances occurred only once out of four quarters of monitoring. At well MW-07, the exceedances are trace concentrations and are below the MRLs. The detections at both wells are likely due to soil entrained in the sample and are not representative of groundwater conditions near the wells.

- The concentrations of a few pesticides exceeded the JSCS criteria, but evaluation of the exceedances supports that these do not reflect the presence of a plume and, similar to the PAH exceedances, are likely due to variability in sample turbidity:

    - MW-09 and MW-11 are the only downgradient wells with an exceedance by 4,4'-DDT. MW-11 is the only downgradient well with an exceedance of 4,4'-DDD and aldrin. The 4,4'-DDT, 4,4'-DDD, and aldrin exceedances occurred just one time out of three or four quarters of sampling at each well.

- MW-08 is the only downgradient well with an exceedance of 4,4'-DDE, heptachlor, and heptachlor epoxide; again, these exceedances occurred only once in four quarters of sampling.

- MW-10 is the only downgradient well with an exceedance of dieldrin; as for the other pesticides, this occurred just once in four quarters of sampling.

- MW-03 is the only downgradient well with an exceedance by PCE and vinyl chloride. Each of these compounds was exceeded just once in four quarters of sampling.

To evaluate the groundwater COPCs further, a simplified analysis was performed as a part of the HHRA to estimate groundwater constituent concentrations in surface-water after discharge to the Willamette River. The analysis is similar to that provided above for ecological receptors, but performed for human health COPCs. The analysis was based on the following assumptions:

- Groundwater flow velocity at the point of discharge: 100 centimeters per day (cm/day)
- Groundwater discharge area: 1 square foot (ft^2) (900 cm2)
- Groundwater daily flow volume through 1 ft^2: 90 liters per day (L/day)
- Range of surface water flow rates (cfs): 0.01, 0.1, and 1.0.

Concentrations were calculated for a range of surface water flow rates to represent different possible mixing rates in the river. The resulting concentrations exceed the benchmark only for heptachlor at the lowest flow rate (0.01 cfs) (Tables 36A and 36B). These concentrations are conservatively low because they represent the conditions in a cubic foot of surface water adjacent to the discharge point of groundwater. Fish consumed by humans are likely to have spent most of their time further from the groundwater discharge, at points in the river where concentrations would be substantially lower.

This process cannot be used for those COPCs retained due to lack of fish consumption criteria. However, their groundwater concentrations would be attenuated by the same amount and it is reasonable to assume that these constituents as well could be eliminated from further concern regarding human health risk. In addition, for arsenic, a report prepared by the USGS and U.S. Department of the Interior in conjunction with the Oregon Water Resources Department supports that the concentrations detected in the groundwater at the Facility are well within the range of arsenic concentrations detected across Oregon, including the Portland area (WRIR, 1999).

The groundwater monitoring results, screening evaluation of the data obtained and a "weight-of-evidence" evaluation support that there are no COPCs at the Facility at concentrations that could cause significant, if any, degradation of water in the Willamette River (or the slips) or pose unacceptable risk to human health from fish consumption.

8.3 Stormwater Assessment

The Stormwater characterization program is in progress and is anticipated to be complete by the end of 2007, with a report of results to be submitted in early 2008.

8.4 Source Control Conclusions

To meet the requirements of the VCP agreement, a source control evaluation was conducted to assess potential migration pathways at the Facility that could potentially discharge contaminants to the Willamette River at concentrations of possible concern. The evaluation included assessing (1) erodable soil on riverbanks (or slipbank) in OU2 (no erodable soil is present on the river or slip banks of OU1); (2) groundwater discharges; and (3) stormwater discharges.

Results of the sampling, analysis, and source control evaluation of potentially erodable riverbank in OU2 indicate there are 20 COPCs present at concentrations that exceed JSCS screening levels. Based on the weight-of-evidence evaluation discussed above, SCMs of the OU2 riverbank (Wheeler Bay) are prudent. Further characterization of the riverbank soil is not needed. Concentrations of some PAHs, metals, and pesticides exceeded JSCS guidance screening levels for erodable soil migration to the river. Based on recommendations supplied in the draft RI report (BBL/ACA/NF, 2006) and subsequent discussions with DEQ staff following that submittal, a source control alternatives evaluation was conducted for these erodable bank areas (ACA/NF, 2007). The source control alternatives evaluation recommended a bank capping, stabilization and re-vegetation alternative that ties into the EA sediment cap planned for the area. DEQ accepted this alternative in an email dated March 8, 2007 (DEQ, 2007). No other soil at the Facility presents a potential threat to the receptors (including sediment) within the river or slips.

Results of the groundwater discharges evaluation support that there are no COPCs at the Facility at concentrations that could cause significant, if any, adverse effects to water or sediment in the Willamette River (or the slips). No plume of contaminants is present at the Facility and COIs, when detected, were just slightly above the screening criteria. Detections appear to be related to the turbidity of the sample and, therefore, are not necessarily representative of water discharging to the river or slips. No source control measures for groundwater are needed.

9. Summary and Conclusions

As required by the December 4, 2003 VCP Agreement between the Port and the DEQ, an RI and evaluation for the need for SCMs was completed at the Terminal 4 Slip 1 Upland Facility. The purpose of the RI was to determine the nature and extent of potential hazardous substance releases in Facility media and to evaluate constituent migration pathways at the Facility. The RI was conducted in accordance with the RI Work Plan (Hart Crowser, 2004a). A screening level HHRA/ERA of data collected during the RI was conducted to determine whether a baseline risk assessment would be needed and, if not, provide guidance for risk management decisions for the Facility. DEQ guidance on conducting HHRA/ERA were used to prepare the screening level risk assessment; a copy of the Risk Assessment Report is included as Appendix A. This section provides a summary of the RI activities and results, risk screening of the RI data, and conclusions from the source control evaluation.

9.1 Summary

The Upland Facility is located adjacent to the Willamette River. The Port acquired the property in 1971 as a result of the Port's merger with the City CPD. The City CPD purchased the property in 1917. Development of the terminal resulted in the filling of Gatton Slough and adjacent areas within the river, and excavation of Slip 1. The following summarizes the information obtained to complete the RI.

Physical Setting. The 98-acre Facility has been divided into operable units: OU1 and OU2. The topography is relatively flat, with steep riverbanks in some areas. The ground surface of the Facility consists mainly of asphalt or concrete, although areas of gravel and grass are also present. Structures and railroad track alignments and rail spurs are also present. The Facility is leased to multiple tenants and is actively used for various industrial purposes.

Most of the riverbanks are heavily vegetated and/or rip-rapped; however, some areas do contain erodable soil. Surface hydrology at the Facility consists primarily of surface runoff as sheet flow during rainfall events. The sheet flow is captured through a permitted, piped stormwater conveyance system.

Geology and Hydrogeology. Soil underlying the Facility consists of sand fill overlying silty native alluvium. The upper portion of the silty alluvium consists of silty sand; the amount of silt appears to increase with depth and likely presents a confining layer to significant downward flow. Depth to groundwater ranges from 8.3 to 30 feet bgs (1.1 to 17.4 feet MSL). Groundwater flows to Slips 1 or 3 at a gradient ranging between 0.01 and 0.001. Shallow (first encountered) groundwater is contained primarily in the sand fill or upper silty sand alluvium. Groundwater velocity in the sand fill is estimated to range from 4 feet per year in the eastern portions of the Facility to 400 feet per year as groundwater nears the slips. The groundwater gradient is flat on the western portions of both operable units and the velocity will be lower than the above estimates as it moves toward the Willamette River.

Potential Sources of COIs. More than 80 potential AOCs were identified and evaluated during the RI. Thirty-five (35) of these potential AOCs were evaluated as part of the RI Work Plan development and were determined to have been assessed sufficiently and are unlikely to present sources of COIs

at concentrations of potential concern. Forty-eight (48) AOCs were investigated during the RI activities. The results obtained during the Phase I, II, and III investigations conducted at the AOCs were evaluated and determined to have sufficiently characterized the lateral and vertical extent of COIs in soil and groundwater for the purposes of a HHRA/ERA (see Appendix H for the summary and evaluation of results for each AOC).

Results of Remedial Investigation: Soil. With the exception of a few localized areas and along the riverbanks, COIs were detected intermittently in soil at generally low concentrations. The localized areas consist of:

- A limited area of surface soil (upper 6 inches) containing multiple PAHs exceeding PRGs in the western portion of OU1. The PAHs are likely due to asphalt materials entrained in the surface soil;

- Deeper soil (greater than 13 feet below grade) in the area of four former cesspools in the northern central portion of OU1 contains TPH and PAHs;

- A limited area of lead concentrations in OU2 that exceed industrial PRGs in surface soil (upper 1 foot) near boring SB-77; and

- A limited area of SPH at a depth of approximately 18 feet below grade at boring SB-67 in OU2. The separate-phase hydrocarbons are not mobile, do not extend significantly beyond SB-67, and have not impacted shallow groundwater.

In addition to the above localized areas, two areas of erodable riverbank soil were observed and investigated. The riverbank soil contained PAHs, pesticides, and metals.

Results of Remedial Investigation: Groundwater. No groundwater plumes were identified at the Facility. Intermittent low detections of some COIs (PAHs, pesticides, metals) were observed during the quarterly monitoring program. Often, a COI was detected during only one of four quarters of sampling, suggesting that variability in sample turbidity was the reason for the detection and supporting that significant dissolved-phase COIs are not present at the Facility.

Locality of Facility and Beneficial Land and Water Use. The soil and groundwater LOF include the Upland Facility (including the riverbanks). Properties to the north, west, and south are not included in the LOF because groundwater does not flow toward these properties and soil cannot migrate to these facilities. Current zoning information indicates the entire site is designated for IH (heavy industrial) use by the City's Bureau of Planning (Title 33, Planning and Zoning, Chapter 33.140). The entire site is designated by the Portland Comprehensive Plan Map as industrial sanctuary (City of Portland, 2004b), which is intended for areas where City policy is to reserve land for existing and future industrial development. Therefore, the Facility is currently and is reasonably expected to remain zoned for IH use for the foreseeable future. A municipal water source supplies the Facility and vicinity with potable water for drinking and other purposes. No beneficial use wells are located on the Facility.

9.2 Summary and Conclusions of the Risk Assessment

The results of the Phase I, II, and III investigations were used to finalize the LOF. The LOF and beneficial land and water use information were used to develop a CSM for potential complete risk exposure pathways at the Facility. A screening level risk assessment was then conducted to evaluate the data collected during the RI to determine:

- Whether a baseline risk assessment would be needed to complete the evaluation of the data;
- Whether COPCs or CPECs in upland soil or groundwater presented unacceptable risks to possible human or ecological receptors at the Facility; and
- Whether source control measures proposed at the site also present potential unacceptable risk to human or terrestrial receptors on the banks of Wheeler Bay.

The HHRA and ERA screening processes were conducted in accordance with DEQ guidance and used conservative screening level benchmarks.

Results of the screening level processes indicate that a baseline risk assessment was not needed. This conclusion is based on three primary considerations: (1) risk screening levels, which adopt highly conservative (i.e., protective) assumptions about site exposure, did not reveal significant site-wide risks for either human health or ecological receptors; (2) when actual site conditions and site use are considered, potential exposure and risk do not warrant site-wide risk management actions; and (3) focused SCMs have been identified that will also effectively reduce potential unacceptable risk to human and terrestrial receptors.

Conclusions for human health are based on a screening-level analysis to identify COPCs, and a streamlined quantitative exposure and risk analysis was used to estimate risks for the COPCs identified in the screen. The quantitative analyses for the HHRA revealed risks are within acceptable limits based on Oregon environmental cleanup regulations, with the exception of three localized areas of surface soil and one subsurface area of soil, each containing PAHs. The three surface soil areas include the areas adjacent to surface soil sampling locations S-12 and S-13 on OU1; a very small surface area near sampling location S-14 on OU2; and the riverbank of Wheeler Bay. The deeper soil area is associated with the former cesspools at OU1 and consists of PAHs in soil deeper than 13 feet. The risk assessment concluded that current risk posed by the presence of the PAHs is within the DEQ acceptable range because the areas are not accessed often (if at all, in the case of the deeper soil). The only potential for unacceptable risk is with possible future use of these areas consistent with typical occupational exposure. Further, the small area near S-14 was adjacent to a utility pole; the utility pole was removed and the soil covered during the recent rail expansion work at OU2, effectively mitigating the risk posed by the PAHs. Soil on the riverbank is being capped and stabilized as a SCM which will also effectively mitigate potential risk associated with occupational exposure to PAHs in this area. A focused feasibility study can be performed to determine the appropriate remedial action for the surface soil near locations S-12 and S-13, and the deeper soil of the former cesspool.

Conclusions for ecological health are based on information gathered during the Level I Scoping and Level II Screening for the ERA processes. COIs in upland soil and groundwater are unlikely to pose unacceptable risks to possible terrestrial receptors. The SCM planned for the riverbank area to

reduce potential transport to the river will also effectively mitigate the limited risk posed by the higher constituent concentrations to potential terrestrial receptors. The results do not support that further remedial action (with the exception of the SCM) is needed to protect ecological receptors at the Facility.

9.3 Summary and Conclusions from Source Control Evaluation

The groundwater monitoring results and screening evaluation of the data obtained support that there are no COPCs at the Facility at concentrations that could pose unacceptable risk to the river. The COPCs were detected infrequently and sporadically in the groundwater samples, and the detections appeared primarily due to sampling variability not groundwater conditions. Based on these results, no source control measures for groundwater are needed.

Concentrations of some PAHs, metals, and pesticides exceeded JSCS guidance screening levels for erodable soil migration to the river. Based on recommendations supplied in the draft RI report (BBL/ACA/NF, 2006) and subsequent discussions with DEQ staff following that submittal, a source control alternatives evaluation was conducted for these erodable bank areas (ACA/NF, 2007).. The source control alternatives evaluation recommended a bank capping, stabilization and re-vegetation alternative that ties into the EA sediment cap planned for the area. DEQ accepted this alternative in an email dated March 8, 2007 (DEQ, 2007).

The stormwater evaluation program is continuing and results of that evaluation will be contained in a separate report.

9.4 Recommendations

To address the PAHs in two limited areas in OU1, a focused feasibility study is recommended to evaluate and select an appropriate remedial option.

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TABLE 1
AREAS OF CONCERN, RI ACTIVITIES, AND ANALYTICAL METHODS

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

AOC Number	AOC Name	Operable Unit	Subarea	Accuracy of Location [1]	Description	Summary of RI Activities	Analytical Program [2]	Exploration or Sample Designations [3]	Number of Samples Planned [4]								
									Surface Soil			Subsurface Soil			Groundwater		
									Phase I	Phase II	Phase III	Phase I	Phase II	Phase III	Phase I	Phase II	Phase III
1	Cargill T-45	OU1	Former Cargill Leasehold	Exact	Cargill Tank #45: 675-gallon, steel, diesel AST, removed in September, 2003. Locomotive and other small equipment fueling. Adsorbent material observed on ground near former tank location.	Drill one boring adjacent to former AST.	HCID+, VOCs, PAHs	T4S1SB-09	--	1	--	--	--	--	--	1	--
5	Cargill T-22	OU1	Former Cargill Leasehold	Approx.	Cargill Tank #22: 500-gallon, 'Heater' Fuel Oil UST, DEQ file # 401. Tank was located in the basement of the Grain Storage Building in an area with limited access. Surface is paved.	UST was reported to be in basement of building and is inaccessible. Other borings and monitoring wells will be installed at locations across and downgradient of this AOC.	None	--	--	--	--	--	--	--	--	--	--	--	--
6	Cargill T-23	OU1	Former Cargill Leasehold	Approx.	Cargill Tank #23: 1,000-gallon, Diesel UST, DEQ file # 401. Located southwest of the headhouse. Reportedly removed in 1989.	Drill two borings adjacent to former UST.	HCID+, VOCs, PAHs	T4S1SB-10	--	--	--	--	1	--	--	1	--
								T4S1SB-11	--	--	--	--	1	--	--	1	--
7	Cargill T-85	OU1	Former Cargill Leasehold	Approx.	Cargill Tank #85 (may be same as #22): Used oil, removed in 1993, DEQ file # 401.	Drill two borings adjacent to former UST.	HCID+, VOCs, PAHs, PCBs, Metals	T4S1SB-12	--	(1)	--	--	1	--	--	1	--
								T4S1SB-13	--	--	--	--	1	--	--	1	--
9	Railroad Track Staining Area	OU1	Former Cargill Leasehold	Exact	Tracks between Berth 401 and the Track Shed. Track staining was identified by URS and ATC during their site reconnaissances.	Drill one monitoring well and two soil borings downgradient of the railroad tracks. Drill three borings adjacent to the railroad tracks.	HCID+, VOCs, SVOCs, PAHs	T4S1MW-07	--	--	--	--	--	--	1	1	--
								T4S1SB-01	--	--	--	--	--	--	1	--	--
								T4S1SB-02	--	--	--	--	--	--	1	--	--
								T4S1SB-14	--	1	--	--	--	--	--	1	--
								T4S1SB-15	--	1	--	--	--	--	--	1	--
								T4S1SB-16	--	1	--	--	--	--	--	1	--
10	Cargill Hydraulic Pump Area Staining	OU1	Former Cargill Leasehold	Exact	Staining around the two hydraulic pump units was identified by URS and ATC during the site reconnaissance.	Drill one monitoring well downgradient of and two borings adjacent to the hydraulic pumps.	HCID+, VOCs, PAHs, PCBs (Phase III = Metals, OCP, and OPP)	T4S1MW-08	--	--	--	--	--	--	1	1	1
								T4S1SB-03	--	--	--	--	--	--	1	--	--
								T4S1SB-17	--	1	--	--	--	--	--	--	--
								T4S1SB-18	--	1	--	--	--	--	--	--	--
11	Cargill Former Deep Well	OU1	Former Cargill Leasehold	Known	1953 drawing shows the well supplied water to the Dust House. Well was filled in 1992 with cement according to Oregon Water Well Report dated April 27, 1992. Field notes indicate approximately 7 feet of oil seen on top of water, beginning at 27 feet bgs. Spencer Environmental pumped 307 gallons of "product" from the well.	Drill monitoring well adjacent to and two borings downgradient of former well.	TPH-Gx, TPH-Dx, VOCs, PAHs (Phase III = Metals, OCP, and OPP)	T4S1MW-17	--	--	--	--	--	--	1	1	1
								T4S1SB-03	--	--	--	--	--	--	(1)	--	--
								T4S1SB-04	--	--	--	--	--	--	1	--	--
12	General Pesticide Usage	OU1	Former Cargill Leasehold	General	Pesticides used in Cargill operations. Quantities, types, and storage areas not known.	Review procedures for pesticide use, including quantity and type. Collect 8 surface soil samples for pesticide analysis in locations where they were applied and randomly within grain storage area.	OCP, OPP	T4S1S-1 through T4S1S-4	--	4	--	--	--	--	--	--	--
								T4S1SB-12	--	1	--	--	--	--	--	--	--
								T4S1SB-19	--	1	--	--	--	--	--	--	--
								T4S1SB-20	--	1	--	--	--	--	--	--	--
								T4S1SB-32	--	(1)	--	--	--	--	--	--	--
13	Former Transformer House	OU1	Former Cargill Leasehold: Southwest of Grain Storage Area	Known	Built ~1918, had below-ground transformer storage. Demolished in 1977. Transformer type not known.	Drill two borings within footprint of former transformer house.	TPH-Dx, PAHs, PCBs	T4S1SB-19	--	(1)	--	--	1	--	--	1	--
								T4S1SB-20	--	(1)	--	--	1	--	--	1	--
14	Cargill Basement Level Sumps	OU1	Former Cargill Leasehold: Cargill Rail Car Tipper Sump	Exact	Cargill Rail Car Tipper Sump contained "discolored and odorous" liquid (likely groundwater) observed during Facility walk. Additional sump at Truck Tipper Scale.	Drill one monitoring well and two borings downgradient of and one boring adjacent to sumps. (Phase III = Drill one soil boring adjacent to the location of SB-85)	HCID+, VOCs, PAHs, PCBs (Phase III = PAHs)	T4S1MW-08	--	--	--	--	--	--	(1)	(1)	--
								T4S1SB-03	--	--	--	--	--	--	(1)	--	--
								T4S1SB-04	--	--	--	--	--	--	(1)	--	--
								T4S1SB-85	--	--	--	--	--	--	--	1	--
								T4S1SB-88	--	--	--	--	--	1	--	--	--
15	Abandoned Cesspools	OU1	Former Cargill Leasehold: Several locations	4 Known, 2 Approx.	4 cesspools identified on maps west of the grain storage silos were labeled as demolished. 2 cesspools (south of the Cargill Truck Dump and west of the former Millwright Shop) were noted on undated Cargill blueprints.	Drill five borings adjacent to former cesspools. (Phase III = Drill one monitoring well downgradient of borings SB-84 and SB-85)	TPH-Dx, VOCs, PAHs, PCBs, OCP, OPP, Metals (if VOC pattern suggest gasoline, analysis will include TPH-Gx) (Phase III = Metals, PAHs, OCP, and OPP)	T4S1SB-21	--	--	--	--	1	--	--	1	--
								T4S1SB-22	--	--	--	--	1	--	--	1	--
								T4S1SB-23	--	--	--	--	1	--	--	1	--
								T4S1SB-24	--	--	--	--	1	--	--	1	--
								T4S1SB-84	--	--	--	--	1	--	--	1	--
								T4S1MW-26	--	--	--	--	--	--	--	--	1
16	Cargill Malathion Mixing Area	OU1	Former Cargill Leasehold: West of Cargill Grain Facility Building	Exact	Room used for bulk Malathion™ storage (in drums) and mixing the Malathion™ with grain prior to shipment. Application ceased in 1997. One HAZMAT response recorded for worker exposure resulting in illness. Odor observed by ATC and URS during site reconnaissance.	Drill four borings adjacent to Malathion mixing area. Because this is a surface feature, if significant pesticides are not detected in either surface soil or groundwater, area will no longer be considered an AOC.	OCP, OPP	T4S1SB-25	--	1	--	--	--	--	--	1	--
								T4S1SB-26	--	1	--	--	--	--	--	1	--
								T4S1SB-27	--	1	--	--	--	--	--	1	--
								T4S1SB-28	--	1	--	--	--	--	--	1	--
17	Cargill Former Millwright Shop and Compressor House	OU1	Former Cargill Leasehold: West of Flour Mill	Exact	1961 historic maps show UST, compressor and sump, and possible UST (no confirmation on 500-gallon heating oil UST in other documents). Information regarding chemical handling has not yet been identified.	Drill four borings adjacent to former millwright shop and compressor house.	TPH-Gx, TPH-Dx, VOCs, PAHs	T4S1SB-25	--	(1)	--	--	--	--	--	(1)	--
								T4S1SB-26	--	(1)	--	--	--	--	--	(1)	--
								T4S1SB-27	--	(1)	--	--	--	--	--	(1)	--
								T4S1SB-28	--	(1)	--	--	--	--	--	(1)	--
18	Cargill Hydraulic Oil Releases	OU1	Former Cargill Leasehold: Pump house near Cargill Truck Inspection Canopy and	Exact	Remediation conducted at C-10 location but not complete. Excavations exposed during June 2003 Facility walk. November 2003 excavation left contaminated soil on-site due to access limitations. Regulatory status of release not known. No		HCID+	T4S1SB-29	--	--	--	--	1	--	--	1	--
								T4S1SB-30	--	--	--	--	1	--	--	1	--

Please refer to notes at end of table.

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TABLE 1
AREAS OF CONCERN, RI ACTIVITIES, AND ANALYTICAL METHODS

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

AOC Number	AOC Name	Operable Unit	Subarea	Accuracy of Location [1]	Description	Summary of RI Activities	Analytical Program [2]	Exploration or Sample Designations [3]	Number of Samples Planned [4]								
									Surface Soil			Subsurface Soil			Groundwater		
									Phase I	Phase II	Phase III	Phase I	Phase II	Phase III	Phase I	Phase II	Phase III
19	Former Blacksmith Shop	OU1	Former Cargill Leasehold	Known	1924 Sanborn Fire Insturance map shows shop layout, with general storage, carpetry, tractor storage, and a blacksmith shop. May have used fuel for a furnace or other equipment.	Drill three borings within footprint of former blacksmith shop.	TPH-Gx, TPH-Dx, VOCs, PAHs, Metals	T4S1SB-31	--	1	--	--	--	--	--	1	--
								T4S1SB-32	--	1	--	--	--	--	--	1	--
								T4S1SB-33	--	1	--	--	--	--	--	1	--
20	Cereal Foods T-19	OU1	Cereal Foods Leasehold	Approx.	Cereal Foods Tank #19: 10,000-gallon, Fuel Oil #5 UST. DEQ file # 447. Tank decommissioned (date unknown).	Drill two borings at former fuel oil UST, one at each end of the UST.	HCID+, VOCs, PAHs	T4S1SB-34	--	--	--	--	1	--	--	1	--
								T4S1SB-35	--	--	--	--	1	--	--	1	--
21	Cereal Foods T-20	OU1	Cereal Foods Leasehold	Approx.	Cereal Foods Tank #20: 1,000-gallon, Diesel UST, removed in approximately 1989, DEQ file # 447. Tank decommissioned by removal in 1989.	Drill two borings adjacent to former diesel UST.	HCID+, VOCs, PAHs	T4S1SB-36	--	--	--	--	1	--	--	1	--
								T4S1SB-37	--	--	--	--	1	--	--	1	--
22	Cereal Foods T-21	OU1	Cereal Foods Leasehold	Approx.	Cereal Foods Tank #21: 1,000-gallon, Fuel Oil #2 UST, DEQ field # 447. Tank decommissioned (date unknown).	Drill two borings adjacent to former fuel oil UST.	HCID+, VOCs, PAHs	T4S1SB-38	--	--	--	--	1	--	--	1	--
								T4S1SB-39	--	--	--	--	1	--	--	1	--
24	Cafeteria Oil Storage UST	OU1	-	General	Fuel oil-storage UST shown in 1965 historical drawing, adjacent to former cafeteria.	As location can only be generally located, drill two borings downgradient (southwest) of the former building.	TPH-Dx, VOCs, PAHs	T4S1SB-40	--	--	--	--	1	--	--	1	--
								T4S1SB-41	--	--	--	--	1	--	--	1	--
25	Waste Pile	OU1	One pile observed in western portion of Facility	Exact	Pile contained tires, scrap metal, railroad ties, and other debris that has been removed. Period of use, historical disposal practice not yet identified.	Drill one boring in former waste pile area.	HCID+, VOCs, SVOCs, PAHs, PCBs, Metals	T4S1SB-42	--	1	--	--	--	--	--	1	--
26	Former Gas Fueling Station	OU1	Along southern boundary of Carroll Road	Approx.	Used by U.S. Army Transport Service during WWII. Very little information regarding period of use, gas tank location, fueling practices.	Drill two borings adjacent to former gas fueling station.	TPH-Gx, TPH-Dx, VOCs, PAHs, Metals	T4S1SB-43	--	--	--	--	--	--	--	1	--
								T4S1SB-44	--	--	--	--	--	--	--	1	--
27	Former Transformer Handling Area	OU1	Western boundary, former Warehouse No. 5	Approx.	Former PCB material handling area. Interviews indicate staining of soils in the vicinity of PCB-containing equipment load/unload ramp.	Drill one monitoring well downgradient of and three borings within the footprint of former transformer handling area.	HCID+, PAHs, PCBs	T4S1MW-01s	--	--	--	--	--	--	1	1	--
								T4S1S-31	--	--	1	--	--	--	--	--	--
								T4S1SB-45	--	1	--	--	--	--	--	1	--
								T4S1SB-46	--	1	--	--	--	--	--	1	--
								T4S1SB-47	--	1	--	--	--	--	--	1	--
28	Possible Drum Burial Area	OU1	Western portion of Facility	Approx.	A past employee alleged that the area west of the Cargill office contained buried drums. An investigation including geophysical testing (in 1993) was performed and anomalies were discovered.	Drill three borings within footprint of possible drum burial area.	TPH-Gx, TPH-Dx, VOCs, PAHs, PCBs, OCP, OPP, Metals (Surface soil will be analyzed for PAHs, PCBs, pesticides, and metals to provide analytical coverage across the Facility).	T4S1SB-48	--	1	--	--	--	--	--	1	--
								T4S1SB-49	--	1	--	--	--	--	--	1	--
								T4S1SB-50	--	1	--	--	--	--	--	1	--
29	Schnitzer Auto Fluff Area	OU1	Northern property boundary	General	Auto demolition occurring at Schnitzer Steel results in dust and airborne particulate dispersion on OU1 property.	Collect three surface soil samples. Well T4S1MW-24 will be sampled used to assess for metals impacts to groundwater.	HCID+, SVOCs, PCBs, Metals	T4S1S-5	--	1	--	--	--	--	--	--	--
								T4S1S-6	--	1	--	--	--	--	--	--	--
								T4S1S-7	--	1	--	--	--	--	--	--	--
								T4S1MW-24	--	--	--	--	--	--	--	(1)	--
54	Hall-Buck T-24	OU2	Kinder Morgan Leasehold	General	Hall-Buck Tank #24: 10,000-gallon UST, contents unknown (possibly gasoline). Reportedly decommissioned (date unknown). May be same tank as tank T-43 (an active Kinder Morgan UST). West side of Building 434.	Drill two borings adjacent to former UST.	HCID+, VOCs, PAHs, PCBs, Metals	T4S1SB-51	--	--	--	--	1	--	--	1	--
								T4S1SB-52	--	--	--	--	1	--	--	1	--
57	Kinder Morgan Former Railcar Wash Area	OU2	Kinder Morgan Leasehold: South of Soda Ash Storage Building	Exact	Interview with Port personnel indicates presence of former rail car wash area. Photos from 1988 show wash down occurring in the area (no rail car visible).	Drill one monitoring well downgradient of and two borings adjacent to rail car wash.	TPH-Gx, TPH-Dx, VOCs, PAHs, Metals	T4S1MW-16	--	--	--	--	--	--	1	1	--
								T4S1SB-53	--	1	--	--	--	--	--	1	--
								T4S1SB-54	--	1	--	--	--	--	--	1	--
58	T-26	OU2	West side of Building 334	Approx.	Tank #26: Size unknown, gasoline UST. Tank management manual indicates the tank was removed with no documentation of the removal date (date unknown).	Drill one monitoring well downgradient of and two borings adjacent to former UST. Surface samples will be collected for general site coverage.	HCID+, VOCs, PAHs, Metals	T4S1MW-11	1	--	--	--	--	--	1	1	--
								T4S1SB-55	--	1	--	--	1	--	--	1	--
								T4S1SB-56	--	1	--	--	1	--	--	1	--
60	City CPD T-44	OU2	West side of Building 334	Approx.	City CPD Tank #44: Size unknown, diesel UST, reportedly removed (date unknown). May be same tank as AOC 58.	Drill one monitoring well downgradient of and two borings adjacent to former UST.	HCID+, VOCs, PAHs, Metals	T4S1MW-11	(1)	--	--	--	--	--	(1)	(1)	--
								T4S1SB-57	--	--	--	--	1	--	--	1	--
								T4S1SB-58	--	--	--	--	1	--	--	1	--
61	Groundwater Seeps	OU2	Below Base of Ro-Ro Dock	Known	Observed by DEQ during a 4/30/01 Facility visit. Three small seeps observed by HAI in November 2002, but no sheen. HAI collected 4 grab samples. Two PAHs detected above SLVs. No source of sheen identified.	Drill two borings and three monitoring wells immediately upgradient of groundwater seeps.	TPH-Gx, TPH-Dx, VOCs, PAHs, OCP, OPP	T4S1MW-03s	--	--	--	--	--	--	1	1	--
								T4S1MW-09	--	--	--	--	--	--	1	1	--
								T4S1MW-10	--	--	--	--	--	--	1	1	--
								T4S1SB-05	--	--	--	--	--	--	1	--	--
								T4S1SB-06	--	--	--	--	--	--	1	--	--
62	Sloped Truck Scale with Sump	OU2	North of IRM offices	Approx.	Truck scale shown as sloped, with sump at the bottom. Sump discharges to surface infiltration area. Currently in use by IRM.	Drill two monitoring wells and one boring downgradient of and two borings adjacent to truck scale with sump.	TPH-Gx, TPH-Dx, VOCs, PAHs, Metals	T4S1MW-09	--	--	--	--	--	--	(1)	(1)	--
								T4S1MW-10	--	--	--	--	--	--	(1)	(1)	--
								T4S1SB-05	--	--	--	--	--	--	(1)	--	--
								T4S1SB-59	--	--	--	--	--	--	--	1	--
								T4S1SB-60	--	--	--	--	--	--	--	1	--

Please refer to notes at end of table.

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TABLE 1
AREAS OF CONCERN, RI ACTIVITIES, AND ANALYTICAL METHODS

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

AOC Number	AOC Name	Operable Unit	Subarea	Accuracy of Location [1]	Description	Summary of RI Activities	Analytical Program [2]	Exploration or Sample Designations [3]	Number of Samples Planned [4]								
									Surface Soil			Subsurface Soil			Groundwater		
									Phase I	Phase II	Phase III	Phase I	Phase II	Phase III	Phase I	Phase II	Phase III
63	Former Ore/Product Handling and Storage Locations	OU2	Pier 2 and Pier 4	General	Materials stored/handled on site until 1996. Included ore, sulfur, coal, soda ash, petroleum, manganese, tallow, and lead.	Drill four monitoring wells, two borings, and collect six surface soil samples within footprint of former ore/product handling and storage locations.	Metals	T4S1MW-12	1	--	--	--	--	--	1	1	--
								T4S1MW-13	1	--	--	--	--	--	1	1	--
								T4S1MW-15	1	--	--	--	--	--	1	1	--
								T4S1MW-16	1	--	--	--	--	--	(1)	(1)	--
								T4S1SB-07	1	--	--	--	--	--	1	--	--
								T4S1SB-08	1	--	--	--	--	--	1	--	--
64	Former Leckenby Fumigation Plant	OU2	West of IRM tank farm	Approx.	1923-1955; used to fumigate Asian cotton or "other commodities requiring reconditioning i.e. peanuts, rice, beans, and other foodstuffs".	Drill two monitoring wells and one soil boring downgradient of and two borings adjacent to former fumigation plant.	OCP, OPP, Metals, and VOCs (VOCs only in groundwater)	T4S1MW-10	--	--	--	--	--	--	(1)	(1)	--
								T4S1MW-11	(1)	--	--	--	--	--	(1)	(1)	--
								T4S1SB-06	--	--	--	--	--	--	(1)	--	--
								T4S1SB-61	--	1	--	--	--	--	--	1	--
								T4S1SB-62	--	1	--	--	--	--	--	1	--
65	Former ATS Disinfestation Plant	OU2	May be same location as AOC 64	Approx.	Specific location not known (indication that it was east of Warehouse No. 1, OU2). Built in 1943, used by U.S. Government Army Transport Service for delousing soldiers and POWs and their belongings. An Army directive from 1944 instructed military installations to use methyl bromide.	Drill two monitoring wells and one soil boring downgradient of and two borings adjacent to former disinfestation plant.	OCP, OPP, Metals, and VOCs (VOCs only in groundwater)	T4S1MW-10	--	--	--	--	--	--	(1)	(1)	--
								T4S1MW-11	(1)	--	--	--	--	--	(1)	(1)	--
								T4S1SB-06	--	--	--	--	--	--	(1)	--	--
								T4S1SB-61	--	(1)	--	--	--	--	--	(1)	--
								T4S1SB-62	--	(1)	--	--	--	--	--	(1)	--
67	Gearlocker and Maintenance Building	OU2	Rogers Terminal Building	General	Housed blacksmith, auto, paint, electrical, oil room, carpenter shops. Exit and area outside of auto shop showed soil staining, as reported by Port personnel. Types and quantities of materials used not yet known.	Drill two monitoring wells downgradient of and six borings around margin of building. (Phase III = Drill one monitoring well in the location of SB-67)	TPH-Gx, TPH-Dx, VOCs, PAHs, PCBs, Metals (Phase III Soil = TPH-Dx and PAHs, Phase III GW = PAHs)	T4S1MW-09	--	--	--	--	--	--	(1)	(1)	--
								T4S1MW-10	--	--	--	--	--	--	(1)	(1)	--
								T4S1SB-05	--	--	--	--	--	--	(1)	--	--
								T4S1SB-63	--	--	--	--	--	--	--	1	--
								T4S1SB-64	--	--	--	--	--	--	--	1	--
								T4S1SB-65	--	--	--	--	--	--	--	1	--
								T4S1SB-66	--	--	--	--	--	--	--	1	--
								T4S1SB-67	--	--	--	--	--	--	--	1	--
								T4S1MW-25	--	--	--	--	--	1	--	--	1
68	Boiler House	OU2	West of Gearlocker Building	Exact	Built in 1919, still existing. Associated equipment included 2.5" below-ground gas line and fueling station.	Drill two borings adjacent to boiler house.	TPH-Gx, TPH-Dx, VOCs, PAHs	T4S1SB-68	--	--	--	--	--	--	--	1	--
								T4S1SB-69	--	--	--	--	--	--	--	1	--
69	Former PCB-Containing Transformer Locations	OU1/OU2	All locations, quantity, and period of use not known	General	Limited information available.	Review information on transformer locations. If warranted, identify locations for surface soil sampling. (Phase III = Soil samples from SB-12, SB-13, SB-14B and SB-15 through SB-19)	TPH-Dx, PAHs, PCBs (Phase III = PAHs and PCBs from S-15)	T4S1S-11 through T4S1S-14B	--	6	3	--	--	2	--	1	--
								T4S1S-15 through T4S1S-19	--	--	5	--	--	--	--	--	--
72	Railroad Alignments	OU2	--	Exact	Potential for spills and dust dispersion during ore and raw material transport. Hazardous substances found during rail maintenance work.	Drill seven borings along former railroad alignments. Borings will be installed to 5 feet.	HCID+, VOCs, SVOCs, Metals	T4S1SB-70	--	1	--	--	1	--	--	--	--
								T4S1SB-71	--	1	--	--	1	--	--	--	--
								T4S1SB-72	--	1	--	--	1	--	--	--	--
								T4S1SB-73	--	1	--	--	1	--	--	--	--
								T4S1SB-74	--	1	--	--	1	--	--	--	--
								T4S1SB-75	--	1	--	--	1	--	--	--	--
								T4S1SB-76	--	1	--	--	1	--	--	--	--
73	Berth 411 Pencil Pitch Handling	OU2	Berth 411	General	Active until 1998. Historical evidence of upland spills.	Drill one monitoring well and collect two surface soil samples within pencil pitch handling area. PCBs were added to analysis because PCBs detected in Phase I surface soil sample from MW-16.	PAHs, PCBs	T4S1MW-16	(1)	--	--	--	--	--	(1)	(1)	--
								T4S1S-8	--	1	--	--	--	--	--	--	--
								T4S1S-9	--	1	--	--	--	--	--	--	--
								T4S1S-10	--	1	--	--	--	--	--	--	--
74	Utility Storage Building	OU2	Southeast of Gearlocker	Exact	Port personnel report formerly housed some hazardous substances. Historical map notes utility storage occurred.	Drill two borings adjacent to utility storage building. (Phase III = Surface soil sampling at and adjacent to T4S1SB-77)	TPH-Gx, TPH-Dx, VOCs, SVOCs, Metals (Phase III = Lead)	T4S1SB-77	--	1	2	--	--	--	--	1	--
								T4S1SB-78	--	1	--	--	--	--	--	1	--
								T4S1S-20 through T4S1S-22	--	--	3	--	--	--	--	1	--
75	Former Car Cleaning Pit and Drain	OU2	North of IRM Offices	General	Rail car and truck cleaning areas identified on maps. Likely removed between 1992 and 1995. Area now level and covered with gravel surface.	Drill one boring and two monitoring wells downgradient of and three borings adjacent to car cleaning pit and drain.	TPH-Gx, TPH-Dx, VOCs, PAHs, Metals	T4S1MW-09	--	--	--	--	--	--	(1)	(1)	--
								T4S1MW-10	--	--	--	--	--	--	(1)	(1)	--
								T4S1SB-05	--	--	--	--	--	--	(1)	--	--
								T4S1SB-79	--	--	--	--	1	--	--	1	--
								T4S1SB-80	--	--	--	--	1	--	--	1	--
								T4S1SB-81	--	--	--	--	1	--	--	1	--
76	Cargill Former Machinery Shop	OU1	Former Cargill Leasehold	Approx.	No record of practices associated with these buildings.	Drill two borings within footprint of former machinery shop.	TPH-Gx, TPH-Dx, VOCs, PAHs, PCBs	T4S1SB-82	--	1	--	--	--	--	--	1	--
								T4S1SB-83	--	1	--	--	--	--	--	1	--
77	Cold Storage Plant UST	OU1	Former Cargill Leasehold	Approx.	Historic Port drawing shows 2,500 gallon oil UST adjacent to former cold storage plant. UST was removed.	Drill two borings adjacent to former UST.	HCID+, VOCs, PAHs	T4S1SB-86	--	--	--	--	1	--	--	1	--
								T4S1SB-87	--	--	--	--	1	--	--	1	--

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									Surface Soil			Subsurface Soil			Groundwater		
									Phase I	Phase II	Phase III	Phase I	Phase II	Phase III	Phase I	Phase II	Phase III
78	Storm Drain Catch Basin	OU1	Former Cargill Leasehold	Exact	Longshoreman reported a storm water catch basin that was used to dump waste/excess pesticides.	Drill one boring adjacent to catch basin.	TPH-Dx, PAHs, OCP, OPP, and Metals	T4S1SB-89	--	--	--	--	--	1	--	--	--
79	Pump at Cargill with Hydraulic Oil Leak	OU1	Former Cargill Leasehold	Approx.	A pump located in the center of the large grain storage tank area was identified by the longshoremen as leaking hydraulic oil.	Drill one boring adjacent to former pump location.	TPH-Dx	T4S1SB-91	--	--	--	--	--	1	--	--	--
80	Storm Drain Catch Basin	OU1	Former Cargill Leasehold	Exact	Longshoreman reported a storm water catch basin that was used to dump waste/excess pesticides.	Drill one boring adjacent to catch basin.	TPH-Dx, PAHs, OCP, OPP, and Metals	T4S1SB-90	--	--	--	--	--	1	--	--	--
81	Creosote Waste Area	OU1	Former Cargill Leasehold	Approx.	Longshoreman identified two unpaved areas as "dump" sites for creosote-coated rail ties and other waste.	Drill two borings in waste area.	TPH-Dx, PAHs, OCP, OPP, and Metals	T4S1SB-92	--	--	--	--	--	1	--	--	--
								T4S1SB-93	--	--	--	--	--	1	--	--	--
82	Creosote Waste Area	OU1	Former Cargill Leasehold	Approx.	Longshoreman identified two unpaved areas as "dump" sites for creosote-coated rail ties and other waste.	Drill two borings in waste area.	TPH-Dx, PAHs, OCP, OPP, and Metals	T4S1SB-94	--	--	--	--	--	1	--	--	--
								T4S1SB-95	--	--	--	--	--	1	--	--	--
83	Erodable Bank Areas	OU2	Wheeler Bay/South Side of Slip 1	Approx.	The areas along Wheeler Bay and the west end of the south side of Slip 1 were identified as having the potential for surface erosion.	Collect surface soil samples.	TPH-Dx, PAHs, OCP, OPP, and Metals	T4S1S-23 through T4S1S-30	--	--	8	--	--	--	--	--	--
--	Upgradient Groundwater Quality	OU1/OU2	--	--	--	Install six monitoring wells along property boundary; evaluate quality of groundwater flowing onto site.	TPH-Gx, TPH-Dx, VOCs, PAHs, Metals	T4S1MW-19 through T4S1MW-24	--	--	--	--	--	--	--	6	--
--	General Groundwater Quality and Hydrogeologic Evaluation	OU1/OU2	--	--	--	Install other monitoring wells at non-AOC-specific locations to evaluate hydrogeology and groundwater quality.	TPH-Gx, TPH-Dx, VOCs, PAHs	T4S1MW-02s, T4S1MW-04s, T4S1MW-14, T4S1MW-18	--	--	--	--	--	--	4	4	--

Notes:

1. Accuracy of Location uses the four relative terms, explained as follows:
   Exact = The AOC is visible and/or locatable in the field.
   Known = Documentation is available that describes or shows the AOC location or may include measurements.
   Approx. = AOC location can be approximated to a relatively small area based on documentation.
   General = AOC is general in nature (i.e., widespread area) or AOC location can only be generally located.
2. Analytical methods:
   HCID= Hydrocarbon Identification by Method NWTPH-HCID. If HCID analysis indicates the presence of TPH, quantification by TPH-Gx and/or TPH-Dx will be conducted in the indicated carbon range.
   TPH-Gx = Gasoline Range Organics by Method NWTPH-Gx.
   TPH-Dx = Diesel and Heavy Oil Range Organics by Method NWTPH-Dx.
   Metals = EPA Method 6020/7470A/7471A (total and dissolved).
   OCP = Organochlorine Pesticides by EPA Method 8081A.
   OPP = Organophosphorus Pesticides by EPA Method 8141A.
   PAHs = Polynuclear Aromatic Hydrocarbons by EPA Method 8270C-SIM.
   PCBs = Polychlorinated Biphenyls by EPA Method 8082.
   SVOCs = Semivolatile Organic Compounds by EPA Method 8270C.
   VOCs = Volatile Organic Compounds by EPA Method 8260B.
3. Figure 1 illustrates the proposed locations of the borings
4. Values in parenthesis identify samples that are previously accounted for at other AOCs; this allows for total count of samples to be taken from table (e.g., samples in parenthesis will not be double-counted).
5. -- = Not applicable or not in scope.

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TABLE 2
GROUNDWATER ELEVATION DATA

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Well ID	Date	Total Depth of Well (ft BTOC)	Northing	Easting	Casing Elevation (ft above MSL)	Depth to Water (ft BTOC)	Ground Water Elevation (ft above MSL)
T4S1MW-01s	5/21/2004	35.30	715157.7	7618979.3	31.37	23.92	7.45
	7/16/2004					26.20	5.17
	8/30/2004					25.57	5.80
	9/30/2004					26.53	4.84
	10/29/2004					25.78	5.59
	11/30/2004					26.63	4.74
	2/1/2005					24.55	6.82
	2/28/2005					24.01	7.36
	4/1/2005					23.50	7.87
	5/2/2005					24.93	6.44
	6/1/2005					23.65	7.72
	7/1/2005					24.61	6.76
	8/1/2005					25.76	5.61
	9/14/2005					27.63	3.74
T4S1MW-02s	5/21/2004	30.26	714999.8	7621229	35.18	17.77	17.41
	7/16/2004					18.75	16.43
	8/30/2004					19.02	16.16
	9/30/2004					19.29	15.89
	10/29/2004					19.50	15.68
	11/30/2004					19.54	15.64
	2/1/2005					19.17	16.01
	2/28/2005					18.96	16.22
	4/1/2005					19.10	16.08
	5/2/2005					18.83	16.35
	6/1/2005					18.58	16.60
	7/1/2005					18.61	16.57
	8/1/2005					18.87	16.31
	9/14/2005					19.35	15.83
T4S1MW-03s	5/21/2004	30.26	714749.8	7620500.8	32.79	19.05	13.74
	7/16/2004					19.56	13.23
	8/30/2004					19.59	13.20
	9/30/2004					19.80	12.99
	10/29/2004					19.90	12.89
	11/30/2004					19.91	12.88
	2/1/2005					19.63	13.16
	2/28/2005					Warehouse Demo	
	4/1/2005					Warehouse Demo	
	5/2/2005					Warehouse Demo	
	6/1/2005					19.18	13.61
	7/1/2005					19.30	13.49
	8/1/2005					19.53	13.26
	9/14/2005					19.88	12.91
T4S1MW-04s	5/21/2004	43.26	714009.9	7619894	31.23	23.97	7.26
	7/16/2004					26.31	4.92
	8/30/2004					29.97	1.26
	9/30/2004					27.15	4.08
	10/29/2004					25.94	5.29
	11/30/2004					26.74	4.49
	2/1/2005					25.65	5.58
	2/28/2005					24.72	6.51
	4/1/2005					22.82	8.41
	5/2/2005					24.50	6.73
	6/1/2005					24.51	6.72
	7/1/2005					24.62	6.61
	8/1/2005					25.94	5.29
	9/14/2005					27.89	3.34

Please refer to notes at end of table.

TABLE 2
GROUNDWATER ELEVATION DATA

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Well ID	Date	Total Depth of Well (ft BTOC)	Northing	Easting	Casing Elevation (ft above MSL)	Depth to Water (ft BTOC)	Ground Water Elevation (ft above MSL)
T4S1MW-07	5/21/2004	38.95	714952.7	7618940.6	30.76	23.16	7.60
	7/16/2004					25.22	5.54
	8/30/2004					24.82	5.94
	9/30/2004					25.78	4.98
	10/29/2004					25.16	5.60
	11/30/2004					26.02	4.74
	2/1/2005					25.10	5.66
	2/28/2005					25.16	5.60
	4/1/2005					22.86	7.90
	5/2/2005					24.43	6.33
	6/1/2005					23.62	7.14
	7/1/2005					24.02	6.74
	8/1/2005					25.03	5.73
	9/14/2005					26.91	3.85
T4S1MW-08	5/21/2004	30.19	714907.7	7619696.7	31.39	20.31	11.08
	7/16/2004					20.52	10.87
	8/30/2004					20.95	10.44
	9/30/2004					21.28	10.11
	10/29/2004					21.18	10.21
	11/30/2004					20.68	10.71
	2/1/2005					20.25	11.14
	2/28/2005					21.25	10.14
	4/1/2005					20.51	10.88
	5/2/2005					20.35	11.04
	6/1/2005					18.88	12.51
	7/1/2005					19.40	11.99
	8/1/2005					20.17	11.22
	9/14/2005					21.22	10.17
T4S1MW-09	5/21/2004	30.08	714627.9	7620525.8	33.35	19.22	14.13
	7/16/2004					19.82	13.53
	8/30/2004					19.80	13.55
	9/30/2004					20.00	13.35
	10/29/2004					20.11	13.24
	11/30/2004					20.12	13.23
	2/1/2005					19.87	13.48
	2/28/2005					19.88	13.47
	4/1/2005					19.69	13.66
	6/1/2005					19.53	13.82
	7/1/2005					19.60	13.75
	8/1/2005					19.72	13.63
	9/14/2005					20.00	13.35
T4S1MW-10	5/21/2004	20.17	714471.7	7620519.9	22.02	8.33	13.69
	7/16/2004					8.84	13.18
	8/30/2004					8.75	13.27
	9/30/2004					8.95	13.07
	10/29/2004					9.05	12.97
	11/30/2004					9.08	12.94
	2/1/2005					8.98	13.04
	2/28/2005					8.93	13.09
	4/1/2005					8.66	13.36
	5/2/2005					8.71	13.31
	6/1/2005					8.61	13.41
	7/1/2005					8.60	13.42
	8/1/2005					8.73	13.29
	9/14/2005					8.98	13.04

Please refer to notes at end of table.

TABLE 2
GROUNDWATER ELEVATION DATA

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Well ID	Date	Total Depth of Well (ft BTOC)	Northing	Easting	Casing Elevation (ft above MSL)	Depth to Water (ft BTOC)	Ground Water Elevation (ft above MSL)
T4S1MW-11	5/21/2004	27.11	714223.3	7620492.2	32.09	16.89	15.20
	7/16/2004					17.63	14.46
	8/30/2004					17.59	14.50
	9/30/2004					17.79	14.30
	11/30/2004					17.99	14.10
	10/29/2004					17.93	14.16
	2/1/2005					17.67	14.42
	2/28/2005					17.69	14.40
	4/1/2005					17.52	14.57
	5/2/2005					17.41	14.68
	6/1/2005					17.21	14.88
	7/1/2005					17.26	14.83
	8/1/2005					17.45	14.64
	9/14/2005					17.80	14.29
T4S1MW-12	5/21/2004	40.20	714247.9	7619783	33.63	26.14	7.49
	7/16/2004					28.28	5.35
	8/30/2004					27.32	6.31
	9/30/2004					29.32	4.31
	10/29/2004					28.18	5.45
	11/30/2004					28.99	4.64
	2/1/2005					28.21	5.42
	2/28/2005					27.51	6.12
	4/1/2005					25.44	8.19
	5/2/2005					26.74	6.89
	6/1/2005					26.63	7.00
	7/1/2005					26.82	6.81
	8/1/2005					27.59	6.04
	9/14/2005					29.94	3.69
T4S1MW-13	5/21/2004	35.06	714225.7	7619281.2	31.75	24.04	7.71
	7/16/2004					26.22	5.53
	8/30/2004					25.71	6.04
	9/30/2004					26.71	5.04
	10/29/2004					26.13	5.62
	11/30/2004					26.98	4.77
	2/1/2005					26.28	5.47
	2/28/2005					26.27	5.48
	4/1/2005					23.71	8.04
	5/2/2005					25.66	6.09
	6/1/2005					24.98	6.77
	7/1/2005					25.06	6.69
	8/1/2005					25.96	5.79
	9/14/2005					27.82	3.93
T4S1MW-14	5/21/2004	28.99	714031.6	7619687.1	28.97	21.42	7.55
	7/16/2004					23.48	5.49
	8/30/2004					23.32	5.65
	9/30/2004					23.82	5.15
	10/29/2004					23.29	5.68
	11/30/2004					23.93	5.04
	2/1/2005					23.05	5.92
	2/28/2005					23.44	5.53
	4/1/2005					21.22	7.75
	5/2/2005					22.56	6.41
	6/1/2005					21.05	7.92
	7/1/2005					22.20	6.77
	8/1/2005					23.15	5.82
	9/14/2005					24.98	3.99

Please refer to notes at end of table.

TABLE 2
GROUNDWATER ELEVATION DATA

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Well ID	Date	Total Depth of Well (ft BTOC)	Northing	Easting	Casing Elevation (ft above MSL)	Depth to Water (ft BTOC)	Ground Water Elevation (ft above MSL)
T4S1MW-15	5/21/2004	39.89	713644.7	7619834.2	33.45	25.87	7.58
	7/16/2004					28.01	5.44
	8/30/2004					27.40	6.05
	9/30/2004					28.71	4.74
	10/29/2004					27.99	5.46
	11/30/2004					28.71	4.74
	2/1/2005					27.89	5.56
	2/28/2005					27.65	5.80
	4/1/2005					25.46	7.99
	5/2/2005					27.15	6.30
	6/1/2005					26.50	6.95
	7/1/2005					26.72	6.73
	8/1/2005					27.74	5.71
	9/14/2005					29.97	3.48
T4S1MW-16	5/21/2004	27.24	713565.2	7620296.1	33.01	24.59	8.42
	7/16/2004					25.17	7.84
	8/30/2004					25.40	7.61
	9/30/2004					25.20	7.81
	10/29/2004					25.16	7.85
	11/30/2004					25.21	7.80
	2/1/2005					25.31	7.70
	2/28/2005					25.33	7.68
	4/1/2005					25.28	7.73
	5/2/2005					25.29	7.72
	6/1/2005					24.10	8.91
	7/1/2005					24.82	8.19
	8/1/2005					25.33	7.68
	9/14/2005					25.50	7.51
T4S1MW-17	5/21/2004	27.52	715070.4	7620055.6	30.92	15.23	15.69
	7/16/2004					16.22	14.70
	8/30/2004					16.59	14.33
	9/30/2004					16.94	13.98
	10/29/2004					16.94	13.98
	11/30/2004					16.83	14.09
	2/1/2005					16.10	14.82
	2/28/2005					16.31	14.61
	4/1/2005					15.65	15.27
	5/2/2005					15.47	15.45
	6/1/2005					15.04	15.88
	7/1/2005					15.45	15.47
	8/1/2005					16.01	14.91
	9/14/2005					16.97	13.95
T4S1MW-18	5/21/2004	32.11	715140.6	7619354.3	32.62	25.13	7.49
	7/16/2004					26.10	6.52
	8/30/2004					27.21	5.41
	9/30/2004					27.46	5.16
	10/29/2004					27.35	5.27
	11/30/2004					27.34	5.28
	2/1/2005					26.70	5.92
	2/28/2005					26.70	5.92
	4/1/2005					26.22	6.40
	5/2/2005					25.95	6.67
	6/1/2005					23.57	9.05
	7/1/2005					25.25	7.37
	8/1/2005					unable to remove monument cover	
	9/14/2005					28.01	4.61

Please refer to notes at end of table.

TABLE 2
GROUNDWATER ELEVATION DATA

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Well ID	Date	Total Depth of Well (ft BTOC)	Northing	Easting	Casing Elevation (ft above MSL)	Depth to Water (ft BTOC)	Ground Water Elevation (ft above MSL)
T4S1MW-19	9/30/2004	31.70	715121.29	7621556.7	41.44	24.91	16.53
	10/29/2004					25.17	16.27
	11/30/2004					25.21	16.23
	2/1/2005					24.81	16.63
	2/28/2005					24.03	17.41
	4/1/2005					24.88	16.56
	5/2/2005					24.55	16.89
	6/1/2005					24.28	17.16
	7/1/2005					24.31	17.13
	8/1/2005					24.59	16.85
	9/14/2005					25.60	15.84
T4S1MW-20	8/30/2004	24.71	714335.69	7621441.4	36.86	24.16	12.70
	9/30/2004					21.35	15.51
	10/29/2004					21.61	15.25
	11/30/2004					21.64	15.22
	2/1/2005					21.08	15.78
	2/28/2005					21.03	15.83
	4/1/2005					19.47	17.39
	5/2/2005					20.71	16.15
	6/1/2005					20.40	16.46
	7/1/2005					20.36	16.50
	8/1/2005					20.68	16.18
	9/14/2005					21.21	15.65
T4S1MW-21	8/30/2004	24.90	713826	7621247.3	35.41	20.20	15.21
	9/30/2004					20.14	15.27
	10/29/2004					20.41	15.00
	11/30/2004					20.35	15.06
	2/1/2005					19.76	15.65
	2/28/2005					19.76	15.65
	4/1/2005					21.01	14.40
	5/2/2005					19.39	16.02
	6/1/2005					19.90	15.51
	7/1/2005					19.09	16.32
	8/1/2005					19.51	15.90
	9/14/2005					20.05	15.36
T4S1MW-22	8/30/2004	22.51	715327.7	7621108.5	32.85	16.06	16.79
	9/30/2004					16.33	16.52
	10/29/2004					16.53	16.32
	11/30/2004					16.58	16.27
	2/1/2005					16.24	16.61
	2/28/2005					16.26	16.59
	4/1/2005					16.27	16.58
	5/2/2005					16.00	16.85
	6/1/2005					15.77	17.08
	7/1/2005					15.85	17.00
	8/1/2005					16.10	16.75
	9/14/2005					16.53	16.32

Please refer to notes at end of table.

KMB00008298

TABLE 2
GROUNDWATER ELEVATION DATA

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Well ID	Date	Total Depth of Well (ft BTOC)	Northing	Easting	Casing Elevation (ft above MSL)	Depth to Water (ft BTOC)	Ground Water Elevation (ft above MSL)
T4S1MW-23	8/30/2004	24.66	715368.4	7620360.1	31.1	14.42	16.68
	9/30/2004					14.70	16.40
	10/29/2004					14.83	16.27
	11/30/2004					14.88	16.22
	2/1/2005					15.50	15.60
	2/28/2005					14.62	16.48
	4/1/2005					14.41	16.69
	5/2/2005					14.25	16.85
	6/1/2005					14.01	17.09
	7/1/2005					14.25	16.85
	8/1/2005					14.52	16.58
	9/14/2005					14.98	16.12
T4S1MW-24	8/30/2004	29.55	715419.1	7619301.4	30.41	29.29	1.12
	9/30/2004					25.15	5.26
	10/29/2004					25.11	5.30
	11/30/2004					24.97	5.44
	2/1/2005					23.67	6.74
	2/28/2005					24.23	6.18
	4/1/2005					23.72	6.69
	5/2/2005					23.51	6.90
	6/1/2005					21.31	9.10
	7/1/2005					22.75	7.66
	8/1/2005					23.79	6.62
	9/14/2005					25.47	4.94
T4S1MW-25	9/14/2005	20.00	7619301.4	7620895.8	30.83	15.97	14.86
	10/21/2005					16.31	14.52
	11/9/2005					15.80	15.03
	1/3/2006					14.63	16.20
T4S1MW-26	9/14/2005	25.00	7619301.4	7620070.6	29.63	19.00	10.63

Notes:
1. Vertical Datum: NGVD 29 (47) Units: U.S. Survey Feet
2. Horizontal Datum: NAD 83 (98) Units: International Feet
3. MSL = Mean Sea Level.
4. BTOC = Below Top of Casing.

TABLE 3
SOIL SAMPLE ANALYSES

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

							TPH		PAHs	SVOCs	VOCs	PCBs	Pesticides	Metals
Sample Location	Type of Boring	Sample ID	Sample Interval (feet)	Date Sampled	Operable Unit	NWTPH-HCID	NWTPH-Gx	NWTPH-Dx	EPA 8270-SIM	EPA 8270C	EPA 8260B	EPA 8082	EPA 8081/8141	EPA 6000/7000 Series
T4S1S-23	RB	T4S1S-23	0 - 1	9/12/2005	OU2	X	X	X	X			X	X	
T4S1S-23A	RB	T4S1S-23A	0 - 1	9/12/2005	OU2								X	
T4S1S-23B	RB	T4S1S-23B	0 - 1	9/12/2005	OU2								X	
T4S1S-23C	RB	T4S1S-23C	0 - 1	9/12/2005	OU2								X	
T4S1S-23D	RB	T4S1S-23D	0 - 1	9/12/2005	OU2						X		X	
T4S1S-24	RB	T4S1S-24	0 - 1	9/12/2005	OU2	X	X	X	X			X	X	X
T4S1S-24A	RB	T4S1S-24A	0 - 1	9/12/2005	OU2								X	
T4S1S-24B	RB	T4S1S-24B	0 - 1	9/12/2005	OU2								X	
T4S1S-24C	RB	T4S1S-24C	0 - 1	9/12/2005	OU2								X	
T4S1S-24D	RB	T4S1S-24D	0 - 1	9/12/2005	OU2								X	
T4S1S-25	RB	T4S1S-25	0 - 1	9/12/2005	OU2	X	X	X	X			X	X	X
T4S1S-25A	RB	T4S1S-25A	0 - 1	9/12/2005	OU2								X	
T4S1S-25B	RB	T4S1S-25B	0 - 1	9/12/2005	OU2								X	
T4S1S-25C	RB	T4S1S-25C	0 - 1	9/12/2005	OU2								X	
T4S1S-25D	RB	T4S1S-25D	0 - 1	9/12/2005	OU2								X	
T4S1S-26	RB	T4S1S-26	0 - 1	9/13/2005	OU2	X	X	X	X			X	X	X
T4S1S-26A	RB	T4S1S-26A	0 - 1	9/13/2005	OU2				X				X	X
T4S1S-26B	RB	T4S1S-26B	0 - 1	9/13/2005	OU2				X				X	X
T4S1S-26C	RB	T4S1S-26C	0 - 1	9/13/2005	OU2				X				X	X
T4S1S-26D	RB	T4S1S-26D	0 - 1	9/13/2005	OU2				X				X	X
T4S1S-27	RB	T4S1S-27	0 - 1	9/13/2005	OU2	X	X	X	X			X	X	X
T4S1S-27A	RB	T4S1S-27A	0 - 1	9/13/2005	OU2				X				X	
T4S1S-27B	RB	T4S1S-27B	0 - 1	9/13/2005	OU2				X				X	
T4S1S-27C	RB	T4S1S-27C	0 - 1	9/13/2005	OU2				X				X	
T4S1S-27D	RB	T4S1S-27D	0 - 1	9/13/2005	OU2				X				X	
T4S1S-28	RB	T4S1S-28	0 - 1	9/13/2005	OU2	X	X	X	X			X	X	X
T4S1S-28A	RB	T4S1S-28A	0 - 1	9/13/2005	OU2				X				X	
T4S1S-28B	RB	T4S1S-28B	0 - 1	9/13/2005	OU2				X				X	
T4S1S-28C	RB	T4S1S-28C	0 - 1	9/13/2005	OU2				X				X	
T4S1S-28D	RB	T4S1S-28D	0 - 1	9/13/2005	OU2				X				X	
T4S1S-29	RB	T4S1S-29	0 - 1	9/13/2005	OU2	X	X	X	X			X	X	X
T4S1S-30	RB	T4S1S-30	0 - 1	9/13/2005	OU2	X	X	X	X			X	X	X
T4S1S-30A	RB	T4S1S-30A	0 - 1	9/13/2005	OU2				X				X	
T4S1S-30C	RB	T4S1S-30C	0 - 1	9/13/2005	OU2				X				X	
T4S1S-30D	RB	T4S1S-30D	0 - 1	9/13/2005	OU2				X				X	
T4S1S-1	SS	T4S1S-1	0 - 0.5	9/13/2004	OU1							X	X	
T4S1S-2	SS	T4S1S-2	0 - 0.5	9/13/2004	OU1							X	X	
T4S1S-3	SS	T4S1S-3	0 - 0.5	9/13/2004	OU1							X	X	
T4S1S-4	SS	T4S1S-4	0 - 0.5	9/13/2004	OU1							X	X	
T4S1S-5	SS	T4S1S-5	0 - 0.5	3/22/2005	OU1	X			X			X		X
T4S1S-6	SS	T4S1S-6	0 - 0.5	3/22/2005	OU1	X			X			X		X
T4S1S-7	SS	T4S1S-7	0 - 0.5	3/22/2005	OU1	X		X	X			X		X
T4S1S-11	SS	T4S1S-11	0 - 0.5	3/22/2005	OU1			X	X			X		
T4S1S-12	SS	T4S1S-12	0 - 0.5	3/22/2005	OU1			X	X			X		
T4S1S-12	SS	T4S1S-12-0.5	0.5 - 1	9/6/2005	OU1				X					
T4S1S-12	SS	T4S1S-12-2	2 - 2.5	9/6/2005	OU1				X					
T4S1S-13	SS	T4S1S-13	0 - 0.5	3/22/2005	OU1			X	X			X		
T4S1S-13	SS	T4S1S-13-0.5	0.5 - 1	9/6/2005	OU1				X					
T4S1S-13	SS	T4S1S-13-2	2 - 2.5	9/6/2005	OU1				X					
T4S1S-15	SS	T4S1S-15-0.5	0.5 - 1	9/6/2005	OU1				X					
T4S1S-16	SS	T4S1S-16-0.5	0.5 - 1	9/6/2005	OU1				X					
T4S1S-17	SS	T4S1S-17-0.5	0.5 - 1	9/6/2005	OU1				X					
T4S1S-18	SS	T4S1S-18-0.5	0.5 - 1	9/6/2005	OU1				X					
T4S1S-19	SS	T4S1S-19-0.5	0.5 - 1	9/6/2005	OU1				X					
AOC72-S1	SS	AOC72-S1-0.5	0.5 - 1.5	3/8/2004	OU2		X	X	X					X
AOC72-S1	SS	AOC72-S1-1.5	1.5 - 2.5	3/8/2004	OU2		X	X	X		X			X
AOC72-S2	SS	AOC72-S2-0.5	0.5 - 1.5	3/8/2004	OU2		X	X	X					X
AOC72-S2	SS	AOC72-S2-1.5	1.5 - 2.5	3/8/2004	OU2		X	X	X					X
AOC72-S3	SS	AOC72-S3-0.5	0.5 - 1.5	3/8/2004	OU2		X	X	X					X
AOC72-S3	SS	AOC72-S3-1.5	1.5 - 2.5	3/8/2004	OU2		X	X	X		X			X
T4S1S-8	SS	T4S1S-8-1	0 - 0.5	8/27/2004	OU2				X			X		
T4S1S-9	SS	T4S1S-9-1	0 - 0.5	8/27/2004	OU2				X			X		
T4S1S-10	SS	T4S1S-10-1	0 - 0.5	8/27/2004	OU2				X			X		
T4S1S-14	SS	T4S1S-14	0 - 0.5	3/22/2005	OU2			X	X			X		
T4S1S-14B	SS	T4S1S-14B	0.5 - 1	9/8/2005	OU2				X					
T4S1S-20	SS	T4S1S-20-0.5-1	0.5 - 1	9/8/2005	OU2									X
T4S1S-21	SS	T4S1S-21-0.5-1	0.5 - 1	9/8/2005	OU2									X
T4S1S-22	SS	T4S1S-22-0.5-1	0.5 - 1	9/8/2005	OU2									X
T4S1S-31	SS	T4S1S-31	0.5 - 2	7/10/2007	OU1	X						X		

Please see notes on the last page.

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TABLE 3
SOIL SAMPLE ANALYSES

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

							TPH		PAHs	SVOCs	VOCs	PCBs	Pesticides	Metals
Sample Location	Type of Boring	Sample ID	Sample Interval (feet)	Date Sampled	Operable Unit	NWTPH-HCID	NWTPH-Gx	NWTPH-Dx	EPA 8270-SIM	EPA 8270C	EPA 8260B	EPA 8082	EPA 8081/8141	EPA 6000/7000 Series
T4S1MW11	MW	MW11-0.5-1	0.5 - 1	3/30/2004	OU2									X
T4S1MW12	MW	MW12-2.0-1	2 - 2.5	3/30/2004	OU2									X
T4S1MW13	MW	MW13-2.5-1	2.5 - 3	4/1/2004	OU2									X
T4S1MW15	MW	MW15-0.5-1	0.5 - 1	3/29/2004	OU2									X
T4S1MW16	MW	MW16-0.5-1	0.5 - 1	3/29/2004	OU2				X			X	X	X
T4S1MW25	MW	T4S1MW-25-17.5-1	17.5 - 18.5	9/8/2005	OU2			X	X					
T4S1MW25	MW	T4S1MW-25-18.5-1	18.5 - 20	9/8/2005	OU2			X	X					
T4S1MW25	MW	T4S1MW-25-7.5-1	7.5 - 10	9/8/2005	OU2			X	X					
T4S1SB-09	SB	T4S1SB-9-0-1	0 - 1	9/2/2004	OU1		X	X	X					
T4S1SB-10	SB	T4S1SB-10-1-1	1 - 2	9/2/2004	OU1	X								
T4S1SB-10	SB	T4S1SB-10-9-1	8.5 - 10	9/2/2004	OU1	X								
T4S1SB-11	SB	T4S1SB-11-1-1	1 - 2	9/8/2004	OU1	X								
T4S1SB-11	SB	T4S1SB-11-8-1	8 - 9	9/8/2004	OU1	X								
T4S1SB-12	SB	T4S1SB-12-0-1	0.5 - 1	9/3/2004	OU1								X	
T4S1SB-12	SB	T4S1SB-12-1-1	1 - 2	9/3/2004	OU1	X								
T4S1SB-12	SB	T4S1SB-12-9-1	9 - 10	9/3/2004	OU1	X								
T4S1SB-14	SB	T4S1SB-14-1-1	1 - 2	8/24/2004	OU1	X	X	X	X	X				
T4S1SB-14	SB	T4S1SB-14-5-1	5 - 7	8/24/2004	OU1						X			
T4S1SB-15	SB	T4S1SB-15-1-1	1 - 2	9/3/2004	OU1	X			X	X				
T4S1SB-15	SB	T4S1SB-15-3-1	3 - 3.5	9/3/2004	OU1						X			
T4S1SB-16	SB	T4S1SB-16-1-1	0.5 - 1.5	9/3/2004	OU1	X			X	X				
T4S1SB-16	SB	T4S1SB-16-3-1	2.5 - 3.5	9/3/2004	OU1						X			
T4S1SB-17	SB	T4S1SB-17-1-1	1 - 2	9/7/2004	OU1	X			X		X	X		
T4S1SB-18	SB	T4S1SB-18-1-1	1 - 1.5	9/2/2004	OU1	X			X		X	X		
T4S1SB-19	SB	T4S1SB-19-0-1	0.5 - 1.5	9/3/2004	OU1								X	
T4S1SB-19	SB	T4S1SB-19-9-1	8.5 - 10	9/3/2004	OU1			X				X		
T4S1SB-20	SB	T4S1SB-20-0-1	0.5 - 1	9/3/2004	OU1								X	
T4S1SB-20	SB	T4S1SB-20-9-1	8.5 - 10	9/3/2004	OU1			X				X		
T4S1SB-21	SB	T4S1SB-21-13-1	12.5 - 14	9/2/2004	OU1			X	X		X	X	X	X
T4S1SB-22	SB	T4S1SB-22-13-1	12.5 - 14	9/2/2004	OU1			X	X		X	X	X	X
T4S1SB-22	SB	T4S1SB-22-17-1	16.5 - 17	9/2/2004	OU1		X	X	X		X	X	X	X
T4S1SB-23	SB	T4S1SB-23-13-1	12.5 - 14	9/2/2004	OU1			X	X		X	X	X	X
T4S1SB-24	SB	T4S1SB-24-13-1	12 - 13	8/25/2004	OU1			X	X		X	X	X	X
T4S1SB-25	SB	T4S1SB-25-1-1	0.5 - 1.5	8/25/2004	OU1								X	
T4S1SB-25	SB	T4S1SB-25-9-1	8.5 - 9.5	8/25/2004	OU1	X								
T4S1SB-26	SB	T4S1SB-26-1-1	1 - 2	8/25/2004	OU1								X	
T4S1SB-26	SB	T4S1SB-26-9-1	8.5 - 9.5	8/25/2004	OU1		X	X						
T4S1SB-27	SB	T4S1SB-27-1-1	1 - 2	8/25/2004	OU1								X	
T4S1SB-27	SB	T4S1SB-27-5-1	5 - 6	8/25/2004	OU1		X	X						
T4S1SB-28	SB	T4S1SB-28-1-1	1 - 2	8/25/2004	OU1								X	
T4S1SB-28	SB	T4S1SB-28-9-1	8.5 - 9.5	8/25/2004	OU1	X								
T4S1SB-29	SB	T4S1SB-29-8-1	8 - 9	9/3/2004	OU1	X								
T4S1SB-30	SB	T4S1SB-30-8-1	8 - 9	9/3/2004	OU1	X								
T4S1SB-31	SB	T4S1SB-31-0-1	0.5 - 1.5	9/3/2004	OU1		X	X	X					X
T4S1SB-31	SB	T4S1SB-31-3-1	3 - 3.5	9/3/2004	OU1						X			
T4S1SB-32	SB	T4S1SB-32-0-1	0.5 - 1.5	9/3/2004	OU1		X	X	X				X	X
T4S1SB-32	SB	T4S1SB-32-3-1	3 - 3.5	9/3/2004	OU1						X			
T4S1SB-33	SB	T4S1SB-33-0-1	0.25 - 1	9/3/2004	OU1		X	X	X			X		X
T4S1SB-33	SB	T4S1SB-33-2-1	1.5 - 2	9/3/2004	OU1						X			
T4S1SB-34	SB	T4S1SB-34-13-1	12.5 - 13.5	9/1/2004	OU1	X								
T4S1SB-35	SB	T4S1SB-35-13-1	12.5 - 13.5	9/1/2004	OU1	X								
T4S1SB-36	SB	T4S1SB-36-8-1	7.5 - 8.5	9/1/2004	OU1	X								
T4S1SB-37	SB	T4S1SB-37-8-1	7.5 - 8.5	9/1/2004	OU1	X								
T4S1SB-38	SB	T4S1SB-38-8-1	7.5 - 8.5	8/26/2004	OU1	X								
T4S1SB-39	SB	T4S1SB-39-9-1	9 - 10	9/1/2004	OU1	X								
T4S1SB-40	SB	T4S1SB-40-13-1	12.5 - 13.5	8/27/2004	OU1			X						
T4S1SB-41	SB	T4S1SB-41-14-1	13.5 - 14.5	8/27/2004	OU1			X						
T4S1SB-42	SB	T4S1SB-42-1-1	0.5 - 1.5	9/3/2004	OU1	X				X		X		X
T4S1SB-42	SB	T4S1SB-42-5-1	5 - 6	9/3/2004	OU1						X			
T4S1SB-45	SB	T4S1SB-45-1-1	0.5 - 2	8/23/2004	OU1	X		X	X			X		
T4S1SB-46	SB	T4S1SB-46-1-1	0.5 - 2	8/23/2004	OU1	X			X					
T4S1SB-47	SB	T4S1SB-47-1-1	0.5 - 2	8/23/2004	OU1	X			X					
T4S1SB-48	SB	T4S1SB-48-1-1	0.5 - 2	8/23/2004	OU1				X				X	X
T4S1SB-49	SB	T4S1SB-49-1-1	0.5 - 2	8/23/2004	OU1				X				X	X
T4S1SB-50	SB	T4S1SB-50-1-1	0.5 - 2.5	8/23/2004	OU1				X				X	X
T4S1SB-82	SB	T4S1SB-82-1-1	0.5 - 1.5	9/1/2004	OU1		X	X	X					
T4S1SB-82	SB	T4S1SB-82-3-1	3 - 3.5	9/1/2004	OU1						X			
T4S1SB-83	SB	T4S1SB-83-1-1	1 - 2	9/1/2004	OU1		X	X	X					
T4S1SB-83	SB	T4S1SB-83-3-1	3 - 3.5	9/1/2004	OU1						X			

Please see notes on the last page.

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TABLE 3
SOIL SAMPLE ANALYSES

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

							TPH		PAHs	SVOCs	VOCs	PCBs	Pesticides	Metals
Sample Location	Type of Boring	Sample ID	Sample Interval (feet)	Date Sampled	Operating Unit	NWTPH-HCID	NWTPH-Gx	NWTPH-Dx	EPA 8270-SIM	EPA 8270C	EPA 8260B	EPA 8082	EPA 8081/8141	EPA 6000/7000 Series
T4S1SB-84	SB	T4S1SB-84-13-1	12 - 13.5	9/8/2004	OU1			X	X		X		X	
T4S1SB-86	SB	T4S1SB-86-9-1	8 - 9	9/1/2004	OU1		X	X						
T4S1SB-87	SB	T4S1SB-87-9-1	8 - 9	9/8/2004	OU1		X	X						
T4S1SB-88	SB	T4S1SB-88-7.5-1	7.5 - 10	9/7/2005	OU1				X					
T4S1SB-89	SB	T4S1SB-89-0-1	0.5 - 2.5	9/7/2005	OU1			X	X				X	X
T4S1SB-90	SB	T4S1SB-90-0-1	1 - 3	9/7/2005	OU1			X	X				X	X
T4S1SB-91	SB	T4S1SB-91-0-1	0.5 - 2.5	9/7/2005	OU1			X					X	
T4S1SB-92	SB	T4S1SB-92-0-1	1 - 3	9/7/2005	OU1			X	X					X
T4S1SB-93	SB	T4S1SB-93-0-1	0.5 - 2.5	9/7/2005	OU1			X	X				X	X
T4S1SB-94	SB	T4S1SB-94-0-1	1 - 3	9/7/2005	OU1			X	X				X	X
T4S1SB-95	SB	T4S1SB-95-0-1	0.5 - 2.5	9/7/2005	OU1			X	X				X	X
T4S1SB-07	SB	SB07-2.0-1	2 - 2.5	3/30/2004	OU2									X
T4S1SB-08	SB	SB08-2.0-1	2 - 2.5	3/31/2004	OU2									X
T4S1SB-51	SB	T4S1SB-51-12-1	11 - 12	8/27/2004	OU2	X								
T4S1SB-51	SB	T4S1SB-51-2.5-1	2 - 2.5	8/27/2004	OU2	X		X			X			
T4S1SB-52	SB	T4S1SB-52-13-1	12 - 13	8/27/2004	OU2	X								
T4S1SB-53	SB	T4S1SB-53-1-1	0.5 - 1	8/27/2004	OU2		X	X	X		X			X
T4S1SB-54	SB	T4S1SB-54-1-1	0.5 - 1	8/27/2004	OU2							X		
T4S1SB-55	SB	T4S1SB-55-1-1	1 - 2	8/27/2004	OU2	X					X			X
T4S1SB-55	SB	T4S1SB-55-8-1	7.5 - 8.5	8/31/2004	OU2	X								
T4S1SB-56	SB	T4S1SB-56-8-1	7.5 - 8.5	8/31/2004	OU2	X								
T4S1SB-57	SB	T4S1SB-57-8-1	7 - 8	8/31/2004	OU2	X								
T4S1SB-58	SB	T4S1SB-58-1-1	1 - 2	8/31/2004	OU2	X					X			X
T4S1SB-58	SB	T4S1SB-58-9-1	8.5 - 9.5	8/31/2004	OU2	X								
T4S1SB-61	SB	T4S1SB-61-0-1	0.5 - 2	9/9/2004	OU2								X	X
T4S1SB-62	SB	T4S1SB-62-0-1	0.5 - 1.5	9/9/2004	OU2								X	X
T4S1SB-67	SB	T4S1SB-67-18-1	18 - 19	9/8/2004	OU2	X					X	X		X
T4S1SB-70	SB	T4S1SB-70-1-1	1 - 2	8/26/2004	OU2	X					X			X
T4S1SB-71	SB	T4S1SB-71-1-1	1 - 2	8/26/2004	OU2	X					X			X
T4S1SB-72	SB	T4S1SB-72-1-1	1 - 2	8/26/2004	OU2	X					X			X
T4S1SB-73	SB	T4S1SB-73-1-1	0.5 - 1.5	8/26/2004	OU2	X					X			X
T4S1SB-74	SB	T4S1SB-74-1-1	1 - 2	8/26/2004	OU2	X					X			X
T4S1SB-75	SB	T4S1SB-75-1-1	1 - 2	8/26/2004	OU2	X					X			X
T4S1SB-76	SB	T4S1SB-76-1-1	1 - 2	8/26/2004	OU2	X					X			X
T4S1SB-77	SB	T4S1SB-77-0.5-1	0.5 - 1	9/8/2005	OU2									X
T4S1SB-77	SB	T4S1SB-77-1-1	1 - 1.5	8/30/2004	OU2		X	X	X					X
T4S1SB-77	SB	T4S1SB-77-2-1	2 - 2.5	9/8/2005	OU2									X
T4S1SB-77	SB	T4S1SB-77-3-1	1.5 - 3	8/30/2004	OU2						X			
T4S1SB-78	SB	T4S1SB-78-1-1	0.5 - 1.5	8/30/2004	OU2		X	X	X					X
T4S1SB-78	SB	T4S1SB-78-3-1	2.5 - 3	8/30/2004	OU2						X			
T4S1SB-79	SB	T4S1SB-79-3-1	2.5 - 3.5	8/30/2004	OU2		X	X	X		X			X
T4S1SB-80	SB	T4S1SB-80-3-1	2.5 - 3.5	8/30/2004	OU2		X	X	X		X			X
T4S1SB-81	SB	T4S1SB-81-3-1	2.5 - 3.5	8/30/2004	OU2		X	X	X		X			X

Notes:
1. RB = Riverbank surface soil.
2. SS = Surface soil.
3. MW = Monitoring well boring.
4. SB = Push probe soil boring.
5. HCID = Hydrocarbon identification.
6. TPH = Total petroleum hydrocarbons.
7. PAHs = Polynuclear aromatic hydrocarbons.
8. VOCs = Volatile organic compounds.
5. PCBs = Polychlorinated biphenyls.

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TABLE 4
GRAB SAMPLE ANALYSES

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

									TPH		PAHs	SVOCs	VOCs	PCBs	Pesticides	Metals
Sample Location	Total Depth of Boring (feet)	Depth to Alluvial Silt Contact (feet)	Screened Interval (feet)	Water Table Depth ATD (feet)	Sample ID	Date Sampled	Operable Unit	NWTPH-HCID	NWTPH-Gx	NWTPH-Dx	EPA 8270-SIM	EPA 8270C	EPA 8260B	EPA 8082	EPA 8081/8141	EPA 6000/7000 Series
T4S1SB-01	35	--	31 - 35	28	SB01-GW-1	4/1/2004	OU1		X	X	X		X			
T4S1SB-02	35	--	31 - 35	25	SB02-GW-1	4/1/2004	OU1		X	X	X		X			
T4S1SB-03	35	15	31 - 35	25	SB03-GW-1	4/5/2004	OU1		X	X	X		X		X	
T4S1SB-04	35	24.5	28 - 32	25	SB04-GW-1	4/5/2004	OU1		X	X	X		X		X	
T4S1SB-09	30	16.5	26 - 30	26	T4S1GW-9-1	9/1/2004	OU1	X			X		X			
T4S1SB-10	30	--	26 - 30	--	T4S1GW-10-1	9/8/2004	OU1	X			X		X			
T4S1SB-11	30	28	26 - 30	--	T4S1GW-11-1	9/9/2004	OU1	X			X		X			
T4S1SB-12	30	17	not shown	20	T4S1GW-12-1	9/9/2004	OU1	X			X		X	X		X
T4S1SB-14	30	--	26 - 30	--	T4S1SB-14-1	8/24/2004	OU1	X			X	X	X			
T4S1SB-15	30	--	26 - 30	27	T4S1GW-15-1	9/7/2004	OU1	X			X	X	X			
T4S1SB-16	30	--	26 - 30	27	T4S1GW-16-1	9/7/2004	OU1	X			X	X	X			
T4S1SB-17	30	--	18 - 22	17	T4S1GW-17-1	9/7/2004	OU1	X			X		X	X		
T4S1SB-18	30	17	26 - 30	--	T4S1GW-18-1	9/3/2004	OU1	X			X		X	X		
T4S1SB-19	30	10	20 - 24	20	T4S1GW-19-1	9/9/2004	OU1		X	X	X			X		
T4S1SB-20	30	10	18 - 22	20	T4S1GW-20-1	9/7/2004	OU1		X	X	X			X		
T4S1SB-21	30	13	18 - 22	18	T4S1GW-21-1	9/13/2004	OU1		X	X	X		X	X	X	X
T4S1SB-22	30	20	16 - 20	15	T4S1GW-22-1	9/2/2004	OU1		X	X	X		X	X	X	X
T4S1SB-23	30	--	16 - 20	12.5	T4S1GW-23-1	9/2/2004	OU1		X	X	X		X	X	X	X
T4S1SB-24	30	20	26 - 30	--	T4S1GW-24-1	8/27/2004	OU1			X	X		X	X	X	X
T4S1SB-25	30	12.5	26 - 30	--	T4S1GW-25-1	8/27/2004	OU1		X	X	X		X		X	
T4S1SB-26	30	16.5	26 - 30	--	T4S1GW-26-1	8/26/2004	OU1		X	X	X		X		X	
T4S1SB-28	30	12	26 - 30	--	T4S1GW-28-1	8/26/2004	OU1		X	X	X		X		X	
T4S1SB-31	30	22	18 - 22	17	T4S1GW-31-1	9/8/2004	OU1		X	X	X		X			X
T4S1SB-32	30	25.5	16 - 20	16	T4S1GW-32-1	9/3/2004	OU1		X	X	X		X			X
T4S1SB-33	30	25	16 - 20	16	T4S1GW-33-1	9/3/2004	OU1		X	X	X		X			
T4S1SB-34	30	17	26 - 30	25	T4S1GW-34-1	9/1/2004	OU1		X	X	X		X			
T4S1SB-35	30	17	26 - 30	--	T4S1GW-35-1	9/1/2004	OU1		X	X	X		X			
T4S1SB-36	30	13.75	26 - 30	--	T4S1GW-36-1	9/3/2004	OU1		X	X	X		X			
T4S1SB-37	30	16.5	26 - 30	--	T4S1GW-37-1	9/1/2004	OU1		X	X	X		X			
T4S1SB-38	30	11	26 - 30	--	T4S1GW-38-1	8/31/2004	OU1		X	X	X		X			
T4S1SB-39	30	13	26 - 30	--	T4S1GW-39-1	9/1/2004	OU1		X	X	X		X			
T4S1SB-40	30	22	20 - 24	20	T4S1GW-40-1	8/27/2004	OU1			X	X		X			
T4S1SB-41	30	22	20 - 24	20	T4S1GW-41-1	8/27/2004	OU1			X	X		X			
T4S1SB-42	30	22	26 - 30	27	T4S1GW-42-1	9/7/2004	OU1	X			X	X	X	X		
T4S1SB-43	30	--	19 - 23	20	T4S1GW-43-1	8/31/2004	OU1		X	X	X		X			X
T4S1SB-44	30	--	18 - 22	18	T4S1GW-44-1	8/31/2004	OU1		X	X	X		X			X
T4S1SB-45	30	29	26 - 30	25	T4S1SB-45-1	8/23/2004	OU1	X			X			X		
T4S1SB-46	30	20	24 - 28	25.5	T4S1SB-46-1	8/23/2004	OU1	X			X			X		
T4S1SB-47	30	--	26 - 30	26.5	T4S1SB-47-1	8/23/2004	OU1	X			X			X		
T4S1SB-48	30	--	26 - 30	26.5	T4S1SB-48-1	8/23/2004	OU1		X	X	X		X	X	X	
T4S1SB-49	30	--	26 - 30	26.5	T4S1SB-49-1	8/23/2004	OU1		X	X	X		X	X	X	
T4S1SB-50	30	--	26 - 30	26	T4S1SB-50-1	8/23/2004	OU1		X	X	X		X	X	X	X
T4S1SB-82	30	28	26 - 30	27	T4S1GW-82-1	9/1/2004	OU1		X	X	X		X	X		
T4S1SB-83	30	--	26 - 30	27	T4S1GW-83-1	9/1/2004	OU1		X	X	X		X	X		
T4S1SB-84	30	16	17 - 21	15	T4S1GW-84-1	9/9/2004	OU1		X	X	X		X	X	X	
T4S1SB-85	30	15	26 - 30	25	T4S1GW-85-1	9/8/2004	OU1	X			X		X	X		
T4S1SB-86	30	29	26 - 30	--	T4S1GW-86-1	9/8/2004	OU1	X					X			
T4S1SB-87	30	29	26 - 30	27.5	T4S1GW-87-1	9/8/2004	OU1	X					X			

Please see notes on the last page.

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TABLE 4
GRAB SAMPLE ANALYSES

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

									TPH		PAHs	SVOCs	VOCs	PCBs	Pesticides	Metals
Sample Location	Total Depth of Boring (feet)	Depth to Alluvial Silt Contact (feet)	Screened Interval (feet)	Water Table Depth ATD (feet)	Sample ID	Date Sampled	Operable Unit	NWTPH-HCID	NWTPH-Gx	NWTPH-Dx	EPA 8270-SIM	EPA 8270C	EPA 8260B	EPA 8082	EPA 8081/8141	EPA 6000/7000 Series
T4S1SB-05	20	--	16 - 20	13.5	SB05-GW-1	3/31/2004	OU2		X	X	X		X		X	
T4S1SB-06	30	28	24 - 28	20	SB06-GW-1	3/31/2004	OU2		X	X	X		X		X	
T4S1SB-07	40	23	35 - 40	23	SB07-GW-1	3/30/2004	OU2		X	X	X		X			X
T4S1SB-08	40	--	36 - 40	29.5	SB08-GW-1	3/31/2004	OU2		X	X	X		X			X
T4S1SB-51	34	25.5	30 - 34	--	T4S1GW-51-1	9/1/2004	OU2	X	X	X	X		X	X		X
T4S1SB-52	34	--	30 - 34	--	T4S1GW-52-1	9/1/2004	OU2	X	X	X	X		X	X		X
T4S1SB-53	30	27.5	26 - 30	25	T4S1GW-53-1	8/30/2004	OU2		X	X	X		X			X
T4S1SB-54	34	25	30 - 34	--	T4S1GW-54-1	9/1/2004	OU2		X	X	X		X			X
T4S1SB-55	30	25.5	17 - 21	17	T4S1GW-55-1	8/31/2004	OU2	X			X		X			X
T4S1SB-56	30	20	17 - 21	20	T4S1GW-56-1	8/31/2004	OU2	X			X		X			X
T4S1SB-57	30	25.5	17 - 21	16.5	T4S1GW-57-1	8/31/2004	OU2	X			X		X			X
T4S1SB-58	30	27	17 - 21	17	T4S1GW-58-1	8/31/2004	OU2	X			X		X			X
T4S1SB-59	30	--	17 - 21	17	T4S1GW-59-1	9/9/2004	OU2		X	X	X		X			X
T4S1SB-60	30	--	17 - 21	16.5	T4S1GW-60-1	8/30/2004	OU2		X	X	X		X			X
T4S1SB-61	30	--	17 - 21	17	T4S1GW-61-1	9/9/2004	OU2						X		X	X
T4S1SB-62	30	--	16 - 20	17	T4S1GW-62-1	9/9/2004	OU2						X		X	X
T4S1SB-63	30	--	17 - 21	17.5	T4S1GW-63-1	9/9/2004	OU2		X	X	X		X	X		X
T4S1SB-64	30	--	17 - 21	17.5	T4S1GW-64-1	9/9/2004	OU2		X	X	X		X	X		X
T4S1SB-65	30	--	18 - 22	18	T4S1GW-65-1	8/31/2004	OU2		X	X	X		X	X		X
T4S1SB-66	30	--	17 - 21	17	T4S1GW-66-1	9/9/2004	OU2		X	X	X		X	X		X
T4S1SB-67	30	--	20 - 24	22	T4S1GW-67-1	9/8/2004	OU2		X	X	X		X	X		X
T4S1SB-68	30	--	17 - 21	17.5	T4S1GW-68-1	9/9/2004	OU2		X	X	X		X			
T4S1SB-69	30	--	18 - 22	17	T4S1GW-69-1	9/9/2004	OU2		X	X	X		X			
T4S1SB-77	30	--	18 - 22	16.5	T4S1GW-77-1	8/30/2004	OU2		X	X	X	X	X			X
T4S1SB-78	30	--	18 - 22	17	T4S1GW-78-1	8/30/2004	OU2		X	X	X	X	X			X
T4S1SB-79	30	--	17 - 21	17	T4S1GW-79-1	8/30/2004	OU2		X	X	X		X			X
T4S1SB-80	30	--	17 - 21	17	T4S1GW-80-1	8/30/2004	OU2			X	X		X			X
T4S1SB-81	30	--	17 - 21	17	T4S1GW-81-1	8/30/2004	OU2		X	X	X		X			X

Notes:
1. HCID = Hydrocarbon identification.
2. TPH = Total petroleum hydrocarbons.
3. PAHs = Polynuclear aromatic hydrocarbons.
4. VOCs = Volatile organic compounds.
5. PCBs = Polychlorinated biphenyls.
6. Not applicable.

KMB00008304

TABLE 5
GROUNDWATER MONITORING WELL SAMPLE ANALYSES

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

				TPH			PAHs	SVOCs	VOCs	PCBs	Pesticides	Metals
Sample Location	Sample ID	Date Sampled	Operable Unit	NWTPH-HCID	NWTPH-Gx	NWTPH-Dx	EPA 8270-SIM	EPA 8270C	EPA 8260B	EPA 8082	EPA 8081/8141	EPA 6000/7000 Series
T4S1MW01s	T4S1MW01s-GW-1	4/21/2004	OU1		X	X	X		X	X		
T4S1MW01s	T4S1MW01s-GW-1	9/1/2004	OU1	X			X			X		
T4S1MW01s	T4S1MW01s-GW-1	2/3/2005	OU1	X			X			X		
T4S1MW01s	T4S1MW01s-GW-1	5/4/2005	OU1		X	X	X			X		
T4S1MW02s	T4S1MW02s-GW-1	4/20/2004	OU1		X	X	X		X			
T4S1MW02s	T4S1MW02s-GW-1	9/2/2004	OU1		X	X	X		X			
T4S1MW02s	T4S1MW02s-GW-1	2/2/2005	OU1		X	X	X		X			
T4S1MW02s	T4S1MW02s-GW-1	5/5/2005	OU1		X	X	X		X			
T4S1MW03s	T4S1MW03s-GW-1	4/21/2004	OU1		X	X	X		X		X	
T4S1MW03s	T4S1MW03s-GW-1	8/30/2004	OU1		X	X	X		X		X	
T4S1MW03s	T4S1MW03s-GW-1	1/31/2005	OU1		X	X	X	X	X		X	
T4S1MW03s	T4S1MW03s-GW-1	5/5/2005	OU1		X	X	X		X		X	
T4S1MW07	T4S1MW07-GW-1	4/20/2004	OU1		X	X	X		X			
T4S1MW07	T4S1MW07-GW-1	8/27/2004	OU1	X			X	X	X			
T4S1MW07	T4S1MW07-GW-1	2/2/2005	OU1	X			X	X	X			
T4S1MW07	T4S1MW07-GW-1	5/4/2005	OU1	X	X	X	X	X	X			
T4S1MW08	T4S1MW08-GW-1	4/21/2004	OU1		X	X	X		X		X	
T4S1MW08	T4S1MW08-GW-1	8/30/2004	OU1	X			X		X	X	X	
T4S1MW08	T4S1MW08-GW-1	2/3/2005	OU1	X			X		X	X	X	
T4S1MW08	T4S1MW08-GW-1	5/4/2005	OU1		X	X	X		X	X	X	X
T4S1MW08	T4S1MW08-GW-1	9/16/2005	OU1								X	X
T4S1MW17	T4S1MW17-GW-1	4/20/2004	OU1		X	X	X		X	X	X	
T4S1MW17	T4S1MW17-GW-1	9/2/2004	OU1		X	X	X		X			
T4S1MW17	T4S1MW17-GW-1	2/1/2005	OU1		X	X	X	X	X			
T4S1MW17	T4S1MW17-GW-1	5/4/2005	OU1		X	X	X		X		X	X
T4S1MW17	T4S1MW17-GW-1	9/16/2005	OU1								X	X
T4S1MW18	T4S1MW18-GW-1	4/21/2004	OU1		X	X	X		X		X	
T4S1MW18	T4S1MW18-GW-1	9/1/2004	OU1		X	X	X		X			
T4S1MW18	T4S1MW18-GW-1	2/1/2005	OU1		X	X	X	X	X			
T4S1MW18	T4S1MW18-GW-1	5/6/2005	OU1		X	X	X		X			
T4S1MW19	T4S1MW19-GW-1	9/15/2004	OU1		X	X	X		X			X
T4S1MW19	T4S1MW19-GW-1	2/1/2005	OU1		X	X	X		X			X
T4S1MW19	T4S1MW19-GW-1	5/9/2005	OU1		X	X	X		X			X
T4S1MW22	T4S1MW22-GW-1	9/2/2004	OU1		X	X	X		X			X
T4S1MW22	T4S1MW22-GW-1	2/4/2005	OU1		X	X	X		X			X
T4S1MW22	T4S1MW22-GW-1	5/6/2005	OU1		X	X	X		X			X
T4S1MW23	T4S1MW23-GW-1	9/2/2004	OU1		X	X	X		X			X
T4S1MW23	T4S1MW23-GW-1	2/4/2005	OU1		X	X	X		X			X
T4S1MW23	T4S1MW23-GW-1	5/6/2005	OU1		X	X	X		X			X
T4S1MW24	T4S1MW24-GW-1	9/1/2004	OU1		X	X	X	X	X	X		X
T4S1MW24	T4S1MW24-GW-1	2/3/2005	OU1		X	X	X	X	X	X		X
T4S1MW24	T4S1MW24-GW-1	5/6/2005	OU1		X	X	X	X	X	X		X
T4S1MW26	T4S1MW26-GW-1	9/16/2005	OU1				X				X	X
T4S1MW04s	T4S1MW04s-GW-1	4/19/2004	OU2		X	X	X		X			
T4S1MW04s	T4S1MW04s-GW-1	8/31/2004	OU2		X	X	X		X			
T4S1MW04s	T4S1MW04s-GW-1	2/8/2005	OU2		X	X	X		X			
T4S1MW04s	T4S1MW04s-GW-1	5/9/2005	OU2		X	X	X		X			
T4S1MW09	T4S1MW09-GW-1	4/20/2004	OU2		X	X	X		X		X	
T4S1MW09	T4S1MW09-GW-1	9/1/2004	OU2		X	X	X		X	X	X	X
T4S1MW09	T4S1MW09-GW-1	2/9/2005	OU2		X	X	X		X	X	X	X
T4S1MW09	T4S1MW09-GW-1	5/9/2005	OU2		X	X	X		X	X	X	X
T4S1MW10	T4S1MW10-GW-1	4/19/2004	OU2		X	X	X		X		X	
T4S1MW10	T4S1MW10-GW-1	9/1/2004	OU2		X	X	X		X	X	X	X
T4S1MW10	T4S1MW10-GW-1	2/4/2005	OU2		X	X	X		X	X	X	X
T4S1MW10	T4S1MW10-GW-1	5/9/2005	OU2		X	X	X		X	X	X	X

Please see notes on the last page.

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TABLE 5
GROUNDWATER MONITORING WELL SAMPLE ANALYSES

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

				TPH		PAHs	SVOCs	VOCs	PCBs	Pesticides	Metals
Well ID	Sample ID	Date Sampled	Operable Unit	NWTPH-HCID	NWTPH-Gx	NWTPH-Dx	EPA 8270-SIM	EPA 8270C	EPA 8260B	EPA 8082	EPA 8081/8141	EPA 6000/7000 Series
T4S1MW11	T4S1MW11-GW-1	4/19/2004	OU2		X	X	X		X		X	X
T4S1MW11	T4S1MW11-GW-1	9/1/2004	OU2	X			X		X		X	X
T4S1MW11	T4S1MW11-GW-1	2/8/2005	OU2		X	X	X		X			X
T4S1MW11	T4S1MW11-GW-1	5/10/2005	OU2	X	X	X	X		X		X	X
T4S1MW12	T4S1MW12-GW-1	4/19/2004	OU2		X	X	X		X			X
T4S1MW12	T4S1MW12-GW-1	8/31/2004	OU2									X
T4S1MW12	T4S1MW12-GW-1	2/7/2005	OU2									X
T4S1MW12	T4S1MW12-GW-1	5/9/2005	OU2									X
T4S1MW13	T4S1MW13-GW-1	4/16/2004	OU2		X	X	X		X			X
T4S1MW13	T4S1MW13-GW-1	8/31/2004	OU2				X					X
T4S1MW13	T4S1MW13-GW-1	2/8/2005	OU2									X
T4S1MW13	T4S1MW13-GW-1	5/10/2005	OU2									X
T4S1MW14	T4S1MW14-GW-1	4/16/2004	OU2		X	X	X		X			
T4S1MW14	T4S1MW14-GW-1	8/31/2004	OU2		X	X	X		X			
T4S1MW14	T4S1MW14-GW-1	2/8/2005	OU2		X	X	X		X			
T4S1MW14	T4S1MW14-GW-1	5/10/2005	OU2		X	X	X		X			
T4S1MW15	T4S1MW15-GW-1	4/16/2004	OU2		X	X	X		X			X
T4S1MW15	T4S1MW15-GW-1	8/27/2004	OU2									X
T4S1MW15	T4S1MW15-GW-1	2/9/2005	OU2	X			X			X		X
T4S1MW15	T4S1MW15-GW-1	5/4/2005	OU2	X	X	X	X					X
T4S1MW16	T4S1MW16-GW-1	4/19/2004	OU2		X	X	X		X	X		X
T4S1MW16	T4S1MW16-GW-1	8/27/2004	OU2		X	X	X		X	X		X
T4S1MW16	T4S1MW16-GW-1	2/10/2005	OU2		X	X			X	X		X
T4S1MW16	T4S1MW16-GW-1	5/10/2005	OU2				X		X			
T4S1MW20	T4S1MW20-GW-1	9/2/2004	OU2		X	X	X		X			X
T4S1MW20	T4S1MW20-GW-1	2/10/2005	OU2		X	X	X		X			X
T4S1MW20	T4S1MW20-GW-1	5/11/2005	OU2		X	X	X		X			X
T4S1MW21	T4S1MW21-GW-1	9/2/2004	OU2		X	X	X		X			X
T4S1MW21	T4S1MW21-GW-1	2/10/2005	OU2		X	X	X		X			X
T4S1MW21	T4S1MW21-GW-1	5/11/2005	OU2		X	X	X		X			X
T4S1MW23	T4S1MW23-GW-1	9/2/2004	OU2		X	X						
T4S1MW23	T4S1MW23-GW-1	2/4/2005	OU2		X	X						
T4S1MW24	T4S1MW24-GW-1	9/1/2004	OU2		X	X						
T4S1MW24	T4S1MW24-GW-1	2/3/2005	OU2		X	X						
T4S1MW25	T4S1MW25-GW-1	11/9/2205	OU2				X					

Notes:
1. HCID = Hydrocarbon identification.
2. TPH = Total petroleum hydrocarbons.
3. PAHs = Polynuclear aromatic hydrocarbons.
4. VOCs = Volatile organic compounds.
5. PCBs = Polychlorinated biphenyls.

KMB00008306

TABLE 6A
SOIL CHEMISTRY RESULTS: PETROLEUM HYDROCARBONS - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	T4S1SB-9	T4S1SB-10	T4S1SB-10	T4S1SB-11	T4S1SB-11	T4S1SB-12	T4S1SB-12	T4S1SB-14	T4S1SB-15	T4S1SB-16	T4S1SB-17	T4S1SB-18	T4S1SB-19
Sample ID:	T4S1SB-9-0-1	T4S1SB-10-1-1	T4S1SB-10-9-1	T4S1SB-11-1-1	T4S1SB-11-8-1	T4S1SB-12-1-1	T4S1SB-12-9-1	T4S1SB-14-1-1	T4S1SB-15-1-1	T4S1SB-16-1-1	T4S1SB-17-1-1	T4S1SB-18-1-1	T4S1SB-19-9-1
Sample Interval:	0 - 1	1 - 2	8.5 - 10	1 - 2	8 - 9	1 - 2	9 - 10	1 - 2	1 - 2	0.5 - 1.5	1 - 2	1 - 1.5	8.5 - 10
Date Sampled:	9/2/2004	9/2/2004	9/2/2004	9/8/2004	9/8/2004	9/3/2004	9/3/2004	8/24/2004	9/3/2004	9/3/2004	9/7/2004	9/2/2004	9/3/2004
HCID (mg/kg)													
Gasoline Range	--	13 U	17 U	15 U	16 U	17 U	16 U	20 U	17 U	15 U	14 U	16 U	--
Diesel Range	--	32 U	41 U	37 U	40 U	41 U	40 U	50 U	41 U	37 U	35 U	39 U	--
Residual Range	--	64 U	82 U	73 U	80 U	81 U	79 U	Det	82 U	74 U	70 U	78 U	--
TPH (mg/kg)													
Gasoline Range	17 U	--	--	--	--	--	--	--	--	--	--	--	--
Diesel Range	42 U	--	--	--	--	--	--	59 J	--	--	--	--	20 U
Residual Range	84 U	--	--	--	--	--	--	780 O	--	--	--	--	8.7 J

Sample Location:	T4S1SB-20	T4S1SB-21	T4S1SB-22	T4S1SB-22	T4S1SB-23	T4S1SB-24	T4S1SB-25	T4S1SB-26	T4S1SB-27	T4S1SB-28	T4S1SB-29	T4S1SB-30	T4S1SB-31
Sample ID:	T4S1SB-20-9-1	T4S1SB-21-13-1	T4S1SB-22-13-1	T4S1SB-22-17-1	T4S1SB-23-13-1	T4S1SB-24-13-1	T4S1SB-25-9-1	T4S1SB-26-9-1	T4S1SB-27-5-1	T4S1SB-28-9-1	T4S1SB-29-8-1	T4S1SB-30-8-1	T4S1SB-31-0-1
Sample Interval:	8.5 - 10	12.5 - 14	12.5 - 14	16.5 - 17	12.5 - 14	12 - 13	8.5 - 9.5	8.5 - 9.5	5 - 6	8.5 - 9.5	8 - 9	8 - 9	0.5 - 1.5
Date Sampled:	9/3/2004	9/2/2004	9/2/2004	9/2/2004	9/2/2004	8/25/2004	8/25/2004	8/25/2004	8/25/2004	8/25/2004	9/3/2004	9/3/2004	9/3/2004
HCID (mg/kg)													
Gasoline Range	--	--	--	--	--	--	14 U	--	--	11 U	17 U	14 U	--
Diesel Range	--	--	--	--	--	--	33 U	--	--	27 U	42 U	34 U	--
Residual Range	--	--	--	--	--	--	66 U	--	--	53 U	83 U	67 U	--
TPH (mg/kg)													
Gasoline Range	--	--	--	100 Z	--	--	--	1.4 J	3.3 U	--	--	--	1.5 J
Diesel Range	20 U	15 J	20 U	4,700 H	1,100 H	39 U	--	41 U	43 U	--	--	--	110 H
Residual Range	12 J	17 J	79 U	16,000 DO	2,800 O	160 U	--	170 U	170 U	--	--	--	1,200 O

Sample Location:	T4S1SB-32	T4S1SB-33	T4S1SB-34	T4S1SB-35	T4S1SB-36	T4S1SB-37	T4S1SB-38	T4S1SB-39	T4S1SB-40	T4S1SB-41	T4S1SB-42	T4S1SB-45	T4S1SB-46
Sample ID:	T4S1SB-32-0-1	T4S1SB-33-0-1	T4S1SB-34-13-1	T4S1SB-35-13-1	T4S1SB-36-8-1	T4S1SB-37-8-1	T4S1SB-38-8-1	T4S1SB-39-9-1	T4S1SB-40-13-1	T4S1SB-41-14-1	T4S1SB-42-1-1	T4S1SB-45-1-1	T4S1SB-46-1-1
Sample Interval:	0.5 - 1.5	0.25 - 1	12.5 - 13.5	12.5 - 13.5	7.5 - 8.5	7.5 - 8.5	7.5 - 8.5	9 - 10	12.5 - 13.5	13.5 - 14.5	0.5 - 1.5	0.5 - 2	0.5 - 2
Date Sampled:	9/3/2004	9/3/2004	9/1/2004	9/1/2004	9/1/2004	9/1/2004	8/26/2004	9/1/2004	8/27/2004	8/27/2004	9/3/2004	8/23/2004	8/23/2004
HCID (mg/kg)													
Gasoline Range	--	--	16 U	15 U	15 U	14 U	20 U	17 U	--	--	15 U	20 U	20 U
Diesel Range	--	--	40 U	36 U	36 U	34 U	50 U	42 U	--	--	36 U	50 U	50 U
Residual Range	--	--	80 U	71 U	72 U	67 U	100 U	84 U	--	--	72 U	Det	100 U
TPH (mg/kg)													
Gasoline Range	6.7 Z	2.5 J	--	--	--	--	--	--	--	--	--	--	--
Diesel Range	20 U	22 U	--	--	--	--	--	--	37 U	40 U	--	19 H	--
Residual Range	80 U	45 J	--	--	--	--	--	--	150 U	160 U	--	120 O	--

Sample Location:	T4S1SB-47	T4S1SB-82	T4S1SB-83	T4S1SB-84	T4S1SB-86	T4S1SB-87	T4S1SB-89	T4S1SB-90	T4S1SB-91	T4S1SB-92	T4S1SB-93	T4S1SB-94	T4S1SB-95
Sample ID:	T4S1SB-47-1-1	T4S1SB-82-1-1	T4S1SB-83-1-1	T4S1SB-84-13-1	T4S1SB-86-9-1	T4S1SB-87-9-1	T4S1SB-89-0-1	T4S1SB-90-0-1	T4S1SB-91-0-1	T4S1SB-92-0-1	T4S1SB-93-0-1	T4S1SB-94-0-1	T4S1SB-95-0-1
Sample Interval:	0.5 - 2	0.5 - 1.5	1 - 2	12 - 13.5	8 - 9	8 - 9	0.5 - 2.5	1 - 3	0.5 - 2.5	1 - 3	0.5 - 2.5	1 - 3	0.5 - 2.5
Date Sampled:	8/23/2004	9/1/2004	9/1/2004	9/8/2004	9/1/2004	9/8/2004	9/7/2005	9/7/2005	9/7/2005	9/7/2005	9/7/2005	9/7/2005	9/7/2005
HCID (mg/kg)													
Gasoline Range	20 U	--	--	--	--	--	--	--	--	--	--	--	--
Diesel Range	50 U	--	--	--	--	--	--	--	--	--	--	--	--
Residual Range	100 U	--	--	--	--	--	--	--	--	--	--	--	--
TPH (mg/kg)													
Gasoline Range	--	3.9 U	3.6 U	--	13 U	17 U	--	--	--	--	--	--	--
Diesel Range	--	18 U	20 U	21 U	31 U	41 U	28.6 U	26.8 U	26.3 U	26.1 U	28.3 U	27.1 U	26.8 U
Residual Range	--	72 U	78 U	83 J	62 U	81 U	55 J, D	53.6 U	74.3 D	55.1 D	79 D	54.2 U	27.4 J, D

Sample Location:	T4S1S-5	T4S1S-6	T4S1S-7	T4S1S-11	T4S1S-12	T4S1S-13	T4S1S-31
Sample ID:	T4S1S-5	T4S1S-6	T4S1S-7	T4S1S-11	T4S1S-12	T4S1S-13	T4S1S-31
Sample Interval:	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0.5 - 2
Date Sampled:	3/22/2005	3/22/2005	3/22/2005	3/22/2005	3/22/2005	3/22/2005	7/10/2007
HCID (mg/kg)							
Gasoline Range	20 U	20 U	20 U	--	--	--	17.8 U
Diesel Range	50 U	50 U	50 U	--	--	--	44.6 U
Residual Range	100 U	100 U	Det	--	--	--	89.2 U
TPH (mg/kg)							
Gasoline Range	--	--	--	--	--	--	--
Diesel Range	--	--	100 DH	20 U	24 U	21 Z	--
Residual Range	--	--	960 DO	77 U	170 Z	140 Z	--

Notes:

1. Only detected compounds are reported in the table.
2. TPH =Total petroleum hydrocarbons (TPH) by Northwest Total Petroleum Hydrocarbons (NWTPH). Diesel and residual range performed with silica gel cleanup.
3. mg/kg = Milligrams per kilogram.
4. -- = No screening level available or not analyzed.
5. J = The result is an estimated concentration that is less than the method reporting limit (MRL) but greater than or equal to the method detection limit (MDL).
6. U = The compound was analyzed for but was not detected at or above the MRL/MDL.
7. H = The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
8. O = The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
9. Z = The chromatographic fingerprint does not resemble a petroleum product.
10. D = Dilution.
11. Sample ID nomenclature is per the following: type of sample-sample number-depth in feet-designation. For example T4S1SB-46-1-1 soil boring (SB) number 46, collected 1 foot below the ground surface, primary sample (1). T4S1S-6 = surface soil sample number 6.

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TABLE 6B
SOIL CHEMISTRY RESULTS: PETROLEUM HYDROCARBONS - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	T4S1SB-51	T4S1SB-51	T4S1SB-52	T4S1SB-53	T4S1SB-55	T4S1SB-55	T4S1SB-56	T4S1SB-57	T4S1SB-58	T4S1SB-58
Sample ID:	T4S1SB-51-2.5-1	T4S1SB-51-12-1	T4S1SB-52-13-1	T4S1SB-53-1-1	T4S1SB-55-1-1	T4S1SB-55-8-1	T4S1SB-56-8-1	T4S1SB-57-8-1	T4S1SB-58-1-1	T4S1SB-58-9-1
Sample Interval:	2 - 2.5	11 - 12	12 - 13	0.5 - 1	1 - 2	7.5 - 8.5	7.5 - 8.5	7 - 8	1 - 2	8.5 - 9.5
Date Sampled:	8/27/2004	8/27/2004	8/27/2004	8/27/2004	8/27/2004	8/31/2004	8/31/2004	8/31/2004	8/31/2004	8/31/2004
HCID (mg/kg)										
Gasoline Range	20 U	20 U	20 U	--	11 U	11 U	11 U	11 U	11 U	11 U
Diesel Range	Det	50 U	50 U	--	26 U	26 U	27 U	27 U	26 U	26 U
Residual Range	Det	100 U	100 U	--	52 U	52 U	54 U	53 U	51 U	52 U
TPH (mg/kg)										
Gasoline Range	--	--	--	4.3 U	--	--	--	--	--	--
Diesel Range	88 Z	--	--	43 U	--	--	--	--	--	--
Residual Range	190 Z	--	--	170 U	--	--	--	--	--	--

Sample Location:	T4S1SB-67	T4S1SB-70	T4S1SB-71	T4S1SB-72	T4S1SB-73	T4S1SB-74	T4S1SB-75	T4S1SB-76	T4S1SB-77	T4S1SB-78
Sample ID:	T4S1SB-67-18-1	T4S1SB-70-1-1	T4S1SB-71-1-1	T4S1SB-72-1-1	T4S1SB-73-1-1	T4S1SB-74-1-1	T4S1SB-75-1-1	T4S1SB-76-1-1	T4S1SB-77-1-1	T4S1SB-78-1-1
Sample Interval:	18 - 19	1 - 2	1 - 2	1 - 2	0.5 - 1.5	1 - 2	1 - 2	1 - 2	0.5 - 1	0.5 - 1.5
Date Sampled:	9/8/2004	8/26/2004	8/26/2004	8/26/2004	8/26/2004	8/26/2004	8/26/2004	38225	8/30/2004	8/30/2004
HCID (mg/kg)										
Gasoline Range	Det	20 U	20 U	20 U	20 U	20 U	20 U	20 U	--	--
Diesel Range	Det	50 U	50 U	50 U	50 U	50 U	50 U	50 U	--	--
Residual Range	Det	100 U	100 U	100 U	100 U	100 U	100 U	100 U	--	--
TPH (mg/kg)										
Gasoline Range	1,400 Z	--	--	--	--	--	--	--	3.6 U	1.3 J
Diesel Range	21,000 DY	--	--	--	--	--	--	--	46 U	42 U
Residual Range	14,000 DO	--	--	--	--	--	--	--	190 U	26 J

Sample Location:	T4S1SB-79	T4S1SB-80	T4S1SB-81	AOC72-S1	AOC72-S1	AOC72-S2	AOC72-S2	AOC72-S3	AOC72-S3	T4S1S-14
Sample ID:	T4S1SB-79-3-1	T4S1SB-80-3-1	T4S1SB-81-3-1	AOC72-S1-0.5	AOC72-S1-1.5	AOC72-S2-0.5	AOC72-S2-1.5	AOC72-S3-0.5	AOC72-S3-1.5	T4S1S-14
Sample Interval:	2.5 - 3.5	2.5 - 3.5	2.5 - 3.5	0.5 - 1.5	1.5 - 2.5	0.5 - 1.5	1.5 - 2.5	0.5 - 1.5	1.5 - 2.5	0 - 0.5
Date Sampled:	8/30/2004	8/30/2004	8/30/2004	3/8/2004	3/8/2004	3/8/2004	3/8/2004	3/8/2004	3/8/2004	3/22/2005
HCID (mg/kg)										
Gasoline Range	--	--	--	--	--	--	--	--	--	--
Diesel Range	--	--	--	--	--	--	--	--	--	--
Residual Range	--	--	--	--	--	--	--	--	--	--
TPH (mg/kg)										
Gasoline Range	1.1 J	3.4 U	4.1 U	2.9 U	2.8 U	2.7 U	2.8 U	2.7 U	2.7 U	--
Diesel Range	42 U	39 U	41 U	14 U	14 U	14 U	14 U	14 U	14 U	120 Z
Residual Range	170 U	160 U	170 U	56 U	55 U	54 U	53 U	52 U	53 U	600 Z

Sample Location:	T4S1MW-25	T4S1MW-25	T4S1MW-25	T4S1S-23	T4S1S-24	T4S1S-25	T4S1S-26	T4S1S-27	T4S1S-28	T4S1S-29	T4S1S-30
Sample ID:	T4S1MW-25-7.5-1	T4S1MW-25-17.5-1	T4S1MW-25-18.5-1	T4S1S-23	T4S1S-24	T4S1S-25	T4S1S-26	T4S1S-27	T4S1S-28	T4S1S-29	T4S1S-30
Sample Interval:	7.5 - 10	17.5 - 18.5	18.5 - 20	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1
Date Sampled:	9/8/2005	9/8/2005	9/8/2005	9/12/2005	9/12/2005	9/12/2005	9/13/2005	9/13/2005	9/13/2005	9/13/2005	9/13/2005
HCID (mg/kg)											
Gasoline Range	--	--	--	--	--	--	--	--	--	--	--
Diesel Range	--	--	--	--	--	--	--	--	--	--	--
Residual Range	--	--	--	--	--	--	--	--	--	--	--
TPH (mg/kg)											
Gasoline Range	--	--	--	--	--	--	--	--	--	--	--
Diesel Range	27.5 U	30 U	29.8 U	26.6 U	27.1 U	29.5 U	26.4 U	18.7 J, D	25.4 U	36.2 D	14.9 J, D
Residual Range	55 U	60 U	59.6 U	53.1 U, D	54.2 U	59.0 U	42.2 J, D	68.2 D	34.0 J, D	138 D	57.3 D

Notes:
1. Only detected compounds are reported in the table.
2. TPH =Total petroleum hydrocarbons (TPH) by Northwest Total Petroleum Hydrocarbons (NWTPH). Diesel and residual range performed with silica gel cleanup.
3. mg/kg = Milligrams per kilogram.
4. -- = No screening level available or not analyzed.
5. J = The result is an estimated concentration that is less than the method reporting limit (MRL) but greater than or equal to the method detection limit (MDL).
6. U = The compound was analyzed for but was not detected at or above the MRL/MDL.
7. D = The reported result is from a dilution.
8. Y = The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not.
9. O = The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
10. Z = The chromatographic fingerprint does not resemble a petroleum product.
11. Det = Detected at or above the MRL. Follow-up analyses were performed in order to obtain quantitative results.
12. Sample ID nomenclature is per the following: type of sample-sample number-depth in feet designation. For example T4S1SB-46-1-1 = soil boring (SB) number 46, collected 1 foot below the ground surface, primary sample (1). T4S1S-6 = surface soil sample number 6.

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TABLE 7A
SOIL CHEMISTRY RESULTS: POLYNUCLEAR AROMATIC HYDROCARBONS - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1SB-9	T4S1SB-14	T4S1SB-15	T4S1SB-16	T4S1SB-17	T4S1SB-18	T4S1SB-21	T4S1SB-22	T4S1SB-22	T4S1SB-23
Sample ID:			T4S1SB-9-0-1	T4S1SB-14-1-1	T4S1SB-15-1-1	T4S1SB-16-1-1	T4S1SB-17-1-1	T4S1SB-18-1-1	T4S1SB-21-13-1	T4S1SB-22-13-1	T4S1SB-22-17-1	T4S1SB-23-13-1
Sample Interval:	PRG	SLV	0 - 1	1 - 2	1 - 2	0.5 - 1.5	1 - 2	1 - 1.5	12.5 - 14	12.5 - 14	16.5 - 17	12.5 - 14
Date Sampled:			9/2/2004	8/24/2004	9/3/2004	9/3/2004	9/7/2004	9/2/2004	9/2/2004	9/2/2004	9/2/2004	9/2/2004
PAHs (µg/kg)												
Naphthalene	190,000	10,000	3.1 J	10	2.8 J	2.4 J	2.1 J	20	2 J	12	2,100 D	220
2-Methylnaphthalene	--	--	1.5 J	6.8	1.4 J	1.5 J	1.4 J	18	1.7 J	4.2 J	740 D	210
Acenaphthylene	--	--	1.7 J	50	3.5 J	3.2 J	3.8 J	13	0.3 J	18	2,700 D	350
Acenaphthene	29,000,000	20,000	0.33 J	11	0.56 J	0.72 J	1.1 J	1.9 J	3.9 U	1.1 J	1,200 D	290
Fluorene	26,000,000	30,000	0.57 J	8.2	0.51 J	0.63 J	1.5 J	1.8 J	0.33 J	7.6	3,500 D	630
Dibenzofuran	3,100,000	2	0.49 J	7.5	0.54 J	0.75 J	0.37 J	5.5	0.31 J	4.9 J	1,300 D	100
Phenanthrene	--	--	4.8	260	7.9	7.3	30	51	1.1 J	100	27,000 D	3,800 D
Anthracene	100,000,000	--	2.6 J	68	4.4 J	5	9.3	19	0.33 J	14	5,400 D	1,000
Fluoranthene	22,000,000	--	11	520	18	15	39	120	0.91 J	140	43,000 D	3,500 D
Pyrene	29,000,000	--	14	560	25	20	60	130	1.2 J	150	44,000 D	4,400 D
Benzo(b)fluoranthene	2,100	--	7	320	15	16	14	78	3.9 U	61	14,000 D	1,200
Benzo(k)fluoranthene	21,000	--	12	260	13	12	15	91	3.9 U	80	16,000 D	1,000
Benzo(a)anthracene	2,100	--	5.5	210	11	9	24	59	0.33 J	64	16,000 D	1,500
Chrysene	210,000	--	11	340	17	15	27	96	3.9 U	81	21,000 D	1,800
Benzo(a)pyrene	210	125,000	6.1	320	8.9	12	15	84	0.38 J	92	17,000 D	1,400
Indeno(1,2,3-cd)pyrene	2,100	--	9.5	330	15	15	12	82	0.37 J	63	12,000 D	1,000
Dibenz(a,h)anthracene	210	--	2 J	53	2.6 J	2.7 J	2.6 J	12	3.9 U	11	2,500 D	210
Benzo(g,h,i)perylene	--	--	9.7	320	17	16	12	100	0.49 J	60	11,000 D	950

Sample Location:	Preliminary Screening Levels		T4S1SB-24	T4S1SB-31	T4S1SB-32	T4S1SB-33	T4S1SB-42	T4S1SB-45	T4S1SB-46	T4S1SB-47	T4S1SB-48	T4S1SB-49
Sample ID:			T4S1SB-24-13-1	T4S1SB-31-0-1	T4S1SB-32-0-1	T4S1SB-33-0-1	T4S1SB-42-1-1	T4S1SB-45-1-1	T4S1SB-46-1-1	T4S1SB-47-1-1	T4S1SB-48-1-1	T4S1SB-49-1-1
Sample Interval:	PRG	SLV	12 - 13	0.5 - 1.5	0.5 - 1.5	0.25 - 1	0.5 - 1.5	0.5 - 2	0.5 - 2	0.5 - 2	0.5 - 2	0.5 - 2
Date Sampled:			8/25/2004	9/8/2004	9/3/2004	9/3/2004	9/3/2004	8/23/2004	8/23/2004	8/23/2004	8/23/2004	8/23/2004
PAHs (µg/kg)												
Naphthalene	190,000	10,000	6.2	33	1.3 J	9.9	2.6 J	36	1.2 J	1.4 J	1.4 J	1.4 J
2-Methylnaphthalene	--	--	0.98 J	50	0.66 J	15	1.4 J	37	0.76 J	0.91 J	0.92 J	0.84 J
Acenaphthylene	--	--	2 J	14	5 U	7.7	13	27	0.59 J	0.27 J	0.52 J	5 U
Acenaphthene	29,000,000	20,000	0.33 J	1.7 J	5 U	0.78 J	1.2 J	1.8 J	4.9 U	4.9 U	4.9 U	5 U
Fluorene	26,000,000	30,000	0.68 J	2.7 J	5 U	1.4 J	0.66 J	4.2 J	4.9 U	4.9 U	4.9 U	5 U
Dibenzofuran	3,100,000	2	0.64 J	21	5 U	4 J	0.94 J	9.8	4.9 U	4.9 U	--	--
Phenanthrene	--	--	1.8 J	66	0.66 J	46	17	110	1.2 J	0.79 J	1.3 J	0.87 J
Anthracene	100,000,000	--	0.41 J	20	5 U	9.4	12	32	0.78 J	0.32 J	0.51 J	5 U
Fluoranthene	22,000,000	--	1.5 J	73	1.3 J	48	62	280	3.4 J	1.9 J	2.2 J	1.7 J
Pyrene	29,000,000	--	1.4 J	110	1.5 J	72	82	360	4.8 J	2.5 J	2.6 J	1.7 J
Benzo(b)fluoranthene	2,100	--	4.9 U	140	1 J	61	58	230	2.1 J	1.4 J	1.4 J	1.4 J
Benzo(k)fluoranthene	21,000	--	4.9 U	67	0.66 J	49	45	170	1.7 J	1.1 J	0.85 J	0.9 J
Benzo(a)anthracene	2,100	--	0.46 J	66	0.98 J	38	58	150	2.1 J	1.6 J	0.89 J	1.4 J
Chrysene	210,000	--	4.9 U	150	0.91 J	63	69	230	2.2 J	1.5 J	1.4 J	1.2 J
Benzo(a)pyrene	210	125,000	0.66 J	97	0.65 J	58	53	250	1.8 J	1.4 J	1.2 J	1.1 J
Indeno(1,2,3-cd)pyrene	2,100	--	1.1 J	84	0.92 J	61	39	280	3 J	1.7 J	1.9 J	1.4 J
Dibenz(a,h)anthracene	210	--	4.9 U	24	5 U	13	9.6	39	0.54 J	0.37 J	0.3 J	5 U
Benzo(g,h,i)perylene	--	--	1.1 J	110	0.87 J	67	40	290	3.1 J	1.8 J	2.3 J	1.4 J

Please refer to notes at end of table

KMB00008309

TABLE 7A
SOIL CHEMISTRY RESULTS: POLYNUCLEAR AROMATIC HYDROCARBONS - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Screening Levels		T4S1SB-50	T4S1SB-82	T4S1SB-83	T4S1SB-84	T4S1SB-88	T4S1SB-89	T4S1SB-90
Sample ID:			T4S1SB-50-1-1	T4S1SB-82-1-1	T4S1SB-83-1-1	T4S1SB-84-13-1	T4S1SB-88-7.5-1	T4S1SB-89-0-1	T4S1SB-90-0-1
Sample Interval:	PRG	SLV	0.5 - 2.5	0.5 - 1.5	1 - 2	12 - 13.5	7.5 - 10	0.5 - 2.5	1 - 3
Date Sampled:			8/23/2004	9/1/2004	9/1/2004	9/8/2004	9/7/2005	9/7/2005	9/7/2005
PAHs (µg/kg)									
Naphthalene	190,000	10,000	1.1 J	2.7 J	1.9 J	1.3 J	7.19 U, D	15.2 U	14.4 U
2-Methylnaphthalene	--	--	0.64 J	1.6 J	0.78 J	1.1 J	--	--	--
Acenaphthylene	--	--	0.46 J	2.3 J	0.47 J	0.65 J	7.19 U, D	15.2 U	14.4 U
Acenaphthene	29,000,000	20,000	5 U	2.2 J	4.9 U	0.28 J	7.19 U, D	15.2 U	14.4 U
Fluorene	26,000,000	30,000	5 U	1.4 J	0.36 J	0.43 J	7.19 U, D	15.2 U	14.4 U
Dibenzofuran	3,100,000	2	5 U	0.74 J	0.23 J	5 U	--	--	--
Phenanthrene	--	--	0.56 J	12	1.3 J	5.5	68.8 D	7.65 J	14.4 U
Anthracene	100,000,000	--	0.65 J	4.8 J	0.81 J	2.1 J	9.78 J, D	15.2 U	14.4 U
Fluoranthene	22,000,000	--	1.5 J	35	2.7 J	7.7	58.0 D	15.3 D	3.80 J, D
Pyrene	29,000,000	--	1.7 J	34	3.8 J	11	51.3 D	24.7 D	7.79 J, D
Benzo(b)fluoranthene	2,100	--	1.8 J	24	1.5 J	3 J	34.8 D	18.9 D	4.00 J, D
Benzo(k)fluoranthene	21,000	--	1.1 J	31	2.7 J	4.1 J	28.3 J	13.9 J, D	14.4 U
Benzo(a)anthracene	2,100	--	1.3 J	15	1.5 J	5.4	34.7 D	10.1 J, D	14.4 U
Chrysene	210,000	--	1.3 J	28	2.7 J	5.7	50.4 D	21.4 D	3.84 J, D
Benzo(a)pyrene	210	125,000	1.2 J	21	2.6 J	3.3 J	35.8 J	16.9 D	4.86 J, D
Indeno(1,2,3-cd)pyrene	2,100	--	2 J	28	2.8 J	2.7 J	15.7 J	8.80 J, D	14.4 U
Dibenz(a,h)anthracene	210	--	5 U	5.9	4.9 U	0.57 J	7.19 U, D	15.2 U	14.4 U
Benzo(g,h,i)perylene	--	--	2.3 J	26	3.5 J	2.6 J	18.2 J, D	11.0 J, D	3.68 J, D

Sample Location:	Screening Levels		T4S1SB-92	T4S1SB-93	T4S1SB-94	T4S1SB-95	T4S1S-5	T4S1S-6	T4S1S-7	T4S1S-11
Sample ID:			T4S1SB-92-0-1	T4S1SB-93-0-1	T4S1SB-94-0-1	T4S1SB-95-0-1	T4S1S-5	T4S1S-6	T4S1S-7	T4S1S-11
Sample Interval:	PRG	SLV	1 - 3	0.5 - 2.5	1 - 3	0.5 - 2.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
Date Sampled:			9/7/2005	9/7/2005	9/7/2005	9/7/2005	3/22/2005	3/22/2005	3/22/2005	3/22/2005
PAHs (µg/kg)										
Naphthalene	190,000	10,000	3.49 J, D	7.47 U, D	5.75 J, D	12.0 J, D	330 U, J	330 U, J	91 J	7.9
2-Methylnaphthalene	--	--	--	--	--	--	330 U, J	330 U, J	65 J	5.3
Acenaphthylene	--	--	5.88 J, D	7.47 U, D	3.53 U	11.2 J, D	330 U, J	330 U, J	97 J	11
Acenaphthene	29,000,000	20,000	20.2 D	7.47 U, D	3.53 U	34.9 D	340 U, J	340 U, J	350 J	14
Fluorene	26,000,000	30,000	8.27 J, D	7.47 U, D	3.53 U	14.3 D	340 U, J	340 U, J	180 J	6.4
Dibenzofuran	3,100,000	2	--	--	--	--	340 U, J	340 U, J	100 J	4.4 J
Phenanthrene	--	--	105 D	15.8 J, D	17.4 D	212 D	47 J	100 J	1,700 J	90
Anthracene	100,000,000	--	26.3 D	7.47 U, D	4.92 J, D	41.7 D	30 J	24 J	390 J	31
Fluoranthene	22,000,000	--	263 D	41.9 D	34.8 D	520 D	26 J	110 J	3,100	290
Pyrene	29,000,000	--	309 D	40.5 D	37.5 D	650 D	77 J	170 J	2,700	290
Benzo(b)fluoranthene	2,100	--	326 D	59.5 J	40.6 J	644 D	92 J	210 J	3,800	310
Benzo(k)fluoranthene	21,000	--	248 D	33.6 J	24.9 J	480 D	31 J	85 J	1,100 J	300
Benzo(a)anthracene	2,100	--	201 D	31.2 D	19.8 D	383 D	52 J	100 J	2,200	190
Chrysene	210,000	--	238 D	43.3 D	34.8 D	474 D	69 J	140 J	2,500	250
Benzo(a)pyrene	210	125,000	281 D	47.8 J	32.1 J	568 D	69 J	150 J	2,800	310
Indeno(1,2,3-cd)pyrene	2,100	--	121 D	25.3 J	25.8 J	242 D	64 J	130 J	2,500	390
Dibenz(a,h)anthracene	210	--	43.9 D	12.0 J	7.03 J, D	84.7 D	330 U	35 J	660	77
Benzo(g,h,i)perylene	--	--	133 D	28.1 J	34.1 J	258 D	93 J	140 J	2,600	380

Please refer to notes at end of table.

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TABLE 7A
SOIL CHEMISTRY RESULTS: POLYNUCLEAR AROMATIC HYDROCARBONS - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1S-12	T4S1S-12	T4S1S-12	T4S1S-13	T4S1S-13	T4S1S-13	T4S1S-15	T4S1S-16	T4S1S-17	T4S1S-18	T4S1S-19
Sample ID:			T4S1S-12	T4S1S-12-0.5	T4S1S-12-2	T4S1S-13	T4S1S-13-0.5	T4S1S-13-2	T4S1S-15-0.5	T4S1S-16-0.5	T4S1S-17-0.5	T4S1S-18-0.5	T4S1S-19-0.5
Sample Interval:	PRG	SLV	0 - 0.5	0.5 - 1	2 - 2.5	0 - 0.5	0.5 - 1	2 - 2.5	0.5 - 1	0.5 - 1	0.5 - 1	0.5 - 1	0.5 - 1
Date Sampled:			3/22/2005	9/6/2005	9/6/2005	3/22/2005	9/6/2005	9/6/2005	9/6/2005	9/6/2005	9/6/2005	9/6/2005	9/6/2005
PAHs (µg/kg)													
Naphthalene	190,000	10,000	76	24.9 J, D	14.2 U	28	40.2 J, D	69.6 U	17.5 U, D	140 U	71.8 U	14.2 U	70.8 U
2-Methylnaphthalene	--	--	42	--		16	--		--	--	--	--	--
Acenaphthylene	--	--	29	61.3 J, D	14.2 U	31	223 D	69.6 U	29 J, D	140 U	56.8 J, D	14.2 U	37.4 J, D
Acenaphthene	29,000,000	20,000	340	112 D	14.2 U	200	114 J, D	69.6 U	37.1 J, D	53.5 J, D	37.8 J, D	7.32 J, D	17.6 J, D
Fluorene	26,000,000	30,000	110	44.9 J, D	14.2 U	65	82.3 J, D	69.6 U	22.6 J, D	140 U	21.5 J, D	14.2 U	70.8 U
Dibenzofuran	3,100,000	2	62	--	--	36	--	--	--	--	--	--	--
Phenanthrene	--	--	2,000 D	588 D	6.75 J, D	1,300 D	677 D	87.9 D	258 D	313 D	203 D	37.6 D	136 D
Anthracene	100,000,000	--	350	179 D	14.2 U	220	627 D	40.6 J, D	78 D	66.1 J, D	115 D	8.62 J, D	50.2 J, D
Fluoranthene	22,000,000	--	6,400 D	1,460 D	20.6 D	3,900 D	1,860 D	275 D	667 D	853 D	490 D	88.8 D	359 D
Pyrene	29,000,000	--	5,800 D	1,380 D	18.3 D	3,800 D	1,810 D	225 D	734 D	900 D	552 D	99.2 D	456 D
Benzo(b)fluoranthene	2,100	--	6,200 D	1,830 D	20.9 D	3,900 D	3,060 D	323 J	616 D	1,080 D	631 D	79.5 D	342 D
Benzo(k)fluoranthene	21,000	--	4,200 D	1,150 D	16.3 D	3,300 D	1,810 D	213 J	627 D	695 D	604 D	85.1 D	378 D
Benzo(a)anthracene	2,100	--	3,900 D	998 D	14.1 J, D	2,400 D	1,300 D	185 D	446 D	581 D	358 D	57.3 D	249 D
Chrysene	210,000	--	4,900 D	1,380 D	20.1 D	3,200 D	1,780 D	228 D	585 D	789 D	467 D	72.0 D	335 D
Benzo(a)pyrene	210	125,000	6,000 D	1,310 D	20.1 D	3,800 D	1,760 D	256 J	616 D	830 D	571 D	83.8 D	354 D
Indeno(1,2,3-cd)pyrene	2,100	--	5,400 D	491 D	16.2 D	3,700 D	1,410 D	210 J	344 D	403 D	290 D	41.3 D	185 D
Dibenz(a,h)anthracene	210	--	1,100	166 D	5.04 J, D	780	500 D	70.1 J	117 D	142 D	99.4 D	14.5 D	61.6 J, D
Benzo(g,h,i)perylene	--	--	5,000 D	445 D	20.1 D	3,400 D	1,340 D	232 J	372 D	416 D	294 D	44.6 D	206 D

Notes:

1. Only detected compounds are reported in the table. The complete analyte list is presented in the Sampling and Analysis Plan (Appendix A) of the RI Work Plan (Hart Crowser, 2004a).
2. PAHs = Polynuclear Aromatic Hydrocarbons by EPA Method 8270C (SIM).
3. µg/kg = Micrograms per kilogram.
4. PRG = EPA Region 9 Preliminary Remediation Goal (PRG) for Industrial Soil (October 2004).
5. -- = No screening level available or not analyzed.
6. J = The result is an estimated concentration that is less than the method reporting limit (MRL) but greater than or equal to the method detection limit (MDL).
7. U = The compound was analyzed for but was not detected at or above the MRL/MDL.
8. D = Dilution.
9. Shaded values indicate that the detected concentration exceeds the PRG.
10. Sample ID nomenclature is per the following: type of sample-sample number-depth in feet-designation.
    For example T4S1SB-46-1-1 = soil boring (SB) number 46, collected 1 foot below the ground surface, primary sample (1). T4S1S-6 = surface soil sample number 6.
11. SLV = Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Terrestrial Receptors (lowest available value).
12. Boxed values indicate that the detected concentration exceeds the SLV (only samples from 0 to 3 feet were screened against the SLV).

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TABLE 7B
SOIL CHEMISTRY RESULTS: POLYNUCLEAR AROMATIC HYDROCARBONS - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1SB-53	T4S1SB-55	T4S1SB-58	T4S1SB-67	T4S1SB-70	T4S1SB-71	T4S1SB-72	T4S1SB-73	T4S1SB-74	T4S1SB-75	T4S1SB-76
Sample ID:			T4S1SB-53-1-1	T4S1SB-55-1-1	T4S1SB-58-1-1	T4S1SB-67-18-1	T4S1SB-70-1-1	T4S1SB-71-1-1	T4S1SB-72-1-1	T4S1SB-73-1-1	T4S1SB-74-1-1	T4S1SB-75-1-1	T4S1SB-76-1-1
Sample Interval:	PRG	SLV	0.5 - 1	1 - 2	1 - 2	18 - 19	1 - 2	1 - 2	1 - 2	0.5 - 1.5	1 - 2	1 - 2	1 - 2
Date Sampled:			8/27/2004	8/31/2004	8/31/2004	9/8/2004	8/26/2004	8/26/2004	8/26/2004	8/26/2004	8/26/2004	8/26/2004	8/26/2004
PAHs (µg/kg)													
Naphthalene	190,000	10,000	3.2 J	1.9 J	0.98 J	2,600 D	330 U	330 U	330 U	330 U	340 U	120 J	330 U
2-Methylnaphthalene	--	--	1.5 J	1 J	0.5 J	140,000 D	330 U	330 U	330 U	330 U	340 U	93 J	330 U
Acenaphthylene	--	--	1.5 J	0.47 J	4.3 U	500 U	330 U	330 U	330 U	330 U	340 U	22 J	330 U
Acenaphthene	29,000,000	20,000	0.28 J	4.4 U	4.3 U	5,500 D	330 U	330 U	330 U	330 U	340 U	330 U	330 U
Fluorene	26,000,000	30,000	0.8 J	0.3 J	0.21 J	10,000 D	330 U	330 U	330 U	330 U	340 U	330 U	330 U
Dibenzofuran	3,100,000	2	0.54 J	0.38 J	0.25 J	2,000 D	330 U	330 U	330 U	330 U	340 U	43 J	330 U
Phenanthrene	--	--	5.2	3.9 J	0.74 J	36,000 D	330 U	330 U	330 U	330 U	340 U	150 J	16 J
Anthracene	100,000,000	--	2.4 J	0.59 J	4.3 U	6,800 D	330 U	330 U	330 U	330 U	340 U	46 J	330 U
Fluoranthene	22,000,000	--	11	4.6	0.81 J	2,000 D	39 J	330 U	330 U	22 J	340 U	250 J	36 J
Pyrene	29,000,000	--	15	4.7	0.93 J	16,000 D	34 J	330 U	330 U	19 J	340 U	200 J	31 J
Benzo(b)fluoranthene	2,100	--	5.7	3.1 J	1.2 J	620 D	30 J	330 U	330 U	330 U	340 U	190 J	22 J
Benzo(k)fluoranthene	21,000	--	8.8	2.2 J	0.81 J	340 J, D	330 U	330 U	330 U	330 U	340 U	150 J	330 U
Benzo(a)anthracene	2,100	--	4.5 J	2.6 J	0.41 J	5,500 D	22 J	330 U	330 U	330 U	340 U	120 J	19 J
Chrysene	210,000	--	9.3	4.2 J	1.3 J	12,000 D	30 J	330 U	330 U	14 J	340 U	240 J	25 J
Benzo(a)pyrene	210	125,000	8	2.1 J	0.7 J	1,700 D	26 J	330 U	330 U	330 U	340 U	150 J	330 U
Indeno(1,2,3-cd)pyrene	2,100	--	9.2	2.3 J	1.1 J	230 J, D	330 U	330 U	330 U	330 U	340 U	170 J	330 U
Dibenz(a,h)anthracene	210	--	1.5 J	0.47 J	0.35 J	240 J, D	330 U	330 U	330 U	330 U	340 U	38 J	330 U
Benzo(g,h,i)perylene	--	--	11	2.6 J	1.4 J	870 D	34 J	330 U	330 U	330 U	340 U	190 J	33 J

Sample Location:	Preliminary Screening Levels		T4S1SB-77	T4S1SB-78	T4S1SB-79	T4S1SB-80	T4S1SB-81	T4S1MW-25	T4S1MW-25	T4S1MW-25
Sample ID:			T4S1SB-77-1-1	T4S1SB-78-1-1	T4S1SB-79-3-1	T4S1SB-80-3-1	T4S1SB-81-3-1	T4S1MW-25-7.5-1	T4S1MW-25-17.5-1	T4S1MW-25-18.5-1
Sample Interval:	PRG	SLV	0.5 - 1	0.5 - 1.5	2.5 - 3.5	2.5 - 3.5	2.5 - 3.5	7.5 - 10	17.5 - 18.5	18.5 - 20
Date Sampled:			8/30/2005	8/30/2005	8/30/2005	8/30/2005	8/30/2005	9/8/2005	9/8/2005	9/8/2005
PAHs (µg/kg)										
Naphthalene	190,000	10,000	330 U	330 U	5	1.3 J	0.84 J	14.6 U	16.0 U	15.9 U
2-Methylnaphthalene	--	--	330 U	330 U	6.6	0.58 J	5 U	--	--	--
Acenaphthylene	--	--	330 U	330 U	0.78 J	5 U	5 U	14.6 U	16.0 U	15.9 U
Acenaphthene	29,000,000	20,000	330 U	330 U	0.46 J	5 U	5 U	14.6 U	16.0 U	15.9 U
Fluorene	26,000,000	30,000	330 U	330 U	0.57 J	5 U	5 U	14.6 U	16.0 U	15.9 U
Dibenzofuran	3,100,000	2	330 U	330 U	2.3 J	0.22 J	5 U	--	--	--
Phenanthrene	--	--	14 J	330 U	11	5 U	5 U	21.9 D	16.0 U	4.93 J, D
Anthracene	100,000,000	--	330 U	330 U	0.92 J	5 U	5 U	6.86 J, D	16.0 U	15.9 U
Fluoranthene	22,000,000	--	19 J	18 J	9.1	0.44 J	0.39 J	32.8 D	16.0 U	8.72 J, D
Pyrene	29,000,000	--	330 U	17 J	11	0.4 J	5 U	37.5 D	16.0 U	12.8 J, D
Benzo(b)fluoranthene	2,100	--	330 U	330 U	5.8	0.54 J	5 U	10.8 J, D	16.0 U	15.9 U
Benzo(k)fluoranthene	21,000	--	330 U	330 U	5.3	5 U	5 U	13.1 J, D	16.0 U	5.02 J, D
Benzo(a)anthracene	2,100	--	330 U	330 U	5.5	0.27 J	5 U	17.9 D	16.0 U	5.86 J, D
Chrysene	210,000	--	330 U	330 U	8.3	5 U	5 U	19.1 D	16.0 U	6.74 J, D
Benzo(a)pyrene	210	125,000	330 U	330 U	6.6	0.26 J	5 U	14.3 J, D	16.0 U	5.75 J, D
Indeno(1,2,3-cd)pyrene	2,100	--	330 U	330 U	6.2	0.28 J	5 U	5.45 J, D	16.0 U	15.9 U
Dibenz(a,h)anthracene	210	--	330 U	330 U	1.1 J	5 U	5 U	14.6 U	16.0 U	15.9 U
Benzo(g,h,i)perylene	--	--	330 U	330 U	7.4	0.31 J	5 U	5.56 J, D	16.0 U	15.9 U

Please refer to notes at end of table

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TABLE 7B
SOIL CHEMISTRY RESULTS: POLYNUCLEAR AROMATIC HYDROCARBONS - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		AOC72-S1	AOC72-S1	AOC72-S2	AOC72-S2	AOC72-S3	AOC72-S3	T4S1S-8	T4S1S-9	T4S1S-10	T4S1S-14	T4S1S-14B	T4S1MW16
Sample ID:			AOC72-S1-0.5	AOC72-S1-1.5	AOC72-S2-0.5	AOC72-S2-1.5	AOC72-S3-0.5	AOC72-S3-1.5	T4S1S-8-1	T4S1S-9-1	T4S1S-10-1	T4S1S-14	T4S1S-14B	MW16-0.5-1
Sample Interval:	PRG	SLV	0.5 - 1.5	1.5 - 2.5	0.5 - 1.5	1.5 - 2.5	0.5 - 1.5	1.5 - 2.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0.5 - 1	0.5 - 1
Date Sampled:			3/8/2004	3/8/2004	3/8/2004	3/8/2004	3/8/2004	3/8/2004	8/27/2004	8/27/2004	8/27/2004	3/22/2005	9/8/2005	3/29/2004
PAHs (µg/kg)														
Naphthalene	190,000	10,000	1.3 J	4.8 U	0.24 J	4.8 U	4.7 U	0.34 J	1.9 J	6.5	19	140 D	14.1 U	3.6 J
2-Methylnaphthalene	--	--	1.1 J	4.8 U	4.7 U	4.8 U	4.7 U	4.8 U	0.7 J	2.1 J	5.9	69 D	--	--
Acenaphthylene	--	--	2.0 J	4.8 U	0.36 J	4.8 U	4.7 U	0.25 J	1.3 J	6	10	26 D	14.1 U	3.3 J
Acenaphthene	29,000,000	20,000	0.66 J	4.8 U	4.7 U	4.8 U	4.7 U	4.8 U	0.21 J	0.7 J	2.1 J	1,000 D	27.4 D	0.60 J
Fluorene	26,000,000	30,000	1.7 J	4.8 U	0.20 J	4.8 U	4.7 U	4.8 U	0.31 J	1.1 J	1.9 J	380 D	12.5 J, D	0.56 J
Dibenzofuran	3,100,000	2	0.79 J	4.8 U	4.7 U	4.8 U	4.7 U	4.8 U	0.35 J	0.88 J	1.5 J	200 D	347 U	--
Phenanthrene	--	--	6.6	1.3 J	1.5 J	1.1 J	1.2 J	0.25 J	1.9 J	14	52	6,400 D	183 D	9.5
Anthracene	100,000,000	--	2.9 J	0.63 J	1.4 J	0.75 J	0.62 J	0.33 J	1 J	5.6	13	1100 D	30.9 D	3.2 J
Fluoranthene	22,000,000	--	7.9	1.2 J	2.7 J	0.98 J	1.1 J	0.44 J	7.3	38	270	18,000 D	483 D	30
Pyrene	29,000,000	--	11	1.2 J	2.9 J	0.91 J	1.1 J	0.55 J	10	54	380	16,000 D	437 D	41
Benzo(b)fluoranthene	2,100	--	3.7 J	0.16 J	2.3 J	4.8 U	4.7 U	0.42 J	7.7	40	200	17,000 D	476 D	26
Benzo(k)fluoranthene	21,000	--	5.3	0.19 J	1.5 J	0.18 J	0.22 J	0.40 J	6.4	37	170	12,000 D	438 D	25
Benzo(a)anthracene	2,100	--	4.2 J	0.45 J	1.3 J	4.8 U	0.22 J	0.21 J	5.8	26	180	10,000 D	315 D	17
Chrysene	210,000	--	6.3	0.38 J	1.9 J	0.21 J	0.31 J	0.41 J	7	36	250	13,000 D	388 D	25
Benzo(a)pyrene	210	125,000	4.5 J	0.26 J	0.8 J	0.23 J	0.23 J	0.19 J	10	55	270	16,000 D	455 D	37
Indeno(1,2,3-cd)pyrene	2,100	--	3.7 J	4.8 U	0.90 J	4.8 U	4.7 U	0.28 J	10	63	240	15,000 D	209 D	51
Dibenz(a,h)anthracene	210	--	0.44 J	4.8 U	4.7 U	4.8 U	4.7 U	4.8 U	1.5 J	7.9	35	2,900 D	76.9 D	7.4
Benzo(g,h,i)perylene	--	--	4.9 J	0.15 J	1.1 J	0.21 J	4.7 U	0.49 J	13	79	270	13,000 D	210 D	64

Sample Location:	Preliminary Screening Levels		T4S1S-23	T4S1S-24	T4S1S-25	T4S1S-26	T4S1S-26A	T4S1S-26B	T4S1S-26C	T4S1S-26D	T4S1S-27	T4S1S-27A	T4S1S-27B
Sample ID:			T4S1S-23	T4S1S-24	T4S1S-25	T4S1S-26	T4S1S-26A	T4S1S-26B	T4S1S-26C	T4S1S-26D	T4S1S-27	T4S1S-27A	T4S1S-27B
Sample Interval:	PRG	SLV	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1
Date Sampled:			9/12/2005	9/12/2005	9/12/2005	9/13/2005	9/13/2005	9/13/2005	9/13/2005	9/13/2005	9/13/2005	9/13/2005	9/13/2005
PAHs (µg/kg)													
Naphthalene	190,000	10,000	14.2 U	14.3 U	15.8 U	30.3 J, D	13.6 U	5.55 J, D	13.9 U	83.2 D	69.2 D	269 D	13.6 U
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	4.74 J, D	14.3 U	15.8 U	35.7 J, D	13.6 U	48.8 D	13.9 U	108 D	18.7 J, D	114 D	13.6 U
Acenaphthene	29,000,000	20,000	14.2 U	14.3 U	15.8 U	70.1 U	13.6 U	27.1 D	13.9 U	77.3 U	97.4 D	375 D	9.59 J, D
Fluorene	26,000,000	30,000	14.2 U	14.3 U	15.8 U	70.1 U	13.6 U	28.7 D	13.9 U	77.3 U	48.0 J, D	207 D	7.51 J, D
Dibenzofuran	3,100,000	2	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	10.9 J, D	9.65 J, D	37.7 D	234 D	23.2 D	361 D	25.4 D	443 D	376 D	1,680 D	141 D
Anthracene	100,000,000	--	17.6 D	14.3 U	6.51 J, D	57.0 J, D	3.40 J, D	206 D	3.63 J, D	99.6 D	93.5 D	471 D	19.7 D
Fluoranthene	22,000,000	--	28.9 D	26.5 D	104 D	962 D	87.5 D	7,990 D	95.4 D	1,640 D	986 D	4,650 D	511 D
Pyrene	29,000,000	--	22.3 D	19.5 D	75.1 D	883 D	83.6 D	7,220 D	86.7 D	1,750 D	722 D	3,440 D	402 D
Benzo(b)fluoranthene	2,100	--	59.6 D	21.3 D	102 D	874 D	89.4 D	2,270 D	94.0 D	1,500 D	916 D	3,690 D	485 D
Benzo(k)fluoranthene	21,000	--	37.9 D	17.2 D	58.8 D	597 D	84.8 D	2,070 D	90.2 D	1,300 D	583 D	3,240 D	409 D
Benzo(a)anthracene	2,100	--	30.8 D	15.1 D	62.3 D	581 D	62.5 D	2,380 D	68.0 D	1,110 D	597 D	2,700 D	320 D
Chrysene	210,000	--	77.4 D	17.9 D	70.7 D	898 D	79.2 D	4,170 D	87.3 D	1,590 D	705 D	3,590 D	393 D
Benzo(a)pyrene	210	125,000	48.1 D	20.9 D	89.1 D	776 D	92.4 D	1,460 D	97.4 D	1,830 D	786 D	3,560 D	445 D
Indeno(1,2,3-cd)pyrene	2,100	--	46.4 D	15.4 D	62.8 D	514 D	55.4 D	433 D	54.8 D	790 D	581 D	2,280 D	181 D
Dibenz(a,h)anthracene	210	--	14.9 D	4.79 J, D	20.5 D	151 D	17.9 D	160 D	17.7 D	183 D	194 D	795 D	64.2 D
Benzo(g,h,i)perylene	--	--	50.9 D	17.5 D	70.2 D	611 D	61.4 D	358 D	60.1 D	926 D	655 D	2,560 D	181 D

Please refer to notes at end of table

KMB00008313

TABLE 7B
SOIL CHEMISTRY RESULTS: POLYNUCLEAR AROMATIC HYDROCARBONS - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1S-27C	T4S1S-27D	T4S1S-28	T4S1S-28A	T4S1S-28B	T4S1S-28C	T4S1S-28D	T4S1S-29	T4S1S-30	T4S1S-30A	T4S1S-30C	T4S1S-30D
Sample ID:			T4S1S-27C	T4S1S-27D	T4S1S-28	T4S1S-28A	T4S1S-28B	T4S1S-28C	T4S1S-28D	T4S1S-29	T4S1S-30	T4S1S-30A	T4S1S-30C	T4S1S-30D
Sample Interval:	PRG	SLV	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1
Date Sampled:			9/13/2005	9/13/2005	9/13/2005	9/13/2005	9/13/2005	9/13/2005	9/13/2005	9/13/2005	9/13/2005	9/13/2005	9/13/2005	9/13/2005
PAHs (µg/kg)														
Naphthalene	190,000	10,000	54.7 U	54.5 U	28.3 J, D	107 D	55.2 U	13.8 U	68.4 U	388 D	39.5 J, D	344 U	33.2 J, D	6,480 D
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	54.7 U	54.5 U	67.6 U	18.2 J, D	55.2 U	13.8 U	68.4 U	176 D	69.2 U	344 U	55.2 U	347 U
Acenaphthene	29,000,000	20,000	54.7 U	54.5 U	151 D	843 D	55.2 U	13.8 U	68.4 U	164 J, D	183 D	295 J, D	171 D	1,180 D
Fluorene	26,000,000	30,000	54.7 U	54.5 U	114 D	825 D	55.2 U	13.8 U	68.4 U	116 J, D	72.5 D	105 J, D	70.3 D	1,240 D
Dibenzofuran	3,100,000	2	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	28.5 J, D	35.0 J, D	1,040 D	6,300 D	29.8 J, D	22.4 D	137 D	1,710 D	972 D	1,630 D	873 D	1,830 D
Anthracene	100,000,000	--	54.7 U	54.5 U	166 D	717 D	55.2 U	13.8 U	24.8 J, D	314 D	173 D	251 J, D	162 D	520 U
Fluoranthene	22,000,000	--	88.1 D	113 D	2,390 D	11,300 D	93.5 D	80.1 D	400 D	5,780 D	2,650 D	4,340 D	2,110 D	139 J, D
Pyrene	29,000,000	--	94.2 D	105 D	1,640 D	8,280 D	85.7 D	63.1 D	379 D	5,490 D	1,870 D	3,610 D	1,770 D	147 D
Benzo(b)fluoranthene	2,100	--	91.0 D	107 D	2,020 D	8,010 D	87.7 D	85.4 D	378 D	4,440 D	2,300 D	3,560 D	1,690 D	7.49 J, D
Benzo(k)fluoranthene	21,000	--	88.6 D	101 D	1,230 D	7,260 D	80.7 D	64.0 D	331 D	3,660 D	1,270 D	3,240 D	1,620 D	5.34 J, D
Benzo(a)anthracene	2,100	--	62.9 D	74.4 D	1,390 D	6,580 D	61.6 D	48.4 D	263 D	3,610 D	1,590 D	2,810 D	1,500 D	16.4 D
Chrysene	210,000	--	83.2 D	98.7 D	1,650 D	8,190 D	83.4 D	64.0 D	357 D	4,510 D	1,850 D	3,600 D	1,720 D	24.3 D
Benzo(a)pyrene	210	125,000	104 D	110 D	1,660 D	7,790 D	85.1 D	74.5 D	376 D	4,920 D	1,880 D	3,610 D	1,840 D	8.08 J, D
Indeno(1,2,3-cd)pyrene	2,100	--	60.6 D	61.4 D	1,130 D	4,460 D	49.1 J, D	30.5 D	247 D	3,500 D	1,220 D	1,950 D	950 D	13.9 U
Dibenz(a,h)anthracene	210	--	18.2 J, D	20.4 J, D	394 D	1,530 D	16.7 J, D	10.9 J, D	73.3 D	1,060 D	427 D	662 D	322 D	13.9 U
Benzo(g,h,i)perylene	--	--	74.4 D	68.3 D	1,240 D	4,770 D	56.3 D	30.5 D	290 D	4,160 D	1,280 D	2,160 D	997 D	13.9 U

Notes:

1. Only detected compounds are reported in the table. The complete analyte list is presented in the Sampling and Analysis Plan (Appendix A) of the RI Work Plan (Hart Crowser, 2004a).
2. PAHs = Polynuclear Aromatic Hydrocarbons by EPA Method 8270C (SIM).
3. µg/kg = Micrograms per kilogram.
4. PRG = EPA Region 9 Preliminary Remediation Goal (PRG) for Industrial Soil (October 2004).
5. -- = No screening level available or not analyzed.
6. J = The result is an estimated concentration that is less than the method reporting limit (MRL) but greater than or equal to the method detection limit (MDL).
7. U = The compound was analyzed for but was not detected at or above the MRL/MDL.
8. D = Dilution.
9. Shaded values indicate that the detected concentration exceeds the PRG.
10. Sample ID nomenclature is per the following: type of sample-sample number-depth in feet-designation.
    For example T4S1SB-46-1-1 = soil boring (SB) number 46, collected 1 foot below the ground surface, primary sample (1). T4S1S-6 = surface soil sample number 6.
11. SLV = Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Terrestrial Receptors (lowest available value).
12. Boxed values indicate that the detected concentration exceeds the SLV (only samples from 0 to 3 feet were screened against the SLV).

KMB00008314

TABLE 8A
SOIL CHEMISTRY RESULTS: SEMI-VOLATILE ORGANIC COMPOUNDS (EXCEPT PAHs) - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1SB-14	T4S1SB-15	T4S1SB-16	T4S1SB-42
Sample ID:			T4S1SB-14-1-1	T4S1SB-15-1-1	T4S1SB-16-1-1	T4S1SB-42-1-1
Sample Interval:	PRG	SLV	1 - 2	1 - 2	0.5 - 1.5	0.5 - 1.5
Date Sampled:			8/24/2004	9/3/2004	9/3/2004	9/3/2004
SVOCs (µg/kg)						
Phenol	100,000,000	30,000	330 U	330 U	330 U	330 U
Di-n-butyl Phthalate	62,000,000	450	330 U	330 U	330 U	330 U
Bis(2-ethylhexyl) Phthalate	120,000	4,500	330 U	330 U	330 U	330 U

Sample Location:	Preliminary Screening Levels		T4S1S-5	T4S1S-6	T4S1S-7	T4S1S-11
Sample ID:			T4S1S-5	T4S1S-6	T4S1S-7	T4S1S-11
Sample Interval:	PRG	SLV	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
Date Sampled:			3/22/2005	3/22/2005	3/22/2005	3/22/2005
SVOCs (µg/kg)						
Phenol	100,000,000	30,000	330 U	24 J	50 J	50 J
Di-n-butyl Phthalate	62,000,000	450	19 J	65 J	71 J	71 J
Bis(2-ethylhexyl) Phthalate	120,000	4,500	60 J	400	720	720

Notes:

1. Only detected compounds are reported in the table. The complete analyte list is presented in the Sampling and Analysis Plan (Appendix A) of the RI Work Plan (Hart Crowser, 2004a).
2. SVOCs = Semi-Volatile Organic Compounds by EPA Method 8270C.
3. µg/kg = Micrograms per kilogram.
4. PRG = EPA Region 9 Preliminary Remediation Goal (PRG) for Industrial Soil (October 2004).
5. -- = No screening level available or not analyzed.
6. J = The result is an estimated concentration that is less than the method reporting limit (MRL) but greater than or equal to the method detection limit (MDL).
7. U = The compound was analyzed for but was not detected at or above the MRL/MDL.
8. Sample ID nomenclature is per the following: type of sample-sample number-depth in feet designation.
   For example T4S1SB-46-1-1 = soil boring (SB) number 46, collected 1 foot below the ground surface, primary sample (1). T4S1S-6 = surface soil sample number 6.
9. SLV = Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Terrestrial Receptors (lowest available value).

KMB00008315

TABLE 8B
SOIL CHEMISTRY RESULTS: SEMI-VOLATILE ORGANIC COMPOUNDS (EXCEPT PAHs) - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1SB-70	T4S1SB-71	T4S1SB-72	T4S1SB-73	T4S1SB-74	T4S1SB-75	T4S1SB-76	T4S1SB-77	T4S1SB-78
Sample ID:			T4S1SB-70-1-1	T4S1SB-71-1-1	T4S1SB-72-1-1	T4S1SB-73-1-1	T4S1SB-74-1-1	T4S1SB-75-1-1	T4S1SB-76-1-1	T4S1SB-77-1-1	T4S1SB-78-1-1
Sample Interval:	PRG	SLV	1 - 2	1 - 2	1 - 2	0.5 - 1.5	1 - 2	1 - 2	1 - 2	0.5 - 1	0.5 - 1.5
Date Sampled:			8/26/2004	8/26/2004	8/26/2004	8/26/2004	8/26/2004	8/26/2004	8/26/2004	8/30/2005	8/30/2005
SVOCs (µg/kg)											
Phenol	100,000,000	30,000	330 U	330 U	330 U	330 U	340 U	330 U	330 U	330 U	330 U
Di-n-butyl Phthalate	62,000,000	450	330 U	330 U	330 U	330 U	340 U	330 U	330 U	330 U	330 U
Bis(2-ethylhexyl) Phthalate	120,000	4,500	330 U	47 J	330 U	330 U	340 U	330 U	330 U	330 U	330 U

Sample Location:	Preliminary Screening Levels		T4S1S-23	T4S1S-24	T4S1S-25	T4S1S-26	T4S1S-27	T4S1S-28	T4S1S-29	T4S1S-30
Sample ID:			T4S1S-23	T4S1S-24	T4S1S-25	T4S1S-26	T4S1S-27	T4S1S-28	T4S1S-29	T4S1S-30
Sample Interval:	PRG	SLV	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1
Date Sampled:			9/12/2005	9/12/2005	9/12/2005	9/13/2005	9/13/2005	9/13/2005	9/13/2005	9/13/2005
SVOCs (µg/kg)										
Phenol	100,000,000	30,000	--	--	--	--	--	--	--	--
Di-n-butyl Phthalate	62,000,000	450	14.2 U	14.4 U	15.9 U	27.9 U	27.0 U	27.2 U	54.8 U	27.7 U
Bis(2-ethylhexyl) Phthalate	120,000	4,500	14.2 U	14.4 U	17.6 D	27.9 U	27.0 U	27.2 U	54.8 U	27.7 U

Notes:
1. Only detected compounds are reported in the table. The complete analyte list is presented in the Sampling and Analysis Plan (Appendix A) of the RI Work Plan (Hart Crowser, 2004a).
2. SVOCs = Semi-Volatile Organic Compounds by EPA Method 8270C.
3. µg/kg = Micrograms per kilogram.
4. PRG = EPA Region 9 Preliminary Remediation Goal (PRG) for Industrial Soil (October 2004).
5. -- = No screening level available or not analyzed.
6. J = The result is an estimated concentration that is less than the method reporting limit (MRL) but greater than or equal to the method detection limit (MDL).
7. U = The compound was analyzed for but was not detected at or above the MRL/MDL.
8. Sample ID nomenclature is per the following: type of sample-sample number-depth in feet designation.
   For example T4S1SB-46-1-1 = soil boring (SB) number 46, collected 1 foot below the ground surface, primary sample (1). T4S1S-6 = surface soil sample number 6.
9. SLV = Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Terrestrial Receptors (lowest available value).

KMB00008316

TABLE 9A
SOIL CHEMISTRY RESULTS: VOLATILE ORGANIC COMPOUNDS - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1SB-14	T4S1SB-15	T4S1SB-16	T4S1SB-17	T4S1SB-18	T4S1SB-21	T4S1SB-22	T4S1SB-22	T4S1SB-23
Sample ID:			T4S1SB-14-5-1	T4S1SB-15-3-1	T4S1SB-16-3-1	T4S1SB-17-1-1	T4S1SB-18-1-1	T4S1SB-21-13-1	T4S1SB-22-13-1	T4S1SB-22-17-1	T4S1SB-23-13-1
Sample Interval:	PRG	SLV	5 - 7	3 - 3.5	2.5 - 3.5	1 - 2	1 - 1.5	12.5 - 14	12.5 - 14	16.5 - 17	12.5 - 14
Date Sampled:			8/24/2004	9/3/2004	9/3/2004	9/7/2004	9/2/2004	9/2/2004	9/2/2004	9/2/2004	9/2/2004
VOCs (µg/kg)											
Acetone	54,000,000	1,250,000	13 J	12 J	23 U	22 U	13 J	45	20 J	790	210
Carbon Disulfide	720,000	--	5.3 U	5.3 U	5.7 U	5.4 U	5.5 U	6.6 U	5.2 U	7.3 J	3 J
Dichloromethane (Methylene Chloride)	21,000	730,000	2.8 J	1.2 J	1.7 J	1.3 J	4.6 J	3.5 J	32	33	11 J
2-Butanone (MEK)	110,000,000	200,000,000	21 U	21 U	23 U	22 U	22 U	27 U	21 U	160	43
Chloroform	470	1,875,000	5.3 U	5.3 U	5.7 U	5.4 U	5.5 U	6.6 U	1.3 J	14 U	8.8 U
Carbon Tetrachloride	550	1,000,000	5.3 U	5.3 U	5.7 U	5.4 U	5.5 U	6.6 U	1.1 J	14 U	8.8 U
Benzene	1,400	3,300,000	5.3 U	5.3 U	5.7 U	5.4 U	5.5 U	6.6 U	5.2 U	14 U	8.8 U
Trichloroethene (TCE)	110	40,000	5.3 U	5.3 U	5.7 U	5.4 U	5.5 U	6.6 U	0.81 J	14 U	8.8 U
Toluene	520,000	200,000	5.3 U	5.3 U	5.7 U	5.4 U	5.5 U	6.6 U	5.2 U	14 U	8.8 U
Tetrachloroethene (PCE)	1,300	10,000	5.3 U	5.3 U	5.7 U	5.4 U	5.5 U	6.6 U	5.2 U	14 U	8.8 U
Chlorobenzene	530,000	40,000	5.3 U	5.3 U	5.7 U	5.4 U	5.5 U	6.6 U	5.2 U	14 U	500
Ethylbenzene	400,000	--	5.3 U	5.3 U	5.7 U	5.4 U	5.5 U	6.6 U	5.2 U	14 U	8.8 U
m,p-Xylenes	420,000	--	5.3 U	5.3 U	5.7 U	5.4 U	5.5 U	6.6 U	5.2 U	14 U	8.8 U
o-Xylene	420,000	1,000	5.3 U	5.3 U	5.7 U	5.4 U	5.5 U	6.6 U	5.2 U	14 U	8.8 U
Isopropylbenzene	2,000,000	--	21 U	21 U	23 U	22 U	22 U	27 U	21 U	53 U	35 U
n-Propylbenzene	240,000	--	21 U	21 U	23 U	22 U	22 U	27 U	21 U	53 U	35 U
1,2,3-Trichlorobenzene	--	--	0.97 U	0.97 U	1.1 U	0.98 U	0.98 U	1.2 U	1.1 U	2.4 U	1.7 U
1,3,5-Trimethylbenzene	70,000	--	21 U	21 U	23 U	22 U	22 U	27 U	21 U	53 U	35 U
1,2,4-Trimethylbenzene	220,000	--	21 U	21 U	23 U	22 U	22 U	27 U	21 U	2.9 J	35 U
sec-Butylbenzene	220,000	--	21 U	21 U	23 U	22 U	22 U	27 U	21 U	53 U	35 U
4-Isopropyltoluene	--	--	21 U	21 U	23 U	22 U	22 U	27 U	21 U	53 U	35 U
1,4-Dichlorobenzene	7,900	20,000	5.3 U	5.3 U	5.7 U	5.4 U	5.5 U	6.6 U	5.2 U	14 U	290
n-Butylbenzene	240,000	--	21 U	21 U	23 U	22 U	22 U	27 U	21 U	53 U	35 U
Hexachlorobutadiene	220,000	--	21 U	21 U	23 U	22 U	22 U	27 U	21 U	53 U	35 U
Naphthalene	190,000	10,000	21 U	21 U	23 U	22 U	22 U	27 U	21 U	53 U	35 U

Sample Location:	Preliminary Screening Levels		T4S1SB-24	T4S1SB-31	T4S1SB-32	T4S1SB-33	T4S1SB-42	T4S1SB-82	T4S1SB-83	T4S1SB-84
Sample ID:			T4S1SB-24-13-1	T4S1SB-31-3-1	T4S1SB-32-3-1	T4S1SB-33-2-1	T4S1SB-42-5-1	T4S1SB-82-3-1	T4S1SB-83-3-1	T4S1SB-84-13-1
Sample Interval:	PRG	SLV	12 - 13	3 - 3.5	3 - 3.5	1.5 - 2	5 - 6	3 - 3.5	3 - 3.5	12 - 13.5
Date Sampled:			8/25/2004	9/3/2004	9/3/2004	9/3/2004	9/3/2004	9/1/2004	9/1/2004	9/8/2004
VOCs (µg/kg)										
Acetone	54,000,000	1,250,000	37	13 J	22 U	17 J	22 U	13 J	20 U	13 J
Carbon Disulfide	720,000	--	6.6 U	5.4 U	5.4 U	5.5 U	5.4 U	5.3 U	4.8 U	5.6 U
Dichloromethane (Methylene Chloride)	21,000	730,000	3.6 J	1.3 J	1.7 J	2.6 J	11 U	2 J	2 J	1.5 J
2-Butanone (MEK)	110,000,000	200,000,000	27 U	22 U	22 U	22 U	22 U	21 U	20 U	23 U
Chloroform	470	1,875,000	6.6 U	5.4 U	5.4 U	5.5 U	5.4 U	5.3 U	4.8 U	5.6 U
Carbon Tetrachloride	550	1,000,000	6.6 U	5.4 U	5.4 U	5.5 U	5.4 U	5.3 U	4.8 U	5.6 U
Benzene	1,400	3,300,000	6.6 U	5.4 U	5.4 U	5.5 U	5.4 U	5.3 U	4.8 U	5.6 U
Trichloroethene (TCE)	110	40,000	6.6 U	5.4 U	5.4 U	5.5 U	5.4 U	5.3 U	2.2 J	5.6 U
Toluene	520,000	200,000	6.6 U	5.4 U	5.4 U	5.5 U	5.4 U	5.3 U	4.8 U	5.6 U
Tetrachloroethene (PCE)	1,300	10,000	6.6 U	5.4 U	5.4 U	5.5 U	5.4 U	5.3 U	4.8 U	5.6 U
Chlorobenzene	530,000	40,000	6.6 U	5.4 U	5.4 U	5.5 U	5.4 U	5.3 U	4.8 U	5.6 U
Ethylbenzene	400,000	--	6.6 U	5.4 U	5.4 U	5.5 U	5.4 U	5.3 U	4.8 U	5.6 U
m,p-Xylenes	420,000	--	6.6 U	5.4 U	5.4 U	5.5 U	5.4 U	5.3 U	4.8 U	5.6 U
o-Xylene	420,000	1,000	6.6 U	5.4 U	5.4 U	5.5 U	5.4 U	5.3 U	4.8 U	5.6 U
Isopropylbenzene	2,000,000	--	27 U	22 U	22 U	22 U	22 U	21 U	20 U	23 U
n-Propylbenzene	240,000	--	27 U	22 U	22 U	22 U	22 U	21 U	20 U	23 U
1,2,3-Trichlorobenzene	--	--	1.2 U	0.98 U	0.98 U	1.1 U	0.96 U	0.95 U	0.95 U	1.1 U
1,3,5-Trimethylbenzene	70,000	--	27 U	22 U	22 U	22 U	22 U	21 U	20 U	23 U
1,2,4-Trimethylbenzene	220,000	--	27 U	22 U	22 U	22 U	22 U	21 U	20 U	23 U
sec-Butylbenzene	220,000	--	27 U	22 U	22 U	22 U	22 U	21 U	20 U	23 U
4-Isopropyltoluene	--	--	27 U	22 U	22 U	22 U	22 U	21 U	20 U	23 U
1,4-Dichlorobenzene	7,900	20,000	6.6 U	5.4 U	5.4 U	5.5 U	5.4 U	5.3 U	4.8 U	5.6 U
n-Butylbenzene	240,000	--	27 U	22 U	22 U	22 U	22 U	21 U	20 U	23 U
Hexachlorobutadiene	220,000	--	27 U	22 U	22 U	22 U	22 U	21 U	20 U	23 U
Naphthalene	190,000	10,000	27 U	22 U	22 U	22 U	22 U	21 U	20 U	23 U

Notes:
1. Only detected compounds are reported in the table. The complete analyte list is presented in the Sampling and Analysis Plan (Appendix A) of the RI Work Plan (Hart Crowser, 2004a).
2. VOCs = Volatile Organic Compounds by EPA Method 8260B
3. µg/kg = Micrograms per kilogram.
4. PRG = EPA Region 9 Preliminary Remediation Goal (PRG) for Industrial Soil (October 2004).
5. -- = No screening level available or not analyzed.
6. J = The result is an estimated concentration that is less than the method reporting limit (MRL) but greater than or equal to the method detection limit (MDL
7. U = The compound was analyzed for but was not detected at or above the MRL/MDL.
8. Sample ID nomenclature is per the following: type of sample-sample number-depth in feet designation.
   For example T4S1SB-46-1-1 = soil boring (SB) number 46, collected 1 foot below the ground surface, primary sample (1). T4S1S-6 = surface soil sample number
9. SLV = Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Terrestrial Receptors (lowest available value

KMB00008317

TABLE 9B
SOIL CHEMISTRY RESULTS: VOLATILE ORGANIC COMPOUNDS - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1SB-51	T4S1SB-53	T4S1SB-55	T4S1SB-58	T4S1SB-67	T4S1SB-70	T4S1SB-71	T4S1SB-72	T4S1SB-73	T4S1SB-74
Sample ID:			T4S1SB-51-2.5-1	T4S1SB-53-1-1	T4S1SB-55-1-1	T4S1SB-58-1-1	T4S1SB-67-18-1	T4S1SB-70-1-1	T4S1SB-71-1-1	T4S1SB-72-1-1	T4S1SB-73-1-1	T4S1SB-74-1-1
Sample Interval:	PRG	SLV	2 - 2.5	0.5 - 1	1 - 2	1 - 2	18 - 19	1 - 2	1 - 2	1 - 2	0.5 - 1.5	1 - 2
Date Sampled:			8/27/2004	8/27/2004	8/31/2004	8/31/2004	9/8/2004	8/26/2004	8/26/2004	8/26/2004	8/26/2004	8/26/2004
VOCs (µg/kg)												
Acetone	54,000,000	1,250,000	96	12 J	21 U	21 U	250	24 U	20 J	26 U	23 U	22 U
Carbon Disulfide	720,000	--	5.6 U	5.5 U	5.2 U	5.2 U	27 U	6 U	5.7 U	6.5 U	5.6 U	5.4 U
Dichloromethane (Methylene Chloride	21,000	730,000	8.8 J	8.3 J	11 U	11 U	87	26	14	3.6 J	3.2 J	5.9 J
2-Butanone (MEK)	110,000,000	200,000,000	12 J	22 U	21 U	21 U	110 U	24 U	23 U	26 U	23 U	22 U
Chloroform	470	1,875,000	5.6 U	5.5 U	5.2 U	5.2 U	27 U	6 U	5.7 U	6.5 U	5.6 U	5.4 U
Carbon Tetrachloride	550	1,000,000	5.6 U	5.5 U	5.2 U	5.2 U	27 U	6 U	5.7 U	6.5 U	5.6 U	5.4 U
Benzene	1,400	3,300,000	5.6 U	5.5 U	5.2 U	5.2 U	130	6 U	5.7 U	6.5 U	5.6 U	5.4 U
Trichloroethene (TCE)	110	40,000	5.6 U	5.5 U	5.2 U	5.2 U	27 U	6 U	5.7 U	6.5 U	5.6 U	5.4 U
Toluene	520,000	200,000	5.6 U	5.5 U	5.2 U	5.2 U	58	6 U	5.7 U	6.5 U	5.6 U	5.4 U
Tetrachloroethene (PCE)	1,300	10,000	5.6 U	5.5 U	5.2 U	5.2 U	4.8 J	6 U	5.7 U	6.5 U	5.6 U	5.4 U
Chlorobenzene	530,000	40,000	5.6 U	5.5 U	5.2 U	5.2 U	27 U	6 U	5.7 U	6.5 U	5.6 U	5.4 U
Ethylbenzene	400,000	--	5.6 U	5.5 U	5.2 U	5.2 U	790	6 U	5.7 U	6.5 U	5.6 U	5.4 U
m,p-Xylenes	420,000	--	5.6 U	5.5 U	5.2 U	5.2 U	560	6 U	5.7 U	6.5 U	5.6 U	5.4 U
o-Xylene	420,000	1,000	5.6 U	5.5 U	5.2 U	5.2 U	2.6	6 U	5.7 U	6.5 U	5.6 U	5.4 U
Isopropylbenzene	2,000,000	--	23 U	22 U	21 U	21 U	290	24 U	23 U	26 U	23 U	22 U
n-Propylbenzene	240,000	--	23 U	22 U	21 U	21 U	18	24 U	23 U	26 U	23 U	22 U
1,2,3-Trichlorobenzene	--	--	1.1 U	0.99 U	0.95 U	0.95 U	0.037 U	1.1 U	1.1 U	1.2 U	1.1 U	0.97 U
1,3,5-Trimethylbenzene	70,000	--	23 U	22 U	21 U	21 U	1.3	24 U	23 U	26 U	23 U	22 U
1,2,4-Trimethylbenzene	220,000	--	23 U	22 U	21 U	21 U	2.6	24 U	23 U	26 U	23 U	22 U
sec-Butylbenzene	220,000	--	23 U	22 U	21 U	21 U	0.87	24 U	23 U	26 U	23 U	22 U
4-Isopropyltoluene	--	--	23 U	22 U	21 U	21 U	1.8	24 U	23 U	26 U	23 U	22 U
1,4-Dichlorobenzene	7,900	20,000	5.6 U	5.5 U	5.2 U	5.2 U	0.054 U	6 U	5.7 U	6.5 U	5.6 U	5.4 U
n-Butylbenzene	240,000	--	23 U	22 U	21 U	21 U	3	24 U	23 U	26 U	23 U	22 U
Hexachlorobutadiene	220,000	--	23 U	22 U	21 U	21 U	--	24 U	23 U	26 U	23 U	22 U
Naphthalene	190,000	10,000	23 U	22 U	21 U	21 U	1	24 U	23 U	26 U	23 U	22 U

Sample Location:	Preliminary Screening Levels		T4S1SB-75	T4S1SB-76	T4S1SB-77	T4S1SB-78	T4S1SB-79	T4S1SB-80	T4S1SB-81	AOC72-S1	AOC72-S3	T4S1S-23D
Sample ID:			T4S1SB-75-1-1	T4S1SB-76-1-1	T4S1SB-77-3-1	T4S1SB-78-3-1	T4S1SB-79-3-1	T4S1SB-80-3-1	T4S1SB-81-3-1	AOC72-S1-1.5	AOC72-S3-1.5	T4S1S-23D
Sample Interval:	PRG	SLV	1 - 2	1 - 2	1.5 - 3	2.5 - 3	2.5 - 3.5	2.5 - 3.5	2.5 - 3.5	1.5 - 2.5	1.5 - 2.5	0 - 1
Date Sampled:			8/26/2004	38225	8/30/2004	8/30/2004	8/30/2004	8/30/2004	8/30/2004	3/8/2004	3/8/2004	9/12/2005
VOCs (µg/kg)												
Acetone	54,000,000	1,250,000	22 U	24 U	21 U	21 U	22 U	21 U	20 U	22 U	22 U	2,650 U
Carbon Disulfide	720,000	--	5.5 U	5.9 U	5.1 U	5.2 U	5.4 U	5.2 U	4.9 U	5.5 U	5.3 U	1,060 U
Dichloromethane (Methylene Chloride	21,000	730,000	5 J	3.4 J	3.1 J	3.3 J	7.5 J	3.7 J	3.5 J	11 U	11 U	529 U, D
2-Butanone (MEK)	110,000,000	200,000,000	22 U	24 U	21 U	21 U	22 U	21 U	20 U	22 U	22 U	1,060 U
Chloroform	470	1,875,000	5.5 U	5.9 U	5.1 U	5.2 U	5.4 U	5.2 U	4.9 U	5.5 U	5.3 U	106 U
Carbon Tetrachloride	550	1,000,000	5.5 U	5.9 U	5.1 U	5.2 U	5.4 U	5.2 U	4.9 U	5.5 U	5.3 U	106 U
Benzene	1,400	3,300,000	5.5 U	5.9 U	5.1 U	5.2 U	5.4 U	5.2 U	4.9 U	5.5 U	5.3 U	106 U
Trichloroethene (TCE)	110	40,000	5.5 U	5.9 U	5.1 U	5.2 U	5.4 U	5.2 U	4.9 U	5.5 U	5.3 U	106 U
Toluene	520,000	200,000	5.5 U	5.9 U	5.1 U	5.2 U	5.4 U	5.2 U	4.9 U	5.5 U	5.3 U	106 U
Tetrachloroethene (PCE)	1,300	10,000	5.5 U	5.9 U	5.1 U	5.2 U	5.4 U	5.2 U	4.9 U	5.5 U	5.3 U	106 U
Chlorobenzene	530,000	40,000	5.5 U	5.9 U	5.1 U	5.2 U	5.4 U	5.2 U	4.9 U	5.5 U	5.3 U	106 U
Ethylbenzene	400,000	--	5.5 U	5.9 U	5.1 U	5.2 U	5.4 U	5.2 U	4.9 U	5.5 U	5.3 U	106 U
m,p-Xylenes	420,000	--	5.5 U	5.9 U	5.1 U	5.2 U	5.4 U	5.2 U	4.9 U	5.5 U	5.3	212 U, D
o-Xylene	420,000	1,000	5.5 U	5.9 U	5.1 U	5.2 U	5.4 U	5.2 U	4.9 U	5.5 U	5.3 U	106 U
Isopropylbenzene	2,000,000	--	22 U	24 U	21 U	21 U	22 U	21 U	20 U	22 U	22 U	212 U
n-Propylbenzene	240,000	--	22 U	24 U	21 U	21 U	22 U	21 U	20 U	22 U	22 U	106 U
1,2,3-Trichlorobenzene	--	--	1.0 U	1.1 U	0.97 U	0.95 U	0.98 U	0.95 U	0.96 U	1.0 U	0.97 U	83.6 J, D
1,3,5-Trimethylbenzene	70,000	--	22 U	24 U	21 U	21 U	22 U	21 U	20 U	22 U	22 U	106 U
1,2,4-Trimethylbenzene	220,000	--	22 U	24 U	21 U	21 U	22 U	21 U	20 U	22 U	22 U	106 U
sec-Butylbenzene	220,000	--	22 U	24 U	21 U	21 U	22 U	21 U	20 U	22 U	22 U	22.2 J, D
4-Isopropyltoluene	--	--	22 U	24 U	21 U	21 U	22 U	21 U	20 U	22 U	22 U	21.2 J, D
1,4-Dichlorobenzene	7,900	20,000	5.5 U	5.9 U	5.1 U	5.2 U	5.4 U	5.2 U	4.9 U	5.5 U	5.3 U	106 U
n-Butylbenzene	240,000	--	22 U	24 U	21 U	21 U	22 U	21 U	20 U	22 U	22 U	43.4 J, D
Hexachlorobutadiene	220,000	--	22 U	24 U	21 U	21 U	22 U	21 U	20 U	22 U	22 U	226 J, D
Naphthalene	190,000	10,000	22 U	24 U	1.9 J	1.2 J	22 U	21 U	20 U	22 U	22 U	212 U

Notes:

1. Only detected compounds are reported in the table. The complete analyte list is presented in the Sampling and Analysis Plan (Appendix A) of the RI Work Plan (Hart Crowser, 2004a).
2. VOCs = Volatile Organic Compounds by EPA Method 8260B.
3. µg/kg = Micrograms per kilogram.
4. PRG = EPA Region 9 Preliminary Remediation Goal (PRG) for Industrial Soil (October 2004).
5. -- = No screening level available or not analyzed.
6. J = The result is an estimated concentration that is less than the method reporting limit (MRL) but greater than or equal to the method detection limit (MDL
7. U = The compound was analyzed for but was not detected at or above the MRL/MDL
8. Sample ID nomenclature is per the following: type of sample-sample number-depth in feet-designation.
   For example T4S1SB-46-1-1 = soil boring (SB) number 46, collected 1 foot below the ground surface, primary sample (1). T4S1S-6 = surface soil sample number 6.
9. SLV = Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Terrestrial Receptors (lowest available value

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TABLE 10A
SOIL CHEMISTRY RESULTS: POLYCHLORINATED BIPHENYLS - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1S-1	T4S1S-2	T4S1S-3	T4S1S-4	T4S1S-5	T4S1S-6	T4S1S-7	T4S1S-11	T4S1S-12	T4S1S-13	T4S1S-31
Sample ID:			T4S1S-1	T4S1S-2	T4S1S-3	T4S1S-4	T4S1S-5	T4S1S-6	T4S1S-7	T4S1S-11	T4S1S-12	T4S1S-13	T4S1S-31
Sample Interval:	PRG	SLV	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0.5 - 2
Date Sampled:			9/13/2004	9/13/2004	9/13/2004	9/13/2004	9/13/2004	9/13/2004	9/13/2004	9/13/2004	9/13/2004	9/13/2004	7/10/2007
PCBs (mg/kg)													
Aroclor 1254	0.74	0.7	0.38	0.69	0.56	0.014 J	0.096	0.062 J	0.10	0.055 J	0.11	0.08	0.035 U
Aroclor 1260	0.74	--	0.25	0.42	0.53 P	0.067 U	0.15	0.089	0.17	0.033 J	0.13	0.17 P	0.035 U
Aroclor 1262	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1268	--	--	--	--	--	--	--	--	--	--	--	--	--

Sample Location:	Preliminary Screening Levels		T4S1SB-17	T4S1SB-18	T4S1SB-19	T4S1SB-20	T4S1SB-21	T4S1SB-22	T4S1SB-22
Sample ID:			T4S1SB-17-1-1	T4S1SB-18-1-1	T4S1SB-19-9-1	T4S1SB-20-9-1	T4S1SB-21-13-1	T4S1SB-22-13-1	T4S1SB-22-17-1
Sample Interval:	PRG	SLV	1 - 2	1 - 1.5	8.5 - 10	8.5 - 10	12.5 - 14	12.5 - 14	16.5 - 17
Date Sampled:			9/7/2004	9/2/2004	9/3/2004	9/3/2004	9/2/2004	9/2/2004	9/2/2004
PCBs (mg/kg)									
Aroclor 1254	0.74	0.7	0.067 U	0.037 U	0.036 U	0.036 U	0.045 U	0.04 U	0.089 Ui
Aroclor 1260	0.74	--	0.067 U	0.037 U	0.036 U	0.036 U	0.045 U	0.04 U	0.10
Aroclor 1262	--	--	--	0.037 U	--	--	0.045 U	0.04 U	--
Aroclor 1268	--	--	--	0.037 U	--	--	0.045 U	0.04 U	--

Sample Location:	Preliminary Screening Levels		T4S1SB-23	T4S1SB-24	T4S1SB-33	T4S1SB-42	T4S1SB-45	T4S1SB-46	T4S1SB-47-1-1
Sample ID:			T4S1SB-23-13-1	T4S1SB-24-13-1	T4S1SB-33-0-1	T4S1SB-42-1-1	T4S1SB-45-1-1	T4S1SB-46-1-1	T4S1SB-47-1-1
Sample Interval:	PRG	SLV	12.5 - 14	12 - 13	0.25 - 1	0.5 - 1.5	0.5 - 2	0.5 - 2	0.5 - 2
Date Sampled:			9/2/2004	8/25/2004	9/3/2004	9/3/2004	8/23/2004	8/23/2004	8/23/2004
PCBs (mg/kg)									
Aroclor 1254	0.74	0.7	0.06 Ui	0.089 U	0.067 U	0.065 U	0.13 Ui	0.1 U	0.1 U
Aroclor 1260	0.74	--	0.06 Ui	0.089 U	0.067 U	0.065 U	0.10 Ui	0.1 U	0.1 U
Aroclor 1262	--	--	0.047 J	--	--	--	--	--	--
Aroclor 1268	--	--	0.03 J	--	--	--	--	--	--

Notes:
1. Only detected compounds are reported in the table. The complete analyte list is presented in the Sampling and Analysis Plan (Appendix A) of the RI Work Plan (Hart Crowser, 2004a).
2. PCBs = Polychlorinated Biphenyls by EPA Method 8082.
3. mg/kg = Milligrams per kilogram.
4. PRG = EPA Region 9 Preliminary Remediation Goal (PRG) for Industrial Soil (October 2004).
5. -- = No screening level available or not analyzed.
6. J = The result is an estimated concentration that is less than the method reporting limit (MRL) but greater than or equal to the method detection limit (MDL).
7. U = The compound was analyzed for but was not detected at or above the MRL/MDL.
8. P = The GC or HPLC confirmation criterion was exceeded. The relative percent difference is greater than 40 percent between the two analytical results.
9. i = The MRL/MDL was elevated due to a chromatographic interference.
10. Sample ID nomenclature is per the following: type of sample-sample number-depth in feet designation.
    For example T4S1SB-46-1-1 = soil boring (SB) number 46, collected 1 foot below the ground surface, primary sample (1). T4S1S-6 = surface soil sample number 6.
11. SLV = Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Terrestrial Receptors (lowest available value).

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TABLE 10B
SOIL CHEMISTRY RESULTS: POLYCHLORINATED BIPHENYLS - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1S-8	T4S1S-9	T4S1S-10	T4S1S-14	T4S1SB-54	T4S1SB-67	T4S1MW16
Sample ID:			T4S1S-8-1	T4S1S-9-1	T4S1S-10-1	T4S1S-14	T4S1SB-54-1-1	T4S1SB-67-18-1	MW16s-0.5-1
Sample Interval:	PRG	SLV	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0.5 - 1	18 - 19	0.5 - 1
Date Sampled:			8/27/2004	8/27/2004	8/27/2004	9/13/2004	8/27/2004	9/8/2004	3/29/2004
PCBs (mg/kg)									
Aroclor 1254	0.74	0.7	0.10 U	0.10 U	0.10 U	0.11	0.10 U	0.065 Ui	0.010 U
Aroclor 1260	0.74	--	0.10 U	0.023 J	0.10 U	0.12	0.045 J	0.065 U	0.022
Aroclor 1262	--	--	--	--	--	--	--	--	--
Aroclor 1268	--	--	--	--	--	--	--	--	--

Sample Location:	Preliminary Screening Levels		T4S1S-23	T4S1S-24	T4S1S-25	T4S1S-26	T4S1S-27	T4S1S-28	T4S1S-29	T4S1S-30
Sample ID:			T4S1S-23	T4S1S-24	T4S1S-25	T4S1S-26	T4S1S-27	T4S1S-28	T4S1S-29	T4S1S-30
Sample Interval:	PRG	SLV	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1
Date Sampled:			9/12/2005	9/12/2005	9/12/2005	9/13/2005	9/13/2005	9/13/2005	9/13/2005	9/13/2005
PCBs (mg/kg)										
Aroclor 1254	0.74	0.7	0.0355 U	0.0359 U	0.0394 U	0.0516 U	0.0335 U	0.0335 U	0.0845 U	0.0343 U
Aroclor 1260	0.74	--	0.0355 U	0.0359 U	0.0394 U	0.0344 U	0.0335 U	0.0335 U	0.0338 U	0.0343 U
Aroclor 1262	--	--	--	--	--	--	--	--	--	--
Aroclor 1268	--	--	--	--	--	--	--	--	--	--

Notes:
1. Only detected compounds are reported in the table. The complete analyte list is presented in the Sampling and Analysis Plan (Appendix A) of the RI Work Plan (Hart Crowser, 2004a).
2. PCBs = Polychlorinated Biphenyls by EPA Method 8082.
3. mg/kg = Milligrams per kilogram.
4. PRG = EPA Region 9 Preliminary Remediation Goal (PRG) for Industrial Soil (October 2004).
5. -- = No screening level available or not analyzed.
6. J = The result is an estimated concentration that is less than the method reporting limit (MRL) but greater than or equal to the method detection limit (MDL).
7. U = The compound was analyzed for but was not detected at or above the MRL/MDL.
8. i = The MRL/MDL was elevated due to a chromatographic interference.
9. Sample ID nomenclature is per the following: type of sample-sample number-depth in feet-designation.
   For example T4S1SB-46-1-1 = soil boring (SB) number 46, collected 1 foot below the ground surface, primary sample (1). T4S1S-6 = surface soil sample number 6.
10. SLV = Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Terrestrial Receptors (lowest available value).

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TABLE 11A
SOIL CHEMISTRY RESULTS: PESTICIDES - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1SB-12	T4S1SB-19	T4S1SB-20	T4S1SB-21	T4S1SB-22	T4S1SB-22	T4S1SB-23	T4S1SB-24	T4S1SB-25	T4S1SB-26	T4S1SB-27
Sample ID:			T4S1SB-12-0-1	T4S1SB-19-0-1	T4S1SB-20-0-1	T4S1SB-21-13-1	T4S1SB-22-13-1	T4S1SB-22-17-1	T4S1SB-23-13-1	T4S1SB-24-13-1	T4S1SB-25-1-1	T4S1SB-26-1-1	T4S1SB-27-1-1
Sample Interval:	PRG	SLV	0.5 - 1	0.5 - 1.5	0.5 - 1	12.5 - 14	12.5 - 14	16.5 - 17	12.5 - 14	12 - 13	0.5 - 1.5	1 - 2	1 - 2
Date Sampled:			9/3/2004	9/3/2004	9/3/2004	9/2/2004	9/2/2004	9/2/2004	9/2/2004	8/25/2004	8/25/2004	8/25/2004	8/25/2004
Pesticides (µg/kg)													
delta-BHC	--	--	1.8 U	1.8 Ui	1.9 U	2.3 U	2 U	8.4	3 Ui	3.4 U	3.4 U	3.4 U	3.4 U
Heptachlor	380	15,000	1.8 U	2.8 Ui	1.9 U	2.3 U	2 U	6.9 Ui	3 U	3.4 U	3.4 U	3.4 U	3.4 U
Aldrin	100	25,000	1.8 U	1.8 U	1.9 U	2.3 U	2 U	4.5 U	1.5 JP	3.4 U	3.4 U	3.4 U	3.4 U
gamma-Chlordane	6,500	9,000	1.8 Ui	2.1 Ui	1.9 Ui	2.3 U	2 U	4.5 U	3.1 Ui	3.4 U	4.8	0.76 J	3.4 U
Endosulfan I	3,700,000	20,000	1.8 U	1.8 U	1.9 U	2.3 U	2 U	4.9	3 U	3.4 U	3.4 U	3.4 U	3.4 U
alpha-Chlordane	6,500	9,000	1.8 U	1.8 Ui	1.9 U	2.3 U	2 U	4.5 Ui	3 Ui	3.4 U	3.4 J	1.1 J	3.4 Ui
Dieldrin	110	300	1.8 Ui	0.93 JP	1.9 U	2.3 U	2 U	4.5 U	3 U	3.4 U	3.4 U	3.4 U	3.4 Ui
4,4'-DDE	7,000	10	1.8 U	8.6 P	1.9 Ui	2.3 U	2 U	6.9 Ui	54 P	3.4 U	5	1.5 J	0.9 JP
Endrin	180,000	40	1.8 U	4.1 Ui	1.9 U	2.3 U	2 U	4.9 Ui	3 U	3.4 U	2.2 J	1.7 JP	3.4 U
4,4'-DDD	10,000	10	2.1 U	2.1 U	2.1 U	2.6 U	2.3 U	13 Ui	35	3.4 U	3.4 U	3.4 U	3.4 U
Endrin Aldehyde	--	--	1.8 Ui	6.5 Ui	1.9 U	2.3 U	2 U	13 Ui	3 Ui	3.4 U	3.4 U	3.4 U	1.4 JP
4,4'-DDT	7,000	10	8.2	1.9 Ui	5.3 P	2.3 U	2 U	14 Ui	2.2 JP	3.4 U	8.2	7.8 P	3.9 P
Endrin Ketone	--	--	1.8 Ui	5.6 Ui	1.9 U	2.3 U	2 U	7.3 P	3 Ui	3.4 U	3.4 Ui	3.4 Ui	1.9 J
Methoxychlor	3,100,000	500,000	2.2 U	2.2 U	2.2 U	2.7 U	2.4 U	5.4 U	3.6 U	3.4 U	3.4 U	4.5 P	3.4 U

Sample Location:	Preliminary Screening Levels		T4S1SB-28	T4S1SB-32	T4S1SB-48	T4S1SB-49	T4S1SB-50	T4S1SB-84	T4S1SB-89	T4S1SB-90	T4S1SB-90
Sample ID:			T4S1SB-28-1-1	T4S1SB-32-0-1	T4S1SB-48-1-1	T4S1SB-49-1-1	T4S1SB-50-1-1	T4S1SB-84-13-1	T4S1SB-89-0-1	T4S1SB-90-0-1	T4S1SB-90-0-2
Sample Interval:	PRG	SLV	1 - 2	0.5 - 1.5	0.5 - 2	0.5 - 2	0.5 - 2.5	12 - 13.5	0.5 - 2.5	1 - 3	1 - 3
Date Sampled:			8/25/2004	9/3/2004	8/23/2004	8/23/2004	8/23/2004	9/8/2004	9/7/2005	9/7/2005	9/7/2005
Pesticides (µg/kg)											
delta-BHC	--	--	3.4 U	1.8 U	3.4 U	3.4 U	3.4 U	3.4 U	1.00 U	1.00 U	1.00 U
Heptachlor	380	15,000	3.4 U	1.8 U	3.4 U	3.4 U	3.4 U	3.4 U	1.00 U	1.00 U	1.00 U
Aldrin	100	25,000	3.4 U	1.8 U	3.4 U	3.4 U	3.4 U	3.4 U	1.00 U	1.00 U	1.00 U
gamma-Chlordane	6,500	9,000	3.4 U	1.8 U	3.4 U	3.4 U	3.4 U	3.4 U	0.418 J	1.00 U	1.00 U
Endosulfan I	3,700,000	20,000	3.4 U	1.8 U	3.4 U	3.4 U	3.4 U	3.4 U	1.00 U	1.00 U	1.00 U
alpha-Chlordane	6,500	9,000	3.4 U	1.8 U	3.4 U	3.4 U	3.4 U	3.4 U	0.334 J	1.00 U	1.00 U
Dieldrin	110	300	3.4 U	1.8 U	3.4 U	3.4 U	3.4 U	3.4 U	0.353 J	2.00 U	2.00 U
4,4'-DDE	7,000	10	3.4 U	1.8 U	3.4 U	3.4 U	3.4 U	3.4 U	1.29 J	2.00 U	2.00 U
Endrin	180,000	40	3.4 U	1.8 U	3.4 U	3.4 U	3.4 U	3.4 U	2.00 U	2.00 U	2.00 U
4,4'-DDD	10,000	10	3.4 U	2.1 U	3.4 U	3.4 U	3.4 U	3.4 U	0.381 J	2.00 U	2.00 U
Endrin Aldehyde	--	--	3.4 U	1.8 U	3.4 U	3.4 U	3.4 U	3.4 U	2.00 U, J	2.00 U, J	2.00 U
4,4'-DDT	7,000	10	3.4 U	1.8 U	3.4 U	3.4 U	3.4 U	3.4 U	5.21 J	0.176 J	2.00 U
Endrin Ketone	--	--	3.4 U	1.8 U	3.4 U	3.4 U	3.4 U	3.4 U	2.00 U, J	2.00 U, J	2.00 U
Methoxychlor	3,100,000	500,000	3.4 U	2.2 U	3.4 U	3.4 U	3.4 U	3.4 U	2.00 U	2.00 U	2.00 U

Sample Location:	Preliminary Screening Levels		T4S1SB-92	T4S1SB-93	T4S1SB-94	T4S1SB-95	T4S1S-1	T4S1S-2	T4S1S-3	T4S1S-4
Sample ID:			T4S1SB-92-0-1	T4S1SB-93-0-1	T4S1SB-94-0-1	T4S1SB-95-0-1	T4S1S-1	T4S1S-2	T4S1S-3	T4S1S-4
Sample Interval:	PRG	SLV	1 - 3	0.5 - 2.5	1 - 3	0.5 - 2.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
Date Sampled:			9/7/2005	9/7/2005	9/7/2005	9/7/2005	3/22/2005	3/22/2005	3/22/2005	3/22/2005
Pesticides (µg/kg)										
delta-BHC	--	--	1.00 U	1.00 U	1.00 U	1.00 U	134 U	134 U	134 U	134 U
Heptachlor	380	15,000	1.00 U	1.00 U	1.00 U	1.00 U	67.0 U	67.0 U	67.0 U	67.0 U
Aldrin	100	25,000	1.00 U	1.00 U	1.00 U	1.00 U	67.0 U	67.0 U	67.0 U	67.0 U
gamma-Chlordane	6,500	9,000	0.922 J	1.00 U	1.00 U	1.00 U	67.0 U	134 U	67.0 U	67.0 U
Endosulfan I	3,700,000	20,000	1.00 U	1.00 U	1.00 U	1.00 U	67.0 U	67.0 U	67.0 U	67.0 U
alpha-Chlordane	6,500	9,000	0.974 J	1.00 U	1.00 U	1.00 U	67.0 U	67.0 U	67.0 U	67.0 U
Dieldrin	110	300	0.590 J	1.10 J	0.677 J	1.15 J	134 U	134 U	134 U	134 U
4,4'-DDE	7,000	10	0.888 J	1.02 J	2.00 U	2.55	134 U	134 U	134 U	134 U
Endrin	180,000	40	2.00 U	2.00 U	2.00 U	2.00 U	134 U	134 U	134 U	134 U
4,4'-DDD	10,000	10	0.660 J	2.00 U	2.00 U	2.00 U	134 U	134 U	134 U	134 U
Endrin Aldehyde	--	--	2.00 U, J	2.00 U, J	0.436 J	2.00 U, J	134 U	134 U	134 U	134 U
4,4'-DDT	7,000	10	3.33 J	2.29 J	2.75 J	8.87 J	134 U	134 U	134 U	134 U
Endrin Ketone	--	--	2.00 U, J	2.00 U, J	2.00 U, J	2.00 U, J	134 U	134 U	134 U	134 U
Methoxychlor	3,100,000	500,000	2.00 U	2.00 U	2.00 U	2.00 U	134 U	134 U	134 U	134 U

Notes:
1. Only detected compounds are reported in the table. The complete analyte list is presented in the Sampling and Analysis Plan (Appendix A) of the RI Work Plan (Hart Crowser, 2004a).
2. Organochlorine Pesticides by EPA Method 8081A. Organophosphorus Pesticides by EPA Method 8141A.
3. µg/kg = Micrograms per kilogram.
4. PRG = EPA Region 9 Preliminary Remediation Goal (PRG) for Industrial Soil (October 2004).
5. -- = No screening level available or not analyzed.
6. J = The result is an estimated concentration that is less than the method reporting limit (MRL) but greater than or equal to the method detection limit (MDL).
7. U = The compound was analyzed for but was not detected at or above the MRL/MDL.
8. P = The GC or HPLC confirmation criterion was exceeded. The relative percent difference is greater than 40 percent between the two analytical results.
9. i = The MRL/MDL was elevated due to a chromatographic interference.
10. Sample ID nomenclature is per the following: type of sample-sample number-depth in feet-designation.
    For example T4S1SB-46-1-1 = soil boring (SB) number 46, collected 1 foot below the ground surface, primary sample (1). T4S1S-6 = surface soil sample number 6.
11. SLV = Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Terrestrial Receptors (lowest available value).

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TABLE 11B
SOIL CHEMISTRY RESULTS: PESTICIDES - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1SB-61	T4S1SB-62	T4S1MW16	T4S1S-23	T4S1S-23A	T4S1S-23B	T4S1S-23C	T4S1S-23D	T4S1S-24
Sample ID:			T4S1SB-61-0-1	T4S1SB-62-0-1	MW16-0.5-1	T4S1S-23	T4S1S-23A	T4S1S-23B	T4S1S-23C	T4S1S-23D	T4S1S-24
Sample Interval:	PRG	SLV	0.5 - 2	0.5 - 1.5	0.5 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1
Date Sampled:			9/9/2004	9/9/2004	3/29/2004	9/12/2005	9/12/2005	9/12/2005	9/12/2005	9/12/2005	9/12/2005
Pesticides (µg/kg)											
delta-BHC	--	--	3.3 U	3.3 U	1.0 U	1.06 U, D	7.22 U	1.44 U	1.43 U	1.44 U	1.09 U, D
Heptachlor	380	15,000	3.3 U	3.3 U	0.35 JP	1.06 U, D	7.22 U	1.44 U	1.43 U	1.44 U	1.09 U, D
Heptachlor Epoxide	190	--	3.3 U	3.3 U	1.0 U	1.06 U, D	7.22 U	1.44 U	1.43 U	1.44 U	1.09 U, D
Aldrin	100	25,000	3.3 U	3.3 U	1.0 U	1.06 U, D	7.22 U	1.44 U	1.43 U	1.44 U	1.09 U, D
gamma-Chlordane	6,500	9,000	3.3 U	3.3 U	0.084 JP	1.06 U, D	7.22 U	1.44 U	1.43 U	1.44 U	1.09 U, D
Endosulfan I	3,700,000	20,000	3.3 U	3.3 U	1.0 U	0.329 J, D	7.22 U	1.44 U	1.43 U	1.44 U	1.09 U, D
alpha-Chlordane	6,500	9,000	3.3 U	3.3 U	1.0 U	1.06 U, D	7.22 U	1.44 U	1.43 U	1.44 U	1.09 U, D
Dieldrin	110	300	3.3 U	3.3 U	1.0 U	2.13 U, D	7.22 U	1.44 U	1.43 U	1.44 U	2.17 U, D
4,4'-DDE	7,000	10	3.3 U	0.75 J	0.092 JP	2.13 U, D	7.22 U	1.44 U	1.43 U	1.44 U	2.17 U, D
Endrin	180,000	40	3.3 U	3.3 U	1.0 U	2.13 U, D	7.22 U	1.44 U	1.43 U	1.44 U	2.17 U, D
4,4'-DDD	10,000	10	3.3 U	3.3 U	0.28 JP	2.13 U, D	7.22 U	1.44 U	1.43 U	1.44 U	2.17 U, D
Endrin Aldehyde	--	--	3.3 U	3.3 U	1.0 U	2.13 U, D	7.22 U	1.44 U	1.43 U	1.44 U	2.17 U, D
4,4'-DDT	7,000	10	2.6 J	5.1	2.1	0.700 J, D	7.22 U	1.44 U, D	1.43 U, D	1.44 U	0.434 J, D
Endrin Ketone	--	--	3.3 U	3.3 U	1.0 U	2.13 U, D	7.22 U	1.44 U	1.43 U	1.44 U	2.17 U, D
Methoxychlor	3,100,000	500,000	3.3 U	3.3 U	0.99 JP	2.13 U, D	7.22 U	1.44 U, D	1.43 U	1.44 U	2.17 U, D

Sample Location:	Preliminary Screening Levels		T4S1S-24A	T4S1S-24B	T4S1S-24C	T4S1S-24D	T4S1S-25	T4S1S-25A	T4S1S-25B	T4S1S-25C	T4S1S-25D
Sample ID:			T4S1S-24A	T4S1S-24B	T4S1S-24C	T4S1S-24D	T4S1S-25	T4S1S-25A	T4S1S-25B	T4S1S-25C	T4S1S-25D
Sample Interval:	PRG	SLV	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1
Date Sampled:			9/12/2005	9/12/2005	9/12/2005	9/12/2005	9/12/2005	9/12/2005	9/12/2005	9/12/2005	9/12/2005
Pesticides (µg/kg)											
delta-BHC	--	--	1.45 U	1.48 U	1.46 U	1.40 U	1.07 U, D	1.49 U	1.39 U	1.42 U	1.39 U
Heptachlor	380	15,000	1.45 U	1.48 U	1.46 U	1.40 U	1.07 U, D	1.49 U	1.39 U	1.42 U	1.39 U
Heptachlor Epoxide	190	--	1.45 U	1.48 U	1.46 U	1.40 U	1.07 U, D	1.49 U	1.39 U	1.42 U	1.39 U
Aldrin	100	25,000	1.45 U	1.48 U	1.46 U	1.40 U	1.07 U, D	1.49 U	1.39 U	1.42 U	1.39 U
gamma-Chlordane	6,500	9,000	1.45 U	1.48 U	1.46 U	1.40 U	1.07 U, D	1.49 U	1.39 U	1.42 U	1.39 U
Endosulfan I	3,700,000	20,000	1.45 U	1.48 U	1.46 U	1.40 U	1.07 U, D	1.49 U	1.39 U	1.42 U	1.39 U
alpha-Chlordane	6,500	9,000	1.45 U	1.48 U	1.46 U	1.40 U	1.07 U, D	1.49 U	1.39 U	1.42 U	1.39 U
Dieldrin	110	300	1.45 U	1.48 U	1.46 U	1.40 U	2.14 U, D	1.49 U	1.39 U	1.42 U	1.39 U
4,4'-DDE	7,000	10	1.45 U	1.48 U	1.46 U	1.40 U	2.14 U, D	1.49 U	1.39 U	1.42 U	1.39 U
Endrin	180,000	40	1.45 U	1.48 U	1.46 U	1.40 U	2.14 U, D	1.49 U	1.39 U	1.42 U	1.39 U
4,4'-DDD	10,000	10	1.45 U	1.48 U	1.46 U	1.40 U	2.14 U, D	1.49 U	1.39 U	1.42 U	1.39 U
Endrin Aldehyde	--	--	1.45 U	1.48 U	1.46 U	1.40 U	2.14 U, D	1.49 U	1.39 U	1.42 U	1.39 U
4,4'-DDT	7,000	10	1.45 U	1.48 U, D	1.46 U, D	1.40 U	0.511 J, D	1.49 U, D	1.39 U, D	1.42 U, D	1.39 U
Endrin Ketone	--	--	1.45 U	1.48 U	1.46 U	1.40 U	2.14 U, D	1.49 U	1.39 U	1.42 U	1.39 U
Methoxychlor	3,100,000	500,000	1.45 U	1.48 U	1.46 U	1.40 U	2.14 U, D	1.49 U	1.39 U	1.42 U	1.39 U

Please refer to notes at end of table.

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TABLE 11B
SOIL CHEMISTRY RESULTS: PESTICIDES - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1S-26	T4S1S-26A	T4S1S-26B	T4S1S-26C	T4S1S-26D	T4S1S-27	T4S1S-27A	T4S1S-27B	T4S1S-27C	T4S1S-27D
Sample ID:			T4S1S-26	T4S1S-26A	T4S1S-26B	T4S1S-26C	T4S1S-26D	T4S1S-27	T4S1S-27A	T4S1S-27B	T4S1S-27C	T4S1S-27D
Sample Interval:	PRG	SLV	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1
Date Sampled:			9/13/2005	9/13/2005	9/13/2005	9/13/2005	9/13/2005	9/13/2005	9/13/2005	9/13/2005	9/13/2005	9/13/2005
Pesticides (µg/kg)												
delta-BHC	--	--	1.04 U, D	1.37 U	6.87 U	1.39 U	7.70 U	1.02 U, D	6.78 U	1.35 U	1.37 U	1.37 U
Heptachlor	380	15,000	1.04 U, D	1.37 U	6.87 U	1.39 U	7.70 U	1.02 U, D	6.78 U	1.35 U	1.37 U	1.37 U
Heptachlor Epoxide	190	--	1.04 U, D	1.37 U	6.87 U	1.39 U	7.70 U	1.02 U, D	6.78 U	1.35 U	1.37 U	1.37 U
Aldrin	100	25,000	1.04 U, D	1.37 U	6.87 U	1.39 U	7.70 U	1.02 U, D	6.78 U	1.35 U	1.37 U	1.37 U
gamma-Chlordane	6,500	9,000	1.04 U, D	1.37 U	6.87 U	1.39 U	7.70 U	1.02 U, D	6.78 U	1.35 U	1.37 U	1.37 U
Endosulfan I	3,700,000	20,000	1.04 U, D	1.37 U	6.87 U	1.39 U	7.70 U	1.02 U, D	6.78 U	1.35 U	1.37 U	1.37 U
alpha-Chlordane	6,500	9,000	1.04 U, D	1.37 U	6.87 U	1.39 U	77.0 U	1.02 U, D	67.8 U	1.35 U	1.37 U	1.37 U
Dieldrin	110	300	0.761 J, D	1.37 U	68.7 U	1.39 U	77.0 U	2.04 U, D	67.8 U	1.35 U	1.37 U	1.37 U
4,4'-DDE	7,000	10	5.22 D	1.37 U	68.7 U	1.39 U	77.0 U	1.83 J, D	6.78 U	1.35 U	1.37 U	1.37 U
Endrin	180,000	40	2.09 U, D	1.37 U	6.87 U	1.39 U	7.70 U	2.04 U, D	67.8 U	1.35 U	1.37 U	1.37 U
4,4'-DDD	10,000	10	2.37 D	1.37 U	6.87 U	1.39 U	7.70 U	2.04 U, D	6.78 U	1.35 U	0.873 J, D	1.37 U
Endrin Aldehyde	--	--	2.09 U, D	1.37 U	6.87 U	1.39 U	77.0 U	2.04 U, D	67.8 U	1.35 U	1.37 U	1.37 U
4,4'-DDT	7,000	10	17.20 D	1.37 U, D	6.87 U	1.11 J, D	96.8 D	3.66 D	67.8 U	1.35 U, D	1.37 U, D	1.37 U, D
Endrin Ketone	--	--	2.09 U, D	1.37 U	6.87 U	1.39 U	77.0 U	2.04 U, D	67.8 U	1.35 U	1.37 U	1.37 U
Methoxychlor	3,100,000	500,000	2.09 U, D	1.37 U	68.7 U	1.39 U	77.0 U	2.04 U, D	67.8 U	1.35 U	1.37 U	1.37 U

Sample Location:	Preliminary Screening Levels		T4S1S-28	T4S1S-28A	T4S1S-28B	T4S1S-28C	T4S1S-28D	T4S1S-29	T4S1S-30	T4S1S-30A	T4S1S-30C	T4S1S-30D
Sample ID:			T4S1S-28	T4S1S-28A	T4S1S-28B	T4S1S-28C	T4S1S-28D	T4S1S-29	T4S1S-30	T4S1S-30A	T4S1S-30C	T4S1S-30D
Sample Interval:	PRG	SLV	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1
Date Sampled:			9/13/2005	9/13/2005	9/13/2005	9/13/2005	9/13/2005	9/13/2005	9/13/2005	9/13/2005	9/13/2005	9/13/2005
Pesticides (µg/kg)												
delta-BHC	--	--	1.01 U, D	1.03 U	1.02 U	1.02 U	1.01 U	1.03 U, D	1.03 U, D	1.03 U	1.01 U	1.04 U
Heptachlor	380	15,000	1.01 U, D	1.03 U	1.02 U	1.02 U	1.01 U	1.03 U, D	1.03 U, D	1.03 U	1.01 U	1.04 U
Heptachlor Epoxide	190	--	1.01 U, D	1.03 U	1.02 U	1.02 U	1.01 U	1.03 U, D	0.190 J, D	1.03 U	1.01 U	1.04 U
Aldrin	100	25,000	1.01 U, D	1.03 U	1.02 U	1.02 U	1.01 U	1.03 U, D	1.03 U, D	1.03 U	1.01 U	1.04 U
gamma-Chlordane	6,500	9,000	1.01 U, D	1.03 U	1.02 U	1.02 U	1.01 U	1.03 U, D	1.03 U, D	1.03 U	1.01 U	1.04 U
Endosulfan I	3,700,000	20,000	1.01 U, D	1.03 U	1.02 U	1.02 U	1.01 U	1.03 U, D	1.03 U, D	1.03 U	1.01 U	1.04 U
alpha-Chlordane	6,500	9,000	1.01 U, D	1.03 U	1.02 U	1.02 U	1.01 U	1.03 U, D	1.03 U, D	1.03 U	1.01 U	1.04 U
Dieldrin	110	300	2.03 U, D	2.06 U	0.274 J	2.05 U	0.808 J	2.06 U, D	0.397 J, D	0.896 J	2.02 U	0.381 J
4,4'-DDE	7,000	10	1.72 J, D	2.06 U	2.04 U	2.05 U	1.61 J	7.84 D	2.05 U, D	2.06 U	2.02 U	2.07 U
Endrin	180,000	40	2.03 U, D	2.06 U	2.04 U	2.05 U	2.01 U	2.06 U, D	2.05 U, D	2.06 U	2.02 U	2.07 U
4,4'-DDD	10,000	10	2.03 U, D	2.06 U	2.04 U	2.05 U	0.654 J	2.79 D	2.05 U, D	2.06 U	2.02 U	2.07 U
Endrin Aldehyde	--	--	2.03 U, D	2.06 U	2.04 U	2.05 U	2.01 U	2.06 U, D	2.05 U, D	2.06 U	2.02 U	2.07 U
4,4'-DDT	7,000	10	3.43 D	3.72	0.648 J	0.925 J	4.66	15.9 D	1.66 J, D	2.50	1.54 J	1.35 J
Endrin Ketone	--	--	2.03 U, D	2.06 U	2.04 U	2.05 U	2.01 U	2.06 U, D	2.05 U, D	2.06 U	2.02 U	2.07 U
Methoxychlor	3,100,000	500,000	2.03 U, D	2.06 U	2.04 U	2.05 U	2.01 U	2.06 U, D	2.05 U, D	2.06 U	2.02 U	2.07 U

Notes:

1. Only detected compounds are reported in the table. The complete analyte list is presented in the Sampling and Analysis Plan (Appendix A) of the RI Work Plan (Hart Crowser, 2004a).
2. Organochlorine Pesticides by EPA Method 8081A. Organophosphorus Pesticides by EPA Method 8141A.
3. µg/kg = Micrograms per kilogram.
4. PRG = EPA Region 9 Preliminary Remediation Goal (PRG) for Industrial Soil (October 2004).
5. -- = No screening level available or not analyzed.
6. J = The result is an estimated concentration that is less than the method reporting limit (MRL) but greater than or equal to the method detection limit (MDL).
7. U = The compound was analyzed for but was not detected at or above the MRL/MDL.
8. P = The GC or HPLC confirmation criterion was exceeded. The relative percent difference is greater than 40 percent between the two analytical results.
9. Sample ID nomenclature is per the following: type of sample-sample number-depth in feet designation.
   For example T4S1SB-46-1-1 = soil boring (SB) number 46, collected 1 foot below the ground surface, primary sample (1). T4S1S-6 = surface soil sample number 6.
10. SLV = Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Terrestrial Receptors (lowest available value).

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TABLE 12A
SOIL CHEMISTRY RESULTS: METALS - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels			T4S1SB-21	T4S1SB-22	T4S1SB-22	T4S1SB-23	T4S1SB-24	T4S1SB-31	T4S1SB-32	T4S1SB-33
Sample ID:				T4S1SB-21-13-1	T4S1SB-22-13-1	T4S1SB-22-17-1	T4S1SB-23-13-1	T4S1SB-24-13-1	T4S1SB-31-0-1	T4S1SB-32-0-1	T4S1SB-33-0-1
Sample Interval:	Background	PRG	SLV	12.5 - 14	12.5 - 14	16.5 - 17	12.5 - 14	12 - 13	0.5 - 1.5	0.5 - 1.5	0.25 - 1
Date Sampled:				9/2/2004	9/2/2004	9/2/2004	9/2/2004	8/25/2004	9/8/2004	9/3/2004	9/3/2004
Metals (mg/kg)											
Antimony	.5	410	5	0.14 N	0.09 N	2.41 N	1.15 N	0.12 N	0.282 N	0.13 N	0.86 N
Arsenic	5.8	1.6	10	1.63	2.2	6.71	4	2.28	2.4	2.46	1.9
Beryllium	2.1	1,900	10	0.645	0.332	0.346	0.483	0.529	0.323	0.271	0.201
Cadmium	0.9	450	4	0.106	0.091	7.87	1.24	0.151	0.19	0.069	0.236
Chromium	26	450	0.4	30.9	16.6	34.1	30.8	31.1	21.1	15.3	25.9
Copper	34	41,000	50	24.5	14.7	153	68.4	24.9	19.4	13.8	14.7
Lead	17	800	16	5.53 *	5.82 *	797	258 *	5.8	38.9	2.9	28.6
Mercury	0.04	310	0.1	0.02	0.03	1.53	0.21	0.05	0.034	0.01 B	0.043
Nickel	21	20,000	30	26.8	20.1	45.9	34.5	26.6	20.1	16.5	13.7
Selenium	0.8	5,100	1	0.4 B	0.2 B	1.3	0.4 B	0.3 B	0.2 B	0.2 B	0.2 B
Silver	0.6	5,100	2	0.055	0.024	1.7	0.578	0.073	0.053	0.024	0.033
Thallium	<5	67	1	0.089	0.05	0.095	0.109	0.084	0.064	0.047	0.06
Zinc	95	100,000	50	65.9	65.1	2,490	533	81.2	110	53.6	102

Sample Location:	Preliminary Screening Levels			T4S1SB-42	T4S1SB-48	T4S1SB-49	T4S1SB-50	T4S1S-5	T4S1S-6	T4S1S-7
Sample ID:				T4S1SB-42-1-1	T4S1SB-48-1-1	T4S1SB-49-1-1	T4S1SB-50-1-1	T4S1S-5	T4S1S-6	T4S1S-7
Sample Interval:	Background	PRG	SLV	0.5 - 1.5	0.5 - 2	0.5 - 2	0.5 - 2.5	0 - 0.5	0 - 0.5	0 - 0.5
Date Sampled:				9/3/2004	8/23/2004	8/23/2004	8/23/2004	3/22/2005	3/22/2005	3/22/2005
Metals (mg/kg)										
Antimony	.5	410	5	0.11 N	0.09 N	0.05 N	0.1 N	0.76 J	0.22 J	1.1 J
Arsenic	5.8	1.6	10	2.64	2.54	2.68	2.62	6.95 J	2.58 J	6.57 J
Beryllium	2.1	1,900	10	0.291	0.303	0.293	0.294	0.316	0.296	0.572
Cadmium	0.9	450	4	0.1	0.065	0.065	0.075	0.539	0.387	1.95
Chromium	26	450	0.4	16.6	16	10.3	14.6	16.1	14.6	152
Copper	34	41,000	50	13.1	14	10.9	12.6	22.2	16.2	70.3
Lead	17	800	16	7.27	2.89	2.4	2.59	49.8	16.9	195
Mercury	0.04	310	0.1	0.017	0.02 U	0.02 U	0.02 U	0.024	0.061	0.215
Nickel	21	20,000	30	18.2	18.6	15.9	21.4	17.2	16.5	19.4
Selenium	0.8	5,100	1	0.2 B	0.3 B	0.2 B	0.2 B	0.1 U, J	0.1 U, J	0.1 J
Silver	0.6	5,100	2	0.04	0.021	0.016 B	0.02 B	0.106	0.044	1.33
Thallium	<5	67	1	0.05	0.04	0.044	0.043	0.084	0.048	0.118
Zinc	95	100,000	50	61.5	50.2	40.6	48.4	255	92.3	521

Sample Location:	Preliminary Screening Levels			T4S1SB-89	T4S1SB-90	T4S1SB-92	T4S1SB-93	T4S1SB-94	T4S1SB-95
Sample ID:				T4S1SB-89-0-1	T4S1SB-90-0-1	T4S1SB-92-0-1	T4S1SB-93-0-1	T4S1SB-94-0-1	T4S1SB-95-0-1
Sample Interval:	Background	PRG	SLV	0.5 - 2.5	1 - 3	1 - 3	0.5 - 2.5	1 - 3	0.5 - 2.5
Date Sampled:				9/7/2005	9/7/2005	9/7/2005	9/7/2005	9/7/2005	9/7/2005
Metals (mg/kg)									
Antimony	.5	410	5	-- R	-- R	-- R	-- R	-- R	-- R
Arsenic	5.8	1.6	10	3.45	3.31	2.65	4.34	3.58	4.47
Beryllium	2.1	1,900	10	0.341 J	0.312 J	0.309 J	0.454 J	0.357 J	0.362 J
Cadmium	0.9	450	4	0.278 J	0.163 J	0.285 J	0.352 J	0.226 J	0.464 J
Chromium	26	450	0.4	30.9	13.9	11.5	15.0	13.9	17.3
Copper	34	41,000	50	16.7	12.7	14.3	14.7	17.8	21.3
Lead	17	800	16	14.2	3.42	27.1	24.2	16.3	42.2
Mercury	0.04	310	0.1	0.142 U	0.0243 J	0.114 U	0.162 U	0.0183 J	0.141 U
Nickel	21	20,000	30	16.3	17.0	14.8	15.5	18.6	21.5
Selenium	0.8	5,100	1	0.534 J	0.386 J	0.459 J	0.593	0.322 J	0.492 J
Silver	0.6	5,100	2	0.568 U	0.465 U	0.0580 J	0.101 J	0.503 U	0.0961 J
Thallium	<5	67	1	0.568 U	0.465 U	0.483 U	0.0534 J	0.503 U	0.565 U
Zinc	95	100,000	50	123	48.0	71.2	88.2	62.3	107

Please refer to notes at end of table.

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TABLE 12A
SOIL CHEMISTRY RESULTS: METALS - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Notes:

1. All analytes are reported in the table.
2. Metals using EPA 6000-7000 Series Methods.
3. mg/kg = Milligrams per kilogram.
4. PRG = EPA Region 9 Preliminary Remediation Goal (PRG) for Industrial Soil (October 2004).
5. -- = No screening level available, not analyzed, or data rejected (R) as part of data quality review.
6. U = The compound was analyzed for but was not detected at or above the MRL/MDL.
7. B = The result is an estimated concentration that is less than the MRL but greater than or equal to the method detection limit (MDL).
8. N = The matrix spike sample recovery is not within control limits. The case narrative suggests that soil samples digested with EPA Method 3050 for Antimony should only be used as indicators to estimate concentrations.
9. * = The laboratory duplicate analysis was not within control limits. The laboratory attributed the variability to the heterogeneous character of the sample.
10. Shaded values indicate that the detected concentration exceeds the background and PRG.
11. Background Levels are from the Washington Department of Ecology's publication Natural Background Soil Metals Concentrations in Washington State, dated October 1994. Values are the 90th percentile values for Clark County, except for antimony, selenium, silver and thallium where state-wide data were used due to a limited number of detections.
12. Boxed values indicate that the detected concentration exceeds the SLV (only samples from 0 to 3 feet were screened against the SLV).

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TABLE 12B
SOIL CHEMISTRY RESULTS: METALS - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels			T4S1SB-07	T4S1SB-08	T4S1SB-53	T4S1SB-55	T4S1SB-58	T4S1SB-61	T4S1SB-62	T4S1SB-67
Sample ID:				SB07-2.0-1	SB08-2.0-1	T4S1SB-53-1-1	T4S1SB-55-1-1	T4S1SB-58-1-1	T4S1SB-61-0-1	T4S1SB-62-0-1	T4S1SB-67-18-1
Sample Interval:	Background	PRG	SLV	2 - 2.5	2 - 2.5	0.5 - 1	1 - 2	1 - 2	0.5 - 2	0.5 - 1.5	18 - 19
Date Sampled:				03/30/2004	03/31/2004	8/27/2004	8/31/2004	8/31/2004	9/9/2004	9/9/2004	9/8/2004
Metals (mg/kg)											
Antimony	.5	410	5	0.06	0.06	0.38 N	0.1 N	0.07 N	0.19 N	0.4 N	0.06 N
Arsenic	5.8	1.6	10	2.6	2.6	2.65	2.61	2.29	1.12	1.58	2.32
Beryllium	2.1	1,900	10	0.308	0.286	0.314	0.452	0.322	0.373	0.385	0.301
Cadmium	0.9	450	4	0.09	0.1	0.817	0.456	0.07	0.361	0.706	0.061
Chromium	26	450	0.4	9.76	11.4	18.3	15.9	15.3	9.52	9.26	17
Copper	34	41,000	50	12.4	12.5	17.4	15.9	12.2	15.5	18.1	12
Lead	17	800	16	2.35	2.94	89.8 *	4.86 *	2.76 *	43.8	85.1	2.69
Mercury	0.04	310	0.1	0.02	0.02	0.042	0.012 B	0.017 U	0.012 B	0.048	0.019 U
Nickel	21	20,000	30	14.6	14.4	23.4	20	15.4	4.2 U	6.7	20.4
Selenium	0.8	5,100	1	1.1 U	1.1 U	0.3 B	0.2 B	0.3 B	0.4 B	0.5 B	0.3 B
Silver	0.6	5,100	2	0.02 U	0.02 U	0.234	0.021	0.017 B	0.089	0.305	0.025
Thallium	<5	67	1	0.051	0.048	0.059	0.044	0.044	0.08	0.089	0.046
Zinc	95	100,000	50	34.5	35.3	170	191	51.4	116	258	50.4

Sample Location:	Preliminary Screening Levels			T4S1SB-70	T4S1SB-71	T4S1SB-72	T4S1SB-73	T4S1SB-74	T4S1SB-75	T4S1SB-76
Sample ID:				T4S1SB-70-1-1	T4S1SB-71-1-1	T4S1SB-72-1-1	T4S1SB-73-1-1	T4S1SB-74-1-1	T4S1SB-75-1-1	T4S1SB-76-1-1
Sample Interval:	Background	PRG	SLV	1 - 2	1 - 2	1 - 2	0.5 - 1.5	1 - 2	1 - 2	1 - 2
Date Sampled:				08/26/2004	8/26/2004	8/26/2004	8/26/2004	8/26/2004	8/26/2004	8/26/2004
Metals (mg/kg)										
Antimony	.5	410	5	0.19 N	0.07 N	0.11 N	0.12 N	0.16 N	0.89 N	0.17 N
Arsenic	5.8	1.6	10	5	2.48	1.75	2.51	2.1	12.8	2.52
Beryllium	2.1	1,900	10	0.277	0.278	0.37	0.298	0.26	0.344	0.328
Cadmium	0.9	450	4	0.122	0.07	1.65	0.166	0.073	3.74	0.299
Chromium	26	450	0.4	18	14.6	21.5	16.4	17.4	14.4	24.7
Copper	34	41,000	50	17	12.8	16.9	13.8	12.9	25.1	18.2
Lead	17	800	16	9.05	2.7	5.97	10	3.09	322	12.7
Mercury	0.04	310	0.1	0.011 B	0.009 B	0.016 B	0.011 B	0.037	0.041	0.018 B
Nickel	21	20,000	30	21.7	16.8	28	20	22.8	19.3	26.6
Selenium	0.8	5,100	1	0.2 B	0.2 B	0.3 B	0.2 B	0.3 B	0.3 B	0.4 B
Silver	0.6	5,100	2	0.052	0.017 B	0.037	0.047	0.019 B	0.419	0.065
Thallium	<5	67	1	0.05	0.048	0.058	0.048	0.061	0.083	0.06
Zinc	95	100,000	50	63.2	49.5	514	60	51.4	320	101

Sample Location:	Preliminary Screening Levels			T4S1SB-77	T4S1SB-77	T4S1SB-77	T4S1SB-78	T4S1SB-79	T4S1SB-80	T4S1SB-81
Sample ID:				T4S1SB-77-0.5-1	T4S1SB-77-1-1	T4S1SB-77-2-1	T4S1SB-78-1-1	T4S1SB-79-3-1	T4S1SB-80-3-1	T4S1SB-81-3-1
Sample Interval:	Background	PRG	SLV	0.5 - 1	1 - 1.5	2 - 2.5	0.5 - 1.5	2.5 - 3.5	2.5 - 3.5	2.5 - 3.5
Date Sampled:				9/8/2005	8/30/2004	9/8/2005	08/30/2004	8/30/2004	8/30/2004	8/30/2004
Metals (mg/kg)										
Antimony	.5	410	5	--	0.3 N	--	0.11 N	0.12 N	0.09 N	0.11 N
Arsenic	5.8	1.6	10	--	2.85	--	3.66	2.77	2.67	2.17
Beryllium	2.1	1,900	10	--	0.336	--	0.297	0.316	0.265	0.27
Cadmium	0.9	450	4	--	0.123	--	0.122	0.125	0.066	0.071
Chromium	26	450	0.4	--	18.9	--	17.2	15.9	14.8	18.2
Copper	34	41,000	50	--	21.6	--	23.1	15.7	13.1	13.8
Lead	17	800	16	189	1,060 *	37.1	43 *	10.4 *	2.24 *	2.43 *
Mercury	0.04	310	0.1	--	0.067	--	0.017	0.014	0.01 B	0.009 B
Nickel	21	20,000	30	--	23.7	--	46.7	16.8	17.2	21
Selenium	0.8	5,100	1	--	0.4 B	--	2.4	0.3 B	0.2 B	0.3 B
Silver	0.6	5,100	2	--	0.037	--	0.049	0.072	0.019 B	0.019 B
Thallium	<5	67	1	--	0.068	--	0.071	0.065	0.049	0.047
Zinc	95	100,000	50	--	70.6	--	63.3	68.2	47.7	52.5

Please refer to notes at end of table.

KMB00008326

TABLE 12B
SOIL CHEMISTRY RESULTS: METALS - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels			AOC72-S1	AOC72-S1	AOC72-S2	AOC72-S2	AOC72-S3	AOC72-S3	T4S1MW11	T4S1MW12
Sample ID:				AOC72-S1-0.5	AOC72-S1-1.5	AOC72-S2-0.5	AOC72-S2-1.5	AOC72-S3-0.5	AOC72-S3-1.5	MW11-0.5-1	MW12-2.0-1
Sample Interval:	Background	PRG	SLV	0.5 - 1	1.5 - 2.5	0.5 - 1	1.5 - 2.5	0.5 - 1	1.5 - 2.5	0.5 - 1	2 - 2.5
Date Sampled:				03/08/2004	03/08/2004	03/08/2004	03/08/2004	03/08/2004	03/08/2004	03/30/2004	03/30/2004
Metals (mg/kg)											
Antimony	.5	410	5	0.12 N	0.03 B	0.07 N	0.05 B	0.06 N	0.03 UJ	0.12	0.07
Arsenic	5.8	1.6	10	4.7	1.7	1.9	1.9	2	1.8	2.1	3
Beryllium	2.1	1,900	10	0.455	0.317	0.255	0.359	0.296	0.258	0.304	0.36
Cadmium	0.9	450	4	0.185	0.155	0.266	0.217	0.16	0.148	0.12	0.12
Chromium	26	450	0.4	10.8	5.92	5.26	6.50	8.23	6.06	8.66	12.6
Copper	34	41,000	50	21	18.6	18.3	20.8	17.9	16.6	11.6	14.6
Lead	17	800	16	11	2.85	5.25	3.05	3.02	2.46	6.03	2.95
Mercury	0.04	310	0.1	0.015 B	0.009 U	0.010 U	0.009 U	0.009 U	0.010 U	0.01	0.01
Nickel	21	20,000	30	12.3	9.32	9.49	10.8	9.86	9.79	13.9	16.1
Selenium	0.8	5,100	1	0.09 B	0.06 B	0.10 B	0.07 B	0.03 U	0.02 U	1.1 U	1.1 U
Silver	0.6	5,100	2	0.051	0.030	0.040	0.03	0.030	0.028	0.03	0.02
Thallium	<5	67	1	0.103 U	0.065	0.061 U	0.064	0.068	0.052	0.048	0.053
Zinc	95	100,000	50	50.6	42.6	53.3	44.8	45.6	41.1	35.2	42.1

Sample Location:	Preliminary Screening Levels			T4S1MW13	T4S1MW15	T4S1MW16	T4S1S-20	T4S1S-21	T4S1S-22
Sample ID:				MW13-2.5-1	MW15-0.5-1	MW16-0.5-1	T4S1S-20-0.5-1	T4S1S-21-0.5-1	T4S1S-22-0.5-1
Sample Interval:	Background	PRG	SLV	2.5 - 3	0.5 - 1	0.5 - 1	0.5 - 1	0.5 - 1	0.5 - 1
Date Sampled:				04/01/2004	03/29/2004	03/29/2004	9/8/2005	9/8/2005	9/8/2005
Metals (mg/kg)									
Antimony	.5	410	5	0.07 N	0.09	0.09	--	--	--
Arsenic	5.8	1.6	10	2.8	2.3	2.7	--	--	--
Beryllium	2.1	1,900	10	0.347	0.357	0.362	--	--	--
Cadmium	0.9	450	4	0.14	0.39	0.18	--	--	--
Chromium	26	450	0.4	12	13.6	14.6	--	--	--
Copper	34	41,000	50	14.2	15.4	16.5	--	--	--
Lead	17	800	16	7.81	7.73	14.4	49.8	548	65.4
Mercury	0.04	310	0.1	0.014 B	0.02	0.05	--	--	--
Nickel	21	20,000	30	16.5	16.9	16.6	--	--	--
Selenium	0.8	5,100	1	0.2 U	1.2 U	1.2 U	--	--	--
Silver	0.6	5,100	2	0.02	0.04	0.07	--	--	--
Thallium	<5	67	1	0.051	0.064	0.065	--	--	--
Zinc	95	100,000	50	46.6	64.9	56.9	--	--	--

Sample Location:	Preliminary Screening Levels			T4S1S-23	T4S1S-24	T4S1S-25	T4S1S-26	T4S1S-26A	T4S1S-26B	T4S1S-26C	T4S1S-26D
Sample ID:				T4S1S-23	T4S1S-24	T4S1S-25	T4S1S-26	T4S1S-26A	T4S1S-26B	T4S1S-26C	T4S1S-26D
Sample Interval:	Background	PRG	SLV	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1
Date Sampled:				9/12/2005	9/12/2005	9/12/2005	9/13/2005	9/13/2005	9/13/2005	9/13/2005	9/13/2005
Metals (mg/kg)											
Antimony	.5	410	5	1.48 U, D	1.58 U, D	1.59 U	0.0728 J	1.53 U	1.53 U	1.54 U	1.74 U
Arsenic	5.8	1.6	10	2.81 D	3.08 D	2.69	10.9	2.49	2.23	2.97	15.7
Beryllium	2.1	1,900	10	0.326 J, D	0.321 J, D	0.296 J	0.260 J	0.209 J	0.285 J	0.277 J	0.186 J
Cadmium	0.9	450	4	0.158 J, D	0.110 J, D	0.122 J	7.02	0.220 J	0.270 J	0.646	25.3
Chromium	26	450	0.4	13.4 D	14.8 D	13.9	16.4	12.3	14.5	15.2	23.6
Copper	34	41,000	50	13.5 D	13.7 D	14.1	78.1	12.0	14.0	16.9	219 D
Lead	17	800	16	6.24 D	4.59 D	5.07	479 D	7.78	12.6	43.6	868 D
Mercury	0.04	310	0.1	0.0954 U, D	0.00920 J, D	0.0108 J, D	0.0947 J	0.126 U, D	0.131 U, D	0.130 U, D	0.325 D
Nickel	21	20,000	30	16.7 D	18.0 D	19.2	18.4	16.2	16.6	17.5	19.3
Selenium	0.8	5,100	1	0.252 J, D	0.479 J, D	0.338 J	0.286 J	0.184 J	0.163 J	0.159 J	0.407 J
Silver	0.6	5,100	2	0.495 U, D	0.526 U, D	0.529 U	1.16	0.511 U	0.509 U	0.123 J	2.10
Thallium	<5	67	1	0.495 U, D	0.526 U, D	0.529 U	0.0624 J	0.511 U	0.509 U	0.513 U	0.122 J
Zinc	95	100,000	50	52.6 D	52.9 D	55.9	949 D	55.7	64.0	127	3,320 D

Please refer to notes at end of table.

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TABLE 12B
SOIL CHEMISTRY RESULTS: METALS - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels			T4S1S-27	T4S1S-28	T4S1S-29D	T4S1S-30
Sample ID:				T4S1S-27	T4S1S-28	T4S1S-29	T4S1S-30
Sample Interval:	Background	PRG	SLV	0 - 1	0 - 1	0 - 1	0 - 1
Date Sampled:				9/13/2005	9/13/2005	9/13/2005	9/13/2005
Metals (mg/kg)							
Antimony	5	410	5	1.53 U	1.53 U	1.51 U, D	1.53 U, D
Arsenic	5.8	1.6	10	2.59	3.72	14.5 D	2.47 D
Beryllium	2.1	1,900	10	0.295 J	0.316 J	0.292 J, D	0.352 J, D
Cadmium	0.9	450	4	0.402 J	0.815	2.12 D	0.352 J, D
Chromium	26	450	0.4	16.0	16.6	23.8 D	16.8 D
Copper	34	41,000	50	16.7	19.5	38.5 D	17.0 D
Lead	17	800	16	30.4	88.8	276 D	41.8 D
Mercury	0.04	310	0.1	0.102 U	0.0261 J, D	0.0799 J, D	0.0340 J, D
Nickel	21	20,000	30	19.5	19.0	17.7 D	20.5 D
Selenium	0.8	5,100	1	0.229 J	0.295 J	0.347 J, D	0.250 J, D
Silver	0.6	5,100	2	0.509 U	0.0967 J	0.660 D	0.510 U, D
Thallium	<5	67	1	0.509 U	0.509 U	0.504 U, D	0.510 U, D
Zinc	95	100,000	50	112	181	328 D	91.4 D

Notes:
1. All analytes are reported in the table.
2. Metals using EPA 6000-7000 Series Methods.
3. mg/kg = Milligrams per kilogram.
4. PRG = EPA Region 9 Preliminary Remediation Goal (PRG) for Industrial Soil (October 2004).
5. -- = No screening level available or not analyzed.
6. U = The compound was analyzed for but was not detected at or above the MRL/MDL.
7. B = The result is an estimated concentration that is less than the MRL but greater than or equal to the method detection limit (MDL).
8. N = The matrix spike sample recovery is not within control limits. The case narrative suggests that soil samples digested with EPA Method 3050 for Antimony should only be used as indicators to estimate concentrations.
9. * = The laboratory duplicate analysis was not within control limits. The laboratory attributed the variability to the heterogeneous character of the sample.
10. Shaded values indicate that the detected concentration exceeds the background and PRG.
11. Background Levels are from the Washington Department of Ecology's publication Natural Background Soil Metals Concentrations in Washington State, dated October 1994. Values are the 90th percentile values for Clark County, except for antimony, selenium, silver and thallium where state-wide data were used due to a limited number of detections.
12. Boxed values indicate that the detected concentration exceeds the SLV (only samples from 0 to 3 feet were screened against the SLV).

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TABLE 13A
GROUNDWATER CHEMISTRY RESULTS: PETROLEUM HYDROCARBONS - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

			HCID (µg/L)			TPH (µg/L)		
Sample Location:	**Sample ID:**	**Date Sampled:**	**Gasoline Range**	**Diesel Range**	**Residual Range**	**Gasoline Range**	**Diesel Range**	**Residual Range**
T4S1MW01s	T4S1MW01s-GW-1	4/21/2004	--	--	--	50 U	300 U	590 U
T4S1MW01s	T4S1MW01s-GW-1	9/1/2004	250 U	630 U	630 U	--	--	--
T4S1MW01s	T4S1MW01s-GW-1	2/3/2005	250 U	630 U	630 U	--	--	--
T4S1MW01s	T4S1MW01s-GW-1	5/4/2005	--	--	--	14 J	21 J	37 J
T4S1MW02s	T4S1MW02s-GW-1	4/20/2004	--	--	--	50 U	290 U	580 U
T4S1MW02s	T4S1MW02s-GW-1	9/2/2004	--	--	--	250 U	250 U	500 U
T4S1MW02s	T4S1MW02s-GW-1	2/2/2005	--	--	--	250 U	20 J	43 J
T4S1MW02s	T4S1MW02s-GW-1	5/5/2005	--	--	--	250 U	250 U	250 U
T4S1MW03s	T4S1MW03s-GW-1	4/21/2004	--	--	--	50 U	300 U	590 U
T4S1MW03s	T4S1MW03s-GW-1	8/30/2004	--	--	--	17 J	240 U	480 U
T4S1MW03s	T4S1MW03s-GW-1	1/31/2005	--	--	--	19 J	28 J	41 J
T4S1MW03s	T4S1MW03s-GW-1	5/5/2005	--	--	--	250 U	250 U	500 U
T4S1MW07	T4S1MW07-GW-1	4/20/2004	--	--	--	50 U	290 U	580 U
T4S1MW07	T4S1MW07-GW-1	8/27/2004	240 U	600 U	600 U	--	--	--
T4S1MW07	T4S1MW07-GW-1	2/2/2005	250 U	630 U	630 U	--	--	--
T4S1MW07	T4S1MW07-GW-1	5/4/2005	250 U	630 U	630 U	250 U	250 U	32 J
T4S1MW08	T4S1MW08-GW-1	4/21/2004	--	--	--	50 U	310 U	610 U
T4S1MW08	T4S1MW08-GW-1	8/30/2004	240 U	600 U	600 U	--	--	--
T4S1MW08	T4S1MW08-GW-1	2/3/2005	250 U	630 U	630 U	--	--	--
T4S1MW08	T4S1MW08-GW-1	5/4/2005	--	--	--	250 U	250 U	500 U
T4S1MW17	T4S1MW17-GW-1	4/20/2004	--	--	--	50 U	260 U	520 U
T4S1MW17	T4S1MW17-GW-1	9/2/2004	--	--	--	250 U	250 U	500 U
T4S1MW17	T4S1MW17-GW-1	2/1/2005	--	--	--	250 U	25 J	45 J
T4S1MW17	T4S1MW17-GW-1	5/4/2005	--	--	--	250 U	250 U	37 J
T4S1MW18	T4S1MW18-GW-1	4/21/2004	--	--	--	50 U	300 U	590 U
T4S1MW18	T4S1MW18-GW-1	9/1/2004	--	--	--	250 U	250 U	500 U
T4S1MW18	T4S1MW18-GW-1	2/1/2005	--	--	--	250 U	26 J	51 J
T4S1MW18	T4S1MW18-GW-1	5/6/2005	--	--	--	250 U	250 U	500 U
T4S1MW19	T4S1MW19-GW-1	9/15/2004	--	--	--	14 J	64 J	480 U
T4S1MW19	T4S1MW19-GW-1	2/1/2005	--	--	--	250 U	62 J	500 U
T4S1MW19	T4S1MW19-GW-1	5/9/2005	--	--	--	26 J	250 U	500 U
T4S1MW22	T4S1MW22-GW-1	9/2/2004	--	--	--	250 U	250 U	500 U
T4S1MW22	T4S1MW22-GW-1	2/4/2005	--	--	--	250 U	62 J	170 J
T4S1MW22	T4S1MW22-GW-1	5/6/2005	--	--	--	19 J	250 U	500 U
T4S1MW23	T4S1MW23-GW-1	9/2/2004	--	--	--	250 U	250 U	500 U
T4S1MW23	T4S1MW23-GW-1	2/4/2005	--	--	--	250 U	65 J	190 J
T4S1MW23	T4S1MW23-GW-1	5/6/2005	--	--	--	250 U	250 U	500 U
T4S1MW24	T4S1MW24-GW-1	9/1/2004	--	--	--	250 U	250 U	500 U
T4S1MW24	T4S1MW24-GW-1	2/3/2005	--	--	--	250 U	30 J	46 J
T4S1MW24	T4S1MW24-GW-1	5/6/2005	--	--	--	14 J	250 U	500 U
	Preliminary	**Fish Consumption SLV**	--	--	--	--	--	--
	Screening Levels	**Aquatic SLV**	--	--	--	1,000	1,000	1,000

Notes:

1. TPH =Total petroleum hydrocarbons (TPH) by Northwest Total Petroleum Hydrocarbons (NWTPH).
2. µg/L = Micrograms per liter.
3. Fish Consumption SLV = EPA National Recommended Water Quality Criteria: 2002 Human Health for Consumption of Fish. None available for TPH.
4. Aquatic SLV = EPA National Recommended Water Quality Criteria: 2002 for CCC Freshwater Biota. Where CCC values are not available, Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Surface Water Aquatic are listed. None available for TPH. In accordance with DEQ policy, 1,000 µg/L used for TPH screening level for surface water ecological receptors.
5. -- = No screening level available or not analyzed.
6. J = The result is an estimated concentration that is less than the method reporting limit (MRL) but greater than or equal to the method detection limit (MDL).
7. U = The compound was analyzed for but was not detected at or above the MRL/MDL.

KMB00008329

TABLE 13B
GROUNDWATER CHEMISTRY RESULTS: PETROLEUM HYDROCARBONS - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

			HCID (µg/L)			TPH (µg/L)		
Sample Location:	Sample ID:	Date Sampled:	Gasoline Range	Diesel Range	Residual Range	Gasoline Range	Diesel Range	Residual Range
T4S1MW04s	T4S1MW04s-GW-1	4/19/2004	--	--	--	50 U	270 U	530 U
T4S1MW04s	T4S1MW04s-GW-1	8/31/2004	--	--	--	250 U	240 U	480 U
T4S1MW04s	T4S1MW04s-GW-1	2/8/2005	--	--	--	250 U	250 U	47 J
T4S1MW04s	T4S1MW04s-GW-1	5/9/2005	--	--	--	250 U	250 U	500 U
T4S1MW09	T4S1MW09-GW-1	4/20/2004	--	--	--	50 U	260 U	520
T4S1MW09	T4S1MW09-GW-1	9/1/2004	--	--	--	250 U	250 U	500 U
T4S1MW09	T4S1MW09-GW-1	2/9/2005	--	--	--	250 U	250 U	35 J
T4S1MW09	T4S1MW09-GW-1	5/9/2005	--	--	--	250 U	250 U	500 U
T4S1MW10	T4S1MW10-GW-1	4/19/2004	--	--	--	50 U	270 U	530 U
T4S1MW10	T4S1MW10-GW-1	9/1/2004	--	--	--	250 U	250 U	500 U
T4S1MW10	T4S1MW10-GW-1	2/4/2005	--	--	--	13 J	250 U	500 U
T4S1MW10	T4S1MW10-GW-1	5/9/2005	--	--	--	250 U	250 U	500 U
T4S1MW11	T4S1MW11-GW-1	4/19/2004	--	--	--	50 U	290 U	570 U
T4S1MW11	T4S1MW11-GW-1	9/1/2004	250 U	630 U	630 U	--	--	--
T4S1MW11	T4S1MW11-GW-1	2/8/2005	--	--	--	250 U	29 J	56 J
T4S1MW11	T4S1MW11-GW-1	5/10/2005	260 U	650 U	650 U	250 U	260 U	520 U
T4S1MW12	T4S1MW12-GW-1	4/19/2004	--	--	--	50 U	330 U	650 U
T4S1MW13	T4S1MW13-GW-1	4/16/2004	--	--	--	50 U	250 U	500 U
T4S1MW14	T4S1MW14-GW-1	4/16/2004	--	--	--	50 U	320 U	500 U
T4S1MW14	T4S1MW14-GW-1	8/31/2004	--	--	--	250 U	120 U	240 U
T4S1MW14	T4S1MW14-GW-1	2/8/2005	--	--	--	250 U	250 U	500 U
T4S1MW14	T4S1MW14-GW-1	5/10/2005	--	--	--	250 U	260 U	520 U
T4S1MW15	T4S1MW15-GW-1	4/16/2004	--	--	--	50 U	250 U	500 U
T4S1MW15	T4S1MW15-GW-1	2/9/2005	250 U	630 U	630 U	--	--	--
T4S1MW15	T4S1MW15-GW-1	5/4/2005	250 U	630 U	630 U	14 J	21 J	37 J
T4S1MW16	T4S1MW16-GW-1	4/19/2004	--	--	--	50 U	320 U	630 U
T4S1MW16	T4S1MW16-GW-1	8/27/2004	--	--	--	250 U	250 U	500 U
T4S1MW16	T4S1MW16-GW-1	2/10/2005	--	--	--	250 U	250 U	43 J
T4S1MW18	T4S1MW18-GW-1	2/1/2005	--	--	--	13 U	26 J	51 J
T4S1MW20	T4S1MW20-GW-1	9/2/2004	--	--	--	18 J	250 U	500 U
T4S1MW20	T4S1MW20-GW-1	2/10/2005	--	--	--	250 U	40 J	85 J
T4S1MW20	T4S1MW20-GW-1	5/11/2005	--	--	--	250 U	250 U	500 U
T4S1MW21	T4S1MW21-GW-1	9/2/2004	--	--	--	250 U	250 U	500 U
T4S1MW21	T4S1MW21-GW-1	2/10/2005	--	--	--	250 U	24 J	89 J
T4S1MW21	T4S1MW21-GW-1	5/11/2005	--	--	--	250 U	250 U	500 U
T4S1MW23	T4S1MW23-GW-1	9/2/2004	--	--	--	250 U	250 U	500 U
T4S1MW23	T4S1MW23-GW-1	2/4/2005	--	--	--	15 J	65 J	190 J
T4S1MW24	T4S1MW24-GW-1	9/1/2004	--	--	--	250 U	250 U	500 U
T4S1MW24	T4S1MW24-GW-1	2/3/2005	--	--	--	13 J	30 J	46 J
	Preliminary	**Fish Consumption SLV**	--	--	--	--	--	--
	Screening Levels	**Aquatic SLV**	--	--	--	1,000	1,000	1,000

Notes:
1. TPH =Total petroleum hydrocarbons (TPH) by Northwest Total Petroleum Hydrocarbons (NWTPH).
2. µg/L = Micrograms per liter.
3. Fish Consumption SLV = EPA National Recommended Water Quality Criteria: 2002 Human Health for Consumption of Fish. None available for TPH.
4. Aquatic SLV = EPA National Recommended Water Quality Criteria: 2002 for CCC Freshwater Biota. Where CCC values are not available, Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Surface Water Aquatic are listed. None available for TPH. In accordance with DEQ policy, 1,000 µg/L used for TPH screening level for surface water ecological receptors.
5. -- = No screening level available or not analyzed.
6. J = The result is an estimated concentration that is less than the method reporting limit (MRL) but greater than or equal to the method detection limit (MDL).
7. U = The compound was analyzed for but was not detected at or above the MRL/MDL.

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TABLE 14A
GROUNDWATER CHEMISTRY RESULTS: POLYNUCLEAR AROMATIC HYDROCARBONS - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

			PAHs (µg/L)																		
Sample Location:	**Sample ID:**	**Date Sampled:**	Naphthalene	1-Methylnaphthalene	2-Methylnaphthalene	Acenaphthylene	Acenaphthene	Dibenzofuran	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(1,2,3-cd)pyrene	Dibenz(a,h)anthracene	Benzo(g,h,i)perylene
T4S1MW01s	T4S1MW01s-GW-1	4/21/2004	0.0078 J	--	--	0.025 U	0.025 U	--	0.025 U	0.0036 J	0.0078 J	0.0041 J	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
T4S1MW01s	T4S1MW01s-GW-1	9/1/2004	0.033	--	0.016 J	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.0098 J	0.020 U	0.0043 J	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
T4S1MW01s	T4S1MW01s-GW-1	2/3/2005	0.0087 J	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.0060 J	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
T4S1MW01s	T4S1MW01s-GW-1	5/4/2005	0.0075 J	0.020 U	0.0029 J	0.020 U	0.020 U	0.020 U	0.020 U	0.0044 J	0.0045 J	0.0052 J	0.0054 J	0.0022 J	0.0028 J	0.0026 J	0.0018 J	0.0018 J	0.020 U	0.020 U	0.020 U
T4S1MW02s	T4S1MW02s-GW-1	4/20/2004	0.011 J	--	--	0.0028 J	0.0033 J	--	0.0054 J	0.015 J	0.010 J	0.011 J	0.010 J	0.0073 J	0.0062 J	0.0043 J	0.0043 J	0.0032 J	0.0024 J	0.023 U	0.023 U
T4S1MW02s	T4S1MW02s-GW-1	9/2/2004	0.021	--	0.0067 J	0.020 U	0.020 U	0.020 U	0.020 U	0.0058 J	0.002 J	0.0038 J	0.0052 J	0.020 U	0.0018 J	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
T4S1MW02s	T4S1MW02s-GW-1	2/2/2005	0.040 U	0.040 U	0.040 U	0.040 U	0.040 U	0.040 U	0.040 U	0.040 U	0.040 U	0.040 U	0.040 U	0.040 U	0.040 U	0.040 U	0.040 U	0.040 U	0.040 U	0.040 U	0.040 U
T4S1MW02s	T4S1MW02s-GW-1	5/5/2005	0.029 U	0.02 U	0.011 J	0.020 U	0.020 U	0.020 U	0.020 U	0.0075 J	0.0043 J	0.0058 J	0.005 J	0.020 U	0.0014 J	0.020 U	0.020 U	0.020 U	0.020 U, J	0.020 U, J	0.020 U
T4S1MW03s	T4S1MW03s-GW-1	4/21/2004	0.0058 J	--	--	0.0022 J	0.025 U	--	0.0044 J	0.014 J	0.056	0.01 J	0.0082 J	0.0038 J	0.0042 J	0.0035 J	0.025 U	0.0023 J	0.0023 J	0.025 U	0.025 U
T4S1MW03s	T4S1MW03s-GW-1	8/30/2004	0.020	--	0.0072 J	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.051	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
T4S1MW03s	T4S1MW03s-GW-1	1/31/2005	2.0 U	--	0.012 U	0.011 U	0.0088 U	0.014 U	0.012 U	0.023 J	0.090 J	0.013 U	0.015 U	0.012 U	0.014 U	0.020 U	0.020 U	0.016 U	0.024 U	0.031 U	0.020 U
T4S1MW03s	T4S1MW03s-GW-1	5/5/2005	0.02 U	0.02 U	0.0038 J	0.002 J	0.020 U	0.020 U	0.020 U	0.0038 J	0.076	0.0055 J	0.0042 J	0.0034 J	0.0028 J	0.0025 J	0.020 U	0.0022 J	0.020 U, J	0.020 U, J	0.020 U
T4S1MW07	T4S1MW07-GW-1	4/20/2004	0.0072 J	--	--	0.025 U	0.025 U	--	0.025 U	0.0089 J	0.021 J	0.0079 J	0.0065 J	0.0029 J	0.025 U	0.0027 J	0.025 U	0.0021 J	0.025 U	0.025 U	0.025 U
T4S1MW07	T4S1MW07-GW-1	8/27/2004	0.0087 J	--	0.02 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.014 J	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
T4S1MW07	T4S1MW07-GW-1	2/2/2005	2.0 U	--	0.012 U	0.011 U	0.0088 U	0.014 U	0.012 U	0.022 J	0.036 J	0.027 J	0.030 J	0.067 J	0.051 J	0.11 J	0.084 J	0.069 J	0.024 U	0.031 U	0.034 J
T4S1MW07	T4S1MW07-GW-1	5/4/2005	0.042	0.02 U	0.0084 J	0.020 U	0.020 U	0.020 U	0.020 U	0.0036 J	0.014 J	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U, J	0.020 U, J	0.020 U
T4S1MW08	T4S1MW08-GW-1	4/21/2004	0.0082 J	--	--	0.024 U	0.0088 J	--	0.01 J	0.04	0.065	0.034	0.031	0.024 U	0.024 U	0.024 U	0.024 U	0.024 U	0.024 U	0.024 U	0.024 U
T4S1MW08	T4S1MW08-GW-1	8/30/2004	0.032	--	0.013 J	0.020 U	0.0057 J	0.020 U	0.0055 J	0.014 J	0.015 J	0.014 J	0.011 J	0.0026 J	0.0031 J	0.0022 J	0.0015 J	0.0016 J	0.020 U	0.0028 J	0.020 U
T4S1MW08	T4S1MW08-GW-1	2/3/2005	0.071	0.028	0.029	0.0042 J	0.020 U	0.020 U	0.020 U	0.0044 J	0.056	0.0060 J	0.0062 J	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
T4S1MW08	T4S1MW08-GW-1	5/4/2005	0.0048 J	0.2 U	0.023	0.0022 J	0.0041 J	0.020 U	0.0079 J	0.025	0.036	0.024	0.019 J	0.0051 J	0.0068 J	0.0036 J	0.0047 J	0.0033 J	0.0031 J	0.020 U, J	0.020 U
T4S1MW15	T4S1MW15-GW-1	5/4/2005	0.02 U	0.020 U	0.0029 J	0.020 U	0.020 U	0.020 U	0.020 U	0.0044 J	0.0045 J	0.0052 J	0.0054 J	0.0022 J	0.0028 J	0.0026 J	0.0018 J	0.0018 J	0.020 U, J	0.020 U, J	0.020 U
T4S1MW17	T4S1MW17-GW-1	4/20/2004	0.0046 J	--	--	0.023 U	0.023 U	--	0.023 U	0.023 U	0.0056 J	0.023 U	0.023 U	0.023 U	0.023 U	0.023 U	0.023 U	0.023 U	0.023 U	0.023 U	0.023 U
T4S1MW17	T4S1MW17-GW-1	9/2/2004	0.017 J	--	0.0046 J	0.0019 J	0.020 U	0.020 U	0.020 U	0.020 U	0.014 J	0.020 U	0.020 U	0.020 U	0.0013 J	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
T4S1MW17	T4S1MW17-GW-1	2/1/2005	2.0 U	--	0.012 U	0.011 U	0.0088 U	0.014 U	0.012 U	0.020 J	0.016 J	0.027 J	0.022 J	0.012 U	0.014 U	0.020 U	0.020 U	0.016 U	0.024 U	0.031 U	0.020 U
T4S1MW17	T4S1MW17-GW-1	5/4/2005	0.02 U	0.0036 J	0.02 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.013 J	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U, J	0.020 U, J	0.020 U
T4S1MW18	T4S1MW18-GW-1	4/21/2004	0.0080 J	--	--	0.025 U	0.025 U	--	0.025 U	0.0071 J	0.011 J	0.006 J	0.005 J	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
T4S1MW18	T4S1MW18-GW-1	9/1/2004	0.026	--	0.0083 J	0.020 U	0.020 U	0.020 U	0.020 U	0.0036 J	0.0034 J	0.020 U	0.0028 J	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
T4S1MW18	T4S1MW18-GW-1	2/1/2005	2.0 U	--	0.012 U	0.011 U	0.0088 U	0.014 U	0.012 U	0.026 J	0.020 J	0.034 J	0.015 U	0.012 U	0.014 U	0.020 U	0.020 U	0.016 U	0.024 U	0.031 U	0.019 U
T4S1MW18	T4S1MW18-GW-1	5/6/2005	0.020 U	0.0050 J	0.0040 J	0.020 U	0.020 U	0.020 U	0.020 U	0.0053 J	0.0078 J	0.0056 J	0.0042 J	0.0029 J	0.0022 J	0.0023 J	0.0017 J	0.0021 J	0.0025 J	0.0022 J	0.020 U
T4S1MW19	T4S1MW19-GW-1	9/15/2004	0.018 J	--	0.017 J	0.020 U	0.0043 J	0.020 U	0.0061 J	0.01 J	0.015 J	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
T4S1MW19	T4S1MW19-GW-1	2/9/2005	0.065	0.015 J	0.020 J	0.0047 J	0.020 U	0.020 U	0.0058 J	0.012 J	0.014 J	0.0068 J	0.0092 J	0.0041 J	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
T4S1MW19	T4S1MW19-GW-1	5/9/2005	0.027	0.0090 J	0.0062 J	0.020 U	0.0020 J	0.020 U	0.0035 J	0.011 J	0.0065 J	0.011 J	0.010 J	0.0033 J	0.0050 J	0.0039 J	0.0040 J	0.0044 J	0.0035 J	0.020 U, J	0.020 U
T4S1MW22	T4S1MW22-GW-1	9/2/2004	0.015 J	--	0.0057 J	0.0034 J	0.020 U	0.020 U	0.020 U	0.011 J	0.012 J	0.0079 J	0.006 J	0.020 U	0.0022 J	0.0022 J	0.002 J	0.0018 J	0.0026 J	0.0018 J	0.020 U
T4S1MW22	T4S1MW22-GW-1	2/4/2005	0.051	0.0081 J	0.013 J	0.0034 J	0.020 U	0.020 U	0.020 U	0.0048 J	0.021	0.020 U	0.0042 J	0.0045 J	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
T4S1MW22	T4S1MW22-GW-1	5/6/2005	0.11 J	0.033	0.025	0.0029 J	0.0027 J	0.020 U	0.0041 J	0.0043 J	0.0096 J	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U, J	0.020 U, J	0.020 U
T4S1MW23	T4S1MW23-GW-1	9/2/2004	0.012 J	--	0.0053 J	0.002 J	0.019 U	0.019 U	0.0035 J	0.023	0.014 J	0.016 J	0.014 J	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U
T4S1MW23	T4S1MW23-GW-1	2/4/2005	0.045	0.0067 J	0.010 J	0.020 U	0.020 U	0.020 U	0.020 U	0.0041 J	0.032	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
T4S1MW23	T4S1MW23-GW-1	5/6/2005	0.020 U	0.0037 J	0.0039 J	0.020 U	0.020 U	0.020 U	0.020 U	0.0048 J	0.023	0.0065 J	0.0053 J	0.020 U	0.0024 J	0.0022 J	0.0017 J	0.0020 J	0.020 U, J	0.020 U, J	0.020 U
T4S1MW24	T4S1MW24-GW-1	9/1/2004	0.041	--	0.018 J	0.020 U	0.020 U	0.020 U	0.003 J	0.008 J	0.0051 J	0.0072 J	0.0058 J	0.02 U	0.0027 J	0.0026 J	0.0017 J	0.0018 J	0.020 U	0.020 U	0.020 U
T4S1MW24	T4S1MW24-GW-1	2/3/2005	0.29 U	--	0.012 U	0.011 U	0.0088 U	0.014 U	0.012 U	0.044 J	0.043 J	0.049 J	0.056 J	0.036 J	0.038 J	0.14 J	0.13 J	0.14 J	0.057 J	0.042 J	0.062 J
T4S1MW24	T4S1MW24-GW-1	5/6/2005	0.020 U	0.0086 J	0.0058 J	0.020 U	0.020 U	0.020 U	0.0026 J	0.0054 J	0.013 J	0.0062 J	0.0048 J	0.0025 J	0.0027 J	0.0032 J	0.0023 J	0.0025 J	0.0027 J	0.020 U, J	0.020 U
T4S1MW26	T4S1MW26-GW-1	9/16/2005	0.100 U	--	--	0.100 U	0.100 U	--	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.200 U	0.100 U
	Preliminary	**Fish Consumption SLV**	--	--	--	--	990	--	5,300	--	40,000	140	4,000	0.018	0.018	0.018	0.018	0.018	0.018	0.018	--
	Screening Levels	**Aquatic SLV**	620	--	--	--	520	3.7	3.9	6.3	13	6.16	--	0.027 [a]	--	--	--	0.014	--	--	--

Notes:

1. Only detected compounds are reported in the table. The complete analyte list is presented in the Sampling and Analysis Plan (Appendix A) of the RI Work Plan (Hart Crowser, 2004a).
2. PAHs = Polynuclear Aromatic Hydrocarbons by EPA Method 8270C (SIM).
3. µg/L = Micrograms per liter.
4. Fish Consumption SLV = EPA National Recommended Water Quality Criteria: 2002 Human Health for Consumption of Fish.
5. Aquatic SLV = EPA National Recommended Water Quality Criteria: 2002 for CCC Freshwater Biota (noted with [a]). Where CCC values are not available, Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Surface Water Aquatic are listed.
6. -- = No screening level available or not analyzed.
7. J = The result is an estimated concentration that is less than the method reporting limit (MRL) but greater than or equal to the method detection limit (MDL).
8. U = The compound was analyzed for but was not detected at or above the MRL/MDL.
9. Boxed values indicate that the detected concentration exceeds the Ecological Screening Criteria.
10. Shaded values indicate that the detected concentration exceeds the EPA AWQC criteria.

KMB00008331

TABLE 14B
GROUNDWATER CHEMISTRY RESULTS: POLYNUCLEAR AROMATIC HYDROCARBONS - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

			PAHs (µg/L)																			
Sample Location:	**Sample ID:**	**Date Sampled:**	Naphthalene	1-Methylnaphthalene	2-Methylnaphthalene	Acenaphthylene	Acenaphthene	Dibenzofuran	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(1,2,3-cd)pyrene	Dibenz(a,h)anthracene	Benzo(g,h,i)perylene
T4S1MW04s	T4S1MW04s-GW-1	4/19/2004	0.0083 J	--	0.025 U	0.025 U	0.025 U	--	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
T4S1MW04s	T4S1MW04s-GW-1	8/31/2004	0.019 J	--	0.008 J	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
T4S1MW04s	T4S1MW04s-GW-1	2/8/2005	0.0082 J	--	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U
T4S1MW04s	T4S1MW04s-GW-1	5/9/2005	0.017 J	0.0085 J	0.013 J	0.0019 J	0.0020 U	0.0071 U	0.0031 J	0.0081 J	0.0019 J	0.014 J	0.014 J	0.0076 J	0.0086 J	0.0060 J	0.0065 J	0.0048 J	0.0043 J	0.0017 U, J	0.0040 J
T4S1MW09	T4S1MW09-GW-1	4/20/2004	0.0087 J	--	--	0.0028 J	0.0028 J	--	0.004 J	0.0075 J	0.05	0.0081 J	0.0078 J	0.0062 J	0.0045 J	0.0043 J	0.0045 J	0.003 J	0.0025 J	0.022 U	0.0038 J
T4S1MW09	T4S1MW09-GW-1	9/1/2004	0.022	--	0.013 J	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.03	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
T4S1MW09	T4S1MW09-GW-1	2/9/2005	0.0080 J	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.0043 J	0.043	0.020 U	0.0042 J	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
T4S1MW09	T4S1MW09-GW-1	5/9/2005	0.033	0.0076 J	0.012 J	0.0022 J	0.0020 U	0.0071 U	0.0028 U	0.0081 J	0.025	0.018 J	0.017 J	0.010 J	0.013 J	0.011 J	0.010 J	0.011 J	0.0090 J	0.0017 U, J	0.0094 J
T4S1MW10	T4S1MW10-GW-1	4/19/2004	0.011 J	--	--	0.0019 J	0.027 U	--	0.027 U	0.0047 J	0.087	0.0084 J	0.0050 J	0.027 U	0.027 U	0.027 U	0.027 U	0.027 U	0.027 U	0.027 U	0.027 U
T4S1MW10	T4S1MW10-GW-1	9/1/2004	0.025	--	0.014 J	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.094	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
T4S1MW10	T4S1MW10-GW-1	2/4/2005	0.0014 J	0.0039 J	0.0057 J	0.0062 J	0.020 U	0.020 U	0.020 U	0.020 U	0.076	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
T4S1MW10	T4S1MW10-GW-1	5/9/2005	0.037	0.0090 J	0.014 J	0.0022 J	0.0020 U	0.0071 U	0.0028 U	0.0032 U	0.070	0.0024 U	0.0023 U	0.0021 U	0.0013 U	0.0020 U	0.0014 U	0.0018 U	0.0021 U, J	0.0017 U, J	0.020 U
T4S1MW11	T4S1MW11-GW-1	4/19/2004	0.0088 J	--	--	0.0018 J	0.025 U	--	0.0037 J	0.028	0.027	0.024 J	0.025 J	0.0038 J	0.0041 J	0.025 U	0.025 U	0.0019 J	0.025 U	0.025 U	0.025 U
T4S1MW11	T4S1MW11-GW-1	9/1/2004	0.043	--	0.024	0.0034 J	0.020 U	0.020 U	0.020 U	0.013 J	0.032	0.020	0.028	0.013 J	0.012 J	0.005 J	0.0071 J	0.0089 J	0.0043 J	0.020 U	0.020 U
T4S1MW11	T4S1MW11-GW-1	2/8/2005	0.012 J	--	0.0073 J	0.019 U	0.019 U	0.019 U	0.019 U	0.0059 J	0.015 J	0.019 U	0.0058 J	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U	0.019 U
T4S1MW11	T4S1MW11-GW-1	5/10/2005	0.02 U	0.020 U	0.0030 J	0.0028 J	0.020 U	0.020 U	0.020 U	0.0094 J	0.025	0.018 J	0.023	0.011 J	0.0098 J	0.0053 J	0.0064 J	0.0070 J	0.0062 J	0.0023 J	0.0050 J
T4S1MW12	T4S1MW12-GW-1	4/19/2004	0.0063 J	--	--	0.025 U	0.025 U	--	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
T4S1MW13	T4S1MW13-GW-1	4/18/2004	0.011 J	0.022 U	0.022 U	0.022 U	0.022 U	--	0.022 U	0.020 J	0.025	0.014 J	0.025	0.0037 J	0.022 U	0.022 U	0.022 U	0.022 U	0.022 U	0.0030 J	0.0044 J
T4S1MW13	T4S1MW13-GW-1	8/31/2004	0.029	--	0.017 J	0.020 U	0.020 U	0.020 U	0.020 U	0.0048 J	0.018 J	0.008 J	0.0097 J	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
T4S1MW14	T4S1MW14-GW-1	4/18/2004	0.0087 J	0.023 U	0.023 U	0.023 U	0.023 U	--	0.023 U	0.023 U	0.023 U	0.023 U	0.023 U	0.023 U	0.023 U	0.023 U	0.023 U	0.023 U	0.023 U	0.0032 J	0.0034 J
T4S1MW14	T4S1MW14-GW-1	8/31/2004	0.035	--	0.024	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.0049 J	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
T4S1MW14	T4S1MW14-GW-1	2/8/2005	0.0099 J	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.013 J	0.019 J	0.0058 J	0.0078 J	0.0046 J	0.020 U	0.0048 J	0.020 U	0.0084 J	0.0043 J	0.020 U	0.0043 J
T4S1MW14	T4S1MW14-GW-1	5/10/2005	0.02 U	0.020 U	0.0028 J	0.020 U	0.020 U	0.020 U	0.020 U	0.0042 J	0.0038 J	0.0081 J	0.0055 J	0.0024 J	0.0031 J	0.0030 J	0.0029 J	0.0033 J	0.0041 J	0.020 U	0.020 U
T4S1MW15	T4S1MW15-GW-1	4/18/2004	0.0089 J	0.0058 J	0.020 U	0.020 U	0.0052 J	--	0.020 U	0.0075 J	0.028	0.0085 J	0.022	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
T4S1MW15	T4S1MW15-GW-1	2/3/2005	0.0087 J	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.0060 J	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
T4S1MW18	T4S1MW18-GW-1	4/19/2004	0.010 J	--	--	0.0045 J	0.0088 J	--	0.0098 J	0.018 J	0.024 J	0.023 J	0.021 J	0.012 J	0.010 J	0.0087 J	0.0084 J	0.0089 J	0.0082 J	0.0058 J	0.0091 J
T4S1MW18	T4S1MW18-GW-1	8/27/2004	0.012 J	--	0.0044 J	0.020 U	0.020 U	0.020 U	0.020 U	0.0042 J	0.027	0.0078 J	0.008 J	0.0048 J	0.0044 J	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
T4S1MW18	T4S1MW18-GW-1	2/10/2005	0.056	0.011 J	0.018 J	0.0037 J	0.020 U	0.020 U	0.020 U	0.0067 J	0.027	0.0071 J	0.0081 J	0.0049 J	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
T4S1MW18	T4S1MW18-GW-1	5/10/2005	0.0082	0.011 J	0.015 J	0.0052 J	0.0098 J	0.020 U	0.0088 J	0.079	0.027	0.15	0.13	0.075	0.11	0.090	0.087	0.095	0.094 J	0.019 J	0.079
T4S1MW20	T4S1MW20-GW-1	9/2/2004	0.14	--	0.015 J	0.0099 J	0.018 J	0.020 U	0.018 J	0.075	0.022	0.023	0.024	0.0074 J	0.0076 J	0.0045 J	0.0043 J	0.0059 J	0.0034 J	0.020 U	0.020 U
T4S1MW20	T4S1MW20-GW-1	2/10/2005	0.074	0.024	0.024	0.020 U	0.020 U	0.020 U	0.0072 J	0.015 J	0.031	0.012 J	0.018 J	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
T4S1MW20	T4S1MW20-GW-1	5/11/2005	0.025	0.0029 J	0.0040 J	0.020 U	0.020 U	0.020 U	0.020 U	0.0071 J	0.020	0.017 J	0.016 J	0.0092 J	0.010 J	0.010 J	0.0062 J	0.0088 J	0.0088 J	0.0022 J	0.0078 J
T4S1MW21	T4S1MW21-GW-1	9/2/2004	0.015 J	--	0.0058 J	0.0022 J	0.0056 J	0.020 U	0.0046 J	0.021	0.011 J	0.013 J	0.012 J	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
T4S1MW21	T4S1MW21-GW-1	2/10/2005	0.072	0.026	0.027	0.0038 J	0.0058 J	0.0050 J	0.0075 J	0.0098 J	0.027	0.0068 J	0.0089 J	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
T4S1MW21	T4S1MW21-GW-1	5/11/2005	0.0088 J	0.020 U	0.0027 J	0.020 U	0.020 U	0.020 U	0.020 U	0.0044 J	0.026	0.020	0.018 J	0.020 U	0.0019 J	0.020 U	0.020 U	0.020 U	0.020 U, J	0.020 U, J	0.020 U
T4S1MW25	T4S1MW25-GW-1	11/9/2005	0.478 U	--	--	0.478 U	0.478 U		0.244 J, D	0.0952 U	0.0952 U	0.0952 U	0.0952 U	0.0952 U	0.0952 U	0.0952 U	0.0952 U	0.0952 U	0.0952 U	0.190 U	0.0952 U
	Preliminary	**Fish Consumption SLV**	--	--	--	--	990	--	5,300	--	40,000	140	4,000	0.018	0.018	0.018	0.018	0.018	0.018	0.018	--
	Screening Levels	**Aquatic SLV**	620	--	--	--	520	3.7	3.9	6.3	13	6.16	--	0.027 *	--	--	--	0.014	--	--	--

Notes:

1. Only detected compounds are reported in the table. The complete analyte list is presented in the Sampling and Analysis Plan (Appendix A) of the RI Work Plan (Hart Crowser, 2004a).
2. PAHs = Polynuclear Aromatic Hydrocarbons by EPA Method 8270C (SIM).
3. µg/L = Micrograms per liter.
4. Fish Consumption SLV = EPA National Recommended Water Quality Criteria: 2002 Human Health for Consumption of Fish.
5. Aquatic SLV = EPA National Recommended Water Quality Criteria: 2002 for CCC Freshwater Biota (noted with *). Where CCC values are not available, Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Surface Water Aquatic are listed.
6. -- = No screening level available or not analyzed.
7. J = The result is an estimated concentration that is less than the method reporting limit (MRL) but greater than or equal to the method detection limit (MDL).
8. U = The compound was analyzed for but was not detected at or above the MRL/MDL.
9. Boxed values indicate that the detected concentration exceeds the Ecological Screening Criteria.
10. Shaded values indicate that the detected concentration exceeds the EPA AWQC criteria.

KMB00008332

TABLE 15
GROUNDWATER CHEMISTRY RESULTS: SEMI-VOLATILE ORGANIC COMPOUNDS - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

			SVOCs (µg/L)								
Sample Location:	**Sample ID:**	**Date Sampled:**	Phenol	4-Methyl phenol	Isophorone	4-Chloro aniline	4-Chloro-3-methylphenol	Dimethyl Phthalate	Diethyl Phthalate	Di-n-butyl Phthalate	Bis(2-ethylhexyl) Phthalate
T4S1MW03S	T4S1MW03S-GW-1	1/31/2005	0.50 U	0.50 U	0.20 U	0.20 U	0.50 U	0.20 U	0.10 J	0.19 J	2.0 U
T4S1MW07	T4S1MW07-GW-1	8/27/2004	0.099 J	0.088 J	0.2 U	0.025 J	0.037 J	0.2 U	0.034 J	0.041 J	2.0 U
T4S1MW07	T4S1MW07-GW-1	2/2/2005	0.48 U	0.48 U	0.20 U	0.20 U	0.48 U	0.20 U	0.2 U	0.2 U	2.0 U
T4S1MW07	T4S1MW07-GW-1	5/4/2005	-- R	-- R	-- R	-- R	-- R	-- R	0.046 J	0.19 U	-- R
T4S1MW17	T4S1MW17-GW-1	2/1/2005	0.48 U	0.48 U	0.20 U	0.20 U	0.068 J	0.20 U	0.089 J	0.11 J	2.0 U
T4S1MW18	T4S1MW18-GW-1	2/1/2005	0.48 U	0.48 U	0.19 U	0.19 U	0.065 J	0.19 U	0.13 J	0.11 J	0.27 J
T4S1MW24	T4S1MW24-GW-1	9/1/2004	0.82 J	1.2 J	9.6 U	9.6 U	9.6 U	9.6 U	9.6 U	9.6 U	9.6 U
T4S1MW24	T4S1MW24-GW-1	2/3/2005	0.49 U	0.49 U	0.20 U	0.20 U	0.49 U	0.20 U	0.2 U	0.2 U	0.35 J
T4S1MW24	T4S1MW24-GW-1	5/6/2005	9.6 U	9.6 U	9.6 U	9.6 U	9.6 U	9.6 U	9.6 U	9.6 U	9.6 U
	Preliminary	**Fish Consumption SLV**	1,700,000	--	960	--	--	1,100,000	44,000	4,500	2.2
	Screening Levels	**Aquatic SLV**	110	--	2,340	--	--	3	210	35	3

Notes:

1. Only detected compounds are reported in the table. The complete analyte list is presented in the Sampling and Analysis Plan (Appendix A) of the RI Work Plan (Hart Crowser, 2004a).
2. SVOCs = Semivolatile Organic Compounds by EPA Method 8270C.
3. µg/L = Micrograms per liter.
4. Fish Consumption SLV = EPA National Recommended Water Quality Criteria: 2002 Human Health for Consumption of Fish.
5. Aquatic SLV = EPA National Recommended Water Quality Criteria: 2002 for CCC Freshwater Biota (noted w[3]). Where CCC values are not available, Oregon Department of Environmental Quality Leve Screening Level Values (SLVs) for Surface Water Aquatic are listed.
6. -- = No screening level available, not analyzed, or data rejected (R) as part of data quality review.
7. J = The result is an estimated concentration that is less than the method reporting limit (MRL) but greater than or equal to the method detection limit (MDL).
8. U = The compound was analyzed for but was not detected at or above the MRL/MDL.
9. R = Rejected.

KMB00008333

TABLE 16A
GROUNDWATER CHEMISTRY RESULTS: VOLATILE ORGANIC COMPOUNDS - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

			VOCs (µg/L)																											
Sample Location:	**Sample ID:**	**Date Sampled:**	Vinyl Chloride	Acetone	1,1-Dichloroethene (1,1-DCE)	Carbon Disulfide	trans-1,2-Dichloroethene	1,1-Dichloroethane (1,1-DCA)	2-Butanone (MEK)	cis-1,2-Dichloroethene	Chloroform	1,1,1-Trichloroethane (TCA)	Benzene	Trichloroethene (TCE)	Toluene	Tetrachloroethene (PCE)	Chlorobenzene	Ethylbenzene	m,p-Xylenes	o-Xylene	Isopropylbenzene	n-Propylbenzene	1,2,4-Trimethylbenzene	sec-Butylbenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene	n-Butylbenzene	Naphthalene
T4S1MW01s	T4S1MW01s-GW-1	4/21/2004	0.50 U	20 U	0.50 U	0.27 J	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.10 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	0.50 U	0.50 U	2 U	2 U
T4S1MW02s	T4S1MW02s-GW-1	4/20/2004	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.13 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	0.50 U	0.50 U	2 U	2 U
T4S1MW02s	T4S1MW02s-GW-1	9/2/2004	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	0.50 U	0.50 U	2 U	2 U
T4S1MW02s	T4S1MW02s-GW-1	2/2/2005	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.92	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U	2.0 U, J
T4S1MW02s	T4S1MW02s-GW-1	5/5/2005	0.50 U	17 J	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2.0 U	2.0 U	2.0 U, J	2.0 U	0.50 U	0.50 U	2.0 U, J	2.0 U
T4S1MW03s	T4S1MW03s-GW-1	4/21/2004	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	2.3	0.23 J	0.50 U	0.50 U	0.29 J	0.23 J	0.77	0.50 U	0.50 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	0.50 U	0.50 U	2 U	2 U
T4S1MW03s	T4S1MW03s-GW-1	8/30/2004	5.4	20 U	0.37 J	0.5 U	0.78	0.50 U	20 U	89	0.50 U	0.50 U	0.50 U	1.3	0.50 U	1.8	0.50 U	0.50 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	0.50 U	0.50 U	2 U	2 U
T4S1MW03s	T4S1MW03s-GW-1	1/31/2005	1.3	20 U	0.5 U	0.5 U	0.5 U	0.5 U	20 U	15	0.19 J	0.5 U	0.5 U	3.5	0.48 J	14	0.5 U	0.5 U	0.5 U	0.5 U	2.0 U	2.0 U	2.0	2.0 U	0.5 U	0.5 U	2.0	2.0 U
T4S1MW03s	T4S1MW03s-GW-1	5/5/2005	0.50 U	20 U	0.50 U	0.50 U	0.20 J	0.50 U	20 U	7.6	0.48 J	0.50 U	0.50 U	0.42 J	0.12 J	1.9	0.50 U	0.50 U	0.50 U	0.50 U	2.0 U	2.0 U	2.0 U, J	2.0 U	0.50 U	0.50 U	2.0 U, J	2.0 U
T4S1MW07	T4S1MW07-GW-1	4/20/2004	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.13 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	0.50 U	0.50 U	2 U	2 U
T4S1MW07	T4S1MW07-GW-1	8/27/2004	0.50 U	20 U	0.50 U	0.94	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	0.50 U	0.50 U	2 U	2 U
T4S1MW07	T4S1MW07-GW-1	2/2/2005	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U	2.0 U, J
T4S1MW07	T4S1MW07-GW-1	5/4/2005	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2.0 U	2.0 U	2.0 U, J	2.0 U	0.50 U	0.50 U	2.0 U, J	2.0 U
T4S1MW08	T4S1MW08-GW-1	4/21/2004	0.50 U	20 U	0.50 U	0.20 J	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	0.50 U	0.50 U	2 U	2 U
T4S1MW08	T4S1MW08-GW-1	8/30/2004	0.50 U	20 U	0.50 U	0.72	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	0.50 U	0.50 U	2 U	2 U
T4S1MW08	T4S1MW08-GW-1	2/3/2005	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U	2.0 U
T4S1MW08	T4S1MW08-GW-1	5/4/2005	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.11 J	0.50 U	0.50 U	0.50 U	0.50 U	2.0 U	2.0 U	2.0 U, J	2.0 U	0.50 U	0.50 U	2.0 U, J	2.0 U
T4S1MW17	T4S1MW17-GW-1	4/20/2004	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.36 J	0.50 U	0.50 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	0.50 U	0.50 U	2 U	2 U
T4S1MW17	T4S1MW17-GW-1	9/2/2004	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	0.50 U	0.50 U	2 U	2 U
T4S1MW17	T4S1MW17-GW-1	2/1/2005	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	1.3	0.21 J	0.50 U	0.50 U	0.50 U	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U	2.0 U
T4S1MW17	T4S1MW17-GW-1	5/4/2005	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2.0 U	2.0 U	2.0 U, J	2.0 U	0.50 U	0.12 J	2.0 U, J	2.0 U
T4S1MW18	T4S1MW18-GW-1	4/21/2004	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.10 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	0.50 U	0.50 U	2 U	2 U
T4S1MW18	T4S1MW18-GW-1	9/1/2004	0.5 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	0.50 U	0.5 U	2 U	2 U
T4S1MW18	T4S1MW18-GW-1	2/1/2005	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	1.3	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U	2.0 U
T4S1MW18	T4S1MW18-GW-1	5/6/2005	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.14 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U	2.0 U, J
T4S1MW19	T4S1MW19-GW-1	9/15/2004	0.5 U	20 U	0.50 U	0.50 U	0.5 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	0.50 U	0.5 U	2 U	2 U
T4S1MW19	T4S1MW19-GW-1	2/9/2005	0.50 U, J	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U	2.0 U
T4S1MW19	T4S1MW19-GW-1	5/9/2005	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.25 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U, J	2.0 U
T4S1MW22	T4S1MW22-GW-1	9/2/2004	0.23 J	20 U	0.40 J	0.50 U	0.59	0.50 U	20 U	23	0.50 U	0.50 U	0.50 U	36	0.50 U	12	0.50 U	0.50 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	0.50 U	0.5 U	2 U	2 U
T4S1MW22	T4S1MW22-GW-1	2/4/2005	0.97	20 U	0.63	0.50 U	0.88	0.50 U	20 U	35	0.50 U	0.50 U	0.50 U	64	0.50 U	27	0.50 U	0.50 U	0.50 U	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U	2.0 U, J
T4S1MW22	T4S1MW22-GW-1	5/6/2005	0.88	20 U	1.1	0.50 U	1.2	0.50 U	20 U	49	0.50 U	0.50 U	0.50 U	83 D	0.11 J	34	0.50 U	0.50 U	0.50 U	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U	2.0 U, J
T4S1MW23	T4S1MW23-GW-1	9/2/2004	0.48 J	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	16	0.50 U	0.50 U	0.50 U	6.2	0.50 U	8	0.50 U	0.50 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	0.50 U	0.5 U	2 U	2 U
T4S1MW23	T4S1MW23-GW-1	2/4/2005	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.86	0.50 U	0.50 U	0.50 U	1.2	0.16 J	5.3	0.50 U	0.50 U	0.50 U	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	0.21 J	0.50 U	2.0 U	2.0 U, J
T4S1MW23	T4S1MW23-GW-1	5/6/2005	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	4.1	0.50 U	0.50 U	0.50 U	2.2	0.50 U	7.8	0.50 U	0.50 U	0.50 U	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U	2.0 U, J
T4S1MW24	T4S1MW24-GW-1	9/1/2004	0.5 U	20 U	0.5 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	0.50 U	0.5 U	2 U	2 U
T4S1MW24	T4S1MW24-GW-1	2/3/2005	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.61	0.50 U	0.50 U	0.50 U	0.50 U	0.25 J	0.12 J	2.0 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U	2.0 U, J
T4S1MW24	T4S1MW24-GW-1	5/6/2005	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.13 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U	2.0 U, J
	Preliminary	**Fish Consumption SLV**	530	–	5.2	–	140,000	–	–	–	470	–	51	30	200,000	3.3	21,000	29,000	–	–	–	–	–	–	960	2,600	–	–
	Screening Levels	**Aquatic SLV**	–	1,500	25	0.92	590	47	–	–	590	1,240	11	130	21,900	9.8	840	50	7.3	1.8	–	–	–	–	71	15	–	620

Notes:
1. Only detected compounds are reported in the table. The complete analyte list is presented in the Sampling and Analysis Plan (Appendix A) of the RI Work Plan (Hart Crowser, 2004a).
2. VOCs = Volatile Organic Compounds by EPA Method 8260B.
3. µg/L = Micrograms per liter.
4. Fish Consumption SLV = EPA National Recommended Water Quality Criteria: 2002 Human Health for Consumption of Fish.
5. Aquatic SLV = EPA National Recommended Water Quality Criteria: 2002 for CCC Freshwater Biota (noted with). Where CCC values are not available, Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Surface Water Aquatic are listed.
6. – = No screening level available or not analyzed.
7. J = The result is an estimated concentration that is less than the method reporting limit (MRL) but greater than or equal to the method detection limit (MDL).
8. U = The compound was analyzed for but was not detected at or above the MRL/MDL.
9. Boxed values indicate that the detected concentration exceeds the Ecological Screening Criteria.
10. Shaded values indicate that the detected concentration exceeds the EPA AWQC criteria.

KMB00008334

TABLE 16B
GROUNDWATER CHEMISTRY RESULTS: VOLATILE ORGANIC COMPOUNDS - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

			VOCs (µg/L)																										
Sample Location:	**Sample ID:**	**Date Sampled:**	Vinyl Chloride	Acetone	1,1-Dichloroethene (1,1-DCE)	Carbon Disulfide	trans-1,2-Dichloroethene	1,1-Dichloroethane (1,1-DCA)	2-Butanone (MEK)	cis-1,2-Dichloroethene	Chloroform	1,1,1-Trichloroethane (TCA)	Benzene	Trichloroethene (TCE)	Toluene	Tetrachloroethene (PCE)	Chlorobenzene	Ethylbenzene	m,p-Xylenes	o-Xylene	Isopropylbenzene	n-Propylbenzene	1,2,4-Trimethylbenzene	sec-Butylbenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene	n-Butylbenzene	Naphthalene
T4S1MW04s	T4S1MW04s-GW-1	4/19/2004	0.50 U	20 U	0.50 U	0.41	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.26 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	0.50 U	0.50 U	2 U	2 U
T4S1MW04s	T4S1MW04s-GW-1	8/31/2004	0.50 U	20 U	0.50 U	0.38 J	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	0.50 U	0.5 U	2 U	2 U
T4S1MW04s	T4S1MW04s-GW-1	2/8/2005	0.50 U	20 U	0.50 U	0.17 J	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.35 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.27 J	0.12 J	2.0 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U	2.0 U
T4S1MW04s	T4S1MW04s-GW-1	5/9/2005	0.22 U	4.1 U	0.13 U	0.41 J	0.15 U	0.11 U	2.0 U	0.12 U	0.14 U	0.12 U	0.14 U	0.14 U	0.36 J	0.13 U	0.14 U	0.29 J	1.5	0.76	0.11 U	0.34 J	3.1	0.13 U	0.11 U	0.12 U	0.23 U, J	1.6 J
T4S1MW09	T4S1MW09-GW-1	4/20/2004	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.15	0.50 U	0.50 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	0.50 U	0.50 U	2 U	2 U
T4S1MW09	T4S1MW09-GW-1	9/1/2004	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	0.50 U	0.5 U	2 U	2 U
T4S1MW09	T4S1MW09-GW-1	2/9/2005	0.50 U, J	20 U	0.50 U, J	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U	2.0 U
T4S1MW09	T4S1MW09-GW-1	5/9/2005	0.22 U	4.1 U	0.13 U	0.16 U	0.15 U	0.11 U	2.0 U	0.12 U	0.14 U	0.12 U	0.14 U	0.14 U	0.26 J	0.13 U	0.14 U	0.13 U	0.22 U	0.11 U	0.11 U	0.098 U	0.15 U, J	0.13 U	0.11 U	0.12 U	0.23 U, J	0.29 U
T4S1MW10	T4S1MW10-GW-1	4/19/2004	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.10 J	20 U	0.19 J	0.50 U	0.50 U	0.50 U	0.19 J	0.22 J	0.24	0.50 U	0.50 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	0.50 U	0.50 U	2 U	2 U
T4S1MW10	T4S1MW10-GW-1	9/1/2004	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.18 J	20 U	0.13 J	0.50 U	0.50 U	0.50 U	0.21 J	0.50 U	0.33 J	0.50 U	0.5 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	0.50 U	0.5 U	2 U	2 U
T4S1MW10	T4S1MW10-GW-1	2/4/2005	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.19 J	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 J	0.50 U	0.51	0.50 U	0.50 U	0.50 U	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U	2.0 U
T4S1MW10	T4S1MW10-GW-1	5/9/2005	0.22 U	4.1 U	0.13 U	0.16 U	0.15 U	0.17 J	2.0 U	0.14 J	0.14 U	0.12 U	0.14 U	0.24 J	0.37 J	0.41 J	0.14 U	0.13 U	0.36 J	0.17 J	0.11 U	0.098 U	0.15 U, J	0.13 U	0.11 U	0.12 U	0.23 U, J	0.29 U
T4S1MW11	T4S1MW11-GW-1	4/19/2004	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.20 J	0.38 U	0.50 U	0.50 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	0.50 U	0.50 U	2 U	2 U
T4S1MW11	T4S1MW11-GW-1	9/1/2004	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	0.50 U	0.50 U	2 U	2 U
T4S1MW11	T4S1MW11-GW-1	2/8/2005	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 J	0.50 U	0.50 U	0.50 U	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U	2.0 U
T4S1MW11	T4S1MW11-GW-1	5/10/2005	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U	2.0 U
T4S1MW12	T4S1MW12-GW-1	4/19/2004	0.50 U	20 U	0.50 U	0.21 J	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	0.50 U	0.50 U	2 U	2 U
T4S1MW13	T4S1MW13-GW-1	4/16/2004	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.13 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	0.50 U	0.50 U	2 U	2 U
T4S1MW14	T4S1MW14-GW-1	4/16/2004	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.16 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	0.50 U	0.50 U	2 U	2 U
T4S1MW14	T4S1MW14-GW-1	8/31/2004	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	0.50 U	0.50 U	2 U	2 U
T4S1MW14	T4S1MW14-GW-1	2/8/2005	0.50 U	20 U	0.50 U, J	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.11 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U	2.0 U
T4S1MW14	T4S1MW14-GW-1	5/10/2005	0.50 U	20 U	0.50 U	0.19 J	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.31 J	0.50 U	0.50 U	0.50 U	0.34 J	0.14 J	2.0 U	2.0 U	0.20 J	2.0 U	0.50 U	0.12 J	2.0 U	2.0 U
T4S1MW15	T4S1MW15-GW-1	4/16/2004	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.13 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	0.50 U	0.50 U	2 U	2 U
T4S1MW16	T4S1MW16-GW-1	4/19/2004	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.90	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	1.4	0.50 U	2 U	2 U
T4S1MW16	T4S1MW16-GW-1	8/27/2004	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.75	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	0.50 U	0.50 U	2 U	2 U
T4S1MW16	T4S1MW16-GW-1	2/10/2005	0.50 U, J	20 U	0.50 U, J	1.7	0.50 U	0.50 U	20 U	0.50 U	4.4	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U	2.0 U
T4S1MW16	T4S1MW16-GW-1	5/10/2005	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	3.1	0.50 U	0.50 U	0.50 U	0.50	0.50 U	0.50 U	0.50 U	0.36 J	0.15 J	2.0 U	2.0 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U	2.0 U
T4S1MW20	T4S1MW20-GW-1	9/2/2004	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	0.50 U	0.50 U	2 U	2 U
T4S1MW20	T4S1MW20-GW-1	2/10/2005	0.50 U, J	20 U	0.50 U, J	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.19 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U	2.0 U
T4S1MW20	T4S1MW20-GW-1	5/11/2005	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.13 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U	2.0 U
T4S1MW21	T4S1MW21-GW-1	9/2/2004	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2 U	2 U	2 U	2 U	0.50 U	0.50 U	2 U	2 U
T4S1MW21	T4S1MW21-GW-1	2/10/2005	0.50 U, J	20 U	0.50 U, J	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U	2.0 U
T4S1MW21	T4S1MW21-GW-1	5/11/2005	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	20 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.15 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U	2.0 U
	Preliminary	**Fish Consumption SLV**	530	--	3.2	--	140,000	--	--	--	470	--	51	30	200,000	3.3	21,000	29,000	--	--	--	--	--	--	960	2,600	--	--
	Screening Levels	**Aquatic SLV**	--	1,500	25	0.92	590	47	--	590	1,240	11	130	21,900	9.8	840	50	7.3	1.8	--	--	--	--	--	71	15	--	620

Notes:
1. Only detected compounds are reported in the table. The complete analyte list is presented in the Sampling and Analysis Plan (Appendix A) of the RI Work Plan (Hart Crowser, 2004a).
2. VOCs = Volatile Organic Compounds by EPA Method 8260B.
3. µg/L = Micrograms per liter.
4. Fish Consumption SLV = EPA National Recommended Water Quality Criteria: 2002 Human Health for Consumption of Fish.
5. Aquatic SLV = EPA National Recommended Water Quality Criteria: 2002 for CCC Freshwater Biota (noted with). Where CCC values are not available, Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Surface Water Aquatic are listed.
6. -- = No screening level available or not analyzed.
7. J = The result is an estimated concentration that is less than the method reporting limit (MRL) but greater than or equal to the method detection limit (MDL).
8. U = The compound was analyzed for but was not detected at or above the MRL/MDL.
9. Boxed values indicate that the detected concentration exceeds the Ecological Screening Criteria.

KMB00008335

TABLE 17A
GROUNDWATER CHEMISTRY RESULTS: POLYCHLORINATED BIPHENYLS - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

			PCBs (µg/L)							
Sample Location:	**Sample ID:**	**Date Sampled:**	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Total PCBs
T4S1MW01s	T4S1MW01s-GW-1	4/21/2004	0.31 U	0.62 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	--
T4S1MW01s	T4S1MW01s-GW-1	9/1/2004	0.2 U	0.39 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	--
T4S1MW01s	T4S1MW01s-GW-1	2/3/2005	0.21 U	0.41 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	--
T4S1MW01s	T4S1MW01s-GW-1	5/4/2005	0.20 U	0.39 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	--
T4S1MW08	T4S1MW08-GW-1	8/30/2004	0.2 U	0.39 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	--
T4S1MW08	T4S1MW08-GW-1	2/3/2005	0.21 U	0.41 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	--
T4S1MW08	T4S1MW08-GW-1	5/5/2005	0.20 U	0.39 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	--
T4S1MW15	T4S1MW15-GW-1	2/3/2005	0.20 U	0.39 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	--
T4S1MW17	T4S1MW17-GW-1	4/20/2004	0.22 U	0.43 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	--
T4S1MW24	T4S1MW24-GW-1	9/1/2004	0.2 U	0.39 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	--
T4S1MW24	T4S1MW24-GW-1	2/3/2005	0.20 U	0.39 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	--
T4S1MW24	T4S1MW24-GW-1	5/6/2005	0.20 U	0.39 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	--
	Preliminary	**Fish Consumption SLV**	--	--	--	--	--	--	--	0.000064
	Screening Levels	**Aquatic SLV**	--	0.28	0.58	0.053	0.081	0.033	94	0.014

Notes:
1. PCBs = Polychlorinated Biphenyls by EPA Method 8082.
2. µg/L = Micrograms per liter.
3. Fish Consumption SLV = EPA National Recommended Water Quality Criteria: 2002 Human Health for Consumption of Fish.
4. Aquatic SLV = EPA National Recommended Water Quality Criteria: 2002 for CCC Freshwater Biota (noted with *). Where CCC values are not available, Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Surface Water Aquatic are listed.
5. -- = No screening level available or not analyzed.
6. U = The compound was analyzed for but was not detected at or above the MRL/MDL.

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TABLE 17B
GROUNDWATER CHEMISTRY RESULTS: POLYCHLORINATED BIPHENYLS - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

			PCBs (µg/L)							
Sample Location:	**Sample ID:**	**Date Sampled:**	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Total PCBs
T4S1MW09	T4S1MW09-GW-1	9/1/2004	0.2 U	0.39 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	--
T4S1MW09	T4S1MW09-GW-1	2/9/2005	0.19 U	0.38 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	--
T4S1MW09	T4S1MW09-GW-1	5/9/2005	0.20 U	0.39 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	--
T4S1MW10	T4S1MW10-GW-1	9/1/2004	0.2 U	0.39 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	--
T4S1MW10	T4S1MW10-GW-1	2/4/2005	0.20 U	0.39 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	--
T4S1MW10	T4S1MW10-GW-1	5/9/2005	0.20 U	0.39 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	--
T4S1MW16	T4S1MW16-GW-1	4/19/2004	0.31 U	0.62 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	--
T4S1MW16	T4S1MW16-GW-1	8/27/2004	0.2 U	0.39 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	--
T4S1MW16	T4S1MW16-GW-1	2/10/2005	0.20 U	0.39 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	--
	Preliminary	**Fish Consumption SLV**	--	--	--	--	--	--	--	0.000064
	Screening Levels	**Aquatic SLV**	--	0.28	0.58	0.053	0.081	0.033	94	0.014

Notes:
1. PCBs = Polychlorinated Biphenyls by EPA Method 8082.
2. µg/L = Micrograms per liter.
3. Fish Consumption SLV = EPA National Recommended Water Quality Criteria: 2002 Human Health for Consumption of Fish.
4. Aquatic SLV = EPA National Recommended Water Quality Criteria: 2002 for CCC Freshwater Biota (noted with a). Where CCC values are not available, Oregon Department of Environmental Quality Level II Quality Level II Screening Level Values (SLVs) for Surface Water Aquatic are listed.
5. -- = No screening level available or not analyzed.
6. U = The compound was analyzed for but was not detected at or above the MRL/MDL.
7. All analytes are reported in the table.

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TABLE 18A
GROUNDWATER CHEMISTRY RESULTS: PESTICIDES - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

			Pesticides (µg/L)																	
Sample Location:	**Sample ID:**	**Date Sampled:**	alpha-BHC	beta-BHC	gamma-BHC (Lindane)	delta-BHC	Heptachlor	Aldrin	Heptachlor Epoxide	Endosulfan I	alpha-Chlordane	Dieldrin	4,4'-DDE	Endrin	Endosulfan II	4,4'-DDD	Endrin Aldehyde	4,4'-DDT	Endrin Ketone	Methoxychlor
T4S1MW03s	T4S1MW03s-GW-1	04/21/2004	0.012 U	0.0035 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 Ui	0.012 U	0.012 U	0.0022 J	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
T4S1MW03s	T4S1MW03s-GW-1	8/30/2004	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.01 U	0.010 U	0.010 U	0.010 U	0.010 U	0.0032 U	0.010 U	0.010 Ui	0.010 U	0.010 U
T4S1MW03s	T4S1MW03s-GW-1	1/31/2005	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U
T4S1MW03s	T4S1MW03s-GW-1	5/5/2005	0.0096 U	0.0079 J	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 Ui	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U
T4S1MW08	T4S1MW08-GW-1	04/21/2004	0.0023 J	0.0035 U	0.0015 J	0.0028 J	0.0028 JP	0.017 Ui	0.0032 JP	0.0016 J	0.012 U	0.012 U	0.0043 J+, P	0.0031 JP	0.012 U	0.012 Ui	0.012 U	0.012 Ui	0.012 Ui	0.0053 JP
T4S1MW08	T4S1MW08-GW-1	8/30/2004	0.0097 U	1.0 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U
T4S1MW08	T4S1MW08-GW-1	2/3/2005	-- R	-- R	-- R	-- R	-- R	-- R	-- R	-- R	-- R	-- R	-- R	-- R	-- R	-- R	-- R	-- R	-- R	-- R
T4S1MW08	T4S1MW08-GW-1	5/4/2005	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 Ui	0.0097 U	0.0097 U	0.0097 U	0.0097 U
T4S1MW08	T4S1MW08-GW1	9/16/2005	0.0400 U	0.0400 U	0.0400 U	0.100 U	0.0800 U	0.0800 U	0.0400 U	0.0200 U	0.0400 U	0.0800 U	0.0800 U	0.0800 U	0.0800 U	0.0400 U	0.160 U	0.0800 U	0.0800 U	0.500 U
T4S1MW17	T4S1MW17-GW-1	04/20/2004	0.011 U	0.0031 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	0.0023 J	0.011 U	0.011 U	0.011 U	0.011 U	0.0042 J	0.011 Ui
T4S1MW17	T4S1MW17-GW-1	5/4/2005	0.0049 U	0.0017 U	0.0022 U	0.0015 U	0.0039 U	0.0018 U	0.0012 U	0.00066 U	0.0013 U	0.0013 Ui	0.00069 U	0.0056 J	0.0019 U	0.00082 U	0.0037 J	0.0096 U	0.031	0.0015 U
T4S1MW17	T4S1MW17-GW-1	9/16/2005	0.0400 U	0.0400 U	0.0400 U	0.100 U	0.0800 U	0.0800 U	0.0400 U	0.0200 U	0.0400 U	0.0800 U	0.0800 U	0.0800 U	0.0800 U	0.0400 U	0.160 U	0.0800 U	0.00762 J	0.500 U
T4S1MW18	T4S1MW18-GW-1	04/21/2004	0.012 U	0.0035 U	0.012 U	0.012 U	0.012 Ui	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
T4S1MW26	T4S1MW26-GW1	9/16/2005	0.0400 U	0.0400 U	0.0400 U	0.100 U	0.0800 U	0.0800 U	0.0400 U	0.0200 U	0.0400 U	0.0800 U	0.0800 U	0.0800 U	0.0800 U	0.0400 U	0.160 U	0.0800 U	0.0800 U	0.500 U
	Preliminary	**Fish Consumption SLV**	0.0049	0.017	0.063	--	8E-05	5E-05	0.000039	89	0.00081	5E-05	0.00022	0.81	89	0.00031	0.3	0.0002	--	--
	Screening Levels	**Aquatic SLV**	2.2	2.2	0.08	--	0.0038 [a]	0.06 [a]	0.0038 [a]	0.056 [a]	0.0043 [a]	0.056 [a]	--	0.036 [a]	0.056 [a]	0.001	--	0.001	--	0.03

Notes:

1. Only detected compounds are reported in the table. The complete analyte list is presented in the Sampling and Analysis Plan (Appendix A) of the RI Work Plan (Hart Crowser, 2004a).
2. Organochlorine Pesticides by EPA Method 8081A. Organophosphorus Pesticides by EPA Method 8141A.
3. µg/L = Micrograms per liter.
4. Fish Consumption SLV = EPA National Recommended Water Quality Criteria: 2002 Human Health for Consumption of Fish.
5. Aquatic SLV = EPA National Recommended Water Quality Criteria: 2002 for CCC Freshwater Biota (noted with [a]). Where CCC values are not available, Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Surface Water Aquatic are listed.
6. -- = No screening level available, not analyzed, or data rejected (R) as part of data quality review.
7. J = The result is an estimated concentration that is less than the method reporting limit (MRL) but greater than or equal to the method detection limit (MDL).
8. U = The compound was analyzed for but was not detected at or above the MRL/MDL.
9. i = The MRL/MDL was raised due to a chromatographic interference.
10. P = The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 25 percent between the two analytical results.
11. Boxed values indicate that the detected concentration exceeds the Ecological Screening Criteria.
12. Shaded values indicate that the detected concentration exceeds the EPA AWQC criteria.
13. J+ = The result is an estimated concentration that is is potentially biased high (compared to the confirmation result).
14. R = Rejected.

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TABLE 18B
GROUNDWATER CHEMISTRY RESULTS: PESTICIDES - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

			Pesticides (µg/L)																	
Sample Location:	**Sample ID:**	**Date Sampled:**	alpha-BHC	beta-BHC	gamma-BHC (Lindane)	delta-BHC	Heptachlor	Aldrin	Heptachlor Epoxide	Endosulfan I	alpha-Chlordane	Dieldrin	4,4'-DDE	Endrin	Endosulfan II	4,4'-DDD	Endrin Aldehyde	4,4'-DDT	Endrin Ketone	Methoxychlor
T4S1MW09	T4S1MW09-GW-1	04/20/2004	0.012 U	0.0033 U	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U	0.012 U	0.0028 U	0.012 U	0.012 U	0.012 U	0.0015	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
T4S1MW09	T4S1MW09-GW-1	9/1/2004	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 Ui	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U
T4S1MW09	T4S1MW09-GW-1	2/3/2005	0.0095 U	0.0095 U	0.0095 U	0.0095 U	0.0095 U	0.0095 U	0.0095 U	0.0095 Ui	0.0095 U	0.0095 Ui	0.0095 Ui	0.0095 U	0.0095 U	0.0095 U	0.0095 U	0.0095 U	0.0030 J	--	--	0.0095 U
T4S1MW09	T4S1MW09-GW-1	5/9/2005	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U
T4S1MW10	T4S1MW10-GW-1	04/19/2004	0.012 U	0.0035 U	0.012 U	0.012 U	0.012 U	0.013 U	0.012 U	0.012 U	0.013 U	0.0044 JP	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
T4S1MW10	T4S1MW10-GW-1	9/1/2004	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U
T4S1MW10	T4S1MW10-GW-1	2/9/2005	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 Ui	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 Ui	0.0097 U	0.0097 U	0.0097 U	--	0.0097 U
T4S1MW10	T4S1MW10-GW-1	5/9/2005	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 Ui	0.0096 Ui	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U
T4S1MW11	T4S1MW11-GW-1	04/19/2004	0.013 U	0.0037 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 Ui	0.013 U	0.0026 J	0.013 U	0.013 U	0.013 U	0.013 U
T4S1MW11	T4S1MW11-GW-1	9/1/2004	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0012 J	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0097 Ui	0.0097 U	0.0014 JP	0.0097 U	0.0097 U
T4S1MW11	T4S1MW11-GW-1	5/10/2005	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 U	0.0096 Ui	0.0096 U	0.0096 U	0.0096 U	0.0096 U
	Preliminary	**Fish Consumption SLV**	0.0049	0.017	0.063	--	8E-05	5E-05	0.000039	89	0.00081	5E-05	0.00022	0.81	89	0.00031	0.3	0.0002	--	--
	Screening Levels	**Aquatic SLV**	2.2	2.2	0.08	--	0.0038 [a]	0.06 [a]	0.0038 [a]	0.056 [a]	0.0043 [a]	0.056 [a]	--	0.036 [a]	0.056 [a]	0.001	--	0.001	--	0.03

Notes:

1. Only detected compounds are reported in the table. The complete analyte list is presented in the Sampling and Analysis Plan (Appendix A) of the RI Work Plan (Hart Crowser, 2004a).
2. Organochlorine Pesticides by EPA Method 8081A. Organophosphorus Pesticides by EPA Method 8141A.
3. µg/L = Micrograms per liter.
4. Fish Consumption SLV = EPA National Recommended Water Quality Criteria: 2002 Human Health for Consumption of Fish.
5. Aquatic SLV = EPA National Recommended Water Quality Criteria: 2002 for CCC Freshwater Biota (noted with [a]). Where CCC values are not available, Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Surface Water Aquatic are listed.
6. -- = No screening level available or not analyzed.
7. J = The result is an estimated concentration that is less than the method reporting limit (MRL) but greater than or equal to the method detection limit (MDL).
8. U = The compound was analyzed for but was not detected at or above the MRL/MDL.
9. i = The MRL/MDL was raised due to a chromatographic interference.
10. P = The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 25 percent between the two analytical results.
11. Boxed values indicate that the detected concentration exceeds the Ecological Screening Criteria.
12. Shaded values indicate that the detected concentration exceeds the EPA AWQC criteria.

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TABLE 19A
GROUNDWATER CHEMISTRY RESULTS: METALS - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

			Total Metals (µg/L)												
Sample Location:	**Sample ID:**	**Date Sampled:**	Antimony	Arsenic	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
T4S1MW08	T4S1MW08-GW-1	5/4/2005	0.05 U	0.38 B	0.033	0.02 J	14.6	3.76 U	0.52 U	0.2 U	12.5	1.0 U	0.006 B	0.02	9.38
T4S1MW08	T4S1MW08-GW-1	9/16/2005	3.0 U	1.00 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.20 U	0.540 J	0.400 J	1.0 U	1.0 U	3.26 J
T4S1MW17	T4S1MW17-GW-1	5/4/2005	0.03 B	0.24 B	0.020 U	0.02	0.94	2.6 J	0.11	0.14 B	8	0.1 B	0.02 U	0.02 U	6.18
T4S1MW17	T4S1MW17-GW-1	9/16/2005	3.0 U	1.00 U	1.0 U	1.0 U	1.0 U	0.530 J	1.0 U	0.20 U	5.64	0.370 J	1.0 U	1.0 U	5.15 J
T4S1MW19	T4S1MW19-GW-1	9/15/2004	0.04 B,N	2.4	0.014 B	0.02	0.66	0.82	0.133	0.2 U	4.83	5 U	0.01 B	0.02 U	3.1
T4S1MW19	T4S1MW19-GW-1	2/9/2005	0.02 B	2.1	0.076	0.148	5.92	5.24	1.160	0.20 U, J	10.2	0.9 B	0.015 B	0.011 B	10.7
T4S1MW19	T4S1MW19-GW-1	5/9/2005	0.03 B	1.81	0.018 B	0.26	7.34	3.55	0.35	0.2 U	7.76	1 B	0.020 U	0.017 B	14.1
T4S1MW22	T4S1MW22-GW-1	9/2/2004	0.05 U	0.3 B	0.008 B	0.04	0.22	0.79	0.056	0.2 U	8.75	1 U	0.02 U	0.009 B	2.5
T4S1MW22	T4S1MW22-GW-1	2/4/2005	0.02 B	0.2 B	0.010 B	0.111	0.22	0.63 J	0.082	0.2 U	5.95	1.0 U	0.020 U	0.011 J	1.5
T4S1MW22	T4S1MW22-GW-1	5/6/2005	0.037 B	0.2 J	0.006 B	0.108	0.27 U	0.45 B	0.153	0.20 U	2.96 J	1.0 U	0.020 U	0.02 U	1.63 J
T4S1MW23	T4S1MW23-GW-1	9/2/2004	0.05 U	3.6	0.02 U	0.02 U	0.27	0.39	0.089	0.2 U	3.73	1 U	0.024	0.02 U	3.3
T4S1MW23	T4S1MW23-GW-1	2/4/2005	0.02 B	4.3	0.020 U	0.02 U	0.2 U	0.27 J	0.044	0.2 U	2.32	1.0 U	0.020 U	0.020 U, J	1.3
T4S1MW23	T4S1MW23-GW-1	5/6/2005	0.042 B	3.4 J	0.011 B	0.287	1.72	1.01	0.282	0.20 U	2.13 J	1.0 U	0.02 U	0.02 U	3.87 J
T4S1MW24	T4S1MW24-GW-1	9/1/2004	0.06	1.4	0.01 B	0.03	0.74	1.1	0.268	0.2 U	13.4	3 B	0.02 U	0.011 B	7.5
T4S1MW24	T4S1MW24-GW-1	2/3/2005	0.02 B	0.5 U	0.011 B	0.052	0.41	1.69 J	0.034	0.20 U	10.5	1.0 U	0.020 U	0.020 U, J	4.4
T4S1MW24	T4S1MW24-GW-1	5/6/2005	0.264 B	0.2 J	0.009 B	0.120	1.44	2.16	0.211	0.20 U	9.94 J	0.2 B	0.020 U	0.020 U	5.34 J
T4S1MW26	T4S1MW26-GW-1	9/16/2005	3.0 U	9.80	1.0 U	1.0 U	1.0 J	1.0 J	1.0 J	0.20 U	3.23	1.35	1.0 U	1.0 U	5.70 J
	Preliminary	**Fish Consumption SLV**	640	0.14	--	--	--	--	--	--	4,600	4,200	--	6.3	26,000
	Screening Levels	**Aquatic SLV**	1,600	150 [a]	5.3	0.25	74 [III], 11 [VI]	9 [a]	2.5 [a]	0.77 [a]	52 [a]	5 [a]	0.12	40	120 [a]

			Dissolved Metals (µg/L)												
Sample Location:	**Sample ID:**	**Date Sampled:**	Antimony	Arsenic	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
T4S1MW08	T4S1MW08-GW-1	5/4/2005	0.05 U	0.13 B	0.020 U	0.02 U	1.4	0.18 U	0.02 U	0.2 U	6.89	1.0 U	0.020 U	0.020 U	4.68 U
T4S1MW08	T4S1MW08-GW-1	9/16/2005	1.01 J	0.230 J	0.110 U	0.100 U	0.0800 J	0.120 J	0.0800 U	0.0500 U	0.460 J	0.320 U	0.0800 U	0.0800 U	2.99 J
T4S1MW17	T4S1MW17-GW-1	5/4/2005	0.03 B	0.17 B	0.020 U	0.03 J	0.79	2.75 J	0.08	0.20 U	7.94	1.0 U	0.020 U	0.02 U	7.62
T4S1MW17	T4S1MW17-GW-1	9/16/2005	0.0400 U	0.310 J	0.110 U	0.100 U	0.390 J	0.440 J	0.0800 U	0.0500 U	5.11	0.320	0.0800 U	0.0800 U	0.800 J
T4S1MW19	T4S1MW19-GW-1	9/15/2004	0.04 B,N	3.1	0.02 U	0.02	2.89	0.51	0.02 U	0.2 U	4.89	5 U	0.02 U	0.02 U	2.3
T4S1MW19	T4S1MW19-GW-1	2/9/2005	0.05 U	1.9	0.006 B	0.083	0.72	0.64	0.461	0.20 U, J	6.95	0.9 B	0.020 U	0.020 U	5.0
T4S1MW19	T4S1MW19-GW-1	5/9/2005	0.03 B	1.85	0.009 B	0.06	2.53	0.75	0.02	0.20 U	7.71	0.8 B	0.007 B	0.015 B	11.5
T4S1MW22	T4S1MW22-GW-1	9/2/2004	0.03 B	0.4 B	0.014 B	0.03	0.66	0.79	0.019 B	0.2 U	8.67	0.4 B	0.02 U	0.009 B	2.8
T4S1MW22	T4S1MW22-GW-1	2/4/2005	0.05 U	0.2 B	0.020 U	0.082 U	0.28	0.54 J	0.069	0.2 U	5.83	1.0 U	0.020 U	0.020 U, J	1.6
T4S1MW22	T4S1MW22-GW-1	5/6/2005	0.028 B	0.2 J	0.020 U	0.067	0.2 U	0.32 B	0.028 U	0.20 U	2.7 J	1.0 U	0.020 U	0.02 U	1.51 J
T4S1MW23	T4S1MW23-GW-1	9/2/2004	0.05 U	3.9	0.02 U	0.02 U	0.36	0.37	0.01 B	0.2 U	4.02	0.5 B	0.02 U	0.004 B	2.7
T4S1MW23	T4S1MW23-GW-1	2/4/2005	0.05 U	3.7	0.020 U	0.039 U	0.2 U	0.32 J	0.067	0.2 U	2.42	1.0 U	0.020 U	0.020 U, J	1.4
T4S1MW23	T4S1MW23-GW-1	5/6/2005	0.023 B	2.1 J	0.020 U	0.158	0.61	0.32 B	0.08	0.20 U	2.98 J	1.0 U	0.020 U	0.02 U	3.07 J
T4S1MW24	T4S1MW24-GW-1	9/1/2004	0.06	1.6	0.011 B	0.06	1.37	1.86	1.78	0.2 U	15	3.6	0.02 U	0.006 B	15.4
T4S1MW24	T4S1MW24-GW-1	2/3/2005	0.02 B	0.5 U	0.010 B	0.057	0.58	1.82 J	0.042	0.2 U	10.4	1.0 U	0.020 U	0.020 U, J	4.0
T4S1MW24	T4S1MW24-GW-1	5/6/2005	0.251 B	0.2 J	0.007 B	0.098	1.12	1.97	0.082	0.20 U	10.5 J	1.0 U	0.020 U	0.02 U	6.36 J
T4S1MW26	T4S1MW26-GW-1	9/16/2005	0.0500 J	10.8	0.110 U	0.100 U	0.990 J	0.420 J	0.120 J	0.0500 U	3.52	0.710 J	0.0800 U	0.080 U	4.82 J
	Preliminary	**Fish Consumption SLV**	640	0.14	--	--	--	--	--	--	4,600	4,200	--	6.3	26,000
	Screening Levels	**Aquatic SLV**	1,600	150 [a]	5.3	0.25 [a]	74 [III], 11 [VI]	9 [a]	2.5 [a]	0.77 [a]	52 [a]	5 [a]	0.12	40	120 [a]

Please refer to notes at end of table.

KMB00008340

TABLE 19A
GROUNDWATER CHEMISTRY RESULTS: METALS - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Notes:
1. All analytes are reported in the table.
2. Total/Dissolved Metals using EPA 6000-7000 Series Methods.
3. µg/L = Micrograms per liter.
4. Fish Consumption SLV = EPA National Recommended Water Quality Criteria: 2002 Human Health for Consumption of Fish.
5. Aquatic SLV = EPA National Recommended Water Quality Criteria: 2002 for CCC Freshwater Biota (noted with [a]). Where CCC values are not available, Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Surface Water Aquatic are listed.
6. "-" = No screening level available or not analyzed.
7. B = The result is an estimated concentration that is less than the MRL but greater than or equal to the method detection limit (MDL).
8. U = The compound was analyzed for but was not detected at or above the MRL/MDL.
9. N = The matrix spike sample recovery is not within control limits. The case narrative suggests that this sample may be biased low.
10. [III] = SLV for Chromium III.
11. [VI] = SLV for Chromium VI.
12. Boxed values indicate that the detected concentration exceeds the Ecological Screening Criteria (for chromium, Chromium III used).
13. Shaded values indicate that the detected concentration exceeds the EPA AWQC criteria.

KMB00008341

TABLE 19B
GROUNDWATER CHEMISTRY RESULTS: METALS - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

			Total Metals (µg/L)												
Sample Location:	**Sample ID:**	**Date Sampled:**	Antimony	Arsenic	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
T4S1MW09	T4S1MW09-GW-1	9/1/2004	0.05 U	8.3	0.02 U	0.02 U	0.23	0.52	0.016 B	0.04 B	3.36	0.4 B	0.02 U	0.009 B	0.8
T4S1MW09	T4S1MW09-GW-1	2/9/2005	0.03 B	11.2	0.015 B	0.069 U	2.65	1.30	0.190	0.20 U	5.49	1.0 U	0.027 U	0.008 J	2.6
T4S1MW09	T4S1MW09-GW-1	5/9/2005	0.05 B	10.6	0.052	0.16	6.29	2.88	0.8	0.2 U	7.82	0.1 B	0.006 B	0.015 B	8.11
T4S1MW10	T4S1MW10-GW-1	9/1/2004	0.05 U	0.6	0.024	0.02 U	0.6	1.9	0.156	0.05 B	5.7	0.3 B	0.02 U	0.004 B	2.3
T4S1MW10	T4S1MW10-GW-1	2/4/2005	0.05 U	0.4 B	0.020 U	0.06	0.81	0.62	0.046	0.05 B	3.6	0.3 B	0.020 U	0.020 U	5.5
T4S1MW10	T4S1MW10-GW-1	5/9/2005	0.02 B	0.35 B	0.020 U	0.08	0.43	0.79	0.06	0.2 U	4.61	0.2 B	0.020 U	0.007 B	2.53
T4S1MW11	T4S1MW11-GW-1	04/19/2004	0.03 B	7.6	0.02 U	0.05	0.43	2.13	0.26	0.10 U	4.95	0.8 B	0.01 U	0.018 U	.9
T4S1MW11	T4S1MW11-GW-1	9/1/2004	0.04 B	17	0.02 B	0.02	0.37	1.24	0.092	0.04 B	4.64	1 U	0.02 U	0.014 B	2.3
T4S1MW11	T4S1MW11-GW-1	2/8/2005	0.05 U	10.0	0.020 U	0.03	0.26	0.44	0.017 B	0.20 U	3.1	0.2 B	0.020 U	0.020 U	0.6
T4S1MW11	T4S1MW11-GW-1	5/10/2005	0.05 U	6.9 J	0.02 U	0.02 U	0.96	1 U	0.075 U	0.20 U	1.85 J	1.0 U	0.02 U	0.02 U	1.95 U
T4S1MW12	T4S1MW12-GW-1	04/19/2004	0.03 B	2.1	0.03	0.02	0.56	6.36	0.2	0.10 U	3.96	1.2	0.01 U	0.017 B	3.56
T4S1MW12	T4S1MW12-GW-1	8/31/2004	0.05 U	10 U	0.01 B	0.02 U	2.71	0.87	0.13	0.2 U	3.47	5 U	0.02 U	0.02 U	1.6
T4S1MW12	T4S1MW12-GW-1	2/7/2005	0.04 B	1.1	0.006 B	0.03	0.84	0.87	0.062	0.06 B	2.6	0.3 B	0.015 B	0.020 U	6.5
T4S1MW12	T4S1MW12-GW-1	5/9/2005	0.14	3.1	0.036	0.15	12.3	3.74	2.27	0.2 U	11.9	0.2 B	0.020 U	0.008 B	11.5
T4S1MW13	T4S1MW13-GW-1	04/16/2004	0.03 B	15.4	0.02 U	0.02 B	0.66	0.72	0.03	0.10 U	2.3	0.3 B	0.01 B	0.041	1.2
T4S1MW13	T4S1MW13-GW-1	8/31/2004	0.05 U	5.8 B	0.02 U	0.02 U	2.55	0.39	0.02 U	0.2 U	3.51	5 U	0.02 U	0.02 U	0.5 B
T4S1MW13	T4S1MW13-GW-1	2/8/2005	0.05 U	14.2	0.020 U	0.02 U	0.47	0.29	0.030	0.05 B	2.1	1.0 U	0.020 U	0.020 U	1.2
T4S1MW13	T4S1MW13-GW-1	5/10/2005	0.05 U	15.4 J	0.02 U	0.024 U	1.63	0.83 B	0.292	0.20 U	1.97 J	1.0 U	0.02 U	0.02 U	2.73 U
T4S1MW15	T4S1MW15-GW-1	04/16/2004	0.02 U	0.02 U	0.02 U	0.01 B	0.43	1.34	0.05	0.10 U	0.3 B	0.2 U	0.01 U	0.006 B	0.6
T4S1MW15	T4S1MW15-GW-1	8/27/2004	0.05 U	10 U	0.01 B	0.02 U	4.12	1.91	1.1	0.2 U	9.56	5 U	0.02 U	0.02 U	3.1
T4S1MW15	T4S1MW15-GW-1	2/9/2005	0.05 U	0.3 B	0.008 B	0.086	1.36	1.32	0.425	0.20 U, J	9.44	1.0 U	0.020 U	0.020 U	2.3
T4S1MW15	T4S1MW15-GW-1	5/10/2005	0.1 U	2.7 J	0.112	0.056	21.9	9.23	10.9	0.20 U	20.4 J	2.0 U	0.04 U	0.04 U	31.5
T4S1MW16	T4S1MW16-GW-1	04/19/2004	0.06	0.9	0.04	0.18	0.23	4.98	0.11	0.10 U	7.34	1.8	0.03	0.072	9.68
T4S1MW16	T4S1MW16-GW-1	8/27/2004	0.33	0.8	0.058	0.06	1.65	14.3	1.12	0.2 U	4.62	0.5 B	0.02 U	0.01 B	13.7
T4S1MW16	T4S1MW16-GW-1	2/10/2005	0.11	0.5 B	0.011 B	0.222	0.57	3.89	0.689	0.20 U	2.52	0.5 B	0.02 U	0.020 U, J	10.3
T4S1MW20	T4S1MW20-GW-1	9/2/2004	0.05 U	1.9	0.027	0.03	0.85	0.95	0.186	0.2 U	10.8	0.8 B	0.02 U	0.005 B	4.4
T4S1MW20	T4S1MW20-GW-1	2/10/2005	0.05 U	1.5	0.011 B	0.095 U	0.21 U	0.64	0.133	0.20 U	10.1	0.7 B	0.02 U	0.008 J	2.3
T4S1MW20	T4S1MW20-GW-1	5/11/2005	0.05 U	1.1 J	0.02 U	0.038 U	1.37	0.69 B	0.176	0.20 U	7.14 J	1.0 U	0.02 U	0.02 U	2.74 U
T4S1MW21	T4S1MW21-GW-1	9/2/2004	0.05 U	0.2 B	0.017 B	0.04	0.48	0.59	0.056	0.2 U	20.3	0.3 B	0.011 B	0.007 B	3.1
T4S1MW21	T4S1MW21-GW-1	2/10/2005	0.05 U	0.5 U	0.015 B	0.113	0.24 U	0.68	0.100	0.20 U	18.0	0.2 B	0.02 U	0.009 J	4.5
T4S1MW21	T4S1MW21-GW-1	5/11/2005	0.063 U	0.4 J	0.035 U	0.397	3.25	1.48	1.110	0.20 U	11.7 J	1.0 U	0.02 U	0.02 U	5.78 U
	Preliminary	**Fish Consumption SLV**	640	0.14	---	---	---	---	---	---	4,600	4,200	---	6.3	26,000
	Screening Levels	**Aquatic SLV**	1,600	150 [a]	5.3	0.25	74 [iii], 11 [vi]	9 [a]	2.5 [a]	0.77 [a]	52 [a]	5 [a]	0.12	40	120 [a]

Please refer to notes at end of table

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TABLE 19B
GROUNDWATER CHEMISTRY RESULTS: METALS - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

			Dissolved Metals (µg/L)												
Sample Location:	**Sample ID:**	**Date Sampled:**	Antimony	Arsenic	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
T4S1MW09	T4S1MW09-GW-1	9/1/2004	0.05 U	8.6	0.02 U	0.02 U	0.57	0.52	0.02 U	0.2 U	3.39	1 U	0.02 U	0.007 B	1
T4S1MW09	T4S1MW09-GW-1	2/9/2005	0.05 U	9.7	0.020 U	0.053	0.91	0.41	0.063	0.20 U	5.45	1.0 U	0.020 U	0.020 U	1.1
T4S1MW09	T4S1MW09-GW-1	5/9/2005	0.05 U	11.5	0.020 U	0.06	1.82	0.55	0.01 B	0.2 U	5.98	1 U	0.020 U	0.007 B	2.01
T4S1MW10	T4S1MW10-GW-1	9/1/2004	0.05 U	0.3 B	0.02 U	0.02 U	0.51	1.37	0.042	0.05 B	6.07	0.4 B	0.02 U	0.02 U	1
T4S1MW10	T4S1MW10-GW-1	2/4/2005	0.05 U	0.4 B	0.020 U	0.04	0.16 B	0.50	0.020 U	0.06 B	3.5	0.3 B	0.020 U	0.020 U	5.5
T4S1MW10	T4S1MW10-GW-1	5/9/2005	0.05 U	0.38 B	0.020 U	0.06	1.17	0.84	0.01 B	0.2 U	5.21	1 U	0.020 U	0.020 U	1.76
T4S1MW11	T4S1MW11-GW-1	04/19/2004	0.13	7.4	0.02 U	0.02	0.09 B	0.69	0.01 U	0.10 U	4.44	0.2 U	0.01 U	0.01 B	2.17
T4S1MW11	T4S1MW11-GW-1	9/1/2004	0.05 U	7.2	0.02 U	0.02 U	0.68	0.52	0.02 U	0.05 B	4.55	1 U	0.02 U	0.02 U	0.9
T4S1MW11	T4S1MW11-GW-1	2/8/2005	0.06	8.0	0.020 U	0.03	0.46	0.33	0.078	0.08 B	3.1	0.4 B	0.020 U	0.020 U	0.8
T4S1MW11	T4S1MW11-GW-1	5/10/2005	0.05 U	6.0 J	0.020 U	0.02 U	0.47	1 U	0.02 U	0.20 U	2.93 J	1.0 U	0.020 U	0.02 U	1.08 U
T4S1MW12	T4S1MW12-GW-1	04/19/2004	0.14	2	0.02 U	0.02 B	0.22	0.82	0.01 B	0.10 U	3.82	1.3	0.01 U	0.015 B	2.65
T4S1MW12	T4S1MW12-GW-1	8/31/2004	0.05 U	10 U	0.02 U	0.02 U	0.93	0.24	0.02 U	0.2 U	2.75	5 U	0.02 U	0.02 U	0.5
T4S1MW12	T4S1MW12-GW-1	2/7/2005	0.05 U	0.6	0.020 U	0.02 U	0.52	0.12	0.020 U	0.09 B	2.6	1.0 U	0.020 U	0.020 U	4.2
T4S1MW12	T4S1MW12-GW-1	5/9/2005	0.02 B	0.55	0.020 U	0.03 J	1.37	0.37	0.03	0.2 U	5.83	1 B	0.020 U	0.020 U	2.82
T4S1MW13	T4S1MW13-GW-1	04/16/2004	0.09	14.6	0.02 U	0.01 U	0.66	0.56	0.01 B	0.10 U	2.4	0.2 U	0.01 U	0.007 B	1.5
T4S1MW13	T4S1MW13-GW-1	8/31/2004	0.05 U	6.4 B	0.02 U	0.02 U	0.75	0.35	0.02 U	0.2 U	3.1	5 U	0.02 U	0.02 U	0.6
T4S1MW13	T4S1MW13-GW-1	2/8/2005	0.05 U	14.4	0.020 U	0.02	0.52	0.18	0.026	0.07 B	2.4	0.2 B	0.020 U	0.020 U	1.3
T4S1MW13	T4S1MW13-GW-1	5/10/2005	0.05 U	12.4 J	0.02 U	0.02 U	0.38 U	1 U	0.022 U	0.20 U	1.05 J	1.0 U	0.02 U	0.020 U	1.01 U
T4S1MW15	T4S1MW15-GW-1	04/16/2004	0.06	0.2 U	0.02 U	0.02	0.47	1.28	0.01 U	0.10 U	0.4	0.2 U	0.01 U	0.006 B	0.5
T4S1MW15	T4S1MW15-GW-1	8/27/2004	0.05 U	10 U	0.02 U	0.02 U	6.8	1.07	0.02	0.2 U	9.45	5 U	0.02 U	0.02 U	0.6
T4S1MW15	T4S1MW15-GW-1	2/9/2005	0.05 U	0.3 B	0.020 U	0.090	1.18	1.00	0.068	0.20 U, J	10.1	1.0 U	0.020 U	0.020 U	1.6
T4S1MW15	T4S1MW15-GW-1	5/10/2005	0.05 U	0.2 J	0.020 U	0.02 U	1.96	1 U	0.023 U	0.20 U	3.36 J	1.0 U	0.02 U	0.020 U	1.60 U
T4S1MW16	T4S1MW16-GW-1	04/19/2004	0.18	0.5	0.02 U	0.14	0.06 U	4.02	0.02	0.10 U	7.19	1.1	0.02 U	0.039	9.18
T4S1MW16	T4S1MW16-GW-1	8/27/2004	0.02 B	0.3 B	0.007 B	0.03	0.46	2.93	0.036	0.05 B	4.18	0.4 B	0.02 U	0.006 B	4.2
T4S1MW16	T4S1MW16-GW-1	2/10/2005	0.05	0.3 B	0.020 U	0.202	0.93	2.16	0.600	0.20 U, J	2.91	0.4 B	0.020 U	0.020 U	4.3
T4S1MW20	T4S1MW20-GW-1	9/2/2004	0.05 U	1.8	0.014 B	0.02	0.25	0.61	0.01 B	0.2 U	10.2	0.6 B	0.02 U	0.005 B	3.2
T4S1MW20	T4S1MW20-GW-1	2/10/2005	0.05 U	1.3	0.011 B	0.075	0.31	0.57	0.070	0.20 U, J	10.2	0.7 B	0.020 U	0.020 U	1.5
T4S1MW20	T4S1MW20-GW-1	5/11/2005	0.05 U	1.4 J	0.02 U	0.027 U	0.80	1 U	0.020 U	0.20 U	7.51 J	1.0 U	0.020 U	0.02 U	2.35 U
T4S1MW21	T4S1MW21-GW-1	9/2/2004	0.05 U	0.3 B	0.013 B	0.04	0.29	0.55	0.035	0.2 U	19.9	0.2 B	0.02 U	0.005 B	3.2
T4S1MW21	T4S1MW21-GW-1	2/10/2005	0.02 B	0.5 U	0.012 B	0.110	0.33	0.65	0.091	0.20 U, J	18.4	1.0 U	0.020 U	0.007 B	4.4
T4S1MW21	T4S1MW21-GW-1	5/11/2005	0.05 U	0.1 J	0.02 U	0.086	0.75	1 U	0.022 U	0.20 U	10.4 J	1.0 U	0.020 U	0.02 U	3.26 U
	Preliminary	**Fish Consumption SLV**	640	0.14	--	--	--	--	--	--	4,600	4,200	--	6.3	26,000
	Screening Levels	**Aquatic SLV**	1,600	150 [a]	5.3	0.25 [a]	74 [III], 11 [VI]	9 [a]	2.5 [a]	0.77 [a]	52 [a]	5 [a]	0.12	40	120 [a]

Notes:

1. All analytes are reported in the table.
2. Total/Dissolved Metals using EPA 6000-7000 Series Methods.
3. µg/L = Micrograms per liter.
4. Fish Consumption SLV = EPA National Recommended Water Quality Criteria: 2002 Human Health for Consumption of Fish.
5. Aquatic SLV = EPA National Recommended Water Quality Criteria: 2002 for CCC Freshwater Biota (noted with [a]). Where CCC values are not available, Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Surface Water Aquatic are listed.
6. -- = No screening level available or not analyzed.
7. B = The result is an estimated concentration that is less than the MRL but greater than or equal to the method detection limit (MDL).
8. U = The compound was analyzed for but was not detected at or above the MRL/MDL.
9. N = The matrix spike sample recovery is not within control limits. The case narrative suggests that this sample may be biased low.
10. [III] = SLV for Chromium III.
11. [VI] = SLV for Chromium VI.
12. Boxed values indicate that the detected concentration exceeds the Ecological Screening Criteria (for chromium, Chromium III used).
13. Shaded values indicate that the detected concentration exceeds the EPA AWQC criteria.

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TABLE 20A
GRAB SAMPLE CHEMISTRY RESULTS: PETROLEUM HYDROCARBONS - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1SB-01	T4S1SB-02	T4S1SB-03	T4S1SB-04	T4S1SB-9	T4S1SB-10	T4S1SB-11	T4S1SB-12	T4S1SB-14	T4S1SB-15	T4S1SB-16
Sample ID:	Fish Consumption SLV	Aquatic SLV	SB01-GW-1	SB02-GW-1	SB03-GW-1	SB04-GW-1	T4S1GW-9-1	T4S1GW-10-1	T4S1GW-11-1	T4S1GW-12-1	T4S1SB-14-1	T4S1GW-15-1	T4S1GW-16-1
Date Sampled:			04/01/2004	04/01/2004	04/05/2004	04/05/2004	9/1/2004	9/8/2004	9/9/2004	9/9/2004	8/24/2004	9/7/2004	9/7/2004
HCID (µg/L)													
Gasoline Range	--	--	--	--	--	--	250 U	250 U	250 U	250 U	250 U	250 U	250 U
Diesel Range	--	--	--	--	--	--	630 U	630 U	630 U	630 U	630 U	630 U	630 U
Residual Range	--	--	--	--	--	--	630 U	630 U	630 U	630 U	630 U	630 U	630 U
TPH (µg/L)													
Gasoline Range	--	1,000	50 U	50 U	50 U	50 U	--	--	--	--	--	--	--
Diesel Range	--	1,000	250 U	250 U	250 U	250 U	--	--	--	--	--	--	--
Residual Range	--	1,000	500 U	500 U	500 U	500 U	--	--	--	--	--	--	--

Sample Location:	Preliminary Screening Levels		T4S1SB-17	T4S1SB-18	T4S1SB-19	T4S1SB-20	T4S1SB-21	T4S1SB-22	T4S1SB-23	T4S1SB-24	T4S1SB-25	T4S1SB-26	T4S1SB-28
Sample ID:	Fish Consumption SLV	Aquatic SLV	T4S1GW-17-1	T4S1GW-18-1	T4S1GW-19-1	T4S1GW-20-1	T4S1GW-21-1	T4S1GW-22-1	T4S1GW-23-1	T4S1GW-24-1	T4S1GW-25-1	T4S1GW-26-1	T4S1GW-28-1
Date Sampled:			9/7/2004	9/3/2004	9/9/2004	9/7/2004	9/13/2004	9/2/2004	9/2/2004	8/27/2004	8/27/2004	8/26/2004	8/26/2004
HCID (µg/L)													
Gasoline Range	--	--	250 U	250 U	--	--	--	--	--	--	--	--	--
Diesel Range	--	--	630 U	630 U	--	--	--	--	--	--	--	--	--
Residual Range	--	--	630 U	630 U	--	--	--	--	--	--	--	--	--
TPH (µg/L)													
Gasoline Range	--	1,000	--	--	13 J	12 J	12 J	16 J	18 J	--	250 U	250 U	250 U
Diesel Range	--	1,000	--	--	250 U	250 U	250 U	430 H	250 U	250 U	250 U	250 U	250 U
Residual Range	--	1,000	--	--	500 U	500 U	500 U	1,800 O	500 U	500 U	500 U	500 U	500 U

Sample Location:	Preliminary Screening Levels		T4S1SB-31	T4S1SB-32	T4S1SB-33	T4S1SB-34	T4S1SB-35	T4S1SB-36	T4S1SB-37	T4S1SB-38	T4S1SB-39	T4S1SB-40	T4S1SB-41
Sample ID:	Fish Consumption SLV	Aquatic SLV	T4S1GW-31-1	T4S1GW-32-1	T4S1GW-33-1	T4S1GW-34-1	T4S1GW-35-1	T4S1GW-36-1	T4S1GW-37-1	T4S1GW-38-1	T4S1GW-39-1	T4S1GW-40-1	T4S1GW-41-1
Date Sampled:			9/8/2004	9/3/2004	9/3/2004	9/1/2004	9/1/2004	9/3/2004	9/1/2004	8/31/2004	9/1/2004	8/27/2004	8/27/2004
HCID (µg/L)													
Gasoline Range	--	--	--	--	--	--	--	--	--	--	--	--	--
Diesel Range	--	--	--	--	--	--	--	--	--	--	--	--	--
Residual Range	--	--	--	--	--	--	--	--	--	--	--	--	--
Gasoline Range	--	1,000	13 J	12 J	250 U	250 U	250 U	250 U	250 U	250 U	250 U	--	--
Diesel Range	--	1,000	250 U	250 U	630 U	630 U	630 U	630 U	630 U	630 U	630 U	250 U	250 U
Residual Range	--	1,000	500 U	500 U	630 U	630 U	630 U	630 U	630 U	630 U	630 U	500 U	500 U

Please refer to notes at end of table.

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TABLE 20A
GRAB SAMPLE CHEMISTRY RESULTS: PETROLEUM HYDROCARBONS - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1GW-42	T4S1SB-43	T4S1SB-44	T4S1SB-45	T4S1SB-46	T4S1SB-47	T4S1SB-48	T4S1SB-49
Sample ID:	Fish Consumption SLV	Aquatic SLV	T4S1GW-42-1	T4S1GW-43-1	T4S1GW-44-1	T4S1SB-45-1	T4S1SB-46-1	T4S1SB-47-1	T4S1SB-48-1	T4S1SB-49-1
Date Sampled:			9/7/2004	8/31/2004	8/31/2004	8/23/2004	8/23/2004	8/23/2004	8/23/2004	8/23/2004
HCID (µg/L)										
Gasoline Range	--	--	250 U	--	--	250 U	250 U	250 U	--	--
Diesel Range	--	--	630 U	--	--	630 U	630 U	630 U	--	--
Residual Range	--	--	630 U	--	--	630 U	630 U	630 U	--	--
TPH (µg/L)										
Gasoline Range	--	1,000	--	250 U	19 J	--	--	--	250 U	250 U
Diesel Range	--	1,000	--	250 U	250 U	--	--	--	250 U	250 U
Residual Range	--	1,000	--	500 U	500 U	--	--	--	500 U	500 U

Sample Location:	Preliminary Screening Levels		T4S1SB-50	T4S1SB-82	T4S1SB-83	T4S1SB-84	T4S1SB-85	T4S1SB-86	T4S1SB-87
Sample ID:	Fish Consumption SLV	Aquatic SLV	T4S1SB-50-1	T4S1GW-82-1	T4S1GW-83-1	T4S1GW-84-1	T4S1GW-85-1	T4S1GW-86-1	T4S1GW-87-1
Date Sampled:			8/23/2004	9/1/2004	9/1/2004	9/9/2004	9/8/2004	9/8/2004	9/8/2004
HCID (µg/L)									
Gasoline Range	--	--	--	--	--	--	250 U	250 U	250 U
Diesel Range	--	--	--	--	--	--	630 U	630 U	630 U
Residual Range	--	--	--	--	--	--	630 U	630 U	630 U
TPH (µg/L)									
Gasoline Range	--	1,000	250 U	250 U	250 U	250 U	--	--	--
Diesel Range	--	1,000	250 U	67 J	250 U	250 U	--	--	--
Residual Range	--	1,000	500 U	75 J	500 U	130 J	--	--	--

Notes:

1. TPH =Total petroleum hydrocarbons (TPH) by Northwest Total Petroleum Hydrocarbons (NWTPH).
2. µg/L = Micrograms per liter.
3. Fish Consumption SLV = EPA National Recommended Water Quality Criteria: 2002 Human Health for Consumption of Fish. None available for TPH.
4. Aquatic SLV = EPA National Recommended Water Quality Criteria: 2002 for CCC Freshwater Biota. Where CCC values are not available, Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Surface Water Aquatic are listed. None available for TPH. IN accordance with DEQ policy, 1,000 µg/L used for TPH screening level for surface water ecological receptors.
5. -- = No screening level available or not analyzed.
6. J = The result is an estimated concentration that is less than the method reporting limit (MRL) but greater than or equal to the method detection limit (MDL).
7. U = The compound was analyzed for but was not detected at or above the MRL/MDL.
8. H = The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
9. O = The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.

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TABLE 20B
GRAB SAMPLE CHEMISTRY RESULTS: PETROLEUM HYDROCARBONS - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1SB-05	T4S1SB-06	T4S1SB-07	T4S1SB-08	T4S1SB-51	T4S1SB-52	T4S1SB-53	T4S1SB-54	T4S1SB-55
Sample ID:	Fish Consumption	Aquatic SLV	SB05-GW-1	SB06-GW-1	SB07-GW-1	SB08-GW-1	T4S1GW-51-1	T4S1GW-52-1	T4S1GW-53-1	T4S1GW-54-1	T4S1GW-55-1
Date Sampled:	SLV		03/31/2004	03/31/2004	03/30/2004	03/31/2004	9/1/2004	9/1/2004	8/30/2004	9/1/2004	8/31/2004
HCID (µg/L)											
Gasoline Range	--	--	--	--	--	--	250 U	250 U	--	--	250 U
Diesel Range	--	--	--	--	--	--	630 U	630 U	--	--	630 U
Residual Range	--	--	--	--	--	--	630 U	630 U	--	--	630 U
TPH (µg/L)											
Gasoline Range	--	1,000	50 U	50 U	50 U	50 U	36 J	14 J	250 U	13 J	--
Diesel Range	--	1,000	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U	--
Residual Range	--	1,000	500 U	500 U	500 U	500 U	86 J	500 U	500 U	500 U	--

Sample Location:	Preliminary Screening Levels		T4S1SB-56	T4S1SB-57	T4S1SB-58	T4S1SB-59	T4S1SB-60	T4S1SB-63	T4S1SB-64	T4S1SB-65	T4S1SB-66
Sample ID:	Fish Consumption	Aquatic SLV	T4S1GW-56-1	T4S1GW-57-1	T4S1GW-58-1	T4S1GW-59-1	T4S1GW-60-1	T4S1GW-63-1	T4S1GW-64-1	T4S1GW-65-1	T4S1GW-66-1
Date Sampled:	SLV		8/31/2004	8/31/2004	8/31/2004	9/9/2004	8/30/2004	9/9/2004	9/9/2004	8/31/2004	9/9/2004
HCID (µg/L)											
Gasoline Range	--	--	250 U	250 U	250 U	--	--	--	--	--	--
Diesel Range	--	--	630 U	630 U	630 U	--	--	--	--	--	--
Residual Range	--	--	630 U	630 U	630 U	--	--	--	--	--	--
TPH (µg/L)											
Gasoline Range	--	1,000	--	--	--	250 U	16 J	250 U	15 J	12 J	250 U
Diesel Range	--	1,000	--	--	--	250 U	250 U	250 U	250 U	250 U	250 U
Residual Range	--	1,000	--	--	--	500 U	500 U	500 U	500 U	500 U	500 U

Sample Location:	Preliminary Screening Levels		T4S1SB-67	T4S1SB-68	T4S1SB-69	T4S1SB-77	T4S1SB-78	T4S1SB-79	T4S1SB-80	T4S1SB-81
Sample ID:	Fish Consumption	Aquatic SLV	T4S1GW-67-1	T4S1GW-68-1	T4S1GW-69-1	T4S1GW-77-1	T4S1GW-78-1	T4S1GW-79-1	T4S1GW-80-1	T4S1GW-81-1
Date Sampled:	SLV		9/8/2004	9/9/2004	9/9/2004	8/30/2004	8/30/2004	8/30/2004	8/30/2004	8/30/2004
HCID (µg/L)										
Gasoline Range	--	--	--	--	--	--	--	--	--	--
Diesel Range	--	--	--	--	--	--	--	--	--	--
Residual Range	--	--	--	--	--	--	--	--	--	--
TPH (µg/L)										
Gasoline Range	--	1,000	130 J	250 U	250 U	14 J	13 J	250 U	--	250 U
Diesel Range	--	1,000	160 J	250 U	250 U	250 U	250 U	250 U	250 U	250 U
Residual Range	--	1,000	84 J	500 U	500 U	500 U	500 U	500 U	500 U	500 U

Notes:
1. TPH =Total petroleum hydrocarbons (TPH) by Northwest Total Petroleum Hydrocarbons (NWTPH).
2. µg/L = Micrograms per liter.
3. Fish Consumption SLV = EPA National Recommended Water Quality Criteria: 2002 Human Health for Consumption of Fish. None available for TPH.
4. Aquatic SLV = EPA National Recommended Water Quality Criteria: 2002 for CCC Freshwater Biota. Where CCC values are not available, Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Surface Water Aquatic are listed. None available for TPH. IN accordance with DEQ policy, 1,000 µg/L used for TPH screening level for surface water ecological receptors.
5. -- = No screening level available or not analyzed.
6. J = The result is an estimated concentration that is less than the method reporting limit (MRL) but greater than or equal to the method detection limit (MDL).
7. U = The compound was analyzed for but was not detected at or above the MRL/MDL.

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TABLE 21A
GRAB SAMPLE CHEMISTRY RESULTS: POLYNUCLEAR AROMATIC HYDROCARBONS - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1SB-01	T4S1SB-02	T4S1SB-03	T4S1SB-04	T4S1SB-09	T4S1SB-10	T4S1SB-11	T4S1SB-12	T4S1SB-14	T4S1SB-15	T4S1SB-16
Sample ID:	Fish Consumption SLV	Aquatic SLV	SB01-GW-1	SB02-GW-1	SB03-GW-1	SB04-GW-1	T4S1GW-9-1	T4S1GW-10-1	T4S1GW-11-1	T4S1GW-12-1	T4S1SB-14-1	T4S1GW-15-1	T4S1GW-16-1
Lab ID:							K2406700-015	K2406847-006	K2406982-005	K2406982-002	K2406369-003	K2406805-008	K2406805-006
Date Sampled:			04/01/2004	04/01/2004	04/05/2004	04/05/2004	9/1/2004	9/8/2004	9/9/2004	9/9/2004	8/24/2004	9/7/2004	9/7/2004
PAHs (µg/L)													
Naphthalene	--	620	0.020 U	0.020 U	0.0086	0.023	0.036	0.037	0.051	0.064	0.02 U	0.02 U	0.02 U
1-Methylphenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	0.016 J	0.012 J	0.035	0.022	0.0068 J	0.0086 J	0.0098 J
Acenaphthylene	--	--	0.020 U	0.020 U	0.020 U	0.020 U	0.0022 J	0.0018 J	0.0071 J	0.022	0.0072 J	0.02 U	0.0049 J
Acenaphthene	990	520	0.020 U	0.020 U	0.020 U	0.020 U	0.021 U	0.02 U	0.0031 J	0.0058 J	0.02 U	0.02 U	0.02 U
Dibenzofuran	--	3.7	--	--	--	--	0.021 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Fluorene	5,300	3.9	0.020 U	0.020 U	0.020 U	0.020 U	0.021 U	0.02 U	0.0042 J	0.0071 J	0.0026 J	0.02 U	0.02 U
Phenanthrene	--	6.3	0.015 J	0.020 U	0.020 U	0.020 U	0.0073 J	0.02 U	0.035	0.069	0.029	0.014 J	0.016 J
Anthracene	40,000	13	0.012 J	0.017 J	0.010 J	0.020 U	0.0055 J	0.02 U	0.011 J	0.022	0.021	0.013 J	0.02 J
Fluoranthene	140	6.16	0.019 J	0.020 U	0.020 U	0.020 U	0.0079 J	0.004 J	0.08	0.081	0.049	0.02 U	0.03
Pyrene	4,000	--	0.023	0.020 U	0.020 U	0.020 U	0.0056 J	0.02 U	0.086	0.091	0.063	0.022	0.04
Benz(a)anthracene	0.018	0.027 [a]	0.013 J	0.020 U	0.020 U	0.020 U	0.021 U	0.02 U	0.029	0.038	0.033	0.0075 J	0.02 J
Chrysene	0.018	--	0.012 J	0.020 U	0.020 U	0.020 U	0.0028 J	0.02 U	0.039	0.047	0.036	0.0078 J	0.022
Benzo(b)fluoranthene	0.018	--	0.020 U	0.020 U	0.020 U	0.020 U	0.0022 J	0.02 U	0.023	0.028	0.017 J	0.02 U	0.0089 J
Benzo(k)fluoranthene	0.018	--	0.020 U	0.020 U	0.020 U	0.020 U	0.0015 J	0.02 U	0.025	0.029	0.019 J	0.02 U	0.013 J
Benzo(a)pyrene	0.018	0.014	0.020 U	0.020 U	0.020 U	0.020 U	0.021 U	0.02 U	0.027	0.031	0.024	0.0052 J	0.017 J
Indeno(1,2,3-cd)pyrene	0.018	--	0.020 U	0.020 U	0.020 U	0.020 U	0.021 U	0.02 U	0.021	0.024	0.0099 J	0.02 U	0.0078 J
Dibenz(a,h)anthracene	0.018	--	0.020 U	0.020 U	0.020 U	0.020 U	0.021 U	0.02 U	0.0039 J	0.0053 J	0.0023 J	0.02 U	0.02 U
Benzo(g,h,i)perylene	--	--	0.020 U	0.020 U	0.020 U	0.020 U	0.021 U	0.02 U	0.022	0.025	0.011 J	0.02 U	0.0075 J

Sample Location:	Preliminary Screening Levels		T4S1SB-17	T4S1SB-18	T4S1SB-19	T4S1SB-20	T4S1SB-21	T4S1SB-22	T4S1SB-23	T4S1SB-24	T4S1SB-25	T4S1SB-26	T4S1SB-28
Sample ID:	Fish Consumption SLV	Aquatic SLV	T4S1GW-17-1	T4S1GW-18-1	T4S1GW-19-1	T4S1GW-20-1	T4S1GW-21-1	T4S1GW-22-1	T4S1GW-23-1	T4S1GW-24-1	T4S1GW-25-1	T4S1GW-26-1	T4S1GW-28-1
Date Sampled:			9/7/2004	9/3/2004	9/9/2004	9/7/2004	9/13/2004	9/1/2004	9/2/2004	8/27/2004	8/27/2004	8/26/2004	8/26/2004
PAHs (µg/L)													
Naphthalene	--	620	0.012 J	0.027	0.15	0.037	0.037	1.3	0.051	0.056	0.029	0.018 J	0.024
1-Methylphenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	0.0073 J	0.014 J	0.065	0.015 J	0.028	0.28	0.043	0.018 J	0.0099 J	0.0091 J	0.014 J
Acenaphthylene	--	--	0.02 U	0.0027 J	0.076	0.021 U	0.02 U	1.7	0.077	0.02 U	0.02 U	0.0025 J	0.0026 J
Acenaphthene	990	520	0.02 U	0.0021 J	0.013 J	0.021 U	0.02 U	0.75	0.15	0.0048 J	0.02 U	0.0023 J	0.02 U
Dibenzofuran	--	3.7	0.02 U	0.02 U	0.015 J	0.021 U	0.02 U	0.43	0.015 J	0.02 U	0.02 U	0.02 U	0.02 U
Fluorene	5,300	3.9	0.02 U	0.0031 J	0.031	0.021 U	0.004 J	0.98	0.2	0.02 U	0.02 U	0.0039 J	0.0031 J
Phenanthrene	--	6.3	0.02 U	0.02 U	0.23	0.021 U	0.02 U	6.5	0.44	0.02 U	0.02 U	0.02 U	0.02 U
Anthracene	40,000	13	0.038	0.0052 J	0.072	0.016 J	0.02 U	1.5	0.12	0.0075 J	0.02 U	0.02 U	0.02 U
Fluoranthene	140	6.16	0.011 J	0.0091 J	0.27	0.021 U	0.0038 J	8	0.33	0.043	0.02 U	0.02 U	0.02 U
Pyrene	4,000	--	0.02 U	0.0095 J	0.36	0.021 U	0.0035 J	7.7	0.68	0.037	0.02 U	0.02 U	0.02 U
Benz(a)anthracene	0.018	0.027 [a]	0.0048 J	0.0025 J	0.088	0.021 U	0.02 U	3	0.13	0.02 U	0.02 U	0.02 U	0.02 U
Chrysene	0.018	--	0.02 U	0.0031 J	0.13	0.021 U	0.02 U	3.9	0.16	0.021	0.02 U	0.02 U	0.02 U
Benzo(b)fluoranthene	0.018	--	0.0036 J	0.02 U	0.06	0.021 U	0.02 U	2.9	0.058	0.013 J	0.02 U	0.02 U	0.02 U
Benzo(k)fluoranthene	0.018	--	0.0036 J	0.0014 J	0.071	0.021 U	0.02 U	3.1	0.078	0.0099 J	0.02 U	0.02 U	0.02 U
Benzo(a)pyrene	0.018	0.014	0.0042 J	0.0023 J	0.081	0.021 U	0.02 U	3.4	0.1	0.0085 J	0.02 U	0.02 U	0.02 U
Indeno(1,2,3-cd)pyrene	0.018	--	0.0025 J	0.02 U	0.072	0.021 U	0.02 U	2.8	0.052	0.02 U	0.02 U	0.02 U	0.02 U
Dibenz(a,h)anthracene	0.018	--	0.02 U	0.02 U	0.012 J	0.021 U	0.02 U	0.57	0.012 J	0.02 U	0.02 U	0.02 U	0.02 U
Benzo(g,h,i)perylene	--	--	0.02 U	0.02 U	0.083	0.021 U	0.02 U	2.4	0.055	0.0071 J	0.02 U	0.02 U	0.02 U

Please refer to notes at end of table.

KMB00008347

TABLE 21A
GRAB SAMPLE CHEMISTRY RESULTS: POLYNUCLEAR AROMATIC HYDROCARBONS - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Screening Levels		T4S1SB-31	T4S1SB-32	T4S1SB-33	T4S1SB-34	T4S1SB-35	T4S1SB-36	T4S1SB-37	T4S1SB-38	T4S1SB-39	T4S1SB-40	T4S1SB-41
Sample ID:			T4S1GW-31-1	T4S1GW-32-1	T4S1GW-33-1	T4S1GW-34-1	T4S1GW-35-1	T4S1GW-36-1	T4S1GW-37-1	T4S1GW-38-1	T4S1GW-39-1	T4S1GW-40-1	T4S1GW-41-1
Lab ID:	Fish Consumption SLV	Aquatic SLV	K2406926-001	K2406760-007	K2406805-001	K2406700-012	K2406700-014	K2406760-004	K2406700-017	K2406645-009	K2406700-013	K2406536-001	K2406536-002
Date Sampled:			9/8/2004	9/3/2004	9/3/2004	9/1/2004	9/1/2004	9/3/2004	9/1/2004	8/31/2004	9/1/2004	8/27/2004	8/27/2004
PAHs (µg/L)													
Naphthalene	--	620	0.026	0.012 J	0.016 J	0.023	0.058	0.064	0.056	0.041	0.069	0.016 J	0.011 J
1-Methylphenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	0.016 J	0.0066 J	0.0093 J	0.012 J	0.029	0.021	0.018 J	0.026	0.02	0.011 J	0.007 J
Acenaphthylene	--	--	0.013 J	0.0019 J	0.02 U	0.02 U	0.02 U	0.0032 J	0.0022 J	0.025 U	0.0026 J	0.02 U	0.02 U
Acenaphthene	990	520	0.0058 J	0.02 U	0.02 U	0.02 U	0.02 U	0.0027 J	0.02 U	0.025 U	0.02 U	0.02 U	0.02 U
Dibenzofuran	--	3.7	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.025 U	0.02 U	0.02 U	0.02 U
Fluorene	5,300	3.9	0.009 J	0.0027 J	0.02 U	0.02 U	0.0027 J	0.02 U	0.0027 J	0.0046 J	0.02 U	0.02 U	0.02 U
Phenanthrene	--	6.3	0.091	0.02 U	0.0092 J	0.0039 J	0.0064 J	0.02 U	0.01 J	0.0073 J	0.0086 J	0.0045 J	0.0046 J
Anthracene	40,000	13	0.029	0.017 J	0.017 J	0.0012 J	0.0027 J	0.0029 J	0.0025 J	0.0039 J	0.0029 J	0.023	0.032
Fluoranthene	140	6.16	0.11	0.012 J	0.0079 J	0.02 U	0.0037 J	0.0054 J	0.011 J	0.025 U	0.012 J	0.0077 J	0.0066 J
Pyrene	4,000	--	0.15	0.013 J	0.0076 J	0.02 U	0.0035 J	0.0053 J	0.014 J	0.025 U	0.014 J	0.013 J	0.01 J
Benz(a)anthracene	0.018	0.027 [a]	0.057	0.0065 J	0.02 U	0.02 U	0.02 U	0.02 U	0.0076 J	0.025 U	0.005 J	0.0044 J	0.02 U
Chrysene	0.018	--	0.064	0.0062 J	0.02 U	0.02 U	0.0014 J	0.0023 J	0.024	0.025 U	0.0043 J	0.02 U	0.0042 J
Benzo(b)fluoranthene	0.018	--	0.024	0.0043 J	0.02 U	0.02 U	0.02 U	0.02 U	0.0082 J	0.025 U	0.0031 J	0.02 U	0.02 U
Benzo(k)fluoranthene	0.018	--	0.031	0.004 J	0.02 U	0.02 U	0.02 U	0.02 U	0.0046 J	0.025 U	0.0027 J	0.02 U	0.02 U
Benzo(a)pyrene	0.018	0.014	0.044	0.0048 J	0.02 U	0.02 U	0.02 U	0.0025 J	0.0057 J	0.025 U	0.0033 J	0.02 U	0.02 U
Indeno(1,2,3-cd)pyrene	0.018	--	0.019 J	0.0029 J	0.02 U	0.02 U	0.02 U	0.0022 J	0.0042 J	0.025 U	0.0025 J	0.02 U	0.02 U
Dibenz(a,h)anthracene	0.018	--	0.0045 J	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.0026 J	0.025 U	0.02 U	0.02 U	0.02 U
Benzo(g,h,i)perylene	--	--	0.019 J	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.0085 J	0.025 U	0.02 U	0.02 U	0.02 U

Sample Location:	Screening Levels		T4S1SB-42	T4S1SB-43	T4S1SB-44	T4S1SB-45	T4S1SB-46	T4S1SB-47	T4S1SB-48	T4S1SB-49	T4S1SB-50
Sample ID:			T4S1GW-42-1	T4S1GW-43-1	T4S1GW-44-1	T4S1SB-45-1	T4S1SB-46-1	T4S1SB-47-1	T4S1SB-48-1	T4S1SB-49-1	T4S1SB-50-1
Date Sampled:	Fish Consumption SLV	Aquatic SLV	9/7/2004	8/31/2004	8/31/2004	8/23/2004	8/23/2004	8/23/2004	8/23/2004	8/23/2004	8/23/2004
PAHs (µg/L)											
Naphthalene	--	620	0.033	0.02 U	0.014 J	0.021 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
1-Methylphenanthrene	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	0.018 J	0.02 U	0.0066 J	0.0077 J	0.0067 J	0.0066 J	0.0075 J	0.0066 J	0.0061 J
Acenaphthylene	--	--	0.005 J	0.0067 J	0.003 J	0.0054 J	0.013 J	0.011 J	0.0036 J	0.0029 J	0.0023 J
Acenaphthene	990	520	0.02 U	0.0022 J	0.0022 J	0.02 U	0.004 J	0.0025 J	0.02 U	0.02 U	0.02 U
Dibenzofuran	--	3.7	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Fluorene	5,300	3.9	0.02 U	0.02 U	0.02 U	0.0026 J	0.005 J	0.0038 J	0.02 U	0.02 U	0.02 U
Phenanthrene	--	6.3	0.028	0.019 J	0.02 U	0.024 U	0.066	0.042	0.02 U	0.02 U	0.02 U
Anthracene	40,000	13	0.019 J	0.0097 J	0.017 J	0.012 J	0.032	0.021	0.0075 J	0.0073 J	0.0087 J
Fluoranthene	140	6.16	0.024	0.044	0.023	0.037	0.11	0.069	0.021	0.018 J	0.016 J
Pyrene	4,000	--	0.026	0.051	0.025	0.047	0.15	0.1	0.024	0.018 J	0.016 J
Benz(a)anthracene	0.018	0.027 [a]	0.02 U	0.028	0.011 J	0.022	0.069	0.049	0.0093 J	0.0089 J	0.0067 J
Chrysene	0.018	--	0.0096 J	0.032	0.011 J	0.023	0.07	0.052	0.0082 J	0.0069 J	0.0041 J
Benzo(b)fluoranthene	0.018	--	0.02 U	0.018 J	0.0081 J	0.012 J	0.029	0.023	0.0052 J	0.0043 J	0.0026 J
Benzo(k)fluoranthene	0.018	--	0.0044 J	0.022	0.0062 J	0.015 J	0.038	0.026	0.006 J	0.0042 J	0.0029 J
Benzo(a)pyrene	0.018	0.014	0.0063 J	0.026	0.0078 J	0.018 J	0.053	0.04	0.0063 J	0.005 J	0.003 J
Indeno(1,2,3-cd)pyrene	0.018	--	0.02 U	0.015 J	0.0064 J	0.0099 J	0.022	0.015 J	0.0032 J	0.0026 J	0.02 U
Dibenz(a,h)anthracene	0.018	--	0.02 U	0.0033 J	0.0019 J	0.0029 J	0.0052 J	0.0035 J	0.02 U	0.02 U	0.02 U
Benzo(g,h,i)perylene	--	--	0.02 U	0.015 J	0.0067 J	0.012 J	0.023	0.017 J	0.005 J	0.02 U	0.02 U

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TABLE 21A
GRAB SAMPLE CHEMISTRY RESULTS: POLYNUCLEAR AROMATIC HYDROCARBONS - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1SB-82	T4S1SB-83	T4S1SB-84	T4S1SB-85
Sample ID:	Fish Consumption SLV	Aquatic SLV	T4S1GW-82-1	T4S1GW-83-1	T4S1GW-84-1	T4S1GW-85-1
Lab ID:			K2406645-013	K2406645-011	K2406982-001	K2406847-004
Date Sampled:			9/1/2004	9/1/2004	9/9/2004	9/8/2004
PAHs (µg/L)						
Naphthalene	--	620	0.016 J	0.019 J	0.23	2.2
1-Methylphenanthrene	--	--	--	--	--	--
2-Methylnaphthalene	--	--	0.0078 J	0.009 J	0.12	6.7
Acenaphthylene	--	--	0.0076 J	0.02 U	0.1	0.4
Acenaphthene	990	520	0.02 U	0.02 U	0.031	20 D
Dibenzofuran	--	3.7	0.02 U	0.02 U	0.028	8.3
Fluorene	5,300	3.9	0.02 U	0.02 U	0.03	15 D
Phenanthrene	--	6.3	0.033	0.017 J	0.35	35 D
Anthracene	40,000	13	0.029	0.016 J	0.15	2.6
Fluoranthene	140	6.16	0.053	0.012 J	0.82	12 D
Pyrene	4,000	--	0.067	0.01 J	1.1	7.7
Benz(a)anthracene	0.018	0.027 [a]	0.033	0.02 U	0.47	1.3
Chrysene	0.018	--	0.037	0.02 U	0.65	1.1
Benzo(b)fluoranthene	0.018	--	0.018 J	0.02 U	0.44	0.34
Benzo(k)fluoranthene	0.018	--	0.022	0.02 U	0.42	0.29
Benzo(a)pyrene	0.018	0.014	0.027	0.02 U	0.6	0.26
Indeno(1,2,3-cd)pyrene	0.018	--	0.013 J	0.02 U	0.48	0.069
Dibenz(a,h)anthracene	0.018	--	0.02 U	0.02 U	0.11	0.016 J
Benzo(g,h,i)perylene	--	--	0.013 J	0.02 U	0.56	0.052

Notes:

1. Only detected compounds are reported in the table. The complete analyte list is presented in the Sampling and Analysis Plan (Appendix A) of the RI Work Plan (Hart Crowser, 2004a).
2. PAHs = Polynuclear Aromatic Hydrocarbons by EPA Method 8270C (SIM).
3. µg/L = Micrograms per liter.
4. Fish Consumption SLV = EPA National Recommended Water Quality Criteria: 2002 Human Health for Consumption of Fish.
5. Aquatic SLV = EPA National Recommended Water Quality Criteria: 2002 for CCC Freshwater Biota (noted with a.). Where CCC values are not available, Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Surface Water Aquatic are listed.
6. -- = No screening level available or not analyzed.
7. J = The result is an estimated concentration that is less than the method reporting limit (MRL) but greater than or equal to the method detection limit (MDL).
8. U = The compound was analyzed for but was not detected at or above the MRL/MDL.
9. i = The MRL/MDL was raised due to a chromatographic interference.
10. D = The reported result is from a dilution.
11. Boxed values indicate that the detected concentration exceeds the Ecological Screening Criteria.
12. Shaded values indicate that the detected concentration exceeds the EPA AWQC criteria.

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TABLE 21B
GRAB SAMPLE CHEMISTRY RESULTS: POLYNUCLEAR AROMATIC HYDROCARBONS - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1SB-05	T4S1SB-06	T4S1SB-07	T4S1SB-08	T4S1SB-51	T4S1SB-52	T4S1SB-53	T4S1SB-54	T4S1SB-55	T4S1SB-56	T4S1SB-57	T4S1SB-58	T4S1SB-59
Sample ID:	Fish Consumption	Aquatic SLV	SB05-GW-1	SB06-GW-1	SB07-GW-1	SB08-GW-1	T4S1GW-51-1	T4S1GW-52-1	T4S1GW-53-1	T4S1GW-54-1	T4S1GW-55-1	T4S1GW-56-1	T4S1GW-57-1	T4S1GW-58-1	T4S1GW-59-1
Date Sampled:	SLV		03/31/2004	03/31/2004	03/30/2004	03/31/2004	9/1/2004	9/1/2004	8/30/2004	9/1/2004	8/31/2004	8/31/2004	8/31/2004	8/31/2004	9/9/2004
PAHs (µg/L)															
Naphthalene	--	620	0.020 U	0.020 U	0.006 J	0.020 U	0.15	0.11	0.014 J	0.19	0.02 U	0.02 U	0.023	0.02	0.02
1-Methylphenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	0.067	0.036	0.0092 J	0.091	0.02 U	0.02 U	0.02 U	0.02 U	0.016 J
Acenaphthylene	--	--	0.020 U	0.020 U	0.023 U	0.020 U	0.036	0.006 J	0.003 J	0.0088 J	0.0073 J	0.0058 J	0.0084 J	0.0061 J	0.011 J
Acenaphthene	990	520	0.020 U	0.020 U	0.023 U	0.020 U	0.012 J	0.0026 J	0.02 U	0.0037 J	0.0036 J	0.0034 J	0.0036 J	0.0028 J	0.048
Dibenzofuran	--	3.7	--	--	--	--	0.0073 J	0.02 U	0.02 U	0.0073 J	0.02 U	0.02 U	0.02 U	0.02 U	0.01 J
Fluorene	5,300	3.9	0.020 U	0.020 U	0.023 U	0.020 U	0.013 J	0.0035 J	0.0032 J	0.0076 J	0.004 J	0.0054 J	0.0033 J	0.02 U	0.02
Phenanthrene	--	6.3	0.020 U	0.020 U	0.011 J	0.027	0.14	0.025	0.02 U	0.047	0.036	0.037	0.037	0.024	0.23
Anthracene	40,000	13	0.022	0.017 J	0.023 U	0.093	0.056	0.0068 J	0.01 J	0.015 J	0.016 J	0.015 J	0.016 J	0.013 J	0.05
Fluoranthene	140	6.16	0.020 U	0.020 U	0.019 J	0.041	0.27	0.035	0.02 U	0.033	0.04	0.046	0.064	0.041	0.49
Pyrene	4,000	--	0.013 J	0.020 U	0.017 J	0.043	0.33	0.044	0.043	0.038	0.051	0.053	0.076	0.045	0.55
Benz(a)anthracene	0.018	0.027 [a]	0.020 U	0.020 U	0.012 J	0.039	0.15	0.017 J	0.02 U	0.012 J	0.024	0.023	0.04	0.024	0.32
Chrysene	0.018	--	0.020 U	0.020 U	0.014 J	0.038	0.2	0.024	0.02 U	0.016 J	0.027	0.023	0.043	0.024	0.4
Benzo(b)fluoranthene	0.018	--	0.011 J	0.020 U	0.016 J	0.038	0.13	0.017 J	0.02 U	0.013 J	0.011 J	0.0095 J	0.026	0.013 J	0.44
Benzo(k)fluoranthene	0.018	--	0.020 U	0.020 U	0.011 J	0.039	0.13	0.012 J	0.02 U	0.011 J	0.016 J	0.014 J	0.028	0.016 J	0.38
Benzo(a)pyrene	0.018	0.014	0.020 U	0.020 U	0.013 J	0.037	0.17	0.017 J	0.02 U	0.012 J	0.018 J	0.016 J	0.033	0.019 J	0.44
Indeno(1,2,3-cd)pyrene	0.018	--	0.0093 J	0.020 U	0.0097 J	0.043	0.13	0.013 J	0.02 U	0.011 J	0.0091 J	0.0075 J	0.019 J	0.0095 J	0.38
Dibenz(a,h)anthracene	0.018	--	0.0085 J	0.020 U	0.023 U	0.04	0.024	0.0026 J	0.02 U	0.0025 J	0.0024 J	0.0021 J	0.0044 J	0.0026 J	0.075
Benzo(g,h,i)perylene	--	--	0.010 J	0.020 U	0.011 J	0.041	0.15	0.016 J	0.02 U	0.011 J	0.0087 J	0.0078 J	0.02 J	0.0096 J	0.35

Sample Location:	Preliminary Screening Levels		T4S1SB-60	T4S1SB-63	T4S1SB-64	T4S1SB-65	T4S1SB-66	T4S1SB-67	T4S1SB-68	T4S1SB-69	T4S1SB-77	T4S1SB-78	T4S1SB-79	T4S1SB-80	T4S1SB-81
Sample ID:	Fish Consumption	Aquatic SLV	T4S1GW-60-1	T4S1GW-63-1	T4S1GW-64-1	T4S1GW-65-1	T4S1GW-66-1	T4S1GW-67-1	T4S1GW-68-1	T4S1GW-69-1	T4S1GW-77-1	T4S1GW-78-1	T4S1GW-79-1	T4S1GW-80-1	T4S1GW-81-1
Date Sampled:	SLV		8/30/2004	9/9/2004	9/9/2004	8/31/2004	9/9/2004	9/8/2004	9/9/2004	9/9/2004	8/30/2004	8/30/2004	8/30/2004	8/30/2004	8/30/2004
PAHs (µg/L)															
Naphthalene	--	620	0.014 J	0.02	0.02 J	0.011 J	0.014 J	0.15	0.016 J	0.012 J	9.6 U	9.6 U	0.02 U	0.019 J	0.02 U
1-Methylphenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	0.0055 J	0.016 J	0.011 J	0.0056 J	0.01 J	1.2	0.011 J	0.0087 J	9.6 U	9.6 U	0.02 U	0.012 J	0.02 U
Acenaphthylene	--	--	0.0051 J	0.0052 J	0.0047 J	0.007 J	0.0058 J	0.02 U	0.0038 J	0.02 U	9.6 U	9.6 U	0.004 J	0.0058 J	0.0047 J
Acenaphthene	990	520	0.0035 J	0.0027 J	0.0024 J	0.0026 J	0.0037 J	0.23	0.0072 J	0.002 J	0.02 U	0.02 U	0.0022 J	0.034	0.0043 J
Dibenzofuran	--	3.7	0.019 U	0.02 U	0.02 U	0.02 U	0.02 U	0.068	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.009 J	0.02 U
Fluorene	5,300	3.9	0.0036 J	0.0032 J	0.0047 J	0.0029 J	0.0083 J	0.36	0.0045 J	0.02 U	0.02 U	0.02 U	0.0036 J	0.015 J	0.0048 J
Phenanthrene	--	6.3	0.025	0.031 U	0.028	0.031	0.052	0.87	0.042	0.02 U	9.6 U	9.6 U	0.02	0.2	0.026
Anthracene	40,000	13	0.017 J	0.017 J	0.011 J	0.018 J	0.015 J	0.15	0.013 J	0.02 U	9.6 U	9.6 U	0.0091 J	0.038	0.012 J
Fluoranthene	140	6.16	0.05	0.051	0.022	0.049	0.061	0.049	0.073	0.017 J	9.6 U	9.6 U	0.02	0.43	0.047
Pyrene	4,000	--	0.055	0.063	0.032	0.061	0.068	0.22	0.085	0.02 U	9.6 U	9.6 U	0.023	0.45	0.05
Benz(a)anthracene	0.018	0.027 [a]	0.03	0.03	0.012 J	0.027	0.029	0.054	0.044	0.0096 J	9.6 U	9.6 U	0.011 J	0.26	0.025
Chrysene	0.018	--	0.036	0.034	0.019 J	0.028	0.031	0.11	0.051	0.02 U	9.6 U	9.6 U	0.011 J	0.32	0.03
Benzo(b)fluoranthene	0.018	--	0.028	0.027	0.0088 J	0.015 J	0.025	0.0091 J	0.05	0.01 J	9.6 U	9.6 U	0.006 J	0.34	0.022
Benzo(k)fluoranthene	0.018	--	0.027	0.028	0.0073 J	0.016 J	0.022	0.0038 J	0.042	0.0071 J	9.6 U	9.6 U	0.0064 J	0.29	0.023
Benzo(a)pyrene	0.018	0.014	0.029	0.03	0.011 J	0.021	0.029	0.013 J	0.05	0.011 J	9.6 U	9.6 U	0.008 J	0.34	0.024
Indeno(1,2,3-cd)pyrene	0.018	--	0.021	0.024	0.0083 J	0.011 J	0.02	0.0028 J	0.041	0.007 J	9.6 U	9.6 U	0.0051 J	0.28	0.017 J
Dibenz(a,h)anthracene	0.018	--	0.0059 J	0.0052 J	0.02 U	0.0027 J	0.0042 J	0.0019 J	0.0087 J	0.0019 J	9.6 U	9.6 U	0.02 U	0.054	0.0039 J
Benzo(g,h,i)perylene	--	--	0.022	0.023	0.01 J	0.01 J	0.019 J	0.0068 J	0.038	0.007 J	9.6 U	9.6 U	0.0053 J	0.28	0.018 J

1. Only detected compounds are reported in the table. The complete analyte list is presented in the Sampling and Analysis Plan (Appendix A) of the RI Work Plan (Hart Crowser, 2004a).
2. PAHs = Polynuclear Aromatic Hydrocarbons by EPA Method 8270C (SIM).
3. µg/L = Micrograms per liter.
4. Fish Consumption SLV = EPA National Recommended Water Quality Criteria: 2002 Human Health for Consumption of Fish.
5. Aquatic SLV = EPA National Recommended Water Quality Criteria: 2002 for CCC Freshwater Biota (noted with a.). Where CCC values are not available, Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Surface Water Aquatic are listed.
6. -- = No screening level available or not analyzed.
7. J = The result is an estimated concentration that is less than the method reporting limit (MRL) but greater than or equal to the method detection limit (MDL).
8. U = The compound was analyzed for but was not detected at or above the MRL/MDL.
9. Boxed values indicate that the detected concentration exceeds the Ecological Screening Criteria.
10. Shaded values indicate that the detected concentration exceeds the EPA AWQC criteria.

KMB00008350

TABLE 22A
GRAB SAMPLE CHEMISTRY RESULTS: SEMI-VOLATILE ORGANIC COMPOUNDS - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1SB-14	T4S1SB-15	T4S1SB-16	T4S1SB-42
Sample ID:	Fish Consumption	Aquatic SLV	T4S1SB-14-1	T4S1GW-15-1	T4S1GW-16-1	T4S1GW-42-1
Date Sampled:	SLV		8/26/2004	9/7/2004	9/7/2004	9/7/2004
SVOCs (µg/L)						
Phenol	1,700,000	110	0.2 U	0.2 U	0.2 U	0.2 U
4-Methylphenol	--	--	0.48 U	0.48 U	0.48 U	0.48 U
Isophorone	960	2,340	0.016 J	0.2 U	0.019 J	0.016 J
4-Chloroaniline	--	--	0.2 U	0.2 U	0.2 U	0.2 U
4-Chloro-3-methylphenol	--	--	0.2 U	0.2 U	0.2 U	0.2 U
Dimethyl Phthalate	1,100,000	3	0.2 U	0.2 U	0.022 J	0.017 J
Diethyl Phthalate	44,000	210	0.068 J	0.2 U	0.2 U	0.2 U
Di-n-butyl Phthalate	4,500	35	0.2 U	0.2 U	0.2 U	0.2 U

Notes:
1. Only detected compounds are reported in the table. The complete analyte list is presented in the Sampling and Analysis Plan (Appendix A) of the RI Work Plan (Hart Crowser, 2004a).
2. SVOCs = Semivolatile Organic Compounds by EPA Method 8270C.
3. µg/L = Micrograms per liter.
4. Fish Consumption SLV = EPA National Recommended Water Quality Criteria: 2002 Human Health for Consumption of Fish.
5. Aquatic SLV = EPA National Recommended Water Quality Criteria: 2002 for CCC Freshwater Biota (noted with a.). Where CCC values are not available, Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Surface Water Aquatic are listed.
6. -- = No screening level available or not analyzed.
7. J = The result is an estimated concentration that is less than the method reporting limit (MRL) but greater than or equal to the method detection limit (MDL).
8. U = The compound was analyzed for but was not detected at or above the MRL/MDL.

KMB00008351

TABLE 22B
GRAB SAMPLE CHEMISTRY RESULTS: SEMI-VOLATILE ORGANIC COMPOUNDS - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1SB-77	T4S1SB-78
Sample ID:	Fish Consumption SLV	Aquatic SLV	T4S1GW-77-1	T4S1GW-78-1
Date Sampled:			8/30/2004	8/30/2004
SVOCs (µg/L)				
Phenol	1,700,000	110	9.6 U	9.6 U
4-Methylphenol	--	--	9.6 U	9.6 U
Isophorone	960	2,340	9.6 U	9.6 U
4-Chloroaniline	--	--	9.6 U	9.6 U
4-Chloro-3-methylphenol	--	--	9.6 U	9.6 U
Dimethyl Phthalate	1,100,000	3	9.6 U	9.6 U
Diethyl Phthalate	44,000	210	9.6 U	9.6 U
Di-n-butyl Phthalate	4,500	35	9.6 U	9.6 U

Notes:

1. Only detected compounds are reported in the table. The complete analyte list is presented in the Sampling and Analysis Plan (Appendix A) of the RI Work Plan (Hart Crowser, 2004a).
2. SVOCs = Semivolatile Organic Compounds by EPA Method 8270C.
3. µg/L = Micrograms per liter.
4. Fish Consumption SLV = EPA National Recommended Water Quality Criteria: 2002 Human Health for Consumption of Fish.
5. Aquatic SLV = EPA National Recommended Water Quality Criteria: 2002 for CCC Freshwater Biota (noted with a.). Where CCC values are not available, Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Surface Water Aquatic are listed.
6. -- = No screening level available or not analyzed.
7. U = The compound was analyzed for but was not detected at or above the MRL/MDL.

TABLE 23A
GRAB SAMPLE CHEMISTRY RESULTS: VOLATILE ORGANIC COMPOUNDS - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1SB-01	T4S1SB-02	T4S1SB-03	T4S1SB-04	T4S1SB-09	T4S1SB-10	T4S1SB-11	T4S1SB-12	T4S1SB-14	T4S1SB-15	T4S1SB-16
Sample ID:	Fish Consumption SLV	Aquatic SLV	SB01-GW-1	SB02-GW-1	SB03-GW-1	SB04-GW-1	T4S1GW-9-1	T4S1GW-10-1	T4S1GW-11-1	T4S1GW-12-1	T4S1SB-14-1	T4S1GW-15-1	T4S1GW-16-1
Date Sampled:			04/01/2004	04/01/2004	04/05/2004	04/05/2004	9/1/2004	9/8/2004	9/9/2004	9/9/2004	8/24/2004	9/7/2004	9/7/2004
VOCs (µg/L)													
Vinyl Chloride	530	--	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Acetone	--	1,500	20 U	20 U	20 U	20 U	20 U	20 U	20 U	11 J	20 U	20 U	6.9 J
1,1-Dichloroethene (1,1-DCE)	3.2	25	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Carbon Disulfide	--	0.92	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.22 J	0.28 J
trans-1,2-Dichloroethene	140,000	590	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloroethane (1,1-DCA)	--	47	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
2-Butanone (MEK)	--	--	20 U	20 U	20 U	20 U	20 U	20 U	20 U	2.3 J	20 U	20 U	20 U
cis-1,2-Dichloroethene	--	590	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Chloroform	470	1,240	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1,1-Trichloroethane (TCA)	--	11	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Benzene	51	130	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.11 J	0.50 U	0.50 U	0.50 U	0.50 U
Trichloroethene (TCE)	30	21,900	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toluene	200,000	9.8	0.46 J	0.18 J	0.34	0.61	0.25 J	0.19 J	0.35 J	0.19 J	0.50 U	0.11 J	0.18 J
Tetrachloroethene (PCE)	3.3	840	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Chlorobenzene	21,000	50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Ethylbenzene	29,000	7.3	0.50 U	0.50 U	0.50 U	0.14 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
m,p-Xylenes	--	1.8	0.43 J	0.27 J	0.39	0.50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
o-Xylene	--	--	0.13 J	0.50 U	0.13	0.15 J	0.50 U	0.08 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Isopropylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
n-Propylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,2,4-Trimethylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
sec-Butylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,3-Dichlorobenzene	960	71	2.7	1.4	4	2.6	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,4-Dichlorobenzene	2,600	15	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.13 J	0.50 U	0.50 U	0.50 U
n-Butylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Naphthalene	--	620	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Methyl tert-Butyl Ether	--	--	0.50 U	0.50 U	0.50 U	0.50 U	--	--	--	--	--	--	--

Sample Location:	Preliminary Screening Levels		T4S1SB-17	T4S1SB-18	T4S1SB-21	T4S1SB-22	T4S1SB-23	T4S1SB-24	T4S1SB-25	T4S1SB-26	T4S1SB-28	T4S1SB-31	T4S1SB-32
Sample ID:	Fish Consumption SLV	Aquatic SLV	T4S1GW-17-1	T4S1GW-18-1	T4S1GW-21-1	T4S1GW-22-1	T4S1GW-23-1	T4S1GW-24-1	T4S1GW-25-1	T4S1GW-26-1	T4S1GW-28-1	T4S1GW-31-1	T4S1GW-32-1
Date Sampled:			9/7/2004	9/3/2004	9/13/2004	9/1/2004	9/2/2004	8/27/2004	8/27/2004	8/26/2004	8/26/2004	9/8/2004	9/3/2004
VOCs (µg/L)													
Vinyl Chloride	530	--	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Acetone	--	1,500	20 U	19 J	36	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
1,1-Dichloroethene (1,1-DCE)	3.2	25	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Carbon Disulfide	--	0.92	0.50 U	0.50 U	0.39 J	0.93	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.17 J	0.50 U
trans-1,2-Dichloroethene	140,000	590	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloroethane (1,1-DCA)	--	47	0.50 U	0.50 U	0.50 U	0.50 U	0.1 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
2-Butanone (MEK)	--	--	20 U	20 U	6.6 J	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
cis-1,2-Dichloroethene	--	590	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Chloroform	470	1,240	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	3.5
1,1,1-Trichloroethane (TCA)	--	11	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.15 J
Benzene	51	130	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Trichloroethene (TCE)	30	21,900	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toluene	200,000	9.8	0.50 U	0.22 J	0.50	0.50 U	0.50 U	0.22 J	0.22 J	0.11 J	0.50 U	0.50 U	0.50 U
Tetrachloroethene (PCE)	3.3	840	0.2 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Chlorobenzene	21,000	50	0.50 U	0.50 U	0.50 U	0.50 U	1	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Ethylbenzene	29,000	7.3	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
m,p-Xylenes	--	1.8	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
o-Xylene	--	--	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.08 J	0.08 J	0.50 U	0.50 U	0.50 U	0.50 U
Isopropylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
n-Propylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,2,4-Trimethylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
sec-Butylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,3-Dichlorobenzene	960	71	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,4-Dichlorobenzene	2,600	15	0.50 U	0.50 U	0.50 U	0.50 U	0.7	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
n-Butylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Naphthalene	--	620	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Methyl tert-Butyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--

Please refer to notes at end of table.

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TABLE 23A
GRAB SAMPLE CHEMISTRY RESULTS: VOLATILE ORGANIC COMPOUNDS - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1SB-33	T4S1SB-34	T4S1SB-35	T4S1SB-36	T4S1SB-37	T4S1SB-38	T4S1SB-39	T4S1SB-40	T4S1SB-41	T4S1SB-42	T4S1SB-43
Sample ID:	Fish Consumption SLV	Aquatic SLV	T4S1GW-33-1	T4S1GW-34-1	T4S1GW-35-1	T4S1GW-36-1	T4S1GW-37-1	T4S1GW-38-1	T4S1GW-39-1	T4S1GW-40-1	T4S1GW-41-1	T4S1GW-42-1	T4S1GW-43-1
Date Sampled:			9/3/2004	9/1/2004	9/1/2004	9/3/2004	9/1/2004	8/31/2004	9/1/2004	8/27/2004	8/27/2004	9/7/2004	8/31/2004
VOCs (µg/L)													
Vinyl Chloride	530	--	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	7.5	1.8	0.50 U	0.50 U
Acetone	--	1,500	20 U	20 U	8.1 J	7.9 J	9 J	5.7 J	4.6 J	20 U	20 U	20 U	20 U
1,1-Dichloroethene (1,1-DCE)	3.2	25	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Carbon Disulfide	--	0.92	0.50 U	0.50 U	0.21 J	0.50 U	0.50 U	0.50 U	0.50 U	0.48 J	0.63	0.27 J	0.50 U
trans-1,2-Dichloroethene	140,000	590	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloroethane (1,1-DCA)	--	47	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.12 J	0.50 U	0.50 U	0.50 U
2-Butanone (MEK)	--	--	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
cis-1,2-Dichloroethene	--	590	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.51	0.50 U	0.50 U
Chloroform	470	1,240	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1,1-Trichloroethane (TCA)	--	11	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Benzene	51	130	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Trichloroethene (TCE)	30	21,900	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toluene	200,000	9.8	0.50 U	0.50 U	0.34 J	0.14 J	0.16 J	0.19 J	0.17 J	0.12 J	0.1 J	0.12 J	0.50 U
Tetrachloroethene (PCE)	3.3	840	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Chlorobenzene	21,000	50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Ethylbenzene	29,000	7.3	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
m,p-Xylenes	--	1.8	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
o-Xylene	--	--	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Isopropylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
n-Propylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,2,4-Trimethylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
sec-Butylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,3-Dichlorobenzene	960	71	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,4-Dichlorobenzene	2,600	15	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
n-Butylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Naphthalene	--	620	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Methyl tert-Butyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--

Sample Location:	Preliminary Screening Levels		T4S1SB-44	T4S1SB-48	T4S1SB-49	T4S1SB-50	T4S1SB-82	T4S1SB-83	T4S1SB-84	T4S1SB-85	T4S1SB-86	T4S1SB-87
Sample ID:	Fish Consumption SLV	Aquatic SLV	T4S1GW-44-1	T4S1SB-48-1	T4S1SB-49-1	T4S1SB-50-1	T4S1GW-82-1	T4S1GW-83-1	T4S1GW-84-1	T4S1GW-85-1	T4S1GW-86-1	T4S1GW-87-1
Date Sampled:			8/31/2004	8/23/2004	8/23/2004	8/23/2004	9/1/2004	9/1/2004	9/9/2004	9/8/2004	9/8/2004	9/8/2004
VOCs (µg/L)												
Vinyl Chloride	530	--	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Acetone	--	1,500	20 U	20 U	20 U	20 U	20 U	20 U	57	20 U	31	20 U
1,1-Dichloroethene (1,1-DCE)	3.2	25	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Carbon Disulfide	--	0.92	0.50 U	0.50 U	0.18 J	0.23 J	0.22 J	0.18 J	0.50 U	0.50 U	0.26 J	0.29 J
trans-1,2-Dichloroethene	140,000	590	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloroethane (1,1-DCA)	--	47	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
2-Butanone (MEK)	--	--	20 U	20 U	20 U	20 U	20 U	20 U	2.4 J	20 U	20 U	20 U
cis-1,2-Dichloroethene	--	590	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Chloroform	470	1,240	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1,1-Trichloroethane (TCA)	--	11	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Benzene	51	130	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.15 J	0.50 U	0.16 J	0.50 U
Trichloroethene (TCE)	30	21,900	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toluene	200,000	9.8	0.50 U	0.50 U	0.50 U	0.50 U	0.13 J	0.11 J	0.46 J	0.17 J	0.41 J	0.14 J
Tetrachloroethene (PCE)	3.3	840	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Chlorobenzene	21,000	50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Ethylbenzene	29,000	7.3	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
m,p-Xylenes	--	1.8	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.25 J	0.50 U	0.50 U	0.50 U
o-Xylene	--	--	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.13 J	0.16 J	0.50 U	0.50 U
Isopropylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
n-Propylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,2,4-Trimethylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	0.35 J	2.0 U	2.0 U
sec-Butylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,3-Dichlorobenzene	960	71	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,4-Dichlorobenzene	2,600	15	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
n-Butylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Naphthalene	--	620	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Methyl tert-Butyl Ether	--	--	--	--	--	--	--	--	--	--	--	--

Please refer to notes at end of table.

KMB00008354

TABLE 23A
GRAB SAMPLE CHEMISTRY RESULTS: VOLATILE ORGANIC COMPOUNDS - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Notes:
1. Only detected compounds are reported in the table. The complete analyte list is presented in the Sampling and Analysis Plan (Appendix A) of the RI Work Plan (Hart Crowser, 2004a).
2. VOCs = Volatile Organic Compounds by EPA Method 8260B.
3. µg/L = Micrograms per liter.
4. Fish Consumption SLV = EPA National Recommended Water Quality Criteria: 2002 Human Health for Consumption of Fish.
5. Aquatic SLV = EPA National Recommended Water Quality Criteria: 2002 for CCC Freshwater Biota (noted with a.). Where CCC values are not available, Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Surface Water Aquatic are listed.
6. -- = No screening level available or not analyzed.
7. J = The result is an estimated concentration that is less than the method reporting limit (MRL) but greater than or equal to the method detection limit (MDL).
8. U = The compound was analyzed for but was not detected at or above the MRL/MDL.
9. Boxed values indicate that the detected concentration exceeds the Ecological Screening Criteria.

KMB00008355

TABLE 23B
GRAB SAMPLE CHEMISTRY RESULTS: VOLATILE ORGANIC COMPOUNDS - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1SB-05	T4S1SB-06	T4S1SB-07	T4S1SB-08	T4S1SB-51	T4S1SB-52	T4S1SB-53	T4S1SB-54	T4S1SB-55	T4S1SB-56	T4S1SB-57
Sample ID:	Fish Consumption SLV	Aquatic SLV	SB05-GW-1	SB06-GW-1	SB07-GW-1	SB08-GW-1	T4S1GW-51-1	T4S1GW-52-1	T4S1GW-53-1	T4S1GW-54-1	T4S1GW-55-1	T4S1GW-56-1	T4S1GW-57-1
Date Sampled:			03/31/2004	03/31/2004	03/30/2004	03/31/2004	9/1/2004	9/1/2004	8/30/2004	9/1/2004	8/31/2004	8/31/2004	8/31/2004
VOCs (µg/L)													
Vinyl Chloride	530	--	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Acetone	--	1,500	20 U	20 U	20 U	20 U	4.8 J	7.8 J	20 U	6.9 J	20 U	20 U	20 U
1,1-Dichloroethene (1,1-DCE)	3.2	25	0.50 U	0.10 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Carbon Disulfide	--	0.92	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.17 J	0.22 J	0.33 J	0.18 J
trans-1,2-Dichloroethene	140,000	590	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloroethane (1,1-DCA)	--	47	0.50 U	0.1	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
2-Butanone (MEK)	--	--	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
cis-1,2-Dichloroethene	--	590	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Chloroform	470	1,240	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1,1-Trichloroethane (TCA)	--	11	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Benzene	51	130	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Trichloroethene (TCE)	30	21,900	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toluene	200,000	9.8	0.35 J	0.29 J	0.31 J	0.50 U	0.6	0.45 J	0.13 J	0.64	0.50 U	0.11 J	0.50 U
Tetrachloroethene (PCE)	3.3	840	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Chlorobenzene	21,000	50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Ethylbenzene	29,000	7.3	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
m,p-Xylenes	--	1.8	0.44 J	0.35 J	0.50 U	0.35	0.34 J	0.27 J	0.50 U	0.31 J	0.50 U	0.50 U	0.50 U
o-Xylene	--	--	0.12 J	0.090 J	0.50 U	0.1	0.12 J	0.11 J	0.50 U	0.13 J	0.50 U	0.50 U	0.50 U
Isopropylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2 U	2 U
n-Propylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2 U	2 U
1,2,4-Trimethylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2 U	2 U
sec-Butylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2 U	2 U
1,3-Dichlorobenzene	960	71	2.1	1.8	0.50 U	1.5	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,4-Dichlorobenzene	2,600	15	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
n-Butylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2 U	2 U
Naphthalene	--	620	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2 U	2 U
Methyl tert-Butyl Ether	--	--	0.24 J	0.50 U	0.50 U	0.50 U	--	--	--	--	--	--	--

Sample Location:	Preliminary Screening Levels		T4S1SB-58	T4S1SB-59	T4S1SB-60	T4S1SB-61	T4S1SB-62	T4S1SB-63	T4S1SB-64	T4S1SB-65	T4S1SB-66	T4S1SB-67	T4S1SB-68
Sample ID:	Fish Consumption SLV	Aquatic SLV	T4S1GW-58-1	T4S1GW-59-1	T4S1GW-60-1	T4S1GW-61-1	T4S1GW-62-1	T4S1GW-63-1	T4S1GW-64-1	T4S1GW-65-1	T4S1GW-66-1	T4S1GW-67-1	T4S1GW-68-1
Date Sampled:			8/31/2004	9/9/2004	8/30/2004	9/9/2004	9/9/2004	9/9/2004	9/9/2004	8/31/2004	9/9/2004	9/8/2004	9/9/2004
VOCs (µg/L)													
Vinyl Chloride	530	--	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Acetone	--	1,500	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
1,1-Dichloroethene (1,1-DCE)	3.2	25	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Carbon Disulfide	--	0.92	0.17 J	0.16 J	0.50 U	0.31 J	0.72	0.49 J	0.50 U	0.21 J	0.50 U	0.50 U	0.2 J
trans-1,2-Dichloroethene	140,000	590	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloroethane (1,1-DCA)	--	47	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
2-Butanone (MEK)	--	--	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
cis-1,2-Dichloroethene	--	590	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Chloroform	470	1,240	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1,1-Trichloroethane (TCA)	--	11	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Benzene	51	130	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.16 J	0.50 U
Trichloroethene (TCE)	30	21,900	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toluene	200,000	9.8	0.50 U	0.11 J	0.50 U	0.50 U	0.11 J	0.14 J	0.2 J	0.50 U	0.50 U	0.11 J	0.50 U
Tetrachloroethene (PCE)	3.3	840	0.50 U	0.16 J	0.21 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Chlorobenzene	21,000	50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Ethylbenzene	29,000	7.3	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.14 J	0.50 U
m,p-Xylenes	--	1.8	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
o-Xylene	--	--	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.29 J	0.50 U
Isopropylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	0.17 J	2.0 U
n-Propylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	0.39 J	2.0 U
1,2,4-Trimethylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
sec-Butylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	0.15 J	2.0 U
1,3-Dichlorobenzene	960	71	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,4-Dichlorobenzene	2,600	15	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
n-Butylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	0.51 J	2.0 U
Naphthalene	--	620	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	0.36 J	2.0 U
Methyl tert-Butyl Ether	--	--	--	--	--	--	--	--	--	--	--	--	--

Please refer to notes at end of table.

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TABLE 23B
GRAB SAMPLE CHEMISTRY RESULTS: VOLATILE ORGANIC COMPOUNDS - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1SB-69	T4S1SB-77	T4S1SB-78	T4S1SB-79	T4S1SB-80	T4S1SB-81
Sample ID:	Fish Consumption SLV	Aquatic SLV	T4S1GW-69-1	T4S1GW-77-1	T4S1GW-78-1	T4S1GW-79-1	T4S1GW-80-1	T4S1GW-81-1
Date Sampled:			9/9/2004	8/30/2004	8/30/2004	8/30/2004	8/30/2004	8/30/2004
VOCs (µg/L)								
Vinyl Chloride	530	--	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Acetone	--	1,500	20 U	20 U	20 U	20 U	20 U	20 U
1,1-Dichloroethene (1,1-DCE)	3.2	25	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Carbon Disulfide	--	0.92	0.4 J	0.50 U	0.16 J	0.2 J	0.16 J	0.41 J
trans-1,2-Dichloroethene	140,000	590	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1-Dichloroethane (1,1-DCA)	--	47	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
2-Butanone (MEK)	--	--	20 U	20 U	20 U	20 U	20 U	20 U
cis-1,2-Dichloroethene	--	590	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Chloroform	470	1,240	0.50 U	0.50 U	0.50 U	0.47 J	0.92	0.15 J
1,1,1-Trichloroethane (TCA)	--	11	0.50 U	0.22 J	0.12 J	0.50 U	0.13 J	0.50 U
Benzene	51	130	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Trichloroethene (TCE)	30	21,900	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toluene	200,000	9.8	0.50 U	0.50 U	0.50 U	0.12 J	0.50 U	0.50 U
Tetrachloroethene (PCE)	3.3	840	0.50 U	1.4	0.51	0.50 U	0.50 U	0.50 U
Chlorobenzene	21,000	50	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Ethylbenzene	29,000	7.3	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
m,p-Xylenes	--	1.8	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
o-Xylene	--	--	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Isopropylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
n-Propylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,2,4-Trimethylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
sec-Butylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,3-Dichlorobenzene	960	71	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,4-Dichlorobenzene	2,600	15	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
n-Butylbenzene	--	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Naphthalene	--	620	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Methyl tert-Butyl Ether	--	--	--	--	--	--	--	--

Notes:

1. Only detected compounds are reported in the table. The complete analyte list is presented in the Sampling and Analysis Plan (Appendix A) of the RI Work Plan (Hart Crowser, 2004a).
2. VOCs = Volatile Organic Compounds by EPA Method 8260B.
3. µg/L = Micrograms per liter.
4. Fish Consumption SLV = EPA National Recommended Water Quality Criteria: 2002 Human Health for Consumption of Fish.
5. Aquatic SLV = EPA National Recommended Water Quality Criteria: 2002 for CCC Freshwater Biota (noted with a.). Where CCC values are not available, Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Surface Water Aquatic are listed.
6. -- = No screening level available or not analyzed.
7. J = The result is an estimated concentration that is less than the method reporting limit (MRL) but greater than or equal to the method detection limit (MDL).
8. U = The compound was analyzed for but was not detected at or above the MRL/MDL.

KMB00008357

TABLE 24A
GRAB SAMPLE CHEMISTRY RESULTS: POLYCHLORINATED BIPHENYLS - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1SB-12	T4S1SB-17	T4S1SB-18	T4S1SB-19	T4S1SB-20	T4S1SB-21	T4S1SB-22	T4S1SB-23	T4S1SB-24	T4S1SB-42
Sample ID:	Fish Consumption SLV	Aquatic SLV	T4S1GW-12-1	T4S1GW-17-1	T4S1GW-18-1	T4S1GW-19-1	T4S1GW-20-1	T4S1GW-21-1	T4S1GW-22-1	T4S1GW-23-1	T4S1GW-24-1	T4S1GW-42-1
Date Sampled:			9/9/2004	9/7/2004	9/3/2004	9/9/2004	9/7/2004	9/13/2004	9/1/2004	9/2/2004	8/27/2004	9/7/2004
PCBs (µg/L)	0.000064	0.014 [a]										
Aroclor 1016	--	--	0.2 U	0.2 U	0.2 U	0.21 U	0.21 U	0.2 U	0.2 U	0.19 U	0.2 U	0.2 U
Aroclor 1221	--	0.28	0.4 U	0.39 U	0.39 U	0.42 U	0.41 U	0.39 U	0.39 U	0.38 U	0.39 U	0.39 U
Aroclor 1232	--	0.58	0.2 U	0.2 U	0.2 U	0.21 U	0.21 U	0.2 U	0.2 U	0.19 U	0.2 U	0.2 U
Aroclor 1242	--	0.053	0.2 U	0.2 U	0.2 U	0.21 U	0.21 U	0.2 U	0.2 U	0.19 U	0.2 U	0.2 U
Aroclor 1248	--	0.081	0.2 U	0.2 U	0.2 U	0.21 U	0.21 U	0.2 U	0.2 U	0.19 U	0.2 U	0.2 U
Aroclor 1254	--	0.033	0.2 U	0.2 U	0.2 U	0.21 U	0.21 U	0.2 U	0.2 U	0.19 U	0.2 U	0.2 U
Aroclor 1260	--	94	0.2 U	0.2 U	0.2 U	0.21 U	0.21 U	0.2 U	0.2 U	0.19 U	0.2 U	0.2 U

Sample Location:	Preliminary Screening Levels		T4S1SB-45	T4S1SB-46	T4S1SB-47	T4S1SB-48	T4S1SB-49	T4S1SB-50	T4S1SB-82	T4S1SB-83	T4S1SB-84	T4S1SB-85
Sample ID:	Fish Consumption SLV	Aquatic SLV	T4S1SB-45-1	T4S1SB-46-1	T4S1SB-47-1	T4S1SB-48-1	T4S1SB-49-1	T4S1SB-50-1	T4S1GW-82-1	T4S1GW-83-1	T4S1GW-84-1	T4S1GW-85-1
Date Sampled:			8/23/2004	8/23/2004	8/23/2004	8/23/2004	8/23/2004	8/23/2004	9/1/2004	9/1/2004	9/9/2004	9/8/2004
PCBs (µg/L)	0.000064	0.014 [a]										
Aroclor 1016	--	--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Aroclor 1221	--	0.28	0.39 U	0.39 U	0.39 U	0.39 U	0.39 U	0.39 U	0.39 U	0.39 U	0.4 U	0.39 U
Aroclor 1232	--	0.58	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Aroclor 1242	--	0.053	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Aroclor 1248	--	0.081	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Aroclor 1254	--	0.033	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Aroclor 1260	--	94	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U

Notes:
1. All analytes compounds are reported in the table.
2. PCBs = Polychlorinated Biphenyls by EPA Method 8082.
3. µg/L = Micrograms per liter.
4. Fish Consumption SLV = EPA National Recommended Water Quality Criteria: 2002 Human Health for Consumption of Fish.
5. Aquatic SLV = EPA National Recommended Water Quality Criteria: 2002 for CCC Freshwater Biota (noted with a.). Where CCC values are not available, Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Surface Water Aquatic are listed.
6. -- = No screening level available or not analyzed.
7. U = The compound was analyzed for but was not detected at or above the MRL/MDL.

KMB00008358

TABLE 24B
GRAB SAMPLE CHEMISTRY RESULTS: POLYCHLORINATED BIPHENYLS - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1SB-51	T4S1SB-52	T4S1SB-63	T4S1SB-64	T4S1SB-65	T4S1SB-66	T4S1SB-67
Sample ID:	Fish Consumption	Aquatic SLV	T4S1GW-51-1	T4S1GW-52-1	T4S1GW-63-1	T4S1GW-64-1	T4S1GW-65-1	T4S1GW-66-1	T4S1GW-67-1
Date Sampled:	SLV		9/1/2004	9/1/2004	9/9/2004	9/9/2004	8/31/2004	9/9/2004	9/8/2004
PCBs (µg/L)									
Aroclor 1016	0.000064	0.014 [a]	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Aroclor 1221	--	--	0.39 U	0.39 U	0.39 U	0.39 U	0.39 U	0.39 U	0.39 U
Aroclor 1232	--	0.28	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Aroclor 1242	--	0.58	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Aroclor 1248	--	0.053	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Aroclor 1254	--	0.081	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Aroclor 1260	--	0.033	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
	--	94	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U

Notes:
1. All analytes compounds are reported in the table.
2. PCBs = Polychlorinated Biphenyls by EPA Method 8082.
3. µg/L = Micrograms per liter.
4. Fish Consumption SLV = EPA National Recommended Water Quality Criteria: 2002 Human Health for Consumption of Fish.
5. Aquatic SLV = EPA National Recommended Water Quality Criteria: 2002 for CCC Freshwater Biota (noted with a.). Where CCC values are not available, Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Surface Water Aquatic are listed.
6. -- = No screening level available or not analyzed.
7. U = The compound was analyzed for but was not detected at or above the MRL/MDL.

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TABLE 25A
GRAB SAMPLE CHEMISTRY RESULTS: PESTICIDES - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1SB-03	T4S1SB-04	T4S1SB-21	T4S1SB-22	T4S1SB-23	T4S1SB-24	T4S1SB-25
Sample ID:	Fish Consumption SLV	Aquatic SLV	SB03-GW-1	SB04-GW-1	T4S1GW-21-1	T4S1GW-22-1	T4S1GW-23-1	T4S1GW-24-1	T4S1GW-25-1
Date Sampled:			04/05/2004	04/05/2004	9/13/2004	9/1/2004	9/2/2004	8/27/2004	8/27/2004
Pesticides/Herbicides (µg/L)									
alpha-BHC	0.0049	2.2	0.0098 U	0.0014 J	0.0097 U	0.0096 U	0.0095 U	0.0096 U	0.0097 U
gamma-BHC (Lindane)	0.063	0.08	0.0098 U	0.0098 U	0.0097 U	0.0096 U	0.0095 U	0.0096 U	0.0097 U
delta-BHC	--	--	0.0098 U	0.0098 U	0.0097 U	0.0096 U	0.0095 U	0.0096 U	0.0097 U
Heptachlor	0.000079	0.0038 [a]	0.0098 U	0.0098 U	0.0097 U	0.0096 U	0.0095 U	0.0096 U	0.0097 U
Aldrin	0.00005	0.06 [a]	0.0098 U	0.0098 U	0.0097 U	0.0096 Ui	0.0095 U	0.0096 U	0.0097 U
Heptachlor Epoxide	0.000039	0.0038 [a]	0.0098 U	0.0098 U	0.0097 U	0.0096 U	0.0095 U	0.0096 U	0.0097 Ui
Endosulfan I	89	0.056 [a]	0.0098 Ui	0.0098 Ui	0.0097 Ui	0.0096 U	0.0095 U	0.0096 U	0.0097 U
alpha-Chlordane	0.00081	0.0043 [a]	0.0098 U	0.0098 U	0.0097 U	0.0023 J	0.0095 U	0.0096 U	0.0097 U
Dieldrin	0.000054	0.056 [a]	0.0098 U	0.0098 U	0.0097 U	0.0096 U	0.0095 U	0.0096 U	0.0097 U
4,4'-DDE	0.00022	--	0.0098 U	0.0098 U	0.0097 U	0.0096 U	0.0095 U	0.0096 U	0.0097 U
Endrin	0.81	0.036 [a]	0.0024 J	0.0024 J	0.0097 Ui	0.0036 JP	0.0095 U	0.0047 J	0.0097 U
Endosulfan II	89	0.056 [a]	0.0098 U	0.0098 U	0.0097 Ui	0.0096 U	0.0095 U	0.0096 U	0.0097 Ui
4,4'-DDD	0.00031	0.001	0.0098 U	0.0098 U	0.0097 Ui	0.018	0.0095 U	0.0096 U	0.0097 U
Endrin Aldehyde	0.3	--	0.0098 U	0.0098 U	0.0097 U	0.0096 Ui	0.0095 U	0.0096 U	0.0097 U
4,4'-DDT	0.00022	0.001	0.0098 U	0.0098 Ui	0.0097 U	0.0096 U	0.0095 U	0.0096 Ui	0.0097 Ui
Endrin Ketone	--	--	0.0098 U	0.0098 U	0.0097 U	0.0096 Ui	0.0095 U	0.0096 U	0.0097 U
Methoxychlor	--	0.03	0.0098 U	0.0098 U	0.0097 Ui	0.0096 Ui	0.0095 U	0.0096 U	0.0097 U

Sample Location:	Preliminary Screening Levels		T4S1SB-26	T4S1SB-28	T4S1SB-48	T4S1SB-49	T4S1SB-50	T4S1SB-84
Sample ID:	Fish Consumption SLV	Aquatic SLV	T4S1GW-26-1	T4S1GW-28-1	T4S1SB-48-1	T4S1SB-49-1	T4S1SB-50-1	T4S1GW-84-1
Date Sampled:			8/26/2004	8/26/2004	8/23/2004	8/23/2004	8/23/2004	9/9/2004
Pesticides/Herbicides (µg/L)								
alpha-BHC	0.0049	2.2	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0098 U	0.01 U
gamma-BHC (Lindane)	0.063	0.08	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0098 U	0.01 U
delta-BHC	--	--	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0098 U	0.01 U
Heptachlor	0.000079	0.0038 [a]	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0098 U	0.01 U
Aldrin	0.00005	0.06 [a]	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0098 U	0.01 U
Heptachlor Epoxide	0.000039	0.0038 [a]	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0098 Ui	0.01 U
Endosulfan I	89	0.056 [a]	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0098 U	0.01 U
alpha-Chlordane	0.00081	0.0043 [a]	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0098 U	0.01 U
Dieldrin	0.000054	0.056 [a]	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0098 U	0.01 U
4,4'-DDE	0.00022	--	0.0097 U	0.0097 U	0.0097 U	0.0097 U	0.0098 U	0.01 U
Endrin	0.81	0.036 [a]	0.0097 U	0.0097 Ui	0.0097 U	0.0097 U	0.0098 U	0.01 U
Endosulfan II	89	0.056 [a]	0.0097 Ui	0.0097 U	0.0097 U	0.0097 U	0.0098 U	0.01 U
4,4'-DDD	0.00031	0.001	0.0097 Ui	0.0097 U	0.0097 U	0.0097 U	0.0098 U	0.01 U
Endrin Aldehyde	0.3	--	0.0097 U	0.011 P	0.0097 U	0.0097 U	0.0098 U	0.01 Ui
4,4'-DDT	0.00022	0.001	0.0047 JP	0.0097 Ui	0.0097 U	0.0097 Ui	0.0098 Ui	0.0054 JP
Endrin Ketone	--	--	0.0097 U	0.0097 Ui	0.0097 U	0.0097 U	0.0098 U	0.01 U
Methoxychlor	--	0.03	0.0097 Ui	0.0097 U	0.0097 U	0.0097 U	0.0098 U	0.01 U

Notes:
1. Only detected compounds are reported in the table. The complete analyte list is presented in the Sampling and Analysis Plan (Appendix A) of the RI Work Plan (Hart Crowser, 2004a).
2. Organochlorine Pesticides by EPA Method 8081A. Organophosphorus Pesticides by EPA Method 8141A.
3. µg/L = Micrograms per liter.
4. Fish Consumption SLV = EPA National Recommended Water Quality Criteria: 2002 Human Health for Consumption of Fish.
5. Aquatic SLV = EPA National Recommended Water Quality Criteria: 2002 for CCC Freshwater Biota (noted with a.). Where CCC values are not available, Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Surface Water Aquatic are listed.
6. -- = No screening level available or not analyzed.
7. J = The result is an estimated concentration that is less than the method reporting limit (MRL) but greater than or equal to the method detection limit (MDL).
8. U = The compound was analyzed for but was not detected at or above the MRL/MDL.
9. Boxed values indicate that the detected concentration exceeds the Ecological Screening Criteria.
10. Shaded values indicate that the detected concentration exceeds the EPA AWQC criteria.
11. i = The MRL/MDL was raised due to a chromatographic interference.
12. P = The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 25 percent between the two analytical results.

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TABLE 25B
GRAB SAMPLE CHEMISTRY RESULTS: PESTICIDES - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1SB-05	T4S1SB-06	T4S1SB-61	T4S1SB-62
Sample ID:	Fish Consumption	Aquatic SLV	SB05-GW-1	SB06-GW-1	T4S1GW-61-1	T4S1GW-62-1
Date Sampled:	SLV		03/31/2004	03/31/2004	9/9/2004	9/9/2004
Pesticides/Herbicides (µg/L)						
alpha-BHC	0.0049	2.2	0.0098 U	0.010 U	0.0097 U	0.0097 U
gamma-BHC (Lindane)	0.063	0.08	0.0098 U	0.010 U	0.0097 U	0.0097 U
delta-BHC	--	--	0.0098 U	0.010 U	0.0097 U	0.0097 U
Heptachlor	0.000079	0.0038 [a]	0.0098 U	0.010 U	0.0097 U	0.0097 U
Aldrin	0.00005	0.06 [a]	0.0098 U	0.010 U	0.0097 U	0.0097 U
Heptachlor Epoxide	0.000039	0.0038 [a]	0.0098 U	0.010 U	0.0017 JP	0.0097 U
Endosulfan I	89	0.056 [a]	0.0098 U	0.010 U	0.0097 U	0.0097 U
alpha-Chlordane	0.00081	0.0043 [a]	0.0098 U	0.010 U	0.0097 U	0.0097 U
Dieldrin	0.000054	0.056 [a]	0.0098 U	0.010 U	0.0097 U	0.0097 U
4,4'-DDE	0.00022	--	0.0098 U	0.010 U	0.0097 U	0.0097 U
Endrin	0.81	0.036 [a]	0.0098 U	0.010 U	0.0097 U	0.0097 U
Endosulfan II	89	0.056 [a]	0.0098 U	0.010 U	0.0097 U	0.0097 U
4,4'-DDD	0.00031	0.001	0.0042 JP	0.0029 J	0.0097 Ui	0.0097 U
Endrin Aldehyde	0.3	--	0.0098 U	0.010 U	0.0097 U	0.0097 U
4,4'-DDT	0.00022	0.001	0.0098 Ui	0.010 U	0.0037 JP	0.0028 JP
Endrin Ketone	--	--	0.0098 U	0.010 U	0.0097 U	0.0097 U
Methoxychlor	--	0.03	0.0098 Ui	0.010 Ui	0.0097 Ui	0.0097 U

Notes:
1. Only detected compounds are reported in the table. The complete analyte list is presented in the Sampling and Analysis Plan (Appendix A) of the RI Work Plan (Hart Crowser, 2004a).
2. Organochlorine Pesticides by EPA Method 8081A. Organophosphorus Pesticides by EPA Method 8141A.
3. µg/L = Micrograms per liter.
4. Fish Consumption SLV = EPA National Recommended Water Quality Criteria: 2002 Human Health for Consumption of Fish.
5. Aquatic SLV = EPA National Recommended Water Quality Criteria: 2002 for CCC Freshwater Biota (noted with a.). Where CCC values are not available, Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Surface Water Aquatic are listed.
6. -- = No screening level available or not analyzed.
7. J = The result is an estimated concentration that is less than the method reporting limit (MRL) but greater than or equal to the method detection limit (MDL).
8. U = The compound was analyzed for but was not detected at or above the MRL/MDL.
9. Boxed values indicate that the detected concentration exceeds the Ecological Screening Criteria.
10. Shaded values indicate that the detected concentration exceeds the EPA AWQC criteria.
11. i = The MRL/MDL was raised due to a chromatographic interference.
12. P = The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 25 percent between the two analytical results.

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TABLE 26A
GRAB SAMPLE CHEMISTRY RESULTS: METALS - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1SB-12	T4S1SB-21	T4S1SB-22	T4S1SB-23	T4S1SB-24	T4S1SB-31	T4S1SB-32	T4S1SB-33
Sample ID:	Fish Consumption	Aquatic SLV	T4S1GW-12-1	T4S1GW-21-1	T4S1GW-22-1	T4S1GW-23-1	T4S1GW-24-1	T4S1GW-31-1	T4S1GW-32-1	T4S1GW-33-1
Date Sampled:	SLV		9/9/2004	9/13/2004	9/1/2004	9/2/2004	8/27/2004	9/8/2004	9/3/2004	9/3/2004
Total Metals (µg/L)										
Antimony	640	1,600	0.09	0.18 U	0.16	0.03 B	1.35	0.02 U	0.05 U	0.1 U
Arsenic	0.14	150 [a]	7.4	4.4	13.9	11.8	3.5 B	36.2	4.7	4.9
Beryllium	--	5.3	0.62	0.129	0.388	0.023	0.13	0.811	0.177	0.069
Cadmium	--	0.25	0.22	0.11	0.91	0.03	0.27	0.08	0.03	0.04
Chromium	--	74 [III], 11 [VI]	21.3	6.45	11.5	1.5	21.2	20.3	4.02	1.68
Copper	--	9 [a]	30.6	6.89	28.1	1.76	19.5	28.4	4.79	1.94
Lead	--	2.5 [a]	5.4	1.16	60.9	0.853	1.32	7.14	1.5	0.739
Mercury	--	0.77 [a]	0.2 U	0.2 U	0.13 B	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	4,600	52 [a]	95.2	28.1	13.3	8.14	102	25.2	7.22	4.21
Selenium	4,200	5 [a]	1.9 B	5 U	0.6 B	0.6 B	5 U	1.1	0.6 B	5 U
Silver	--	0.12	0.041	0.038 U	0.144	0.02 U	0.03	0.013 B	0.02 U	0.023 U
Thallium	6.3	40	0.095	0.028	0.044	0.02 U	0.052	0.082	0.017 B	0.009 B
Zinc	26,000	120 [a]	88.1	99	259	32.3	328	74.3	10.7	4.9
Dissolved Metals (µg/L)										
Antimony	640	1,600	0.26	0.17 U	0.05 U	0.02 B	1.98	0.05 U	0.05 U	0.06 U
Arsenic	0.14	150 [a]	4.2	3.2	8.2	11.3	2.1 B	45.3	2.4	2.8
Beryllium	--	5.3	0.02 U	0.02 U	0.009 B	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Cadmium	--	0.25 [a]	0.17	0.09	0.02 U	0.02	0.32	0.02 U	0.02 U	0.02
Chromium	--	74 [III], 11 [VI]	0.41 U	0.59	0.97	0.86	11.2	0.32	0.26 U	0.2 U
Copper	--	9 [a]	1.29	1.44	0.45	0.44	7.94	0.31	0.68	0.3
Lead	--	2.5 [a]	0.03	0.833	0.05	0.02 U	0.01 B	0.02 U	0.02 U	0.02 U
Mercury	--	0.77 [a]	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	4,600	52 [a]	73.2	24.9	4.27	7.98	120	3.57	3.16	2.51
Selenium	4,200	5 [a]	1.6 B	5 U	0.3 B	0.5 B	5 U	0.7 B	0.5 B	5 U
Silver	--	0.12	0.02 U	0.021	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Thallium	6.3	40	0.02 U	0.012 B	0.02 U	0.02 U	0.028	0.02 U	0.02 U	0.007 B
Zinc	26,000	120 [a]	22.8	63.1	2.4	30.7	345	8.2	1.4	0.9

Please refer to notes at end of table.

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TABLE 26A
GRAB SAMPLE CHEMISTRY RESULTS: METALS - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1SB-42	T4S1SB-43	T4S1SB-44	T4S1SB-84	T4S1SB-48	T4S1SB-49	T4S1SB-50
Sample ID:	Fish Consumption SLV	Aquatic SLV	T4S1GW-42-1	T4S1GW-43-1	T4S1GW-44-1	T4S1GW-84-1	T4S1SB-48-1	T4S1SB-49-1	T4S1SB-50-1
Date Sampled:			9/7/2004	8/31/2004	8/31/2004	9/9/2004	8/23/2004	8/23/2004	8/23/2004
Total Metals (µg/L)									
Antimony	640	1,600	0.05 U	0.12 N	0.04 B	0.17	0.05 U	0.06	0.05 U
Arsenic	0.14	150 [a]	0.6	19.1	5.3	9.9	1.2	1.2	0.8
Beryllium	--	5.3	0.009 B	0.657	0.217	1.54	0.08	0.05	0.033
Cadmium	--	0.25	0.02	0.07	0.03	0.45	0.02 U	0.02 U	0.02 U
Chromium	--	74 [III], 11 [VI]	0.46	7.37	3.64	39.8	2.18	1.21	0.84
Copper	--	9 [a]	0.82	7.18	4.51	56.8	2.29	1.3	0.91
Lead	--	2.5 [a]	0.133	6.39	2.3	43.6	1.14	0.775	0.594
Mercury	--	0.77 [a]	0.2 U	0.2 U	0.2 U	0.11 B	0.2 U	0.2 U	0.2 U
Nickel	4,600	52 [a]	7.47	7.07	5.62	34.3	3.99	2.74	2.49
Selenium	4,200	5 [a]	5 U	0.8 B	0.8 B	1.4 B	0.2 B	0.3 B	0.3 B
Silver	--	0.12	0.02 U	0.02 U	0.02 U	0.13	0.02 U	0.009 B	0.02 U
Thallium	6.3	40	0.011 B	0.051	0.027	0.184	0.011 B	0.007 B	0.02 U
Zinc	26,000	120 [a]	2.2	11.3	10.9	107	6.6	3.5	3.1
Dissolved Metals (µg/L)									
Antimony	640	1,600	0.06 U	0.05 U	0.05 U	0.05 B	0.05 U	0.05 U	0.02 B
Arsenic	0.14	150 [a]	0.5	0.3 B	0.3 B	0.5 B	0.5	0.3 B	0.3 B
Beryllium	--	5.3	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Cadmium	--	0.25 [a]	0.03	0.02 U	0.02 U	0.03	0.02 U	0.02 U	0.02 U
Chromium	--	74 [III], 11 [VI]	0.14 B	0.24 U	0.22 U	0.24 U	0.15 B	0.15 B	0.18 B
Copper	--	9 [a]	0.56	0.35	0.52	0.7	0.24	0.28	0.28
Lead	--	2.5 [a]	0.014 B	0.028 U	0.02 U	0.03	0.02 U	0.02 U	0.144
Mercury	--	0.77 [a]	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	4,600	52 [a]	7.72	1.81	2.29	3.78	1.8	1.73	1.84
Selenium	4,200	5 [a]	5 U	1 U	0.7 B	0.3 B	1 U	0.3 B	1 U
Silver	--	0.12	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Thallium	6.3	40	0.013 B	0.008 B	0.02 U	0.005 B	0.02 U	0.02 U	0.02 U
Zinc	26,000	120 [a]	1.5	0.6	1.4	1.97	0.8	0.8	1.5

Notes:

1. All analytes compounds are reported in the table.
2. Total/Dissolved Metals using EPA 6000-7000 Series Methods.
3. µg/L = Micrograms per liter.
4. Fish Consumption SLV = EPA National Recommended Water Quality Criteria: 2002 Human Health for Consumption of Fish.
5. Aquatic SLV = EPA National Recommended Water Quality Criteria: 2002 for CCC Freshwater Biota (noted with a.). Where CCC values are not available, Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Surface Water Aquatic are listed.
6. -- = No screening level available or not analyzed.
7. B = The result is an estimated concentration that is less than the MRL but greater than or equal to the method detection limit (MDL).
8. U = The compound was analyzed for but was not detected at or above the MRL/MDL.
9. N = The matrix spike sample recovery is not within control limits. The case narrative suggests that this sample may be biased low.
10. [III] = SLV for Chromium III.
11. [VI] = SLV for Chromium VI.
12. Boxed values indicate that the detected concentration exceeds the Ecological Screening Criteria (for chromium, Chromium III used).
13. Shaded values indicate that the detected concentration exceeds the EPA AWQC.

KMB00008363

TABLE 26B
GRAB SAMPLE CHEMISTRY RESULTS: METALS - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1SB-07	T4S1SB-08	T4S1SB-51	T4S1SB-52	T4S1SB-53	T4S1SB-54	T4S1SB-55	T4S1SB-56	T4S1SB-57
Sample ID:	Fish Consumption	Aquatic SLV	SB07-GW-1	SB08-GW-1	T4S1GW-51-1	T4S1GW-52-1	T4S1GW-53-1	T4S1GW-54-1	T4S1GW-55-1	T4S1GW-56-1	T4S1GW-57-1
Date Sampled:	SLV		03/30/2004	03/31/2004	9/1/2004	9/1/2004	8/30/2004	9/1/2004	8/31/2004	8/31/2004	8/31/2004
Total Metals (µg/L)											
Antimony	640	1,600	0.056	0.018 B	1.15	5.48	0.05 U	4.37	0.05 U,N	0.05 U,N	0.05 U,N
Arsenic	0.14	150 [a]	0.9	15.7	8	5.5	17.9	7.2	4.3	6.3	7.7
Beryllium	--	5.3	0.018 B	0.01 B	0.538	0.014 B	0.03 U	0.152	0.059	0.065	0.045
Cadmium	--	0.25	0.011 B	0.02 U	0.08	0.06	0.03	0.04	0.06	0.02 U	0.02
Chromium	--	74 [III], 11 [VI]	5.18	0.72	42.4	2.18	4.51	16.3	2.21	2.53	2.04
Copper	--	9 [a]	2.29	0.47 B	41.6	8.94	0.96	17.9	2.42	2.5	2.02
Lead	--	2.5 [a]	1.21	0.113	6.5	0.294	0.7	1.87	0.873	0.583	0.535
Mercury	--	0.77 [a]	0.10 U	0.10 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	4,600	52 [a]	4.53	1.13	93.4	73.8	8.47	45	6.45	6.73	7.02
Selenium	4,200	5 [a]	0.5 B	0.1 B	3.5 B	4.3 B	5 U	3.1 B	0.3 B	0.7 B	0.8 B
Silver	--	0.12	0.005 B	0.004 U	0.043	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Thallium	6.3	40	0.005 B	0.003 U	0.063	0.007 B	0.005 B	0.012 B	0.02 U	0.02 U	0.02 U
Zinc	26,000	120 [a]	16.8	3	1,040	1,520	4.5	6,730	6.1	5.7	4.7
Dissolved Metals (µg/L)											
Antimony	640	1,600	0.062	0.024 B	2.17	6.32	0.05 U	3.02	0.05 U	0.05 U	0.05 U
Arsenic	0.14	150 [a]	0.8	14.7	2.1	3.5	14.9	0.9	4.2	5.9	7.6
Beryllium	--	5.3	0.005 B	0.008 B	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Cadmium	--	0.25 [a]	0.006 U	0.006 U	0.02	0.03	0.02 U	0.03	0.02 U	0.02 U	0.02 U
Chromium	--	74 [III], 11 [VI]	0.27	0.12 B	0.31 U	0.48	0.77	0.35 U	0.92	0.77	0.85
Copper	--	9 [a]	0.15 B	0.07 B	0.94	1.77	0.06 B	2.07	0.75	0.65	0.76
Lead	--	2.5 [a]	0.007 U	0.014 B	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Mercury	--	0.77 [a]	0.10 U	0.10 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	4,600	52 [a]	2.93	0.85	31.6	61.7	7.47	26	5.16	5	5.66
Selenium	4,200	5 [a]	0.4 B	0.1 B	3.2 B	3.8 B	5 U	2.7 B	0.3 B	0.5 B	0.8 B
Silver	--	0.12	0.004 U	0.004 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Thallium	6.3	40	0.004 B	0.004 B	0.02 U	0.009 B	0.02 U	0.009 B	0.02 U	0.02 U	0.02 U
Zinc	26,000	120 [a]	3.2	1.2	153	1,680	1.7	1,120	1.3	1	1.4

Please refer to notes at end of table.

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TABLE 26B
GRAB SAMPLE CHEMISTRY RESULTS: METALS - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1SB-58	T4S1SB-59	T4S1SB-60	T4S1SB-61	T4S1SB-62	T4S1SB-63	T4S1SB-64	T4S1SB-65	T4S1SB-66
Sample ID:	Fish Consumption SLV	Aquatic SLV	T4S1GW-58-1	T4S1GW-59-1	T4S1GW-60-1	T4S1GW-61-1	T4S1GW-62-1	T4S1GW-63-1	T4S1GW-64-1	T4S1GW-65-1	T4S1GW-66-1
Date Sampled:			8/31/2004	9/9/2004	8/30/2004	9/9/2004	9/9/2004	9/9/2004	9/9/2004	8/31/2004	9/9/2004
Total Metals (µg/L)											
Antimony	640	1,600	0.56 N	0.03 B	0.05 U	0.03 B	0.04 B	0.02 B	0.05 U	0.02 B	0.05 U
Arsenic	0.14	150 [a]	4	2.5	1.3	8.6	3.1	0.9	1.7	5.2	2.4
Beryllium	--	5.3	0.038	0.09	0.1	0.54	0.29	0.04	0.06	0.184	0.21
Cadmium	--	0.25	0.02	0.04	0.03	0.04	0.05	0.03	0.02 U	0.02	0.07
Chromium	--	74 [III], 11 [VI]	1.23	1.78	2.88	9.72	5.38	1.06	1.29	2.82	5.69
Copper	--	9 [a]	1.77	3.86	2.95	9.99	6.15	1.55	1.99	3.85	10.5
Lead	--	2.5 [a]	0.488	1.55	1.85	4.36	2.51	1.86	1.03	1.79	3.23
Mercury	--	0.77 [a]	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	4,600	52 [a]	6.01	4.62	8.35	13	9.58	4.13	4.34	4.16	8.36
Selenium	4,200	5 [a]	0.3 B	0.2 B	5 U	0.7 B	0.3 B	0.6 B	0.7 B	0.5 B	0.5 B
Silver	--	0.12	0.02 U	0.02 U	0.01 B	0.02 U	0.03	0.02 U	0.02 U	0.02 U	0.02 U
Thallium	6.3	40	0.02 U	0.008 B	0.016 B	0.026	0.019 B	0.006 B	0.008 B	0.024	0.034
Zinc	26,000	120 [a]	3.1	6.04	10.7	24.8	12.6	7.44	7.45	7.6	19.9
Dissolved Metals (µg/L)											
Antimony	640	1,600	0.61	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Arsenic	0.14	150 [a]	3.9	1.5	0.2 B	1.2	0.6	0.4 B	0.3 B	1.8	1.7
Beryllium	--	5.3	0.02 U	0.02 U	0.02 U	0.01 B	0.04	0.02 U	0.02 U	0.02 U	0.02 U
Cadmium	--	0.25 [a]	0.02	0.02 U	0.02	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Chromium	--	74 [III], 11 [VI]	0.82	0.2 U	0.65	0.3 U	0.22 U	0.2 U	0.24 U	0.2 U	0.2 U
Copper	--	9 [a]	0.72	0.67	0.3	0.8	0.58	0.65	0.68	0.34	0.25
Lead	--	2.5 [a]	0.117	0.05	0.02 U	0.06	0.04	0.07	0.02	0.024 U	0.02 B
Mercury	--	0.77 [a]	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	4,600	52 [a]	5.8	2.91	5.78	2.59	4.14	3.38	3.07	1.83	1.28
Selenium	4,200	5 [a]	0.3 B	0.3 B	5 U	1 U	0.3 B	0.7 B	0.7 B	0.6 B	0.5 B
Silver	--	0.12	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Thallium	6.3	40	0.02 U	0.02 U	0.01 B	0.02 U	0.02 U	0.02 U	0.02 U	0.007 B	0.02 U
Zinc	26,000	120 [a]	1.5	1.72	1.7	2.59	1.3	4.06	3.28	1.8	0.85

Please refer to notes at end of table.

KMB00008365

TABLE 26B
GRAB SAMPLE CHEMISTRY RESULTS: METALS - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Sample Location:	Preliminary Screening Levels		T4S1SB-67	T4S1SB-70	T4S1SB-77	T4S1SB-78	T4S1SB-79	T4S1SB-80	T4S1SB-81
Sample ID:			T4S1GW-67-1	T4S1GW-70-3	T4S1GW-77-1	T4S1GW-78-1	T4S1GW-79-1	T4S1GW-80-1	T4S1GW-81-1
Date Sampled:	Fish Consumption SLV	Aquatic SLV	9/8/2004	8/26/2004	8/30/2004	8/30/2004	8/30/2004	8/30/2004	8/30/2004
Total Metals (µg/L)									
Antimony	640	1,600	0.03 B	0.05 U	0.08 U	0.06 U	0.04 B,N	0.08 U	0.5 N
Arsenic	0.14	150 [a]	4.6	0.5 U	1.8	1.2	1.3	2	1.5
Beryllium	--	5.3	0.58	0.02 U	0.23	0.07	0.112	0.16	0.173
Cadmium	--	0.25	0.05	0.02 U	0.06	0.02 U	0.03	0.04	0.04
Chromium	--	74 [III], 11 [VI]	13.6	0.11 B	6.95	3.92	2.88	4.89	5.44
Copper	--	9 [a]	15.4	0.31	6.24	2.48	4.25	4.26	5.91
Lead	--	2.5 [a]	4.8	0.037	3.52	0.78	1.49	3.36	2.5
Mercury	--	0.77 [a]	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	4,600	52 [a]	17.5	0.2 U	14.6	8.69	5.69	7.06	9.46
Selenium	4,200	5 [a]	0.6 B	1 U	1.1 B	2 B	0.5 B	5 U	0.4 B
Silver	--	0.12	0.015 B	0.02 U	0.03	0.01 B	0.02 U	0.01 B	0.02 U
Thallium	6.3	40	0.053	0.02 U	0.045	0.017 B	0.02 U	0.016 B	0.02 U
Zinc	26,000	120 [a]	44.9	0.8	21.1	9.8	7.8	12.7	15.6
Dissolved Metals (µg/L)									
Antimony	640	1,600	0.05 U	0.05 U	0.05 U	0.05 U	0.03 B	0.05 U	0.81
Arsenic	0.14	150 [a]	1.1	0.5 U	0.3 B	0.4 B	0.4 B	0.3 B	0.4 B
Beryllium	--	5.3	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.03
Cadmium	--	0.25 [a]	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.04
Chromium	--	74 [III], 11 [VI]	0.2 U	0.08 B	0.78	1.38	0.21 U	0.93	0.44
Copper	--	9 [a]	0.49	0.06 B	0.34	0.35	0.7	0.34	0.82
Lead	--	2.5 [a]	0.04	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.029
Mercury	--	0.77 [a]	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	4,600	52 [a]	2.67	0.2 U	5.37	6.4	3.21	3	3.44
Selenium	4,200	5 [a]	0.4 B	1 U	1.5 B	1.9 B	0.4 B	5 U	0.4 B
Silver	--	0.12	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.014 B
Thallium	6.3	40	0.02 U	0.02 U	0.009 B	0.008 B	0.02 U	0.02 U	0.034
Zinc	26,000	120 [a]	2.83	0.4 B	1.1	1.4	1	1	1

Notes:
1. All analytes compounds are reported in the table.
2. Total/Dissolved Metals using EPA 6000-7000 Series Methods.
3. µg/L = Micrograms per liter.
4. Fish Consumption SLV = EPA National Recommended Water Quality Criteria: 2002 Human Health for Consumption of Fish.
5. Aquatic SLV = EPA National Recommended Water Quality Criteria: 2002 for CCC Freshwater Biota (noted with a.). Where CCC values are not available, Oregon Department of Environmental Quality Level II Screening Level Values (SLVs) for Surface Water Aquatic are listed.
6. -- = No screening level available or not analyzed.
7. B = The result is an estimated concentration that is less than the MRL but greater than or equal to the method detection limit (MDL).
8. U = The compound was analyzed for but was not detected at or above the MRL/MDL.
9. N = The matrix spike sample recovery is not within control limits. The case narrative suggests that this sample may be biased low.
10. [III] = SLV for Chromium III.
11. [VI] = SLV for Chromium VI.
12. Boxed values indicate that the detected concentration exceeds the Ecological Screening Criteria (for chromium, Chromium III used).
13. Shaded values indicate that the detected concentration exceeds the EPA AWQC.
14. Sample T4S1GW-70-3 represents a primary sample although the nomenclature suggests that it is a duplicate.

KMB00008366

TABLE 27A
RISK EVALUATION USING 90UCL AND RME EXPOSURE FACTORS - OU1
SOILS FROM LESS THAN OR EQUAL TO 15 FEET

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

OU1: Soils from less than or equal to 15 feet

Constituents of Potential Concern (COPCs)		Mean Conc. (mg/kg)	90UCL		Occupational Worker				Excavation/Construction Worker			
CASNo	Analyte		Value (mg/kg)	Data Distribution	Ingestion	Dermal Contact	Inhalation of Particulates	Total	Ingestion	Dermal Contact	Inhalation of Particulates	Total
Semivolatile Organics (PAHs)												
56-55-3	Benzo[a]anthracene	0.35	0.70	lognormal*	1.6E-07	1.4E-07	2.2E-12	3.0E-07	8.5E-10	3.3E-10	3.6E-15	1.2E-09
50-32-8	Benzo[a]pyrene	0.50	1.00	lognormal*	2.3E-06	2.0E-06	3.2E-11	4.3E-06	1.2E-08	4.7E-09	5.1E-14	1.7E-08
205-99-2	Benzo[b]fluoranthene	0.57	1.14	unknown	2.6E-07	2.2E-07	3.7E-12	4.9E-07	1.4E-09	5.4E-10	5.8E-15	1.9E-09
53-70-3	Dibenz[ah]anthracene	0.10	0.20	lognormal*	4.6E-07	4.0E-07	6.5E-12	8.6E-07	2.4E-09	9.5E-10	1.0E-14	3.4E-09
193-39-5	Indeno[1,2,3-cd]pyrene	0.40	0.86	lognormal*	2.0E-07	1.7E-07	2.8E-12	3.7E-07	1.0E-09	4.1E-10	4.4E-15	1.4E-09
							Cumulative:	6.3E-06				2.5E-08

Notes:

1. Values in the table are excess individual lifetime risk of developing cancer. The cumulative risk is the sum of exposure route-specific risks. A cancer risk of 1 x 10-6 indicates that an additional 1 in 1,000,000 individuals would be expected to get cancer above the normal expected cancer rate.
2. Each data set was tested for distribution (norma, gamma, and lognormal); 90UCL was calculated. Non parametric methods for calculating the 90UCL were used when the distribution was unknown or when the lognormal distribution (*) was highly skewed (>2.5)
3. Equation for incidential ingestion is derived from Equation A.9 in the DEQ (2000)
4. Equation for direct contact is derived from Equations A.30 and A.32 in the DEQ (2000)
5. Equation for inhalation of soil particulates is Equations A.50, A.52, and A.53 in the DEQ (2000) and Particulate Emission Factor parameters for Portland, Oregon from Table 2 of Appendix D in EPA (1996). Source size was assumed to be 30 acres with 50% vegetative/hard cover.
6. EPA 1996 Soil Screening Guidance: Users Guide (July 1996 9355.4-23) and Technical Background Document for Soil Screening Guidance (May 1996 9355.4-1/A)

KMB00008367

TABLE 27B
RISK EVALUATION USING 90UCL AND RME EXPOSURE FACTORS - OU2
SOILS FROM LESS THAN OR EQUAL TO 15 FEET

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

OU2: Soils from less than or equal to 15 feet

Constituents of Potential Concern (COPCs)		Mean Conc. (mg/kg)	90UCL		Occupational Worker				Excavation/Construction Worker			
CASNo	Analyte		Value (mg/kg)	Data Distribution	Ingestion	Dermal Contact	Inhalation of Particulates	Total	Ingestion	Dermal Contact	Inhalation of Particulates	Total
Semivolatile Organics (PAHs)												
56-55-3	Benzo[a]anthracene	0.73	1.55	lognormal*	3.6E-07	3.1E-07	5.0E-12	6.6E-07	1.9E-09	7.3E-10	8.0E-15	2.6E-09
50-32-8	Benzo[a]pyrene	0.95	2.1	lognormal*	4.9E-06	4.2E-06	6.8E-11	9.1E-06	2.6E-08	1.0E-08	1.1E-13	3.6E-08
205-99-2	Benzo[b]fluoranthene	0.97	2.21	lognormal*	5.1E-07	4.3E-07	7.1E-12	9.4E-07	2.7E-09	1.0E-09	1.1E-14	3.7E-09
53-70-3	Dibenz[ah]anthracene	0.20	0.42	lognormal*	9.6E-07	8.3E-07	1.3E-11	1.8E-06	5.1E-09	2.0E-09	2.1E-14	7.1E-09
193-39-5	Indeno[1,2,3-cd]pyrene	0.69	1.70	lognormal*	3.9E-07	3.3E-07	5.5E-12	7.3E-07	2.1E-09	8.0E-10	8.7E-15	2.9E-09
							Cumulative:	1.3E-05				5.2E-08

Notes:

1. Values in the table are excess individual lifetime risk of developing cancer. The cumulative risk is the sum of exposure route-specific risks. A cancer risk of 1 x 10-6 indicates that an additional 1 in 1,000,000 individuals would be expected to get cancer above the normal expected cancer rate.
2. Each data set was tested for distribution (norma, gamma, and lognormal); 90UCL was calculated. Non parametric methods for calculating the 90UCL were used when the distribution was unknown or when the lognormal distribution (*) was highly skewed (>2.5)
3. Equation for incidential ingestion is derived from Equation A.9 in the DEQ (2000)
4. Equation for direct contact is derived from Equations A.30 and A.32 in the DEQ (2000)
5. Equation for inhalation of soil particulates is Equations A.50, A.52, and A.53 in the DEQ (2000) and Particulate Emission Factor parameters for Portland, Oregon from Table 2 of Appendix D in EPA (1996). Source size was assumed to be 30 acres with 50% vegetative/hard cover.
6. EPA 1996 Soil Screening Guidance: Users Guide (July 1996 9355.4-23) and Technical Background Document for Soil Screening Guidance (May 1996 9355.4-1/A)

TABLE 28
WORKER EXPOSURE PARAMETERS

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Terminal 4 Slip 1 OU1 and OU2

Occupational Worker

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	Rationale/Reference
Adult					
General	BW	Body Weight	kg	70	Recommended value for adults (DEQ 2000, EPA 1989)
	EF	Exposure Frequency	days/yr	225	Recommended value for Outdoor workers (EPA 2002)
	ED	Exposure Duration	years	25	Recommended value for Outdoor workers (EPA 2002)
	ATc	Averaging time, cancer	days	25,550	Recommended value (EPA 1989 and DEQ 2000)
	ATnc	Averaging time, noncancer	days	9,125	Recommended value (EPA 1989 and DEQ 2000)
	CF	Conversion Factor	kg/mg	0.000001	
Ingestion	SIR	Soil Ingestion Rate	mg/day	100	Recommended value for construction workers (EPA 2002)
Inhalation	IRa	Inhalation Rate	m3/day	20	Recommended value for construction workers (EPA 2002)
	EFh	Hours of exposure	hrs/day	8	Standard work day
Dermal	SA	Exposure skin surface area per day	cm^2/day	3,300	Recommended value for construction workers (EPA 2002, 2004)
	AF	Adherence factor	mg/cm^2	0.20	Recommended value for construction workers (EPA 2002, 2004)

Excavation/Constuction Worker

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	Rationale/Reference
General	BW	Body Weight	kg	70	Recommended value for adults (DEQ 2000, EPA 1989)
	EF	Exposure Frequency	days/yr	9	Recommended RME value for excavation workers (DEQ 2000)
	ED	Exposure Duration	years	1	Recommended RME value for excavation workers (DEQ 2000)
	ATc	Averaging time, cancer	days	25,550	Recommended value (EPA 1989 and DEQ 2000)
	ATnc	Averaging time, noncancer	days	365	Recommended value (EPA 1989 and DEQ 2000)
	CF	Conversion Factor	kg/mg	0.000001	
Ingestion	SIR	Soil Ingestion Rate	mg/day	330	Recommended value for construction workers (EPA 2002)
Inhalation	IRa	Inhalation Rate	m3/day	20.0	Recommended value for construction workers (EPA 2002)
	EFh	Hours of exposure	hrs/day	8	Standard work day
Dermal	SA	Exposure skin surface area per day	cm^2/day	3,300	Recommended value for construction workers (EPA 2002, 2004)
	AF	Adherence factor	mg/cm^2	0.30	Recommended value for construction workers (EPA 2002, 2004)

Notes:

1. CTE - central tendency exposure
2. EPA, 1989. Risk Assessment Guidance for Superfund. Volume I, Human Health Evaluation Manual (Part A). Interim Final. EPA/540/1-89/002.
3. EPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites
4. EPA, 2004. Risk Asseesment Guidance for Superfund Sites Volume I: Human Health Evaluation Manual Part E, Suipplemental Guidance for Dermal Risk Assessment
5. DEQ, 2000. Guidance for Conduct of Deterministic Human Health Risk Assessments, Final December 1998, Updated May 2000.

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TABLE 29
SUMMARY OF CPECs - SOILS

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Terminal 4 Slip 1 Operable Unit 1 - Oregon Screening Levels (Ecological Receptors)

Analyte (CPECs)[1]	Plants				Invertebrates				Birds				Mammals			
	T/E Species (HQ>1)		*Non-T/E Species (HQ>5)*		*T/E Species (HQ>1)*		*Non-T/E Species (HQ>5)*		*T/E Species (HQ>1)*		*Non-T/E Species (HQ>5)*		*T/E Species (HQ>1)*		*Non-T/E Species (HQ>5)*	
	MDC	90UCL	MDC	90UCL	MDC	90UCL	MDC	90UCL	MDC	90UCL	MDC	90UCL	MDC	90UCL	MDC	90UCL
Lead	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes	No	No	No	No	No
Zinc	Yes	Yes	Yes	No	Yes	Yes	Yes[2]	No	Yes	Yes	Yes	No	No	No	No	No
Copper	No	--	No	--	Yes	No	No	No	No	No	No	No	No	No	No	No
Mercury	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No
Total Chromium	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	Yes	Yes	Yes	Yes

Terminal 4 Slip 1 Operable Unit 2 - Oregon Screening Levels (Ecological Receptors)

Analyte (CPECs)[1]	Plants				Invertebrates				Birds				Mammals			
	T/E Species (HQ>1)		*Non-T/E Species (HQ>5)*		*T/E Species (HQ>1)*		*Non-T/E Species (HQ>5)*		*T/E Species (HQ>1)*		*Non-T/E Species (HQ>5)*		*T/E Species (HQ>1)*		*Non-T/E Species (HQ>5)*	
	MDC	90UCL	MDC	90UCL	MDC	90UCL	MDC	90UCL	MDC	90UCL	MDC	90UCL	MDC	90UCL	MDC	90UCL
Cadmium	Yes	No	Yes	No	Yes	No	No	No	Yes	No	No	No	No	No	No	No
Copper	Yes	No	No	No	Yes	No	No	No	Yes	No	No	No	No	No	No	No
Lead	Yes	Yes	Yes	No	Yes	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No
Nickel	Yes	No	No	No	No	No	No	No	No	--	No	--	No	No	No	No
Selenium	Yes	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No
Silver	Yes	No	No	No	No	No	No	No	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	Yes	Yes	Yes	Yes
Arsenic	Yes	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No
Mercury	Yes	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No
DDT	--	--	--	--	--	--	--	--	Yes	Yes	Yes	No	No	No	No	No
Total Chromium	Yes		Yes		Yes		Yes		Yes		Yes		No		No	
Zinc	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	No	No	No

Terminal 4 Slip 1 Operable Unit 2 Riverbank Area - Oregon Screening Levels (Ecological Receptors)

Analyte (CPECs)[1]	Plants				Invertebrates				Birds				Mammals			
	T/E Species (HQ>1)		*Non-T/E Species (HQ>5)*		*T/E Species (HQ>1)*		*Non-T/E Species (HQ>5)*		*T/E Species (HQ>1)*		*Non-T/E Species (HQ>5)*		*T/E Species (HQ>1)*		*Non-T/E Species (HQ>5)*	
	MDC	90UCL	MDC	90UCL	MDC	90UCL	MDC	90UCL	MDC	90UCL	MDC	90UCL	MDC	90UCL	MDC	90UCL
Cadmium	Yes	Yes	Yes	No	Yes	No	No	No	Yes	Yes	No	No	Yes[2]	No	No	No
Copper	Yes	No	No	No	Yes	Yes	No	No	Yes	No	No	No	Yes[2]	No	No	No
Lead	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes[2]	No	No	No
Silver	Yes	No	No	No	No	No	No	No	--	--	--	--	--	--	--	--
Arsenic	Yes	No	No	No	No	No	No	No	Yes	No	No	No	Yes[2]	No	Yes[2]	No
Mercury	Yes	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No
DDT	--	--	--	--	--	--	--	--	Yes	Yes	Yes	No	No	No	No	No
Zinc	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes[2]	No	No	No
Thallium	No	No	No	No	--	--	--	--	--	--	--	--	Yes[2]		No	
Total Chromium	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No

Notes:
1. CPECs are COIs whose MDCs exceed a DEQ Level II SLV (Table 1, Guidance for Ecological Risk Assessment, DEQ, December 2001)
2. These are CPECs based on potential risk from multiple COIs simultaneously
3. CPECs - contaminants of potential ecological concern
4. COIs - constituents of interest
5. SLV - screening level value
6. DEQ - Oregon Department of Environmental Quality
7. MDC - maximum detected concentration
8. 90UCL - 90% upper confidence limit
9. * - no 90UCL calculated due to too few samples
10. -- = indicates that there is no SLV for the receptor
11. 90UCLs were calculated using one half the detection limit for nondetects
12. Highlights indicate that the 90UCL is greater than SLV
13. Bold Italics indicate that 90UCL is greater than SLV for non-T/E species (HQ>5)

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TABLE 30
SUMMARY OF CPECs - GROUNDWATER

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Terminal 4 Slip 1 Operable Unit 1 - Oregon Screening Levels (Aquatic Receptors)

Analyte (CPECs)[1]	*T/E Species (HQ>1)*		*Non-T/E Species (HQ>5)*	
	MDC	90UCL	MDC	90UCL
Benzo(a)anthracene	Yes	No	Yes[2]	No
Benzo(a)pyrene	Yes	***Yes***	Yes[2]	No
Carbon Disulfide	Yes	No	No	No
Total Chromium, total	Yes	*	No	*
Heptachlor	Yes[2]	*	No	*
Heptachlor epoxide	Yes[2]	*	No	*
Lead, total	Yes[2]	*	No	*

Terminal 4 Slip 1 Operable Unit 2 - Oregon Screening Levels (Aquatic Receptors)

Analyte (CPECs)[1]	*T/E Species (HQ>1)*		*Non-T/E Species (HQ>5)*	
	MDC	90UCL	MDC	90UCL
Benzo(a)anthracene	Yes	***Yes***	No	No
Benzo(a)pyrene	Yes	***Yes***	Yes	No
Carbon Disulfide	Yes	No	No	No
Copper, total	Yes	No	No	No
DDD	Yes	*	No	*
DDT	Yes	*	No	*
Lead, total	Yes	No	No	No
Total Chromium, total	Yes	No	No	No

Notes:
1. CPECs are COIs whose MDCs exceed a DEQ Level II SLV (Table 1, Guidance for Ecological Risk Assessment, DEQ, December 20(
2. These are CPECs based on potential risk from multiple COIs simultaneously
3. CPECs - contaminants of potential ecological concern
4. COIs - constituents of interest
5. SLV - screening level value
6. DEQ - Oregon Department of Environmental Quality
7. MDC - maximum detected concentration
8. 90UCL - 90% upper confidence limit
9. * - no 90UCL calculated due to too few samples
10. -- = indicates that there is no SLV for the receptor
11. 90UCLs were calculated using one half the detection limit for nondetects
12. Highlights indicate that the 90UCL is greater than SLV
13. Bold Italics indicate that 90UCL is greater than SLV for non-T/E species (HQ>1)

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TABLE 31
SUMMARY OF JSCS SCREENING - ECOLOGICAL RECEPTORS

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Terminal 4 Slip 1 Operable Unit 2 - Riverbank Soils [1.]

Analyte (CPECs)[2]	Exceedance Locations[3]
Acenaphthene	S27A, S28A, S30D
Benzo[a]anthracene	S26B, S26D, S27A, S28, S28A, S29, S30, S30A, S30C
Benzo[a]pyrene	S26B, S26D, S27A, S28, S28A, S29, S30, S30A, S30C
Benzo[g,h,i]perylene	S26, S26B, S26D, S27, S27A, S28, S28A, S29, S30, S30A, S30C
Cadmium	S23, S24, S25, S26, S26A, S26B, S26C, S26D, S27, S28, S29, S30
Chrysene	S26B, S26D, S27A, S28, S29, S30, S30A, S30C
Copper	S23, S24, S25, S26, S26A, S26B, S26C, S26D, S27, S28, S29, S30
DDD	S26, S27C, S28D, S29
DDE	S26, S27, S28, S28D, S29
DDT	S23, S24, S25, S26, S26C, S26D, S27, S28, S28A, S28B, S28C, S28D, S29, S30, S30A, S30C, S30D
Dibenz[ah]anthracene	S28A
Fluoranthene	S26B, S27A, S28, S28A, S29, S30, S30A
Fluorene	S28A, S30D
Indeno[1,2,3-cd]pyrene	S26, S26B, S26D, S27, S27A, S27B, S28, S28A, S28D, S29, S30, S30A, S30C
Lead	S26, 26D, S29
Naphthalene	S30D
Phenanthrene	S27A, S28A, S29, S30A, S30D
Pyrene	S26B, S26D, S27A, S28, S28A, S29, S30, S30A, S30C
Selenium	S23, S24, S25, S26, S26A, S26B, S26C, S26D, S27, S28, S29, S30
Zinc	S23, S24, S25, S26, S26A, S26B, S26C,S26D, S27, S28, S29, S30

Terminal 4 Slip 1 Operable Unit 1 - Groundwater [4.]

Analyte (CPECs) [2.]	Exceedance Locations [3.]
Benzo[a]anthracene	MW07
Benzo[a]pyrene	MW07
Carbon disulfide	MW07
Lead, total	MW26

Terminal 4 Slip 1 Operable Unit 2 - Groundwater [4.]

Analyte (CPECs) [2.]	Exceedance Locations [3.]
Benzo[a]anthracene	MW16
Benzo[a]pyrene	MW16
Cadmium, dissolved	MW16
Carbon disulfide	MW16
Copper, dissolved	MW16
Copper, total	MW12, MW15, MW16
DDT	MW09, MW11
Lead, dissolved	MW16
Lead, total	MW09, MW12, MW15, MW16
Mercury, total	MW09, MW10, MW11, MW12, MW13
Xylene (mixed)	MW10

Notes:

1. Soil results are only presented for OU2, because there are no potentially erodable riverbank soils in OU1.
2. CPECs are constituents whose MDCs exceed the applicable JSCS screening criteria; refer to Appendix B-3 for more information.
3. Exceedance locations are sampling locations with a detected concentration that exceeded the applicable JSCS screening criteria. Soil locations with A, B, C, D are discrete samples (versus composite samples).
4. Groundwater data based on results from downgradient monitoring wells only
5. JSCS - Joint Source Control Strategy
6. CPECs - contaminants of potential ecological concern
7. MDC - maximum detected concentration
8. All JSCS criteria from Table 3-1, Final Portland Harbor Joint Source Control Strategy, December 21, 2005, http://www.deq.state.or.us/nwr/Portland Harbor/jscs (downloaded January 3, 2006)

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TABLE 32A
GROUNDWATER SUMMARY (DOWNGRADIENT MONITORING WELLS) AND RISK SCREENING (HUMAN HEALTH) - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

OU1: Oregon Joint Source Control Screening Levels (Human Health)

Constituents of Interest (COI)					Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	COI Conc. (max)	JSCS Screening Level Value - Human Health Fish Consumption (17.5 g/day consumption rate)*		Does COI Concentration Exceed Screening Value?	All sample locations where detects exceed JSCS criteria
CASNo	Analyte	Analyte Group	Fraction	Units	Minimum	Maximum	Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max			Value (mg/L)	Source		
71-55-6	1,1,1-Trichloroethane	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.0005	0.0005				ND	NA	NA	NA	
75-34-3	1,1-Dichloroethane	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.0005	0.0005				ND	NA	NA	NA	
75-35-4	1,1-Dichloroethylene	VOC		mg/L	4/20/2004	5/5/2005	14	13	7%	0.0005	0.0005	0.00037	0.00037	MW03s	3.70E-04	NA	NA	NA	
95-63-6	1,2,4-Trimethylbenzene	VOC		mg/L	4/20/2004	5/5/2005	14	13	7%	0.002	0.002	0.002	0.002	MW01s	2.00E-03	NA	NA	NA	
156-59-2	1,2-Dichloroethylene (cis)	VOC		mg/L	4/20/2004	5/5/2005	14	9	36%	0.0005	0.0005	0.0023	0.089	MW03s	8.90E-02	NA	NA	NA	
156-60-5	1,2-Dichloroethylene (trans)	VOC		mg/L	4/20/2004	5/5/2005	14	11	21%	0.0005	0.0005	0.0002	0.00078	MW03s	7.80E-04	1.00E+01	EPA's 2004 NRWQC (organism only)	No	
541-73-1	1,3-Dichlorobenzene	SVOC, Halogenated		mg/L	4/20/2004	5/5/2005	14	14	0%	0.0005	0.0005				ND	9.60E-01	EPA's 2004 NRWQC (organism only)	No	
106-46-7	1,4-Dichlorobenzene	SVOC, Halogenated		mg/L	4/20/2004	5/5/2005	14	14	0%	0.0005	0.0005				ND	1.90E-01	EPA's 2004 NRWQC (organism only)	No	
90-12-0	1-Methylnaphthalene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	2/3/2005	5/5/2005	7	6	14%	0.00002	0.0002	2.8E-05	2.8E-05	MW08	2.80E-05	NA	NA	NA	
78-93-3	2-Butanone	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.02	0.02				ND	NA	NA	NA	
91-57-6	2-Methylnaphthalene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	8/27/2004	5/5/2005	13	5	62%	1.2E-05	0.00002	2.9E-06	2.9E-05	MW08	2.90E-05	NA	NA	NA	
35421-08-0	4-Chloro-3-methylphenol	SVOC, Phenols and Substituted Phenols		mg/L	8/27/2004	2/2/2005	3	2	33%	0.00048	0.0005	3.7E-05	3.7E-05	MW07	3.70E-05	NA	NA	NA	
106-47-8	4-Chloroaniline	SVOC, Halogenated		mg/L	8/27/2004	2/2/2005	3	2	33%	0.0002	0.0002	2.5E-05	2.5E-05	MW07	2.50E-05	NA	NA	NA	
106-44-5	4-Methylphenol	SVOC, Phenols and Substituted Phenols		mg/L	8/27/2004	2/2/2005	3	2	33%	0.00048	0.0005	8.8E-05	8.8E-05	MW07	8.80E-05	NA	NA	NA	
83-32-9	Acenaphthene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	15	21%	8.8E-06	0.0001	4.1E-06	8.3E-05	MW26	8.27E-05	9.90E-01	EPA's 2004 NRWQC (organism only)	No	
208-96-8	Acenaphthylene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	15	21%	1.1E-05	0.0001	2E-06	4.2E-06	MW08	4.20E-06	NA	NA	NA	
67-64-1	Acetone	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.02	0.02				ND	NA	NA	NA	
309-00-2	***Aldrin***	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	11	0%	1.8E-06	0.00008				ND	5.00E-08	EPA's 2004 NRWQC (organism only)	***ND>SLV***	
5103-71-9	***alpha-Chlordane***	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	11	0%	1.8E-06	0.00004				ND	8.10E-07	EPA's 2004 NRWQC (organism only)	***ND>SLV***	
120-12-7	Anthracene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	2	89%	0.0001	0.0001	4.5E-06	0.00009	MW03s	9.00E-05	4.00E+01	EPA's 2004 NRWQC (organism only)	No	
7440-36-0	Antimony and compounds	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	2	50%	0.00004	0.00005	0.00005	0.00101	MW08	1.01E-03	6.40E-01	EPA's 2004 NRWQC (organism only)	No	
7440-36-0	Antimony and compounds	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	4	0%	0.00005	0.003				ND	6.40E-01	DEQ's 2004 AWQC (organism only)	No	
12674-11-2	Aroclor 1016	PCBs Aroclors		mg/L	4/21/2004	5/5/2005	7	7	0%	0.0002	0.00031				ND	NA	NA	NA	
11104-28-2	Aroclor 1221	PCBs Aroclors		mg/L	4/21/2004	5/5/2005	7	7	0%	0.00039	0.00062				ND	NA	NA	NA	
11141-16-5	Aroclor 1232	PCBs Aroclors		mg/L	4/21/2004	5/5/2005	7	7	0%	0.0002	0.00031				ND	NA	NA	NA	
53469-21-9	Aroclor 1242	PCBs Aroclors		mg/L	4/21/2004	5/5/2005	7	7	0%	0.0002	0.00031				ND	NA	NA	NA	
12672-29-6	Aroclor 1248	PCBs Aroclors		mg/L	4/21/2004	5/5/2005	7	7	0%	0.0002	0.00031				ND	NA	NA	NA	
11097-69-1	Aroclor 1254	PCBs Aroclors		mg/L	4/21/2004	5/5/2005	7	7	0%	0.0002	0.00031				ND	NA	NA	NA	
11096-82-5	Aroclor 1260	PCBs Aroclors		mg/L	4/21/2004	5/5/2005	7	7	0%	0.0002	0.00031				ND	NA	NA	NA	
7440-38-2	*Arsenic*	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	0	100%			0.00013	0.0108	MW26	1.08E-02	1.40E-04	EPA's 2004 NRWQC (organism only)	Yes	MW08, MW26
7440-38-2	*Arsenic*	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	1	75%	0.001	0.001	0.00038	0.0098	MW26	9.80E-03	1.40E-04	DEQ's 2004 AWQC (organism only)	Yes	MW08, MW26
71-43-2	Benzene	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.0005	0.0005				ND	5.10E-02	EPA's 2004 NRWQC (organism only)	No	
56-55-3	*Benzo[a]anthracene*	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	12	37%	1.2E-05	0.0001	2.2E-06	6.7E-05	MW07	6.70E-05	1.80E-05	EPA's 2004 NRWQC (organism only)	Yes	MW07
50-32-8	*Benzo[a]pyrene*	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	12	37%	1.6E-05	0.0001	1.6E-06	6.9E-05	MW07	6.90E-05	1.80E-05	EPA's 2004 NRWQC (organism only)	Yes	MW07
205-99-2	*Benzo[b]fluoranthene*	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	12	37%	0.00002	0.0001	2.2E-06	0.00011	MW07	1.10E-04	1.80E-05	EPA's 2004 NRWQC (organism only)	Yes	MW07
191-24-2	Benzo[g,h,i]perylene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	18	5%	0.00002	0.0001	3.4E-05	3.4E-05	MW07	3.40E-05	NA	NA	NA	
207-08-9	*Benzo[k]fluoranthene*	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	15	21%	0.00002	0.0001	1.5E-06	8.4E-05	MW07	8.40E-05	1.80E-05	EPA's 2004 NRWQC (organism only)	Yes	MW07
7440-41-7	Beryllium and compounds	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	4	0%	0.00002	0.00011				ND	NA	NA	NA	
7440-41-7	Beryllium and compounds	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	3	25%	0.001	0.001	3.3E-05	3.3E-05	MW08	3.30E-05	NA	NA	NA	
319-84-6	BHC (alpha)	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	10	9%	1.8E-06	0.00004	2.3E-06	2.3E-06	MW08	2.30E-06	4.90E-06	EPA's 2004 NRWQC (organism only)	No	
319-85-7	BHC (beta)	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	9	18%	1.8E-06	0.001	5.3E-06	7.9E-06	MW03s	7.90E-06	1.70E-05	EPA's 2004 NRWQC (organism only)	No	
58-89-9	BHC (gamma) Lindane	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	10	9%	1.8E-06	0.00004	1.5E-06	1.5E-06	MW08	1.50E-06	1.80E-03	EPA's 2004 NRWQC (organism only)	No	
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	SVOC, Phthalate Esters		mg/L	8/27/2004	2/2/2005	3	3	0%	0.002	0.002				ND	2.20E-03	EPA's 2004 NRWQC (organism only)	No	
7440-43-9	Cadmium and compounds	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	4	0%	0.00002	0.0001				ND	NA	NA	NA	
7440-43-9	Cadmium and compounds	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	3	25%	0.001	0.001	0.00002	0.00002	MW08	2.00E-05	NA	NA	NA	
75-15-0	Carbon disulfide	VOC		mg/L	4/20/2004	5/5/2005	14	10	29%	0.0005	0.0005	0.0002	0.00094	MW07	9.40E-04	NA	NA	NA	
108-90-7	Chlorobenzene	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.0005	0.0005				ND	1.60E+00	EPA's 2004 NRWQC (organism only)	No	
67-66-3	Chloroform	VOC		mg/L	4/20/2004	5/5/2005	14	10	29%	0.0005	0.0005	0.00019	0.0005	MW01s	5.00E-04	4.70E-01	EPA's 2004 NRWQC (organism only)	No	
218-01-9	*Chrysene*	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	12	37%	1.4E-05	0.0001	2.8E-06	5.1E-05	MW07	5.10E-05	1.80E-05	EPA's 2004 NRWQC (organism only)	Yes	MW07
7440-50-8	Copper and compounds	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	1	75%	0.00018	0.00018	0.00012	0.00042	MW26	4.20E-04	NA	NA	NA	
7440-50-8	Copper and compounds	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	2	50%	0.001	0.00376	0.001	0.001	MW08	1.00E-03	NA	NA	NA	
98-82-8	Cumene (isopropylbenzene)	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.002	0.002				ND	NA	NA	NA	
72-54-8	***DDD***	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	11	0%	1.8E-06	0.00004				ND	3.10E-07	EPA's 2004 NRWQC (organism only)	***ND>SLV***	
72-55-9	*DDE*	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	10	9%	1.8E-06	0.00008	4.3E-06	4.3E-06	MW08	4.30E-06	2.20E-07	EPA's 2004 NRWQC (organism only)	Yes	MW08
50-29-3	***DDT***	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	11	0%	1.8E-06	0.00008				ND	2.20E-07	EPA's 2004 NRWQC (organism only)	***ND>SLV***	
319-86-8	delta-BHC	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	10	9%	1.8E-06	0.0001	2.8E-06	2.8E-06	MW08	2.80E-06	NA	NA	NA	
53-70-3	Dibenz[ah]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	18	5%	0.00002	0.0002	2.8E-06	2.8E-06	MW08	2.80E-06	1.80E-05	EPA's 2004 NRWQC (organism only)	No	
132-64-9	Dibenzofuran	SVOC, Oxygen-Containing		mg/L	8/27/2004	5/5/2005	13	13	0%	1.4E-05	0.00002				ND	NA	NA	NA	
60-57-1	***Dieldrin***	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	11	0%	1.8E-06	0.00008				ND	5.40E-08	EPA's 2004 NRWQC (organism only)	***ND>SLV***	
DRO	Diesel Range	Petroleum Hydrocarbons		mg/L	4/20/2004	5/5/2005	18	16	11%	0.24	0.63	0.021	0.028	MW03s	2.80E-02	NA	NA	NA	
84-66-2	Diethyl phthalate	SVOC, Phthalate Esters		mg/L	8/27/2004	5/4/2005	4	1	75%	0.0002	0.0002	3.4E-05	0.0001	MW03s	1.00E-04	4.40E+01	EPA's 2004 NRWQC (organism only)	No	
131-11-3	Dimethyl phthalate	SVOC, Phthalate Esters		mg/L	8/27/2004	2/2/2005	3	3	0%	0.0002	0.0002				ND	1.10E+03	EPA's 2004 NRWQC (organism only)	No	
84-74-2	Di-n-butyl phthalate	SVOC, Phthalate Esters		mg/L	8/27/2004	5/4/2005	4	2	50%	0.00019	0.0002	4.1E-05	0.00019	MW03s	1.90E-04	4.50E+00	EPA's 2004 NRWQC (organism only)	No	

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TABLE 32A
GROUNDWATER SUMMARY (DOWNGRADIENT MONITORING WELLS) AND RISK SCREENING (HUMAN HEALTH) - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

OU1: Oregon Joint Source Control Screening Levels (Human Health)

Constituents of Interest (COI)					Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	COI Conc. (max)	JSCS Screening Level Value - Human Health Fish Consumption (17.5 g/day consumption rate)*		Does COI Concentration Exceed Screening Value?	All sample locations where detects exceed JSCS criteria
CASNo	Analyte	Analyte Group	Fraction	Units	Minimum	Maximum	Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max			Value (mg/L)	Source		
959-98-8	Endosulfan I	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	10	9%	1.8E-06	0.00002	1.6E-06	1.6E-06	MW08	1.60E-06	8.90E-02	EPA's 2004 NRWQC (organism only)	No	
33213-65-9	Endosulfan II	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	10	9%	1.8E-06	0.00008	2.2E-06	2.2E-06	MW03s	2.20E-06	8.90E-02	EPA's 2004 NRWQC (organism only)	No	
72-20-8	Endrin	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	10	9%	1.8E-06	0.00008	3.1E-06	3.1E-06	MW08	3.10E-06	6.00E-05	EPA's 2004 NRWQC (organism only)	No	
7421-93-4	Endrin Aldehyde	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	11	0%	1.8E-06	0.00016				ND	3.00E-04	EPA's 2004 NRWQC (organism only)	No	
53494-70-5	Endrin Ketone	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	11	0%	1.8E-06	0.00008				ND	NA	NA	NA	
100-41-4	Ethylbenzene	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.0005	0.0005				ND	2.10E+00	EPA's 2004 NRWQC (organism only)	No	
206-44-0	Fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	9	53%	1.3E-05	0.0001	4.1E-06	3.4E-05	MW08	3.40E-05	1.40E-01	EPA's 2004 NRWQC (organism only)	No	
86-73-7	Fluorene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	15	21%	1.2E-05	0.0001	4.4E-06	0.00001	MW08	1.00E-05	5.30E+00	EPA's 2004 NRWQC (organism only)	No	
GRO	Gasoline Range	Petroleum Hydrocarbons		mg/L	4/20/2004	5/5/2005	18	15	17%	0.05	0.25	0.014	0.019	MW03s	1.90E-02	NA	NA	NA	
76-44-8	*Heptachlor*	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	10	9%	1.8E-06	0.00008	2.8E-06	2.8E-06	MW08	2.80E-06	7.90E-08	EPA's 2004 NRWQC (organism only)	*Yes*	MW08
1024-57-3	*Heptachlor epoxide*	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	10	9%	1.8E-06	0.00004	3.2E-06	3.2E-06	MW08	3.20E-06	3.90E-08	EPA's 2004 NRWQC (organism only)	*Yes*	MW08
193-39-5	Indeno[1,2,3-cd]pyrene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	17	11%	0.00002	0.0001	2.3E-06	3.1E-06	MW08	3.10E-06	1.80E-05	EPA's 2004 NRWQC (organism only)	No	
78-59-1	Isophorone	SVOC, Oxygen-Containing		mg/L	8/27/2004	2/2/2005	3	3	0%	0.0002	0.0002				ND	9.60E-01	EPA's 2004 NRWQC (organism only)	No	
7439-92-1	Lead	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	3	25%	0.00002	0.00008	0.00012	0.00012	MW26	1.20E-04	NA	NA	NA	
7439-92-1	Lead	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	3	25%	0.00052	0.001	0.001	0.001	MW26	1.00E-03	NA	NA	NA	
7487-94-7	Mercury and compounds	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	4	0%	0.00005	0.0002				ND	NA	NA	NA	
7487-94-7	***Mercury and compounds***	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	4	0%	0.0002	0.0002				ND	1.46E-04	DEQ's 2004 AWQC (organism only)	***ND>SLV***	
72-43-5	Methoxychlor	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	10	9%	1.8E-06	0.0005	5.3E-06	5.3E-06	MW08	5.30E-06	NA	NA	NA	
91-20-3	Naphthalene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	33	20	39%	0.00002	0.002	4.8E-06	7.1E-05	MW08	7.10E-05	NA	NA	NA	
104-51-8	n-Butylbenzene	VOC		mg/L	4/20/2004	5/5/2005	14	13	7%	0.002	0.002	0.002	0.002	MW01s	2.00E-03	NA	NA	NA	
7440-02-0	Nickel	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	0	100%			0.00046	0.00689	MW08	6.89E-03	4.60E+00	EPA's 2004 NRWQC (organism only)	No	
7440-02-0	Nickel	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	0	100%			0.00054	0.0125	MW08	1.25E-02	4.60E+00	DEQ's 2004 AWQC (organism only)	No	
103-65-1	n-Propylbenzene	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.002	0.002				ND	NA	NA	NA	
95-47-6	o-Xylene	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.0005	0.0005				ND	NA	NA	NA	
85-01-8	Phenanthrene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	7	63%	0.00002	0.0001	3.6E-06	0.00004	MW08	4.00E-05	NA	NA	NA	
108-95-2	Phenol	SVOC, Phenols and Substituted Phenols		mg/L	8/27/2004	2/2/2005	3	2	33%	0.00048	0.0005	9.9E-05	9.9E-05	MW07	9.90E-05	1.70E+03	EPA's 2004 NRWQC (organism only)	No	
129-00-0	Pyrene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	9	53%	1.5E-05	0.0001	4.2E-06	3.1E-05	MW08	3.10E-05	4.00E+00	EPA's 2004 NRWQC (organism only)	No	
RRO	Residual Range	Petroleum Hydrocarbons		mg/L	4/20/2004	5/5/2005	18	15	17%	0.48	0.63	0.032	0.041	MW03s	4.10E-02	NA	NA	NA	
135-9-88	sec-Butylbenzene	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.002	0.002				ND	NA	NA	NA	
7782-49-2	Selenium	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	2	50%	0.00032	0.001	0.00059	0.00071	MW26	7.10E-04	4.20E+00	EPA's 2004 NRWQC (organism only)	No	
7782-49-2	Selenium	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	1	75%	0.001	0.001	0.0004	0.00135	MW26	1.35E-03	4.20E+00	DEQ's 2004 AWQC (organism only)	No	
7440-22-4	Silver and compounds	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	4	0%	0.00002	0.00008				ND	NA	NA	NA	
7440-22-4	Silver and compounds	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	3	25%	0.001	0.001	6E-06	6E-06	MW08	6.00E-06	NA	NA	NA	
127-18-4	*Tetrachloroethylene (PCE)*	VOC		mg/L	4/20/2004	5/5/2005	14	9	36%	0.0005	0.0005	0.00077	0.014	MW03s	1.40E-02	3.30E-03	EPA's 2004 NRWQC (organism only)	*Yes*	MW03s
7440-28-0	Thallium	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	4	0%	0.00002	0.00008				ND	NA	NA	NA	
7440-28-0	Thallium	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	3	25%	0.001	0.001	0.00002	0.00002	MW08	2.00E-05	NA	NA	NA	
108-88-3	Toluene	VOC		mg/L	4/20/2004	5/5/2005	14	8	43%	0.0005	0.0005	0.0001	0.00048	MW03s	4.80E-04	1.50E+01	EPA's 2004 NRWQC (organism only)	No	
7440-47-3	Chromium, total	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	0	100%			0.00008	0.0014	MW08	1.40E-03	NA	NA	NA	
7440-47-3	Chromium, total	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	1	75%	0.001	0.001	0.001	0.0146	MW08	1.46E-02	NA	NA	NA	
79-01-6	Trichloroethylene (TCE)	VOC		mg/L	4/20/2004	5/5/2005	14	9	36%	0.0005	0.0005	0.00029	0.0035	MW03s	3.50E-03	3.00E-02	EPA's 2004 NRWQC (organism only)	No	
75-01-4	*Vinyl chloride*	VOC		mg/L	4/20/2004	5/5/2005	14	12	14%	0.0005	0.0005	0.0013	0.0054	MW03s	5.40E-03	2.40E-03	EPA's 2004 NRWQC (organism only)	*Yes*	MW03s
1330-20-7	Xylene (mixed)	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.0005	0.0005				ND	NA	NA	NA	
7440-66-6	Zinc	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	1	75%	0.00468	0.00468	0.00299	0.00482	MW26	4.82E-03	2.60E+01	EPA's 2004 NRWQC (organism only)	No	
7440-66-6	Zinc	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	0	100%			0.00326	0.00938	MW08	9.38E-03	2.60E+01	DEQ's 2004 AWQC (organism only)	No	

Notes: COI - constituent of interest; min - minimum; SLV - screening level value; JSCS - Joint Source Control Strategy; NRWQC - National Recommended Water Quality Criteria
ND - non-detect; max - maximum; VOC - volatile organic compound; DEQ - Oregon Department of Environmental Quality; AWQC - Ambient water quality criteria
mg/L - milligram per liter; NA - not available; SVOC - semi-volatile organic compound; EPA - U.S. Environmental Protection Agency
* All JSCS criteria from Table 3-1, Final Portland Harbor Joint Source Control Strategy, December 21, 2005, http://www.deq.state.or.us/nwr/Portland Harbor/jscs (downloaded January 3, 2006).

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TABLE 32B
GROUNDWATER SUMMARY (DOWNGRADIENT MONITORING WELLS) AND RISK SCREENING (HUMAN HEALTH) - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

OU2: Oregon Joint Source Control Screening Levels (Human Health)

Constituents of Interest (COI)					Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	COI Conc. (max)	JSCS Screening Level Value - Human Health Fish Consumption (17.5 g/day consumption rate)*		Does COI Concentration Exceed Screening Value?	All sample locations where detects exceed JSCS criteria
CASNo	Analyte	Analyte Group	Fraction	Units	Minimum	Maximum	Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max			Value (mg/L)	Source		
71-55-6	1,1,1-Trichloroethane	VOC		mg/L	4/16/2004	5/10/2005	24	24	0%	0.00012	0.0005				ND	NA	NA	NA	
75-34-3	1,1-Dichloroethane	VOC		mg/L	4/16/2004	5/10/2005	24	20	17%	0.00011	0.0005	0.0001	0.00019	MW10	1.90E-04	NA	NA	NA	
75-35-4	1,1-Dichloroethylene	VOC		mg/L	4/16/2004	5/10/2005	24	24	0%	0.00013	0.0005				ND	NA	NA	NA	
95-63-6	1,2,4-Trimethylbenzene	VOC		mg/L	4/16/2004	5/10/2005	24	22	8%	0.00015	0.002	0.0002	0.001	MW10	1.00E-03	NA	NA	NA	
156-59-2	1,2-Dichloroethylene (cis)	VOC		mg/L	4/16/2004	5/10/2005	24	21	13%	0.00012	0.0005	0.00013	0.00019	MW10	1.90E-04	NA	NA	NA	
156-60-5	1,2-Dichloroethylene (trans)	VOC		mg/L	4/16/2004	5/10/2005	24	24	0%	0.00015	0.0005				ND	1.00E+01	EPA's 2004 NRWQC (organism only)	No	
541-73-1	1,3-Dichlorobenzene	SVOC, Halogenated		mg/L	4/16/2004	5/10/2005	24	23	4%	0.00011	0.0005	0.0014	0.0014	MW16	1.40E-03	9.60E-01	EPA's 2004 NRWQC (organism only)	No	
106-46-7	1,4-Dichlorobenzene	SVOC, Halogenated		mg/L	4/16/2004	5/10/2005	24	23	4%	0.00012	0.0005	0.00012	0.00012	MW09	1.20E-04	1.90E-01	EPA's 2004 NRWQC (organism only)	No	
90-12-0	1-Methylnaphthalene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	14	8	43%	0.00002	0.000023	3.9E-06	0.000011	MW16	1.10E-05	NA	NA	NA	
78-93-3	2-Butanone	VOC		mg/L	4/16/2004	5/10/2005	24	24	0%	0.002	0.02				ND	NA	NA	NA	
91-57-6	2-Methylnaphthalene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	21	6	71%	0.00002	0.000023	2.8E-06	0.000024	MW11	2.40E-05	NA	NA	NA	
83-32-9	Acenaphthene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	22	15%	0.000002	0.000027	2.8E-06	9.6E-06	MW16	9.60E-06	9.90E-01	EPA's 2004 NRWQC (organism only)	No	
208-96-8	Acenaphthylene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	15	42%	0.000019	0.000025	1.8E-06	6.2E-06	MW10	6.20E-06	NA	NA	NA	
67-64-1	Acetone	VOC		mg/L	4/16/2004	5/10/2005	24	24	0%	0.0041	0.02				ND	NA	NA	NA	
309-00-2	*Aldrin*	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	10	9%	0.0000095	0.000013	1.2E-06	1.2E-06	MW11	1.20E-06	5.00E-08	EPA's 2004 NRWQC (organism only)	Yes	MW11
5103-71-9	***alpha-Chlordane***	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	0.0000028	0.000013				ND	8.10E-07	EPA's 2004 NRWQC (organism only)	***ND>SLV***	
120-12-7	Anthracene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	2	92%	0.000023	0.000025	3.6E-06	0.000094	MW10	9.40E-05	4.00E+01	EPA's 2004 NRWQC (organism only)	No	
7440-36-0	Antimony and compounds	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	18	33%	0.00002	0.00005	0.00002	0.00018	MW16	1.80E-04	6.40E-01	EPA's 2004 NRWQC (organism only)	No	
7440-36-0	Antimony and compounds	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	14	48%	0.00002	0.0001	0.00002	0.00033	MW16	3.30E-04	6.40E-01	DEQ's 2004 AWQC (organism only)	No	
12674-11-2	Aroclor 1016	PCBs Aroclors		mg/L	4/19/2004	5/9/2005	11	11	0%	0.00019	0.00031				ND	NA	NA	NA	
11104-28-2	Aroclor 1221	PCBs Aroclors		mg/L	4/19/2004	5/9/2005	11	11	0%	0.00038	0.00062				ND	NA	NA	NA	
11141-16-5	Aroclor 1232	PCBs Aroclors		mg/L	4/19/2004	5/9/2005	11	11	0%	0.00019	0.00031				ND	NA	NA	NA	
53469-21-9	Aroclor 1242	PCBs Aroclors		mg/L	4/19/2004	5/9/2005	11	11	0%	0.00019	0.00031				ND	NA	NA	NA	
12672-29-6	Aroclor 1248	PCBs Aroclors		mg/L	4/19/2004	5/9/2005	11	11	0%	0.00019	0.00031				ND	NA	NA	NA	
11097-69-1	Aroclor 1254	PCBs Aroclors		mg/L	4/19/2004	5/9/2005	11	11	0%	0.00019	0.00031				ND	NA	NA	NA	
11096-82-5	Aroclor 1260	PCBs Aroclors		mg/L	4/19/2004	5/9/2005	11	11	0%	0.00019	0.00031				ND	NA	NA	NA	
7440-38-2	*Arsenic*	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	3	89%	0.0002	0.01	0.0002	0.0146	MW13	1.46E-02	1.40E-04	EPA's 2004 NRWQC (organism only)	Yes	MW09, MW10, MW11, MW12, MW13, MW15, MW16
7440-38-2	*Arsenic*	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	3	89%	0.00002	0.01	0.0003	0.017	MW11	1.70E-02	1.40E-04	DEQ's 2004 AWQC (organism only)	Yes	MW09, MW10, MW11, MW12, MW13, MW15, MW16
71-43-2	Benzene	VOC		mg/L	4/16/2004	5/10/2005	24	24	0%	0.00014	0.0005				ND	5.10E-02	EPA's 2004 NRWQC (organism only)	No	
56-55-3	*Benzo[a]anthracene*	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	13	50%	0.0000021	0.000027	2.2E-06	0.000075	MW16	7.50E-05	1.80E-05	EPA's 2004 NRWQC (organism only)	Yes	MW16
50-32-8	*Benzo[a]pyrene*	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	16	38%	0.0000016	0.000027	1.8E-06	0.000095	MW16	9.50E-05	1.80E-05	EPA's 2004 NRWQC (organism only)	Yes	MW16
205-99-2	*Benzo[b]fluoranthene*	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	17	35%	0.000002	0.000027	2.6E-06	0.000096	MW16	9.60E-05	1.80E-05	EPA's 2004 NRWQC (organism only)	Yes	MW16
191-24-2	Benzo[g,h,i]perylene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	18	31%	0.000019	0.000027	3.4E-06	0.000079	MW16	7.90E-05	NA	NA	NA	
207-08-9	*Benzo[k]fluoranthene*	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	18	31%	0.0000014	0.000027	1.8E-06	0.000087	MW16	8.70E-05	1.80E-05	EPA's 2004 NRWQC (organism only)	Yes	MW16
7440-41-7	Beryllium and compounds	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	26	4%	0.000006	0.00002	0.000007	0.000007	MW16	7.00E-06	NA	NA	NA	
7440-41-7	Beryllium and compounds	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	13	52%	0.000006	0.00002	0.000006	0.000112	MW15	1.12E-04	NA	NA	NA	
319-84-6	***BHC (alpha)***	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	0.0000095	0.000013				ND	4.90E-06	EPA's 2004 NRWQC (organism only)	***ND>SLV***	
319-85-7	BHC (beta)	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	0.0000033	0.0000097				ND	1.70E-05	EPA's 2004 NRWQC (organism only)	No	
58-89-9	BHC (gamma) Lindane	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	0.0000095	0.000013				ND	1.80E-03	EPA's 2004 NRWQC (organism only)	No	
7440-43-9	Cadmium and compounds	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	11	59%	0.00001	0.00002	0.00002	0.000202	MW16	2.02E-04	NA	NA	NA	
7440-43-9	Cadmium and compounds	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	10	63%	0.00002	0.000069	0.00001	0.000222	MW16	2.22E-04	NA	NA	NA	
75-15-0	Carbon disulfide	VOC		mg/L	4/16/2004	5/10/2005	24	21	13%	0.00016	0.0005	0.00019	0.0017	MW16	1.70E-03	NA	NA	NA	
108-90-7	Chlorobenzene	VOC		mg/L	4/16/2004	5/10/2005	24	24	0%	0.00014	0.0005				ND	1.60E+00	EPA's 2004 NRWQC (organism only)	No	
67-66-3	Chloroform	VOC		mg/L	4/16/2004	5/10/2005	24	21	13%	0.00014	0.0005	0.00075	0.0044	MW16	4.40E-03	4.70E-01	EPA's 2004 NRWQC (organism only)	No	
218-01-9	*Chrysene*	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	16	38%	0.0000013	0.000027	2.8E-06	0.00011	MW16	1.10E-04	1.80E-05	EPA's 2004 NRWQC (organism only)	Yes	MW16
7440-50-8	Copper and compounds	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	3	89%	0.001	0.001	0.00012	0.00402	MW16	4.02E-03	NA	NA	NA	
7440-50-8	Copper and compounds	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	1	96%	0.001	0.001	0.00029	0.0143	MW16	1.43E-02	NA	NA	NA	
98-82-8	Cumene (isopropylbenzene)	VOC		mg/L	4/16/2004	5/10/2005	24	24	0%	0.00011	0.002				ND	NA	NA	NA	
72-54-8	*DDD*	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	10	9%	0.0000095	0.000012	2.6E-06	2.6E-06	MW11	2.60E-06	3.10E-07	EPA's 2004 NRWQC (organism only)	Yes	MW11
72-55-9	***DDE***	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	0.0000095	0.000013				ND	2.20E-07	EPA's 2004 NRWQC (organism only)	***ND>SLV***	
50-29-3	*DDT*	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	9	18%	0.0000096	0.000013	1.4E-06	0.000003	MW09	3.00E-06	2.20E-07	EPA's 2004 NRWQC (organism only)	Yes	MW09, MW11
319-86-8	delta-BHC	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	0.0000095	0.000013				ND	NA	NA	NA	
53-70-3	*Dibenz[a,h]anthracene*	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	21	19%	0.0000017	0.000027	2.3E-06	0.000019	MW11	1.90E-05	1.80E-05	EPA's 2004 NRWQC (organism only)	Yes	MW16
132-64-9	Dibenzofuran	SVOC, Oxygen-Containing		mg/L	8/27/2004	5/10/2005	18	18	0%	0.0000071	0.00002				ND	NA	NA	NA	
60-57-1	*Dieldrin*	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	10	9%	0.0000095	0.000013	4.4E-06	4.4E-06	MW10	4.40E-06	5.40E-08	EPA's 2004 NRWQC (organism only)	Yes	MW10
DRO	Diesel Range	Petroleum Hydrocarbons		mg/L	4/16/2004	5/10/2005	28	25	11%	0.12	0.65	0.021	0.041	MW10	4.10E-02	NA	NA	NA	
959-98-8	Endosulfan I	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	0.0000095	0.000013				ND	8.90E-02	EPA's 2004 NRWQC (organism only)	No	
33213-65-9	Endosulfan II	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	10	9%	0.0000095	0.000013	1.5E-06	1.5E-06	MW09	1.50E-06	8.90E-02	EPA's 2004 NRWQC (organism only)	No	
72-20-8	Endrin	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	0.0000095	0.000013				ND	6.00E-05	EPA's 2004 NRWQC (organism only)	No	
7421-93-4	Endrin Aldehyde	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	0.0000095	0.000013				ND	3.00E-04	EPA's 2004 NRWQC (organism only)	No	
53494-70-5	Endrin Ketone	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	9	9	0%	0.0000096	0.000013				ND	NA	NA	NA	
100-41-4	Ethylbenzene	VOC		mg/L	4/16/2004	5/10/2005	24	23	4%	0.00013	0.0005	0.00063	0.00063	MW10	6.30E-04	2.10E+00	EPA's 2004 NRWQC (organism only)	No	
206-44-0	Fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	10	62%	0.0000024	0.000025	5.2E-06	0.00015	MW16	1.50E-04	1.40E-01	EPA's 2004 NRWQC (organism only)	No	

KMB00008375

TABLE 32B
GROUNDWATER SUMMARY (DOWNGRADIENT MONITORING WELLS) AND RISK SCREENING (HUMAN HEALTH) - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

OU2: Oregon Joint Source Control Screening Levels (Human Health)

Constituents of Interest (COI)					Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	COI Conc. (max)	JSCS Screening Level Value - Human Health Fish Consumption (17.5 g/day consumption rate)*		Does COI Concentration Exceed Screening Value?	All sample locations where detects exceed JSCS criteria
					Minimum	Maximum	Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max			Value (mg/L)	Source		
CASNo	Analyte	Analyte Group	Fraction	Units															
86-73-7	Fluorene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	22	15%	0.0000026	0.000027	3.7E-06	9.8E-06	MW16	9.80E-06	5.30E+00	EPA's 2004 NRWQC (organism only)	No	
GRO	Gasoline Range	Petroleum Hydrocarbons		mg/L	4/16/2004	5/10/2005	28	26	7%	0.05	0.26	0.013	0.051	MW10	5.10E-02	NA	NA	NA	
76-44-8	***Heptachlor***	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	0.0000095	0.000013				ND	7.90E-08	EPA's 2004 NRWQC (organism only)	***ND>SLV***	
1024-57-3	***Heptachlor epoxide***	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	0.0000095	0.000013				ND	3.90E-08	EPA's 2004 NRWQC (organism only)	***ND>SLV***	
193-39-5	Indeno[1,2,3-cd]pyrene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	18	31%	0.0000021	0.000027	2.5E-06	0.000094	MW16	9.40E-05	1.80E-05	EPA's 2004 NRWQC (organism only)	Yes	MW16
7439-92-1	Lead	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	12	56%	0.000009	0.000023	0.00001	0.0006	MW16	6.00E-04	NA	NA	NA	
7439-92-1	Lead	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	2	93%	0.00002	0.000075	0.000016	0.0109	MW15	1.09E-02	NA	NA	NA	
7487-94-7	Mercury and compounds	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	19	30%	0.0001	0.0002	0.00005	0.00009	MW12	9.00E-05	NA	NA	NA	
7487-94-7	Mercury and compounds	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	20	26%	0.0001	0.0002	0.00004	0.00006	MW12	6.00E-05	1.46E-04	DEQ's 2004 AWQC (organism only)	No	
72-43-5	Methoxychlor	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	0.0000095	0.000013				ND	NA	NA	NA	
91-20-3	Naphthalene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	50	26	48%	0.00002	0.002	1.4E-06	0.00033	MW10	3.30E-04	NA	NA	NA	
104-51-8	n-Butylbenzene	VOC		mg/L	4/16/2004	5/10/2005	24	24	0%	0.00023	0.002				ND	NA	NA	NA	
7440-02-0	Nickel	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	0	100%			0.0004	0.0101	MW15	1.01E-02	4.60E+00	EPA's 2004 NRWQC (organism only)	No	
7440-02-0	Nickel	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	0	100%			0.0003	0.0204	MW15	2.04E-02	4.60E+00	DEQ's 2004 AWQC (organism only)	No	
103-65-1	n-Propylbenzene	VOC		mg/L	4/16/2004	5/10/2005	24	23	4%	0.000098	0.002	0.00014	0.00014	MW10	1.40E-04	NA	NA	NA	
95-47-6	o-Xylene	VOC		mg/L	4/16/2004	5/10/2005	24	20	17%	0.00011	0.0005	0.00014	0.0013	MW10	1.30E-03	NA	NA	NA	
85-01-8	Phenanthrene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	8	69%	0.0000032	0.000025	4.2E-06	0.000079	MW16	7.90E-05	NA	NA	NA	
129-00-0	Pyrene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	8	69%	0.0000023	0.000025	4.2E-06	0.00013	MW16	1.30E-04	4.00E+00	EPA's 2004 NRWQC (organism only)	No	
RRO	Residual Range	Petroleum Hydrocarbons		mg/L	4/16/2004	5/10/2005	28	22	21%	0.24	0.65	0.035	0.52	MW09	5.20E-01	NA	NA	NA	
135-9-88	sec-Butylbenzene	VOC		mg/L	4/16/2004	5/10/2005	24	24	0%	0.00013	0.002				ND	NA	NA	NA	
7782-49-2	Selenium	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	17	37%	0.0002	0.005	0.0002	0.0013	MW12	1.30E-03	4.20E+00	EPA's 2004 NRWQC (organism only)	No	
7782-49-2	Selenium	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	12	56%	0.0002	0.005	0.0001	0.0018	MW16	1.80E-03	4.20E+00	DEQ's 2004 AWQC (organism only)	No	
7440-22-4	Silver and compounds	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	27	0%	0.000009	0.00002				ND	NA	NA	NA	
7440-22-4	Silver and compounds	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	23	15%	0.000009	0.00004	0.000006	0.00003	MW16	3.00E-05	NA	NA	NA	
127-18-4	Tetrachloroethylene (PCE)	VOC		mg/L	4/16/2004	5/10/2005	24	18	25%	0.00013	0.0005	0.00015	0.00051	MW10	5.10E-04	3.30E-03	EPA's 2004 NRWQC (organism only)	No	
7440-28-0	Thallium	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	18	33%	0.000004	0.00002	0.000006	0.000039	MW16	3.90E-05	NA	NA	NA	
7440-28-0	Thallium	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	15	44%	0.000004	0.00004	0.000004	0.000072	MW16	7.20E-05	NA	NA	NA	
108-88-3	Toluene	VOC		mg/L	4/16/2004	5/10/2005	24	13	46%	0.00011	0.0005	0.00013	0.0018	MW10	1.80E-03	1.50E+01	EPA's 2004 NRWQC (organism only)	No	
7440-47-3	Chromium, total	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	2	93%	0.00006	0.00038	0.00009	0.0068	MW15	6.80E-03	NA	NA	NA	
7440-47-3	Chromium, total	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	0	100%			0.00023	0.0219	MW15	2.19E-02	NA	NA	NA	
79-01-6	Trichloroethylene (TCE)	VOC		mg/L	4/16/2004	5/10/2005	24	20	17%	0.00014	0.0005	0.00019	0.0005	MW09	5.00E-04	3.00E-02	EPA's 2004 NRWQC (organism only)	No	
75-01-4	Vinyl chloride	VOC		mg/L	4/16/2004	5/10/2005	24	24	0%	0.00022	0.0005				ND	2.40E-03	EPA's 2004 NRWQC (organism only)	No	
1330-20-7	Xylene (mixed)	VOC		mg/L	4/16/2004	5/10/2005	24	20	17%	0.00022	0.0005	0.00034	0.003	MW10	3.00E-03	NA	NA	NA	
7440-66-6	Zinc	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	3	89%	0.00101	0.0016	0.0005	0.00918	MW16	9.18E-03	2.60E+01	EPA's 2004 NRWQC (organism only)	No	
7440-66-6	Zinc	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	2	93%	0.00195	0.00273	0.0005	0.0315	MW15	3.15E-02	2.60E+01	DEQ's 2004 AWQC (organism only)	No	

Notes:
COI - constituent of interest; min - minimum; SLV - screening level value; JSCS - Joint Source Control Strategy; NRWQC - National Recommended Water Quality Criteria
ND - non-detect; max - maximum; VOC - volatile organic compound; DEQ - Oregon Department of Environmental Quality; AWQC - Ambient water quality criteria
mg/L - milligram per liter; NA - not available; SVOC - semi-volatile organic compound; EPA - U.S. Environmental Protection Agency
* All JSCS criteria from Table 3-1, Final Portland Harbor Joint Source Control Strategy, December 21, 2005, http://www.deq.state.or.us/nwr/Portland Harbor/jscs (downloaded January 3, 2006)

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TABLE 33A
GROUNDWATER SUMMARY (DOWNGRADIENT MONITORING WELLS) AND RISK SCREENING (ECOLOGICAL RECEPTORS) - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

OU1: Oregon Joint Source Control Screening Levels (Ecological Receptors)

Constituents of Interest (COI)					Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	COI Conc. (max)	JSCS Screening Level Value - Ecological Receptors		Does COI Concentration Exceed Screening Value?	All locations where detects exceed JSCS criteria
CASNo	Analyte	Analyte Group	Fraction	Units	Minimum	Maximum	Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max			Value (mg/L)	Source		
71-55-6	1,1,1-Trichloroethane	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.0005	0.0005				ND	0.011	ORNL's (Tier II SCV) value	No	
75-34-3	1,1-Dichloroethane	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.0005	0.0005				ND	0.047	ORNL's (Tier II SCV) value	No	
75-35-4	1,1-Dichloroethylene	VOC		mg/L	4/20/2004	5/5/2005	14	13	7%	0.0005	0.0005	0.00037	0.00037	MW03s	0.00037	NA	NA		
95-63-6	1,2,4-Trimethylbenzene	VOC		mg/L	4/20/2004	5/5/2005	14	13	7%	0.002	0.002	0.002	0.002	MW01s	0.002	NA	NA		
156-59-2	1,2-Dichloroethylene (cis)	VOC		mg/L	4/20/2004	5/5/2005	14	9	36%	0.0005	0.0005	0.0023	0.089	MW03s	0.089	NA	NA		
156-60-5	1,2-Dichloroethylene (trans)	VOC		mg/L	4/20/2004	5/5/2005	14	11	21%	0.0005	0.0005	0.0002	0.00078	MW03s	0.00078	0.59	ORNL's (Tier II SCV) value	No	
541-73-1	1,3-Dichlorobenzene	SVOC, Halogenated		mg/L	4/20/2004	5/5/2005	14	14	0%	0.0005	0.0005				ND	0.763	DEQ's 2004 AWQC (chronic) value	No	
106-46-7	1,4-Dichlorobenzene	SVOC, Halogenated		mg/L	4/20/2004	5/5/2005	14	14	0%	0.0005	0.0005				ND	0.763	DEQ's 2004 AWQC (chronic) value	No	
90-12-0	1-Methylnaphthalene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	2/3/2005	5/5/2005	7	6	14%	0.00002	0.0002	2.8E-05	2.8E-05	MW08	0.000028	NA	NA		
78-93-3	2-Butanone	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.02	0.02				ND	14	ORNL's (Tier II SCV) value	No	
91-57-6	2-Methylnaphthalene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	8/27/2004	5/5/2005	13	5	62%	1.2E-05	0.00002	2.9E-06	2.9E-05	MW08	0.000029	0.0021	ORNL's (Tier II SCV) value	No	
35421-08-0	4-Chloro-3-methylphenol	SVOC, Phenols and Substituted Phenols		mg/L	8/27/2004	2/2/2005	3	2	33%	0.00048	0.0005	3.7E-05	3.7E-05	MW07	0.000037	NA	NA		
106-47-8	4-Chloroaniline	SVOC, Halogenated		mg/L	8/27/2004	2/2/2005	3	2	33%	0.0002	0.0002	2.5E-05	2.5E-05	MW07	0.000025	NA	NA		
106-44-5	4-Methylphenol	SVOC, Phenols and Substituted Phenols		mg/L	8/27/2004	2/2/2005	3	2	33%	0.00048	0.0005	8.8E-05	8.8E-05	MW07	0.000088	NA	NA		
83-32-9	Acenaphthene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	15	21%	8.8E-06	0.0001	4.1E-06	8.3E-05	MW26	0.0000827	0.52	DEQ's 2004 AWQC (chronic) value	No	
208-96-8	Acenaphthylene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	15	21%	1.1E-05	0.0001	2E-06	4.2E-06	MW08	0.0000042	NA	NA		
67-64-1	Acetone	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.02	0.02				ND	1.5	ORNL's (Tier II SCV) value	No	
309-00-2	Aldrin	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	11	0%	1.8E-06	0.00008				ND	NA	NA		
5103-71-9	***alpha-Chlordane***	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	11	0%	1.8E-06	0.00004				ND	0.0000043	EPA's 2004 NRWQC (chronic) value	***ND>SLV***	
120-12-7	Anthracene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	2	89%	0.0001	0.0001	4.5E-06	0.00009	MW03s	0.00009	0.00073	ORNL's (Tier II SCV) value	No	
7440-36-0	Antimony and compounds	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	2	50%	0.00004	0.00005	0.00005	0.00101	MW08	0.00101	NA	NA		
7440-36-0	Antimony and compounds	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	4	0%	0.00005	0.003				ND	1.6	DEQ's 2004 AWQC (chronic) value	No	
12674-11-2	Aroclor 1016	PCBs Aroclors		mg/L	4/21/2004	5/5/2005	7	7	0%	0.0002	0.00031				ND	NA	NA		
11104-28-2	***Aroclor 1221***	PCBs Aroclors		mg/L	4/21/2004	5/5/2005	7	7	0%	0.00039	0.00062				ND	0.00028	ORNL's (Tier II SCV) value	***ND>SLV***	
11141-16-5	Aroclor 1232	PCBs Aroclors		mg/L	4/21/2004	5/5/2005	7	7	0%	0.0002	0.00031				ND	0.00058	ORNL's (Tier II SCV) value	No	
53469-21-9	***Aroclor 1242***	PCBs Aroclors		mg/L	4/21/2004	5/5/2005	7	7	0%	0.0002	0.00031				ND	0.000053	ORNL's (Tier II SCV) value	***ND>SLV***	
12672-29-6	***Aroclor 1248***	PCBs Aroclors		mg/L	4/21/2004	5/5/2005	7	7	0%	0.0002	0.00031				ND	0.000081	ORNL's (Tier II SCV) value	***ND>SLV***	
11097-69-1	***Aroclor 1254***	PCBs Aroclors		mg/L	4/21/2004	5/5/2005	7	7	0%	0.0002	0.00031				ND	0.000033	ORNL's (Tier II SCV) value	***ND>SLV***	
11096-82-5	Aroclor 1260	PCBs Aroclors		mg/L	4/21/2004	5/5/2005	7	7	0%	0.0002	0.00031				ND	0.094	ORNL's (Tier II SCV) value	No	
7440-38-2	Arsenic	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	0	100%			0.00013	0.0108	MW26	0.0108	0.15	EPA's 2004 NRWQC (chronic) value	No	
7440-38-2	Arsenic	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	1	75%	0.001	0.001	0.00038	0.0098	MW26	0.0098	0.19	DEQ's 2004 AWQC (chronic) value	No	
71-43-2	Benzene	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.0005	0.0005				ND	0.13	ORNL's (Tier II SCV) value	No	
56-55-3	*Benzo[a]anthracene*	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	12	37%	1.2E-05	0.0001	2.2E-06	6.7E-05	MW07	0.000067	0.000027	ORNL's (Tier II SCV) value	Yes	MW07
50-32-8	*Benzo[a]pyrene*	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	12	37%	1.6E-05	0.0001	1.6E-06	6.9E-05	MW07	0.000069	0.000014	ORNL's (Tier II SCV) value	Yes	MW07
205-99-2	Benzo[b]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	12	37%	0.00002	0.0001	2.2E-06	0.00011	MW07	0.00011	NA	NA		
191-24-2	Benzo[g,h,i]perylene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	18	5%	0.00002	0.0001	3.4E-05	3.4E-05	MW07	0.000034	NA	NA		
207-08-9	Benzo[k]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	15	21%	0.00002	0.0001	1.5E-06	8.4E-05	MW07	0.000084	NA	NA		
7440-41-7	Beryllium and compounds	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	4	0%	0.00002	0.00011				ND	NA	NA		
7440-41-7	Beryllium and compounds	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	3	25%	0.001	0.001	3.3E-05	3.3E-05	MW08	0.000033	NA	NA		
319-84-6	BHC (alpha)	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	10	9%	1.8E-06	0.00004	2.3E-06	2.3E-06	MW08	0.0000023	0.0022	ORNL's (Tier II SCV) value	No	
319-85-7	BHC (beta)	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	9	18%	1.8E-06	0.001	5.3E-06	7.9E-06	MW03s	0.0000079	NA	NA		
58-89-9	BHC (gamma) Lindane	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	10	9%	1.8E-06	0.00004	1.5E-06	1.5E-06	MW08	0.0000015	0.00008	DEQ's 2004 AWQC (chronic) value	No	
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	SVOC, Phthalate Esters		mg/L	8/27/2004	2/2/2005	3	3	0%	0.002	0.002				ND	0.003	DEQ's 2004 AWQC (chronic) value	No	
7440-43-9	***Cadmium and compounds***	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	4	0%	0.00002	0.0001				ND	0.000094	EPA's 2004 NRWQC (chronic) value	***ND>SLV***	
7440-43-9	Cadmium and compounds	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	3	25%	0.001	0.001	0.00002	0.00002	MW08	0.00002	0.00038	DEQ's 2004 AWQC (chronic) value	No	
75-15-0	*Carbon disulfide*	VOC		mg/L	4/20/2004	5/5/2005	14	10	29%	0.0005	0.0005	0.0002	0.00094	MW07	0.00094	0.00092	ORNL's (Tier II SCV) value	Yes	MW07
108-90-7	Chlorobenzene	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.0005	0.0005				ND	0.05	DEQ's 2004 AWQC (chronic) value	No	
67-66-3	Chloroform	VOC		mg/L	4/20/2004	5/5/2005	14	10	29%	0.0005	0.0005	0.00019	0.0005	MW01s	0.0005	1.24	DEQ's 2004 AWQC (chronic) value	No	
218-01-9	Chrysene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	12	37%	1.4E-05	0.0001	2.8E-06	5.1E-05	MW07	0.000051	NA	NA		
7440-50-8	Copper and compounds	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	1	75%	0.00018	0.00018	0.00012	0.00042	MW26	0.00042	0.0029	EPA's 2004 NRWQC (chronic) value	No	
7440-50-8	Copper and compounds	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	2	50%	0.001	0.00376	0.001	0.001	MW08	0.001	0.0036	DEQ's 2004 AWQC (chronic) value	No	
98-82-8	Cumene (isopropylbenzene)	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.002	0.002				ND	NA	NA		
72-54-8	***DDD***	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	11	0%	1.8E-06	0.00004				ND	0.000011	ORNL's (Tier II SCV) value	***ND>SLV***	
72-55-9	DDE	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	10	9%	1.8E-06	0.00008	4.3E-06	4.3E-06	MW08	0.0000043	NA	NA		
50-29-3	***DDT***	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	11	0%	1.8E-06	0.00008				ND	0.000001	EPA's 2004 NRWQC (chronic) value	***ND>SLV***	
319-86-8	delta-BHC	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	10	9%	1.8E-06	0.0001	2.8E-06	2.8E-06	MW08	0.0000028	NA	NA		
53-70-3	Dibenz[ah]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	18	5%	0.00002	0.0002	2.8E-06	2.8E-06	MW08	0.0000028	NA	NA		
132-64-9	Dibenzofuran	SVOC, Oxygen-Containing		mg/L	8/27/2004	5/5/2005	13	13	0%	1.4E-05	0.00002				ND	0.0037	ORNL's (Tier II SCV) value	No	
60-57-1	***Dieldrin***	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	11	0%	1.8E-06	0.00008				ND	0.000056	EPA's 2004 NRWQC (chronic) value	***ND>SLV***	
DRO	Diesel Range	Petroleum Hydrocarbons		mg/L	4/20/2004	5/5/2005	18	16	11%	0.24	0.63	0.021	0.028	MW03s	0.028	NA	NA		
84-66-2	Diethyl phthalate	SVOC, Phthalate Esters		mg/L	8/27/2004	5/4/2005	4	1	75%	0.0002	0.0002	3.4E-05	0.0001	MW03s	0.0001	0.003	DEQ's 2004 AWQC (chronic) value	No	
131-11-3	Dimethyl phthalate	SVOC, Phthalate Esters		mg/L	8/27/2004	2/2/2005	3	3	0%	0.0002	0.0002				ND	0.003	DEQ's 2004 AWQC (chronic) value	No	
84-74-2	Di-n-butyl phthalate	SVOC, Phthalate Esters		mg/L	8/27/2004	5/4/2005	4	2	50%	0.00019	0.0002	4.1E-05	0.00019	MW03s	0.00019	0.003	DEQ's 2004 AWQC (chronic) value	No	

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TABLE 33A
GROUNDWATER SUMMARY (DOWNGRADIENT MONITORING WELLS) AND RISK SCREENING (ECOLOGICAL RECEPTORS) - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

OU1: Oregon Joint Source Control Screening Levels (Ecological Receptors)

Constituents of Interest (COI)					Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	COI Conc. (max)	JSCS Screening Level Value - Ecological Receptors		Does COI Concentration Exceed Screening Value?	All locations where detects exceed JSCS criteria
CASNo	Analyte	Analyte Group	Fraction	Units	Minimum	Maximum	Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max			Value (mg/L)	Source		
959-98-8	Endosulfan I	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	10	9%	1.8E-06	0.00002	1.6E-06	1.6E-06	MW08	0.0000016	0.000056	EPA's 2004 NRWQC (chronic) value	No	
33213-65-9	Endosulfan II	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	10	9%	1.8E-06	0.00008	2.2E-06	2.2E-06	MW03s	0.0000022	0.000056	EPA's 2004 NRWQC (chronic) value	No	
72-20-8	Endrin	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	10	9%	1.8E-06	0.00008	3.1E-06	3.1E-06	MW08	0.0000031	0.000036	EPA's 2004 NRWQC (chronic) value	No	
7421-93-4	Endrin Aldehyde	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	11	0%	1.8E-06	0.00016				ND	NA	NA	NA	
53494-70-5	Endrin Ketone	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	11	0%	1.8E-06	0.00008				ND	NA	NA	NA	
100-41-4	Ethylbenzene	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.0005	0.0005				ND	0.0073	ORNL's (Tier II SCV) value	No	
206-44-0	Fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	9	53%	1.3E-05	0.0001	4.1E-06	3.4E-05	MW08	0.000034	NA	NA	NA	
86-73-7	Fluorene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	15	21%	1.2E-05	0.0001	4.4E-06	0.00001	MW08	0.00001	0.0039	ORNL's (Tier II SCV) value	No	
GRO	Gasoline Range	Petroleum Hydrocarbons		mg/L	4/20/2004	5/5/2005	18	15	17%	0.05	0.25	0.014	0.019	MW03s	0.019	NA	NA	NA	
76-44-8	Heptachlor	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	10	9%	1.8E-06	0.00008	2.8E-06	2.8E-06	MW08	0.0000028	0.0000038	DEQ's 2004 AWQC (chronic) value	No	
1024-57-3	Heptachlor epoxide	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	10	9%	1.8E-06	0.00004	3.2E-06	3.2E-06	MW08	0.0000032	0.0000038	EPA's 2004 NRWQC (chronic) value	No	
193-39-5	Indeno[1,2,3-cd]pyrene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	17	11%	0.00002	0.0001	2.3E-06	3.1E-06	MW08	0.0000031	NA	NA	NA	
78-59-1	Isophorone	SVOC, Oxygen-Containing		mg/L	8/27/2004	2/2/2005	3	3	0%	0.0002	0.0002				ND	NA	NA	NA	
7439-92-1	Lead	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	3	25%	0.00002	0.00008	0.00012	0.00012	MW26	0.00012	0.00054	EPA's 2004 NRWQC (chronic) value	No	
7439-92-1	Lead	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	3	25%	0.00052	0.001	0.001	0.001	MW26	0.001	0.00054	DEQ's 2004 AWQC (chronic) value	Yes	MW26
7487-94-7	Mercury and compounds	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	4	0%	0.00005	0.0002				ND	0.00077	EPA's 2004 NRWQC (chronic) value	No	
7487-94-7	***Mercury and compounds***	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	4	0%	0.0002	0.0002				ND	0.000012	DEQ's 2004 AWQC (chronic) value	***ND>SLV***	
72-43-5	Methoxychlor	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	10	9%	1.8E-06	0.0005	5.3E-06	5.3E-06	MW08	0.0000053	0.00003	EPA's 2004 NRWQC (chronic) value	No	
91-20-3	Naphthalene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	33	20	39%	0.00002	0.002	4.8E-06	7.1E-05	MW08	0.000071	0.62	DEQ's 2004 AWQC (chronic) value	No	
104-51-8	n-Butylbenzene	VOC		mg/L	4/20/2004	5/5/2005	14	13	7%	0.002	0.002	0.002	0.002	MW01s	0.002	NA	NA	NA	
7440-02-0	Nickel	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	0	100%			0.00046	0.00689	MW08	0.00689	0.016	EPA's 2004 NRWQC (chronic) value	No	
7440-02-0	Nickel	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	0	100%			0.00054	0.0125	MW08	0.0125	0.049	DEQ's 2004 AWQC (chronic) value	No	
103-65-1	n-Propylbenzene	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.002	0.002				ND	NA	NA	NA	
95-47-6	o-Xylene	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.0005	0.0005				ND	0.013	ORNL's (Tier II SCV) value	No	
85-01-8	Phenanthrene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	7	63%	0.00002	0.0001	3.6E-06	0.00004	MW08	0.00004	NA	NA	NA	
108-95-2	Phenol	SVOC, Phenols and Substituted Phenols		mg/L	8/27/2004	2/2/2005	3	2	33%	0.00048	0.0005	9.9E-05	9.9E-05	MW07	0.000099	2.56	DEQ's 2004 AWQC (chronic) value	No	
129-00-0	Pyrene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	9	53%	1.5E-05	0.0001	4.2E-06	3.1E-05	MW08	0.000031	NA	NA	NA	
RRO	Residual Range	Petroleum Hydrocarbons		mg/L	4/20/2004	5/5/2005	18	15	17%	0.48	0.63	0.032	0.041	MW03s	0.041	NA	NA	NA	
135-9-88	sec-Butylbenzene	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.002	0.002				ND	NA	NA	NA	
7782-49-2	Selenium	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	2	50%	0.00032	0.001	0.00059	0.00071	MW26	0.00071	NA	NA	NA	
7782-49-2	Selenium	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	1	75%	0.001	0.001	0.0004	0.00135	MW26	0.00135	0.005	EPA's 2004 NRWQC (chronic) value	No	
7440-22-4	Silver and compounds	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	4	0%	0.00002	0.00008				ND	NA	NA	NA	
7440-22-4	Silver and compounds	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	3	25%	0.001	0.001	6E-06	6E-06	MW08	0.000006	0.00012	DEQ's 2004 AWQC (chronic) value	No	
127-18-4	Tetrachloroethylene (PCE)	VOC		mg/L	4/20/2004	5/5/2005	14	9	36%	0.0005	0.0005	0.00077	0.014	MW03s	0.014	0.84	DEQ's 2004 AWQC (chronic) value	No	
7440-28-0	Thallium	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	4	0%	0.00002	0.00008				ND	NA	NA	NA	
7440-28-0	Thallium	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	3	25%	0.001	0.001	0.00002	0.00002	MW08	0.00002	NA	NA	NA	
108-88-3	Toluene	VOC		mg/L	4/20/2004	5/5/2005	14	8	43%	0.0005	0.0005	0.0001	0.00048	MW03s	0.00048	0.0098	ORNL's (Tier II SCV) value	No	
7440-47-3	Chromium, total	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	0	100%			0.00008	0.0014	MW08	0.0014	NA	NA	NA	
7440-47-3	Chromium, total	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	1	75%	0.001	0.001	0.001	0.0146	MW08	0.0146	NA	NA	NA	
79-01-6	Trichloroethylene (TCE)	VOC		mg/L	4/20/2004	5/5/2005	14	9	36%	0.0005	0.0005	0.00029	0.0035	MW03s	0.0035	21.9	DEQ's 2004 AWQC (chronic) value	No	
75-01-4	Vinyl chloride	VOC		mg/L	4/20/2004	5/5/2005	14	12	14%	0.0005	0.0005	0.0013	0.0054	MW03s	0.0054	NA	NA	NA	
1330-20-7	Xylene (mixed)	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.0005	0.0005				ND	0.0018	ORNL's (Tier II SCV) value	No	
7440-66-6	Zinc	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	1	75%	0.00468	0.00468	0.00299	0.00482	MW26	0.00482	0.0365	EPA's 2004 NRWQC (chronic) value	No	
7440-66-6	Zinc	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	0	100%			0.00326	0.00938	MW08	0.00938	0.033	DEQ's 2004 AWQC (chronic) value	No	

Notes:
COI - constituent of interest; min - minimum; SLV - screening level value; JSCS - Joint Source Control Strategy; NRWQC - National Recommended Water Quality Criteria
ND - non-detect; max - maximum; VOC - volatile organic compound; DEQ - Oregon Department of Environmental Quality; AWQC - Ambient water quality criteria
mg/L - milligram per liter; NA - not available; SVOC - semi-volatile organic compound; EPA - U.S. Environmental Protection Agency; ORNL - Oak Ridge National Laboratory
* All JSCS criteria from Table 3-1, Final Portland Harbor Joint Source Control Strategy, December 21, 2005, http://www.deq.state.or.us/nwr/Portland Harbor/jscs (downloaded January 3, 2006)

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TABLE 33B
GROUNDWATER SUMMARY (DOWNGRADIENT MONITORING WELLS) AND RISK SCREENING (ECOLOGICAL RECEPTORS) - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

OU2: Oregon Joint Source Control Screening Levels (Ecological Receptors)

Constituents of Interest (COI)					Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	COI Conc. (max)	JSCS Screening Level Value - Ecological Receptors *		Does COI Concentration Exceed Screening Value?	All locations where detects exceed JSCS criteria
CASNo	Analyte	Analyte Group	Fraction	Units	Minimum	Maximum	Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max			Value (mg/L)	Source		
71-55-6	1,1,1-Trichloroethane	VOC		mg/L	4/16/2004	5/10/2005	24	24	0%	0.00012	0.0005				ND	0.011	ORNL's (Tier II SCV) value	No	
75-34-3	1,1-Dichloroethane	VOC		mg/L	4/16/2004	5/10/2005	24	20	17%	0.00011	0.0005	0.0001	0.00019	MW10	0.00019	0.047	ORNL's (Tier II SCV) value	No	
75-35-4	1,1-Dichloroethylene	VOC		mg/L	4/16/2004	5/10/2005	24	24	0%	0.00013	0.0005				ND	NA	NA	NA	
95-63-6	1,2,4-Trimethylbenzene	VOC		mg/L	4/16/2004	5/10/2005	24	22	8%	0.00015	0.002	0.0002	0.001	MW10	0.001	NA	NA	NA	
156-59-2	1,2-Dichloroethylene (cis)	VOC		mg/L	4/16/2004	5/10/2005	24	21	13%	0.00012	0.0005	0.00013	0.00019	MW10	0.00019	NA	NA	NA	
156-60-5	1,2-Dichloroethylene (trans)	VOC		mg/L	4/16/2004	5/10/2005	24	24	0%	0.00015	0.0005				ND	0.59	ORNL's (Tier II SCV) value	No	
541-73-1	1,3-Dichlorobenzene	SVOC, Halogenated		mg/L	4/16/2004	5/10/2005	24	23	4%	0.00011	0.0005	0.0014	0.0014	MW16	0.0014	0.763	DEQ's 2004 AWQC (chronic) value	No	
106-46-7	1,4-Dichlorobenzene	SVOC, Halogenated		mg/L	4/16/2004	5/10/2005	24	23	4%	0.00012	0.0005	0.00012	0.00012	MW09	0.00012	0.763	DEQ's 2004 AWQC (chronic) value	No	
90-12-0	1-Methylnaphthalene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	14	8	43%	0.00002	0.000023	3.9E-06	0.000011	MW16	0.000011	NA	NA	NA	
78-93-3	2-Butanone	VOC		mg/L	4/16/2004	5/10/2005	24	24	0%	0.002	0.02				ND	14	ORNL's (Tier II SCV) value	No	
91-57-6	2-Methylnaphthalene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	21	6	71%	0.00002	0.000023	2.8E-06	0.000024	MW11	0.000024	0.0021	ORNL's (Tier II SCV) value	No	
83-32-9	Acenaphthene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	22	15%	0.000002	0.000027	2.8E-06	9.6E-06	MW16	9.6E-06	0.52	DEQ's 2004 AWQC (chronic) value	No	
208-96-8	Acenaphthylene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	15	42%	0.000019	0.000025	1.8E-06	6.2E-06	MW10	6.2E-06	NA	NA	NA	
67-64-1	Acetone	VOC		mg/L	4/16/2004	5/10/2005	24	24	0%	0.0041	0.02				ND	1.5	ORNL's (Tier II SCV) value	No	
309-00-2	Aldrin	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	10	9%	0.0000095	0.000013	1.2E-06	1.2E-06	MW11	1.2E-06	NA	NA	NA	
5103-71-9	***alpha-Chlordane***	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	0.0000028	0.000013				ND	0.0000043	NA	***ND>SLV***	
120-12-7	Anthracene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	2	92%	0.000023	0.000025	3.6E-06	0.000094	MW10	0.000094	0.00073	ORNL's (Tier II SCV) value	No	
7440-36-0	Antimony and compounds	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	18	33%	0.00002	0.00005	0.00002	0.00018	MW16	0.00018	NA	NA	NA	
7440-36-0	Antimony and compounds	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	14	48%	0.00002	0.0001	0.00002	0.00033	MW16	0.00033	1.6	DEQ's 2004 AWQC (chronic) value	No	
12674-11-2	Aroclor 1016	PCBs Aroclors		mg/L	4/19/2004	5/9/2005	11	11	0%	0.00019	0.00031				ND	NA	NA	NA	
11104-28-2	***Aroclor 1221***	PCBs Aroclors		mg/L	4/19/2004	5/9/2005	11	11	0%	0.00038	0.00062				ND	0.00028	ORNL's (Tier II SCV) value	***ND>SLV***	
11141-16-5	Aroclor 1232	PCBs Aroclors		mg/L	4/19/2004	5/9/2005	11	11	0%	0.00019	0.00031				ND	0.00058	ORNL's (Tier II SCV) value	No	
53469-21-9	***Aroclor 1242***	PCBs Aroclors		mg/L	4/19/2004	5/9/2005	11	11	0%	0.00019	0.00031				ND	0.000053	ORNL's (Tier II SCV) value	***ND>SLV***	
12672-29-6	***Aroclor 1248***	PCBs Aroclors		mg/L	4/19/2004	5/9/2005	11	11	0%	0.00019	0.00031				ND	0.000081	ORNL's (Tier II SCV) value	***ND>SLV***	
11097-69-1	***Aroclor 1254***	PCBs Aroclors		mg/L	4/19/2004	5/9/2005	11	11	0%	0.00019	0.00031				ND	0.000033	ORNL's (Tier II SCV) value	***ND>SLV***	
11096-82-5	Aroclor 1260	PCBs Aroclors		mg/L	4/19/2004	5/9/2005	11	11	0%	0.00019	0.00031				ND	0.094	ORNL's (Tier II SCV) value	No	
7440-38-2	Arsenic	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	3	89%	0.0002	0.01	0.0002	0.0146	MW13	0.0146	0.15	EPA's 2004 NRWQC (chronic) value	No	
7440-38-2	Arsenic	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	3	89%	0.00002	0.01	0.0003	0.017	MW11	0.017	0.19	DEQ's 2004 AWQC (chronic) value	No	
71-43-2	Benzene	VOC		mg/L	4/16/2004	5/10/2005	24	24	0%	0.00014	0.0005				ND	0.13	ORNL's (Tier II SCV) value	No	
56-55-3	*Benzo[a]anthracene*	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	13	50%	0.0000021	0.000027	2.2E-06	0.000075	MW16	0.000075	0.000027	ORNL's (Tier II SCV) value	Yes	MW16
50-32-8	*Benzo[a]pyrene*	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	16	38%	0.0000016	0.000027	1.8E-06	0.000095	MW16	0.000095	0.000014	ORNL's (Tier II SCV) value	Yes	MW16
205-99-2	Benzo[b]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	17	35%	0.000002	0.000027	2.6E-06	0.000096	MW16	0.000096	NA	NA	NA	
191-24-2	Benzo[g,h,i]perylene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	18	31%	0.000019	0.000027	3.4E-06	0.000079	MW16	0.000079	NA	NA	NA	
207-08-9	Benzo[k]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	18	31%	0.0000014	0.000027	1.8E-06	0.000087	MW16	0.000087	NA	NA	NA	
7440-41-7	Beryllium and compounds	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	26	4%	0.000006	0.00002	0.000007	0.000007	MW16	0.000007	NA	NA	NA	
7440-41-7	Beryllium and compounds	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	13	52%	0.000006	0.00002	0.000006	0.000112	MW15	0.000112	NA	NA	NA	
319-84-6	BHC (alpha)	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	0.0000095	0.000013				ND	0.0022	ORNL's (Tier II SCV) value	No	
319-85-7	BHC (beta)	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	0.0000033	0.0000097				ND	NA	NA	NA	
58-89-9	BHC (gamma) Lindane	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	0.0000095	0.000013				ND	0.00008	DEQ's 2004 AWQC (chronic) value	No	
7440-43-9	*Cadmium and compounds*	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	11	59%	0.00001	0.00002	0.00002	0.000202	MW16	0.000202	0.000094	EPA's 2004 NRWQC (chronic) value	Yes	MW16
7440-43-9	Cadmium and compounds	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	10	63%	0.00002	0.000069	0.00001	0.000222	MW16	0.000222	0.00038	DEQ's 2004 AWQC (chronic) value	No	
75-15-0	*Carbon disulfide*	VOC		mg/L	4/16/2004	5/10/2005	24	21	13%	0.00016	0.0005	0.00019	0.0017	MW16	0.0017	0.00092	ORNL's (Tier II SCV) value	Yes	MW16
108-90-7	Chlorobenzene	VOC		mg/L	4/16/2004	5/10/2005	24	24	0%	0.00014	0.0005				ND	0.05	DEQ's 2004 AWQC (chronic) value	No	
67-66-3	Chloroform	VOC		mg/L	4/16/2004	5/10/2005	24	21	13%	0.00014	0.0005	0.00075	0.0044	MW16	0.0044	1.24	DEQ's 2004 AWQC (chronic) value	No	
218-01-9	Chrysene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	16	38%	0.0000013	0.000027	2.8E-06	0.00011	MW16	0.00011	NA	NA	NA	
7440-50-8	*Copper and compounds*	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	3	89%	0.001	0.001	0.00012	0.00402	MW16	0.00402	0.0029	EPA's 2004 NRWQC (chronic) value	Yes	MW16
7440-50-8	*Copper and compounds*	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	1	96%	0.001	0.001	0.00029	0.0143	MW16	0.0143	0.0036	DEQ's 2004 AWQC (chronic) value	Yes	MW12, MW15, MW16
98-82-8	Cumene (isopropylbenzene)	VOC		mg/L	4/16/2004	5/10/2005	24	24	0%	0.00011	0.002				ND	NA	NA	NA	
72-54-8	DDD	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	10	9%	0.0000095	0.000012	2.6E-06	2.6E-06	MW11	2.6E-06	0.000011	ORNL's (Tier II SCV) value	No	
72-55-9	DDE	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	0.0000095	0.000013				ND	NA	NA	NA	
50-29-3	*DDT*	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	9	18%	0.0000096	0.000013	1.4E-06	0.000003	MW09	0.000003	0.000001	EPA's 2004 NRWQC (chronic) value	Yes	MW09, MW11
319-86-8	delta-BHC	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	0.0000095	0.000013				ND	NA	NA	NA	
53-70-3	Dibenz[ah]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	21	19%	0.0000017	0.000027	2.3E-06	0.000019	MW11	0.000019	NA	NA	NA	
132-64-9	Dibenzofuran	SVOC, Oxygen-Containing		mg/L	8/27/2004	5/10/2005	18	18	0%	0.0000071	0.00002				ND	0.0037	ORNL's (Tier II SCV) value	No	
60-57-1	Dieldrin	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	10	9%	0.0000095	0.000013	4.4E-06	4.4E-06	MW10	4.4E-06	0.000056	EPA's 2004 NRWQC (chronic) value	No	
DRO	Diesel Range	Petroleum Hydrocarbons		mg/L	4/16/2004	5/10/2005	28	25	11%	0.12	0.65	0.021	0.041	MW10	0.041	NA	NA	NA	
959-98-8	Endosulfan I	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	0.0000095	0.000013				ND	0.000056	EPA's 2004 NRWQC (chronic) value	No	
33213-65-9	Endosulfan II	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	10	9%	0.0000095	0.000013	1.5E-06	1.5E-06	MW09	1.5E-06	0.000056	EPA's 2004 NRWQC (chronic) value	No	
72-20-8	Endrin	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	0.0000095	0.000013				ND	0.000036	EPA's 2004 NRWQC (chronic) value	No	

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TABLE 33B
GROUNDWATER SUMMARY (DOWNGRADIENT MONITORING WELLS) AND RISK SCREENING (ECOLOGICAL RECEPTORS) - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

OU2: Oregon Joint Source Control Screening Levels (Ecological Receptors)

Constituents of Interest (COI)					Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	COI Conc. (max)	JSCS Screening Level Value - Ecological Receptors *		Does COI Concentration Exceed Screening Value?	All locations where detects exceed JSCS criteria
CASNo	Analyte	Analyte Group	Fraction	Units	Minimum	Maximum	Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max			Value (mg/L)	Source		
7421-93-4	Endrin Aldehyde	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	0.0000095	0.000013				ND	NA	NA	NA	
53494-70-5	Endrin Ketone	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	9	9	0%	0.0000096	0.000013				ND	NA	NA	NA	
100-41-4	Ethylbenzene	VOC		mg/L	4/16/2004	5/10/2005	24	23	4%	0.00013	0.0005	0.00063	0.00063	MW10	0.00063	0.0073	ORNL's (Tier II SCV) value	No	
206-44-0	Fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	10	62%	0.0000024	0.000025	5.2E-06	0.00015	MW16	0.00015	NA	NA	NA	
86-73-7	Fluorene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	22	15%	0.0000026	0.000027	3.7E-06	9.8E-06	MW16	9.8E-06	0.0039	ORNL's (Tier II SCV) value	No	
GRO	Gasoline Range	Petroleum Hydrocarbons		mg/L	4/16/2004	5/10/2005	28	26	7%	0.05	0.26	0.013	0.051	MW10	0.051	NA	NA	NA	
76-44-8	***Heptachlor***	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	0.0000095	0.000013				ND	0.0000038	DEQ's 2004 AWQC (chronic) value	***ND>SLV***	
1024-57-3	***Heptachlor epoxide***	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	0.0000095	0.000013				ND	0.0000038	EPA's 2004 NRWQC (chronic) value	***ND>SLV***	
193-39-5	Indeno[1,2,3-cd]pyrene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	18	31%	0.0000021	0.000027	2.5E-06	0.000094	MW16	0.000094	NA	NA	NA	
7439-92-1	*Lead*	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	12	56%	0.000009	0.000023	0.00001	0.0006	MW16	0.0006	0.00054	EPA's 2004 NRWQC (chronic) value	Yes	MW16
7439-92-1	*Lead*	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	2	93%	0.00002	0.000075	0.000016	0.0109	MW15	0.0109	0.00054	DEQ's 2004 AWQC (chronic) value	Yes	MW09, MW12, MW15, MW16
7487-94-7	Mercury and compounds	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	19	30%	0.0001	0.0002	0.00005	0.00009	MW12	0.00009	0.00077	EPA's 2004 NRWQC (chronic) value	No	
7487-94-7	*Mercury and compounds*	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	20	26%	0.0001	0.0002	0.00004	0.00006	MW12	0.00006	0.000012	DEQ's 2004 AWQC (chronic) value	Yes	MW09, MW10, MW11, MW12, MW13
72-43-5	Methoxychlor	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	0.0000095	0.000013				ND	0.00003	EPA's 2004 NRWQC (chronic) value	No	
91-20-3	Naphthalene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	50	26	48%	0.00002	0.002	1.4E-06	0.00033	MW10	0.00033	0.62	DEQ's 2004 AWQC (chronic) value	No	
104-51-8	n-Butylbenzene	VOC		mg/L	4/16/2004	5/10/2005	24	24	0%	0.00023	0.002				ND	NA	NA	NA	
7440-02-0	Nickel	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	0	100%			0.0004	0.0101	MW15	0.0101	0.016	EPA's 2004 NRWQC (chronic) value	No	
7440-02-0	Nickel	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	0	100%			0.0003	0.0204	MW15	0.0204	0.049	DEQ's 2004 AWQC (chronic) value	No	
103-65-1	n-Propylbenzene	VOC		mg/L	4/16/2004	5/10/2005	24	23	4%	0.000098	0.002	0.00014	0.00014	MW10	0.00014	NA	NA	NA	
95-47-6	o-Xylene	VOC		mg/L	4/16/2004	5/10/2005	24	20	17%	0.00011	0.0005	0.00014	0.0013	MW10	0.0013	0.013	ORNL's (Tier II SCV) value	No	
85-01-8	Phenanthrene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	8	69%	0.0000032	0.000025	4.2E-06	0.000079	MW16	0.000079	NA	NA	NA	
129-00-0	Pyrene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	8	69%	0.0000023	0.000025	4.2E-06	0.00013	MW16	0.00013	NA	NA	NA	
RRO	Residual Range	Petroleum Hydrocarbons		mg/L	4/16/2004	5/10/2005	28	22	21%	0.24	0.65	0.035	0.52	MW09	0.52	NA	NA	NA	
135-9-88	sec-Butylbenzene	VOC		mg/L	4/16/2004	5/10/2005	24	24	0%	0.00013	0.002				ND	NA	NA	NA	
7782-49-2	Selenium	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	17	37%	0.0002	0.005	0.0002	0.0013	MW12	0.0013	NA	NA	NA	
7782-49-2	Selenium	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	12	56%	0.0002	0.005	0.0001	0.0018	MW16	0.0018	0.005	EPA's 2004 NRWQC (chronic) value	No	
7440-22-4	Silver and compounds	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	27	0%	0.000009	0.00002				ND	NA	NA	NA	
7440-22-4	Silver and compounds	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	23	15%	0.000009	0.00004	0.000006	0.00003	MW16	0.00003	0.00012	DEQ's 2004 AWQC (chronic) value	No	
127-18-4	Tetrachloroethylene (PCE)	VOC		mg/L	4/16/2004	5/10/2005	24	18	25%	0.00013	0.0005	0.00015	0.00051	MW10	0.00051	0.84	DEQ's 2004 AWQC (chronic) value	No	
7440-28-0	Thallium	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	18	33%	0.000004	0.00002	0.000006	0.000039	MW16	0.000039	NA	NA	NA	
7440-28-0	Thallium	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	15	44%	0.000004	0.00004	0.000004	0.000072	MW16	0.000072	NA	NA	NA	
108-88-3	Toluene	VOC		mg/L	4/16/2004	5/10/2005	24	13	46%	0.00011	0.0005	0.00013	0.0018	MW10	0.0018	0.0098	ORNL's (Tier II SCV) value	No	
7440-47-3	Chromium, total	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	2	93%	0.00006	0.00038	0.00009	0.0068	MW15	0.0068	0.011	EPA's 2004 NRWQC (chronic) value	No	
7440-47-3	*Chromium, total*	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	0	100%			0.00023	0.0219	MW15	0.0219	0.011	DEQ's 2004 AWQC (chronic) value	Yes	
79-01-6	Trichloroethylene (TCE)	VOC		mg/L	4/16/2004	5/10/2005	24	20	17%	0.00014	0.0005	0.00019	0.0005	MW09	0.0005	21.9	DEQ's 2004 AWQC (chronic) value	No	
75-01-4	Vinyl chloride	VOC		mg/L	4/16/2004	5/10/2005	24	24	0%	0.00022	0.0005				ND	NA	NA	NA	
1330-20-7	*Xylene (mixed)*	VOC		mg/L	4/16/2004	5/10/2005	24	20	17%	0.00022	0.0005	0.00034	0.003	MW10	0.003	0.0018	ORNL's (Tier II SCV) value	Yes	MW10
7440-66-6	Zinc	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	3	89%	0.00101	0.0016	0.0005	0.00918	MW16	0.00918	0.0365	EPA's 2004 NRWQC (chronic) value	No	
7440-66-6	Zinc	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	2	93%	0.00195	0.00273	0.0005	0.0315	MW15	0.0315	0.033	DEQ's 2004 AWQC (chronic) value	No	

Notes:
COI - constituent of interest; min - minimum; SLV - screening level value; JSCS - Joint Source Control Strategy; NRWQC - National Recommended Water Quality Criteria
ND - non-detect; max - maximum; VOC - volatile organic compound; DEQ - Oregon Department of Environmental Quality; AWQC - Ambient water quality criteria
mg/L - milligram per liter; NA - not available; SVOC - semi-volatile organic compound; EPA - U.S. Environmental Protection Agency; ORNL - Oak Ridge National Laboratory
* All JSCS criteria from Table 3-1, Final Portland Harbor Joint Source Control Strategy, December 21, 2005, http://www.deq.state.or.us/nwr/Portland Harbor/jscs (downloaded January 3, 2006)

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TABLE 34
SUMMARY OF JSCS SCREENING - HUMAN HEALTH

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Terminal 4 Slip 1 Operable Unit 1 - Groundwater [1.]

Analyte (COPCs) [2.]	Exceedance Locations [3.]
Arsenic, dissolved	MW08, MW26
Arsenic, total	MW08, MW26
Benzo[a]anthracene	MW07
Benzo[a]pyrene	MW07
Benzo[b]fluoranthene	MW07
Benzo[k]fluoranthene	MW07
Chrysene	MW07
DDE	MW08
Heptachlor	MW08
Heptachlor epoxide	MW08
Tetrachloroethylene (PCE)	MW03s
Vinyl chloride	MW03s

Terminal 4 Slip 1 Operable Unit 2 - Groundwater [1.]

Analyte (COPCs) [2.]	Exceedance Locations [3.]
Aldrin	MW11
Arsenic, dissolved	MW09, MW10, MW11, MW12, MW13, MW15, MW16
Arsenic, total	MW09, MW10, MW11, MW12, MW13, MW15, MW16
Benzo[a]anthracene	MW16
Benzo[a]pyrene	MW16
Benzo[b]fluoranthene	MW16
Benzo[k]fluoranthene	MW16
Chrysene	MW16
DDD	MW11
DDT	MW09, MW11
Dibenz[ah]anthracene	MW16
Dieldrin	MW10
Indeno[1,2,3-cd]pyrene	MW16

Notes:

1. Groundwater data based on results from downgradient monitoring wells only.
2. COPCs are constituents whose MDCs exceed the applicable JSCS screening criteria; refer to Appendix C-5 for more information.
3. Exceedance locations are sampling locations with a detected concentration that exceeded the applicable JSCS screening criteria.
4. JSCS - Joint Source Control Strategy
5. COPCs - contaminants of potential concern
6. MDC - maximum detected concentration
7. All JSCS criteria from Table 3-1, Final Portland Harbor Joint Source Control Strategy, December 21, 2005, http://www.deq.state.or.us/nwr/Portland Harbor/jscs (downloaded January 3, 2006).

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TABLE 35
COMPARISON OF GROUNDWATER MIXING ESTIMATES - ECOLOGICAL RECEPTORS

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Terminal 4 Slip 1 OU1 - Ecological Receptors

Analyte (CPECs)[1]					Oregon Screening Levels[2]	CPEC Conc. (mg/L)[3]	Estimated Concentration in Groundwater based on Surface Water Flow Rate (cfs)		
					Aquatic Receptors				
CASNo	Analyte	Analyte Group	Fraction	Units			0.01	0.1	1
56-55-3	Benzo[a]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	2.70E-05	2.14E-05	8.26E-08	8.26E-09	8.26E-10
50-32-8	Benzo(a)pyrene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	1.40E-05	2.64E-05	1.02E-07	1.02E-08	1.02E-09
75-15-0	Carbon disulfide	VOC		mg/L	9.20E-04	4.28E-04	1.65E-06	1.65E-07	1.65E-08
76-44-8	Heptachlor	Organochlorine Pesticides		mg/L	3.80E-06	2.80E-06	1.08E-08	1.08E-09	1.08E-10
1024-57-3	Heptachlor epoxide	Organochlorine Pesticides		mg/L	3.80E-06	3.20E-06	1.23E-08	1.23E-09	1.23E-10
7439-92-1	Lead	Metals/Inorganics	Total	mg/L	2.50E-03	1.00E-03	3.86E-06	3.86E-07	3.86E-08
7440-47-3	Total Chromium	Metals/Inorganics	Total	mg/L	1.10E-02	1.46E-02	5.63E-05	5.63E-06	5.63E-07

Terminal 4 Slip 1 OU2 - Ecological Receptors

Analyte (CPECs)[1]					Oregon Screening Levels[2]	CPEC Conc. (mg/L)[3]	Estimated Concentration in Groundwater based on Surface Water Flow Rate (cfs)		
					Aquatic Receptors				
CASNo	Analyte	Analyte Group	Fraction	Units			0.01	0.1	1
11097-69-1	Aroclor 1254	PCBs Aroclors		mg/L	3.30E-05	1.14E-04	4.38E-07	4.38E-08	4.38E-09
56-55-3	Benzo[a]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	2.70E-05	1.88E-05	7.26E-08	7.26E-09	7.26E-10
50-32-8	Benzo(a)pyrene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	1.40E-05	2.20E-05	8.47E-08	8.47E-09	8.47E-10
75-15-0	Carbon disulfide	VOC		mg/L	9.20E-04	4.88E-04	1.88E-06	1.88E-07	1.88E-08
7440-50-8	Copper and compounds	Metals/Inorganics	Total	mg/L	9.00E-03	4.07E-03	1.57E-05	1.57E-06	1.57E-07
72-54-8	DDD	Organochlorine Pesticides		mg/L	1.00E-06	2.60E-06	1.00E-08	1.00E-09	1.00E-10
50-29-3	DDT	Organochlorine Pesticides		mg/L	1.00E-06	3.00E-06	1.16E-08	1.16E-09	1.16E-10
76-44-8	Heptachlor	Organochlorine Pesticides		mg/L	3.80E-06	5.47E-06	2.11E-08	2.11E-09	2.11E-10
7439-92-1	Lead	Metals/Inorganics	Total	mg/L	2.50E-03	1.31E-03	5.05E-06	5.05E-07	5.05E-08
7440-47-3	Total Chromium	Metals/Inorganics	Total	mg/L	1.10E-02	4.14E-03	1.60E-05	1.60E-06	1.60E-07

Notes:

1. CPECs are COIs whose MDCs exceed a DEQ Level II SLV (Table 1, Guidance for Ecological Risk Assessment, DEQ, March 2001) or are CPECs due to risk from multiple COIs; see Appendix Table B-2.
2. All Level II SLV criteria from Oregon DEQ, Table 1, Guidance for Ecological Risk Assessment, December 2001.
3. CPEC concentration is 90UCL, or MDC (if 90UCL could not be calculated) ; see Appendix B-2
   Bolded and highlighted concentrations are greater than the corresponding Aquatic Receptor SLV.
4. CPECs - contaminants of potential ecological concern
5. SLV - screening level value
6. DEQ - Oregon Department of Environmental Quality
7. COI - constituent of interest
8. 90UCL - 90% upper confidence limit
9. mg/L - milligram per liter
10. MDC - maximum detected concentration

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TABLE 36A
COMPARISON OF GROUNDWATER MIXING ESTIMATES - HUMAN HEALTH - OU1

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

OU1, Downgradient Wells only - Human Health

Constituents of Potential Concern (COPCs)		Human Health Screening for Fish Consumption Only	COPC Conc. Value (ug/L)	Surface Water Flow Rate (cfs)		
CASNo	Analyte			0.01	0.1	1
Metals						
7440-38-2	Arsenic (total)	1.4E-01	**3.6E+00**	1.4E-02	1.4E-03	1.4E-04
7440-38-2	Arsenic (dissolved)	1.4E-01	**3.7E+00**	1.4E-02	1.4E-03	1.4E-04
Volatile Organics						
127-18-4	Tetrachloroethylene (PCE)	3.3E+00	**4.7E+00**	1.8E-02	1.8E-03	1.8E-04
75-01-4	Vinyl chloride	2.4E+00	1.9E+00	7.4E-03	7.4E-04	7.4E-05
Semivolatile Organics (PAHs)						
56-55-3	Benzo[a]anthracene	1.8E-02	**2.6E-02**	1.0E-04	1.0E-05	1.0E-06
50-32-8	Benzo[a]pyrene	1.8E-02	**2.6E-02**	1.0E-04	1.0E-05	1.0E-06
205-99-2	Benzo[b]fluoranthene	1.8E-02	**3.5E-02**	1.4E-04	1.4E-05	1.4E-06
207-08-9	Benzo[k]fluoranthene	1.8E-02	**3.1E-02**	1.2E-04	1.2E-05	1.2E-06
218-01-9	Chrysene	1.8E-02	**2.4E-02**	9.1E-05	9.1E-06	9.1E-07
Pesticides						
72-55-9	DDE	2.2E-04	**4.3E-03**	1.7E-05	1.7E-06	1.7E-07
76-44-8	Heptachlor	7.9E-05	**2.8E-03**	1.1E-05	1.1E-06	1.1E-07

Notes:

1. Fish Consumption Only from EPA 2004, National Recommended Water Quality Criteria for Human Health For Consumption of Organism Only

2. Bolded and highlighted concentrations are greater than the corresponding Human Health Screening Criteria

3. The COPC concentration is the lesser of the maximum concentration or the calculated 90UCL. See Appendix Table C-2.

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TABLE 36B
COMPARISON OF GROUNDWATER MIXING ESTIMATES - HUMAN HEALTH - OU2

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

OU2, Downgradient Wells only - Human Health

Constituents of Potential Concern (COPCs)		Human Health Screening for Fish Consumption Only	COPC Conc. Value (ug/L)	Surface Water Flow Rate (cfs)		
CASNo	Analyte			0.01	0.1	1
Metals						
7440-38-2	Arsenic (total)	1.4E-01	**8.3E+00**	3.2E-02	3.2E-03	3.2E-04
7440-38-2	Arsenic (dissolved)	1.4E-01	**7.8E+00**	3.0E-02	3.0E-03	3.0E-04
Semivolatile Organics (PAHs)						
56-55-3	Benzo[a]anthracene	1.8E-02	**1.9E-02**	7.3E-05	7.3E-06	7.3E-07
50-32-8	Benzo[a]pyrene	1.8E-02	**2.2E-02**	8.5E-05	8.5E-06	8.5E-07
205-99-2	Benzo[b]fluoranthene	1.8E-02	**2.2E-02**	8.6E-05	8.6E-06	8.6E-07
207-08-9	Benzo[k]fluoranthene	1.8E-02	**2.1E-02**	8.1E-05	8.1E-06	8.1E-07
218-01-9	Chrysene	1.8E-02	**2.5E-02**	9.5E-05	9.5E-06	9.5E-07
53-70-3	Dibenz[ah]anthracene	1.8E-02	1.1E-02	4.4E-05	4.4E-06	4.4E-07
193-39-5	Indeno[1,2,3-cd]pyrene	1.8E-02	**2.2E-02**	8.5E-05	8.5E-06	8.5E-07
Pesticides						
309-00-2	Aldrin	5.0E-05	**1.2E-03**	4.6E-06	4.6E-07	4.6E-08
72-54-8	DDD	3.1E-04	**2.6E-03**	1.0E-05	1.0E-06	1.0E-07
50-29-3	DDT	2.2E-04	**3.0E-03**	1.2E-05	1.2E-06	1.2E-07
60-57-1	Dieldrin	5.4E-05	**4.4E-03**	1.7E-05	1.7E-06	1.7E-07

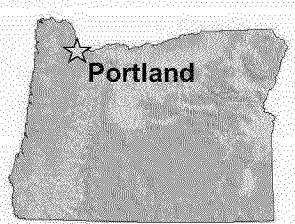
Notes:

1. Fish Consumption Only from EPA 2004, National Recommended Water Quality Criteria for Human Health For Consumption of Organism Only

2. Bolded and highlighted concentrations are greater than the corresponding Human Health Screening Criteria

3. The COPC concentration is the lesser of the maximum concentration or the calculated 90UCL. See Appendix Table C-2.

Base map prepared from the USGS 7.5-minute quadrangle of Linnton, Oregon, dated 1990.



0 2000 4000

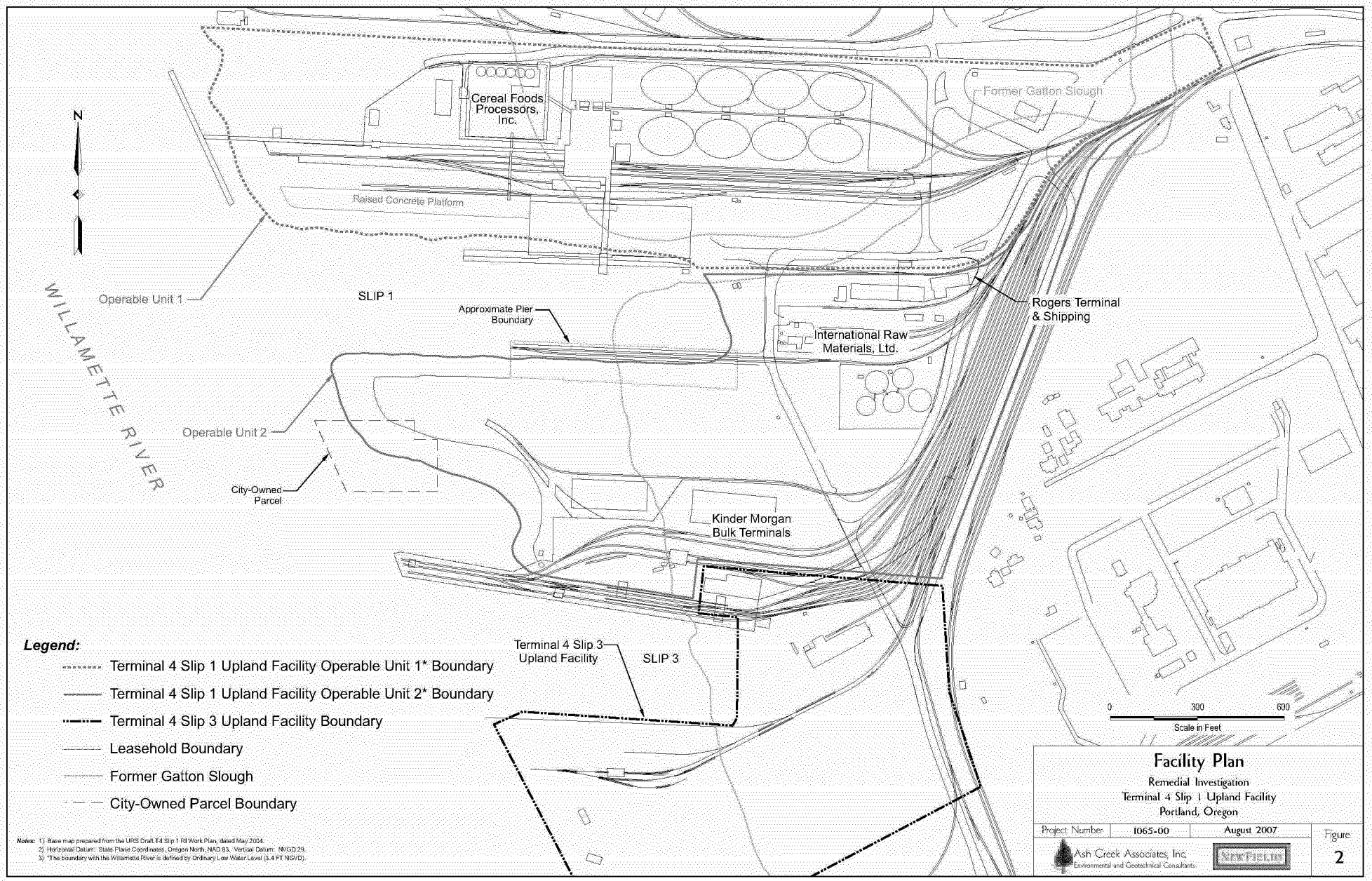
Scale in Feet

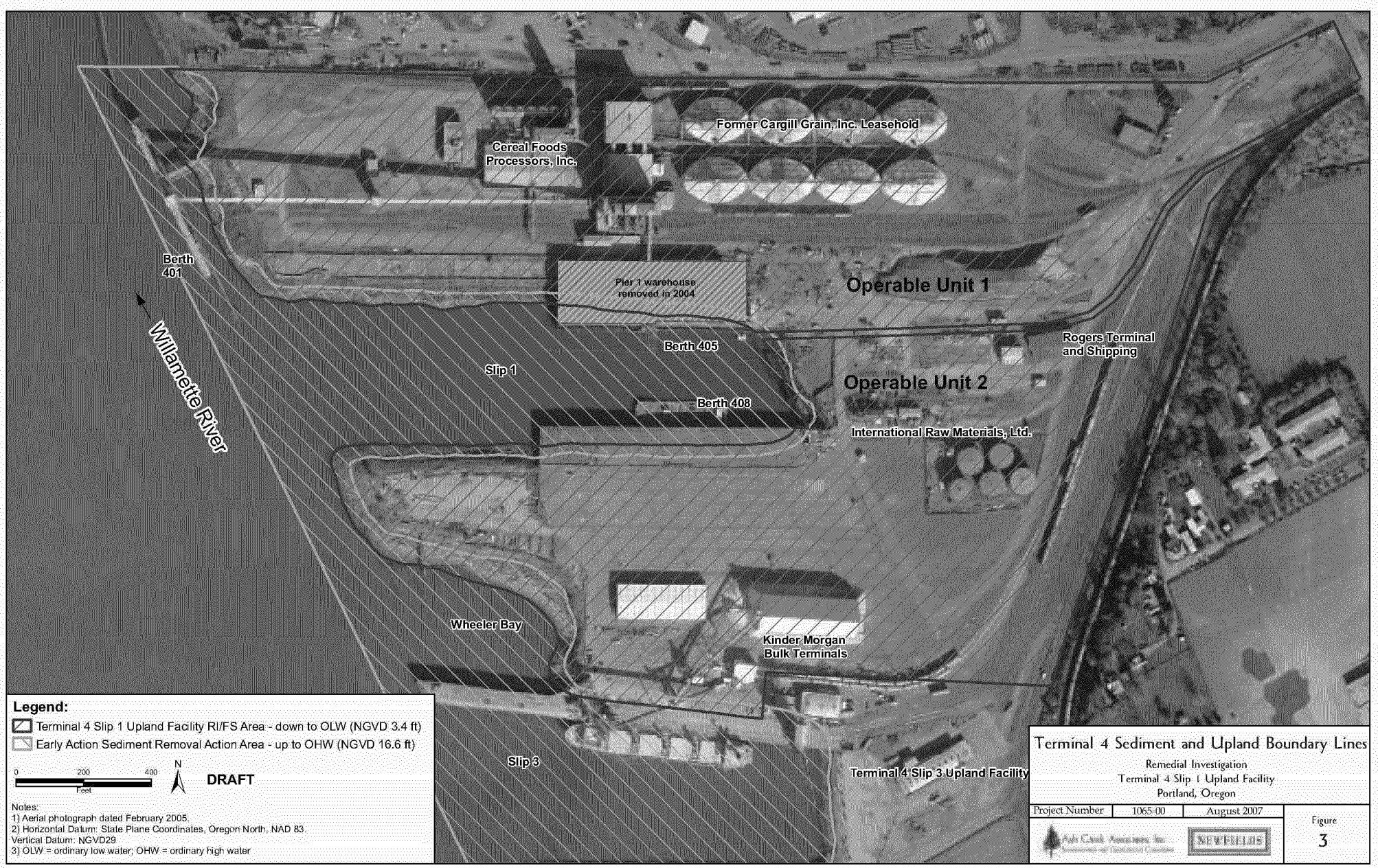
Facility Location Map

Remedial Investigation
Terminal 4 Slip 1 Upland Facility
Portland, Oregon

Project Number	1065-00	August 2007	Figure
Ash Creek Associates, Inc. Environmental and Geotechnical Consultants	NEWFIELDS		1

KMB00008385


N
Cereal Foods Processors, Inc.
Former Gatton Slough
Raised Concrete Platform
Operable Unit 1
SLIP 1
Approximate Pier Boundary
International Raw Materials, Ltd.
Rogers Terminal & Shipping
WILLAMETTE RIVER
Operable Unit 2
City-Owned Parcel
Kinder Morgan Bulk Terminals
Terminal 4 Slip 3 Upland Facility
SLIP 3
Legend:
Terminal 4 Slip 1 Upland Facility Operable Unit 1* Boundary
Terminal 4 Slip 1 Upland Facility Operable Unit 2* Boundary
Terminal 4 Slip 3 Upland Facility Boundary
Leasehold Boundary
Former Gatton Slough
City-Owned Parcel Boundary
0
300
600
Scale in Feet
Facility Plan
Remedial Investigation
Terminal 4 Slip 1 Upland Facility
Portland, Oregon
Project Number
1065-00
August 2007
Figure
2
Ash Creek Associates, Inc.
Environmental and Geotechnical Consultants
NewFields
Notes: 1) Base map prepared from the URS Draft T4 Slip 1 RI Work Plan, dated May 2004.
2) Horizontal Datum: State Plane Coordinates, Oregon North, NAD 83. Vertical Datum: NVGD 29.
3) *The boundary with the Willamette River is defined by Ordinary Low Water Level (3.4 FT NGVD).



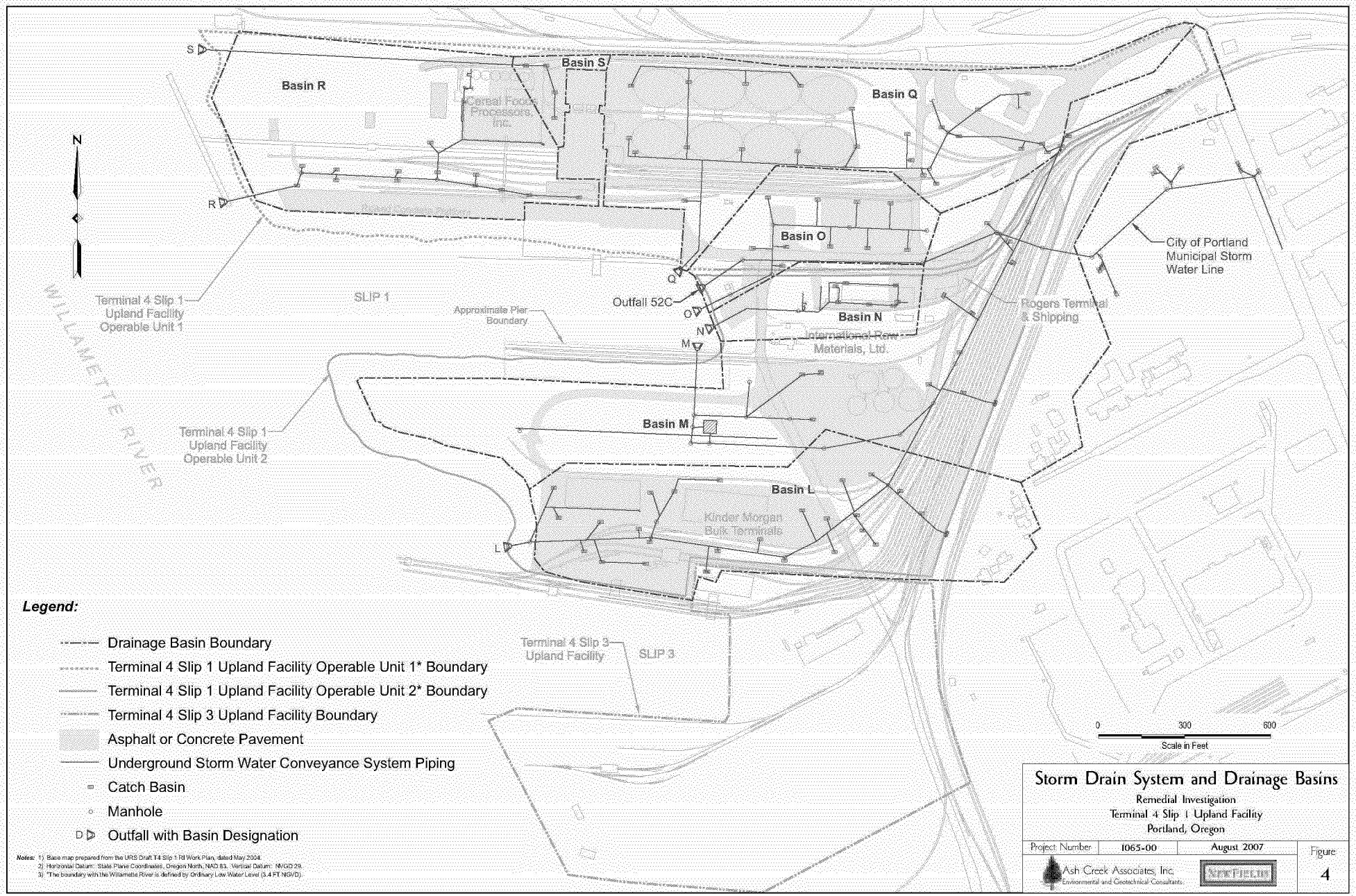
Terminal 4 Sediment and Upland Boundary Lines

Remedial Investigation
Terminal 4 Slip 1 Upland Facility
Portland, Oregon

Project Number	1065-00	August 2007

Figure 3

KMB00008387



Legend:

- Drainage Basin Boundary
- Terminal 4 Slip 1 Upland Facility Operable Unit 1* Boundary
- Terminal 4 Slip 1 Upland Facility Operable Unit 2* Boundary
- Terminal 4 Slip 3 Upland Facility Boundary
- Asphalt or Concrete Pavement
- Underground Storm Water Conveyance System Piping
- Catch Basin
- Manhole
- D Outfall with Basin Designation

Notes: 1) Base map prepared from the URS Draft T4 Slip 1 RI Work Plan, dated May 2004.
2) Horizontal Datum: State Plane Coordinates, Oregon North, NAD 83. Vertical Datum: NVGD 29.
3) *The boundary with the Willamette River is defined by Ordinary Low Water Level (3.4 FT NGVD).

Storm Drain System and Drainage Basins

Remedial Investigation
Terminal 4 Slip 1 Upland Facility
Portland, Oregon

Project Number	1065-00	August 2007	Figure
Ash Creek Associates, Inc. Environmental and Geotechnical Consultants	NEWFIELDS		4

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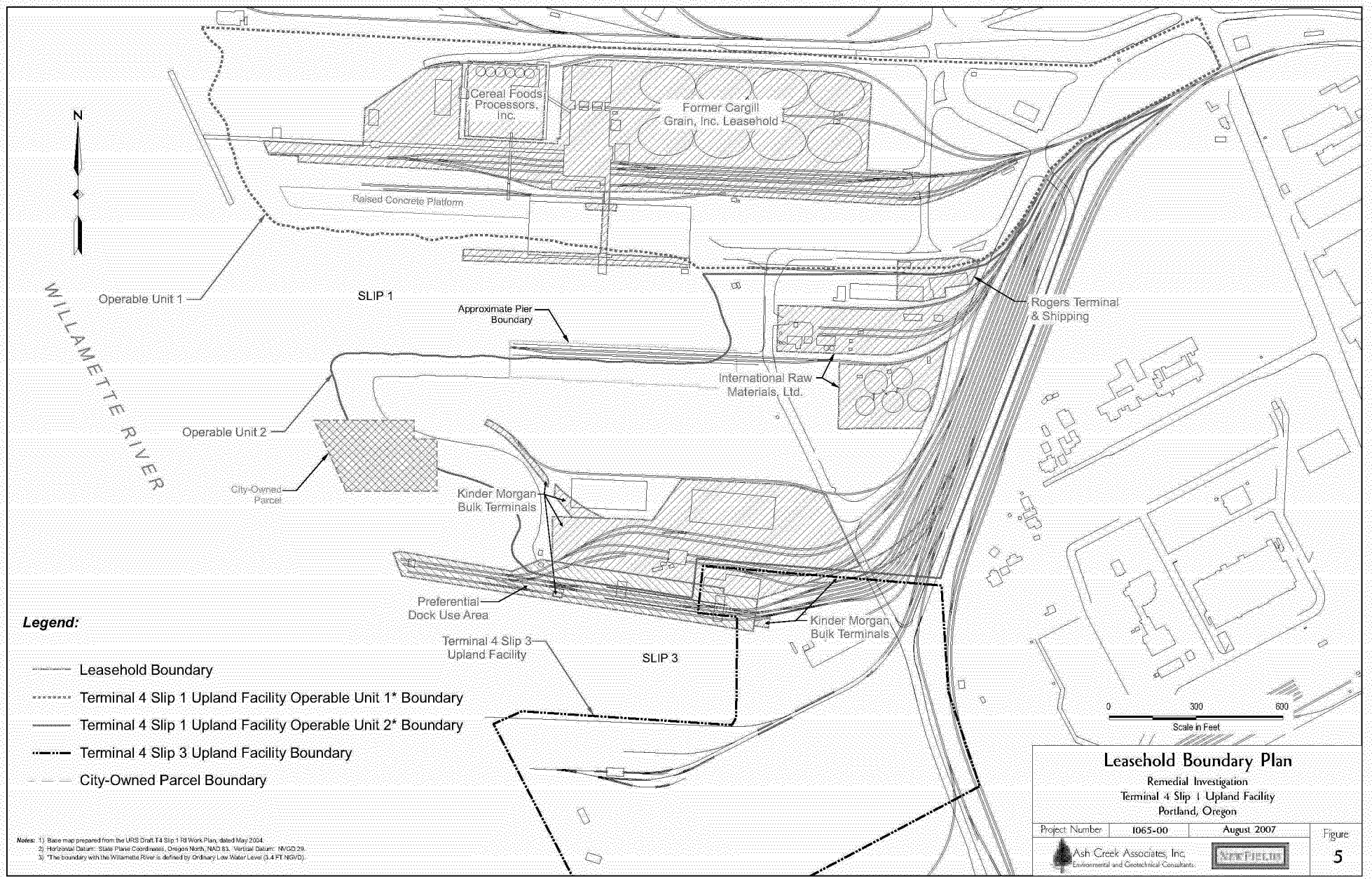
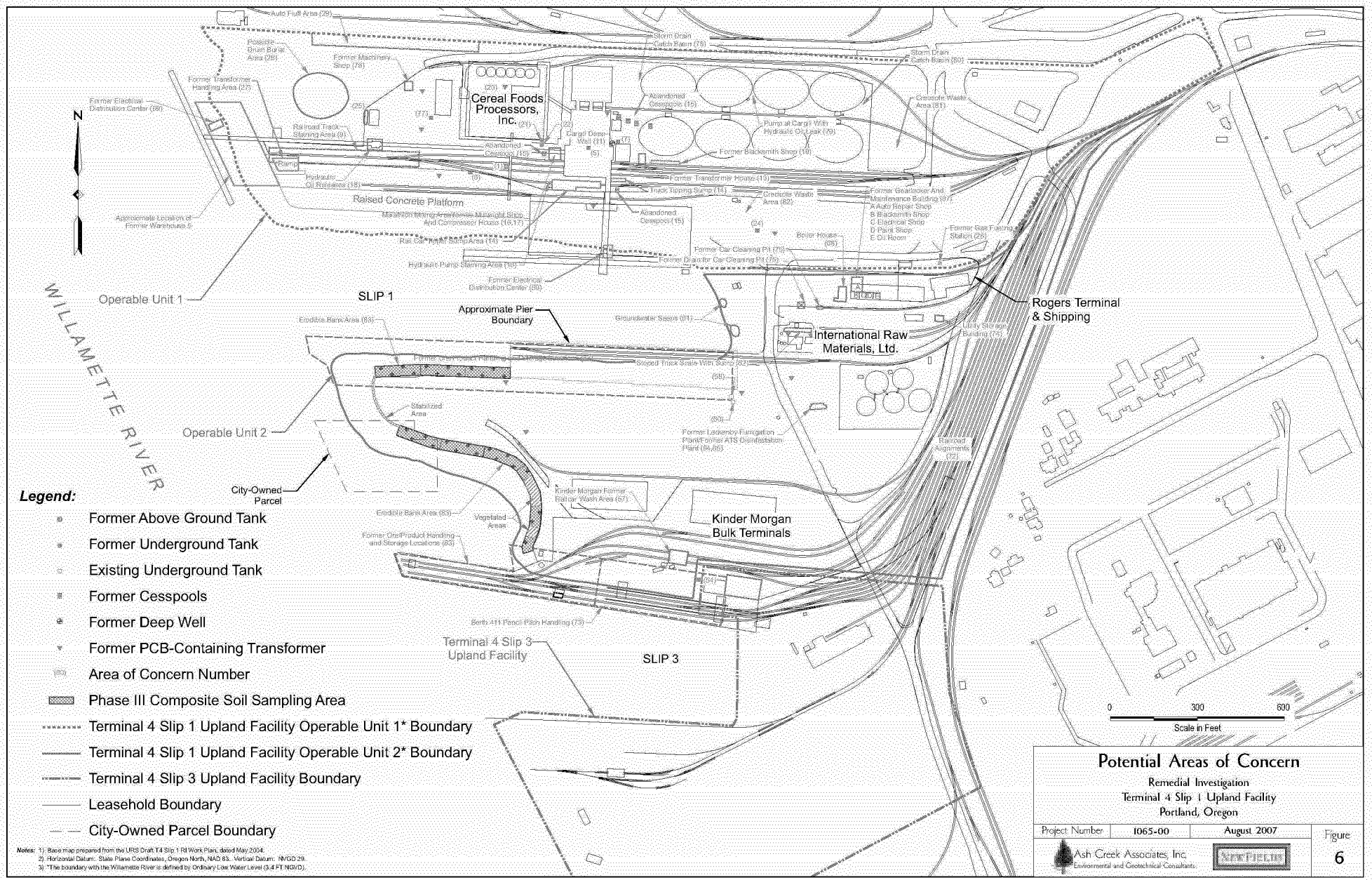


Leasehold Boundary Plan

Remedial Investigation
Terminal 4 Slip 1 Upland Facility
Portland, Oregon

Project Number	1065-00	August 2007	Figure
Ash Creek Associates, Inc. Environmental and Geotechnical Consultants	NEWFIELDS		5



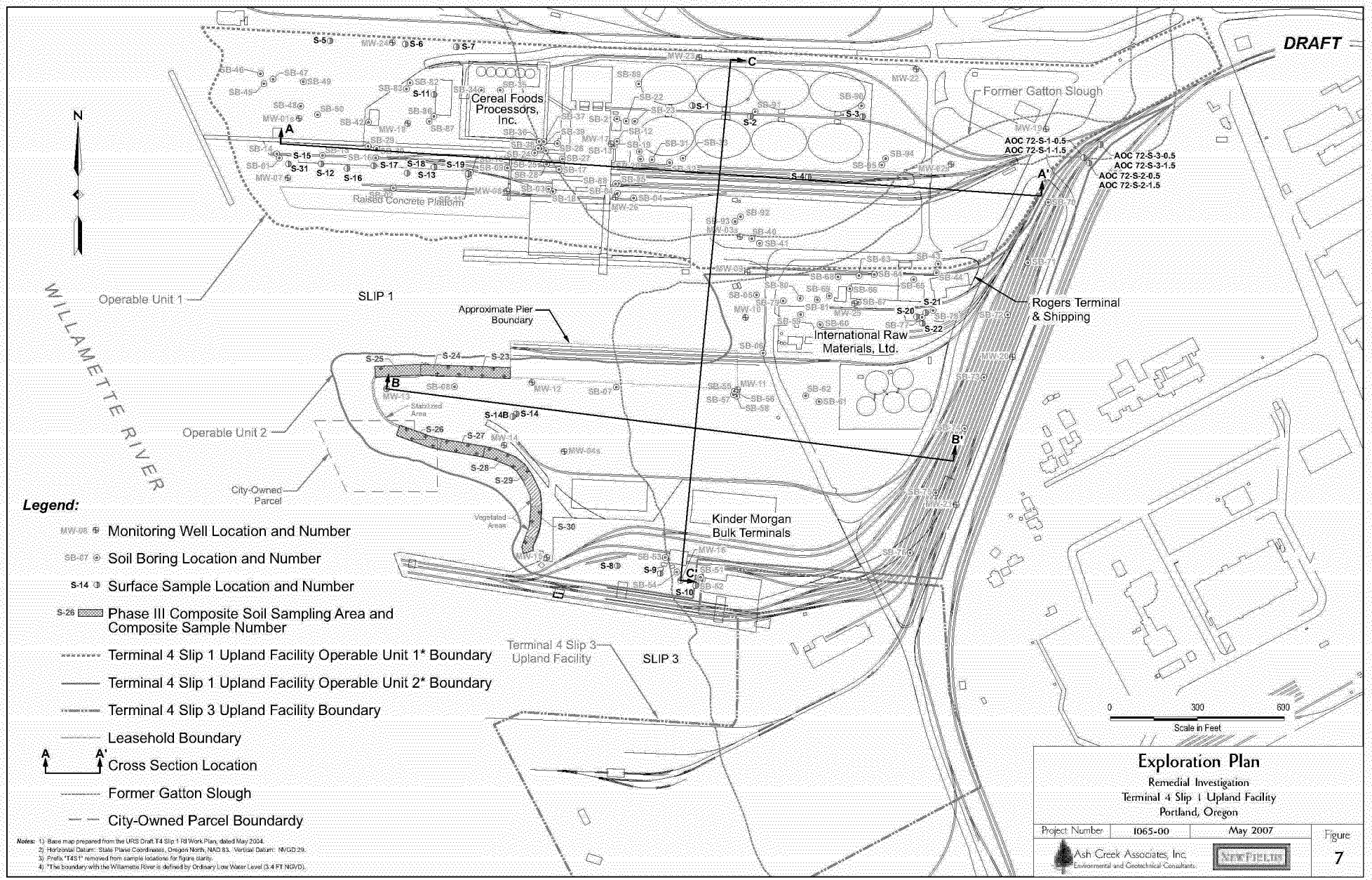
Legend:

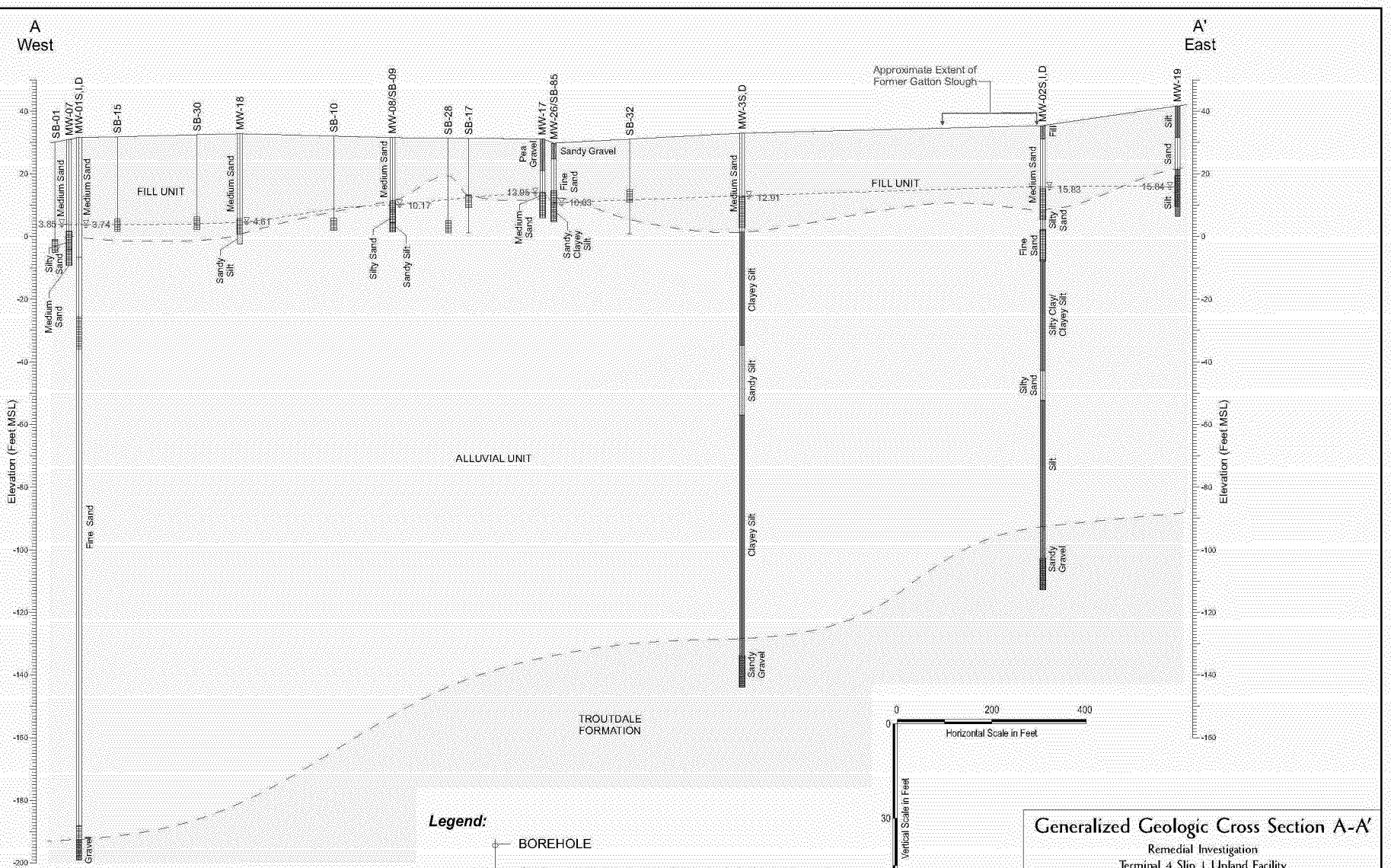
Notes: 1) Base map prepared from the URS Draft T4 Slip 1 RI Work Plan, dated May 2004.
2) Horizontal Datum: State Plane Coordinates, Oregon North, NAD 83. Vertical Datum: NVGD 29.
3) *The boundary with the Willamette River is defined by Ordinary Low Water Level (3.4 FT NGVD).

Potential Areas of Concern

Remedial Investigation
Terminal 4 Slip 1 Upland Facility
Portland, Oregon

Project Number	1065-00	August 2007	Figure
Ash Creek Associates, Inc. Environmental and Geotechnical Consultants	NEW FIELDS		6


DRAFT
N
Cereal Foods Processors, Inc.
Former Gatton Slough
Raised Concrete Platform
Operable Unit 1
SLIP 1
Approximate Pier Boundary
Rogers Terminal & Shipping
International Raw Materials, Ltd.
WILLAMETTE RIVER
Operable Unit 2
Stabilized Area
City-Owned Parcel
Vegetated Areas
Kinder Morgan Bulk Terminals
Terminal 4 Slip 3 Upland Facility
SLIP 3
AOC 72-S-1-0.5
AOC 72-S-1-1.5
AOC 72-S-3-0.5
AOC 72-S-3-1.5
AOC 72-S-2-0.5
AOC 72-S-2-1.5
0
300
600
Scale in Feet
Legend:
Monitoring Well Location and Number
Soil Boring Location and Number
Surface Sample Location and Number
Phase III Composite Soil Sampling Area and Composite Sample Number
Terminal 4 Slip 1 Upland Facility Operable Unit 1* Boundary
Terminal 4 Slip 1 Upland Facility Operable Unit 2* Boundary
Terminal 4 Slip 3 Upland Facility Boundary
Leasehold Boundary
Cross Section Location
Former Gatton Slough
City-Owned Parcel Boundardy
Notes: 1) Base map prepared from the URS Draft T4 Slip 1 RI Work Plan, dated May 2004.
2) Horizontal Datum: State Plane Coordinates, Oregon North, NAD 83. Vertical Datum: NVGD 29.
3) Prefix "T4S1" removed from sample locations for figure clarity.
4) *The boundary with the Willamette River is defined by Ordinary Low Water Level (3.4 FT NGVD).
Exploration Plan
Remedial Investigation
Terminal 4 Slip 1 Upland Facility
Portland, Oregon
Project Number 1065-00
May 2007
Figure 7
Ash Creek Associates, Inc.
Environmental and Geotechnical Consultants
New Fields



NOTE: To the west, the contact between the Fill unit and underlying alluvium is distinguished by a color change from brown to gray or black, and generally (but not at all locations) an increase in fines. The contact is more distinct in the central and eastern portions of the Facility as both a color change and change from sand to silt or silty sand.

Generalized Geologic Cross Section A-A'

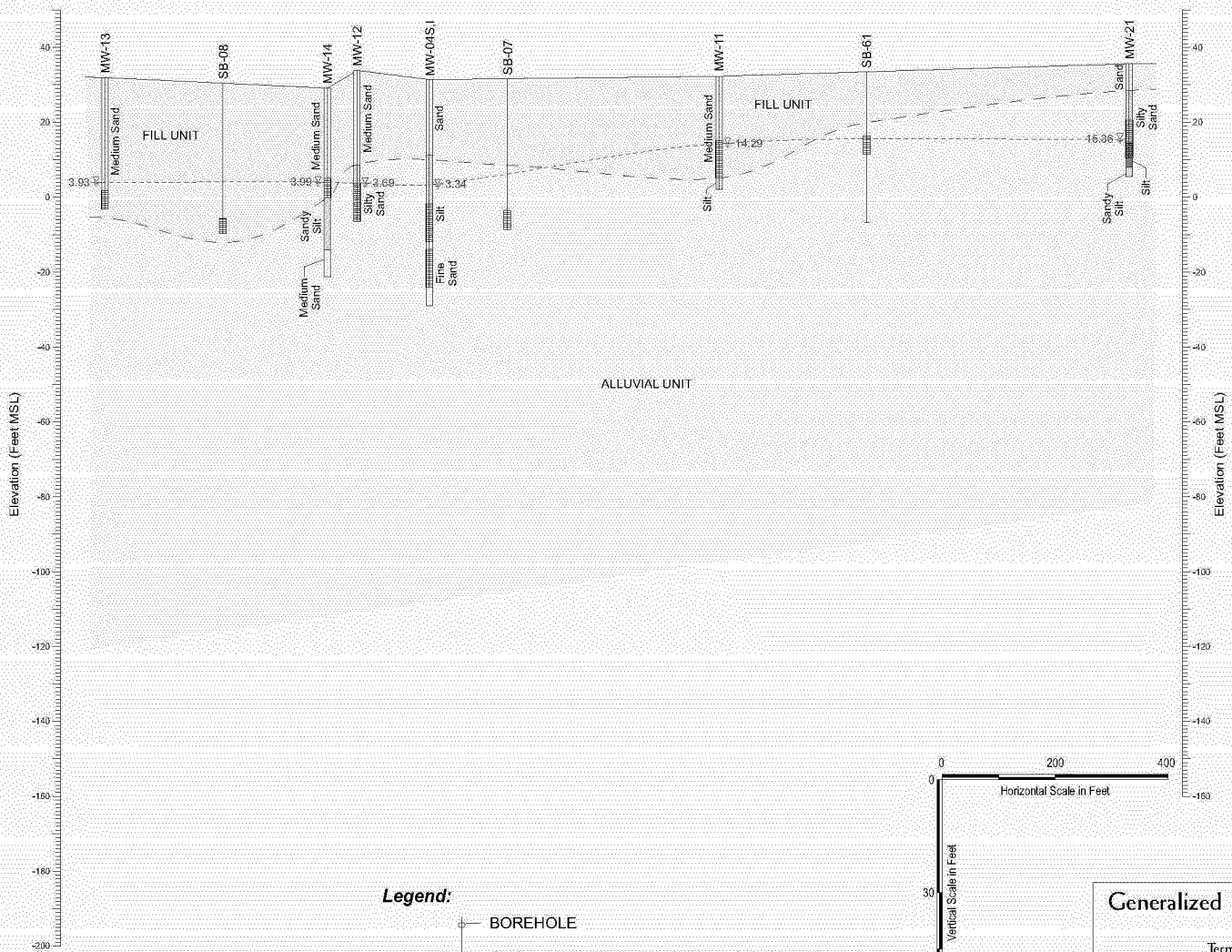
Remedial Investigation
Terminal 4 Slip 1 Upland Facility
Portland, Oregon

Project Number	1065-00	August 2007

Ash Creek Associates, Inc.
Environmental and Geotechnical Consultants

Figure 8

KMB00008392



Legend:

BOREHOLE

3.99 GROUNDWATER LEVEL (FEET MSL), SEP 14, 2005

MONITORING WELL SCREEN INTERVAL

NOTE: To the west, the contact between the Fill unit and underlying alluvium is distinguished by a color change from brown to gray or black, and generally (but not at all locations) an increase in fines. The contact is more distinct in the central and eastern portions of the Facility as both a color change and change from sand to silt or silty sand.

Generalized Geologic Cross Section B-B'

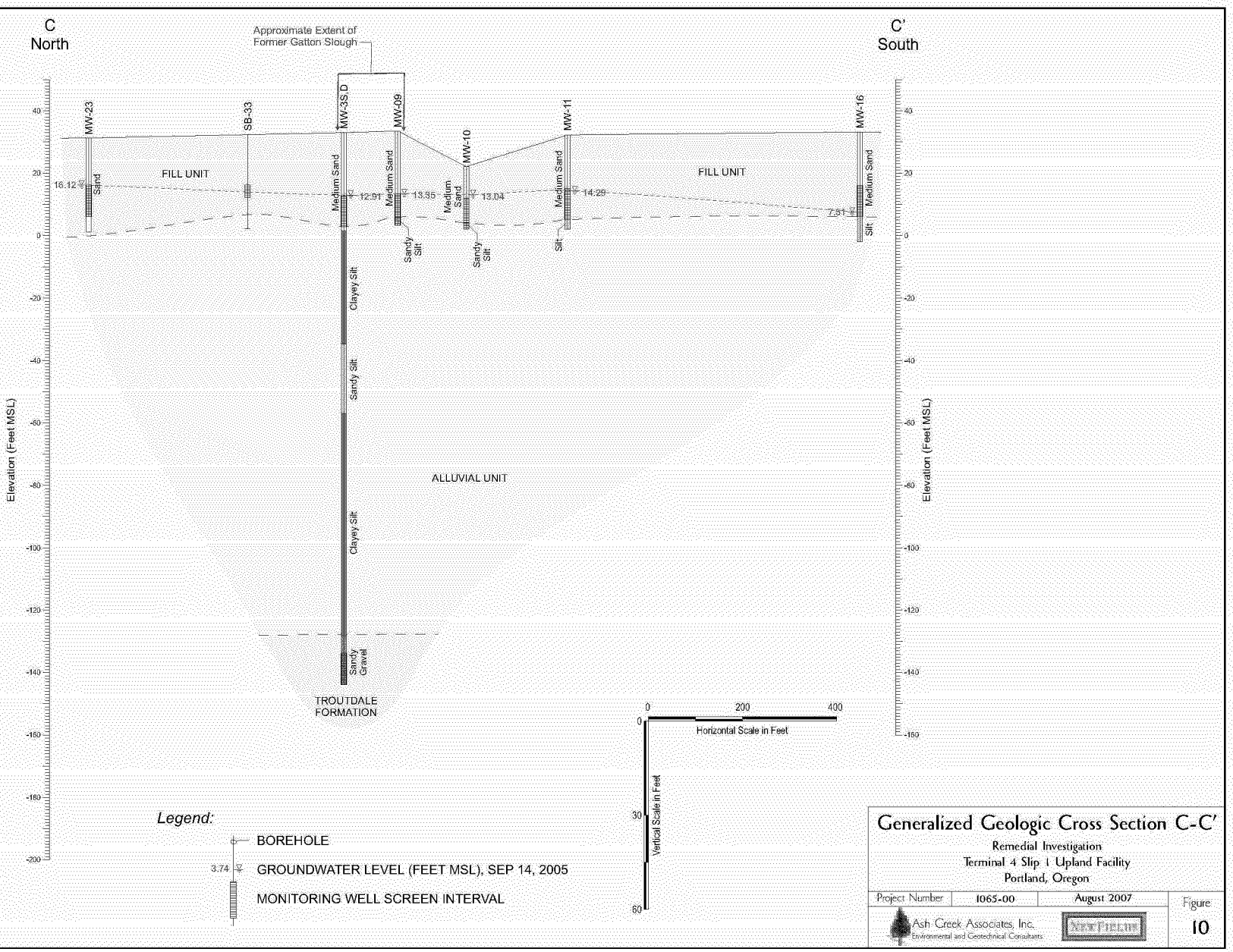
Remedial Investigation
Terminal 4 Slip 1 Upland Facility
Portland, Oregon

Project Number	1065-00	August 2007

Ash Creek Associates, Inc.
Environmental and Geotechnical Consultants

Figure 9

KMB00008393



Generalized Geologic Cross Section C-C'

Remedial Investigation
Terminal 4 Slip 1 Upland Facility
Portland, Oregon

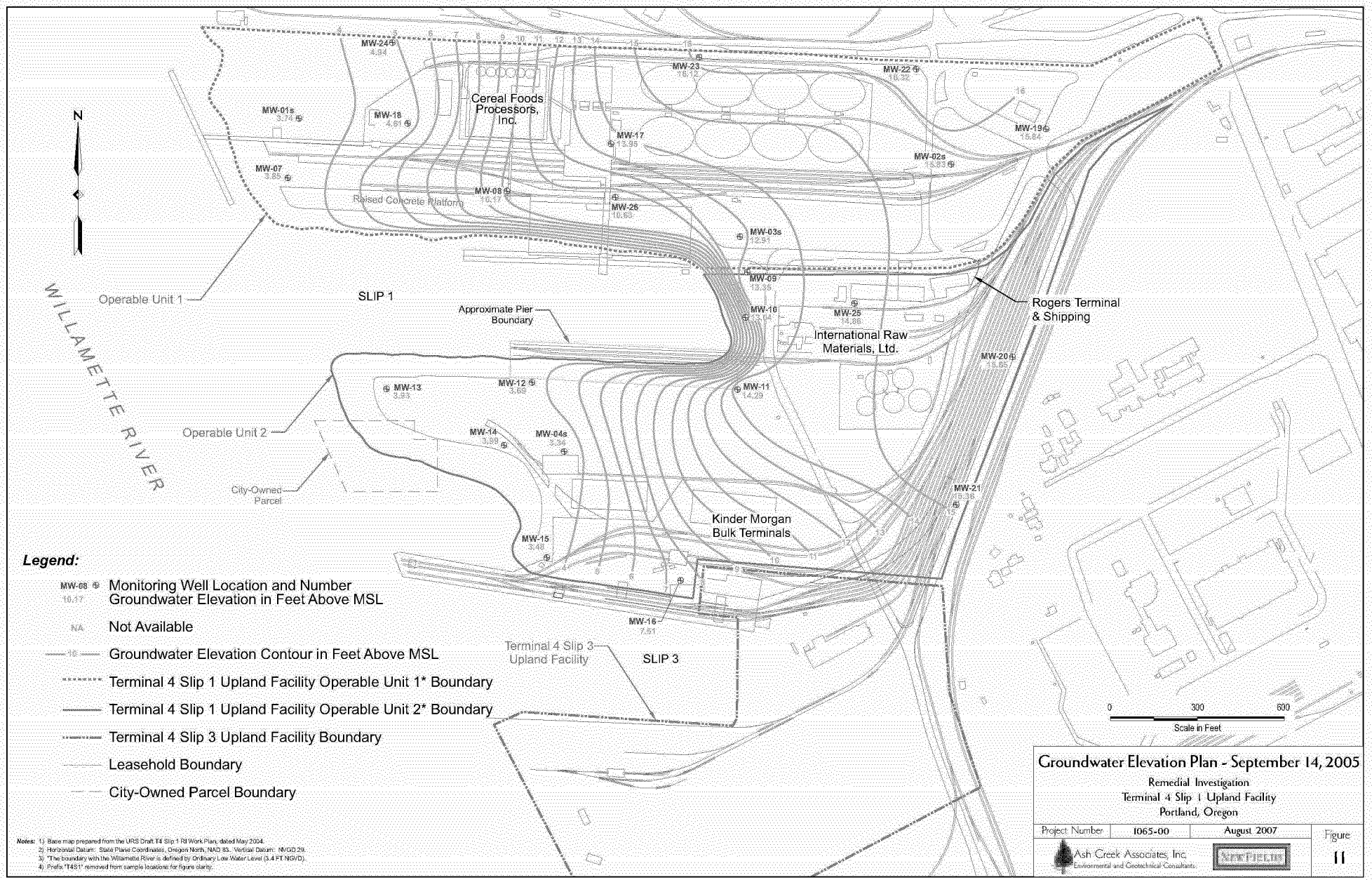
Project Number	1065-00	August 2007

Ash Creek Associates, Inc.
Environmental and Geotechnical Consultants

NEW FIELD

Figure
10

KMB00008394



Legend:

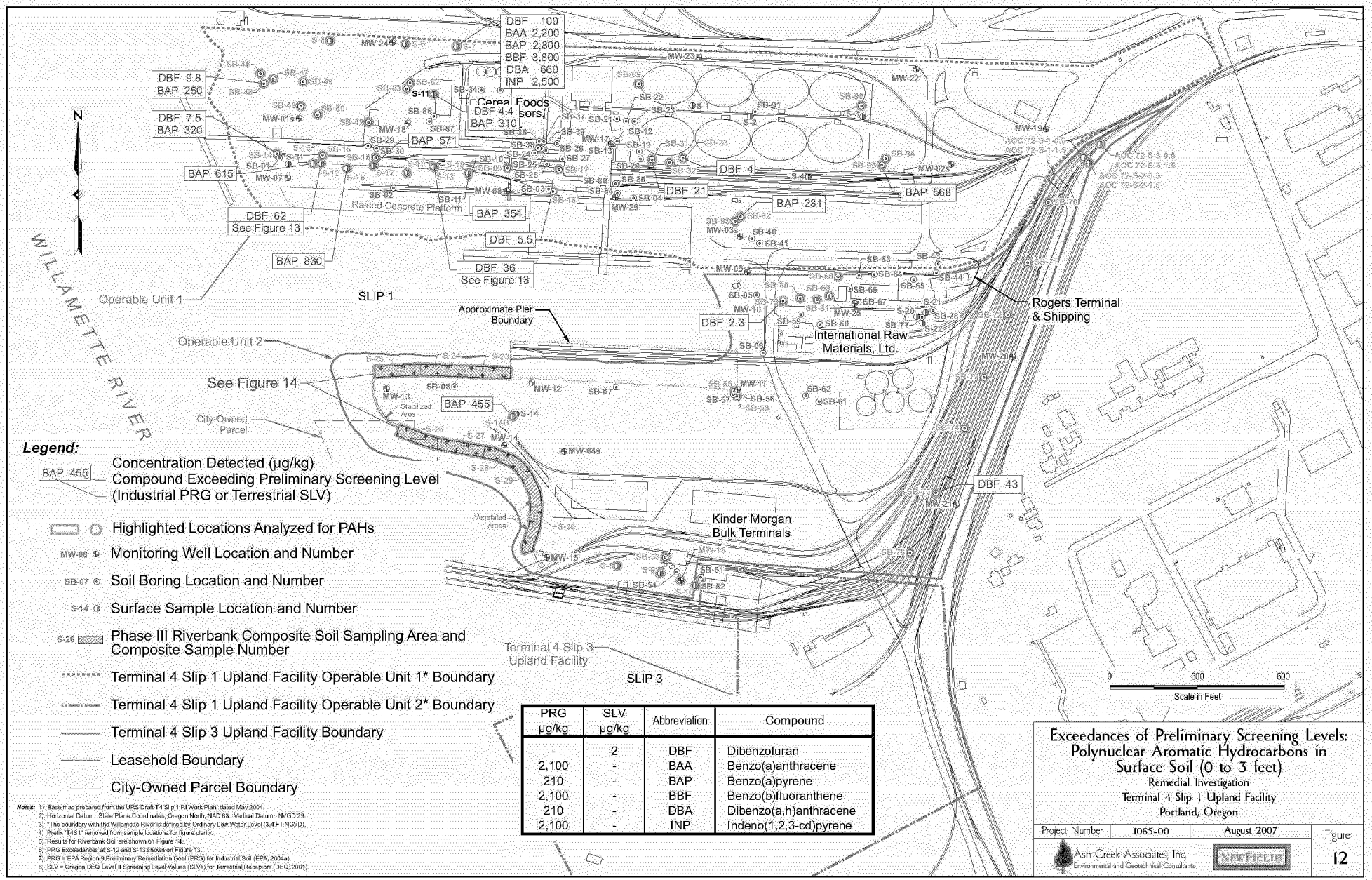
- MW-08 ⊕ / 16.17 — Monitoring Well Location and Number / Groundwater Elevation in Feet Above MSL
- NA — Not Available
- 16 — Groundwater Elevation Contour in Feet Above MSL
- Terminal 4 Slip 1 Upland Facility Operable Unit 1* Boundary
- Terminal 4 Slip 1 Upland Facility Operable Unit 2* Boundary
- Terminal 4 Slip 3 Upland Facility Boundary
- Leasehold Boundary
- City-Owned Parcel Boundary

Notes: 1) Base map prepared from the URS Draft T4 Slip 1 RI Work Plan, dated May 2004.
2) Horizontal Datum: State Plane Coordinates, Oregon North, NAD 83. Vertical Datum: NVGD 29.
3) *The boundary with the Willamette River is defined by Ordinary Low Water Level (3.4 FT NGVD).
4) Prefix "T4S1" removed from sample locations for figure clarity.

Groundwater Elevation Plan - September 14, 2005

Remedial Investigation
Terminal 4 Slip 1 Upland Facility
Portland, Oregon

Project Number	1065-00	August 2007	Figure
Ash Creek Associates, Inc. Environmental and Geotechnical Consultants	NEW FIELDS		11



Legend:

BAP 455 — Concentration Detected (µg/kg) Compound Exceeding Preliminary Screening Level (Industrial PRG or Terrestrial SLV)

- Highlighted Locations Analyzed for PAHs
- MW-08 — Monitoring Well Location and Number
- SB-07 — Soil Boring Location and Number
- S-14 — Surface Sample Location and Number
- S-26 — Phase III Riverbank Composite Soil Sampling Area and Composite Sample Number
- Terminal 4 Slip 1 Upland Facility Operable Unit 1* Boundary
- Terminal 4 Slip 1 Upland Facility Operable Unit 2* Boundary
- Terminal 4 Slip 3 Upland Facility Boundary
- Leasehold Boundary
- City-Owned Parcel Boundary

PRG µg/kg	SLV µg/kg	Abbreviation	Compound
-	2	DBF	Dibenzofuran
2,100	-	BAA	Benzo(a)anthracene
210	-	BAP	Benzo(a)pyrene
2,100	-	BBF	Benzo(b)fluoranthene
210	-	DBA	Dibenzo(a,h)anthracene
2,100	-	INP	Indeno(1,2,3-cd)pyrene

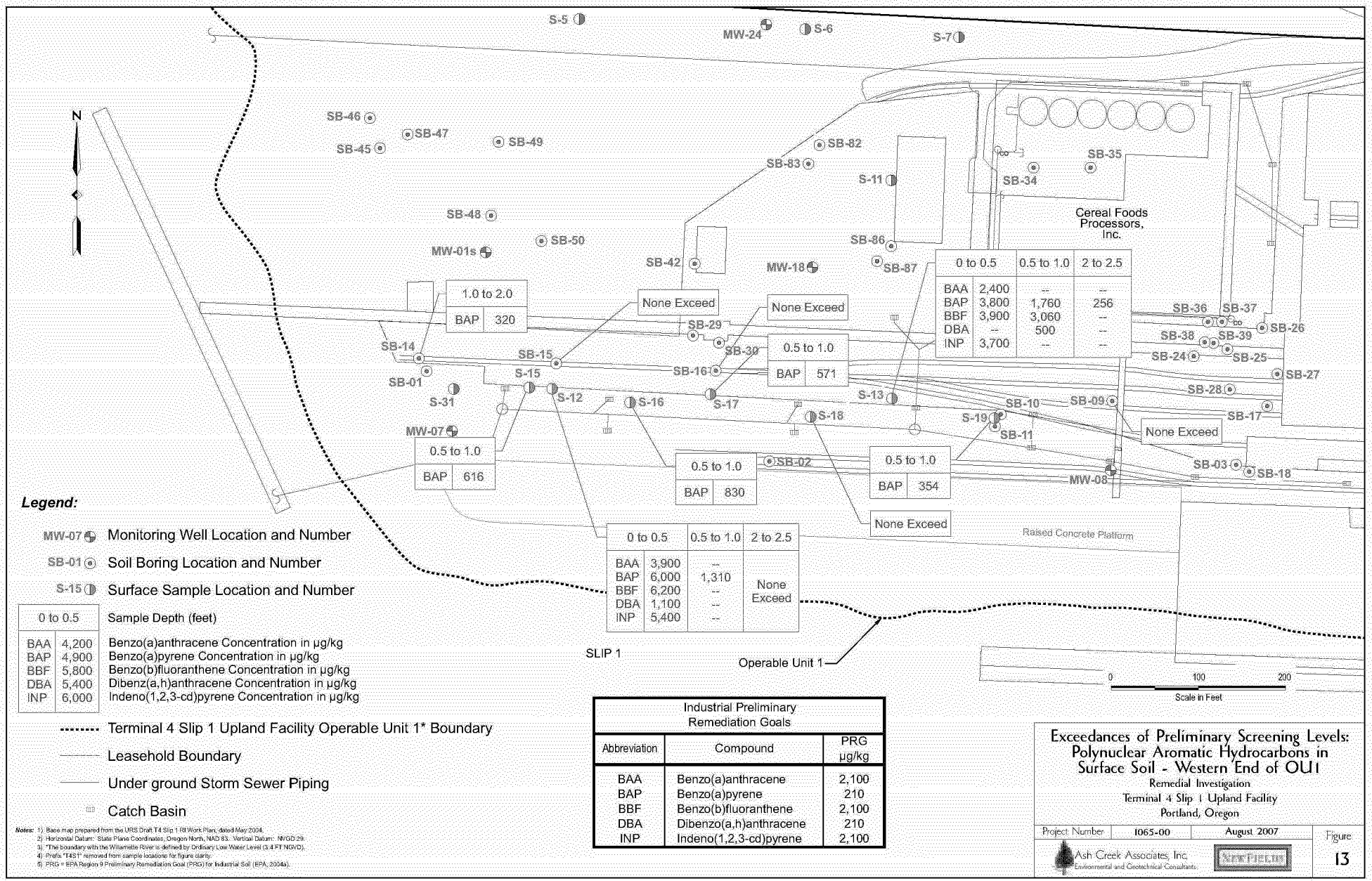
Notes:
1) Base map prepared from the URS Draft T4 Slip 1 RI Work Plan, dated May 2004.
2) Horizontal Datum: State Plane Coordinates, Oregon North, NAD 83. Vertical Datum: NVGD 29.
3) *The boundary with the Willamette River is defined by Ordinary Low Water Level (3.4 FT NGVD).
4) Prefix "T4S1" removed from sample locations for figure clarity.
5) Results for Riverbank Soil are shown on Figure 14.
6) PRG Exceedances at S-12 and S-13 shown on Figure 13.
7) PRG = EPA Region 9 Preliminary Remediation Goal (PRG) for Industrial Soil (EPA, 2004a).
8) SLV = Oregon DEQ Level II Screening Level Values (SLVs) for Terrestrial Receptors (DEQ, 2001).

Exceedances of Preliminary Screening Levels: Polynuclear Aromatic Hydrocarbons in Surface Soil (0 to 3 feet)

Remedial Investigation
Terminal 4 Slip 1 Upland Facility
Portland, Oregon

Project Number	1065-00	August 2007	Figure
Ash Creek Associates, Inc. Environmental and Geotechnical Consultants	NEW FIELDS		12

KMB00008396



Legend:

MW-07 Monitoring Well Location and Number

SB-01 Soil Boring Location and Number

S-15 Surface Sample Location and Number

0 to 0.5	Sample Depth (feet)
BAA	4,200 Benzo(a)anthracene Concentration in µg/kg
BAP	4,900 Benzo(a)pyrene Concentration in µg/kg
BBF	5,800 Benzo(b)fluoranthene Concentration in µg/kg
DBA	5,400 Dibenz(a,h)anthracene Concentration in µg/kg
INP	6,000 Indeno(1,2,3-cd)pyrene Concentration in µg/kg

Terminal 4 Slip 1 Upland Facility Operable Unit 1* Boundary

Leasehold Boundary

Under ground Storm Sewer Piping

Catch Basin

Industrial Preliminary Remediation Goals		
Abbreviation	Compound	PRG µg/kg
BAA	Benzo(a)anthracene	2,100
BAP	Benzo(a)pyrene	210
BBF	Benzo(b)fluoranthene	2,100
DBA	Dibenzo(a,h)anthracene	210
INP	Indeno(1,2,3-cd)pyrene	2,100

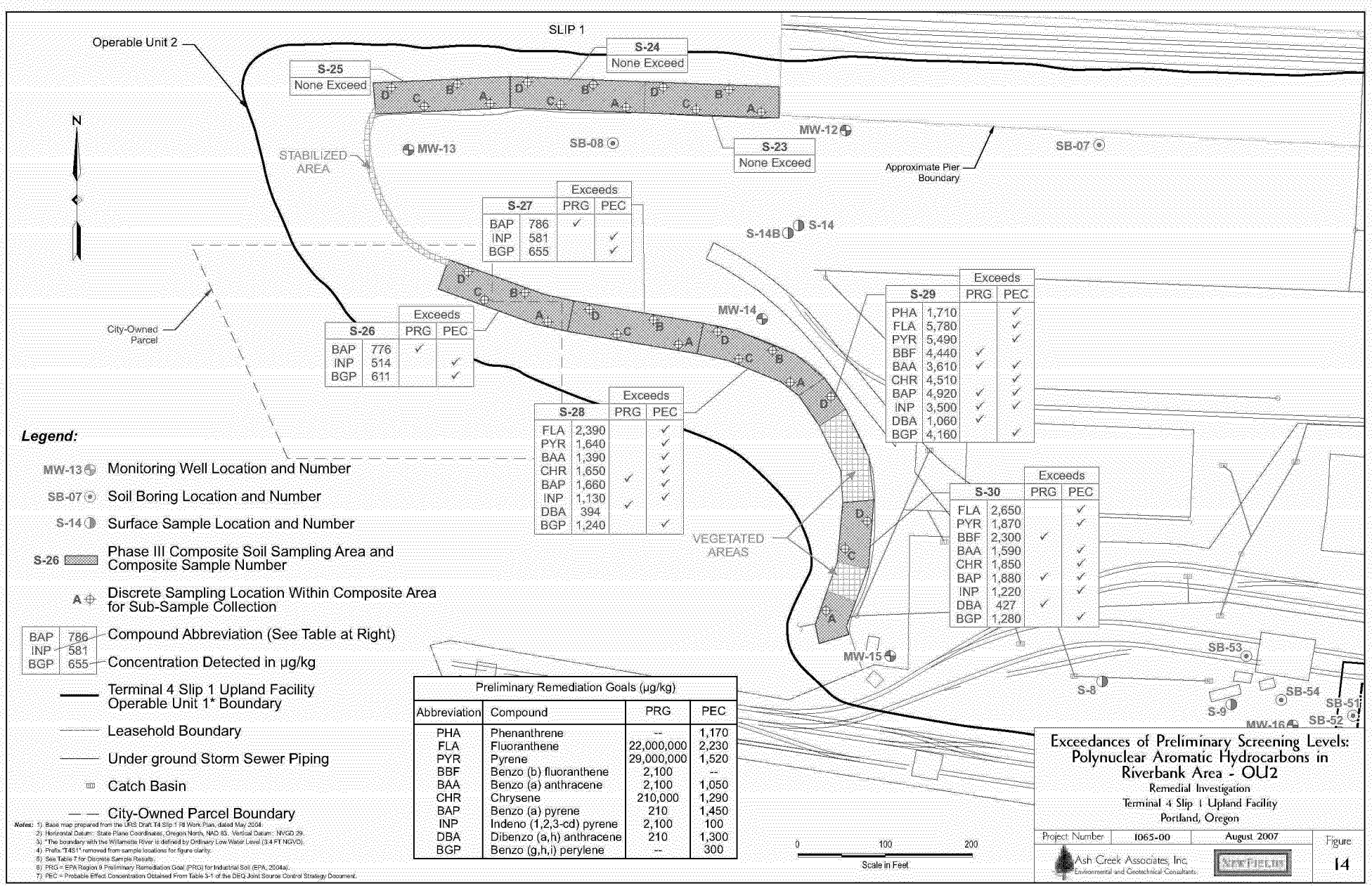
Notes: 1). Base map prepared from the URS Draft T4 Slip 1 RI Work Plan, dated May 2004.
2). Horizontal Datum: State Plane Coordinates, Oregon North, NAD 83. Vertical Datum: NVGD 29.
3). *The boundary with the Willamette River is defined by Ordinary Low Water Level (3.4 FT NGVD).
4). Prefix "T4S1" removed from sample locations for figure clarity.
5). PRG = EPA Region 9 Preliminary Remediation Goal (PRG) for Industrial Soil (EPA, 2004a).

Exceedances of Preliminary Screening Levels: Polynuclear Aromatic Hydrocarbons in Surface Soil - Western End of OU1

Remedial Investigation
Terminal 4 Slip 1 Upland Facility
Portland, Oregon

Project Number	1065-00	August 2007	Figure
Ash Creek Associates, Inc. Environmental and Geotechnical Consultants	NEWFIELDS		13

KMB00008397



Preliminary Remediation Goals (µg/kg)			
Abbreviation	Compound	PRG	PEC
PHA	Phenanthrene	--	1,170
FLA	Fluoranthene	22,000,000	2,230
PYR	Pyrene	29,000,000	1,520
BBF	Benzo (b) fluoranthene	2,100	--
BAA	Benzo (a) anthracene	2,100	1,050
CHR	Chrysene	210,000	1,290
BAP	Benzo (a) pyrene	210	1,450
INP	Indeno (1,2,3-cd) pyrene	2,100	100
DBA	Dibenzo (a,h) anthracene	210	1,300
BGP	Benzo (g,h,i) perylene	--	300

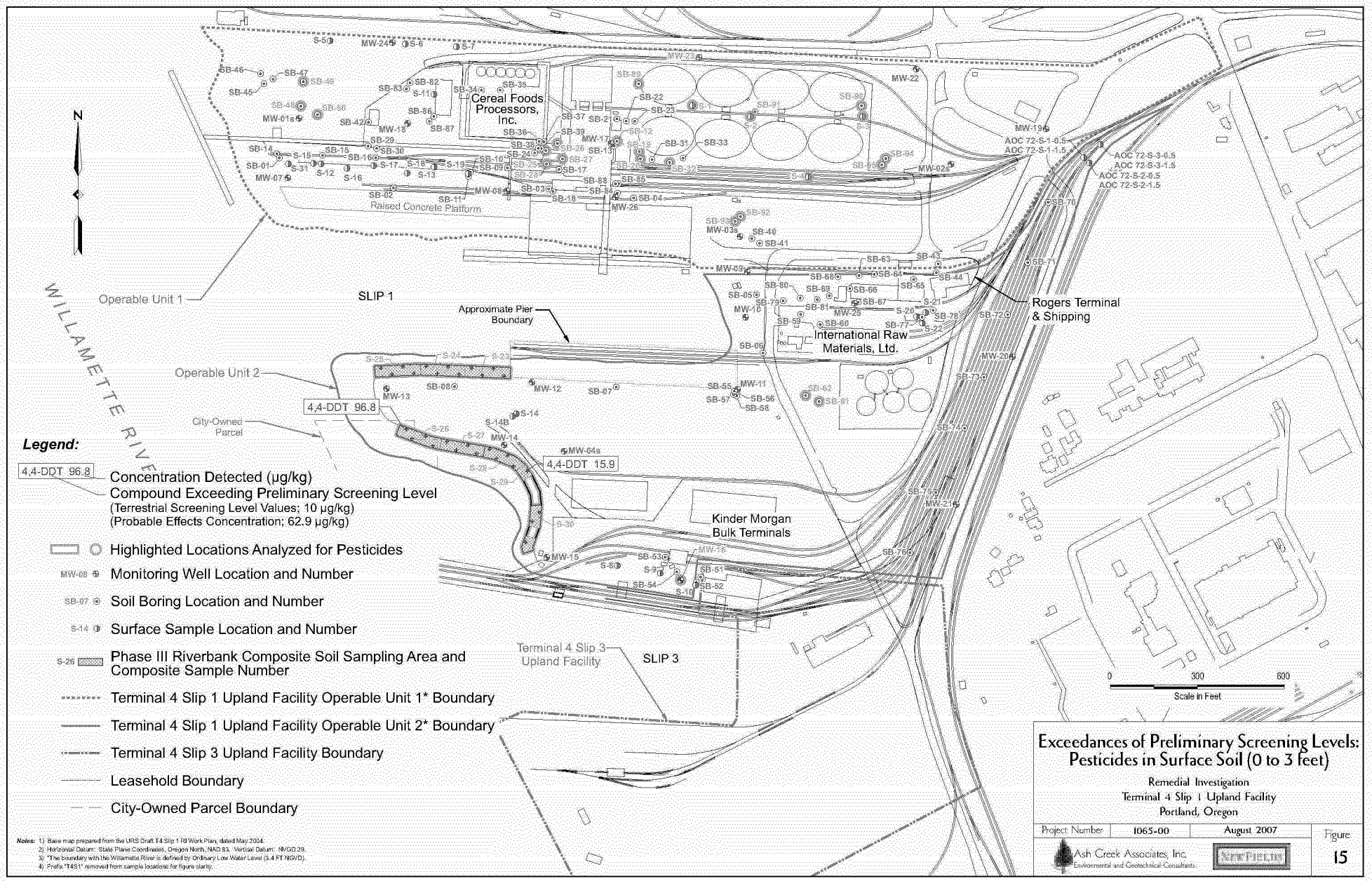
Notes:
1). Base map prepared from the URS Draft T4 Slip 1 RI Work Plan, dated May 2004.
2). Horizontal Datum: State Plane Coordinates, Oregon North, NAD 83. Vertical Datum: NVGD 29.
3). *The boundary with the Willamette River is defined by Ordinary Low Water Level (3.4 FT NGVD).
4). Prefix "T4S1" removed from sample locations for figure clarity.
5). See Table 7 for Discrete Sample Results.
6). PRG = EPA Region 9 Preliminary Remediation Goal (PRG) for Industrial Soil (EPA, 2004a).
7). PEC = Probable Effect Concentration Obtained From Table 3-1 of the DEQ Joint Source Control Strategy Document.

Exceedances of Preliminary Screening Levels: Polynuclear Aromatic Hydrocarbons in Riverbank Area - OU2

Remedial Investigation
Terminal 4 Slip 1 Upland Facility
Portland, Oregon

Project Number	1065-00	August 2007	Figure
Ash Creek Associates, Inc. Environmental and Geotechnical Consultants	NEWFIELDS		14

KMB00008398

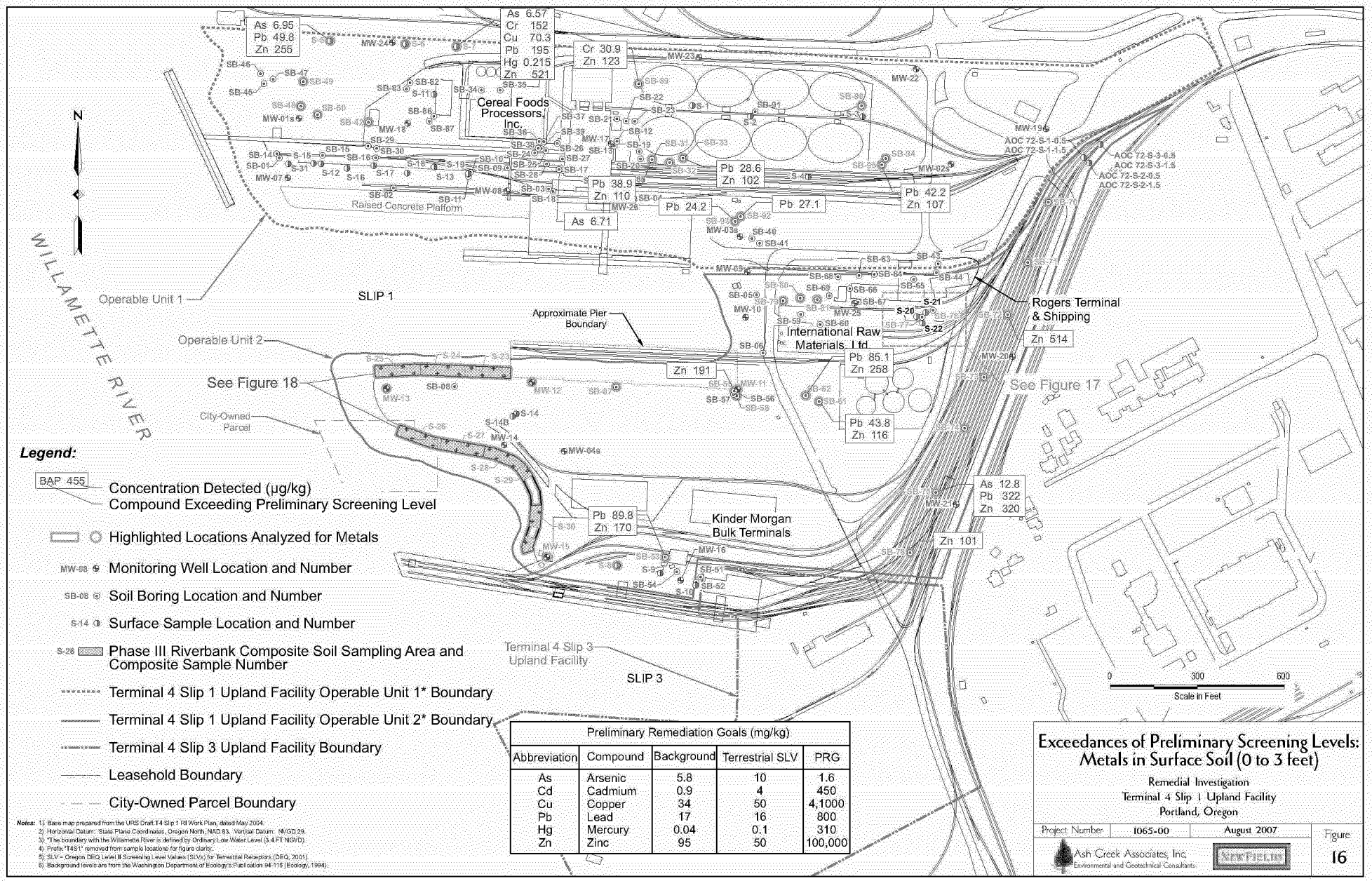


Notes: 1) Base map prepared from the URS Draft T4 Slip 1 RI Work Plan, dated May 2004.
2) Horizontal Datum: State Plane Coordinates, Oregon North, NAD 83. Vertical Datum: NVGD 29.
3) *The boundary with the Willamette River is defined by Ordinary Low Water Level (3.4 FT NGVD).
4) Prefix "T4S1" removed from sample locations for figure clarity.

Exceedances of Preliminary Screening Levels: Pesticides in Surface Soil (0 to 3 feet)

Remedial Investigation
Terminal 4 Slip 1 Upland Facility
Portland, Oregon

Project Number	1065-00	August 2007	Figure
Ash Creek Associates, Inc. Environmental and Geotechnical Consultants	NEW FIELDS		15



Legend:

- BAP 455 — Concentration Detected (µg/kg) / Compound Exceeding Preliminary Screening Level
- Highlighted Locations Analyzed for Metals
- MW-08 — Monitoring Well Location and Number
- SB-08 — Soil Boring Location and Number
- S-14 — Surface Sample Location and Number
- S-26 — Phase III Riverbank Composite Soil Sampling Area and Composite Sample Number
- Terminal 4 Slip 1 Upland Facility Operable Unit 1* Boundary
- Terminal 4 Slip 1 Upland Facility Operable Unit 2* Boundary
- Terminal 4 Slip 3 Upland Facility Boundary
- Leasehold Boundary
- City-Owned Parcel Boundary

Preliminary Remediation Goals (mg/kg)

Abbreviation	Compound	Background	Terrestrial SLV	PRG
As	Arsenic	5.8	10	1.6
Cd	Cadmium	0.9	4	450
Cu	Copper	34	50	4,1000
Pb	Lead	17	16	800
Hg	Mercury	0.04	0.1	310
Zn	Zinc	95	50	100,000

Notes:
1). Base map prepared from the URS Draft T4 Slip 1 RI Work Plan, dated May 2004.
2). Horizontal Datum: State Plane Coordinates, Oregon North, NAD 83. Vertical Datum: NVGD 29.
3). *The boundary with the Willamette River is defined by Ordinary Low Water Level (3.4 FT NGVD).
4). Prefix "T4S1" removed from sample locations for figure clarity.
5). SLV = Oregon DEQ Level II Screening Level Values (SLVs) for Terrestrial Receptors (DEQ, 2001).
6). Background levels are from the Washington Department of Ecology's Publication 94-115 (Ecology, 1994).

Exceedances of Preliminary Screening Levels: Metals in Surface Soil (0 to 3 feet)

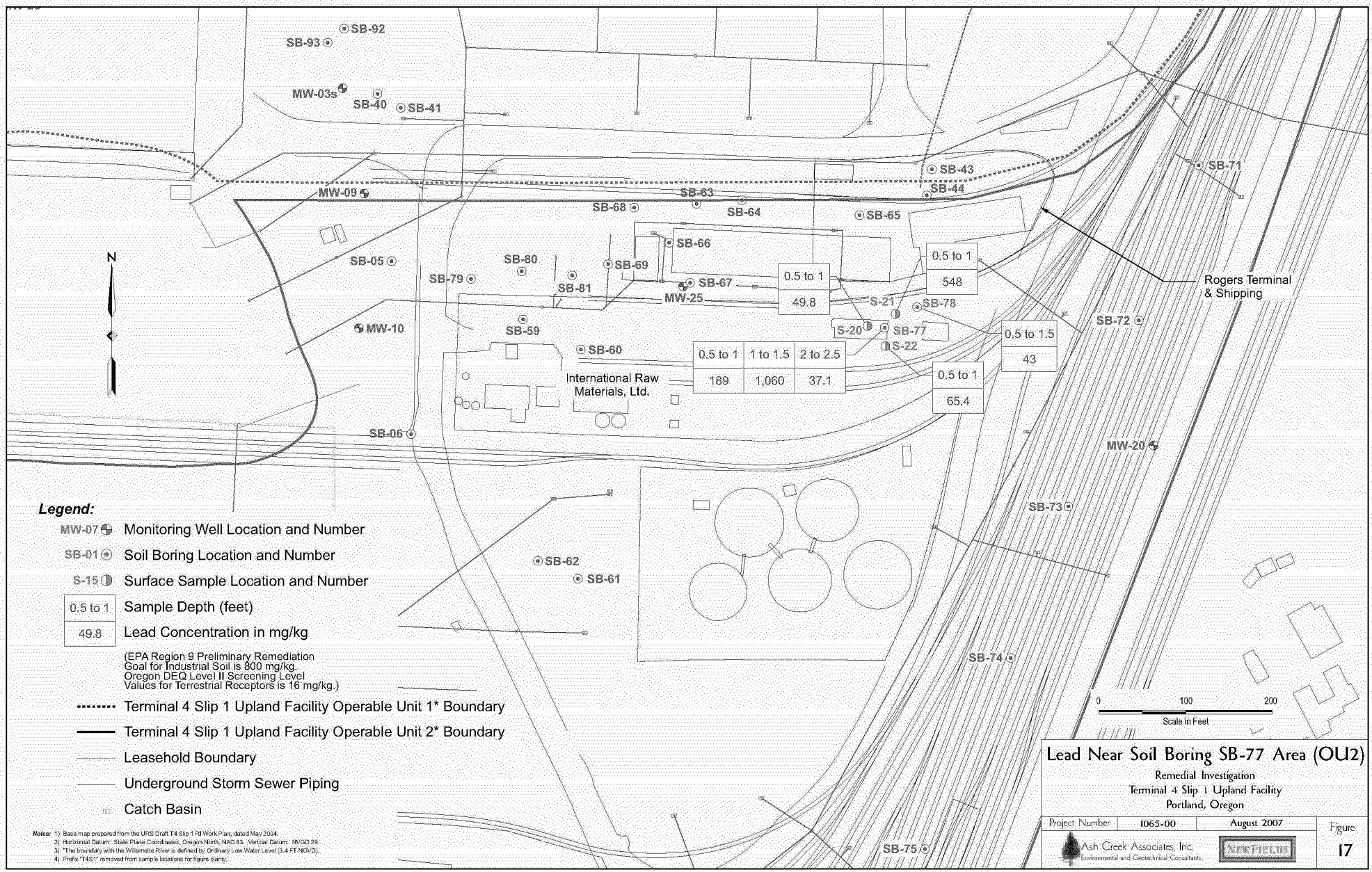
Remedial Investigation
Terminal 4 Slip 1 Upland Facility
Portland, Oregon

Project Number		Figure
1065-00	August 2007	16

Ash Creek Associates, Inc.
Environmental and Geotechnical Consultants

NEW FIELDS

KMB00008400



Legend:

- MW-07 — Monitoring Well Location and Number
- SB-01 — Soil Boring Location and Number
- S-15 — Surface Sample Location and Number
- 0.5 to 1 / 49.8 — Sample Depth (feet) / Lead Concentration in mg/kg

(EPA Region 9 Preliminary Remediation Goal for Industrial Soil is 800 mg/kg. Oregon DEQ Level II Screening Level Values for Terrestrial Receptors is 16 mg/kg.)

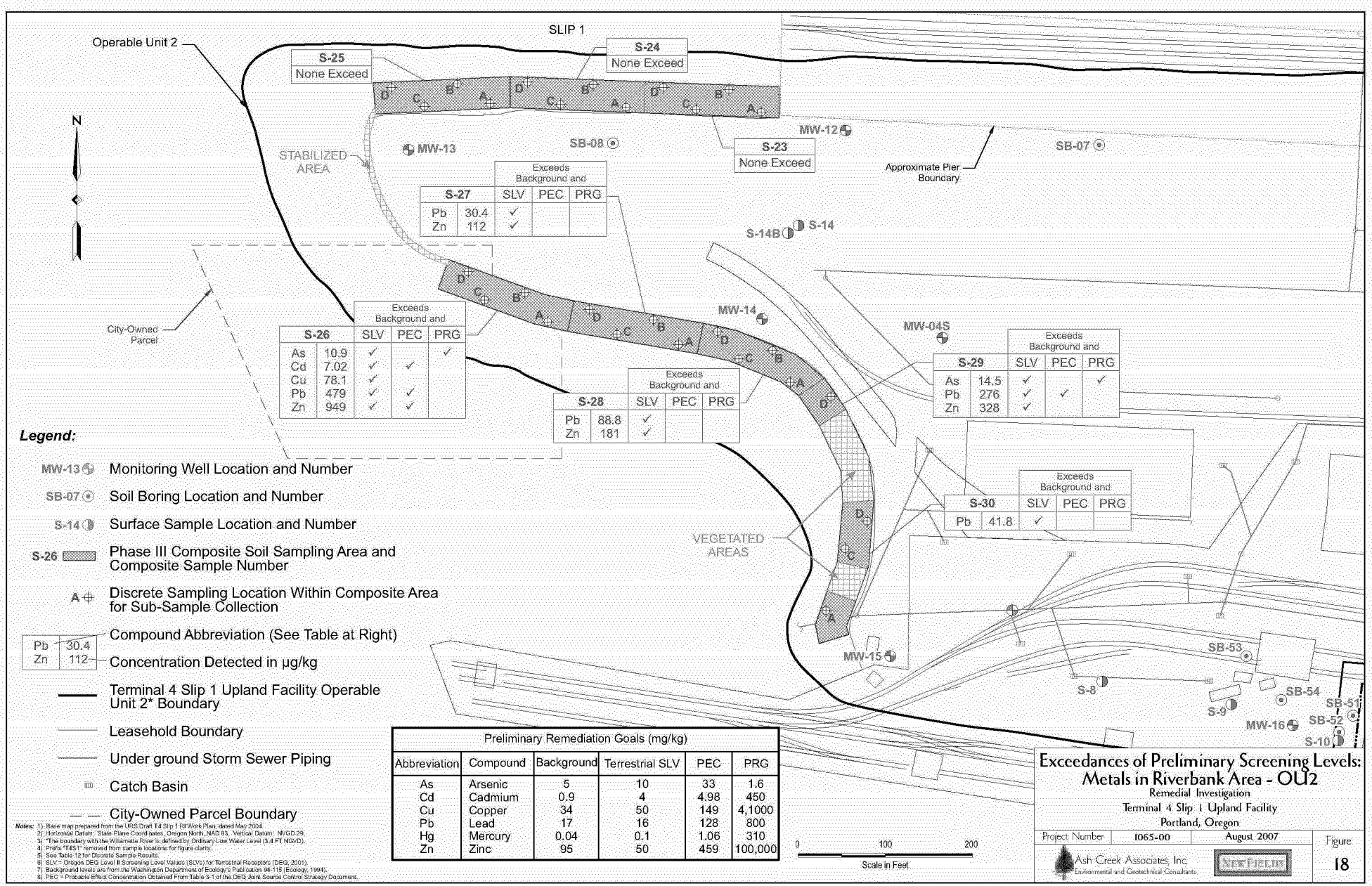
- Terminal 4 Slip 1 Upland Facility Operable Unit 1* Boundary
- Terminal 4 Slip 1 Upland Facility Operable Unit 2* Boundary
- Leasehold Boundary
- Underground Storm Sewer Piping
- Catch Basin

Notes: 1) Base map prepared from the URS Draft T4 Slip 1 RI Work Plan, dated May 2004.
2) Horizontal Datum: State Plane Coordinates, Oregon North, NAD 83. Vertical Datum: NVGD 29.
3) *The boundary with the Willamette River is defined by Ordinary Low Water Level (3.4 FT NGVD).
4) Prefix "T4S1" removed from sample locations for figure clarity.

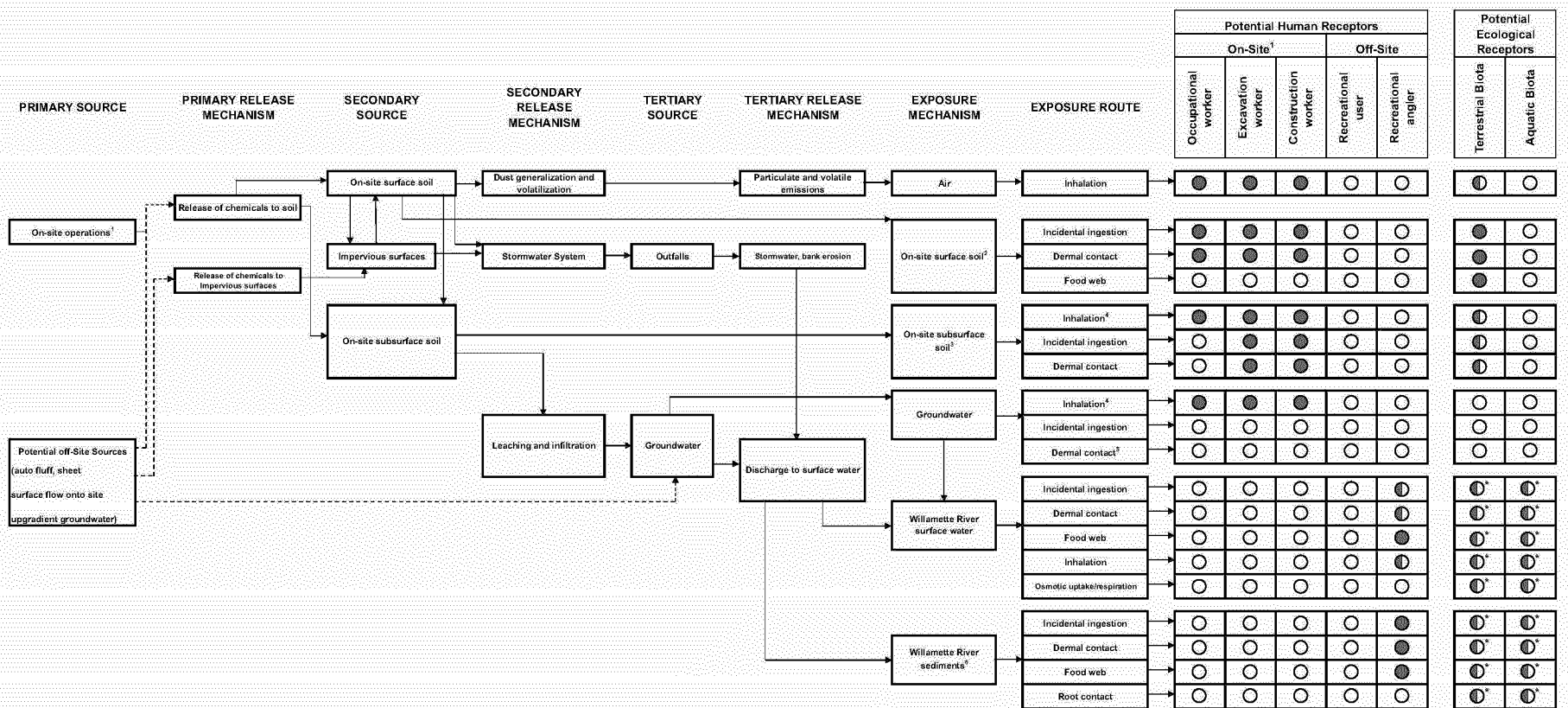
Lead Near Soil Boring SB-77 Area (OU2)

Remedial Investigation
Terminal 4 Slip 1 Upland Facility
Portland, Oregon

Project Number	1065-00	August 2007	Figure
Ash Creek Associates, Inc. Environmental and Geotechnical Consultants	NewFields		17



KMB00008402



Notes:

1. "On-site" is defined as the upland portion of Port of Portland Terminal 4 Slip 1 (POP T4S1) facility.
2. Surface soil is defined as 0 to 3 feet below ground surface (bgs). Surface soil also includes riverbank areas with potentially erodable surfaces.
3. Subsurface is defined as 3 to 15 feet bgs.
4. In regard to potential inhalation of chemicals volatizing to surface air from site media at depth, occupational workers might be exposed to both indoor and outdoor air, while excavation and construction workers would be exposed to outdoor air only.
5. Once depth to groundwater is determined, pathway designations may change.
6. Exposure to Willamette River sediment will be addressed through the T4 removal action project and the Portland Harbor Superfund project.

Legend:

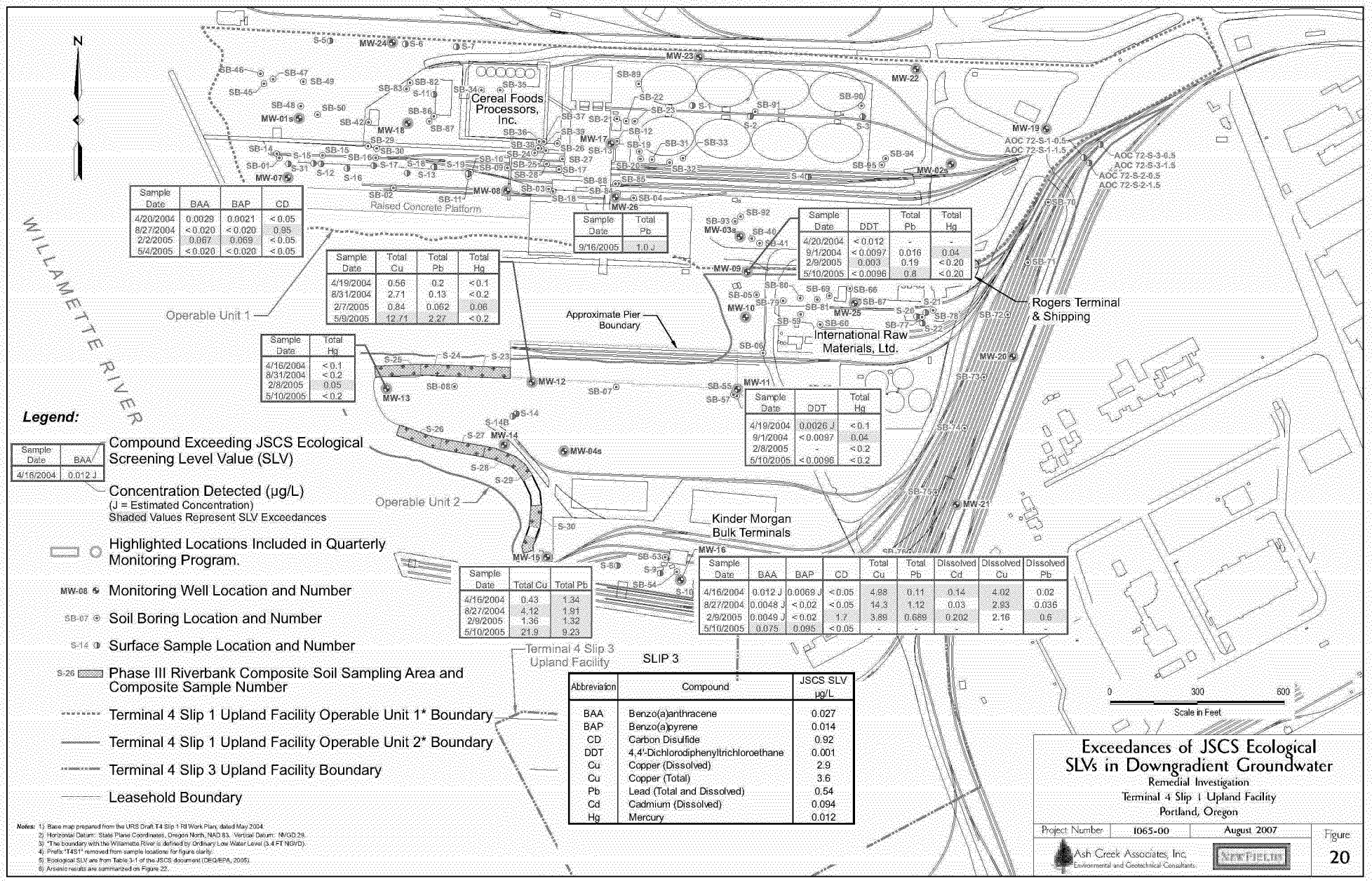
- ● = Potentially complete pathway
- ◐ = Potentially complete pathway; minor or insignificant
- ○ = Incomplete pathway
- ◐* = Potentially complete pathway; formal evaluation performed in Portland Harbor RI/FS. Pathway screened for groundwater to surface water transport under Joint Source Control Strategy guidance
- ----- =Possible impacts from off-site sources.

Preliminary Conceptual Site Model of Human and Ecological Exposure Pathways

Remedial Investigation
Terminal 4 Slip 1 Upland Facility
Portland, Oregon

Project Number	1065-00	August 2007	Figure
Ash Creek Associates, Inc. Environmental and Geotechnical Consultants	NEW FIELDS		19

KMB00008403



Sample Date	BAA	BAP	CD
4/20/2004	0.0029	0.0021	< 0.05
8/27/2004	< 0.020	< 0.020	0.95
2/2/2005	0.067	0.069	< 0.05
5/4/2005	< 0.020	< 0.020	< 0.05

Sample Date	Total Pb
9/16/2005	1.0 J

Sample Date	Total Cu	Total Pb	Total Hg
4/19/2004	0.56	0.2	< 0.1
8/31/2004	2.71	0.13	< 0.2
2/7/2005	0.84	0.062	0.06
5/9/2005	12.71	2.27	< 0.2

Sample Date	DDT	Total Pb	Total Hg
4/20/2004	< 0.012	-	-
9/1/2004	< 0.0097	0.016	0.04
2/9/2005	0.003	0.19	< 0.20
5/10/2005	< 0.0096	0.8	< 0.20

Sample Date	Total Hg
4/16/2004	< 0.1
8/31/2004	< 0.2
2/8/2005	0.05
5/10/2005	< 0.2

Sample Date	DDT	Total Hg
4/19/2004	0.0026 J	< 0.1
9/1/2004	< 0.0097	0.04
2/8/2005	-	< 0.2
5/10/2005	< 0.0096	< 0.2

Sample Date	Total Cu	Total Pb
4/16/2004	0.43	1.34
8/27/2004	4.12	1.91
2/9/2005	1.36	1.32
5/10/2005	21.9	9.23

Sample Date	BAA	BAP	CD	Total Cu	Total Pb	Dissolved Cd	Dissolved Cu	Dissolved Pb
4/16/2004	0.012 J	0.0069 J	< 0.05	4.88	0.11	0.14	4.02	0.02
8/27/2004	0.0048 J	< 0.02	< 0.05	14.3	1.12	0.03	2.93	0.036
2/9/2005	0.0049 J	< 0.02	1.7	3.89	0.689	0.202	2.16	0.6
5/10/2005	0.075	0.095	< 0.05	-	-	-	-	-

Legend:

Sample Date	BAA
4/16/2004	0.012 J

Compound Exceeding JSCS Ecological Screening Level Value (SLV)

Concentration Detected (µg/L)
(J = Estimated Concentration)
Shaded Values Represent SLV Exceedances

Highlighted Locations Included in Quarterly Monitoring Program.

MW-08 Monitoring Well Location and Number

SB-07 Soil Boring Location and Number

S-14 Surface Sample Location and Number

S-26 Phase III Riverbank Composite Soil Sampling Area and Composite Sample Number

Terminal 4 Slip 1 Upland Facility Operable Unit 1* Boundary

Terminal 4 Slip 1 Upland Facility Operable Unit 2* Boundary

Terminal 4 Slip 3 Upland Facility Boundary

Leasehold Boundary

Abbreviation	Compound	JSCS SLV µg/L
BAA	Benzo(a)anthracene	0.027
BAP	Benzo(a)pyrene	0.014
CD	Carbon Disulfide	0.92
DDT	4,4'-Dichlorodiphenyltrichloroethane	0.001
Cu	Copper (Dissolved)	2.9
Cu	Copper (Total)	3.6
Pb	Lead (Total and Dissolved)	0.54
Cd	Cadmium (Dissolved)	0.094
Hg	Mercury	0.012

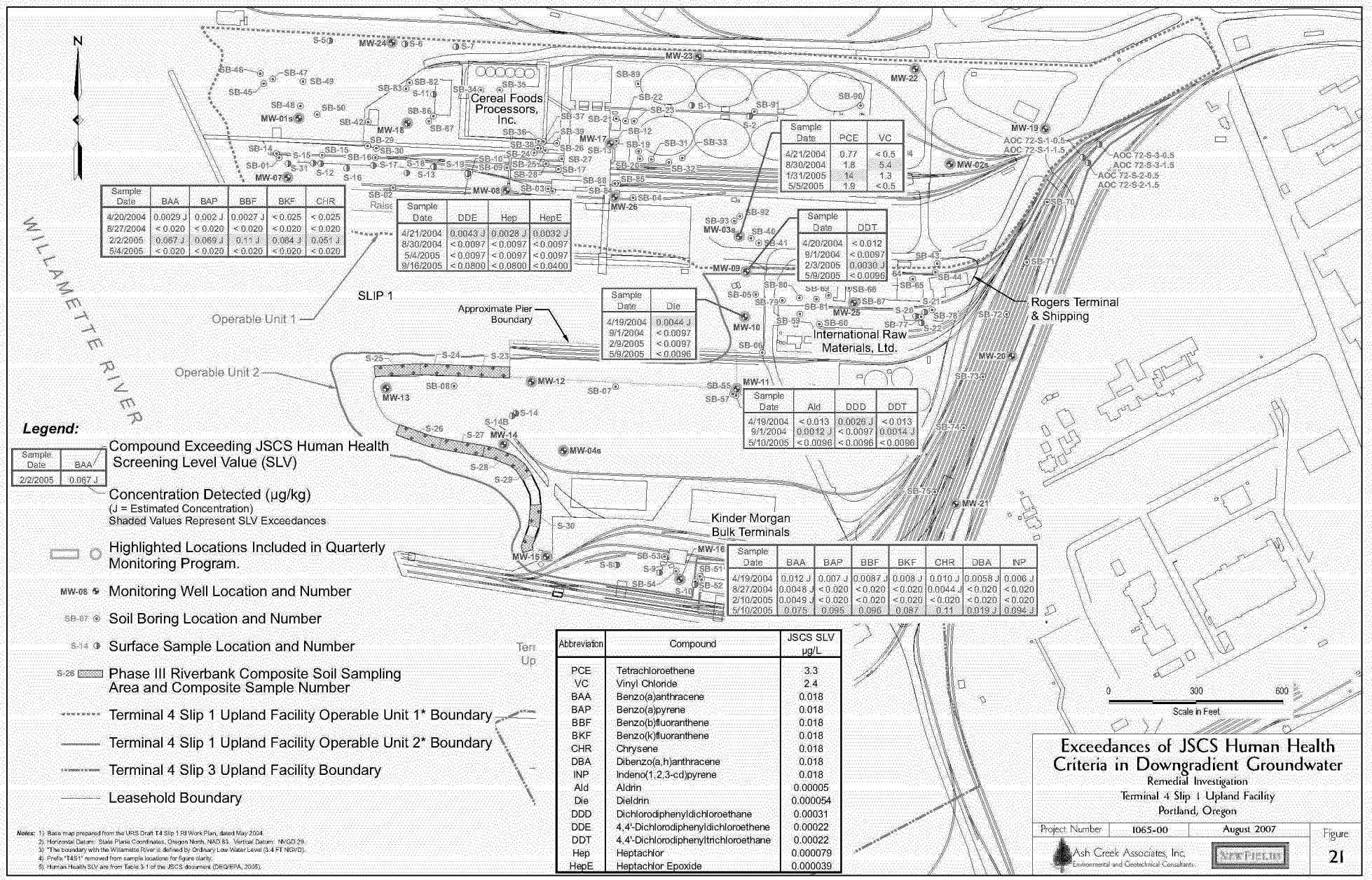
Notes: 1) Base map prepared from the URS Draft T4 Slip 1 RI Work Plan, dated May 2004.
2) Horizontal Datum: State Plane Coordinates, Oregon North, NAD 83. Vertical Datum: NVGD 29.
3) *The boundary with the Willamette River is defined by Ordinary Low Water Level (3.4 FT NGVD).
4) Prefix "T4S1" removed from sample locations for figure clarity.
5) Ecological SLV are from Table 3-1 of the JSCS document (DEQ/EPA, 2005).
6) Arsenic results are summarized on Figure 22.

Exceedances of JSCS Ecological SLVs in Downgradient Groundwater

Remedial Investigation
Terminal 4 Slip 1 Upland Facility
Portland, Oregon

Project Number	1065-00	August 2007	Figure
Ash Creek Associates, Inc. Environmental and Geotechnical Consultants	NEWFIELDS		20

KMB00008404



Sample Date	BAA	BAP	BBF	BKF	CHR
4/20/2004	0.0029 J	0.002 J	0.0027 J	< 0.025	< 0.025
8/27/2004	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
2/2/2005	0.067 J	0.069 J	0.11 J	0.084 J	0.051 J
5/4/2005	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020

Sample Date	DDE	Hep	HepE
4/21/2004	0.0043 J	0.0028 J	0.0032 J
8/30/2004	< 0.0097	< 0.0097	< 0.0097
5/4/2005	< 0.0097	< 0.0097	< 0.0097
9/16/2005	< 0.0800	< 0.0800	< 0.0400

Sample Date	PCE	VC
4/21/2004	0.77	< 0.5
8/30/2004	1.8	5.4
1/31/2005	14	1.3
5/5/2005	1.9	< 0.5

Sample Date	DDT
4/20/2004	< 0.012
9/1/2004	< 0.0097
2/3/2005	0.0030 J
5/9/2005	< 0.0096

Sample Date	Die
4/19/2004	0.0044 J
9/1/2004	< 0.0097
2/9/2005	< 0.0097
5/9/2005	< 0.0096

Sample Date	Ald	DDD	DDT
4/19/2004	< 0.013	0.0026 J	< 0.013
9/1/2004	0.0012 J	< 0.0097	0.0014 J
5/10/2005	< 0.0096	< 0.0096	< 0.0096

Sample Date	BAA	BAP	BBF	BKF	CHR	DBA	INP
4/19/2004	0.012 J	0.007 J	0.0087 J	0.008 J	0.010 J	0.0058 J	0.006 J
8/27/2004	0.0048 J	< 0.020	< 0.020	< 0.020	0.0044 J	< 0.020	< 0.020
2/10/2005	0.0049 J	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
5/10/2005	0.075	0.095	0.096	0.087	0.11	0.019 J	0.094 J

Legend:

Sample Date	BAA
2/2/2005	0.067 J

Compound Exceeding JSCS Human Health Screening Level Value (SLV)

Concentration Detected (µg/kg)
(J = Estimated Concentration)
Shaded Values Represent SLV Exceedances

Highlighted Locations Included in Quarterly Monitoring Program.

MW-08 Monitoring Well Location and Number

SB-07 Soil Boring Location and Number

S-14 Surface Sample Location and Number

S-26 Phase III Riverbank Composite Soil Sampling Area and Composite Sample Number

Terminal 4 Slip 1 Upland Facility Operable Unit 1* Boundary

Terminal 4 Slip 1 Upland Facility Operable Unit 2* Boundary

Terminal 4 Slip 3 Upland Facility Boundary

Leasehold Boundary

Abbreviation	Compound	JSCS SLV µg/L
PCE	Tetrachloroethene	3.3
VC	Vinyl Chloride	2.4
BAA	Benzo(a)anthracene	0.018
BAP	Benzo(a)pyrene	0.018
BBF	Benzo(b)fluoranthene	0.018
BKF	Benzo(k)fluoranthene	0.018
CHR	Chrysene	0.018
DBA	Dibenzo(a,h)anthracene	0.018
INP	Indeno(1,2,3-cd)pyrene	0.018
Ald	Aldrin	0.00005
Die	Dieldrin	0.000054
DDD	Dichlorodiphenyldichloroethane	0.00031
DDE	4,4'-Dichlorodiphenyldichloroethene	0.00022
DDT	4,4'-Dichlorodiphenyltrichloroethane	0.00022
Hep	Heptachlor	0.000079
HepE	Heptachlor Epoxide	0.000039

Notes:
1). Base map prepared from the URS Draft T4 Slip 1 RI Work Plan, dated May 2004.
2). Horizontal Datum: State Plane Coordinates, Oregon North, NAD 83. Vertical Datum: NVGD 29.
3). *The boundary with the Willamette River is defined by Ordinary Low Water Level (3.4 FT NGVD).
4). Prefix "T4S1" removed from sample locations for figure clarity.
5). Human Health SLV are from Table 3-1 of the JSCS document (DEQ/EPA, 2005).

Exceedances of JSCS Human Health Criteria in Downgradient Groundwater

Remedial Investigation
Terminal 4 Slip 1 Upland Facility
Portland, Oregon

Project Number	1065-00	August 2007	Figure
Ash Creek Associates, Inc. Environmental and Geotechnical Consultants			21

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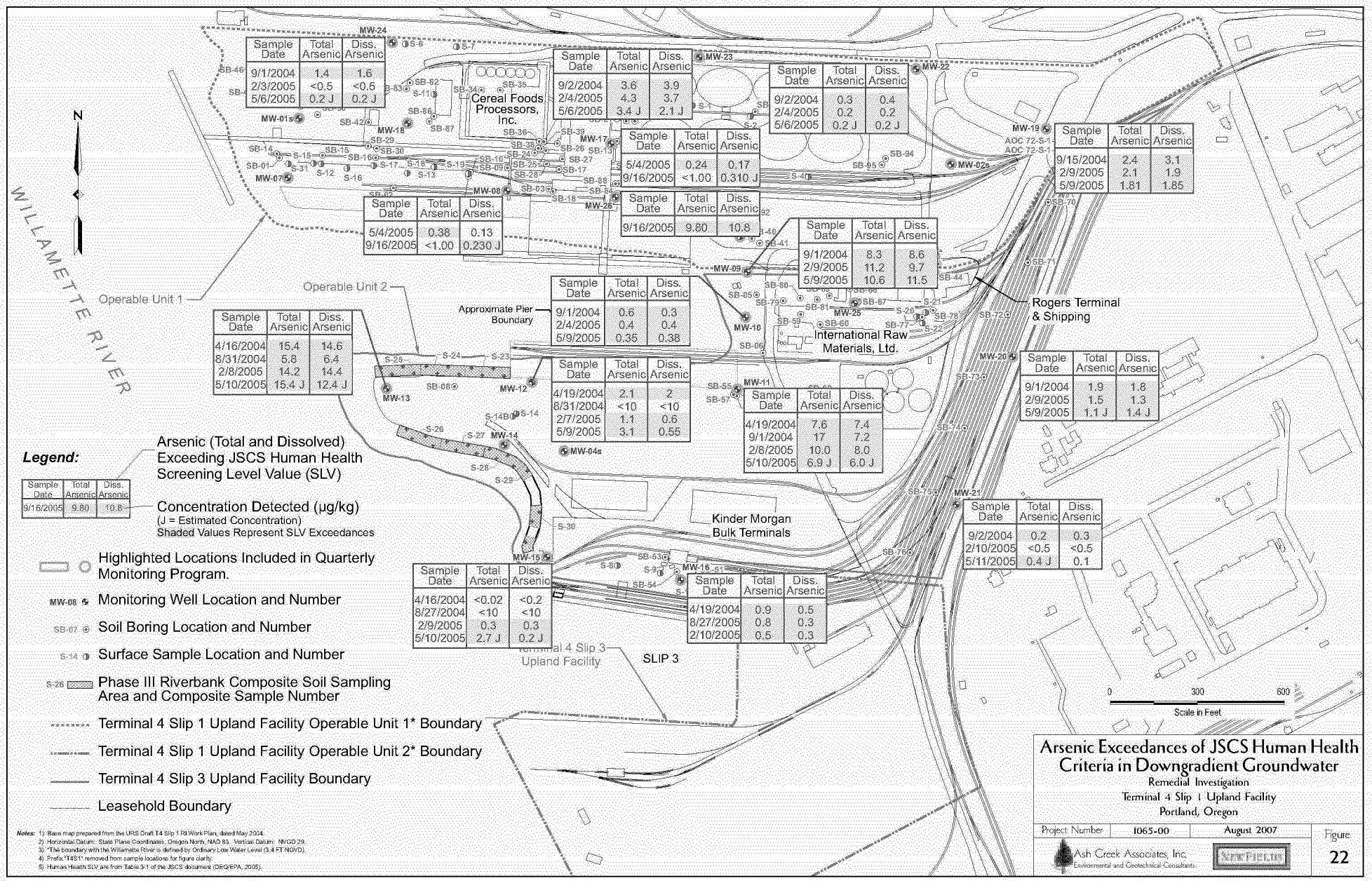

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Appendix A

Screening Level Human Health and Ecological Risk Assessments

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Ecological and Human Health Risk Assessments
Terminal 4 Slip 1 Upland Facility
Portland, Oregon

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List of Acronyms and Abbreviations

5x-	Five times
50x	Fifty times
%	Percent
90UCL	90th percentile Upper Confidence Limit
µm	Micrometer
µg/kg	Micrograms per kilogram
ACA	Ash Creek Associates
AOCs	Areas of Concern
AWQC	Ambient Water Quality Criteria
BBL	Blasland, Bouck & Lee, Inc.
bgs	Below Ground Surface
cm/day	Centimeter per day
cfs	Cubic feet per second
City CPD	City of Portland Commission of Public Docks
COIs	Contaminants of Interest
COPCs	Constituents of Potential Concern
CPECs	Contaminants of Potential Ecological Concern
CRA	Comprehensive Risk Assessment
CSM	Conceptual Site Model
DCE	1,2-dichloroethene
DEQ	Department of Environmental Quality
EA	Early Action
ECSI	Environmental Cleanup Site Information
EPA	Environmental Protection Agency
EPCs	Exposure Point Concentrations
ERA	Ecological Risk Assessment
ESL	Ecological Screening Levels
ft^2	Square foot
g/day	Grams per day
HHRA	Human Health Risk Assessment
IH	Heavy Industrial
L/day	Liters per day
LWG	Lower Willamette Group

MDCs	Maximum Detected Concentrations
MDL	Method Detection Limit
mg/kg	Milligram per kilogram
mg/L	Milligram per liter
MRL	Method Reporting Limit
MSL	Mean Sea Level
NF	NewFields
NOAEL	No-observed-adverse-effects level
NRI	Natural Resource Inventory
NRWQC	National Recommended Water Quality Criteria
OAR	Oregon Administrative Rule
ORNHIC	Oregon Natural Heritage Information Center
ORNL	Oak Ridge National Laboratories
OU	Operable Unit
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PCE	Tetrachloroethene
PECs	Probable Effect Concentrations
PRGs	Preliminary Remediation Goals
RBCs	Risk-Based Concentrations
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
SCM	Source Control Measure
SCV	Secondary Chronic Values
SLVs	Screening Level Values
SVOCs	Semivolatile Organic Compounds
T4S1	Terminal 4 Slip 1
T4S3	Terminal 4 Slip 3
TCE	Trichloroethene
T/E	Threatened and Endangered
TMDP	Technical-Management Decision Point
TPHs	Total Petroleum Hydrocarbons
TRVs	Toxicity Reference Values
USDOE	US Department of Energy
USGS	United States Geological Survey
USTs	Underground Storage Tanks
VCP	Voluntary Cleanup Program
VOCs	Volatile Organic Compounds

1.0 Introduction

The following sections present the screening level ecological risk assessment (ERA) and human health risk assessment (HHRA) for soil and groundwater conditions at the Terminal 4 Slip 1 Upland Facility (Facility). The screening level risk assessments are based on the review of historical information presented in the *Remedial Investigation (RI) Work Plan* (Hart Crowser, 2004) and Phase I, II, and III analytical results from the *Remedial Investigation (RI) Report* (Ash Creek Associates/NewFields [ACA/NF], 2007a).

1.1 Purpose and Scope

The risk assessment report presents the scope of work, procedures used to complete, and results of a screening level ERA and HHRA for the Facility that meets the objectives of the Voluntary Cleanup Program (VCP). Section 1 summarizes background information from the remedial investigation (RI) work plans relevant to the risk assessments. The ERA for the Facility is presented in Section 2 and is based upon the process prescribed by Oregon Department of Environmental Quality (DEQ) in the *Guidance for Ecological Risk Assessment: Levels I, II, III, IV* (DEQ, 1998 with updates through 2001). The HHRA for the Facility is presented in Section 3 and is based upon the process prescribed by DEQ in the *Guidance for Conduct of Deterministic Human Health Risk Assessment* (DEQ, 1998 with updates through 2000).

1.2 Site Description

Terminal 4 (11040 North Lombard, Portland, Oregon, 97203) comprises approximately 283 acres on the east bank of the lower Willamette River and is downstream from the St. Johns Bridge in North Portland, between River Miles 4.1 and 4.6. The Facility is located in the NW ¼ and NE ¼ of Section 2, Township 1 North, Range 1 West of the Willamette Meridian, Portland, Multnomah County, Oregon. The Facility is included on the Linnton Oregon U.S. Geological Survey (USGS) 7.5-Minute Quadrangle map.

The portion of Terminal 4 identified as the Slip 1 Upland Facility is approximately 98 acres in area. The Facility is located at the northern end of Terminal 4 and is bounded to the north by the property boundary with the Schnitzer Steel Products facility, to the east by the Terminal 4 property boundary, to the south by the Willamette River (Wheeler Bay) and the boundary of the Terminal 4 Slip 3 (T4S3) Upland Facility, and to the west by the Willamette River at Slip 1 and Wheeler Bay. The VCP Agreement (DEQ, 2003a) identifies the ordinary line of low water as the Facility boundary adjacent to the river. The Facility property has been owned by the Port, with the exception of one City of Portland (City)-owned parcel, since 1971.

Figures 1.2-1 and 1.2-2 show the vicinity and layout of the Facility. The VCP Agreement (DEQ, 2003a) divides the Facility into two Operable Units (OUs), OU1 and OU2, as shown on Figure 1.2-2. OU1 consists of an approximately 53-acre northern portion of the Facility, which encompasses the former Cargill leasehold. OU2 consists of the remainder of the Facility, with the City-owned parcel,

and is approximately 45 acres in area. Figure 1.2-2 incorporates an aerial photograph from May 2002 and identifies current and recent tenant occupied areas at the Facility.

1.3 Site History

This section provides a brief description of the Facility history and previous environmental investigations conducted at the Facility. A detailed discussion of the history of Terminal 4 (including the Facility) was incorporated into Appendix E of the *RI Work Plan* for the Facility (Hart Crowser, 2004). This history includes site operations, former and current tenants, and chemicals currently or formerly handled at the Facility.

The Port acquired the property constituting the Facility in 1971 as a result of the Port's merger with the City of Portland Commission of Public Docks (City CPD). The City CPD purchased the property in 1917 as part of the original 117.55-acre site for the St. Johns terminal. This included approximately 36 acres of submerged land around the former Gatton Slough, which entered the river near the head of Slip 1. Development of the terminal resulted in the filling of Gatton Slough and adjacent areas within the river, and excavation of Slip 1. In 1972, the Port purchased a strip of land along the northern property line from Broadway Holding Company in connection with the relocation of the grain berth to the face of current Berth 401. The Port currently leases portions of the Facility to various tenants. Figure 1.2-2 shows the location of current and recent tenant occupied areas at the Facility.

Historic operations prior to 1971 included a variety of facilities. The grain facilities on site were maintained by a variety of operators from 1920 to 1950s, until Cargill was assigned the lease in 1954. The grain facilities included storage silos, maintenance shops, office buildings, transformers, fueling facilities, underground storage tanks (USTs), conveyors, rail tracks, and hydraulic equipment. A cold storage plant and warehouse was operated by the Apple Growers Association of Hood River in the 1920s. H.N. Leckenby/NW Pesticide Company (and the Army, for a short time) operated a fumigating plant from 1923 to the 1950s. A liquid bulk storage facility with a warehouse, tank cleaning facility, edible-oil cleaning pit, steel tanks, pipeline, and a steam cleaning area was operated by PM Ag (formerly Pacific Molasses) until 1995, when the lease was assigned to International Raw Materials. A flour mill, with production and storage facilities (i.e., warehouse, conveyors, track pit, storage tanks), was operated by Eagle Flour Mills Company from 1919 to 1923, by Terminal Flour Mills Company from 1923 to 1992, and by Cereal Food Processors from 1992 to present. The Matson Navigation Company operated a freight dock and containerized cargo operations from 1922 to 1982. The Union Pacific Railroad operated and maintained a fuel oil dock, pipeline, tank farm, and tank car loading facility. Some of the operations were taken over by the Standard Oil Company of California in 1969. Quaker State operated a motor oil bottling facility from 1953 through 1985. The Army Transport Service leased Terminal 4 from 1942 to 1946 and operated a fumigation plant, salvage yard, auxiliary oil pipeline, gasoline station, and sulphur plant. In addition to these facilities, Terminal 4 has been the site of import and export of a range of general bulk cargoes, including but not limited to, coal, phosphate, lead and zinc concentrates, pencil pitch, soda ash, vegetable oil, molasses, wool, cotton, natural rubber, automobiles, log bundles, sulfur, and steel.

After the 1970s, some of the facilities at Terminal 4 became obsolete and were removed. Cargill Grain, Inc. terminated its lease at the grain terminal facility in 2003. Current leased operations include a flour mill facility (Cereal Food Processors), a liquid bulk storage facility (International Raw Materials), terminal service operations and warehouse storage (Rogers Terminal), loading/unloading bulk cargo (Kinder Morgan Bulk Terminals), and moorage agreement (Schnitzer Investment

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Corporation). The Oregon Terminal Company managed operations of the break-bulk berths from 1988 to 1996.

The City of Portland owns a small parcel within the western portion of OU2. This property was originally associated with a fire boat station located on the upstream end of Wheeler Bay. Adjacent properties are owned by Schnitzer Steel Industries and Northwest Pipe and Casing to the north, Burgard Industrial Park to the northeast, Toyota to the south, and Union Pacific Railroad to the east.

1.4 Regulatory Status

Investigation activities are being conducted at the Facility under a *VCP Agreement (DEQ No. LQVC-NWR-LQVC-NWR-03-18) for Remedial Investigation, Source Control Measures, and Feasibility Study*, effective December 4, 2003. This agreement is between the Port of Portland (Port) and the Oregon DEQ. The risk assessments will be performed in accordance with the applicable Oregon Administrative Rule (OAR) direction, Oregon DEQ guidance, and U.S. Environmental Protection Agency (EPA) guidance as referenced in the text. The Environmental Cleanup Site Information (ECSI) site ID number for the Facility is 2356.

The scopes of the risk assessments are limited to the upland portion of the Facility. As described in the VCP agreement (DEQ, 2003a), the upland portion of the Facility is the area above the ordinary line of low water of the lower Willamette River at Slip 1 and Wheeler Bay. In accordance with the requirements of the VCP Agreement, the risk assessment approach and methodology will be the same for both OUs. The scope of the RI does not include the in-water sediments of Slip 1, or the City of Portland's (City) municipal stormwater system that crosses the Facility and discharges at Outfall 52C (the City's outfall does not drain any stormwater from the Facility).

1.5 Summary of Investigations

Several environmental investigations have been performed at and near the Facility, including the adjacent shoreline and river sediments. A detailed discussion of these investigations and their findings are presented in the *RI Work Plan* (Hart Crowser, 2004). Previous investigations include UST decommissioning reports, spill cleanup remediation reports, site status assessments, soil investigations, preliminary assessments, excavated soil report, groundwater seep sampling report, and environmental site assessments.

The *RI Work Plan* (Hart Crowser, 2004) also summarizes Phase I and Phase II sampling plans. Phase I took place from March to August 2004 and evaluated groundwater discharge to the slips. Phase II took place from August 2004 to May 2005 and included the collection of surface soil, subsurface soil, and groundwater samples to characterize the nature and extent of potential contamination.

The *Remedial Investigation (RI) Work Plan Addendum for Phase III Work Scope Terminal 4 Slip 1 Upland Facility* (BBL/ACA/NF, 2005) identified Phase III sampling to further characterize the magnitude and extent of chemical contamination in soil and groundwater at the Facility. The Phase III sampling took place in September 2005 and included subsurface and surface soil sampling, riverbank surface soil sampling, and additional monitoring well installation. Additional Phase III sampling at

AOC 27 (former transformer handling area) was completed in July 2007 and included the collection of one surface soil sample at location (S-31), as detailed in an approved sampling plan (dated June 28, 2007).

The results of the Phase I, II, and III sampling events are summarized in the *RI Report* (ACA/NF, 2007a). These sampling events provided a comprehensive dataset that adequately characterizes the current soil and groundwater conditions at the Facility. Thus, these risk assessments use the Phase I, II, and III data for risk screening because this dataset is relevant, current, and of known data quality suitable for risk assessment purposes.

1.6 Site Land and/or Water Uses

1.6.1 Current Uses

Current use of the Facility (including OU1 and OU2) is an industrial site. Current zoning information indicates the entire site is designated for heavy industrial (IH) use by the City's Bureau of Planning (Title 33, Planning and Zoning, Chapter 33.140; City of Portland, 2001). IH zoning provides areas where many industries may locate, including those not desirable in other zones due to their objectionable impacts or appearance. The development standards are the minimum necessary to assure safe, functional, efficient, and environmentally sound development.

1.6.2 Future Uses

Current zoning information indicates the entire site is designated for IH use by the City's Bureau of Planning (City of Portland, 2001). The IH zoning for the western portion of the Facility, including Slip 1 and Wheeler Bay, includes an overlay zone "i", which identifies areas covered by the River Industrial Overlay Zone (City of Portland, 2003a). Overlay zones help to insure that the characteristics that make up an industrial sanctuary are protected. The River Industrial Overlay Zone is one of the overlay zones that fall under the broader category of Greenway Overlay Zones. As defined under the City of Portland Title 33, Chapter 33.440 regulation, Greenway Overlay Zones are intended to protect and maintain the natural, scenic, historical, economic, and recreational qualities of lands along Portland's rivers; establish criteria, standards, and procedures for the development of land, change of uses, and the intensification of uses within the greenway; and increase public access to and along the Willamette River for the purpose of increasing recreational opportunities, providing emergency vehicle access, assisting in flood protection and control, providing connections to other transportation systems, and helping to create a pleasant, aesthetically pleasing urban environment. The River Industrial Overlay Zone specifically encourages and promotes the development of river-related industries while preserving the riparian habitat and providing public access where practical.

The entire site is designated by the Portland Comprehensive Plan Map as an industrial sanctuary (City of Portland, 2003b). The Portland Comprehensive Plan Map is not the same as the Zoning Map. The Comprehensive Plan Map is an official description of where and to what level future zoning should be permitted, and presents a pattern for future development that will accomplish the purposes of applicable land use policies. Legally, zoning must comply with the limits set by a comprehensive plan. Thus, the land use designations of a comprehensive plan are superior to those used in the Zoning Map (i.e., the zoning map cannot allow land uses which are more intensive than those allowed by the Comprehensive Plan Map). As stated previously, the Comprehensive Plan includes the Facility

as part of an industrial sanctuary, which is intended for areas where City policy is to reserve land for existing and future industrial development. A full range of industrial uses are permitted and encouraged, while non-industrial uses are limited to prevent land use conflicts and preserve land for industry. As part of upland redevelopment, the Port recently completed a new rail loop at Terminal 4 (referred to as the Berth 408 Rail Yard Modernization Project). Therefore, the Facility is currently and is reasonably expected to remain zoned for heavy industrial use for the foreseeable future (Hart Crowser, 2004).

1.7 Known or Suspected Hazardous Substance Releases

Areas of Concern (AOCs) are areas with potential sources of contamination that could pose a risk to human or ecological receptors should a complete pathway exist. AOCs at the Facility were identified in the *RI Work Plan* (Hart Crowser, 2004) and *RI Work Plan Addendum for Phase III Work Scope Terminal 4 Slip 1 Upland Facility* (BBL/ACA/NF, 2005) based on historical documentation, interviews with on-site personnel, and site visits.

The AOCs were characterized by (but not limited to) the following activities and facilities: USTs, railroad areas, hydraulic pumps, general pesticide usage, sump pumps, cesspools, waste piles, blacksmith shop, fueling station, transformer handling, drum burial area, automobile demolition, machinery shops, and storm drain catch basins. The VCP (DEQ, 2003a) summarized potential sources of contamination at the Facility as the following: potential spills from hazardous substance storage, potential spills from bulk handling practices in collection with ship-to-shore and land-to-rail loading and unloading, and unpermitted discharges into stormwater management systems with outfalls into the lower Willamette River.

1.8 Site Cleanup Actions

Many of the operations identified as having potential AOCs are no longer active or have been decommissioned. For example, USTs have been removed, soils have been excavated, and buildings have been removed. In addition, remedial actions, such as spill cleanups, have taken place at the site. Refer to Hart Crowser (2004) for a summary of the history at each AOC. The Port is in the process of completing an Early Action (EA) cleanup of sediments at Terminal 4. The EA includes the construction of a sediment cap in Wheeler Bay that will extend up to the ordinary high water elevation (16.6 feet) (Anchor, 2006). Additional source-control measures (SCMs) have been proposed and approved for potentially erodable riverbank areas in Wheeler Bay (ACA/NF, 2007b). The accepted source control alternative for the potentially erodable riverbank soils is riprap armoring with re-grading and re-vegetation of the upper slope (ACA/NF, 2007b). The armoring, re-grading, and re-vegetation will prevent erosion thereby stabilizing the riverbank, and will isolate affected soils from direct contact by terrestrial ecological or human receptors.

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2.0 *Ecological Risk Assessment*

2.1 Purpose and Scope of the ERA

The ERA process for the T4S1 Upland Facility was based upon the process prescribed by DEQ in the *Guidance for Ecological Risk Assessment: Levels I, II, III, IV* (DEQ, 2001). The guidance describes a sequence for conducting ERAs, beginning with Level I Scoping. The purpose of the Level I Scoping ERA is to provide a conservative qualitative determination of whether there is reason to believe that ecological receptors and/or exposure pathways are present at the Facility (DEQ, 2001). If existing information indicates that Facility conditions will not result in exposure of ecological receptors, then no further risk analysis is necessary. If hazardous substances and exposure pathways are present, the process proceeds to a Level II Screening analysis to determine if hazardous substances are present at potentially ecotoxic concentrations and, if so, what additional risk analysis may be necessary to make risk management decisions for the Facility. Based on the Level II Screening, recommendations for any further risk analysis are presented.

Preliminary evaluations of data from the Facility indicated that complete exposure pathways are possible, and that a Level II screening analysis would be necessary. Therefore, the information in this document is a combination of requirements for the Level I and Level II ERA analyses. The Level I evaluation is presented in Sections 2.2 through 2.6. Sections 2.7 through 2.10 present results of the Level II Screening that was conducted for the exposure pathways identified in the Level I Scoping evaluation.

2.2 Level I/II Site Ecology and Scoping Level Ecological Evaluation

An overall description of the location, physical features, current uses, and history of the Facility is presented in the *RI Work Plan* (Hart Crowser, 2004) and *RI Work Plan Addendum for Phase III Work Scope Terminal 4 Slip 1 Upland Facility* (BBL/ACA/NF, 2005). The following sections are intended to supplement that information for elements relevant to the Level I Scoping and Level II Screening.

2.2.1 Ecological Site Description

A Facility visit was conducted by the project lead ecological risk assessor on November 1, 2005. The following site description is based on the Facility visit, aerial photographs, historical information, and general Facility knowledge. More detailed background information about climate, geology, and hydrogeology are presented in the *RI Work Plan* (Hart Crowser, 2004). Refer to Attachment A-1 (Level I Ecological Scoping Checklist) and Attachment A-2 (Level I Evaluation of Receptor-Pathway Evaluations), as required by DEQ (2001). Photographs are presented in Attachment A-4 to this report.

The topography of the Facility is relatively flat, with an elevation of approximately 30 feet above mean sea level (MSL). Groundwater was encountered within the fill unit and upper portion of the alluvial unit at a depth of 8.3 to 31.2 feet below ground surface (bgs) (1.1 to 30.8 feet above MSL) (BBL/ACA/NF, 2006). Groundwater flow within the fill and alluvial units at the Facility is generally

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toward the Willamette River, Slip 1 or Slip 3. Because the slips extend well into the Facility, the shallow groundwater gradient within the fill and upper alluvium is relatively flat beneath the western portions of OU1 and OU2. No surface water bodies are located on the Facility, but it is located adjacent to the Willamette River (Hart Crowser, 2004).

Figure 2.2-1 presents a habitat map of the Facility, based on local habitat surveys completed by the Port of Portland in 2002 as part of their Natural Resource Inventory (NRI) program. The majority of the Facility is covered by asphalt, concrete, gravel, or compacted soil surfaces and is largely devoid of vegetation. Specifically, developed (impervious and pervious), railroad (crushed rock, gravel, paved), roads (paved), and wasteland (barren or weedy fill) cover types comprise over 90 percent (%) of the land cover at the Facility. Existing vegetation on the disturbed upland area is mostly ruderal, consisting of opportunistic or weedy annual species (both native and non-native) growing along the margins of roads or buildings. There is a small area of irrigated landscaped land (i.e., developed-cultivated) and hardwoods near administrative buildings at the east end of OU1 and a small area of compacted soil with sparse ruderal species (i.e., herbaceous upland) at the west end of OU1. The existing surface conditions and active use of the Facility prevent more long-lived plant species from establishing and creating early successional native habitat types.

All of the riverbank area of the Facility is modified by dredge/fill operations, mostly conducted to construct Terminal 4 in the early 1900s. The riverbank is generally characterized by modified/armored banks which are predominately comprised of steep slopes with concrete stabilization structures and bulkheads that are remnants of piers and other marine facilities. Most of the areas without bulkheads have rip-rap armoring at typical water levels to protect against erosion from waves and high flows. Significant portions of riverbank in Slip 1 and Slip 3 are entirely covered by piers.

The small areas of vegetated riverbank are narrow (not more than 75 feet wide at the widest areas), make up approximately 3.8% of the Facility, and are disconnected from any other riparian areas along the Willamette River or any off-site upland habitat. The riverbank vegetation is comprised of a mixture of scrub-shrub (planted), blackberry scrub-shrub, mixed conifer-hardwood (planted), and hardwood (planted) habitat types. Many of these areas are dominated by non-native species and have signs of significant disturbance. In OU2, there is a small area (0.02 acres) of vegetated shallows (i.e., emergent wetlands) with native species (e.g., *Juncus effusus*, *Typha latifolia*) and non-native species (e.g., *Phalaris arundinacea*) among old pilings at the east end of Slip 1 (the site of the former Gatton Slough). The habitat value of these riverbank areas is limited by the small size, distance from other habitat areas, significant barriers (i.e., development, railroad, major roads, fences), and lack of any corridor to provide wildlife cover during travel.

The Facility is surrounded by developed tracts to the north, east, and south, and no significant upland ecological resources are present within 1 mile of the Facility. As described in Section 1.6.2, industrial use of the Facility is expected to continue. Thus, the majority of the Facility does not and will not provide suitable habitat for ecological receptors because of former, current, and likely future uses of the property. The Port recently completed a new rail loop at Terminal 4 (i.e., Berth 408 Rail Yard Modernization Project) and SCMs will be implemented in the Wheeler Bay area (ACA/NF, 2007b). The approved SCMs for potentially erodable riverbank soils in Wheeler Bay (i.e., armoring, re-grading, and re-vegetation) will resist erosion, stabilize the bank, and the act as a cap to prevent direct contact by terrestrial ecological or human receptors. The only riverbank habitat areas that may exist in the future are small, narrow strips of vegetation at the west ends of OU1 and OU2. The habitat in these

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areas consists of, or will consist of, planted vegetation and stabilized riverbank structures and are considered marginal habitat at best.

The Willamette River runs along the western edge of the site, and provides habitat for aquatic and semi-aquatic species. The Lower Willamette Group (LWG) has collected biota (i.e., fish tissue) and sediment samples offshore of the Facility and will use the resulting data in the Portland Harbor RI/FS.

2.2.2 Sensitive Environments

Based on the Oregon Natural Heritage Information Center (ORNHIC) information on protected species, there are no sensitive environments within the Facility. Although bald eagles are known to nest in other areas along the Willamette River, the Facility does not contain habitat suitable for nesting bald eagles.

The Facility is adjacent to the Willamette River, which is identified as a sensitive environment in OAR 340-122-0115 (50) because it harbors protected fish and wildlife species. The conceptual site model (CSM) presented in Section 2.5 identifies potential pathways for transport of site contaminants of interest (COIs) to the river.

2.2.3 Threatened and/or Endangered Species

A listing of threatened and endangered (T/E) species potentially present in the area was provided by ORNHIC. The list includes historical presence of federal and state-listed T/E species and other species of special interest. Attachment A-3 summarizes information on species of special interest from ORNHIC.

According to ORNHIC information, areas within 2 miles of the Facility potentially contain habitat for several terrestrial or semi-terrestrial species of interest, including one turtle species, several bird species, and two plant species. Bald eagles and peregrine falcons are federally listed T/E species that are known to nest in other areas along the Willamette River, but the Facility does not contain habitat suitable for these species. Thus, no T/E species are known to inhabit the Facility. Areas within 2 miles of the Facility potentially contain habitat for several fish species of interest, including green sturgeon, chinook salmon, coho salmon, and steelhead. The Facility does not provide aquatic habitat in which these fish species would be found, but there are potential pathways for transport of site COIs to the river (Refer to Section 2.5, *Conceptual Site Model and Exposure Pathways*).

2.2.4 Other Ecologically Important Species/Habitats

Based on the Facility visit, historical information, ORNHIC data, and general Facility knowledge, there are no rare or ecologically unusual habitats or species at the Facility.

2.3 Contaminants of Interest (COIs)

COIs were identified based on previous investigations described in the *RI Work Plan* (Hart Crowser, 2004) and *RI Work Plan Addendum for Phase III Work Scope Terminal 4 Slip 1 Upland Facility* (BBL/ACA/NF, 2005). The full list of COIs for the Facility are presented in the *RI Report* (ACA/NF, 2007a). The contaminants include volatile organic compounds (VOCs), semi-volatile organic

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compounds (SVOCs), polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), pesticides, metals, and petroleum hydrocarbons. The VCP (DEQ, 2003a) lists the initial chemicals of interest as metals (mercury, cadmium, chromium, lead, and zinc), PAHs, dibenzofuran, DDT, and PCBs. The COIs screened in the Level II Screening analysis are presented in Appendices B-1 through B-3.

2.4 Observed Impacts

As indicated above, there are limited ecological resources located at the Facility. No impacts on ecological receptors were observed at the Facility. No signs of toxic stress from COIs were observed during site visits. Such signs would include stressed or dead vegetation, patches of barren soil, or dead or dying animals that could not be explained based on other factors.

2.5 Conceptual Site Model and Exposure Pathways

A CSM provides information about contaminant sources, release mechanisms, potential receptors, and exposure pathways at a site. Preliminary identification of potential exposure pathways for ecological receptors was outlined in a Preliminary CSM in the *RI Work Plan* (Hart Crowser, 2004), and an updated CSM is presented as Figure 2.5-1. Modifications include identification of pathway/receptor categories that are being addressed through the Portland Harbor RI/FS risk assessment process. In addition, the pathways related to transport of COIs in erodable soils were added to the CSM. A general evaluation of potential exposure pathways is provided in the Level I Scoping checklists in Attachments A-1 and A-2. The primary contaminant sources and release mechanisms are release of chemicals to soil or impervious surfaces as a result of onsite or offsite operations.

The potentially complete exposure pathways outlined in the CSM include the following:

Direct Exposure Pathways:

- direct contact with contaminated surface or subsurface soil through contact with external surfaces or ingestion (terrestrial receptors); or
- direct contact or ingestion of contaminants that have been transported to surface water or sediments in the Willamette River (aquatic receptors).

Indirect Exposure Pathways:

- ingestion of terrestrial food sources that have become contaminated through direct or indirect pathways (i.e., food web exposure); or
- ingestion of aquatic food sources that have become contaminated through direct or indirect pathways (i.e., food web exposure).

As noted above, the Facility is an active industrial area mostly covered by asphalt or barren ground and does not represent a significant ecological resource. Narrow riverbank areas have vegetation, but these areas represent less than 5% of the Facility, and these areas will be altered through SCMs (ACA/NF, 2007b) and EA activities (Anchor, 2006). As a result, wildlife are unlikely to feed at the Facility and ecological exposures to surface soils at the Facility would be limited to occasional contact by birds or mammals that may cross the Facility while in transit (e.g., songbirds or raccoons). The

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low-quality riverbank areas at the west ends of OU1 and OU2 may be visited occasionally by semi-aquatic birds or mammals (e.g., shorebirds or beaver).

Since the Facility is mostly paved or otherwise covered, and will remain so in the future, terrestrial receptors will have limited contact with any contaminated soils. Inhalation of dust particulates is a minor or insignificant pathway because most surfaces are asphalt- or gravel-covered. The paved surfaces also minimize contaminated soils from being eroded into the Willamette River, with the exception of two riverbank areas with possible erodable slopes (west end of south side of Slip 1, and Wheeler Bay) (Figure 2.2-1). Thus, direct surface soil exposure pathways for visiting terrestrial receptors at the Facility are possible (although minimal due to limited soil coverage), and subsurface soil exposure is minor or insignificant. Ecological receptors could potentially be exposed as a result of the possible transport of soil contaminants from erodable riverbank slopes to surface water and sediments in the Willamette River. However, the erodable riverbank areas will be altered through SCMs (ACA/NF, 2007b), and EA activities (Anchor, 2006).. Thus, potential surface soil exposure pathways are limited to occasional contact by visiting terrestrial receptors and aquatic and aquatic-feeding receptors associated with the river.

No permanent surface-water bodies or sources of sediment are present at the upland portions of the Facility and long-term use of the Facility calls for it to remain paved or covered by buildings. Surface-water flow from precipitation and runoff on impervious surfaces is collected in seven drainage basins, with subsequent transport to the Willamette River. Thus, potential surface water and sediment exposure pathways are limited to aquatic and aquatic-feeding receptors associated with the river.

Since the Facility will remain as mostly paved, and groundwater is approximately 8 to 31 feet bgs, direct groundwater exposure pathways for burrowing terrestrial receptors at the Facility are incomplete. The only route of transport and exposure relevant to ecological receptors is the possible transport of contaminants in groundwater to surface water in the Willamette River. Thus, potential, significant groundwater exposure pathways are limited to aquatic and aquatic-feeding receptors associated with the river.

The Portland Harbor RI/FS is addressing any risk to shorebirds and other ecological receptors to contaminants in beach sediments; and risk to aquatic biota and wildlife from exposure to surface water and sediment, or bioaccumulation of COIs from surface water or sediments.

2.6 Level I Recommendations

Based on the information presented above, a Level II screening analysis will be necessary to support risk management decisions for the Facility. This recommendation is based on the following evidence: (1) release of hazardous substances is apparent from the historical site data, (2) there are potentially complete exposure pathways to ecological receptors, and (3) screening in the *RI Report* (ACA/NF, 2007a) indicates that concentrations in individual samples exceed ecological screening level values (SLVs). The Level II screen was conducted using data analysis and data aggregation methods prescribed in the guidance to help determine whether further action is needed.

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2.7 Level II - Screening

2.7.1 Methods for Level II Screening

The ecotoxicological risk screen was conducted according to DEQ guidance for Level II Screening ERA (DEQ, 2001). DEQ guidance specifies several tasks when the Level II analysis is conducted independently. However, many of the tasks and much of the background information cited in the Level II guidance were addressed in the Level I evaluation (i.e., conduct site survey, provide site description, identify ecological receptors, and identify complete exposure pathways). Therefore, the analysis presented below focuses on the tasks that relate directly to conducting the Level II screen, including:

- evaluate data sufficiency (Task 1 of the guidance);
- identify candidate assessment endpoints (Task 6);
- identify known ecological effects (Task 7);
- calculate COI concentrations (Task 8); and
- identify contaminants of potential ecological concern (CPECs) (Task 9).

Pursuant to OAR 340-122-080 (7), a hot spot evaluation was conducted. The hot spot evaluation was based on the DEQ's *Guidance for Identification of Hot Spots* (1998).

2.7.2 Data Available for Screening

Data available from the Phase I through Phase III RI sampling (ACA/NF, 2007a) are sufficient to perform the screen for all portions of the Facility. Method reporting limits (MRLs) were deemed to be suitable for comparisons to appropriate screening criteria; refer to Section 5.2 in the *RI Report* for additional discussion. Consistent with the *RI Report*, results with estimated concentrations below the MRLs but above the method detection limits (MDLs) are referred to herein as "trace" concentrations.

Soil samples were collected during several field investigations conducted between March 2004 and July 2007. Subsurface soil samples are available for 53 borings in OU1 and 32 borings in OU2. Surface soil samples (to 3 feet bgs) are available for 16 locations in OU1 and 18 locations in OU2. There were also 24 riverbank samples collected in September 2005 to characterize potentially erodable riverbank soils in OU2. Data from these 24 riverbank sampling locations were used for Level II comparisons against SLV criteria in the following manner: 1) in conjunction with the rest of the OU2 dataset for OU-wide analyses and 2) independent from the rest of the OU2 dataset to evaluate the potential riverbank habitat area. Refer to Figure 2.7-1 for all sample locations.

In July 2007, a composited surface soil sample (0.5 to 2 ft) was collected at S-31 as part of Phase III sampling. This sample was analyzed for total petroleum hydrocarbons (TPH) and PCBs, and no compounds were detected above the MRLs. The results and location of this sample are detailed in the *RI Report* (ACA/NF, 2007a). Although these sample results were collected after the draft *RI Report* was completed (BBL/ACA/NF, 2006), and not incorporated into the quantitative risk screening calculations in this document, these sample results were evaluated qualitatively. The concentrations of evaluated compounds in these samples were non-detected, and excluding these non-detected results from quantitative estimates of site-wide concentrations is a more conservative approach for these screening level analyses. The results from sample S-31 will not be discussed further in this document.

Groundwater data from monitoring wells located on the downgradient side of each OU (i.e., nearest the slips or river) were used for the Level II groundwater screen against SLV criteria. For OU1, data from the following monitoring wells were used in the screen: MW-01s, MW-07, MW-08, MW-26, and MW-03s. For OU2, data from the following monitoring wells were used in the screen: MW-09, MW-10, MW-11, MW-12, MW-13, MW-14, MW-15, and MW-16.

Samples were analyzed for a range of COIs including VOCs, SVOCs, PAHs, organochlorine pesticides, organophosphorus pesticides, PCBs, volatile and extractable petroleum hydrocarbons, gasoline, diesel, and heavy oil range organics, phthalates, and metals. Table 5 of the *RI Report* (ACA/NF, 2007a) lists the analyte suites for the RI samples. For metals, data for total recoverable and dissolved (i.e., filtered) were available, but only total recoverable data were available for organic COIs. Where available, both forms were used in the screening process.

2.7.3 Candidate Assessment Endpoints

According to DEQ guidance (2001), assessment endpoints are "…an explicit expression of a value deemed important to protect, operationally defined by an entity (hereafter, "endpoint receptor") and one or more of that entity's measurable attributes…" Assessment endpoints serve to focus the ERA on species and measures that are directly relevant to risk management decisions for the site. The assessment endpoints generally represent species or functional groups that are important to ecological function at a site, or rare species that have great ecological, aesthetic, or cultural value.

Assessment endpoints for a screening level assessment (e.g., Level II screening) are typically not as specific as those identified for baseline risk assessments where specific measures or data analysis methods are needed to make decisions. In addition, there are no T/E or other rare species known to use the Facility. For the DEQ Level II analysis, SLVs for soils and surface water have been identified for general groups of organisms including plants, invertebrates, birds, mammals, and aquatic receptors. Therefore, the following candidate assessment endpoints were identified:

- Survival, growth, and reproduction of terrestrial plants;
- Survival, growth, and reproduction of terrestrial invertebrates;
- Survival, growth, and reproduction of terrestrial-feeding birds;
- Survival, growth, and reproduction of terrestrial-feeding mammals; and
- Survival, growth, and reproduction of aquatic receptors.

2.7.4 Calculating COI Concentrations

Because wildlife receptors don't experience their environment on a "point" basis, environmental data for each COI need to be converted to an estimate of concentration over a habitat exposure area (DEQ, 2001). Exposure-point concentrations (EPCs) are concentrations of COIs that represent a reasonable maximum exposure based on the media characteristics and site-specific receptors. The Level II guidance specifies that screening level EPCs can be based on (1) site maximum detected concentrations (MDCs) for immobile or nearly immobile receptors (i.e., plants, aquatic invertebrates, and soil invertebrates), or (2) 90%-upper confidence limits (90UCL) of the mean concentrations for more mobile wildlife receptors (i.e., birds, mammals, fish) (DEQ, 2001).

EPCs of COIs for both soil and groundwater were calculated separately for OU1 and OU2 at the Facility, as identified in the VCP (DEQ, 2003a). For groundwater risk screening, data from monitoring wells nearest the point of discharge to the river were analyzed, as stipulated in the guidance (DEQ, 2001). Analyses included data from MW01s, MW07, MW08, MW26, and MW03s in OU1 and MW09, MW10, MW11, MW12, MW13, MW14, MW15, and MW16 in OU2 (Figure 2.7-1). For soil risk screening, all available soil samples from the OUs were used to estimate reasonable maximum exposure for wildlife potentially visiting the site from adjacent locations. This approach assumes that wildlife receptors could utilize all areas of the site, even though habitat quality is low throughout. In addition, 90UCLs of COIs for soil were calculated independently for the riverbank area in OU2 (i.e., along Wheeler Bay), which currently has marginal wildlife habitat. Soil samples from less than 3 feet bgs were included in the calculations, to adequately account for exposure to potential burrowing animals. Riverbank soils collected in OU2 (sampling locations S-23 through S-30; see Figure 2.7-1) were included in the EPCs. The riverbank samples were collected as composite samples comprised of four sub-samples, with the exception of S-29 (no sub-samples) and S-30 (3 sub-samples). The composite samples were analyzed for all analytes, while the four discrete samples were only analyzed for some analyte classes. For determining an EPC based on MDC, all available sample results, both composite and discrete, were included in the determination. For determining an EPC based on 90UCL, the discrete sample results were included if available and the corresponding composite sample results were omitted. This procedure prevented multiple results from the same sample from being included in the 90UCL calculation.

The EPA ProUCL computer program (EPA, 2004a) was used to calculate the 90UCLs for COIs that exceeded Level II screening criteria based on MDC. Results reported as non-detectable concentrations were replaced with half the reported detection limit (e.g., MRL). ProUCL created an output file that includes general distribution statistics (e.g., mean, standard deviation, count, minimum, maximum), and identified the statistical distribution type (i.e., normal, log-normal, gamma approximation, or non-parametric) that best fit the data. The appropriate 90UCL estimation method was chosen based on the best distribution fit.

2.7.5 Frequency of Detection and Background Analysis

COIs were screened on the basis of detection frequency and comparison to regional background levels before being compared to toxicity SLVs, as outlined in Task 9 of the Level II guidance (DEQ, 2001). COIs detected in less than 5% of the samples were excluded as CPECs on the basis of infrequent detection. The MDCs for metals in soils were compared to regional background concentrations, as published for Clark County, Washington (San Juan, 1994). If the MDC for a COI was less than the background value, then the COI was excluded as a CPEC. Task 9d of the guidance (DEQ, 2001) indicates that the potential adverse effects of any detected bioaccumulative toxins should be discussed in the Level II screening. Analytes were considered potentially bioaccumulative if they were detected in the Portland Harbor Superfund Round 1a fish tissue.

2.7.6 Screening Level Values (SLVs)

SLVs published by DEQ (2001) for use in Level II analyses were used in the screening level analysis. These values are based on no-observed-adverse-effects levels (NOAELs) for each of the COIs. Therefore, if site concentrations are less than the SLV, no adverse effects are expected and no further analysis is required because risk is assumed to be negligible. Please note that the SLVs are based on intensive use of a site by receptors. Because the Facility is industrialized, and will remain so,

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ecological receptors are unlikely to utilize the site at levels represented in the SLVs. As a result, comparison of site soil data to SLVs overestimates exposure and risk. Therefore, concentrations that exceed the SLV do not necessarily represent unacceptable risk, but indicate that additional evaluation of site conditions may be necessary to support risk management decisions. For groundwater, data were screened against surface water criteria for aquatic receptors because exposure to groundwater contaminants would only occur after discharge to surface water.

2.7.7 Hot Spot Levels

Guidance published by DEQ (1998) was used for the hot spot evaluation. Assessment of a soil hot spot is accomplished by comparing the concentration of an individual site contaminant to its "highly concentrated" hot spot level. Hot spot levels are risk-based concentrations that correspond to a given multiplier of the acceptable risk level. For this evaluation, the "highly concentrated" hot spot level for non-T/E ecological terrestrial receptors is defined as 50 times (50x) the applicable DEQ Level II SLV. The hot spot evaluation was completed for the riverbank area in OU2 because those soils are considered to be within habitat areas for terrestrial receptors.

2.8 Screening Results and Identification of Contaminants of Potential Ecological Concern (CPECs)

CPEC identification followed Task 9 of the DEQ guidance (DEQ, 2001), including consideration of detection frequency, background comparison, cumulative risk from multiple COIs, bioaccumulative toxins, and screening level availability. CPECs were identified by calculating the toxicity ratio (T) of the EPC (MDC or 90UCL) of each of the COIs to Level II SLVs (DEQ, 2001). The guidance indicates two potential levels of analysis for soil COIs. For threatened or endangered species, the toxicity ratio is compared to the "receptor designator" (Q) value of 1 (i.e., if the Facility soil concentration exceeds the SLV, the constituent is identified as a CPEC). For non-protected species, T is compared to a Q value of 5 (i.e., if the Facility soil concentration exceeds five times [5x-] the SLV, the constituent is identified as a CPEC). For completeness, both levels of results are presented. However, CPECs are identified based on Q=5 because no T/E species are present at the site. For groundwater concentrations, the Q value of 1 is used for all receptors (DEQ, 2001). In addition, potential risk to a receptor from multiple COIs simultaneously within a given medium was addressed by comparing T of an individual COI to the sum of T for all COIs.

2.8.1 Soil CPECs

2.8.1.1 Frequency of Detection and Background Analysis

For soils in OU1, maximum concentrations of arsenic, cadmium, copper, lead, mercury, nickel, chromium, and zinc exceeded regional background concentrations, and beryllium was excluded as a CPEC as a result of the background analysis (Table 2.8-1). For soils in OU2, maximum concentrations of arsenic, cadmium, copper, lead, mercury, nickel, and zinc exceeded regional background concentrations, and beryllium and chromium were excluded as CPECs as a result of the background analysis (Table 2.8-1).

Appendix B-1 presents results of soil screening for plant, invertebrate, bird, and mammal receptors for each OU. For each COI, the tables show a detailed data summary, the maximum concentration,

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SLVs, and results of the data comparison. For soils in OU1, 30 COIs were excluded as CPECs because there was less than 5% detection frequency for those analytes (DEQ, 2001). Of those analytes, only 2 were detected (endrin ketone, methoxychlor). For soils in OU2, 28 COIs were excluded as CPECs because there was less than 5% detection frequency for those analytes. Of those analytes, only 4 were detected (chlordane, endosulfan I, heptachlor, methoxychlor). Thus, there were no analytes for soils in either OU that were excluded as CPECs based on frequency detection analysis that had detects which exceeded SLVs.

2.8.1.2 Screening Analysis

Identification of Candidate CPECs

Table 2.8-2 summarizes results of the OU1 and OU2 soil toxicity screens for COIs for which the MDC exceeded at least one SLV with a risk ratio (Q) greater than 1. These constituents are considered "candidate CPECs" that are subject to further analysis including calculation of 90UCLs and comparison to appropriate risk ratios. In addition, this table includes CPECs that were identified as a result of potential risk to a receptor from multiple COIs simultaneously within a given medium (DEQ, 2001).

For soils in OU1, 6 candidate CPECs (lead, zinc, copper, mercury, total chromium, dibenzofuran) were identified. For soils in OU2, 11 candidate CPECs (cadmium, copper, lead, nickel, selenium, silver, dibenzofuran, arsenic, mercury, DDT, and zinc) were identified. For riverbank soils in OU2, 7 candidate CPECs (cadmium, copper, lead, mercury, DDT, and zinc, and total chromium) were identified.

Comparison of MDCs to SLVs for Non-Wildlife Receptors

For plants and soil invertebrates (i.e., non-wildlife receptors), comparing the MDCs to the SLVs is an appropriate comparison (DEQ, 2001), as these receptors are immobile or nearly immobile. Table 2.8-2 summarizes results of the OU1 and OU2 soil toxicity screens based on comparison of MDCs to SLVs. In addition, the summary table also indicates which MDCs exceeded SLVs with a risk ratio greater than 1, and which MDCs exceeded SLVs with a risk ratio greater than 5 (i.e., the MDC was greater than 5x-SLV). As noted above, the Facility does not have suitable habitat for T/E species and a risk ratio of 5 corresponding to non-T/E species is a more appropriate benchmark for identifying CPECs.

Zinc and total chromium were identified as CPECs for non-wildlife receptors in OU1 and cadmium, lead, and zinc were identified in OU2. For the riverbank areas in OU2, cadmium, lead, and zinc, and total chromium were identified as CPECs for non-wildlife receptors.

Comparison of 90UCLs to SLVs for Wildlife Receptors

For bird and mammal receptors (i.e., wildlife receptors), EPCs based on 90UCLs were calculated for all CPECs (i.e., constituents with MDCs that exceeded an SLV). Refer to Appendix B-1 for the results of screens based on comparisons of the calculated 90UCLs to SLVs. Table 2.8-2 summarizes the results of the OU1 and OU2 soil toxicity screens based on comparison of 90UCLs to SLVs. The summary table indicates which 90UCLs exceeded SLVs with a risk ratio greater than 1, and which 90UCLs exceeded SLVs with a risk ratio greater than 5 (i.e., the 90UCL was greater than 5x-SLV). As noted above, the Facility does not have suitable habitat for T/E species and a risk ratio of 5 corresponding to non-T/E species is a more appropriate benchmark for identifying CPECs.

For soils in OU1, dibenzofuran (for the mammal receptor) and total chromium (for the bird receptor) are the only CPECs based on a risk ratio greater than 5 (Table 2.8-2). For soils in OU2, dibenzofuran (mammal receptor), lead (bird receptor), and zinc (bird receptor) were identified as CPECs based on a risk ratio greater than 5 (Table 2.8-2). For riverbank soils in OU2, lead, zinc, and total chromium were identified as CPECs based on a risk ratio greater than 5 for bird receptors. There were no CPECs identified for mammal receptors (Table 2.8-2).

Hot Spot Evaluation

The soil data for the samples within OU1 and OU2 were compared to hot spot levels, as described in Section 2.7.7; the results are summarized on Table 2.8-4. Although there are potential hot spots in OU1 and OU2 based on this analysis, these areas lack habitat for terrestrial ecological receptors. The only habitat areas at the Facility are within the riverbank area of OU2.

Distribution of Soil Exceedances

Although exposure to terrestrial receptors is best estimated by a reasonable maximum estimate of concentration over a habitat exposure area (MDC for plant and invertebrate receptors; 90UCL for bird and mammal receptors), mapping exceedances on a "point" basis is helpful to identify where soil concentrations have occurred at the Facility. Figure 2.8-1 identifies detected CPEC concentrations in soil that exceed five times the most conservative, applicable SLVs. For OU1, detected concentrations of zinc that exceed 5x-plant SLV, and detected concentrations of dibenzofuran that exceed 5x-mammal SLV are depicted. In addition, detected concentrations of chromium that exceed regional background levels are depicted. For OU2, detected concentrations of cadmium that exceed 5x-plant SLV, detected concentrations of zinc that exceed 5x-plant SLV, detected concentrations of lead that exceed 5x-bird SLV, and detected concentrations of dibenzofuran that exceed 5x-mammal SLV are depicted.

There are two locations in OU1 with zinc exceedances, four locations with dibenzofuran exceedances, and two locations with chromium exceedances. These locations are along the northern boundary with Schnitzer Steel Products facility or in developed areas in the western half of OU1. It does not appear that there is a distinct "hotspot" of zinc, dibenzofuran, or chromium in OU1. In addition, these locations are not located in vegetated areas where wildlife might visit. The highest zinc exceedance (521 milligram per kilogram [mg/kg]) at S-7 is a risk ratio of 2 when compared to 5x-plant SLV. The highest detected dibenzofuran exceedance (0.1 mg/kg, trace) at S-7 is a risk ratio of 10 when compared to 5x-mammal SLV. The highest detected chromium concentration (152 mg/kg) is 5.7 times greater than regional background levels.

There are eight locations in OU2 with lead exceedances, five locations with zinc exceedances, two locations with dibenzofuran exceedances, and one location with a cadmium exceedance. These locations are generally in developed areas in the eastern half of OU2 (developed areas or along rail lines) or along the riverbank of Wheeler Bay. The highest dibenzofuran exceedance (0.2 mg/kg) at S-14 is a risk ratio of 20 when compared to 5x-mammal SLV. The highest lead exceedance (1060 mg/kg) at SB-77 is a risk ratio of 13 when compared to 5x-bird SLV. The highest detected zinc exceedance (3320 mg/kg) at S-26 is a risk ratio of 13 when compared to 5x-plant SLV. The highest detected cadmium exceedance (25.3 mg/kg) at S-26 is a risk ratio of 1.3 when compared to 5x-plant SLV.

The areas of potential ecological concern at the Facility are those areas with potential habitat with soil concentrations that exceed upland ecological screening levels. The Facility is mostly paved or

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otherwise covered, and will remain so in the future, so available habitat is minimal and marginal. The primary area of potential ecological concern is the riverbank area in OU2. As indicated in Section 2.2.1, the riverbank areas along Wheeler Bay will be altered through EA activities (Anchor, 2006) and SCMs (ACA/NF, 2007b). The approved SCMs for potentially erodable riverbank soils in Wheeler Bay (i.e., armoring, re-grading, and re-vegetation) will resist erosion, stabilize the bank, and the act as a cap to prevent direct contact by terrestrial ecological or human receptors. The only riverbank habitat areas that may exist in the future in Wheeler Bay are narrow strips of planted vegetation on stabilized riverbank soil, which is the approved source control measure.

2.8.2 Groundwater CPECs

2.8.2.1 Frequency of Detection Analysis

Groundwater COI concentrations at downgradient monitoring wells (i.e., nearest the point of discharge to the river) were compared to surface water SLVs for aquatic life. Appendix B-2 presents the results of toxicity screening for aquatic receptors for each OU. Results for both total and filtered (i.e., dissolved) metals samples are presented. For each COI, the tables list a detailed data summary, the maximum concentration, SLVs, and results of the data comparison. For groundwater in OU1, 39 COIs were excluded as CPECs because there were no samples with detected results for those analytes. For groundwater in OU2, 38 COIs were excluded as CPECs because there was less than 5% detection frequency for those analytes. Thus, there were no analytes for groundwater in either OU that were excluded as CPECs based on frequency detection analysis that had detects which exceeded SLVs.

2.8.2.2 Screening Analysis

Identification of Candidate CPECs

Table 2.8-3 summarizes results of the groundwater screen for CPECs for which the MDC exceeded the aquatic SLV (i.e., risk ratio greater than 1). These constituents are considered candidate CPECs. In addition, this table also includes candidate CPECs that were identified as a result of potential risk to a receptor from multiple COIs simultaneously within a given medium (DEQ, 2001).

For downgradient monitoring wells in OU1, 7 candidate CPECs (benzo(a)anthracene, benzo(a)pyrene, carbon disulfide, total chromium, heptachlor, heptachlor epoxide, and total lead) were identified. Heptachlor, heptachlor epoxide, and lead concentrations did not exceed SLVs and thus do not have risk ratios greater than 1, but having risk ratios greater than 0.02 caused them to be screened out on the basis of risk from multiple COIs. The individual risk ratios for these analytes are 0.7, 0.8, and 0.4, respectively. For lead and chromium, the dissolved (i.e., filtered) concentrations did not exceed the SLVs.

For downgradient monitoring wells in OU2, 8 CPECs (benzo(a)anthracene, benzo(a)pyrene, carbon disulfide, total copper, DDD, DDT, total chromium, and total lead) were identified. For lead, chromium, and copper, the dissolved (i.e., filtered) concentrations did not exceed the SLVs.

Comparison of MDCs to SLVs for Immobile Receptors

For largely immobile receptors (i.e., aquatic invertebrates, aquatic plants), comparing the MDCs to the SLVs provides a comparison for exposure to an individual organism. Table 2.8-3 summarizes results of the OU1 and OU2 groundwater toxicity screens based on comparison of MDCs to SLVs. In

addition, the summary table also indicates which MDCs exceeded SLVs with a risk ratio greater than 1, and which MDCs exceeded SLVs with a risk ratio greater than 5 (i.e., the MDC was greater than 5x-SLV). According to DEQ (2001), a risk ratio of 1 is an appropriate benchmark for groundwater exposure. The results of this comparison are summarized in the previous section (*Identification of Candidate CPECs*).

Comparison of 90UCLs to SLVs for Mobile Receptors

For mobile receptors (i.e., fish), EPCs based on 90UCLs were calculated for all CPECs (i.e., constituents with MDCs that exceeded an SLV). Refer to Appendix B-2 for the results of screens based on comparisons of the calculated 90UCLs to SLVs. Table 2.8-3 summarizes the results of the OU1 and OU2 groundwater toxicity screens based on comparison of 90UCLs to SLVs. The summary table indicates which 90UCLs exceeded SLVs with a risk ratio greater than 1, and which 90UCLs exceeded SLVs with a risk ratio greater than 5 (i.e., the 90UCL was greater than 5x-SLV). According to DEQ (2001), a risk ratio of 1 is an appropriate benchmark for groundwater exposure.

For downgradient monitoring wells in OU1, benzo(a)pyrene is the only CPEC whose 90UCL exceeds the aquatic SLV. 90UCLs could not be calculated for total chromium, heptachlor, heptachlor epoxide, or total lead as a result of small sample sizes.

For downgradient monitoring wells in OU2, benzo(a)anthracene and benzo(a)pyrene are the only CPECs whose 90UCLs exceed the aquatic SLVs. 90UCLs could not be calculated for DDD or DDT as a result of small sample sizes.

Distribution of Groundwater Exceedances

Although exposure to receptors is best estimated by a reasonable maximum estimate of concentration over a habitat exposure area (either MDC for relatively immobile aquatic receptors; 90UCL for mobile aquatic receptors), mapping exceedances on a "point" basis is helpful to identify where groundwater concentrations occur at the Facility. Figure 2.8-2 identifies detected CPEC concentrations in groundwater at downgradient monitoring wells that exceed aquatic SLVs with a risk ratio greater than 1.

For OU1, there are no detected concentrations of heptachlor, heptachlor epoxide, or total lead that exceed aquatic screening criteria.

MW-07 and MW-26 are the only downgradient wells with exceedances of benzo(a)anthracene and/or benzo(a)pyrene. Benzo(a)anthracene exceeded the SLV at MW-07 in February 2005, but did not exceed at that location in May 2005. Benzo(a)anthracene exceeded the SLV at MW-26 in May 2005. The highest concentration of benzo(a)anthracene (0.000067 milligram per liter [mg/L], trace) at MW-07 has a risk ratio of 2.5 compared to aquatic screening levels. Benzo(a)pyrene exceeded the SLV at MW-07 in February 2005, but did not exceed at that location in May 2005. The highest concentration of benzo(a)pyrene (0.000069 mg/L, trace) at MW-07 has a risk ratio of 4.9 compared to aquatic screening levels.

MW-07 is the only downgradient well in OU1 with an exceedance of carbon disulfide. Of four sampling periods throughout 2004 and 2005, there was only one exceedance of this CPEC. Carbon disulfide exceeded the SLV in August 2004, but did not exceed at that location in February or May 2005. The highest concentration of carbon disulfide (0.00094 mg/L) yields a risk ratio of 1.02 when compared to the aquatic SLV.

MW-08 is the only downgradient well in OU1 with an exceedance by total chromium. There was a detected exceedance by this CPEC in May 2005, but not in September 2005. The highest concentration of total chromium (0.0146 mg/L) yields a risk ratio of 1.3 when compared to the aquatic SLV.

For OU2, MW-09 and MW-11 are the only downgradient wells with exceedances by DDT and/or DDD. Of four sampling periods at MW-09 and three sampling periods at MW-11 throughout 2004 and 2005, there was only 1 detected exceedance per CPEC for each well. There was an exceedance by DDT at MW-09 in February 2005, but there was only a non-detect result in May 2005. There was an exceedance by DDT at MW-11 in September 2004, but there was only a non-detect result in May 2005. There was an exceedance by DDD at MW-11 in April 2004, but there were only non-detect results in September 2004 and May 2005. The highest concentration of DDT (0.000014 mg/L, trace) at MW-11 has a risk ratio of 1.4 compared to aquatic screening levels. The highest concentration of DDD (0.0000026 mg/L, trace) at MW-11 has a risk ratio of 2.6 compared to aquatic screening levels.

MW-16 is the only downgradient monitoring well in OU2 with exceedances of benzo(a)anthracene, benzo(a)pyrene, and carbon disulfide. Of four sampling periods throughout 2004 and 2005, there was only one exceedance of benzo(a)anthracene and benzo(a)pyrene in May 2005. There was an exceedance of carbon disulfide at MW-16 in February 2005, but there was only a non-detect result in May 2005. The highest concentration of benzo(a)anthracene (0.000075 mg/L) has a risk ratio of 2.8 compared to aquatic screening levels. The highest concentration of benzo(a)pyrene (0.000095 mg/L) has a risk ratio of 6.8 compared to aquatic screening levels. The highest concentration of carbon disulfide (0.0017 mg/L) has a risk ratio of 1.8 compared to aquatic screening levels.

MW-15 is the only downgradient monitoring well in OU2 with exceedances of total lead and total chromium. Of four sampling periods at MW-15 throughout 2004 and 2005, total lead and total chromium exceeded the SLVs in May 2005 only. The highest concentration of total lead (0.0109 mg/L) has a risk ratio of 4.3 compared to aquatic screening levels. The highest concentration of total chromium (0.0219 mg/L) has a risk ratio of 2.0 compared to aquatic screening levels.

MW-15 and MW-16 are the only downgradient wells with exceedances by total copper. Of four sampling periods at MW-15 and three sampling periods at MW-16 throughout 2004 and 2005, there was only one exceedance by total copper for each well. There was an exceedance at MW-16 in September 2004, but there was no exceedance in February 2005. There was a detected exceedance at MW-15 in May 2005 only. The highest concentration of total copper (0.0143 mg/L) at MW-16 has a risk ratio of 1.6 compared to aquatic screening levels.

2.9 Technical-Management Decision Points (TMDPs) and Recommendations

According to DEQ guidance (2001), TMDPs are steps in the risk assessment process where one of three recommendations is determined: 1) no further ecological investigations at the site; 2) continuation of the risk assessment process to the next level; or 3) undertake a removal or remedial action. DEQ guidance identifies two TMDPs at the end of the Level II screening process. The information gathered during the Level I Scoping and Level II Screening processes are used to evaluate TMDP 3 and TMDP 4.

2.9.1 TMDP 3

This TMDP is intended to help determine whether unacceptable ecological risk is *probable*. According to DEQ guidance (2001), the *potential* for risk exists when CPECs are present and there are complete exposure pathways between contaminated media and ecological receptors. The Level I scoping indicated that the *potential* for risk exists at the Facility based on the presence of contaminated media and possible contact with receptors. However, the guidance indicates that unacceptable risk is *probable* only if the locality exhibits the following three criteria: 1) contains any individuals of a T/E species, critical habitat of a T/E species, or contains habitat of sufficient size and quality to support a local population of non-T/E species; 2) CPECs were selected on the basis of exceedance of SLVs or because they have a high potential to bioaccumulate; and 3) there appears to be plausible links between CPEC sources and endpoint receptors (DEQ, 2001).

Based on information gathered during the Level I scoping and Level II screening processes, the above criteria are not all exhibited throughout the Facility mainly because this area is an industrial site which lacks habitat of sufficient size and quality to support local populations of non-T/E species. The Facility is currently and is reasonably expected to remain zoned for heavy industrial use for the foreseeable future. As a result, terrestrial wildlife receptors are unlikely to spend substantial amounts of time feeding or engaged in other behaviors that would result in substantial contact with contaminated media at the site. Likewise, the upland areas of the Facility do not represent significant habitat for rare or important plant communities. Decisions regarding the probability of unacceptable risk from environmental media should include consideration of these factors. The conclusions regarding the probability of risk are discussed separately for upland soils and groundwater.

2.9.1.1 Upland Soils

The soil risk ratios for plants and invertebrates in OU1 (based on MDCs) range up to approximately 10 (for zinc/plants), and up to 66 in OU2 (also zinc/plants). The 90UCL concentrations reflect much lower maximum risk ratios, approximately 4 and 8 for OU1 and OU2, respectively. Although the risk ratios exceed the value of 5 recommended by DEQ for non-T/E species, the industrial nature of the site indicates that these exposures probably do not represent substantial effects on local plant or invertebrate populations, or on ecosystem function provided by these groups.

For mammals and birds in OU1, only the risk ratio for dibenzofuran (36) exposure to mammals exceeds 5. In OU2, the maximum risk ratios for lead (11), zinc (7), and dibenzofuran (58) exceed 5. DEQ developed the SLVs to be conservative screening values, and to represent relatively high exposure rates. Therefore, the risk ratios calculated for the Facility using the SLVs substantially overestimate the potential exposure and ecological risk, especially for terrestrial-feeding birds and mammals. If relative site use were to be considered, the site-wide risk ratios for lead and zinc in OU2 would be below 5 when animals used the site approximately 50% of the time or less. Due to the limited resources at the Facility, most wildlife species are unlikely to spend 50% or more of their time at the site. Some localized areas of the site with exceptionally high concentrations, such as zinc at S-26, could represent unacceptable risk for animals that utilize these areas extensively, but unacceptable risk to local populations is not expected.

For dibenzofuran, concentrations are relatively evenly distributed across the site. There are no known or suspected site-specific sources of dibenzofuran at the Facility, and so it is likely that concentrations in soils are due to general anthropogenic sources that affect soils throughout the region. When relative site use by wildlife species is considered, risk ratios would be approximately 5 or less if

receptors spent 10% or less of their foraging time at the Facility. While some individuals of urbanized species such as pigeons or Norway rats may spend more than 10 percent of their time foraging at the Facility, it is unlikely that other species such as deer, coyote, or raptors would feed this extensively on the upland areas at the Facility.

Also, the relatively high risk ratios for dibenzofuran are due, in part, to a very low SLV compared to achievable detection limits. Non-detect concentrations are included in 90UCL calculations using 0.5 of the MRL. The SLV for dibenzofuran (0.002 mg/kg) is less than the MRL observed for samples from the site and the 90UCL is influenced by locations with non-detected concentrations. Since samples were analyzed using standard, low-detection limit methods, the presence of dibenzofuran at many locations cannot be confirmed, and risk from this CPEC is unlikely to warrant remedial action.

Additional research was performed to evaluate dibenzofuran toxicity to mammals and potential alternative screening levels. The *Final Comprehensive Risk Assessment (CRA) Work Plan and Methodology* (U.S. Department of Energy [USDOE], 2005) document summarizes extensive research undertaken by USDOE as part of Rocky Flats CRA, approved by EPA Region 8 and other regulatory agencies, to develop ecological screening levels (ESLs). The methods for developing ESLs included: identifying representative receptors and receptor attributes, literature review of toxicity data to derive toxicity reference values (TRVs) for vertebrate receptors, and calculation of NOAEL-based ESLs using appropriate uncertainty factors. If the soil concentration of a contaminant of interest does not exceed the NOAEL-based ESLs, then risk is considered to be negligible to receptors of interest. Based on this work, a range of dibenzofuran ESLs were developed for mammalian receptors. These ESLs range from 21.2 mg/kg for an insectivorous deer mouse to 93.8 mg/kg for an omnivorous coyote, and 2,440 mg/kg for a herbivorous prairie dog. These values are substantially higher than DEQ's SLV, but are protective literature-based values underlying ESL development. The MDC of dibenzofuran at the Facility is 0.2 mg/kg, which is two orders of magnitude lower than the lowest NOAEL-based ESL. This research provides additional evidence that dibenzofuran is not expected to provide unacceptable risk to terrestrial receptors at the Facility.

Overall, little habitat currently exists or will exist for terrestrial receptors at the Facility because of likely future uses of the property. The only persistent patches of riverbank vegetation are located on narrow strips (less than 20 to 40 feet wide in most places). With the exception of the areas sampled for this RI (e.g., the bank of Wheeler Bay and the south side of Slip 1), these areas were previously stabilized through addition of rip rap (below typical river levels) and landscaping improvements, including placement of clean topsoil (above the typical river levels). As indicated in Section 2.2.1, the Port recently constructed a new rail loop as part of the Berth 408 Rail Yard Modernization Project and this development further minimized potential wildlife movement and potential exposure pathways. The sediment cap in Wheeler Bay will extend up to the ordinary high water elevation (16.6 feet), and additional SCMs have been proposed and approved for potentially erodable riverbank areas in Wheeler Bay (ACA/NF, 2007b). The armoring, re-grading, and re-vegetation will resist erosion, stabilize the bank, and act as a cap to prevent direct contact by terrestrial ecological receptors.

Relative use of the Facility by terrestrial receptors is minimal, only a small amount of marginal habitat exists at the Facility, SCMs to reduce potential erosion of soils will also reduce exposure of terrestrial wildlife, and thus potential exposure to CPECs identified in the screening analysis is also low. Based on these results, the probability of unacceptable ecological risk from upland soils is minimal, and does not warrant additional remediation at the site.

2.9.1.2 Groundwater Screen

The groundwater screening results indicate the presence of benzo(a)pyrene, benzo(a)anthracene, carbon disulfide, total chromium, heptachlor, heptachlor epoxide, total lead, total copper, DDD, and DDT in downgradient monitoring wells. However, these CPECs are unlikely to represent unacceptable risk. For lead, chromium, and copper, only the total (i.e., unfiltered) concentrations of these CPECs exceeded the SLVs. However, total concentrations probably do not represent the fraction in groundwater that will ultimately be transported to the river. Historically, regulatory agencies have considered filtered (conventionally at 0.45 micrometer [µm] pore size) as a better estimation of bioavailable metals in water. No dissolved (i.e., filtered) MDCs exceeded the SLVs, indicating that those metals in groundwater at the Facility probably do not represent a risk to aquatic life in the Willamette River.

Based on total (i.e., unfiltered) concentrations in OU1, lead, heptachlor, and heptachlor epoxide were identified as CPECs based on risk from multiple COIs. However, the individual risk ratios for these CPECs (0.4, 0.7, and 0.8, respectively) indicate that risk to aquatic receptors from these CPECs would be minimal. In addition, chromium, carbon disulfide, benzo(a)pyrene and benzo(a)anthracene concentrations were infrequently detected above screening levels, both from a temporal and spatial perspective. These CPECs had risk ratios less than 5 for those point concentrations and the detected concentrations were lower than SLVs during the most recent sampling event. As discussed in the *RI Report* (ACA/NF, 2007a), the groundwater results support that PAH and metal exceedances were intermittent (i.e., not repeated in the other quarters of monitoring), are likely due to variability in sample turbidity (i.e., soil entrained in the samples), and are not representative of the concentrations of these analytes in groundwater near these wells. Thus, CPECs identified in the Level II screening analysis lack widespread, substantial, and persistent detections throughout the downgradient monitoring wells in OU1.

In OU2, all CPEC concentrations were also infrequently detected above screening levels, both from a temporal and spatial perspective. The detected concentrations of DDD, DDT, and carbon disulfide had risk ratios less than 2.6 for those point concentrations and the detected concentrations were lower than SLVs during the most recent sampling event. As discussed above, only the total concentrations of lead, chromium, and copper, exceeded the SLVs, not the more bioavailable dissolved fractions of these CPECs. Benzo(a)anthracene and benzo(a)pyrene in MW-16 had detected concentrations above SLVs in the most recent sampling event, yielding risk ratios of 6.8 and 2.8, respectively, at that well.

The groundwater CPECs are unlikely to represent unacceptable risk to organisms in surface water. Samples of groundwater collected at the Facility are very turbid and are not representative of the groundwater discharging to the river. The rate of groundwater flow to the river is very low compared with the rate of sample collection, limiting the ability of sediment to be entrained in the groundwater prior to discharge. Further, there are no sources of the COIs between the wells and the river; therefore, the concentrations will continue to attenuate between the well locations and the river.

Organisms may be exposed to contaminants from groundwater after groundwater discharges to the river and mixes with surface water; no aquatic organisms in the Willamette River would be exposed to undiluted groundwater. To further evaluate the groundwater CPECs, a simplified analysis was performed to estimate the concentrations of groundwater constituent concentrations in surface water after discharge to the Willamette River (i.e., at the point of exposure). Exposure concentrations would decrease rapidly with distance from the discharge zone, as groundwater mixes with surface water.

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Benthic invertebrates or small fish that reside in close association with the submerged riverbank have the highest potential exposure. Such organisms likely remain in close proximity to the substrate, probably within 1 ft (30 cm). Groundwater contaminant concentrations in surface water within this near-bottom zone depend upon the rate of groundwater flow and river flow. Although neither of these variables is precisely known, conservative estimates of concentrations can be derived based on a range of assumptions. If groundwater discharge is 100 cm/day, river flow (or rate of mixing) near the groundwater discharge point is 0.1 cubic feet per second (cfs), and groundwater and surface water are fully mixed, lead concentrations within 1 foot of the bank would be approximately 96-fold lower than in unmixed groundwater. Concentration would be substantially lower further from the discharge point, at higher surface water flow, or lower groundwater flow velocity. Concentrations were calculated for a range of surface water flow rates to represent different possible mixing rates in the river and are presented on Table 2.9-1.

The groundwater CPEC with the highest risk ratio (6.8) compared to SLVs is benzo(a)pyrene. The highest detected concentration of benzo(a)pyrene was measured at 9.5×10^{-5} mg/L in MW-16 in OU2. Assuming this concentration was discharged to the Willamette River, and the flow assumptions stated above, benzo(a)pyrene concentrations within the 1 foot zone would be approximately 3.6×10^{-8} mg/L, which is well below the SLV. Even at a groundwater velocity of 100 cm/day and surface water flow rates as low as 0.01 cfs, benzo(a)pyrene concentrations in the near-bottom zone would still be lower than the SLV. Flows in the river are likely to be substantially higher than this, even in the slips. Therefore, benthic invertebrates and fish that live continuously within 1 foot of the substrate at the discharge point would be unlikely to be exposed to benzo(a)pyrene, or other CPEC, concentrations above the SLV. Fish or other invertebrates that spend most of their time in the water column further from the substrate would be exposed to substantially lower concentrations.

2.9.2 TMDP 4

This TMDP assesses whether a remedial action decision is possible based on the existing information and current levels of uncertainty. Specifically, if cleanup would be less costly than further investigation and data are adequate to select and approve a remedy action, then further ecological investigation should be deferred in favor of a response action. The alternative is for the assessment process to proceed to Level III for further evaluation. Based on information gathered during the Level I Scoping and Level II Screening processes, the existing information seems adequate to identify localized remediation measures, and/or to help incorporate such measures into site development or construction actions.

2.9.3 Ecological Risk Assessment Conclusions

Based on the Level I Scoping and Level II Screening processes, potential ecological risk to terrestrial receptors from upland soils at the Facility is minimal as a result of limited ecological resources at the Facility and few CPECs. While contact with CPECs in soils is possible for some terrestrial receptors, exposure is unlikely to reach levels of concern defined in DEQ guidance for non-T/E species. While not quantified, risk to terrestrial receptors from CPECs will be reduced when focused actions (i.e., SCMs) at the Wheeler Bay riverbank in OU2 are implemented.

As demonstrated by the screening level analyses and TMDP discussion, potential ecological risk to terrestrial or aquatic receptors as a result of possible exposure to CPECs via groundwater is also low. Overall, the groundwater CPECs identified in the Level II screening analysis lack widespread,

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substantial, and persistent detections in downgradient monitoring wells that would lead to significant degradation of water quality in the Willamette River. However, because this pathway is potentially complete, an assessment of the groundwater to surface water pathway was included in the Source Control Evaluation conducted pursuant to the VCP Agreement and in accordance with the DEQ/EPA Portland Harbor Joint Source Control Strategy guidance document (DEQ/EPA, 2005). The DEQ and EPA are completing this additional source evaluation process so that upland sources to Portland Harbor Study Area can be identified and prioritized. The results of the Source Control Evaluation are presented in the *RI report* (ACA/NF, 2007a).

Thus, sufficient data currently exist to support risk management decisions. Any risk issues may be further evaluated by a review of existing data concerning location and distribution of identified CPECs and development of a remedial program that would cost-effectively address them. Neither a baseline risk assessment (i.e., Level III), nor more sampling are necessary to support risk management decisions.

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3.0 *Human Health Risk Assessment*

3.1 Existing Site Information

The description and history of the Facility are provided in Sections 1.2 and 1.3; a summary of previous investigations is provided in Section 1.5. Consistent with other phases of investigation, the human health risk evaluation will be conducted separately for the operable units (OU1 and OU2) as defined in the *RI Work Plan* (Hart Crowser, 2004).

The purpose and scope of the human health risk assessment will be to identify those constituents and exposure pathways that may present a significant risk under the land use scenarios (described below) that have been determined to be applicable to the Facility. Depending upon the outcome of this evaluation (in conjunction with the ecological risk assessment), remedial management decisions may need to be implemented to address human health risk. This report presents an evaluation of potential exposures and risks that corresponds to the Problem Formulation phase of the Human Health Risk Assessment described in DEQ guidance (DEQ, 2000). The analysis was undertaken to evaluate both the potential risks at the Facility, and the need for conducting a baseline risk assessment for the Facility to support risk management decisions.

3.2 Land and Water Use Determinations

The *RI Report* (ACA/NF, 2007a) provides a determination of the land and water use that will assist in the identification of the potential human health exposure pathways. According to Section 3.1 of the *RI Report*, the City of Portland's Bureau of Planning (Title 33, Planning and Zoning, Chapter 33.140, City of Portland, 2001) has determined that the upland portion of the Facility (encompassing both operable units [OU1 and OU2]) is zoned for heavy industrial use. In addition, the Portland Comprehensive Plan Map has designated the site as an industrial sanctuary; this plan map identifies the future zoning and land use issues for sites and facilities within the map. Areas so identified as industrial sanctuaries are reserved by City policy for current and future industrial use. Therefore, it can be determined that the most likely future land use for the upland portions of the Facility will be industrial.

Section 3.2 of the *RI Report* provides a determination of the nature of water use at the Facility. A water well survey conducted for the T4S3 upland RI documented that 12 water wells are located within the vicinity of the Facility; most of these wells have been shown to be used for industrial or irrigation purposes, and all are cross gradient or up-gradient of the Facility.

Additionally, the Facility and its adjacent areas are supplied by the municipal water supply of the City of Portland. No beneficial use wells are present on the Facility.

3.3 Nature and Extent of Contamination Determination

The sampling and analysis programs that have determined the nature and extent of contamination are described by reference in Section 1.5.

3.4 Data Quality Objectives

Data quality objectives define the appropriate type of data and the quality parameters that support the data for a specific application. For this Facility, the objectives have been established for data to sufficiently characterize the contamination and to be useable in a risk assessment. These objectives are described in detail in Section 8.1 of Appendix A (Sampling and Analysis Plan) of the RI Work Plan (Hart Crowser 2004).

As a part of the data evaluations for the RI (refer to Section 5.2 in the *RI Report*), the MRLs were reviewed to assess whether the MRLs were sufficient to characterize the environmental conditions of the site. The results of the review support that the MRLs were sufficiently low for completion of the risk assessment. For soil sample results, the MRLs were generally below the preliminary screening Levels for each of the analyte suites, with exception of PAHs, pesticides, and mercury in a few samples. The MRLs for two PAHs (benzo(a)pyrene and benzo (a,h)anthracene) in surface samples from locations SB-70 through SB-78, located on or near rail lines, were 340 micrograms per kilogram (µg/kg) compared to the preliminary remediation goal (PRG) of 210 µg/kg. These slight exceedances in a few soil sampling locations did not affect the ability to characterize the potential AOCs at the Facility and are sufficiently low to complete the risk assessment.

For groundwater results, the fish consumption criteria are quite low for some compounds (e.g., several PAHs, pesticides, and PCB aroclors) and are below the MDLs achievable by standard EPA Methods. However, review of the dataset as a whole provides sufficient information for characterizing groundwater conditions at the Facility. For example, most of these constituents are relatively insoluble in water. This coupled with the fact that no significant (if any) sources of these constituents were identified in soil allows for the evaluation of the dataset and confidence that groundwater is not impacted when the analyte concentrations are below the MRLs. This risk assessment adopts a conservative approach for evaluation by assuming that constituents listed as “non-detect” are present at one half the MRL.

3.5 Contaminants of Interest (COIs)

COIs are the constituents that have been reported above detection limits in the analytical program; and are the same as those identified for the ecological risk assessment, as described in Section 2.3. The full list of COIs for the Facility are presented in the *RI Report* (ACA/NF, 2007a). The contaminants include VOCs, SVOCs, PAHs, PCBs, pesticides, metals, and petroleum hydrocarbons. These are the constituents in soil and groundwater that are initially screened by evaluation in relation to background and promulgated health-based benchmarks.

3.6 Conceptual Site Model (CSM) – Human Health Pathways

The CSM integrates constituent source areas, mechanisms of transport, and location and route of potential chemical exposure into exposure pathways that represent site conditions (see Figure 2.5-1). These pathways provide the foundation for the risk assessment.

For human health risk evaluation, the CSM identifies pathways relevant to both soil and groundwater in the context of a current and future industrial land use scenario. The source areas for assumed

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exposure are the affected soil and groundwater that have been characterized in the RI. The CSM provides specific details regarding primary, secondary and tertiary sources, as well as primary and secondary release mechanisms.

3.7 Identification of Exposure Scenarios

The identification of exposure scenarios is based upon the land use determination that has been identified for the Facility (Section 3.2) and upon the CSM (Section 3.6) that identifies exposure pathways. Exposure scenarios consist of descriptions of activities as they relate to users of the Facility and the means by which exposure is assumed to occur. For this Facility, the following exposure scenarios have been identified:

The appropriate human receptors (assumed exposed persons) will be the following:

- Occupational worker (worker engaged in full-time operational duties at the Facility);
- Excavation worker (worker engaged in short-term activities specific to sub-surface work, such as trenching for utility lines);
- Construction worker (worker engaged in short-term activities relating to construction of buildings and foundations); and
- Recreational fisherman (person occasionally fishing in the river adjacent to the bank of the terminal).

A recreational visitor to the Facility is not assumed since the site will be maintained as an operating industrial facility.

3.8 Identification of Exposure Routes

The assumption of direct exposure to affected soil will apply only to the occupational, construction and excavation workers; these pathways will involve the following routes of exposure:

- Inhalation of fugitive dust emissions;
- Incidental ingestion; and
- Dermal contact.

For the occupational, construction, and excavation workers, the following indirect route of exposure will also be evaluated due to the presence of chlorinated VOCs in groundwater from a few monitoring wells (see Section 5.2.2.1 of the *RI Report* [ACA/NF, 2007a]):

- Inhalation of volatiles in groundwater (indoor and outdoor).

For the recreational fishermen; the following indirect route of exposure will be evaluated:

- Food web exposure to surface water (i.e., fish consumption).

Direct exposure routes for the recreational fisherman will be evaluated during the Portland Harbor Superfund project.

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3.9 Identification of Potentially Exposed Populations

Persons or groups of individuals that are assumed to be potentially exposed to affected media are derived from and closely related to the identified exposure scenarios. These persons are:

- Full-time site personnel (employees of the Port)
- Construction/excavation workers (temporarily present through subcontractors); and
- Recreational fishermen in adjacent river (the general public accessing the adjacent river by boat).

3.10 Contaminant Screening Procedures

3.10.1 General Procedures

Contaminants were screened for selection of constituents of potential concern (COPCs) according to Section 2.3.2 of the *Guidance for Conduct of Deterministic Human Health Risk Assessments* (DEQ, 2000). The purpose of this screening exercise is to select COPCs from the universe of reported constituents for further evaluation. Those chemicals being screened out have been determined to be insignificant in terms of potential human risk. Site analytical data for each constituent are evaluated according to the following general criteria:

- Frequency of detection;
- Background; and
- Results of a three-phased concentration-risk calculation.

Frequency of Detection: Any constituent reported as detected in less than five percent of samples was eliminated from further risk evaluation.

Background: For naturally occurring constituents, their MDCs were compared to background values established for Clark County, Washington (San Juan, 1994) (Table 3.10-1). Those constituents occurring at levels consistent with background were removed from further evaluation. This screening step applies to metals only and not to chemicals of anthropogenic origin (e.g., PAHs).

Concentration-Risk Screen: For those constituents not eliminated by one of the preceding two steps, a three-phased concentration-risk evaluation was conducted. Details of this process are provided in Section 2.3.2(3) of the Oregon guidance (DEQ, 2000). Basically, this screening step evaluated risk from a) an individual constituent, b) multiple COIs simultaneously in a single medium, and c) individual or multiple COIs within different media. Those constituents not meeting the criteria for elimination by one or more phases of this method were retained for further evaluation.

3.10.2 Selection of Screening Benchmarks

Consistent with DEQ risk guidance, the primary benchmarks for screening of soil constituents were obtained from the 2004 update of the EPA Region 9 PRGs (EPA 2004b). These benchmarks apply to COIs (except petroleum fractions) for the pathways that involve direct contact with soil by site workers

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(operational personnel or construction workers). For gasoline, diesel and residual range petroleum-derived hydrocarbons, benchmarks for the soil pathway for the construction worker were obtained from Appendix A of the Oregon DEQ guidance *Risk-Based Decision Making for the Remediation of Petroleum-Contaminated Sites* (Oregon DEQ, 2003b).

For the recreational fishing pathway, the screening benchmarks were obtained from *National Recommended Water Quality Criteria* (EPA, 2004c) for Human Health for Consumption of Organisms Only.

For evaluating potential risk from inhalation of volatiles in groundwater via vapor intrusion into buildings, screening criteria were obtained from Appendix A (Groundwater RBC for Vapor Intrusion into Buildings, RBCwi, for Occupational Workers) of the Oregon DEQ (2003b) guidance and Table 2c (Question 4 Generic Screening Levels and Summary Sheet, Risk = 1 x 10-6) of EPA's *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils* (EPA, 2002a). Outdoor air exposure to volatiles from soil or groundwater sources is typically not considered to be an important source of exposure because any outdoor volatiles are quickly dissipated by wind. Evaluating potential risk from inhalation of volatiles in indoor air is also a conservative means to screen any potential risk from inhalation of volatiles in outdoor air.

Guidance published by DEQ (1998) was used for the hot spot evaluation. Assessment of a soil hot spot is accomplished by comparing the concentration of an individual site contaminant to its "highly concentrated" hot spot level. Hot spot levels are risk-based concentrations that correspond to a given multiplier of the acceptable risk level. For this evaluation, the "highly concentrated" hot spot level for human receptors is defined as 10 times (10x) the applicable PRG.

3.10.3 Screening Procedures

All analytical data were sorted by medium for each operable unit. For duplicates, the maximum value was selected. The data were summarized by tabulation showing maximum and minimum values; the sampling location of each maximum was identified and frequency of detection was calculated. The 90th percentile upper confidence limit (90UCL) of each constituent was also calculated; the process for this is described in Section 3.11.3.3.

Concentration values for constituents in soil and groundwater were screened in two phases: a) comparison of benchmarks to MDCs; and b) comparison of the benchmark to the 90UCL of each constituent.

Soil results from subsurface samples (to 15 ft bgs) and surface soil samples (including riverbank soil samples) were used in the screening process.

Groundwater data from monitoring wells located on the downgradient side of each OU (i.e., nearest the slips or river) were used for the screen against EPA fish consumption criteria. These data represent groundwater at the point of discharge to the river, which is relevant to surface water exposures related to the river. For OU1, data from the following monitoring wells were used in the screen: MW-01s, MW-07, MW-08, MW-26, and MW-03s. For OU2, data from the following monitoring wells were used in the screen: MW-09, MW-10, MW-11, MW-12, MW-13, MW-14, MW-15, and MW-16. Refer to Figure 2.7-1 for well locations.

Groundwater data from all monitoring wells in each OU were used for the screen against EPA and DEQ criteria to evaluate the risk potential from inhalation of volatiles from groundwater.

3.10.3.1 Soil Screening

As a pre-screening step, constituents being reported as detected in less than five per cent of samples were eliminated. For metals, MDCs were compared to published background values; constituents whose MDC was less than background were eliminated.

Next, the MDC for each COI was evaluated relative to the Region 9 PRG for industrial direct contact. Soil concentration values were evaluated according to the three risk-based procedures described below.

Individually within the medium: a risk ratio (Rij) was calculated by comparing the MDC (Cij) to the PRG for that chemical (PRGij). The equation for this step is Rij = Cij / PRGij. If the ratio was greater than one (i.e., the concentration was greater than the PRG), the constituent was retained as a COPC (Appendix C-1).

Additivity within the medium: a cumulative risk ratio (Rc) was calculated by summation of all individual risk ratios within one medium. The individual risk ratio was then divided by the cumulative risk ratio. This result was then compared to 1 divided by the number (Nij) of constituents in the medium. The equation for this step is Rij / Rj > 1 / Nij. If the result was greater than 1 / Nij, the constituent was retained (Appendix C-1).

Additivity across media: the individual risk ratios for a given chemical in both soil and groundwater were summed. If the sum of these two ratios was greater than 1.0, the constituent was retained (Appendix C-3).

Those chemicals not meeting the selection criteria in any of these three steps were eliminated from further consideration. For those COIs that were not eliminated by the screening of maximum values, the screening was repeated using the 90UCL for those constituents (Appendix C-1; see discussion below for description of derivation of the 90UCL).

3.10.3.2 Groundwater Screening

Groundwater data were conservatively screened based on fish consumption criteria for surface water described below, using the same risk-based procedures described for soils (i.e., individually within the medium, additivity within the medium, and additivity across media). In addition, groundwater data were also screened using RBCs for inhalation of volatiles.

Fish consumption screen: The screening benchmark for groundwater was the fish consumption criterion from the EPA's 2004 water quality criteria guidance (EPA, 2004c). Both maximum and 90UCL values (Appendix C-2) were screened for downgradient monitoring wells within each operable unit. As with soil, the COIs not screened out by maximum values were then screened with the 90UCL.

The rationale for screening with this particular benchmark step is the assumption of recreational fishing in the river adjacent to the Facility. The fish consumption benchmark represents a

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conservative concentration of a constituent in water that would not be expected to create a human health hazard as a result of consumption of fish that had been exposed to that concentration. Since groundwater entering the Willamette River would undergo a high level of mixing, the direct comparison of groundwater values to the fish consumption criterion is very conservative and will significantly overestimate the number of COPCs.

Constituents not having a published fish consumption criterion were retained as COPCs, as required Section 2.3.2(3)(e) of the Oregon guidance (Appendix C-2). The lack of criteria for these COIs will be identified as a data gap and will be dealt with qualitatively. Refer to Tables 3.10-4 and Tables 3.10-5 for a summary of these constituents.

Inhalation of volatiles screen: For evaluating potential risk from inhalation of volatiles in groundwater, the OU-wide MDCs for groundwater COIs were compared to the lower of screening criteria from DEQ (2003b) and EPA (2002a). These criteria serve as conservative, screening level values for potential exposure to workers in buildings or for workers outdoors. Screening criteria and results are presented in Appendix C-4.

As indicated in Section 5.2.2.1 of the *RI Report* (ACA/NF, 2007a), chlorinated solvents including PCE and several degradation products (e.g., TCE, 1,2-dichloroethene (DCE), and vinyl chloride) were detected above screening levels in the samples from wells MW-22 and MW-23. These wells are located at the upgradient boundary of OU1 (Figure 2.7-1). Several of these compounds have been detected at lower concentrations in well MW-03s, located downgradient of well MW-22. Based on the observed distribution and knowledge of historical Facility operations, the presence of the chlorinated solvents in Facility groundwater appears to be due to an upgradient source that is not on the facility, and is not related to former Facility operations. To separate the contribution of these wells from other potential contamination in OU1 groundwater, Appendix C-4 also presents results of the groundwater screen for OU1, excluding these three wells.

3.10.3.3 Calculation of 90th Percentile Upper Confidence Limits

The 90UCL was calculated consistent with methods described in Section 3.1.1. (Exposure Point Concentrations) of DEQ (2000). At least ten data points were necessary before the term was calculated; otherwise only the maximum value was used. Half the reporting limit was used when the analyte was not reported in a given sample. Each data set was first tested by means of EPA's ProUCL program (EPA, 2004a) to determine the data distribution. If a normal distribution was identified, the 90UCL was calculated with the Student-t method. A gamma distribution was evaluated using the ProUCL's recommended gamma method. If a lognormal distribution was identified, the Chebyshev method was used for non-highly skewed data and the non-parametric Chebyshev method was used for highly skewed data. If the distribution could not be determined, the non-parametric Chebyshev method was used.

Riverbank soils collected in OU2 are represented by sampling locations S-23 through S-30 (Refer to Figure 2.2-1). These samples were collected as composite samples comprised of four sub-samples, with the exception of S-29 (no sub-samples) and S-30 (three sub-samples). The composite samples were generally analyzed for all analytes and the four discrete samples were only analyzed for some analyte classes. For calculating the 90UCL using riverbank samples, the discrete sample results were included if available and the corresponding composite sample results were omitted. This

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procedure prevented multiple results from the same sample from being included in the 90UCL calculations.

3.10.3.4 Soil Screening Results

The constituents that were not initially screened out are highlighted on their respective tables (Appendix C-1) and summarized on Table 3.10-2. The hot spot evaluation is summarized on Table 3.10-3.

For soil in OU1, benzo(a)pyrene was the only COPC that remained after comparing 90UCLs to screening criteria. For soil in OU2, three COPCs remained after comparing 90UCLs to screening criteria: benzo(a)pyrene, benzo(b)fluoranthene, and dibenz(a,h)anthracene. For both operable units, arsenic falls out of consideration since its 90UCL value is less than background.

The potential hotspots are listed on Table 3.10-3. There is a potential hotspot of benzo(a)pyrene in OU1, and potential hotspots of benzo(a)pyrene and dibenz(a,h)anthracene in OU2.

3.10.3.5 Groundwater Screening Results

Fish consumption screen results

The constituents that were not initially screened out based on fish consumption criteria are highlighted on their respective tables (Appendix C-2) and summarized on Table 3.10-2. For groundwater at OU1, arsenic, tetrachloroethene (PCE), five PAHs and two pesticides were retained after comparisons of the 90UCL for groundwater to fish consumption surface water criteria (Table 3.10-2). For groundwater at OU2, arsenic, six PAHs and four pesticides were retained after comparisons of the 90UCL to fish consumption criteria. Groundwater constituents that were retained because of the lack of a fish consumption criterion are listed in Tables 3.10-4 and 3.10-5.

Inhalation of volatiles screen results

For site-wide groundwater at OU1, PCE, trichloroethene (TCE), and vinyl chloride were retained based on screens using vapor intrusion criteria (Appendix C-4). Based on an additional screen that excluded the monitoring wells MW-23, MW-22, and MW-03s (see discussion in Section 3.10.3.2), it is apparent that the potential risks from groundwater due to these contaminants are limited to those wells only. The presence of the chlorinated solvents in the three wells is due to an upgradient source that is not on the Facility, and is not related to former Facility operations.

For groundwater at OU1 (excluding wells MW-23, MW-22, and MW-03s), no COIs were retained. For groundwater at OU2, no COIs were retained. Potential risk from inhalation of volatiles from Facility groundwater will not be considered further in this evaluation.

3.10.3.6 Multiple Media Screening Results

The individual risk ratios for a given chemical in both soil and groundwater were summed and if the sum of these two ratios was greater than 1.0, the constituent was retained (Appendix C-3). These results are summarized on Table 3.10-2, and reflect the soil and groundwater exceedances described above. However, in general, the assumption of additivity across media is of limited use because the receptors in potential indirect contact with groundwater (i.e., recreational fisherman) are generally not the same receptors that are in potential contact with soil at the Facility (occupational, construction, and excavation workers).

3.11 Summary and Conclusion

The information gathered during the screening analyses provides a foundation for the Problem Formulation step described in DEQ guidance (2000). Although not specifically identified in the guidance, the synthesis of information at the end of Problem Formulation provides an opportunity for a decision point similar to the TMDP 3 and 4 described for the Level II ERA. A similar set of potential recommendations can be considered: 1) no further characterization investigations at the site are necessary and there exists sufficient information to make a remedial action decision; or 2) continuation of the risk assessment process is recommended to proceed to the next level. Although not explicitly identified in the guidance, the possibility of applying such recommendations to this step in the HHRA was discussed with DEQ personnel prior to embarking on this risk assessment process. The following is a summary of the relevant information and presentation of the conclusions reached as a result of the process.

3.11.1 Soil Evaluation

To further evaluate the retained COPCs in soil, an expanded exposure assessment and risk characterization were performed to provide a more representative estimate of potential human health risk. This risk assessment was conducted by calculating exposure and risk by use of the risk equations and exposure variables provided in the Oregon risk guidance (DEQ, 2000). The reasonable maximum exposure (RME) values for exposure parameters relating to occupational employees and excavation/construction workers were used in these calculations (Appendix B of the guidance). Equations for exposure quantification in the oral, dermal and inhalation (particulates) pathways were obtained from Appendix A of the guidance. The EPC for each COPC is the 90UCL of the constituent for each operable unit. RME parameters were used in combination with the 90UCL to provide a preliminary assessment of site-specific exposure and to help determine whether exposures warrant baseline risk analysis to make site decisions.

The risk assessment calculates the excess individual lifetime risk of developing cancer as a result of potential exposure to COPCs. The cumulative risk is calculated by summing exposure route-specific risks. Excess lifetime cancer risk of 1E-06 means that a person experiencing the RME has a 1 in 1,000,000 chance of developing cancer as a result of site-related exposure. This risk is in addition to the cumulative risks of cancer for individuals from other causes such as smoking or solar radiation. The cumulative individual cancer risk from all other causes has been estimated to be as high as one in three. For individual chemicals, Oregon DEQ generally considers excess cancer risks below 1E-06 to be acceptable; for cumulative risks from multiple chemicals, DEQ considers risks less than 1E-05 is acceptable (OAR 340-122-115(2)(a), (3)(a)).

Although only a subset of PAHs were retained after the 90UCL screening, all reported PAHs were used in this analysis since they tend to generally be co-located within affected media; in addition, the Port wishes to address the issue of cumulative exposure. Since PAHs are toxicologically related, it is appropriate to evaluate all of them in this analysis. However, only a few of these constituents were retained after screening (one in OU1, three in OU2). The majority of PAHs were sufficiently low in concentration to have been eliminated by the standard screening process. Results of the risk characterization are provided in Tables 3.11-1 and 3.11-2. Toxicity factors were obtained from EPA Region 9 and exposure variables for both occupational and excavation workers are provided in Appendix C-5.

For OU1 and OU2, no risk is indicated for the excavation/construction worker based on the RME analysis (Tables 3.11-1 and 3.11-2). Potential risk from benzo(a)pyrene and cumulative PAH exposure are greater than 1E-06, but less than 1E-05, for the occupational worker in OU1. Potential risk from benzo(a)pyrene and dibenz(a,h)anthracene are greater than 1E-06, but less than 1E-05, for the occupational worker in OU2. Additive risk from PAH exposure is only slightly greater than 1E-05 for the occupational worker in OU2.

3.11.1.1 Soil Sub-area Analysis

This risk evaluation, based on RME (i.e., conservative) assumptions, identified PAHs as COPCs in Facility soil under the occupational worker scenario. Although exposure to receptors is best estimated by a reasonable maximum estimate (i.e., 90UCL) of concentration over an exposure area, mapping soil concentrations on a "point" basis is helpful to identify where sub-areas of concern with respect to potential risk to human receptors may occur at the Facility. Figure 3.11-1 shows concentrations of benzo(a)pyrene and dibenz(a,h)anthracene. This figure emphasizes that very localized areas with elevated concentrations are responsible for the 90UCL concentrations in the operable unit that exceed the conservative risk criteria used in this analysis.

In OU1, S-12 and S-13 are two locations with high concentrations of PAHs (Figure 3.11-1). As described in Section 5.2 and Appendix H of the *RI Report* (ACA/NF, 2007a), these two locations in the western portion of OU1 were part of the sampling effort to describe AOC 69, former transformer areas. Additional surface soil sampling was conducted around S-12 and S-13 to better assess the extent of PAHs in this area. The results of this additional sampling indicated that PAH concentrations decreased significantly both vertically and laterally from S-12 and S-13, and support that the elevated PAHs are limited locally and contained within the upper 6 to 12 inches of soil. In addition, the RI also found that much of the area is now gravelly, but was formerly asphalt-paved. It is likely that the elevated PAHs in the surface soil in this area are due to the presence of residual fragments of asphalt and/or asphalt sealants, which are known to contain high concentrations of PAHs (Mahler et al., 2005).

In OU1, SB-22 and SB-23 are two other locations with high concentrations of PAHs (Figure 3.11-1). As described in Section 5.2 and Appendix H of the *RI Report* (ACA/NF, 2007a), these two locations in the central portion of OU1 were part of the sampling effort to describe AOC 15, abandoned cesspools. Concentrations of five PAHs exceeded industrial PRGs in the 17-foot bgs sample from SB-22 and only benzo(a)pyrene exceeded the industrial PRG at 13 ft bgs at the adjacent boring (SB-23). Overall, nearby sampling indicates that the PAH-impacted subsurface soil in this sub-area is limited in extent (both laterally and vertically) and below a depth of 13 ft bgs.

In OU2, S-14 is a location with high concentrations of PAHs (e.g., benzo(a)pyrene and dibenz(a,h)anthracene) (Figure 3.11-1). S-14 was located adjacent to a utility pole. The surface soil next to the pole was visibly stained with creosote from the pole. As described in Section 5.2 and Appendix H of the *RI Report* (ACA/NF, 2007a), this location in the western portion of OU2 was also part of the sampling effort to describe AOC 69, former transformer areas. PAH concentrations were elevated in the surface soil sample from S-14, located near the creosoted utility pole. The area was re-sampled by collecting another surface soil sample about 5 feet from the utility pole and still in the former transformer area; PAHs were almost two orders of magnitude less. These results support that the creosote from the utility pole is the cause of the elevated PAHs in the initial surface soil sample from this area and indicate that previous operations in the area have not significantly impacted surface soil, if at all.

Also in OU2, erodable bank areas (AOC83) at the west end of OU2 have high PAH concentrations (Figures 3.11-2). As described in Appendix H of the *RI Report* (ACA/NF, 2007a), the RI evaluation concluded that sufficient evidence exists to indicate that potentially erodable areas have higher concentrations of COIs and that localized actions (e.g., removal or covering of contaminated soils) to attenuate higher concentrations will minimize the chance for contact with human receptors and allow appropriate management.

Thus, very localized concentrations of 2 PAHs (benzo(a)pyrene and dibenz(a.h)anthracene) have been identified as potential hot spots and are "driving" human health risk considerations. These high PAH concentrations would only pose a risk to potential future workers that work extensively in those areas specifically. The risk evaluation based on RME parameters suggested that workers would need to work for 225 days per year, for 25 years, for 8 hours a day in areas with concentration levels equivalent to the 90UCL in order to experience cancer risks greater than 1E-06. None of these four areas (i.e., S-12 and S-13 in OU1; SB-22 and SB-23 in OU1, S-14 in OU2; and riverbank area in OU2) experience high-levels of work activity, such as are seen in the administrative areas of the Facility or near Facility buildings. In the cesspool area in OU1 (SB-22 and SB-23), the contamination is very limited and more than 13 ft deep. With respect to the sub-area around S-12 and S-13 (where the maximum detected concentrations of PAHs range from 1.1 to 6 mg/kg), an occupational worker would have to spend 7 days per year, for 25 years, for 8 hours a day in that sub-area to experience additive cancer risks of 1E-06 and 325 days per year, for 48 years, for 8 hours a day in that sub-area to experience additive cancer risks of 1E-04.

With respect to the riverbank areas in OU2, the accepted source control alternative for the potentially erodable riverbank soils in OU2 is riprap armoring with re-grading/re-vegetation of the upper slope (ACA/NF, 2007b). The armoring, re-grading, and re-vegetation will resist erosion, stabilize the bank, and the act as a cap to prevent direct contact by human receptors. While not quantified, potential risk to occupational workers from those soils will be reduced when SCMs are implemented. With respect to the S-14 area, the contamination was limited to 5 feet or less from the utility pole. The utility pole was removed and this area was covered with 2 or more feet of soil during the recent Berth 408 Rail Yard Modernization Project.

3.11.2 Groundwater

For groundwater, a higher number of COPCs have been retained due to the conservative nature of the screening process (comparing groundwater concentrations to a surface-water based benchmark) and to the lack of a fish consumption benchmark for several COIs.

3.11.2.1 Mixing Evaluation

To evaluate the groundwater COPCs further, a simplified analysis was performed to estimate the concentrations of groundwater constituent concentrations in surface water after discharge to the Willamette River (i.e., at the point of exposure). The analysis is similar to that provided in the ecological risk assessment, but performed for human health COPCs. The analysis was based on the following assumptions:

Groundwater flow velocity at the point of discharge: 100 centimeters per day (cm/day)
Groundwater discharge area: 1 square foot (ft^2) (900 cm^2)
Groundwater daily flow volume through 1 ft^2: 90 liters per day (L/day)

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Range of surface water flow rates (cfs): 0.01, 0.1, and 1.0.

Concentrations were calculated for a range of surface water flow rates to represent different possible mixing rates in the river. The resulting concentrations exceed the benchmark only for heptachlor at the lowest flow rate (0.01 cfs) (Tables 3.11-5 and 3.11-6). These concentrations are conservatively low because they represent the conditions in a cubic foot of surface water adjacent to the discharge point of groundwater. Fish consumed by humans are likely to have spent most of their time further from the groundwater discharge, at points in the river where concentrations would be substantially lower.

This process cannot be used for those COPCs retained due to lack of fish consumption criteria. However, their groundwater concentrations would be attenuated by the same amount and it is reasonable to assume that these constituents as well could be eliminated from further concern regarding human health risk. In addition, for arsenic, a report prepared by the USGS and US Department of the Interior in conjunction with the Oregon Water Resources Department (Water Resources Investigation Report 98-4205, 1999) supports that the concentrations detected in the groundwater at the Facility are well within the range of arsenic concentrations detected across Oregon, including the Portland area.

3.11.3 Human Health Risk Assessment Conclusions

Screening level analyses, combined with streamlined, quantitative risk analyses on existing soil data, indicates that risks from direct exposure to COPCs in soil are low. Screening level analyses also suggest that groundwater contaminants are unlikely to be transported to surface water at levels that will result in unacceptable risk from fish ingestion. Based on these results, performance of a baseline risk assessment does not appear to be necessary to make risk management decisions to protect human health at the Facility. Because the groundwater to surface water pathway leading to the potential exposure to human receptors via fish consumption is potentially complete, an assessment of this pathway was included in the Source Control Evaluation conducted pursuant to the VCP Agreement and in accordance with the DEQ/EPA Portland Harbor Joint Source Control Strategy guidance document (DEQ/EPA, 2005). The results of the Source Control Evaluation are presented in the *RI report* (ACA/NF, 2007a).

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Tables

Terminal 4 Slip 1 Upland Facility

TABLE 2.8-1 Comparison of Soil Concentrations to Regional Background Levels

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Constituents of Interest (COI)			Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Background Screening Levels *	COI Conc. (max)	COI Concentration Exceeds Background Levels?
			Minimum	Maximum	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Natural Background Soil Concentrations (mg/kg)		
CASNo	Analyte	Units													
Metals/Inorganics															
7440-38-2	Arsenic	mg/kg	8/23/2004	9/7/2005	16	0	100%			1.9	6.95	S-5	5.81	6.95	YES
7440-41-7	Beryllium and compounds	mg/kg	8/23/2004	9/7/2005	16	0	100%			0.201	0.572	S-7	2.07	0.572	NO
7440-43-9	Cadmium and compounds	mg/kg	8/23/2004	9/7/2005	16	0	100%			0.065	1.95	S-7	0.93	1.95	YES
7440-50-8	Copper and compounds	mg/kg	8/23/2004	9/7/2005	16	0	100%			10.9	70.3	S-7	34.43	70.3	YES
7439-92-1	Lead	mg/kg	8/23/2004	9/7/2005	16	0	100%			2.4	195	S-7	16.83	195	YES
7439-97-6	Mercury and compounds	mg/kg	8/23/2004	9/7/2005	16	7	56%	0.02	0.162	0.01	0.215	S-7	0.04	0.215	YES
7440-02-0	Nickel	mg/kg	8/23/2004	9/7/2005	16	0	100%			13.7	21.5	SB-95	21.04	21.5	YES
7440-47-3	Total Chromium	mg/kg	8/23/2004	9/7/2005	16	0	100%			10.3	152	S-7	26.57	152	YES
7440-66-6	Zinc	mg/kg	8/23/2004	9/7/2005	16	0	100%			40.6	521	S-7	95.526	521	YES

Terminal 4 Slip 1 - Operable Unit 2

Constituents of Interest (COI)			Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Background Screening Levels *	COI Conc. (max)	COI Concentration Exceeds Background Levels?
			Minimum	Maximum	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Natural Background Soil Concentrations (mg/kg)		
CASNo	Analyte	Units													
Metals/Inorganics															
7440-38-2	Arsenic	mg/kg	3/8/2004	9/13/2005	43	0	100%			1.12	15.7	S-26D	5.81	15.7	YES
7440-41-7	Beryllium and compounds	mg/kg	3/8/2004	9/13/2005	43	0	100%			0.186	0.455	AOC72-S1	2.07	0.455	NO
7440-43-9	Cadmium and compounds	mg/kg	3/8/2004	9/13/2005	43	0	100%			0.066	25.3	S-26D	0.93	25.3	YES
7440-50-8	Copper and compounds	mg/kg	3/8/2004	9/13/2005	43	0	100%			11.6	219	S-26D	34.43	219	YES
7439-92-1	Lead	mg/kg	3/8/2004	9/13/2005	48	0	100%			2.24	1060	SB-77	16.83	1060	YES
7439-97-6	Mercury and compounds	mg/kg	3/8/2004	9/13/2005	43	12	72%	0.009	0.131	0.009	0.325	S-26D	0.04	0.325	YES
7440-02-0	Nickel	mg/kg	3/8/2004	9/13/2005	43	1	98%	4.2	4.2	6.7	46.7	SB-78	21.04	46.7	YES
7440-47-3	Total Chromium	mg/kg	3/8/2004	9/13/2005	43	0	100%			5.26	24.7	SB-76	26.57	24.7	NO
7440-66-6	Zinc	mg/kg	3/8/2004	9/13/2005	43	0	100%			34.5	3320	S-26D	95.526	3320	YES

Notes:

* Washington Department of Ecology. 1994. Natural Background Soil Metals Concentrations in Washington State. Toxics Cleanup Program, publication #94-115. October 1994.

COI - constituent of interest

Min - minimum

Max - maximum

Conc. - concentration

mg/kg - milligrams per kilogram

Highlights indicate that the maximum COI concentration exceeds background levels

Soil data based on samples less than 3 feet deep

TABLE 2.8-2 Summary of CPECs - Soils

Terminal 4 Slip 1 Operable Unit 1 - Oregon Screening Levels (Ecological Receptors)

Analyte (CPECs)[1]	Plants				Invertebrates				Birds				Mammals			
	T/E Species (HQ>1)		*Non-T/E Species (HQ>5)*		*T/E Species (HQ>1)*		*Non-T/E Species (HQ>5)*		*T/E Species (HQ>1)*		*Non-T/E Species (HQ>5)*		*T/E Species (HQ>1)*		*Non-T/E Species (HQ>5)*	
	MDC	90UCL	MDC	90UCL	MDC	90UCL	MDC	90UCL	MDC	90UCL	MDC	90UCL	MDC	90UCL	MDC	90UCL
Lead	Yes	No	No	No	No	No	No	No	Yes	*Yes*	Yes	No	No	No	No	No
Zinc	Yes	*Yes*	Yes	No	Yes	*Yes*	Yes[2]	No	Yes	*Yes*	Yes	No	No	No	No	No
Copper	No	--	No	--	Yes	No	No	No	No	No	No	No	No	No	No	No
Mercury	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No
Total Chromium	Yes	*Yes*	Yes	*Yes*	Yes	*Yes*	Yes	*Yes*	Yes	*Yes*	Yes	*Yes*	No	No	No	No
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	Yes	*Yes*	Yes	*Yes*

Terminal 4 Slip 1 Operable Unit 2 - Oregon Screening Levels (Ecological Receptors)

Analyte (CPECs)[1]	Plants				Invertebrates				Birds				Mammals			
	T/E Species (HQ>1)		*Non-T/E Species (HQ>5)*		*T/E Species (HQ>1)*		*Non-T/E Species (HQ>5)*		*T/E Species (HQ>1)*		*Non-T/E Species (HQ>5)*		*T/E Species (HQ>1)*		*Non-T/E Species (HQ>5)*	
	MDC	90UCL	MDC	90UCL	MDC	90UCL	MDC	90UCL	MDC	90UCL	MDC	90UCL	MDC	90UCL	MDC	90UCL
Cadmium	Yes	No	Yes	No	Yes	No	No	No	Yes	No	No	No	No	No	No	No
Copper	Yes	No	No	No	Yes	No	No	No	Yes	No	No	No	No	No	No	No
Lead	Yes	*Yes*	Yes	No	Yes	No	No	No	Yes	*Yes*	Yes	*Yes*	No	No	No	No
Nickel	Yes	No	No	No	No	No	No	No	No	--	No	--	No	No	No	No
Selenium	Yes	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No
Silver	Yes	No	No	No	No	No	No	No	--	--	--	--	--	--	--	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	--	Yes	*Yes*	Yes	*Yes*
Arsenic	Yes	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No
Mercury	Yes	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No
DDT	--	--	--	--	--	--	--	--	Yes	*Yes*	Yes	No	No	No	No	No
Total Chromium	Yes	*Yes*	Yes	*Yes*	Yes	*Yes*	Yes	*Yes*	Yes	*Yes*	Yes	No	No	No	No	No
Zinc	Yes	*Yes*	Yes	*Yes*	Yes	*Yes*	Yes	No	Yes	*Yes*	Yes	*Yes*	No	No	No	No

Terminal 4 Slip 1 Operable Unit 2 Riverbank Area - Oregon Screening Levels (Ecological Receptors)

Analyte (CPECs)[1]	Plants				Invertebrates				Birds				Mammals			
	T/E Species (HQ>1)		*Non-T/E Species (HQ>5)*		*T/E Species (HQ>1)*		*Non-T/E Species (HQ>5)*		*T/E Species (HQ>1)*		*Non-T/E Species (HQ>5)*		*T/E Species (HQ>1)*		*Non-T/E Species (HQ>5)*	
	MDC	90UCL	MDC	90UCL	MDC	90UCL	MDC	90UCL	MDC	90UCL	MDC	90UCL	MDC	90UCL	MDC	90UCL
Cadmium	Yes	*Yes*	Yes	No	Yes	No	No	No	Yes	Yes	No	No	Yes[2]	No	No	No
Copper	Yes	No	No	No	Yes	*Yes*	No	No	Yes	No	No	No	Yes[2]	No	No	No
Lead	Yes	*Yes*	Yes	*Yes*	Yes	No	No	No	Yes	*Yes*	Yes	*Yes*	Yes[2]	No	No	No
Silver	Yes	No	No	No	No	No	No	No	--	--	--	--	--	--	--	--
Arsenic	Yes	No	No	No	No	No	No	No	Yes	No	No	No	Yes[2]	No	Yes[2]	No
Mercury	Yes	No	No	No	Yes	*Yes*	No	No	No	No	No	No	No	No	No	No
DDT	--	--	--	--	--	--	--	--	Yes	*Yes*	Yes	No	No	No	No	No
Zinc	Yes	*Yes*	Yes	*Yes*	Yes	*Yes*	Yes	*Yes*	Yes	*Yes*	Yes	*Yes*	Yes[2]	No	No	No
Thallium	No	No	No	No	--	--	--	--	--	--	--	--	Yes[2]	No	No	No
Total Chromium	Yes	*Yes*	Yes	*Yes*	Yes	*Yes*	Yes	*Yes*	Yes	*Yes*	Yes	*Yes*	No	No	No	No

Notes:
CPECs - contaminants of potential ecological concern
COIs - constituents of interest
SLV - screening level value
DEQ - Oregon Department of Environmental Quality
MDC - maximum detected concentration
90UCL - 90% upper confidence limit
1 - CPECs are COIs whose MDCs exceed a DEQ Level II SLV (Table 1, Guidance for Ecological Risk Assessment, DEQ, December 2001)
2 - These are CPECs based on potential risk from multiple COIs simultaneously
-- = indicates that there is no SLV for the receptor
90UCLs were calculated using one half the detection limit for nondetects
Highlights indicate that the 90UCL is greater than SLV
Bold Italics indicate that 90UCL is greater than SLV for non-T/E species (HQ>5)

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TABLE 2.8-3 Summary of CPECs - Groundwater

Terminal 4 Slip 1 Operable Unit 1 - Oregon Screening Levels (Aquatic Receptors)

Analyte (CPECs)[1]	*T/E Species (HQ>1)*		*Non-T/E Species (HQ>5)*	
	MDC	90UCL	MDC	90UCL
Benzo(a)anthracene	Yes	No	Yes[2]	No
Benzo(a)pyrene	Yes	***Yes***	Yes[2]	No
Carbon Disulfide	Yes	No	No	No
Total Chromium, total	Yes	*	No	*
Heptachlor	Yes[2]	*	No	*
Heptachlor epoxide	Yes[2]	*	No	*
Lead, total	Yes[2]	*	No	*

Terminal 4 Slip 1 Operable Unit 2 - Oregon Screening Levels (Aquatic Receptors)

Analyte (CPECs)[1]	*T/E Species (HQ>1)*		*Non-T/E Species (HQ>5)*	
	MDC	90UCL	MDC	90UCL
Benzo(a)anthracene	Yes	***Yes***	No	No
Benzo(a)pyrene	Yes	***Yes***	Yes	No
Carbon Disulfide	Yes	No	No	No
Copper, total	Yes	No	No	No
DDD	Yes	*	No	*
DDT	Yes	*	No	*
Lead, total	Yes	No	No	No
Total Chromium, total	Yes	No	No	No

Notes:
CPECs - contaminants of potential ecological concern
COIs - constituents of interest
SLV - screening level value
DEQ - Oregon Department of Environmental Quality
MDC - maximum detected concentration
90UCL - 90% upper confidence limit
1 - CPECs are COIs whose MDCs exceed a DEQ Level II SLV (Table 1, Guidance for Ecological Risk Assessment, DEQ, March 2001)
2 - These are CPECs based on potential risk from multiple COIs simultaneously
* - no 90UCL calculated due to too few samples
90UCLs were calculated using one half the detection limit for nondetects
Groundwater data based on results from downgradient monitoring wells only
Highlights indicate that the 90UCL is greater than the SLV
Bold Italics indicate that 90UCL is greater than the SLV for T/E species (HQ>1)

TABLE 2.8-4 Hot Spot Evaluation Summary

Terminal 4 Slip 1 Operable Unit 1 - Oregon Screening Levels (Ecological Receptors)

Analyte (CPEC)[1]	Receptor	Hot Spot Level (mg/kg)[2]	Number of Samples Exceed	Exceedance Locations
Total Chromium	Plants	50	1	S-7
Total Chromium	Invertebrates	20	8	S-7, SB-21, SB-22, SB-23, SB-24, SB-31, SB-33, SB-89
Dibenzofuran	Mammals	0.1	3	S-5, S-6, SB-22

Terminal 4 Slip 1 Operable Unit 2 - Oregon Screening Levels (Ecological Receptors)

Analyte (CPEC)[1]	Receptor	Hot Spot Level (mg/kg)[2]	Number of Samples Exceed	Exceedance Locations
Lead	Birds	800	2	S-26D, SB-77
Dibenzofuran	Mammals	0.1	11	S-14, S-14B, SB-67, SB-70, SB-71, SB-72, SB-73, SB-74, SB-76, SB-77, SB-78
Total Chromium	Invertebrates	20	4	S-26D, S-29, SB-72, SB-76
Zinc	Plants	2500	1	S-26D
Zinc	Birds	3000	1	S-26D

Terminal 4 Slip 1 Operable Unit 2 Riverbank Area - Oregon Screening Levels (Ecological Receptors)

Analyte (CPECs)[1]	Receptor	Hot Spot Level (mg/kg)[2]	Number of Samples Exceed	Exceedance Locations
Zinc	Plants	2500	1	S-26D
Zinc	Birds	3000	1	S-26D
Total Chromium	Invertebrates	20	2	S-26D, S-29
Lead	Birds	800	1	S-26D

Notes:
CPECs - contaminants of potential ecological concern
COIs - constituents of interest
SLV - screening level value
DEQ - Oregon Department of Environmental Quality
1 - CPECs are COIs whose MDCs exceed a DEQ Level II SLV (Table 1, Guidance for Ecological Risk Assessment, DEQ, December 2001)
2 - Hot spot levels for non-T/E receptors are based on 50 times the DEQ Level II SLV.

TABLE 2.9-1 Comparison of Groundwater Mixing Estimates

Terminal 4 Slip 1 OU1 - Ecological Receptors

Analyte (CPECs)[1]					Oregon Screening Levels[2]	CPEC Conc. (mg/L)[3]	Estimated Concentration in Groundwater based on Surface Water Flow Rate (cfs)		
CASNo	Analyte	Analyte Group	Fraction	Units	Aquatic Receptors		0.01	0.1	1
56-55-3	Benzo[a]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	2.70E-05	2.14E-05	8.26E-08	8.26E-09	8.26E-10
50-32-8	Benzo(a)pyrene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	1.40E-05	**2.64E-05**	1.02E-07	1.02E-08	1.02E-09
75-15-0	Carbon disulfide	VOC		mg/L	9.20E-04	4.28E-04	1.65E-06	1.65E-07	1.65E-08
76-44-8	Heptachlor	Organochlorine Pesticides		mg/L	3.80E-06	2.80E-06	1.08E-08	1.08E-09	1.08E-10
1024-57-3	Heptachlor epoxide	Organochlorine Pesticides		mg/L	3.80E-06	3.20E-06	1.23E-08	1.23E-09	1.23E-10
7439-92-1	Lead	Metals/Inorganics	Total	mg/L	2.50E-03	1.00E-03	3.86E-06	3.86E-07	3.86E-08
7440-47-3	Total Chromium	Metals/Inorganics	Total	mg/L	1.10E-02	**1.46E-02**	5.63E-05	5.63E-06	5.63E-07

Terminal 4 Slip 1 OU2 - Ecological Receptors

Analyte (CPECs)[1]					Oregon Screening Levels[2]	CPEC Conc. (mg/L)[3]	Estimated Concentration in Groundwater based on Surface Water Flow Rate (cfs)		
CASNo	Analyte	Analyte Group	Fraction	Units	Aquatic Receptors		0.01	0.1	1
11097-69-1	Aroclor 1254	PCBs Aroclors		mg/L	3.30E-05	**1.14E-04**	4.38E-07	4.38E-08	4.38E-09
56-55-3	Benzo[a]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	2.70E-05	1.88E-05	7.26E-08	7.26E-09	7.26E-10
50-32-8	Benzo(a)pyrene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	1.40E-05	**2.20E-05**	8.47E-08	8.47E-09	8.47E-10
75-15-0	Carbon disulfide	VOC		mg/L	9.20E-04	4.88E-04	1.88E-06	1.88E-07	1.88E-08
7440-50-8	Copper and compounds	Metals/Inorganics	Total	mg/L	9.00E-03	4.07E-03	1.57E-05	1.57E-06	1.57E-07
72-54-8	DDD	Organochlorine Pesticides		mg/L	1.00E-06	**2.60E-06**	1.00E-08	1.00E-09	1.00E-10
50-29-3	DDT	Organochlorine Pesticides		mg/L	1.00E-06	**3.00E-06**	1.16E-08	1.16E-09	1.16E-10
76-44-8	Heptachlor	Organochlorine Pesticides		mg/L	3.80E-06	**5.47E-06**	2.11E-08	2.11E-09	2.11E-10
7439-92-1	Lead	Metals/Inorganics	Total	mg/L	2.50E-03	1.31E-03	5.05E-06	5.05E-07	5.05E-08
7440-47-3	Total Chromium	Metals/Inorganics	Total	mg/L	1.10E-02	4.14E-03	1.60E-05	1.60E-06	1.60E-07

Notes:

CPECs - contaminants of potential ecological concern
SLV - screening level value
DEQ - Oregon Department of Environmental Quality
COI - constituent of interest
90UCL - 90% upper confidence limit
mg/L - milligram per liter
MDC - maximum detected concentration

1 - CPECs are COIs whose MDCs exceed a DEQ Level II SLV (Table 1, Guidance for Ecological Risk Assessment, DEQ, March 2001) or are CPECs due to risk from multiple COIs; see Appendix B-2

2 - All Level II SLV criteria from Oregon DEQ, Table 1, Guidance for Ecological Risk Assessment, December 2001.

3 - CPEC concentration is 90UCL, or MDC (if 90UCL could not be calculated) ; see Appendix B-2

Bolded and highlighted concentrations are greater than the corresponding Aquatic Receptor SLV.

TABLE 3.10-1 Background Soil Concentrations and Surrogates for PRG Values

Background Soil Concentrations

CASNo	Analyte	Clark County, WA
7429-90-5	Aluminum	52,276
7440-38-2	Arsenic	5.81
7440-41-7	Beryllium and compounds	2.07
7440-43-9	Cadmium and compounds	0.93
7440-47-3	Total Chromium	26.57
7440-50-8	Copper and compounds	34.43
7439-89-6	Iron	58,665
7439-92-1	Lead	16.83
7439-96-5	Manganese and compounds	1,511
7487-94-7	Mercury and compounds	0.04
7440-02-0	Nickel	21.04
7440-66-6	Zinc	95.52

Source:

Concentrations from Clark County, Washington. Natural Background Soil Metals Concentrations in Washington State, October 1994 Publication No. 94-115

Surrogates used for PRG

CASNo	COI	Comments
91-57-6	2-Methylnaphthalene	Calculated with IRIS Toxicity Values
90-12-0	1-Methylnaphthalene	2-Methylnaphthalene
832-69-9	1-Methylphenanthrene	Pyrene
87-61-6	1,2,3-Trichlorobenzene	isomer 1,2,4-Trichlorobenzene
2245-38-7	2,3,5-Trimethylnaphthalene	2-Methylnaphthalene
581-42-0	2,6-Dimethylnaphthalene	2-Methylnaphthalene
35421-08-0	4-Chloro-3-methylphenol	4-Methylphenol
208-96-8	Acenaphthylene	Acenaphthene
192-97-2	Benzo(e)pyrene	Pyrene
191-24-2	Benzo(ghi)perylene	Pyrene
99-87-6	p-Cymene	Cumene
7421-93-4	Endrin Aldehyde	Endrin
53494-70-5	Endrin Ketone	Endrin
85-01-8	Phenanthrene	Pyrene
198-55-0	Perylene	Pyrene
95-47-6	o-Xylene	total Xylenes

TABLE 3.10-2 Summary of COPCs - Human Health Screening

Terminal 4 Slip 1, OU1

Analyte (COPCs)[1]	Soils		Groundwater		Multiple Media[5]
	MDC	90UCL	MDC	90UCL	MDC
Aroclor 1254	***Yes*** [2]	No	No	No	No
Arsenic, dissolved	--	--	***Yes***	(6)	--
Arsenic, total	(3)	(3)	***Yes***	(6)	***Yes***
Benzo[a]anthracene	***Yes***	No	***Yes***	Yes	***Yes***
Benzo[a]pyrene	***Yes***	Yes	***Yes***	Yes	***Yes***
Benzo[b]fluoranthene	***Yes***	No	***Yes***	Yes	***Yes***
Benzo[k]fluoranthene	No	No	***Yes***	Yes	***Yes***
Chrysene	No	No	***Yes***	Yes	***Yes***
DDE	No	No	***Yes***	(6)	***Yes***
Dibenz[ah]anthracene	***Yes***	No	No	No	***Yes***
Heptachlor	No	No	***Yes***	(6)	***Yes***
Indeno[1,2,3-cd]pyrene	***Yes***	No	No	No	***Yes***
Tetrachloroethylene (PCE)	No	No	***Yes***	Yes	***Yes***
Vinyl chloride	No	No	***Yes***	No	***Yes***

Terminal 4 Slip 1, OU2

Analyte (COPCs)[1]	Soils		Groundwater		Multiple Media
	MDC	90UCL	MDC	90UCL	MDC
Aldrin	No	No	***Yes***	(6)	***Yes***
Arsenic, dissolved	--	--	***Yes***	Yes	--
Arsenic, total	***Yes*** [2]	(3)	***Yes***	Yes	***Yes***
Benzo[a]anthracene	***Yes***	No	***Yes***	Yes	***Yes***
Benzo[a]pyrene	***Yes***	Yes	***Yes***	Yes	***Yes***
Benzo[b]fluoranthene	***Yes***	Yes	***Yes***	Yes	***Yes***
Benzo[k]fluoranthene	No	No	***Yes***	Yes	***Yes***
Chrysene	No	No	***Yes***	Yes	***Yes***
DDD	No	No	***Yes***	(6)	***Yes***
DDT	No	No	***Yes***	(6)	***Yes***
Dibenz[ah]anthracene	***Yes***	Yes	***Yes***	No	***Yes***
Dieldrin	No	No	***Yes***	(6)	***Yes***
Indeno[1,2,3-cd]pyrene	***Yes***	No	***Yes***	Yes	***Yes***
Lead, total	***Yes***	No	(4)	(4)	(4)

Notes:
COPCs - contaminants of potential concern
COIs - constituents of interest
MDC - maximum detected concentration
90UCL - 90% upper confidence limit; calculated using one half the detection limit for nondetects
total - for metals; indicates non-filtered groundwater samples or soil samples
dissolved - for metals; indicates filtered groundwater samples

1 - COPCs are COIs whose MDCs exceed applicable human health screening criteria with a risk ratio greater than 1.
For soils, screening criteria are Direct Contact Industrial Soil PRGs (see Appendix C-1).
For groundwater, screening criteria are Criteria for Human Health For Consumption of Organism Only (see Appendix C-3), based on results from downgradient monitoring wells only
2 - These are COPCs based on potential risk from multiple COIs simultaneously within one media
3 - MDC and 90UCL exceeded screening criteria, but 90UCL was less than naturally occurring background levels
Background soil concentrations from Clark County, Washington (see Table 3.10-1)
4 - These are potential COPCs based on lack of screening criteria - see also Tables 3.10-3 and 3.10-4
5 - These are COPCs based on the cumulative media risk ratio (i.e., sum of individual soil and groundwater risk ratios); "Yes" indicates that the cumulative media risk ratio was greater than 1.
6 - 90UCL was not calculated due to too few observations for data distribution testing or the 90UCL exceeded the MDC
-- Dissolved (filtered) samples are applicable to groundwater samples only.

Highlights indicate that the 90UCL is greater than screening criteria
Bold-italic indicate a "Yes"

TABLE 3.10-3 Hot Spot Evaluation Summary - Human Health

Terminal 4 Slip 1, OU1

Analyte (COPCs)[1]	Hot Spot Level (mg/kg)[2]	Number of Samples Exceed	Exceedance Locations
Benzo[a]pyrene	2.1	4	S-13, S-12, S-7, SB-22

Terminal 4 Slip 1, OU2

Analyte (COPCs)[1]	Hot Spot Level (mg/kg)[2]	Number of Samples Exceed	Exceedance Locations
Benzo[a]pyrene	2.1	1	S-14, S-27A, S-28A, S-29, S-30A
Dibenz[ah]anthracene	2.1	1	S-14

Notes:

COPCs - contaminants of potential concern

COIs - constituents of interest

1 - COPCs are COIs whose MDCs exceed applicable human health screening criteria with a risk ratio greater than 1.

2 - Hot spot levels are based on 10 times the applicable Direct Contact Industrial Soil PRG.

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TABLE 3.10-4 OU1 Potential COPCs in Groundwater due to lack of Screening Criteria

CASNo	Analyte
Metals	
7440-41-7	Beryllium and compounds
7440-43-9	Cadmium and compounds
7440-50-8	Copper and compounds
7439-92-1	Lead
7440-22-4	Silver and compounds
7440-28-0	Thallium
7440-47-3	Total Chromium
Volatile Organics	
95-63-6	1,2,4-Trimethylbenzene
156-59-2	1,2-Dichloroethylene (cis)
75-15-0	Carbon disulfide
104-51-8	n-Butylbenzene
Semivolatile Organics	
90-12-0	1-Methylnaphthalene
91-57-6	2-Methylnaphthalene
35421-08-0	4-Chloro-3-methylphenol
106-47-8	4-Chloroaniline
106-44-5	4-Methylphenol
208-96-8	Acenaphthylene
191-24-2	Benzo[g,h,i]perylene
91-20-3	Naphthalene
85-01-8	Phenanthrene
Petroleum Hydrocarbon Fractions	
DRO	Diesel Range
GRO	Gasoline Range
RRO	Residual Range
Pesticides	
319-86-8	delta-BHC
1024-57-3	Heptachlor epoxide
72-43-5	Methoxychlor

TABLE 3.10-5 OU2 Potential COPCs in Groundwater due to lack of Screening Criteria

CASNo	Analyte
Metals	
7440-41-7	Beryllium and compounds
7440-43-9	Cadmium and compounds
7440-50-8	Copper and compounds
7439-92-1	Lead
7440-22-4	Silver and compounds
7440-28-0	Thallium
7440-47-3	Total Chromium
Volatile Organics	
75-34-3	1,1-Dichloroethane
95-63-6	1,2,4-Trimethylbenzene
156-59-2	1,2-Dichloroethylene (cis)
75-15-0	Carbon disulfide
95-47-6	o-Xylene
1330-20-7	Xylene (mixed)
Semivolatile Organics	
90-12-0	1-Methylnaphthalene
91-57-6	2-Methylnaphthalene
208-96-8	Acenaphthylene
191-24-2	Benzo[g,h,i]perylene
91-20-3	Naphthalene
85-01-8	Phenanthrene
Petroleum Hydrocarbon Fractions	
DRO	Diesel Range
GRO	Gasoline Range
RRO	Residual Range

TABLE 3.11-1 Risk Evaluation using 90UCL and RME Exposure Factors

OU1: Soils from less than or equal to 15 feet

Constituents of Potential Concern (COPCs)		Mean Conc. (mg/kg)	90UCL		Occupational Worker				Excavation/Construction Worker			
CASNo	Analyte		Value (mg/kg)	Data Distribution	Ingestion	Dermal Contact	Inhalation of Particulates	Total	Ingestion	Dermal Contact	Inhalation of Particulates	Total
Semivolatile Organics (PAHs)												
56-55-3	Benzo[a]anthracene	0.35	0.70	lognormal*	1.6E-07	1.4E-07	2.2E-12	3.0E-07	8.5E-10	3.3E-10	3.6E-15	1.2E-09
50-32-8	Benzo[a]pyrene	0.50	1.00	lognormal*	2.3E-06	2.0E-06	3.2E-11	4.3E-06	1.2E-08	4.7E-09	5.1E-14	1.7E-08
205-99-2	Benzo[b]fluoranthene	0.57	1.14	unknown	2.6E-07	2.2E-07	3.7E-12	4.9E-07	1.4E-09	5.4E-10	5.8E-15	1.9E-09
53-70-3	Dibenz[ah]anthracene	0.10	0.20	lognormal*	4.6E-07	4.0E-07	6.5E-12	8.6E-07	2.4E-09	9.5E-10	1.0E-14	3.4E-09
193-39-5	Indeno[1,2,3-cd]pyrene	0.40	0.86	lognormal*	2.0E-07	1.7E-07	2.8E-12	3.7E-07	1.0E-09	4.1E-10	4.4E-15	1.4E-09
								6.3E-06				2.5E-08

Notes:

RME - Reasonable Maximum Exposure

Values in the table are excess individual lifetime risk of developing cancer. The cumulative risk is the sum of exposure route-specific risks. A cancer risk of 1 x 10-6 indicates that an additional 1 in 1,000,000 individuals would be expected to get cancer above the normal expected cancer rate.

Each data set was tested for distribution (normal, gamma, and lognormal); 90UCL was calculated per EPA 2002. Non parametric methods for calculating the 90UCL were used when the distribution was unknown or when the lognormal distribution (*) was highly skewed (>2.5)

Equation for incidental ingestion is derived from Equation A.9 in the Oregon DEQ (2000)

Equation for direct contact is derived from Equations A.30 and A.32 in the Oregon DEQ (2000)

Equation for inhalation of soil particulates is Equations A.50, A.52, and A.53 in the Oregon DEQ (2000) and Particulate Emission Factor parameters for Portland, Oregon from Table 2 of Appendix D in EPA (1996). Source size was assumed to be 30 acres with 50% vegetative/hard cover.

EPA.1996. Soil Screening Guidance: User's Guide. Office of Solid Waste and Emergency Response, Washington, D.C. 9355.4-23. Second edition, July 1996.

Oregon DEQ. 2000. Guidance for Conduct of Deterministic Human Health Risk Assessments, Final December 1998, Updated May 2000.

TABLE 3.11-2 Risk Evaluation using 90UCL and RME Exposure Factors

OU2: Soils from less than or equal to 15 feet

Constituents of Potential Concern (COPCs)		Mean Conc. (mg/kg)	90UCL		Occupational Worker				Excavation/Construction Worker			
CASNo	Analyte		Value (mg/kg)	Data Distribution	Ingestion	Dermal Contact	Inhalation of Particulates	Total	Ingestion	Dermal Contact	Inhalation of Particulates	Total
Semivolatile Organics (PAHs)												
56-55-3	Benzo[a]anthracene	0.73	1.55	lognormal*	3.6E-07	3.1E-07	5.0E-12	6.6E-07	1.9E-09	7.3E-10	8.0E-15	2.6E-09
50-32-8	Benzo[a]pyrene	0.95	2.1	lognormal*	4.9E-06	4.2E-06	6.8E-11	9.1E-06	2.6E-08	1.0E-08	1.1E-13	3.6E-08
205-99-2	Benzo[b]fluoranthene	0.97	2.21	lognormal*	5.1E-07	4.3E-07	7.1E-12	9.4E-07	2.7E-09	1.0E-09	1.1E-14	3.7E-09
53-70-3	Dibenz[ah]anthracene	0.20	0.42	lognormal*	9.6E-07	8.3E-07	1.3E-11	1.8E-06	5.1E-09	2.0E-09	2.1E-14	7.1E-09
193-39-5	Indeno[1,2,3-cd]pyrene	0.69	1.70	lognormal*	3.9E-07	3.3E-07	5.5E-12	7.3E-07	2.1E-09	8.0E-10	8.7E-15	2.9E-09
								1.3E-05				5.2E-08

Notes:

RME - Reasonable Maximum Exposure

Values in the table are excess individual lifetime risk of developing cancer. The cumulative risk is the sum of exposure route-specific risks. A cancer risk of 1 x 10-6 indicates that an additional 1 in 1,000,000 individuals would be expected to get cancer above the normal expected cancer rate.

Each data set was tested for distribution (normal, gamma, and lognormal); 90UCL was calculated per EPA 2002. Non parametric methods for calculating the 90UCL were used when the distribution was unknown or when the lognormal distribution (*) was highly skewed (>2.5)

Equation for incidental ingestion is derived from Equation A.9 in the Oregon DEQ (2000)

Equation for direct contact is derived from Equations A.30 and A.32 in the Oregon DEQ (2000)

Equation for inhalation of soil particulates is Equations A.50, A.52, and A.53 in the Oregon DEQ (2000) and Particulate Emission Factor parameters for Portland, Oregon from Table 2 of Appendix D in EPA (1996). Source size was assumed to be 30 acres with 50% vegetative/hard cover.

EPA.1996. Soil Screening Guidance: User's Guide. Office of Solid Waste and Emergency Response, Washington, D.C. 9355.4-23. Second edition, July 1996.

Oregon DEQ. 2000. Guidance for Conduct of Deterministic Human Health Risk Assessments, Final December 1998, Updated May 2000.

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TABLE 3.11-3 Comparison of Groundwater Mixing Estimates

Terminal 4 Slip 1 OU1 - Human Health

Constituents of Potential Concern (COPCs)		Human Health Screening for Fish Consumption Only	COPC Conc. Value (ug/L)	Surface Water Flow Rate (cfs)		
CASNo	Analyte			0.01	0.1	1
Metals						
7440-38-2	Arsenic (total)	1.4E-01	**3.6E+00**	1.4E-02	1.4E-03	1.4E-04
7440-38-2	Arsenic (dissolved)	1.4E-01	**3.7E+00**	1.4E-02	1.4E-03	1.4E-04
Volatile Organics						
127-18-4	Tetrachloroethylene (PCE)	3.3E+00	**4.7E+00**	1.8E-02	1.8E-03	1.8E-04
75-01-4	Vinyl chloride	2.4E+00	1.9E+00	7.4E-03	7.4E-04	7.4E-05
Semivolatile Organics (PAHs)						
56-55-3	Benzo[a]anthracene	1.8E-02	**2.6E-02**	1.0E-04	1.0E-05	1.0E-06
50-32-8	Benzo[a]pyrene	1.8E-02	**2.6E-02**	1.0E-04	1.0E-05	1.0E-06
205-99-2	Benzo[b]fluoranthene	1.8E-02	**3.5E-02**	1.4E-04	1.4E-05	1.4E-06
207-08-9	Benzo[k]fluoranthene	1.8E-02	**3.1E-02**	1.2E-04	1.2E-05	1.2E-06
218-01-9	Chrysene	1.8E-02	**2.4E-02**	9.1E-05	9.1E-06	9.1E-07
Pesticides						
72-55-9	DDE	2.2E-04	**4.3E-03**	1.7E-05	1.7E-06	1.7E-07
76-44-8	Heptachlor	7.9E-05	**2.8E-03**	1.1E-05	1.1E-06	1.1E-07

Notes:

Fish Consumption Only from EPA 2004, National Recommended Water Quality Criteria for Human Health For Consumption of Organism Only

Bolded and highlighted concentrations are greater than the corresponding Human Health Screening Criteria

The COPC concentration is the lesser of the maximum concentration or the calculated 90UCL. See Appendix C-2.

KMB00008464

TABLE 3.11-4 Comparison of Groundwater Mixing Estimates

OU2, Downgradient Wells only - Human Health

Constituents of Potential Concern (COPCs)		Human Health Screening for Fish Consumption Only	COPC Conc.	Surface Water Flow Rate (cfs)		
			Value (ug/L)			
CASNo	Analyte			0.01	0.1	1
Metals						
7440-38-2	Arsenic (total)	1.4E-01	**8.3E+00**	3.2E-02	3.2E-03	3.2E-04
7440-38-2	Arsenic (dissolved)	1.4E-01	**7.8E+00**	3.0E-02	3.0E-03	3.0E-04
Semivolatile Organics (PAHs)						
56-55-3	Benzo[a]anthracene	1.8E-02	**1.9E-02**	7.3E-05	7.3E-06	7.3E-07
50-32-8	Benzo[a]pyrene	1.8E-02	**2.2E-02**	8.5E-05	8.5E-06	8.5E-07
205-99-2	Benzo[b]fluoranthene	1.8E-02	**2.2E-02**	8.6E-05	8.6E-06	8.6E-07
207-08-9	Benzo[k]fluoranthene	1.8E-02	**2.1E-02**	8.1E-05	8.1E-06	8.1E-07
218-01-9	Chrysene	1.8E-02	**2.5E-02**	9.5E-05	9.5E-06	9.5E-07
53-70-3	Dibenz[ah]anthracene	1.8E-02	1.1E-02	4.4E-05	4.4E-06	4.4E-07
193-39-5	Indeno[1,2,3-cd]pyrene	1.8E-02	**2.2E-02**	8.5E-05	8.5E-06	8.5E-07
Pesticides						
309-00-2	Aldrin	5.0E-05	**1.2E-03**	4.6E-06	4.6E-07	4.6E-08
72-54-8	DDD	3.1E-04	**2.6E-03**	1.0E-05	1.0E-06	1.0E-07
50-29-3	DDT	2.2E-04	**3.0E-03**	1.2E-05	1.2E-06	1.2E-07
60-57-1	Dieldrin	5.4E-05	**4.4E-03**	1.7E-05	1.7E-06	1.7E-07

Notes:

Fish Consumption Only from EPA 2004, National Recommended Water Quality Criteria for Human Health For Consumption of Organism Only

The COPC concentration is the lesser of the maximum concentration or the calculated 90UCL. See Appendix C-2

Bolded and highlighted concentrations are greater than the corresponding Human Health Screening Criteria

KMB00008465

Figures

Terminal 4 Slip 1 Upland Facility

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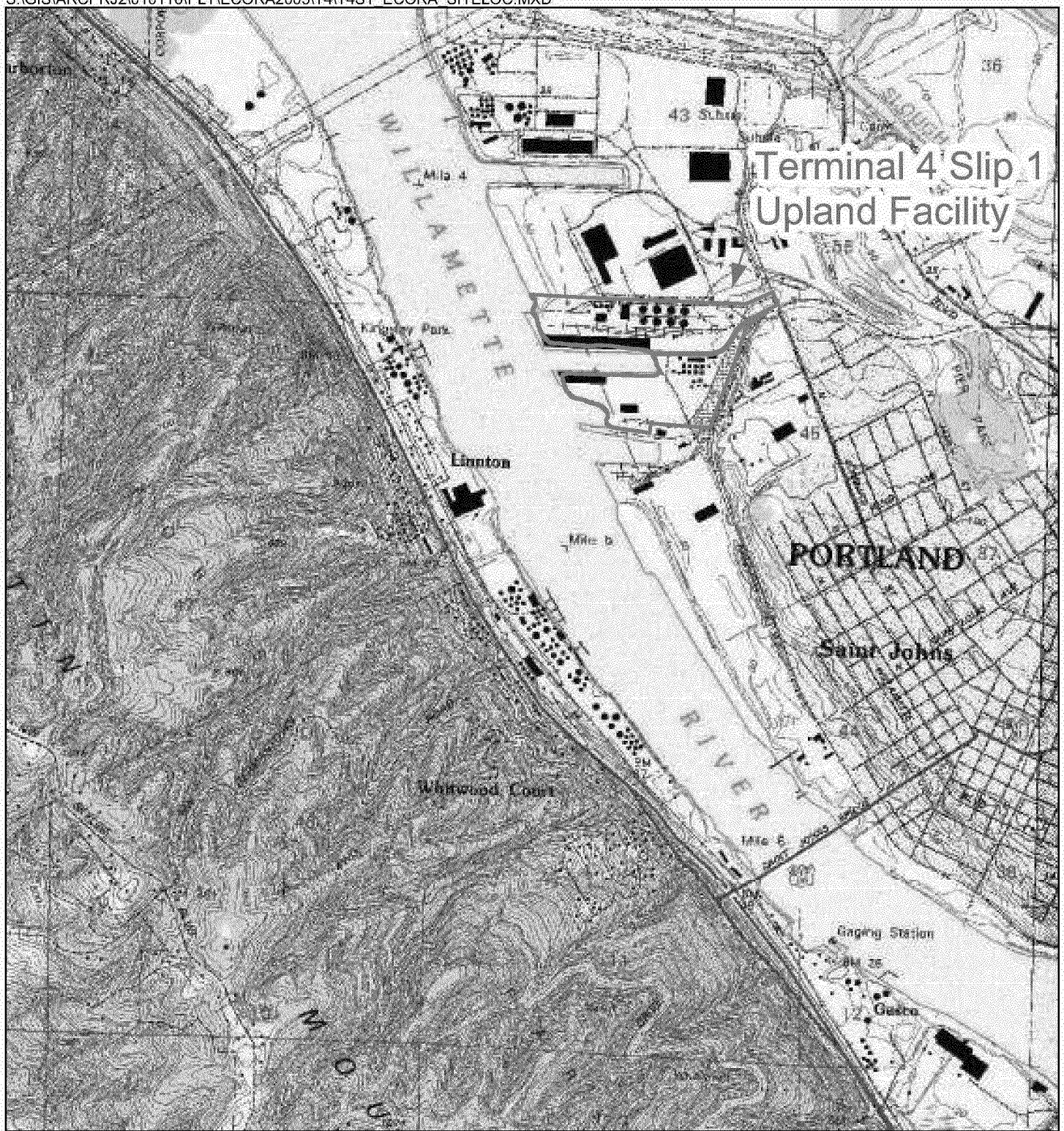

TERMINAL 4 SLIP 1 UPLAND FACILITY
PORT OF PORTLAND, OREGON

FIGURE 1.2-1

Site Location Map

N

0 2,000 4,000

Feet

PRJ: 0219-010-900	DATE: MAR 19, 2007	
REV: 0	BY: RCR	CHK: MCL

Fish Creek Associates, Inc.
Environmental and Construction Consultants

NEWFIELDS

KMB00008467

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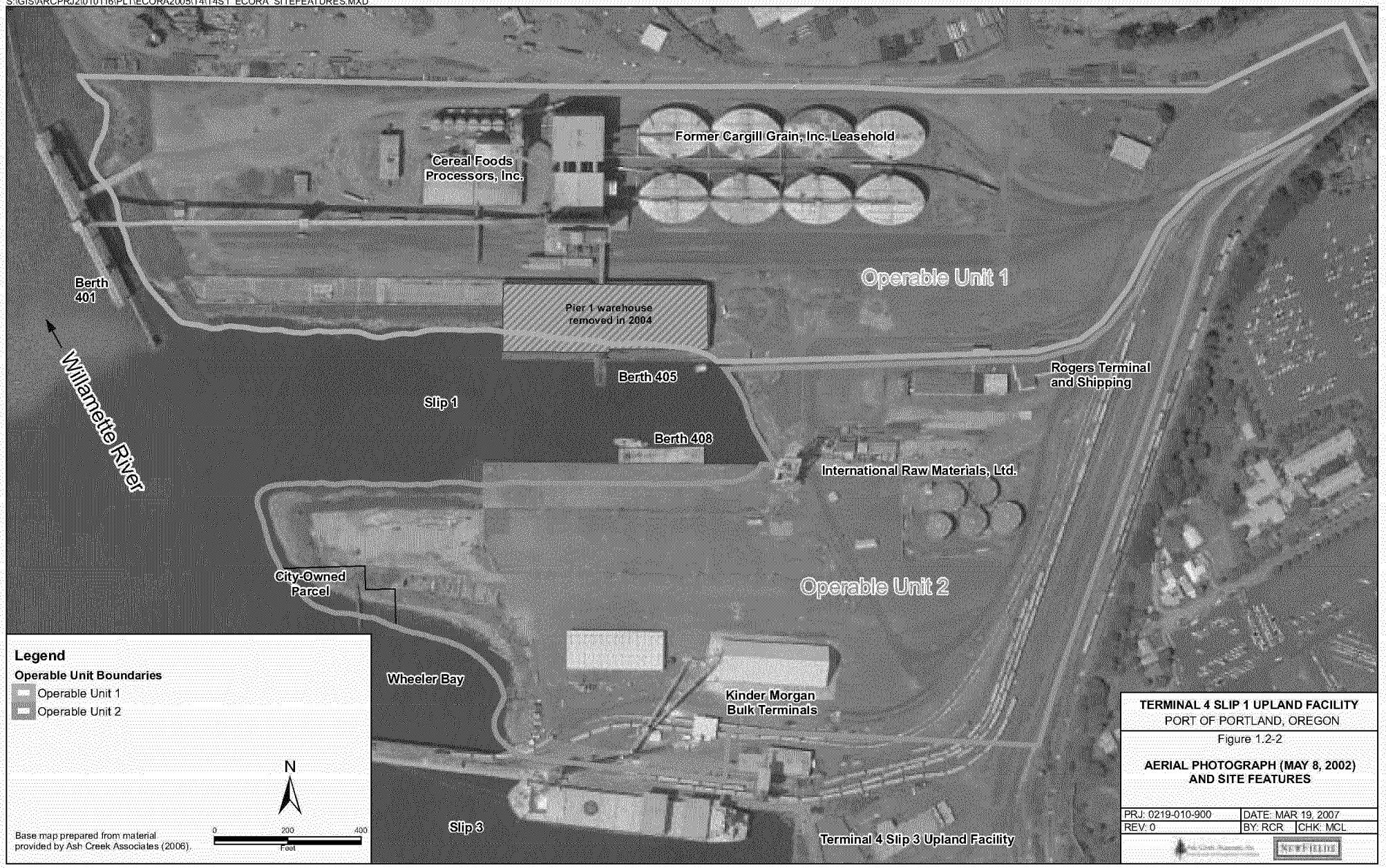

TERMINAL 4 SLIP 1 UPLAND FACILITY
PORT OF PORTLAND, OREGON

Figure 1.2-2

AERIAL PHOTOGRAPH (MAY 8, 2002) AND SITE FEATURES

PRJ: 0219-010-900	DATE: MAR 19, 2007	
REV: 0	BY: RCR	CHK: MCL

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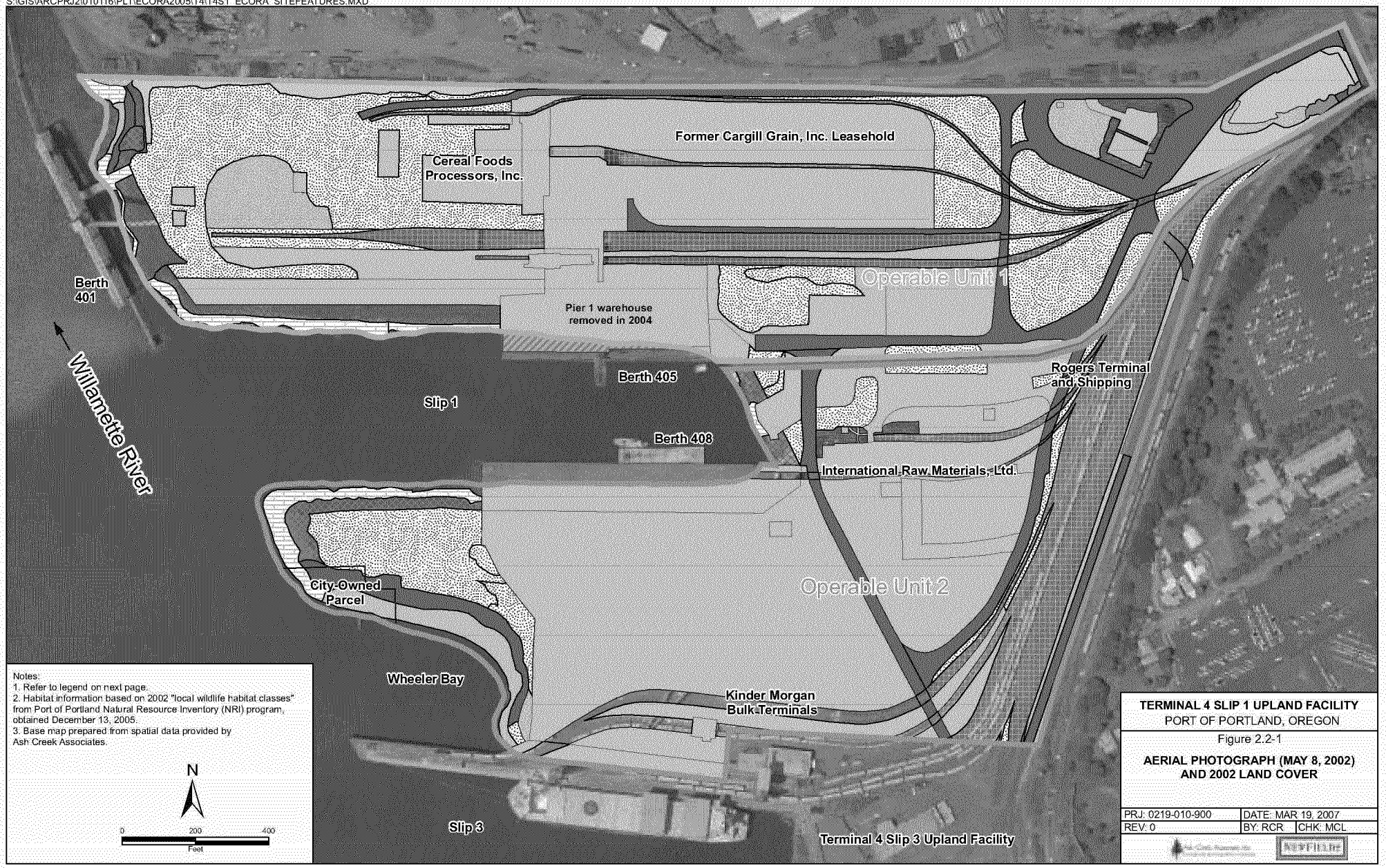


Notes:
1. Refer to legend on next page.
2. Habitat information based on 2002 "local wildlife habitat classes" from Port of Portland Natural Resource Inventory (NRI) program, obtained December 13, 2005.
3. Base map prepared from spatial data provided by Ash Creek Associates.

N

0 200 400
Feet

TERMINAL 4 SLIP 1 UPLAND FACILITY
PORT OF PORTLAND, OREGON

Figure 2.2-1

AERIAL PHOTOGRAPH (MAY 8, 2002) AND 2002 LAND COVER

PRJ: 0219-010-900	DATE: MAR 19, 2007	
REV: 0	BY: RCR	CHK: MCL

KMB00008469

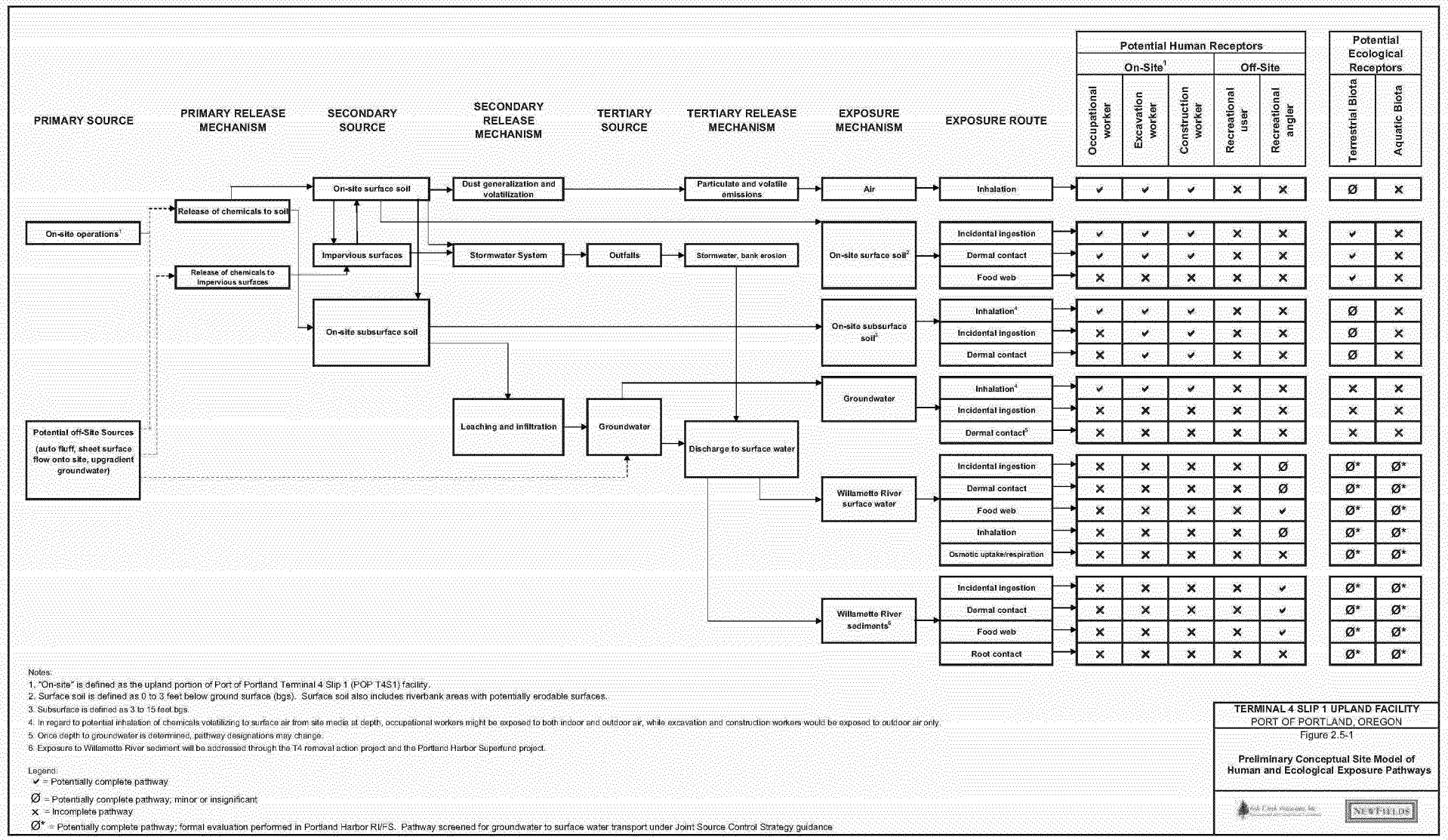
FIGURE 2.2-1 LEGEND
Aerial Photograph (May 8, 2002) and 2002 Land Cover

Operable Unit Boundaries

- T4 Slip 1 Operable Unit 1
- T4 Slip 1 Operable Unit 2

Local Wildlife Habitat Classes

- Blackberry Scrub-Shrub
- Developed - Cultivated
- Developed - Impervious
- Developed - Pervious
- Emergent Wetland
- Hardwood
- Hardwood (Planted)
- Herbaceous Upland
- Mixed Conifer-Hardwood (Planted)
- Pervious Wasteland/Barren/Weedy Fill
- Railroad - Crushed Rock
- Railroad - Gravel
- Railroad - Paved
- River Beach (Modified/Protected)
- River Beach (Natural)
- Road - Paved
- Scrub-Shrub (Planted)
- Water Related Structure



Notes:
1. "On-site" is defined as the upland portion of Port of Portland Terminal 4 Slip 1 (POP T4S1) facility.
2. Surface soil is defined as 0 to 3 feet below ground surface (bgs). Surface soil also includes riverbank areas with potentially erodable surfaces.
3. Subsurface is defined as 3 to 15 feet bgs.
4. In regard to potential inhalation of chemicals volatilizing to surface air from site media at depth, occupational workers might be exposed to both indoor and outdoor air, while excavation and construction workers would be exposed to outdoor air only.
5. Once depth to groundwater is determined, pathway designations may change.
6. Exposure to Willamette River sediment will be addressed through the T4 removal action project and the Portland Harbor Superfund project.

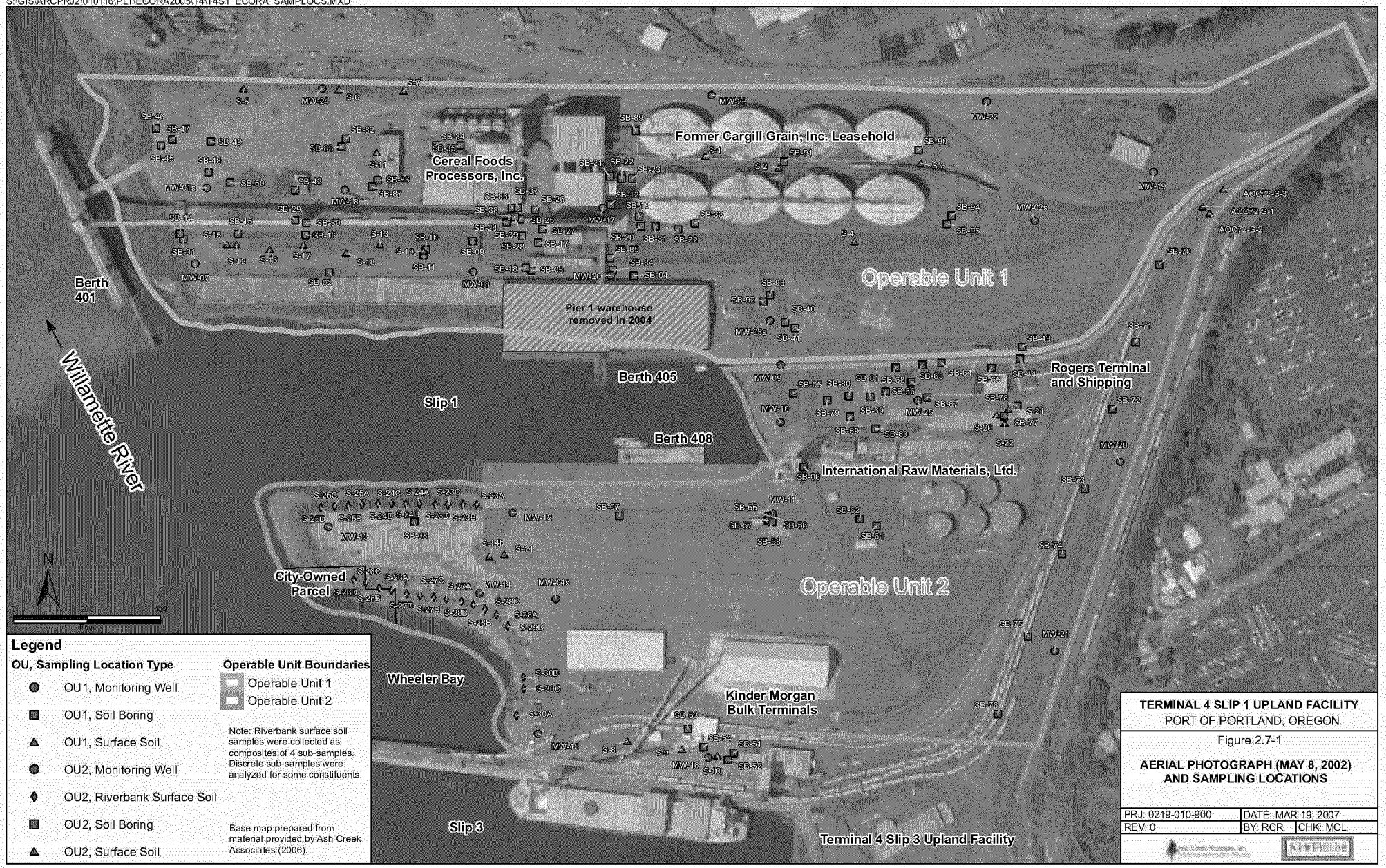
Legend:
✔ = Potentially complete pathway
Ø = Potentially complete pathway; minor or insignificant
× = Incomplete pathway
Ø* = Potentially complete pathway; formal evaluation performed in Portland Harbor RI/FS. Pathway screened for groundwater to surface water transport under Joint Source Control Strategy guidance

TERMINAL 4 SLIP 1 UPLAND FACILITY
PORT OF PORTLAND, OREGON
Figure 2.5-1

Preliminary Conceptual Site Model of Human and Ecological Exposure Pathways

S:\Jobs\0219-010-900-USCS_T4_OU1\Risk Assessment\DraftFinal_RIA\Figures\Conceptual Site Model_T4S1.xls

S:\GIS\ARCPRJ2\010116\PLT\ECORA2005\T4\T4S1_ECORA_SAMPLOCS.MXD



Legend

OU, Sampling Location Type

- OU1, Monitoring Well
- OU1, Soil Boring
- OU1, Surface Soil
- OU2, Monitoring Well
- OU2, Riverbank Surface Soil
- OU2, Soil Boring
- OU2, Surface Soil

Operable Unit Boundaries

- Operable Unit 1
- Operable Unit 2

Note: Riverbank surface soil samples were collected as composites of 4 sub-samples. Discrete sub-samples were analyzed for some constituents.

Base map prepared from material provided by Ash Creek Associates (2006).

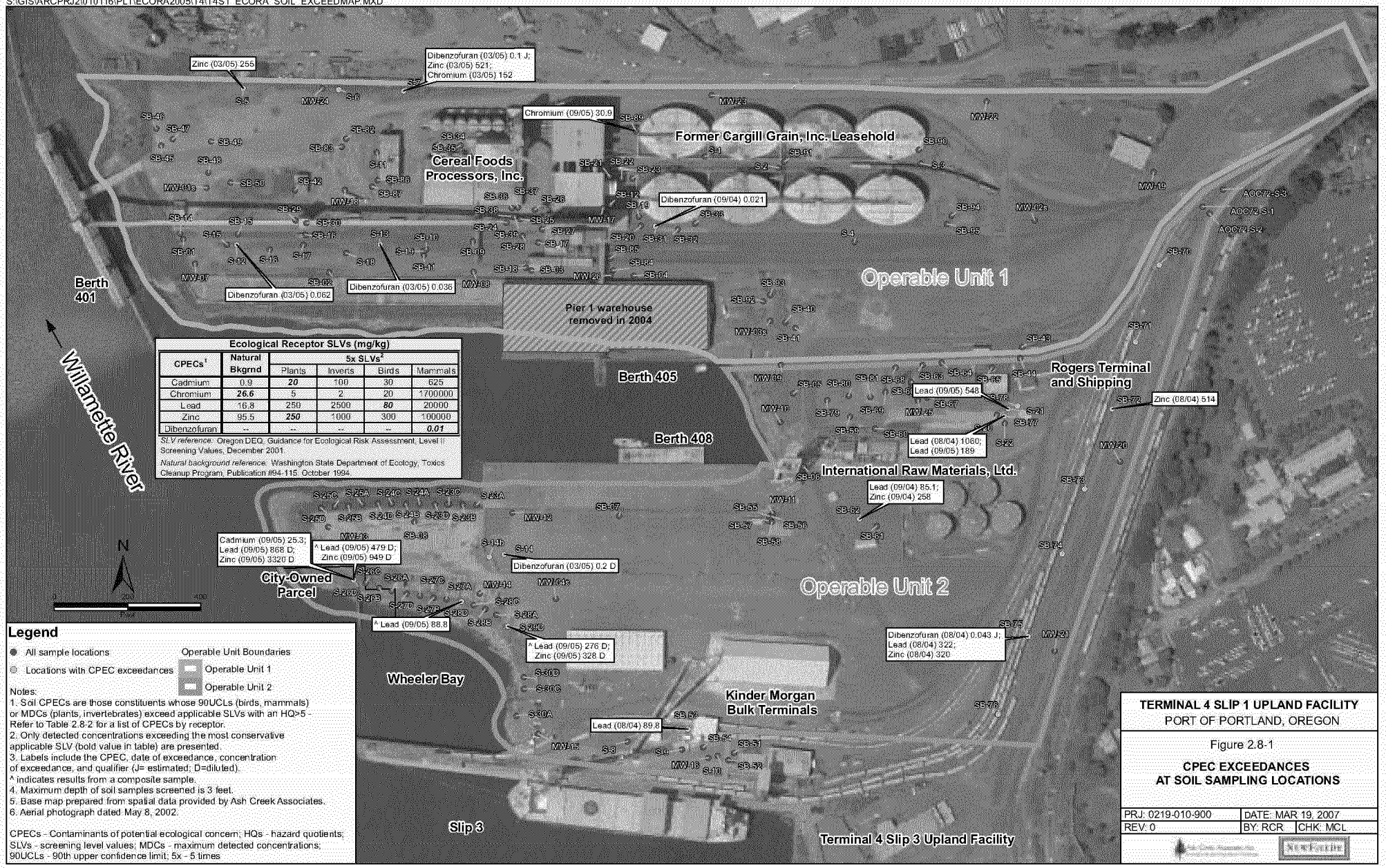
TERMINAL 4 SLIP 1 UPLAND FACILITY
PORT OF PORTLAND, OREGON

Figure 2.7-1

AERIAL PHOTOGRAPH (MAY 8, 2002) AND SAMPLING LOCATIONS

PRJ: 0219-010-900	DATE: MAR 19, 2007	
REV: 0	BY: RCR	CHK: MCL

S:\GIS\ARCPRJ2\010116\PLT\ECORA2005\T4\T4S1_ECORA_SOIL_EXCEEDMAP.MXD



Ecological Receptor SLVs (mg/kg)

CPECs[1]	Natural Bkgrnd	5x SLVs[2]			
		Plants	Inverts	Birds	Mammals
Cadmium	0.9	***20***	100	30	625
Chromium	***26.6***	5	2	20	1700000
Lead	16.8	250	2500	***80***	20000
Zinc	95.5	***250***	1000	300	100000
Dibenzofuran	--	--	--	--	***0.01***

SLV reference: Oregon DEQ, Guidance for Ecological Risk Assessment, Level II Screening Values, December 2001.

Natural background reference: Washington State Department of Ecology, Toxics Cleanup Program, Publication #94-115, October 1994.

Legend

- All sample locations
- Locations with CPEC exceedances
- Operable Unit Boundaries
  - Operable Unit 1
  - Operable Unit 2

Notes:
1. Soil CPECs are those constituents whose 90UCLs (birds, mammals) or MDCs (plants, invertebrates) exceed applicable SLVs with an HQ>5 - Refer to Table 2.8-2 for a list of CPECs by receptor.
2. Only detected concentrations exceeding the most conservative applicable SLV (bold value in table) are presented.
3. Labels include the CPEC, date of exceedance, concentration of exceedance, and qualifier (J= estimated; D=diluted).
^ indicates results from a composite sample.
4. Maximum depth of soil samples screened is 3 feet.
5. Base map prepared from spatial data provided by Ash Creek Associates.
6. Aerial photograph dated May 8, 2002.

CPECs - Contaminants of potential ecological concern; HQs - hazard quotients; SLVs - screening level values; MDCs - maximum detected concentrations; 90UCLs - 90th upper confidence limit; 5x - 5 times

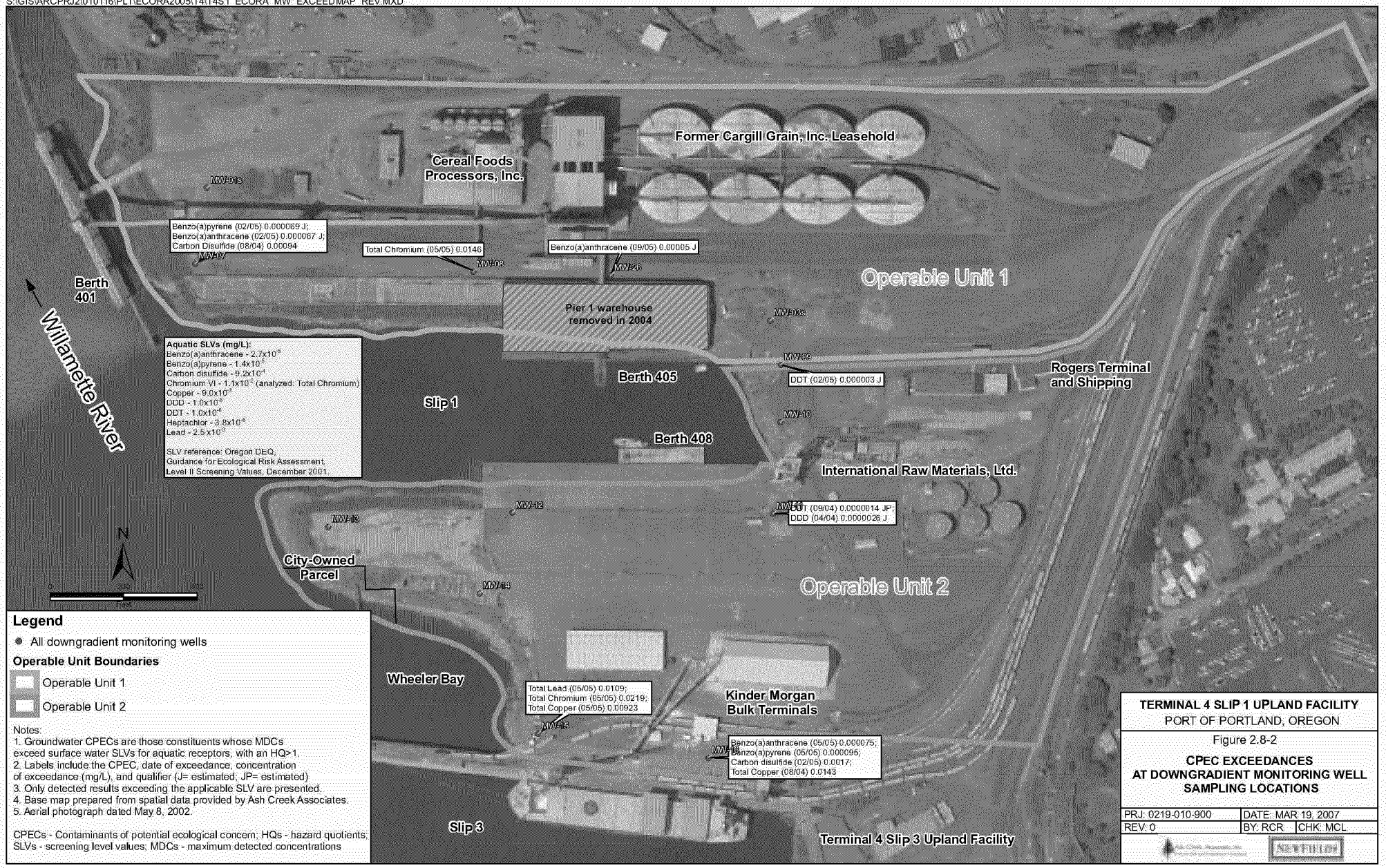
TERMINAL 4 SLIP 1 UPLAND FACILITY
PORT OF PORTLAND, OREGON

Figure 2.8-1

CPEC EXCEEDANCES AT SOIL SAMPLING LOCATIONS

PRJ: 0219-010-900	DATE: MAR 19, 2007	
REV: 0	BY: RCR	CHK: MCL

S:\GIS\ARCPRJ2\010116\PLT\ECORA2005\T4\T4S1_ECORA_MW_EXCEEDMAP_REV.MXD



Legend

- All downgradient monitoring wells

Operable Unit Boundaries

- Operable Unit 1
- Operable Unit 2

Notes:
1. Groundwater CPECs are those constituents whose MDCs exceed surface water SLVs for aquatic receptors, with an HQ>1.
2. Labels include the CPEC, date of exceedance, concentration of exceedance (mg/L), and qualifier (J= estimated; JP= estimated)
3. Only detected results exceeding the applicable SLV are presented.
4. Base map prepared from spatial data provided by Ash Creek Associates.
5. Aerial photograph dated May 8, 2002.

CPECs - Contaminants of potential ecological concern; HQs - hazard quotients; SLVs - screening level values; MDCs - maximum detected concentrations

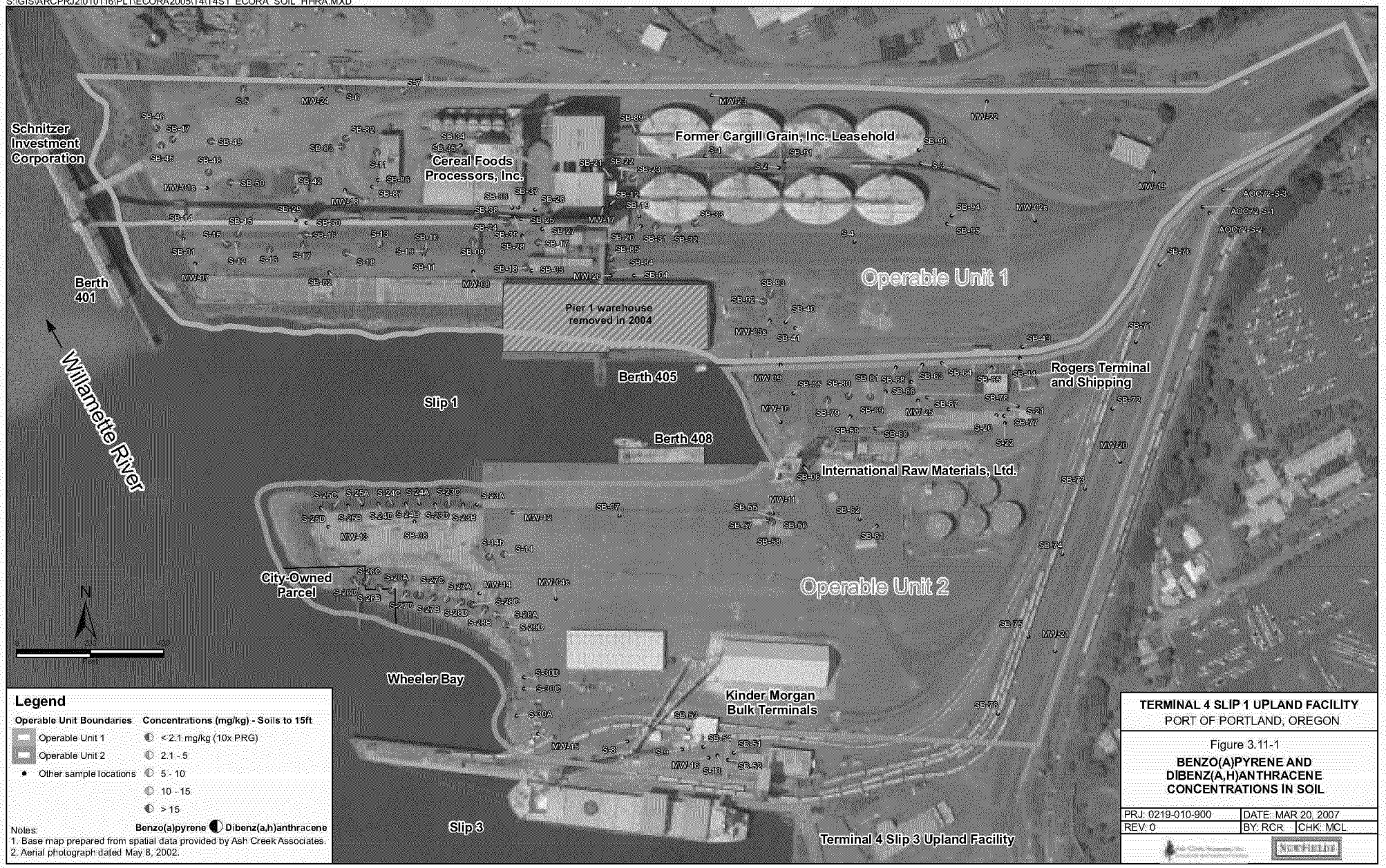
TERMINAL 4 SLIP 1 UPLAND FACILITY
PORT OF PORTLAND, OREGON

Figure 2.8-2

CPEC EXCEEDANCES AT DOWNGRADIENT MONITORING WELL SAMPLING LOCATIONS

PRJ: 0219-010-900	DATE: MAR 19, 2007	
REV: 0	BY: RCR	CHK: MCL

S:\GIS\ARCPRJ2\010116\PLT\ECORA2005\T4\T4S1_ECORA_SOIL_HHRA.MXD



TERMINAL 4 SLIP 1 UPLAND FACILITY
PORT OF PORTLAND, OREGON

Figure 3.11-1

BENZO(A)PYRENE AND DIBENZ(A,H)ANTHRACENE CONCENTRATIONS IN SOIL

PRJ: 0219-010-900	DATE: MAR 20, 2007	
REV: 0	BY: RCR	CHK: MCL

Appendix A-1

Ecological Scoping Checklist (Attachment 1)

Terminal 4 Slip 1 Upland Facility

ATTACHMENT A-1
Ecological Scoping Checklist for the Terminal 4 Slip 1 Upland Facility

Site Name	Terminal 4 Slip 1 Upland Facility
Date of Site Visit	November 1, 2005
Site Location	Terminal 4 is located at 11040 North Lombard, Portland, Oregon, 97203, on the east bank of the Willamette River, downstream of the St. Johns Bridge, Portland, OR. The Slip 1 Upland Facility is comprised of OU1 and OU2.
Site Visit Conducted by	Mark Lewis, NewFields Boulder

Part 1

CONTAMINANTS OF INTEREST **Types, Classes, Or Specific Hazardous Substances ‡** **Known Or Suspected**	**Onsite**	**Adjacent to or in locality of the facility †**
Total petroleum hydrocarbons as gasoline, diesel, and oil (TPH)	X	
Volatile organic compounds (VOCs)	X	
Semivolatile organic compounds (SVOCs)	X	
Polynuclear aromatic hydrocarbons (PAHs)	X	
Polychorinated biphenyls (PCBs)	X	
Pesticides	X	
Metals (mercury, cadmium, chromium, lead, zinc)	X	

‡ As defined by OAR 340-122-115(30) † As defined by OAR 340-122-115(34)

Part 2

OBSERVED IMPACTS ASSOCIATED WITH THE SITE	**Finding**
Onsite vegetation (**N**one, **L**imited, **E**xtensive)	Limited
Vegetation in the locality of the site (**N**one, **L**imited, **E**xtensive)	Limited
Onsite wildlife such as macroinvertebrates, reptiles, amphibians, birds, mammals, other (**N**one, **L**imited, **E**xtensive)	None
Wildlife such as macroinvertebrates, reptiles, amphibians, birds, mammals, other in the locality of the site (**N**one, **L**imited, **E**xtensive)	None
Other readily observable impacts (**N**one, **D**iscuss below)	None
Discussion: Over 90% of land cover at OU1 and OU2 is comprised of developed areas, railroads, and roads. Land cover is characterized by paved surfaces, gravel, or compacted soil and sparse ruderal vegetation. These areas do not provide suitable habitat for ecological receptors. There are narrow riverbank areas of beach (approximately 3% of the land cover) or vegetated areas (approximately 3.5% of the land cover) with trees, shrubs, grasses, and forbs that provide limited habitat.	

ATTACHMENT A-1
Ecological Scoping Checklist (cont'd)

Part 3

SPECIFIC EVALUATION OF ECOLOGICAL RECEPTORS / HABITAT	Finding
Terrestrial - Wooded	
Percentage of site that is wooded	1.5%
Dominant vegetation type (**E**vergreen, **D**eciduous, **M**ixed)	M
Prominent tree size at breast height, i.e., four feet (<6", 6" to 12", >12")	6" to 12"
Evidence / observation of wildlife (**M**acroinvertebrates, **R**eptiles, **A**mphibians, **B**irds, **M**ammals, **O**ther)	B
Terrestrial - Scrub/Shrub/Grasses	
Percentage of site that is scrub/shrub. ***NOTE: this habitat is mainly found in riverbank areas**	4%
Dominant vegetation type (**Sc**rub, **Sh**rub, **G**rasses, **O**ther)	Sc & G
Prominent height of vegetation (<2', 2' to 5', >5')	2'-5' on riverbank
Density of vegetation (**D**ense, **P**atchy, **S**parse)	S or absent on upland; D on riverbank
Evidence / observation of wildlife (**M**acroinvertebrates, **R**eptiles, **A**mphibians, **B**irds, **M**ammals, **O**ther)	B
Terrestrial - Ruderal	
Percentage of site that is ruderal ***NOTE: this percentage includes 87.7% developed/paved, 4.8% unpaved/ruderal, and 2% modified (i.e., riprapped) riverbank**	94.5%
Dominant vegetation type (**L**andscaped, **A**griculture, **B**are ground)	B (compacted soil, barren, weedy fill, riprap)
Prominent height of vegetation (0', >0' to <2', 2' to 5', >5')	>0' to <2'
Density of vegetation (**D**ense, **P**atchy, **S**parse)	S on upland
Evidence / observation of wildlife (**M**acroinvertebrates, **R**eptiles, **A**mphibians, **B**irds, **M**ammals, **O**ther)	None observed
Aquatic - Non-flowing (lentic)	
Percentage of site that is covered by lakes or ponds	0%
Type of water bodies (**L**akes, **P**onds, **V**ernal pools, **I**mpoundments, **Lag**oon, **R**eservoir, **C**anal)	N/A
Size (acres), average depth (feet), trophic status of water bodies	N/A
Source water (**R**iver, **St**ream, **G**roundwater, **I**ndustrial discharge, **Su**rface water runoff)	N/A
Water discharge point (**N**one, **R**iver, **St**ream, **G**roundwater, **W**etlands impoundment)	N/A
Nature of bottom (**M**uddy, **R**ocky, **S**and, **C**oncrete, **O**ther)	N/A
Vegetation present (**S**ubmerged, **E**mergent, **F**loating)	N/A
Obvious wetlands present (**Y**es / **N**o)	N/A

Evidence / observation of wildlife (**M**acroinvertebrates, **R**eptiles, **A**mphibians, **B**irds, **M**ammals, **O**ther)	N/A
Aquatic - Flowing (lotic)	
Percentage of site that is covered by rivers, streams (brooks, creeks), intermittent streams, dry wash, arroyo, ditches, or channel waterway. ***NOTE: No permanent waterbody other than portion of Willamette River adjacent to upland.**	0%
Type of water bodies (**R**ivers, **S**treams, **I**ntermittent Streams, **D**ry wash, **A**rroyo, **D**itches, **C**hannel waterway)	N/A
Size (acres), average depth (feet), approximate flow rate (cfs) of water bodies	N/A
Bank environment (cover: **V**egetated, **B**are / slope: **S**teep, **G**radual / height (in feet))	N/A
Source water (**R**iver, **S**tream, **G**roundwater, **I**ndustrial discharge, **Su**rface water runoff)	N/A
Tidal influence (**Y**es / **N**o)	N/A
Water discharge point (**N**one, **R**iver, **S**tream, **G**roundwater, **W**etlands impoundment)	N/A
Nature of bottom (**M**uddy, **R**ocky, **S**and, **C**oncrete, **O**ther)	N/A
Vegetation present (**S**ubmerged, **E**mergent, **F**loating)	N/A
Obvious wetlands present (**Y**es / **N**o)	N/A
Evidence / observation of wildlife (**M**acroinvertebrates, **R**eptiles, **A**mphibians, **B**irds,	N/A
Mammals, **O**ther)	N/A
Aquatic - Wetlands	
Obvious or designated wetlands present (**Y**es / **N**o)	Yes
Wetlands suspected as site is/has (**A**djacent to water body, in **F**loodplain, **S**tanding water, **D**ark wet soils, **M**ud cracks, **D**ebris line, **W**ater marks)	A
Vegetation present (**S**ubmerged, **E**mergent, **S**crub/shrub, **W**ooded)	E
Size (acres) and depth (feet) of suspected wetlands	0.02 ac
Source water (**R**iver, **S**tream, **G**roundwater, **I**ndustrial discharge, **Su**rface water runoff)	R, Su
Water discharge point (**N**one, **R**iver, **S**tream, **G**roundwater, **I**mpoundment)	R
Tidal influence (**Y**es / **N**o)	Y
Evidence / observation of wildlife (**M**acroinvertebrates, **R**eptiles, **A**mphibians, **B**irds, **M**ammals, **O**ther)	None observed

* **P**: Photographic documentation of these features is highly recommended.

ECOLOGICALLY IMPORTANT SPECIES / HABITATS OBSERVED
Industrial development along the river significantly limits the habitat potential of this facility. No ecologically important habitats are observed at OU1 and OU2, except for one small emergent fringe (0.02 acres) along the river. The upland area will continue to be used for industrial purposes. The habitat value of riverbank areas is limited by the small size, distance from other vegetated areas, significant barriers (i.e., development, railroads, major roads, fences), and lack of any corridor to provide wildlife cover during travel. Thus, the Facility does not and will not provide suitable habitat for ecological receptors because of former, current, and likely future uses of the property.

Appendix A-2

Evaluation of Receptor-Pathway Interactions (Attachment 2)

Terminal 4 Slip 1 Upland Facility

ATTACHMENT A-2
Evaluation of Receptor-Pathway Interactions

EVALUATION OF RECEPTOR-PATHWAY INTERACTIONS	Y	N	U
Are hazardous substances present or potentially present in surface waters? **AND** **Are ecologically important species or habitats present?** **AND** **Could hazardous substances reach these receptors via surface water?**			X
When answering the above questions, consider the following: • Known or suspected presence of hazardous substances in surface waters. • Ability of hazardous substances to migrate to surface waters. • Terrestrial organisms may be dermally exposed to water-borne contaminants as a result of wading or swimming in contaminated waters. Aquatic receptors may be exposed through osmotic exchange, respiration or ventilation of surface waters. • Contaminants may be taken-up by terrestrial plants whose roots are in contact with surface waters. • Terrestrial receptors may ingest water-borne contaminants if contaminated surface waters are used as a drinking water source.	Surfacewater/ groundwater could be transported to the Willamette River, but there is no on-site surfacewater		
Are hazardous substances present or potentially present in groundwater? **AND** **Are ecologically important species or habitats present?** **AND** **Could hazardous substances reach these receptors via groundwater?**		X	
When answering the above questions, consider the following: • Known or suspected presence of hazardous substances in groundwater. • Ability of hazardous substances to migrate to groundwater. • Potential for hazardous substances to migrate via groundwater and discharge into habitats and/or surface waters. • Contaminants may be taken-up by terrestrial and rooted aquatic plants whose roots are in contact with groundwater present within the root zone (1m depth). • Terrestrial wildlife receptors generally will not contact groundwater unless it is discharged to the surface.			

"Y" = yes; "N" = No, "U" = Unknown (counts as a "Y")

ATTACHMENT A-2
Evaluation of Receptor-Pathway Interactions (cont'd)

EVALUATION OF RECEPTOR-PATHWAY INTERACTIONS	Y	N	U
Are hazardous substances present or potentially present in sediments? **AND** **Are ecologically important species or habitats present?** **AND** **Could hazardous substances reach these receptors via contact with sediments?**			X
When answering the above questions, consider the following: • Known or suspected presence of hazardous substances in sediment. • Ability of hazardous substances to leach or erode from surface soils and be carried into sediment via surface runoff. • Potential for contaminated groundwater to upwell through, and deposit contaminants in, sediments. • If sediments are present in an area that is only periodically inundated with water, terrestrial species may be dermally exposed during dry periods. Aquatic receptors may be directly exposed to sediments or may be exposed through osmotic exchange, respiration or ventilation of sediment pore waters. • Terrestrial plants may be exposed to sediment in an area that is only periodically inundated with water. • If sediments are present in an area that is only periodically inundated with water, terrestrial species may have direct access to sediments for the purposes of incidental ingestion. Aquatic receptors may regularly or incidentally ingest sediment while foraging.	Soils/sediments could be transported to the Willamette River via the storm drain or any erodable riverbank soils, but there are no on-site sediments.		
Are hazardous substances present or potentially present in prey or food items of ecologically important receptors? **AND** **Are ecologically important species or habitats present?** **AND** **Could hazardous substances reach these receptors via consumption of food items?**			X
When answering the above questions, consider the following: • Higher trophic level terrestrial and aquatic consumers and predators may be exposed through consumption of contaminated food sources. • In general, organic contaminants with log Kow > 3.5 may accumulate in terrestrial mammals and those with a log Kow > 5 may accumulate in aquatic vertebrates.			

"Y" = yes; "N" = No, "U" = Unknown (counts as a "Y")

ATTACHMENT A-2
Evaluation of Receptor-Pathway Interactions (cont'd)

EVALUATION OF RECEPTOR-PATHWAY INTERACTIONS	Y	N	U
Are hazardous substances present or potentially present in surficial soils? **AND** **Are ecologically important species or habitats present?** **AND** **Could hazardous substances reach these receptors via incidental ingestion of or dermal contact with surficial soils?**	X		
When answering the above questions, consider the following: • Known or suspected presence of hazardous substances in surficial (1m depth) soils. • Ability of hazardous substances to migrate to surficial soils. • Significant exposure via dermal contact would generally be limited to organic contaminants which are lipophilic and can cross epidermal barriers. • Exposure of terrestrial plants to contaminants present in particulates deposited on leaf and stem surfaces by rain striking contaminated soils (i.e., rain splash). • Contaminants in bulk soil may partition into soil solution, making them available to roots. Incidental ingestion of contaminated soil could occur while animals grub for food resident in the soil, feed on plant matter covered with contaminated soil or while grooming themselves clean of soil.			
Are hazardous substances present or potentially present in soils? **AND** **Are ecologically important species or habitats present?** **AND** **Could hazardous substances reach these receptors via vapors or fugitive dust carried in surface air or confined in burrows?**	X		
When answering the above questions, consider the following: • Volatility of the hazardous substance (volatile chemicals generally have Henry's Law constant > 10-5 atm-m3/mol and molecular weight < 200 g/mol). • Exposure via inhalation is most important to organisms that burrow in contaminated soils, given the limited amounts of air present to dilute vapors and an absence of air movement to disperse gases. • Exposure via inhalation of fugitive dust is particularly applicable to ground-dwelling species that could be exposed to dust disturbed by their foraging or burrowing activities or by wind movement. • Foliar uptake of organic vapors would be limited to those contaminants with relatively high vapor pressures. • Exposure of terrestrial plants to contaminants present in particulates deposited on leaf and stem surfaces.			

"Y" = yes; "N" = No, "U" = Unknown (counts as a "Y")

Appendix A-3

Oregon Natural Heritage Information Center Species of Special Interest

Terminal 4 Slip 1 Upland Facility

Appendix A-3

Oregon Natural Heritage Information Center Species of Special Interest
Terminal 4 Slip 1 Upland Facility

Common Name	Scientific Name	Federal Status	State Status
Plants			
Tall bugbane	*Cimicifuga elata*	-	C
Oregon sullivantia	*Sullivantia oregana*	SOC	C
Fish[1]			
Green sturgeon	*Acipenser medirostris*	SOC	-
Steelhead (Lower Columbia River ESU)	*Oncorhynchus mykiss* pop. 27	LT	SC
Chinook salmon (Lower Columbia River ESU)	*Oncorhynchus tshawytscha* pop. 21, pop. 22	LT	SC
Coho salmon (Lower Columbia River/SW Washington Coast ESU)	*Oncorhynchus kisutch* pop. 1	-	LE
Birds			
Bald eagle	*Haliaeetus leucocephalus*	LT	LT
American peregrine falcon	*Falco peregrinus annatum*	-	LE
Yellow-billed cuckoo	*Coccyzus americanus*	C	SC
Tricolored blackbird	*Agelaius tricolor*	SOC	SP
Reptiles/amphibians			
Painted turtle	*Chrysemys picta*	-	SC

Notes:

[1]The Upland Facility does not contain aquatic habitats. Fish are included only because of potentially complete pathways to the Willamette River.

LE - listed endangered
E - endangered
SC or C - sensitive, critical
SOC - species of concern
LT - listed threatened
SP - sensitive-peripheral

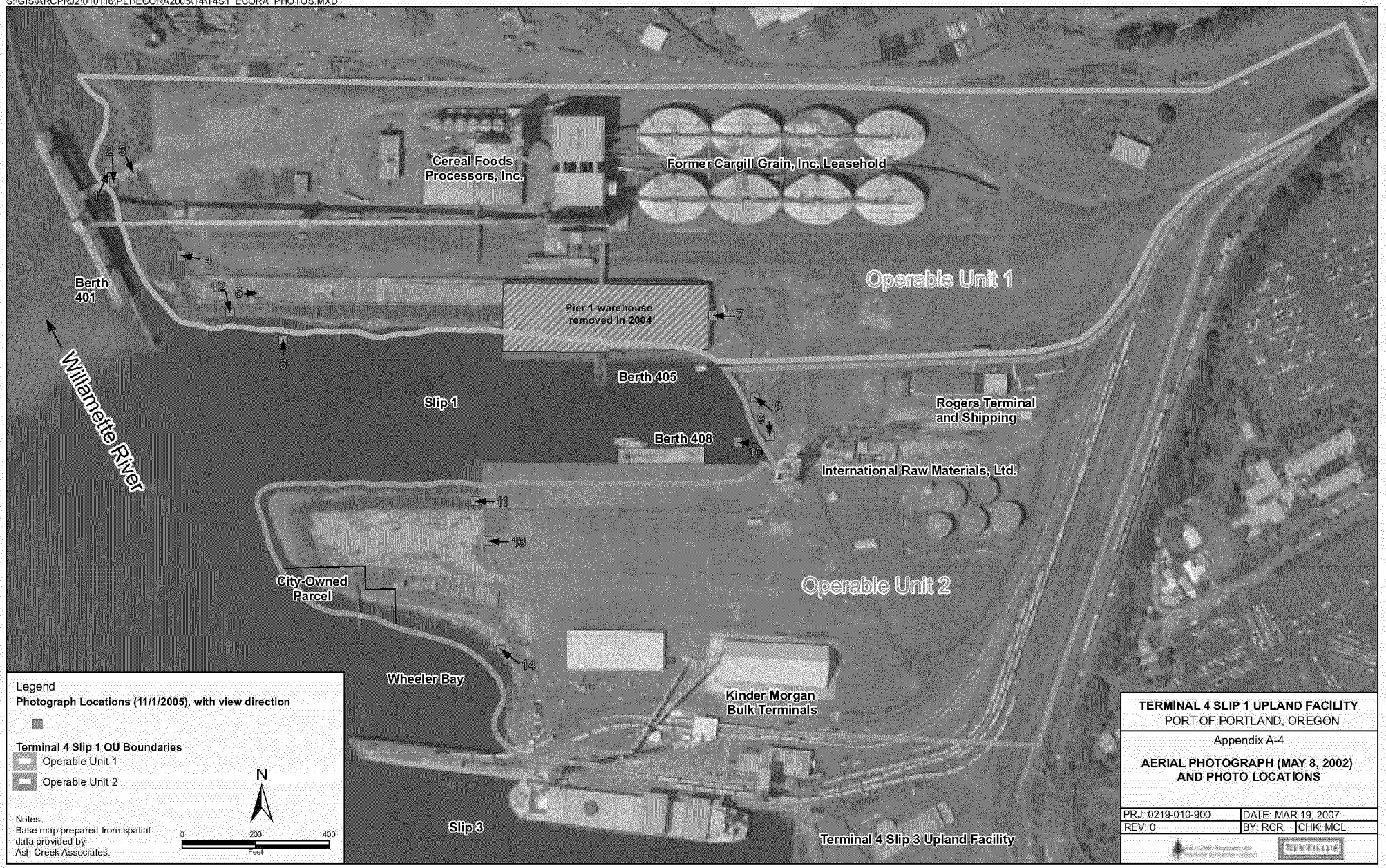
Source: Confidential analysis of rare, threatened and endangered species provided by Oregon Natural Heritage Information Center on June 15, 2005

Appendix A-4

Site Photographs (November 2005)

Terminal 4 Slip 1 Upland Facility

S:\GIS\ARCPRJ2\010116\PLT\ECORA2005\T4\T4S1_ECORA_PHOTOS.MXD



Legend

Photograph Locations (11/1/2005), with view direction

Terminal 4 Slip 1 OU Boundaries

- Operable Unit 1
- Operable Unit 2

N

0 200 400

Feet

Notes:
Base map prepared from spatial data provided by Ash Creek Associates.

TERMINAL 4 SLIP 1 UPLAND FACILITY
PORT OF PORTLAND, OREGON

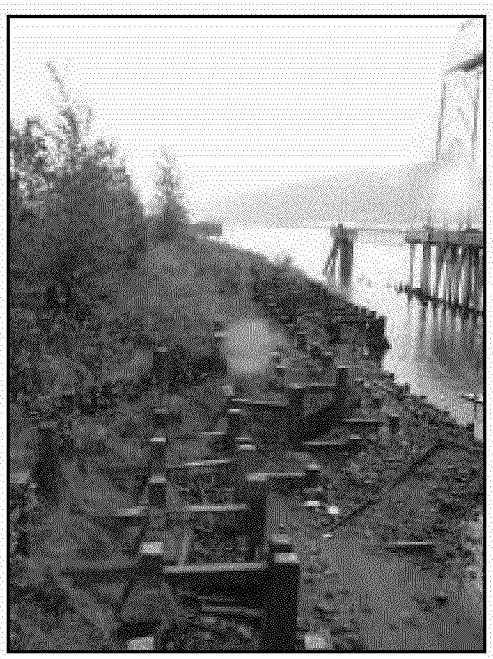
Appendix A-4

AERIAL PHOTOGRAPH (MAY 8, 2002) AND PHOTO LOCATIONS

PRJ: 0219-010-900	DATE: MAR 19, 2007
REV: 0	BY: RCR CHK: MCL

KMB00008494

1) Riverbank along shoreline north of Berth 401



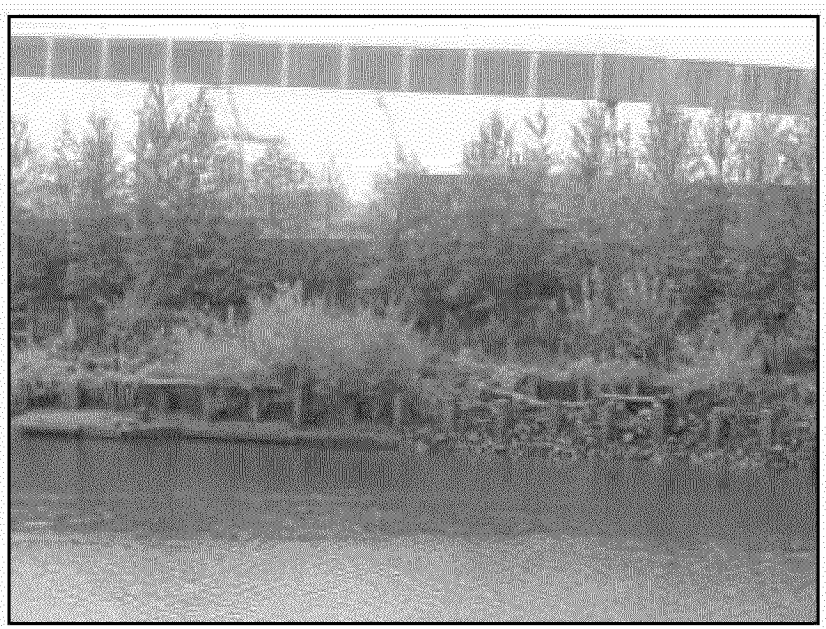
2) Shoreline near Berth 401

KMB00008495

3) Concrete wall, top of bank on shoreline near Berth 401

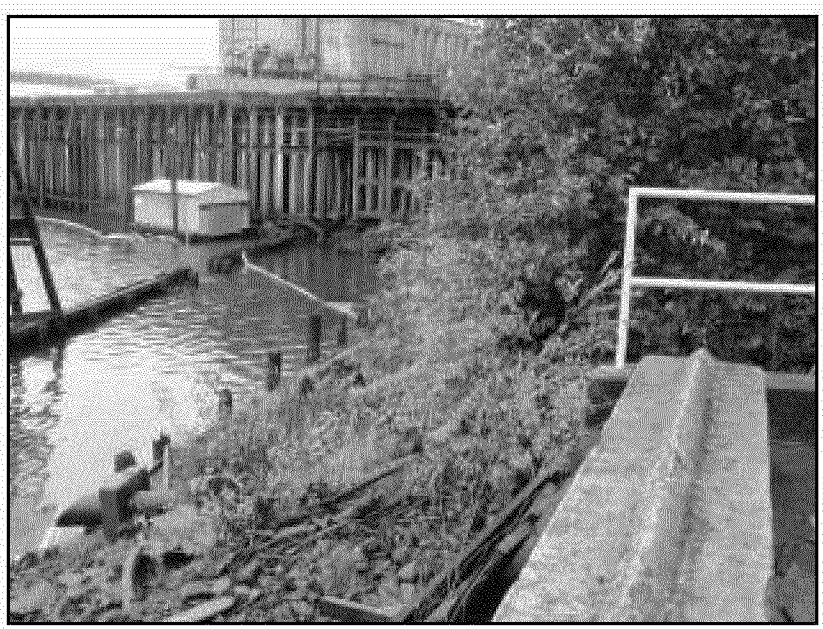
4) Top of bank, shoreline near Berth 401

5) Concrete pad along north edge of Slip 1



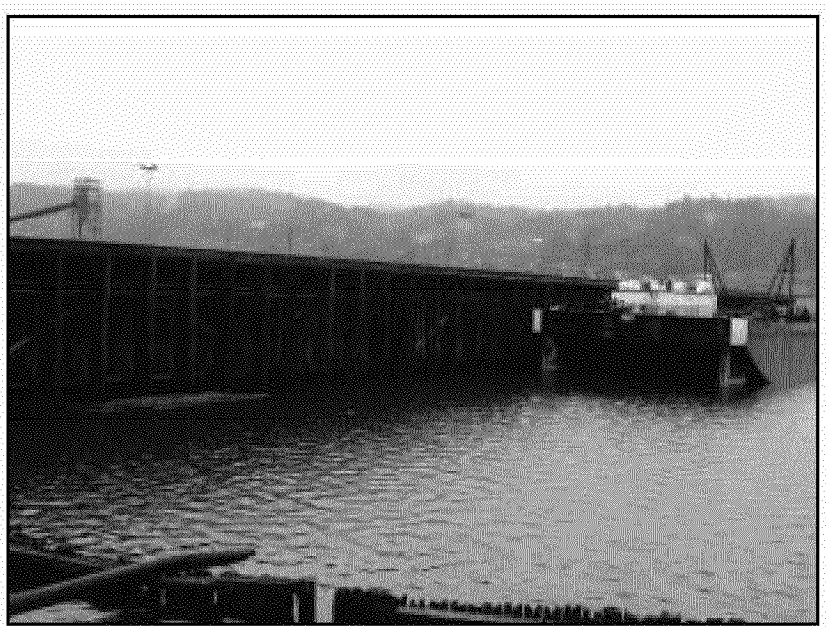
6) Shoreline, north side Slip 1

7) Location of former warehouse, Pier 1

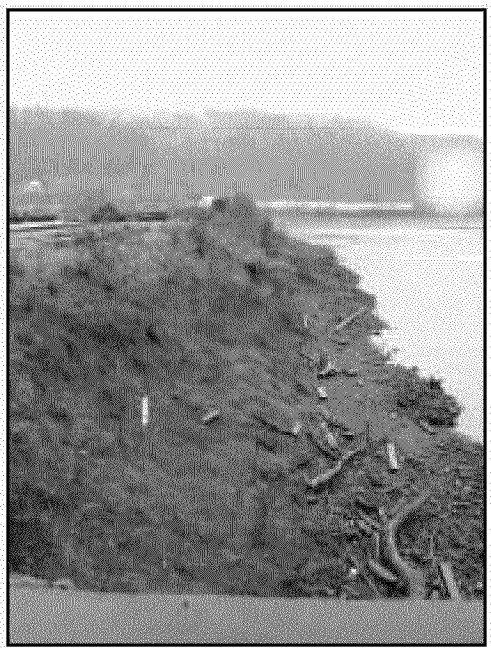


8) Northeast corner of Slip 1

9) Southeast corner of Slip 1



10) Berth 408



11) Shoreline, south side of Slip 1 west of Berth 408

12) Shoreline, south side of Slip 1

13) Surface between Slip 1 and Wheeler Bay

14) Shoreline, Wheeler Bay

KMB00008501

Appendix B-1

Ecological Soil Summary and Risk Screening

Terminal 4 Slip 1 Upland Facility

Appendix B-1a Soil Summary (<3ft) and Risk Screening

Terminal 4 Slip 1 Operable Unit 1 - Oregon Screening Levels (Receptors - Plants)

Constituents of Interest (COI)				Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels	COI Conc. (max)	Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	CPEC due to Multiple COI Risk? (Q=1) (T&E)	CPEC due to Multiple COI Risk? (Q=5)
				Minimum	Maximum	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Plant Receptors							
CASNo	Analyte	Analyte Group	Units												Cij	Tij			Tij/Tj		
7440-36-0	Antimony and compounds	Metals/Inorganics	mg/kg	8/23/2004	3/22/2005	10	0	100%			0.05	1.1	S-7	5	1.1	0.220	No	No	0.001	No	No
7440-38-2	Arsenic	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	0	100%			1.9	6.95	S-5	10	6.95	0.695	No	No	0.004	No	No
7440-41-7	Beryllium and compounds	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	0	100%			0.201	0.572	S-7	10	0.572	0.057	No	No	0.000	No	No
7440-43-9	Cadmium and compounds	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	0	100%			0.065	1.95	S-7	4	1.95	0.488	No	No	0.003	No	No
75-15-0	Carbon disulfide	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				NA	<5%D	NA	No	No	NA	No	No
7440-50-8	Copper and compounds	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	0	100%			10.9	70.3	S-7	100	70.3	0.703	No	No	0.004	No	No
7439-92-1	*Lead*	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	0	100%			2.4	195	S-7	50	195	3.900	*Yes*	No	0.023	No	No
7439-97-6	Mercury and compounds	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	7	56%	0.02	0.162	0.01	0.215	S-7	0.3	0.215	0.717	No	No	0.004	No	No
7440-02-0	Nickel	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	0	100%			13.7	21.5	SB-95	30	21.5	0.717	No	No	0.004	No	No
7782-49-2	Selenium	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	2	88%	0.1	0.1	0.1	0.593	SB-93	1	0.593	0.593	No	No	0.003	No	No
7440-22-4	Silver and compounds	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	3	81%	0.465	0.568	0.016	1.33	S-7	2	1.33	0.665	No	No	0.004	No	No
7440-28-0	Thallium	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	5	69%	0.465	0.568	0.04	0.118	S-7	1	0.118	0.118	No	No	0.001	No	No
7440-47-3	*Total Chromium*	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	0	100%			10.3	152	S-7	1	152	152.000	*Yes*	*Yes*	0.887	*Yes*	*Yes*
7440-66-6	*Zinc*	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	0	100%			40.6	521	S-7	50	521	10.420	*Yes*	*Yes*	0.061	*Yes*	No
91-57-6	2-Methylnaphthalene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	3/22/2005	24	2	92%	0.33	0.33	0.0006	0.065	S-7	NA	0.065	NA	No	No	NA	No	No
83-32-9	Acenaphthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	17	59%	0.0035	0.34	0.0003	0.35	S-7	20	0.35	0.018	No	No	0.000	No	No
208-96-8	Acenaphthylene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	14	66%	0.0035	0.33	0.0003	0.223	S-13	NA	0.223	NA	No	No	NA	No	No
120-12-7	Anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	7	83%	0.005	0.0152	0.0003	0.627	S-13	NA	0.627	NA	No	No	NA	No	No
56-55-3	Benzo[a]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	2	95%	0.0143	0.0144	0.0009	3.9	S-12	NA	3.9	NA	No	No	NA	No	No
50-32-8	Benzo[a]pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	0	100%			0.0007	6	S-12	NA	6	NA	No	No	NA	No	No
205-99-2	Benzo[b]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	1	98%	0.0143	0.0143	0.001	6.2	S-12	NA	6.2	NA	No	No	NA	No	No
191-24-2	Benzo[g,h,i]perylene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	1	98%	0.0143	0.0143	0.0009	5	S-12	NA	5	NA	No	No	NA	No	No
207-08-9	Benzo[k]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	2	95%	0.0143	0.0144	0.0007	4.2	S-12	NA	4.2	NA	No	No	NA	No	No
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	SVOC, Phthalate Esters	mg/kg	8/24/2004	3/22/2005	8	4	50%	0.33	0.33	0.06	0.72	S-11	NA	0.72	NA	No	No	NA	No	No
218-01-9	Chrysene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	1	98%	0.0143	0.0143	0.0009	4.9	S-12	NA	4.9	NA	No	No	NA	No	No
99-87-6	Cymene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
53-70-3	Dibenz[ah]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	8	80%	0.0049	0.33	0.0003	1.1	S-12	NA	1.1	NA	No	No	NA	No	No
132-64-9	Dibenzofuran	SVOC, Oxygen-Containing	mg/kg	8/23/2004	3/22/2005	22	6	73%	0.0049	0.34	0.0002	0.1	S-7	NA	0.1	NA	No	No	NA	No	No
84-74-2	Di-n-butyl phthalate	SVOC, Phthalate Esters	mg/kg	8/24/2004	3/22/2005	8	4	50%	0.33	0.33	0.019	0.071	S-11	200	0.071	0.000	No	No	0.000	No	No
206-44-0	Fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	1	98%	0.0143	0.0143	0.0013	6.4	S-12	NA	6.4	NA	No	No	NA	No	No
86-73-7	Fluorene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	19	54%	0.0035	0.34	0.0004	0.18	S-7	NA	0.18	NA	No	No	NA	No	No
193-39-5	Indeno[1,2,3-cd]pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	2	95%	0.0143	0.0144	0.0009	5.4	S-12	NA	5.4	NA	No	No	NA	No	No
91-20-3	Naphthalene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	45	17	62%	0.0075	0.33	0.0011	0.091	S-7	10	0.091	0.009	No	No	0.000	No	No
85-01-8	Phenanthrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	2	95%	0.0143	0.0144	0.0006	2	S-12	NA	2	NA	No	No	NA	No	No
129-00-0	Pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	0	100%			0.0015	5.8	S-12	NA	5.8	NA	No	No	NA	No	No
11097-69-1	Aroclor 1254	PCBs Aroclors	mg/kg	8/23/2004	9/13/2004	15	5	67%	0.037	0.13	0.014	0.69	S-2	NA	0.69	NA	No	No	NA	No	No
11096-82-5	Aroclor 1260	PCBs Aroclors	mg/kg	8/23/2004	9/13/2004	15	6	60%	0.037	0.1	0.033	0.53	S-3	NA	0.53	NA	No	No	NA	No	No
37324-23-5	Aroclor 1262	PCBs Aroclors	mg/kg	9/2/2004	9/2/2004	1	1	0%	0.037	0.037				NA	<5%D	NA	No	No	NA	No	No
11100-14-4	Aroclor 1268	PCBs Aroclors	mg/kg	9/2/2004	9/2/2004	1	1	0%	0.037	0.037				NA	<5%D	NA	No	No	NA	No	No
309-00-2	Aldrin	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	22	0%	0.001	0.067				NA	<5%D	NA	No	No	NA	No	No
5103-71-9	alpha-Chlordane	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	18	18%	0.001	0.067	0.0003	0.0034	SB-25	NA	0.0034	NA	No	No	NA	No	No
12789-03-6	Chlordane (technical)	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	18	18%	0.001	0.134	0.0004	0.0048	SB-25	NA	0.0048	NA	No	No	NA	No	No
72-54-8	DDD	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	20	9%	0.002	0.134	0.0004	0.0007	SB-92	NA	0.00066	NA	No	No	NA	No	No
72-55-9	DDE	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	14	36%	0.0018	0.134	0.0009	0.0086	SB-19	NA	0.0086	NA	No	No	NA	No	No
50-29-3	DDT	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	11	50%	0.0018	0.134	0.0002	0.0089	SB-95	NA	0.00887	NA	No	No	NA	No	No
319-86-8	delta-BHC	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	22	0%	0.001	0.134				NA	<5%D	NA	No	No	NA	No	No
60-57-1	Dieldrin	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	16	27%	0.0018	0.134	0.0004	0.0012	SB-95	NA	0.00115	NA	No	No	NA	No	No
959-98-8	Endosulfan I	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	22	0%	0.001	0.067				NA	<5%D	NA	No	No	NA	No	No
72-20-8	Endrin	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	20	9%	0.0018	0.134	0.0017	0.0022	SB-25	NA	0.0022	NA	No	No	NA	No	No
7421-93-4	Endrin Aldehyde	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	20	9%	0.0018	0.134	0.0004	0.0014	SB-27	NA	0.0014	NA	No	No	NA	No	No
53494-70-5	Endrin Ketone	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	21	5%	0.0018	0.134	0.0019	0.0019	SB-27	NA	<5%D	NA	No	No	NA	No	No

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Appendix B-1a Soil Summary (<3ft) and Risk Screening

Terminal 4 Slip 1 Operable Unit 1 - Oregon Screening Levels (Receptors - Plants)

Constituents of Interest (COI)				Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels	COI Conc. (max)	Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	CPEC due to Multiple COI Risk? (Q=1) (T&E)	CPEC due to Multiple COI Risk? (Q=5)
				Minimum	Maximum	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Plant Receptors							
CASNo	Analyte	Analyte Group	Units												Cij	Tij			Tij/Tj		
76-44-8	Heptachlor	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	22	0%	0.001	0.067				NA	<5%D	NA	No	No	NA	No	No
72-43-5	Methoxychlor	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	21	5%	0.002	0.134	0.0045	0.0045	SB-26	NA	<5%D	NA	No	No	NA	No	No
87-61-6	1,2,3-Trichlorobenzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.001	0.0011				NA	<5%D	NA	No	No	NA	No	No
95-63-6	1,2,4-Trimethylbenzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
108-67-8	1,3,5-Trimethylbenzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
106-46-7	1,4-Dichlorobenzene	SVOC, Halogenated	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				NA	<5%D	NA	No	No	NA	No	No
78-93-3	2-Butanone	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
67-64-1	Acetone	VOC	mg/kg	9/2/2004	9/7/2004	4	2	50%	0.022	0.023	0.013	0.017	SB-33	NA	0.017	NA	No	No	NA	No	No
71-43-2	Benzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				NA	<5%D	NA	No	No	NA	No	No
56-23-5	Carbon tetrachloride	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				NA	<5%D	NA	No	No	NA	No	No
108-90-7	Chlorobenzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				NA	<5%D	NA	No	No	NA	No	No
67-66-3	Chloroform	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				NA	<5%D	NA	No	No	NA	No	No
98-82-8	Cumene (isopropylbenzene)	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
DRO	Diesel Range	Petroleum Hydrocarbons	mg/kg	8/23/2004	9/7/2005	35	30	14%	18	50	19	110	SB-31	NA	110	NA	No	No	NA	No	No
100-41-4	Ethylbenzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				NA	<5%D	NA	No	No	NA	No	No
GRO	Gasoline Range	Petroleum Hydrocarbons	mg/kg	8/23/2004	3/22/2005	21	18	14%	3.6	20	1.5	6.7	SB-32	NA	6.7	NA	No	No	NA	No	No
87-68-3	Hexachlorobutadiene	SVOC, Halogenated	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
75-09-2	Methylene chloride	VOC	mg/kg	9/2/2004	9/7/2004	4	0	100%			0.0013	0.0046	SB-18	NA	0.0046	NA	No	No	NA	No	No
104-51-8	n-Butylbenzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
103-65-1	n-Propylbenzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
95-47-6	o-Xylene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				1	<5%D	NA	No	No	NA	No	No
108-95-2	Phenol	SVOC, Phenols and Substituted Phenols	mg/kg	8/24/2004	3/22/2005	8	5	38%	0.33	0.33	0.024	0.05	S-11	70	0.05	0.001	No	No	0.000	No	No
RRO	Residual Range	Petroleum Hydrocarbons	mg/kg	8/23/2004	9/7/2005	32	20	38%	53.6	100	27.4	1200	SB-31	NA	1200	NA	No	No	NA	No	No
135-9-88	sec-Butylbenzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
127-18-4	Tetrachloroethylene (PCE)	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				10	<5%D	NA	No	No	NA	No	No
108-88-3	Toluene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				200	<5%D	NA	No	No	NA	No	No
79-01-6	Trichloroethylene (TCE)	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057			SB-83	NA	<5%D	NA	No	No	NA	No	No
1330-20-7	Xylene (mixed)	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				100	<5%D	NA	No	No	NA	No	No

Notes:
* All Level II SLV criteria from Oregon DEQ, Table 1, Guidance for Ecological Risk Assessment, December 2001)
VOC - volatile organic compound
SVOC - semi-volatile organic compound
ND - non-detect
mg/kg - milligram per kilogram
min - minimum
max - maximum
NA - not available
Q = 1 for T&E species
Q = 5 for non-T&E species
DEQ - Oregon Department of Environmental Quality
EPA - U.S. Environmental Protection Agency
COI - constituent of interest
CPEC - constituent of potential ecological concern
SLV - screening level value
Cij -concentration of COI i in medium j
Tij - toxicity ratios for COI i in medium j
T&E - listed threatened and endangered species

Tj = Sum of toxicity ratios for all COIs in medium j 171.320
Nij = Number of i COIs in medium j 17.000
1/Nij= 0.059

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Appendix B-1b Soil Summary (<3ft) and Risk Screening

Terminal 4 Slip 1 Operable Unit 1 - Oregon Screening Levels (Receptors - Invertebrates)

Constituents of Interest (COI)				Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels	COI Conc. (max)	Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	CPEC due to Multiple COI Risk? (Q=1) (T&E)	CPEC due to Multiple COI Risk? (Q=5)
				Minimum	Maximum	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Invertebrate Receptors							
CASNo	Analyte	Analyte Group	Units												Cij	Tij			Tij/Tj		
7440-36-0	Antimony and compounds	Metals/Inorganics	mg/kg	8/23/2004	3/22/2005	10	0	100%			0.05	1.1	S-7	NA	1.1	NA	No	No	NA	No	No
7440-38-2	Arsenic	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	0	100%			1.9	6.95	S-5	60	6.95	0.116	No	No	0.000	No	No
7440-41-7	Beryllium and compounds	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	0	100%			0.201	0.572	S-7	NA	0.572	NA	No	No	NA	No	No
7440-43-9	Cadmium and compounds	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	0	100%			0.065	1.95	S-7	20	1.95	0.098	No	No	0.000	No	No
75-15-0	Carbon disulfide	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				NA	<5%D	NA	No	No	NA	No	No
7440-50-8	Copper and compounds	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	0	100%			10.9	70.3	S-7	50	70.3	1.406	Yes	No	0.004	No	No
7439-92-1	Lead	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	0	100%			2.4	195	S-7	500	195	0.390	No	No	0.001	No	No
7439-97-6	Mercury and compounds	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	7	56%	0.02	0.162	0.01	0.215	S-7	0.1	0.215	2.150	Yes	No	0.006	No	No
7440-02-0	Nickel	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	0	100%			13.7	21.5	SB-95	200	21.5	0.108	No	No	0.000	No	No
7782-49-2	Selenium	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	2	88%	0.1	0.1	0.1	0.593	SB-93	70	0.593	0.008	No	No	0.000	No	No
7440-22-4	Silver and compounds	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	3	81%	0.465	0.568	0.016	1.33	S-7	50	1.33	0.027	No	No	0.000	No	No
7440-28-0	Thallium	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	5	69%	0.465	0.568	0.04	0.118	S-7	NA	0.118	NA	No	No	NA	No	No
7440-47-3	Total Chromium	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	0	100%			10.3	152	S-7	0.4	152	380.000	Yes	Yes	0.982	Yes	Yes
7440-66-6	Zinc	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	0	100%			40.6	521	S-7	200	521	2.605	Yes	No	0.007	No	No
91-57-6	2-Methylnaphthalene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	3/22/2005	24	2	92%	0.33	0.33	0.0006	0.065	S-7	NA	0.065	NA	No	No	NA	No	No
83-32-9	Acenaphthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	17	59%	0.0035	0.34	0.0003	0.35	S-7	NA	0.35	NA	No	No	NA	No	No
208-96-8	Acenaphthylene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	14	66%	0.0035	0.33	0.0003	0.223	S-13	NA	0.223	NA	No	No	NA	No	No
120-12-7	Anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	7	83%	0.005	0.0152	0.0003	0.627	S-13	NA	0.627	NA	No	No	NA	No	No
56-55-3	Benzo[a]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	2	95%	0.0143	0.0144	0.0009	3.9	S-12	NA	3.9	NA	No	No	NA	No	No
50-32-8	Benzo[a]pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	0	100%			0.0007	6	S-12	NA	6	NA	No	No	NA	No	No
205-99-2	Benzo[b]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	1	98%	0.0143	0.0143	0.001	6.2	S-12	NA	6.2	NA	No	No	NA	No	No
191-24-2	Benzo[g,h,i]perylene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	1	98%	0.0143	0.0143	0.0009	5	S-12	NA	5	NA	No	No	NA	No	No
207-08-9	Benzo[k]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	2	95%	0.0143	0.0144	0.0007	4.2	S-12	NA	4.2	NA	No	No	NA	No	No
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	SVOC, Phthalate Esters	mg/kg	8/24/2004	3/22/2005	8	4	50%	0.33	0.33	0.06	0.72	S-11	NA	0.72	NA	No	No	NA	No	No
218-01-9	Chrysene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	1	98%	0.0143	0.0143	0.0009	4.9	S-12	NA	4.9	NA	No	No	NA	No	No
99-87-6	Cymene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
53-70-3	Dibenz[ah]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	8	80%	0.0049	0.33	0.0003	1.1	S-12	NA	1.1	NA	No	No	NA	No	No
132-64-9	Dibenzofuran	SVOC, Oxygen-Containing	mg/kg	8/23/2004	3/22/2005	22	6	73%	0.0049	0.34	0.0002	0.1	S-7	NA	0.1	NA	No	No	NA	No	No
84-74-2	Di-n-butyl phthalate	SVOC, Phthalate Esters	mg/kg	8/24/2004	3/22/2005	8	4	50%	0.33	0.33	0.019	0.071	S-11	NA	0.071	NA	No	No	NA	No	No
206-44-0	Fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	1	98%	0.0143	0.0143	0.0013	6.4	S-12	NA	6.4	NA	No	No	NA	No	No
86-73-7	Fluorene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	19	54%	0.0035	0.34	0.0004	0.18	S-7	30	0.18	0.006	No	No	0.000	No	No
193-39-5	Indeno[1,2,3-cd]pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	2	95%	0.0143	0.0144	0.0009	5.4	S-12	NA	5.4	NA	No	No	NA	No	No
91-20-3	Naphthalene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	45	17	62%	0.0075	0.33	0.0011	0.091	S-7	NA	0.091	NA	No	No	NA	No	No
85-01-8	Phenanthrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	2	95%	0.0143	0.0144	0.0006	2	S-12	NA	2	NA	No	No	NA	No	No
129-00-0	Pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	0	100%			0.0015	5.8	S-12	NA	5.8	NA	No	No	NA	No	No
11097-69-1	Aroclor 1254	PCBs Aroclors	mg/kg	8/23/2004	9/13/2004	15	5	67%	0.037	0.13	0.014	0.69	S-2	NA	0.69	NA	No	No	NA	No	No
11096-82-5	Aroclor 1260	PCBs Aroclors	mg/kg	8/23/2004	9/13/2004	15	6	60%	0.037	0.1	0.033	0.53	S-3	NA	0.53	NA	No	No	NA	No	No
37324-23-5	Aroclor 1262	PCBs Aroclors	mg/kg	9/2/2004	9/2/2004	1	1	0%	0.037	0.037				NA	<5%D	NA	No	No	NA	No	No
11100-14-4	Aroclor 1268	PCBs Aroclors	mg/kg	9/2/2004	9/2/2004	1	1	0%	0.037	0.037				NA	<5%D	NA	No	No	NA	No	No
309-00-2	Aldrin	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	22	0%	0.001	0.067				NA	<5%D	NA	No	No	NA	No	No
5103-71-9	alpha-Chlordane	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	18	18%	0.001	0.067	0.0003	0.0034	SB-25	NA	0.0034	NA	No	No	NA	No	No
12789-03-6	Chlordane (technical)	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	18	18%	0.001	0.134	0.0004	0.0048	SB-25	NA	0.0048	NA	No	No	NA	No	No
72-54-8	DDD	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	20	9%	0.002	0.134	0.0004	0.0007	SB-92	NA	0.00066	NA	No	No	NA	No	No
72-55-9	DDE	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	14	36%	0.0018	0.134	0.0009	0.0086	SB-19	NA	0.0086	NA	No	No	NA	No	No
50-29-3	DDT	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	11	50%	0.0018	0.134	0.0002	0.0089	SB-95	NA	0.00887	NA	No	No	NA	No	No
319-86-8	delta-BHC	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	22	0%	0.001	0.134				NA	<5%D	NA	No	No	NA	No	No
60-57-1	Dieldrin	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	16	27%	0.0018	0.134	0.0004	0.0012	SB-95	NA	0.00115	NA	No	No	NA	No	No
959-98-8	Endosulfan I	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	22	0%	0.001	0.067				NA	<5%D	NA	No	No	NA	No	No
72-20-8	Endrin	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	20	9%	0.0018	0.134	0.0017	0.0022	SB-25	NA	0.0022	NA	No	No	NA	No	No
7421-93-4	Endrin Aldehyde	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	20	9%	0.0018	0.134	0.0004	0.0014	SB-27	NA	0.0014	NA	No	No	NA	No	No
53494-70-5	Endrin Ketone	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	21	5%	0.0018	0.134	0.0019	0.0019	SB-27	NA	<5%D	NA	No	No	NA	No	No
76-44-8	Heptachlor	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	22	0%	0.001	0.067				NA	<5%D	NA	No	No	NA	No	No
72-43-5	Methoxychlor	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	21	5%	0.002	0.134	0.0045	0.0045	SB-26	NA	<5%D	NA	No	No	NA	No	No
87-61-6	1,2,3-Trichlorobenzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.001	0.0011				20	<5%D	NA	No	No	NA	No	No

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Appendix B-1b Soil Summary (<3ft) and Risk Screening

Terminal 4 Slip 1 Operable Unit 1 - Oregon Screening Levels (Receptors - Invertebrates)

Constituents of Interest (COI)				Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels	COI Conc. (max)	Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	CPEC due to Multiple COI Risk? (Q=1) (T&E)	CPEC due to Multiple COI Risk? (Q=5)
CASNo	Analyte	Analyte Group	Units	Minimum	Maximum	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Invertebrate Receptors	Cij	Tij			Tij/Tj		
95-63-6	1,2,4-Trimethylbenzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
108-67-8	1,3,5-Trimethylbenzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
106-46-7	1,4-Dichlorobenzene	SVOC, Halogenated	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				20	<5%D	NA	No	No	NA	No	No
78-93-3	2-Butanone	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
67-64-1	Acetone	VOC	mg/kg	9/2/2004	9/7/2004	4	2	50%	0.022	0.023	0.013	0.017	SB-33	NA	0.017	NA	No	No	NA	No	No
71-43-2	Benzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				NA	<5%D	NA	No	No	NA	No	No
56-23-5	Carbon tetrachloride	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				1000	<5%D	NA	No	No	NA	No	No
108-90-7	Chlorobenzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				40	<5%D	NA	No	No	NA	No	No
67-66-3	Chloroform	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				NA	<5%D	NA	No	No	NA	No	No
98-82-8	Cumene (isopropylbenzene)	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
DRO	Diesel Range	Petroleum Hydrocarbons	mg/kg	8/23/2004	9/7/2005	35	30	14%	18	50	19	110	SB-31	NA	110	NA	No	No	NA	No	No
100-41-4	Ethylbenzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				NA	<5%D	NA	No	No	NA	No	No
GRO	Gasoline Range	Petroleum Hydrocarbons	mg/kg	8/23/2004	3/22/2005	21	18	14%	3.6	20	1.5	6.7	SB-32	NA	6.7	NA	No	No	NA	No	No
87-68-3	Hexachlorobutadiene	SVOC, Halogenated	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
75-09-2	Methylene chloride	VOC	mg/kg	9/2/2004	9/7/2004	4	0	100%			0.0013	0.0046	SB-18	NA	0.0046	NA	No	No	NA	No	No
104-51-8	n-Butylbenzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
103-65-1	n-Propylbenzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
95-47-6	o-Xylene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				NA	<5%D	NA	No	No	NA	No	No
108-95-2	Phenol	SVOC, Phenols and Substituted Phenols	mg/kg	8/24/2004	3/22/2005	8	5	38%	0.33	0.33	0.024	0.05	S-11	30	0.05	0.002	No	No	0.000	No	No
RRO	Residual Range	Petroleum Hydrocarbons	mg/kg	8/23/2004	9/7/2005	32	20	38%	53.6	100	27.4	1200	SB-31	NA	1200	NA	No	No	NA	No	No
135-9-88	sec-Butylbenzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
127-18-4	Tetrachloroethylene (PCE)	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				NA	<5%D	NA	No	No	NA	No	No
108-88-3	Toluene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				NA	<5%D	NA	No	No	NA	No	No
79-01-6	Trichloroethylene (TCE)	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057			SB-83	NA	<5%D	NA	No	No	NA	No	No
1330-20-7	Xylene (mixed)	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				NA	<5%D	NA	No	No	NA	No	No

Notes:

* All Level II SLV criteria from Oregon DEQ, Table 1, Guidance for Ecological Risk Assessment, December 2001)

VOC - volatile organic compound
SVOC - semi-volatile organic compound
ND - non-detect
mg/kg - milligram per kilogram
min - minimum
max - maximum
NA - not available
Q = 1 for T&E species
Q = 5 for non-T&E species

DEQ - Oregon Department of Environmental Quality
EPA - U.S. Environmental Protection Agency
COI - constituent of interest
CPEC - constituent of potential ecological concern
SLV - screening level value
Cij -concentration of COI i in medium j
Tij - toxicity ratios for COI i in medium j
T&E - listed threatened and endangered species

Tj = Sum of toxicity ratios for all COIs in medium j 386.915
Nij = Number of i COIs in medium j 12.000
1/Nij= 0.083

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Appendix B-1c Soil Summary (<3ft) and Risk Screening

Terminal 4 Slip 1 Operable Unit 1 - Oregon Screening Levels (Receptors - Birds)

Constituents of Interest (COI)				Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels	COI Conc. (max)	Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	CPEC due to Multiple COI Risk? (Q=1) (T&E)	CPEC due to Multiple COI Risk? (Q=5)
				Minimum	Maximum	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Bird Receptors							
CASNo	Analyte	Analyte Group	Units												Cij	Tij			Tij/Tj		
7440-36-0	Antimony and compounds	Metals/Inorganics	mg/kg	8/23/2004	3/22/2005	10	0	100%			0.05	1.1	S-7	NA	1.1	NA	No	No	NA	No	No
7440-38-2	Arsenic	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	0	100%			1.9	6.95	S-5	10	6.95	0.695	No	No	0.011	No	No
7440-41-7	Beryllium and compounds	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	0	100%			0.201	0.572	S-7	NA	0.572	NA	No	No	NA	No	No
7440-43-9	Cadmium and compounds	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	0	100%			0.065	1.95	S-7	6	1.95	0.325	No	No	0.005	No	No
75-15-0	Carbon disulfide	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				NA	<5%D	NA	No	No	NA	No	No
7440-50-8	Copper and compounds	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	0	100%			10.9	70.3	S-7	190	70.3	0.370	No	No	0.006	No	No
7439-92-1	Lead	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	0	100%			2.4	195	S-7	16	195	12.188	Yes	Yes	0.190	Yes	No
7439-97-6	Mercury and compounds	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	7	56%	0.02	0.162	0.01	0.215	S-7	1.5	0.215	0.143	No	No	0.002	No	No
7440-02-0	Nickel	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	0	100%			13.7	21.5	SB-95	320	21.5	0.067	No	No	0.001	No	No
7782-49-2	Selenium	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	2	88%	0.1	0.1	0.1	0.593	SB-93	2	0.593	0.297	No	No	0.005	No	No
7440-22-4	Silver and compounds	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	3	81%	0.465	0.568	0.016	1.33	S-7	NA	1.33	NA	No	No	NA	No	No
7440-28-0	Thallium	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	5	69%	0.465	0.568	0.04	0.118	S-7	NA	0.118	NA	No	No	NA	No	No
7440-47-3	Total Chromium	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	0	100%			10.3	152	S-7	4	152	38.000	Yes	Yes	0.594	Yes	Yes
7440-66-6	Zinc	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	0	100%			40.6	521	S-7	60	521	8.683	Yes	Yes	0.136	Yes	No
91-57-6	2-Methylnaphthalene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	3/22/2005	24	2	92%	0.33	0.33	0.0006	0.065	S-7	NA	0.065	NA	No	No	NA	No	No
83-32-9	Acenaphthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	17	59%	0.0035	0.34	0.0003	0.35	S-7	NA	0.35	NA	No	No	NA	No	No
208-96-8	Acenaphthylene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	14	66%	0.0035	0.33	0.0003	0.223	S-13	NA	0.223	NA	No	No	NA	No	No
120-12-7	Anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	7	83%	0.005	0.0152	0.0003	0.627	S-13	NA	0.627	NA	No	No	NA	No	No
56-55-3	Benzo[a]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	2	95%	0.0143	0.0144	0.0009	3.9	S-12	NA	3.9	NA	No	No	NA	No	No
50-32-8	Benzo[a]pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	0	100%			0.0007	6	S-12	NA	6	NA	No	No	NA	No	No
205-99-2	Benzo[b]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	1	98%	0.0143	0.0143	0.001	6.2	S-12	NA	6.2	NA	No	No	NA	No	No
191-24-2	Benzo[g,h,i]perylene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	1	98%	0.0143	0.0143	0.0009	5	S-12	NA	5	NA	No	No	NA	No	No
207-08-9	Benzo[k]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	2	95%	0.0143	0.0144	0.0007	4.2	S-12	NA	4.2	NA	No	No	NA	No	No
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	SVOC, Phthalate Esters	mg/kg	8/24/2004	3/22/2005	8	4	50%	0.33	0.33	0.06	0.72	S-11	4.5	0.72	0.160	No	No	0.003	No	No
218-01-9	Chrysene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	1	98%	0.0143	0.0143	0.0009	4.9	S-12	NA	4.9	NA	No	No	NA	No	No
99-87-6	Cymene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
53-70-3	Dibenz[ah]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	8	80%	0.0049	0.33	0.0003	1.1	S-12	NA	1.1	NA	No	No	NA	No	No
132-64-9	Dibenzofuran	SVOC, Oxygen-Containing	mg/kg	8/23/2004	3/22/2005	22	6	73%	0.0049	0.34	0.0002	0.1	S-7	NA	0.1	NA	No	No	NA	No	No
84-74-2	Di-n-butyl phthalate	SVOC, Phthalate Esters	mg/kg	8/24/2004	3/22/2005	8	4	50%	0.33	0.33	0.019	0.071	S-11	0.45	0.071	0.158	No	No	0.002	No	No
206-44-0	Fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	1	98%	0.0143	0.0143	0.0013	6.4	S-12	NA	6.4	NA	No	No	NA	No	No
86-73-7	Fluorene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	19	54%	0.0035	0.34	0.0004	0.18	S-7	NA	0.18	NA	No	No	NA	No	No
193-39-5	Indeno[1,2,3-cd]pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	2	95%	0.0143	0.0144	0.0009	5.4	S-12	NA	5.4	NA	No	No	NA	No	No
91-20-3	Naphthalene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	45	17	62%	0.0075	0.33	0.0011	0.091	S-7	NA	0.091	NA	No	No	NA	No	No
85-01-8	Phenanthrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	2	95%	0.0143	0.0144	0.0006	2	S-12	NA	2	NA	No	No	NA	No	No
129-00-0	Pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	0	100%			0.0015	5.8	S-12	NA	5.8	NA	No	No	NA	No	No
11097-69-1	Aroclor 1254	PCBs Aroclors	mg/kg	8/23/2004	9/13/2004	15	5	67%	0.037	0.13	0.014	0.69	S-2	0.7	0.69	0.986	No	No	0.015	No	No
11096-82-5	Aroclor 1260	PCBs Aroclors	mg/kg	8/23/2004	9/13/2004	15	6	60%	0.037	0.1	0.033	0.53	S-3	NA	0.53	NA	No	No	NA	No	No
37324-23-5	Aroclor 1262	PCBs Aroclors	mg/kg	9/2/2004	9/2/2004	1	1	0%	0.037	0.037				NA	<5%D	NA	No	No	NA	No	No
11100-14-4	Aroclor 1268	PCBs Aroclors	mg/kg	9/2/2004	9/2/2004	1	1	0%	0.037	0.037				NA	<5%D	NA	No	No	NA	No	No
309-00-2	Aldrin	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	22	0%	0.001	0.067				NA	<5%D	NA	No	No	NA	No	No
5103-71-9	alpha-Chlordane	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	18	18%	0.001	0.067	0.0003	0.0034	SB-25	9	0.0034	0.000	No	No	0.000	No	No
12789-03-6	Chlordane (technical)	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	18	18%	0.001	0.134	0.0004	0.0048	SB-25	9	0.0048	0.001	No	No	0.000	No	No
72-54-8	DDD	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	20	9%	0.002	0.134	0.0004	0.0007	SB-92	0.01	0.00066	0.066	No	No	0.001	No	No
72-55-9	DDE	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	14	36%	0.0018	0.134	0.0009	0.0086	SB-19	0.01	0.0086	0.860	No	No	0.013	No	No
50-29-3	DDT	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	11	50%	0.0018	0.134	0.0002	0.0089	SB-95	0.01	0.00887	0.887	No	No	0.014	No	No
319-86-8	delta-BHC	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	22	0%	0.001	0.134				2.5	<5%D	NA	No	No	NA	No	No
60-57-1	Dieldrin	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	16	27%	0.0018	0.134	0.0004	0.0012	SB-95	0.3	0.00115	0.004	No	No	0.000	No	No
959-98-8	Endosulfan I	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	22	0%	0.001	0.067				42	<5%D	NA	No	No	NA	No	No
72-20-8	Endrin	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	20	9%	0.0018	0.134	0.0017	0.0022	SB-25	0.04	0.0022	0.055	No	No	0.001	No	No
7421-93-4	Endrin Aldehyde	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	20	9%	0.0018	0.134	0.0004	0.0014	SB-27	0.04	0.0014	0.035	No	No	0.001	No	No
53494-70-5	***Endrin Ketone***	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	21	5%	0.0018	0.134	0.0019	0.0019	SB-27	0.04	<5%D	NA	***ND>SLV***	***ND>SLV***	NA	No	No
76-44-8	Heptachlor	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	22	0%	0.001	0.067				NA	<5%D	NA	No	No	NA	No	No
72-43-5	Methoxychlor	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	21	5%	0.002	0.134	0.0045	0.0045	SB-26	NA	<5%D	NA	No	No	NA	No	No
87-61-6	1,2,3-Trichlorobenzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.001	0.0011				NA	<5%D	NA	No	No	NA	No	No

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Appendix B-1c Soil Summary (<3ft) and Risk Screening

Terminal 4 Slip 1 Operable Unit 1 - Oregon Screening Levels (Receptors - Birds)

Constituents of Interest (COI)				Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels	COI Conc. (max)	Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	CPEC due to Multiple COI Risk? (Q=1) (T&E)	CPEC due to Multiple COI Risk? (Q=5)
				Minimum	Maximum	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Bird Receptors							
CASNo	Analyte	Analyte Group	Units												Cij	Tij			Tij/Tj		
95-63-6	1,2,4-Trimethylbenzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
108-67-8	1,3,5-Trimethylbenzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
106-46-7	1,4-Dichlorobenzene	SVOC, Halogenated	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				NA	<5%D	NA	No	No	NA	No	No
78-93-3	2-Butanone	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
67-64-1	Acetone	VOC	mg/kg	9/2/2004	9/7/2004	4	2	50%	0.022	0.023	0.013	0.017	SB-33	NA	0.017	NA	No	No	NA	No	No
71-43-2	Benzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				NA	<5%D	NA	No	No	NA	No	No
56-23-5	Carbon tetrachloride	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				NA	<5%D	NA	No	No	NA	No	No
108-90-7	Chlorobenzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				NA	<5%D	NA	No	No	NA	No	No
67-66-3	Chloroform	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				NA	<5%D	NA	No	No	NA	No	No
98-82-8	Cumene (isopropylbenzene)	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
DRO	Diesel Range	Petroleum Hydrocarbons	mg/kg	8/23/2004	9/7/2005	35	30	14%	18	50	19	110	SB-31	NA	110	NA	No	No	NA	No	No
100-41-4	Ethylbenzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				NA	<5%D	NA	No	No	NA	No	No
GRO	Gasoline Range	Petroleum Hydrocarbons	mg/kg	8/23/2004	3/22/2005	21	18	14%	3.6	20	1.5	6.7	SB-32	NA	6.7	NA	No	No	NA	No	No
87-68-3	Hexachlorobutadiene	SVOC, Halogenated	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
75-09-2	Methylene chloride	VOC	mg/kg	9/2/2004	9/7/2004	4	0	100%			0.0013	0.0046	SB-18	NA	0.0046	NA	No	No	NA	No	No
104-51-8	n-Butylbenzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
103-65-1	n-Propylbenzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
95-47-6	o-Xylene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				NA	<5%D	NA	No	No	NA	No	No
108-95-2	Phenol	SVOC, Phenols and Substituted Phenols	mg/kg	8/24/2004	3/22/2005	8	5	38%	0.33	0.33	0.024	0.05	S-11	NA	0.05	NA	No	No	NA	No	No
RRO	Residual Range	Petroleum Hydrocarbons	mg/kg	8/23/2004	9/7/2005	32	20	38%	53.6	100	27.4	1200	SB-31	NA	1200	NA	No	No	NA	No	No
135-9-88	sec-Butylbenzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
127-18-4	Tetrachloroethylene (PCE)	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				NA	<5%D	NA	No	No	NA	No	No
108-88-3	Toluene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				NA	<5%D	NA	No	No	NA	No	No
79-01-6	Trichloroethylene (TCE)	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057			SB-83	NA	<5%D	NA	No	No	NA	No	No
1330-20-7	Xylene (mixed)	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				NA	<5%D	NA	No	No	NA	No	No

Notes:

* All Level II SLV criteria from Oregon DEQ, Table 1, Guidance for Ecological Risk Assessment, December 2001)

VOC - volatile organic compound
SVOC - semi-volatile organic compound
ND - non-detect
mg/kg - milligram per kilogram
min - minimum
max - maximum
NA - not available
Q = 1 for T&E species
Q = 5 for non-T&E species

DEQ - Oregon Department of Environmental Quality
EPA - U.S. Environmental Protection Agency
COI - constituent of interest
CPEC - constituent of potential ecological concern
SLV - screening level value
Cij -concentration of COI i in medium j
Tij - toxicity ratios for COI i in medium j
T&E - listed threatened and endangered species

Tj = Sum of toxicity ratios for all COIs in medium j 63.979
Nij = Number of i COIs in medium j 20.000
1/Nij= 0.050

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Appendix B-1d Soil Summary (<3ft) and Risk Screening

Terminal 4 Slip 1 Operable Unit 1 - Oregon Screening Levels (Receptors - Mammals)

Constituents of Interest (COI)				Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels	COI Conc. (max)	Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	CPEC due to Multiple COI Risk? (Q=1) (T&E)	CPEC due to Multiple COI Risk? (Q=5)
				Minimum	Maximum	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Mammal Receptors							
CASNo	Analyte	Analyte Group	Units												Cij	Tij			Tij/Tj		
7440-36-0	Antimony and compounds	Metals/Inorganics	mg/kg	8/23/2004	3/22/2005	10	0	100%			0.05	1.1	S-7	15	1.1	0.073	No	No	0.001	No	No
7440-38-2	Arsenic	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	0	100%			1.9	6.95	S-5	29	6.95	0.240	No	No	0.005	No	No
7440-41-7	Beryllium and compounds	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	0	100%			0.201	0.572	S-7	83	0.572	0.007	No	No	0.000	No	No
7440-43-9	Cadmium and compounds	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	0	100%			0.065	1.95	S-7	125	1.95	0.016	No	No	0.000	No	No
75-15-0	Carbon disulfide	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				NA	<5%D	NA	No	No	NA	No	No
7440-50-8	Copper and compounds	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	0	100%			10.9	70.3	S-7	390	70.3	0.180	No	No	0.004	No	No
7439-92-1	Lead	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	0	100%			2.4	195	S-7	4000	195	0.049	No	No	0.001	No	No
7439-97-6	Mercury and compounds	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	7	56%	0.02	0.162	0.01	0.215	S-7	73	0.215	0.003	No	No	0.000	No	No
7440-02-0	Nickel	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	0	100%			13.7	21.5	SB-95	625	21.5	0.034	No	No	0.001	No	No
7782-49-2	Selenium	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	2	88%	0.1	0.1	0.1	0.593	SB-93	25	0.593	0.024	No	No	0.000	No	No
7440-22-4	Silver and compounds	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	3	81%	0.465	0.568	0.016	1.33	S-7	NA	1.33	NA	No	No	NA	No	No
7440-28-0	Thallium	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	5	69%	0.465	0.568	0.04	0.118	S-7	1	0.118	0.118	No	No	0.002	No	No
7440-47-3	Total Chromium	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	0	100%			10.3	152	S-7	340000	152	0.000	No	No	0.000	No	No
7440-66-6	Zinc	Metals/Inorganics	mg/kg	8/23/2004	9/7/2005	16	0	100%			40.6	521	S-7	20000	521	0.026	No	No	0.001	No	No
91-57-6	2-Methylnaphthalene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	3/22/2005	24	2	92%	0.33	0.33	0.0006	0.065	S-7	NA	0.065	NA	No	No	NA	No	No
83-32-9	Acenaphthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	17	59%	0.0035	0.34	0.0003	0.35	S-7	NA	0.35	NA	No	No	NA	No	No
208-96-8	Acenaphthylene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	14	66%	0.0035	0.33	0.0003	0.223	S-13	NA	0.223	NA	No	No	NA	No	No
120-12-7	Anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	7	83%	0.005	0.0152	0.0003	0.627	S-13	NA	0.627	NA	No	No	NA	No	No
56-55-3	Benzo[a]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	2	95%	0.0143	0.0144	0.0009	3.9	S-12	NA	3.9	NA	No	No	NA	No	No
50-32-8	Benzo[a]pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	0	100%			0.0007	6	S-12	125	6	0.048	No	No	0.001	No	No
205-99-2	Benzo[b]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	1	98%	0.0143	0.0143	0.001	6.2	S-12	NA	6.2	NA	No	No	NA	No	No
191-24-2	Benzo[g,h,i]perylene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	1	98%	0.0143	0.0143	0.0009	5	S-12	NA	5	NA	No	No	NA	No	No
207-08-9	Benzo[k]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	2	95%	0.0143	0.0144	0.0007	4.2	S-12	NA	4.2	NA	No	No	NA	No	No
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	SVOC, Phthalate Esters	mg/kg	8/24/2004	3/22/2005	8	4	50%	0.33	0.33	0.06	0.72	S-11	1020	0.72	0.001	No	No	0.000	No	No
218-01-9	Chrysene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	1	98%	0.0143	0.0143	0.0009	4.9	S-12	NA	4.9	NA	No	No	NA	No	No
99-87-6	Cymene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
53-70-3	Dibenz[ah]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	8	80%	0.0049	0.33	0.0003	1.1	S-12	NA	1.1	NA	No	No	NA	No	No
132-64-9	Dibenzofuran	SVOC, Oxygen-Containing	mg/kg	8/23/2004	3/22/2005	22	6	73%	0.0049	0.34	0.0002	0.1	S-7	0.002	0.1	50.000	Yes	Yes	0.981	Yes	Yes
84-74-2	Di-n-butyl phthalate	SVOC, Phthalate Esters	mg/kg	8/24/2004	3/22/2005	8	4	50%	0.33	0.33	0.019	0.071	S-11	30000	0.071	0.000	No	No	0.000	No	No
206-44-0	Fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	1	98%	0.0143	0.0143	0.0013	6.4	S-12	NA	6.4	NA	No	No	NA	No	No
86-73-7	Fluorene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	19	54%	0.0035	0.34	0.0004	0.18	S-7	NA	0.18	NA	No	No	NA	No	No
193-39-5	Indeno[1,2,3-cd]pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	2	95%	0.0143	0.0144	0.0009	5.4	S-12	NA	5.4	NA	No	No	NA	No	No
91-20-3	Naphthalene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	45	17	62%	0.0075	0.33	0.0011	0.091	S-7	3900	0.091	0.000	No	No	0.000	No	No
85-01-8	Phenanthrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	2	95%	0.0143	0.0144	0.0006	2	S-12	NA	2	NA	No	No	NA	No	No
129-00-0	Pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	8/23/2004	9/7/2005	41	0	100%			0.0015	5.8	S-12	NA	5.8	NA	No	No	NA	No	No
11097-69-1	Aroclor 1254	PCBs Aroclors	mg/kg	8/23/2004	9/13/2004	15	5	67%	0.037	0.13	0.014	0.69	S-2	4	0.69	0.173	No	No	0.003	No	No
11096-82-5	Aroclor 1260	PCBs Aroclors	mg/kg	8/23/2004	9/13/2004	15	6	60%	0.037	0.1	0.033	0.53	S-3	NA	0.53	NA	No	No	NA	No	No
37324-23-5	Aroclor 1262	PCBs Aroclors	mg/kg	9/2/2004	9/2/2004	1	1	0%	0.037	0.037				NA	<5%D	NA	No	No	NA	No	No
11100-14-4	Aroclor 1268	PCBs Aroclors	mg/kg	9/2/2004	9/2/2004	1	1	0%	0.037	0.037				NA	<5%D	NA	No	No	NA	No	No
309-00-2	Aldrin	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	22	0%	0.001	0.067				25	<5%D	NA	No	No	NA	No	No
5103-71-9	alpha-Chlordane	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	18	18%	0.001	0.067	0.0003	0.0034	SB-25	250	0.0034	0.000	No	No	0.000	No	No
12789-03-6	Chlordane (technical)	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	18	18%	0.001	0.134	0.0004	0.0048	SB-25	250	0.0048	0.000	No	No	0.000	No	No
72-54-8	DDD	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	20	9%	0.002	0.134	0.0004	0.0007	SB-92	100	0.00066	0.000	No	No	0.000	No	No
72-55-9	DDE	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	14	36%	0.0018	0.134	0.0009	0.0086	SB-19	100	0.0086	0.000	No	No	0.000	No	No
50-29-3	DDT	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	11	50%	0.0018	0.134	0.0002	0.0089	SB-95	100	0.00887	0.000	No	No	0.000	No	No
319-86-8	delta-BHC	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	22	0%	0.001	0.134				200	<5%D	NA	No	No	NA	No	No
60-57-1	Dieldrin	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	16	27%	0.0018	0.134	0.0004	0.0012	SB-95	3	0.00115	0.000	No	No	0.000	No	No
959-98-8	Endosulfan I	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	22	0%	0.001	0.067				20	<5%D	NA	No	No	NA	No	No
72-20-8	Endrin	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	20	9%	0.0018	0.134	0.0017	0.0022	SB-25	5	0.0022	0.000	No	No	0.000	No	No
7421-93-4	Endrin Aldehyde	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	20	9%	0.0018	0.134	0.0004	0.0014	SB-27	5	0.0014	0.000	No	No	0.000	No	No
53494-70-5	Endrin Ketone	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	21	5%	0.0018	0.134	0.0019	0.0019	SB-27	5	<5%D	NA	No	No	NA	No	No
76-44-8	Heptachlor	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	22	0%	0.001	0.067				15	<5%D	NA	No	No	NA	No	No
72-43-5	Methoxychlor	Organochlorine Pesticides	mg/kg	8/23/2004	9/7/2005	22	21	5%	0.002	0.134	0.0045	0.0045	SB-26	500	<5%D	NA	No	No	NA	No	No
87-61-6	1,2,3-Trichlorobenzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.001	0.0011				NA	<5%D	NA	No	No	NA	No	No

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Appendix B-1d Soil Summary (<3ft) and Risk Screening

Terminal 4 Slip 1 Operable Unit 1 - Oregon Screening Levels (Receptors - Mammals)

Constituents of Interest (COI)				Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels	COI Conc. (max)	Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	CPEC due to Multiple COI Risk? (Q=1) (T&E)	CPEC due to Multiple COI Risk? (Q=5)
				Minimum	Maximum	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Mammal Receptors							
CASNo	Analyte	Analyte Group	Units												Cij	Tij			Tij/Tj		
95-63-6	1,2,4-Trimethylbenzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
108-67-8	1,3,5-Trimethylbenzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
106-46-7	1,4-Dichlorobenzene	SVOC, Halogenated	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				NA	<5%D	NA	No	No	NA	No	No
78-93-3	2-Butanone	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				200000	<5%D	NA	No	No	NA	No	No
67-64-1	Acetone	VOC	mg/kg	9/2/2004	9/7/2004	4	2	50%	0.022	0.023	0.013	0.017	SB-33	1250	0.017	0.000	No	No	0.000	No	No
71-43-2	Benzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				3300	<5%D	NA	No	No	NA	No	No
56-23-5	Carbon tetrachloride	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				2000	<5%D	NA	No	No	NA	No	No
108-90-7	Chlorobenzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				NA	<5%D	NA	No	No	NA	No	No
67-66-3	Chloroform	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				1875	<5%D	NA	No	No	NA	No	No
98-82-8	Cumene (isopropylbenzene)	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
DRO	Diesel Range	Petroleum Hydrocarbons	mg/kg	8/23/2004	9/7/2005	35	30	14%	18	50	19	110	SB-31	NA	110	NA	No	No	NA	No	No
100-41-4	Ethylbenzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				NA	<5%D	NA	No	No	NA	No	No
GRO	Gasoline Range	Petroleum Hydrocarbons	mg/kg	8/23/2004	3/22/2005	21	18	14%	3.6	20	1.5	6.7	SB-32	NA	6.7	NA	No	No	NA	No	No
87-68-3	Hexachlorobutadiene	SVOC, Halogenated	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
75-09-2	Methylene chloride	VOC	mg/kg	9/2/2004	9/7/2004	4	0	100%			0.0013	0.0046	SB-18	730	0.0046	0.000	No	No	0.000	No	No
104-51-8	n-Butylbenzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
103-65-1	n-Propylbenzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
95-47-6	o-Xylene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				NA	<5%D	NA	No	No	NA	No	No
108-95-2	Phenol	SVOC, Phenols and Substituted Phenols	mg/kg	8/24/2004	3/22/2005	8	5	38%	0.33	0.33	0.024	0.05	S-11	NA	0.05	NA	No	No	NA	No	No
RRO	Residual Range	Petroleum Hydrocarbons	mg/kg	8/23/2004	9/7/2005	32	20	38%	53.6	100	27.4	1200	SB-31	NA	1200	NA	No	No	NA	No	No
135-9-88	sec-Butylbenzene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.022	0.023				NA	<5%D	NA	No	No	NA	No	No
127-18-4	Tetrachloroethylene (PCE)	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				80	<5%D	NA	No	No	NA	No	No
108-88-3	Toluene	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				1440	<5%D	NA	No	No	NA	No	No
79-01-6	Trichloroethylene (TCE)	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057			SB-83	40	<5%D	NA	No	No	NA	No	No
1330-20-7	Xylene (mixed)	VOC	mg/kg	9/2/2004	9/7/2004	4	4	0%	0.0054	0.0057				120	<5%D	NA	No	No	NA	No	No

Notes:

* All Level II SLV criteria from Oregon DEQ, Table 1, Guidance for Ecological Risk Assessment, December 2001).

VOC - volatile organic compound
SVOC - semi-volatile organic compound
ND - non-detect
mg/kg - milligram per kilogram
min - minimum
max - maximum
NA - not available
Q = 1 for T&E species
Q = 5 for non-T&E species

DEQ - Oregon Department of Environmental Quality
EPA - U.S. Environmental Protection Agency
COI - constituent of interest
CPEC - constituent of potential ecological concern
SLV - screening level value
Cij -concentration of COI i in medium j
Tij - toxicity ratios for COI i in medium j
T&E - listed threatened and endangered species

Tj = Sum of toxicity ratios for all COIs in medium j 50.993
Nij = Number of i COIs in medium j 28.000
1/Nij= 0.036

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APPENDIX B-1e Soil Summary (<3ft) with 90UCLs and Risk Screening

Terminal 4 Slip 1 Operable Unit 1 - Oregon Screening Levels (Receptors - Plants)

Constituents of Interest (COI)			Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels	COI Concentration (90 UCL)				Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)
			Minimum	Maximum	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Plant Receptors	Cij	Distribution	Estimation Method	Tij			
CASNo	Analyte	Units																		
7439-92-1	Lead	mg/kg	8/23/2004	9/7/2005	16	0	100%			2.4	195	S-7	50	46.84	Gamma	Approximate Gamma	0.937	No	No
7440-66-6	*Zinc*	mg/kg	8/23/2004	9/7/2005	16	0	100%			40.6	521	S-7	50	204.64	Non-parametric	90% Chebyshev	4.093	*Yes*	No
7440-47-3	*Total Chromium*	mg/kg	8/23/2004	9/7/2005	16	0	100%			10.3	152	S-7	1	50.95	Non-parametric	90% Chebyshev	50.947	*Yes*	*Yes*

Terminal 4 Slip 1 Operable Unit 1 - Oregon Screening Levels (Receptors - Invertebrates)

Constituents of Interest (COI)			Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels	COI Concentration (90 UCL)				Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)
			Minimum	Maximum	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Invertebrate Receptors	Cij	Distribution	Estimation Method	Tij			
CASNo	Analyte	Units																		
7440-50-8	Copper and compounds	mg/kg	8/23/2004	9/7/2005	16	0	100%			10.9	70.3	S-7	50	24.28	Non-parametric	Mod-t (adj for skewness)	0.486	No	No
7440-66-6	*Zinc*	mg/kg	8/23/2004	9/7/2005	16	0	100%			40.6	521	S-7	200	204.64	Non-parametric	90% Chebyshev	1.023	*Yes*	No
7440-47-3	*Total Chromium*	mg/kg	8/23/2004	9/7/2005	16	0	100%			10.3	152	S-7	0.4	50.95	Non-parametric	90% Chebyshev	127.368	*Yes*	*Yes*
7439-97-6	Mercury and compounds	mg/kg	8/23/2004	9/7/2005	16	7	56%	0.02	0.162	0.01	0.215	S-7	0.1	0.07	Gamma	Approximate Gamma	0.662	No	No

Terminal 4 Slip 1 Operable Unit 1 - Oregon Screening Levels (Receptors - Birds)

Constituents of Interest (COI)			Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels	COI Concentration (90 UCL)				Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)
			Minimum	Maximum	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Bird Receptors	Cij	Distribution	Estimation Method	Tij			
CASNo	Analyte	Units																		
7439-92-1	*Lead*	mg/kg	8/23/2004	9/7/2005	16	0	100%			2.4	195	S-7	16	46.84	Gamma	Approximate Gamma	2.927	*Yes*	No
7440-66-6	*Zinc*	mg/kg	8/23/2004	9/7/2005	16	0	100%			40.6	521	S-7	60	204.64	Non-parametric	90% Chebyshev	3.411	*Yes*	No
7440-47-3	*Total Chromium*	mg/kg	8/23/2004	9/7/2005	16	0	100%			10.3	152	S-7	4	50.95	Non-parametric	90% Chebyshev	12.737	*Yes*	*Yes*

Terminal 4 Slip 1 Operable Unit 1 - Oregon Screening Levels (Receptors - Mammals)

Constituents of Interest (COI)			Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels	COI Concentration (90 UCL)				Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)
			Minimum	Maximum	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Mammal Receptors	Cij	Distribution	Estimation Method	Tij			
CASNo	Analyte	Units																		
132-64-9	*Dibenzofuran*	mg/kg	8/23/2004	3/22/2005	22	6	73%	0.0049	0.34	0.0002	0.1	S-7	0.002	0.07	Lognormal	90% Chebyshev (MVUE)	36.817	*Yes*	*Yes*

Notes:

	90UCL - 90th upper confidence limit	CPEC - constituent of potential ecological concern	T&E - listed threatened and endangered species
	mg/kg - milligram per kilogram	SLV - screening level value	Q = 1 for listed threatened and endangered (T&E) species
	min - minimum	Cij -concentration of COI i in medium j	Q = 5 for non-T&E species
	max - maximum	Tij - toxicity ratios for COI i in medium j	DEQ - Oregon Department of Environmental Quality
	COI - constituent of interest		SVOC - semi-volatile organic compound

90UCLs were calculated using ProUCL software and EPA (2002) guidance. Each dataset was tested for distribution (normal, gamma, and lognormal) and the appropriate calculation method was chosen on that basis. Non-parametric methods for calculating the 90UCL were used when the distribution was unknown or when the lognormal distribution (*) was highly skewed (>2.5).

* All Level II SLV criteria from Oregon DEQ, Table 1, Guidance for Ecological Risk Assessment, December 2001.

EPA 2002 - Calculating Upper Confidence Limits for Expopsure Point Concentrations at Hazardous Waste Sites, OSWER 9285.6-10 (December 2002)

EPA 2004 - ProUCL software, version 3.00.02, Downloaded at http://www.epa.gov/nerlesd1/tsc/form.htm (11/20/05).

Highlights indicate that the 90UCL is greater than SLV; Bold /italics indicate that 90UCL is greater than SLV for non-T/E species (HQ>5).

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Appendix B-1f Soil Summary (<3ft) and Risk Screening

Terminal 4 Slip 1 Operable Unit 2 - Oregon Screening Levels (Receptors - Plants)

Constituents of Interest (COI)				Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels	COI Conc. (max)	Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	CPEC due to Multiple COI Risk? (Q=1) (T&E)	CPEC due to Multiple COI Risk? (Q=5)
				Minimum	Maximum	Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max		Plant Receptors							
CASNo	Analyte	Analyte Group	Units												Cij	Tij			Tij/Tj		
7440-36-0	Antimony and compounds	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	13	70%	0.03	1.74	0.03	0.89	SB-75	5	0.89	0.178	No	No	0.001	No	No
7440-38-2	Arsenic	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	0	100%			1.12	15.7	S-26D	10	15.7	1.570	Yes	No	0.012	No	No
7440-41-7	Beryllium and compounds	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	0	100%			0.186	0.455	AOC72-S1	10	0.455	0.046	No	No	0.000	No	No
7440-43-9	Cadmium and compounds	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	0	100%			0.066	25.3	S-26D	4	25.3	6.325	Yes	Yes	0.049	No	No
75-15-0	Carbon disulfide	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	1.06				NA	<5%D	NA	No	No	NA	No	No
7440-50-8	Copper and compounds	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	0	100%			11.6	219	S-26D	100	219	2.190	Yes	No	0.017	No	No
7439-92-1	Lead	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	48	0	100%			2.24	1060	SB-77	50	1060	21.200	Yes	Yes	0.164	Yes	No
7439-97-6	Mercury and compounds	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	12	72%	0.009	0.131	0.009	0.325	S-26D	0.3	0.325	1.083	Yes	No	0.008	No	No
7440-02-0	Nickel	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	1	98%	4.2	4.2	6.7	46.7	SB-78	30	46.7	1.557	Yes	No	0.012	No	No
7782-49-2	Selenium	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	9	79%	0.02	1.2	0.06	2.4	SB-78	1	2.4	2.400	Yes	No	0.019	No	No
7440-22-4	Silver and compounds	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	10	77%	0.02	0.529	0.017	2.1	S-26D	2	2.1	1.050	Yes	No	0.008	No	No
7440-28-0	Thallium	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	13	70%	0.061	0.529	0.044	0.122	S-26D	1	0.122	0.122	No	No	0.001	No	No
7440-47-3	Total Chromium	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	0	100%			5.26	24.7	SB-76	1	24.7	24.700	Yes	Yes	0.191	Yes	No
7440-66-6	Zinc	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	0	100%			34.5	3320	S-26D	50	3320	66.400	Yes	Yes	0.513	Yes	Yes
91-57-6	2-Methylnaphthalene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	3/22/2005	25	14	44%	0.0047	0.34	0.0005	0.093	SB-75	NA	0.093	NA	No	No	NA	No	No
83-32-9	Acenaphthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	31	39%	0.0043	0.34	0.0002	1.18	S-30D	20	1.18	0.059	No	No	0.000	No	No
208-96-8	Acenaphthylene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	31	39%	0.0043	0.347	0.0003	0.176	S-29	NA	0.176	NA	No	No	NA	No	No
120-12-7	Anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	18	65%	0.0043	0.52	0.0003	1.1	S-14	NA	1.1	NA	No	No	NA	No	No
56-55-3	Benzo[a]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	50	7	86%	0.005	0.34	0.0002	10	S-14	NA	10	NA	No	No	NA	No	No
50-32-8	Benzo[a]pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	8	84%	0.005	0.34	0.0002	16	S-14	NA	16	NA	No	No	NA	No	No
205-99-2	Benzo[b]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	9	82%	0.0047	0.34	0.0002	17	S-14	NA	17	NA	No	No	NA	No	No
191-24-2	Benzo[g,h,i]perylene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	9	82%	0.0047	0.34	0.0002	13	S-14	NA	13	NA	No	No	NA	No	No
207-08-9	Benzo[k]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	10	80%	0.005	0.34	0.0002	12	S-14	NA	12	NA	No	No	NA	No	No
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	SVOC, Phthalate Esters	mg/kg	8/26/2004	9/13/2005	18	16	11%	0.0142	0.34	0.0176	0.047	SB-71	NA	0.047	NA	No	No	NA	No	No
218-01-9	Chrysene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	7	86%	0.005	0.34	0.0002	13	S-14	NA	13	NA	No	No	NA	No	No
99-87-6	Cymene	VOC	mg/kg	3/8/2004	9/12/2005	19	18	5%	0.02	0.026	0.0212	0.0212	S-23D	NA	0.0212	NA	No	No	NA	No	No
53-70-3	Dibenz[ah]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	16	69%	0.0047	0.34	0.0004	2.9	S-14	NA	2.9	NA	No	No	NA	No	No
132-64-9	Dibenzofuran	SVOC, Oxygen-Containing	mg/kg	3/8/2004	9/8/2005	26	15	42%	0.0047	0.347	0.0002	0.2	S-14	NA	0.2	NA	No	No	NA	No	No
84-74-2	Di-n-butyl phthalate	SVOC, Phthalate Esters	mg/kg	8/26/2004	9/13/2005	18	18	0%	0.0142	0.34				200	<5%D	NA	No	No	NA	No	No
206-44-0	Fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	3	94%	0.33	0.34	0.0004	18	S-14	NA	18	NA	No	No	NA	No	No
86-73-7	Fluorene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	28	45%	0.0047	0.34	0.0002	1.24	S-30D	NA	1.24	NA	No	No	NA	No	No
193-39-5	Indeno[1,2,3-cd]pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	13	75%	0.0047	0.34	0.0003	15	S-14	NA	15	NA	No	No	NA	No	No
91-20-3	Naphthalene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	70	42	40%	0.0047	0.344	0.0002	6.48	S-30D	10	6.48	0.648	No	No	0.005	No	No
85-01-8	Phenanthrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	8	84%	0.005	0.34	0.0003	6.4	S-14	NA	6.4	NA	No	No	NA	No	No
129-00-0	Pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	5	90%	0.005	0.34	0.0004	16	S-14	NA	16	NA	No	No	NA	No	No
11097-69-1	Aroclor 1254	PCBs Aroclors	mg/kg	3/29/2004	9/13/2005	15	14	7%	0.01	0.1	0.11	0.11	S-14	NA	0.11	NA	No	No	NA	No	No
11096-82-5	Aroclor 1260	PCBs Aroclors	mg/kg	3/29/2004	9/13/2005	15	11	27%	0.0335	0.1	0.022	0.12	S-14	NA	0.12	NA	No	No	NA	No	No
309-00-2	Aldrin	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	39	0%	0.001	0.0077				NA	<5%D	NA	No	No	NA	No	No
5103-71-9	alpha-Chlordane	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	39	0%	0.001	0.077				NA	<5%D	NA	No	No	NA	No	No
12789-03-6	Chlordane (technical)	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	38	3%	0.001	0.0077	8E-05	8E-05	MW16	NA	<5%D	NA	No	No	NA	No	No
72-54-8	DDD	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	33	15%	0.0014	0.0077	0.0001	0.0028	S-29	NA	0.00279	NA	No	No	NA	No	No
72-55-9	DDE	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	32	18%	0.0014	0.077	9E-05	0.0078	S-29	NA	0.00784	NA	No	No	NA	No	No
50-29-3	DDT	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	18	54%	0.0014	0.0678	0.0004	0.0968	S-26D	NA	0.0968	NA	No	No	NA	No	No
319-86-8	delta-BHC	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	39	0%	0.001	0.0077				NA	<5%D	NA	No	No	NA	No	No
60-57-1	Dieldrin	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	33	15%	0.001	0.077	0.0003	0.0009	S-30A	NA	0.000896	NA	No	No	NA	No	No
959-98-8	Endosulfan I	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	38	3%	0.001	0.0077	0.0003	0.0003	S-23	NA	<5%D	NA	No	No	NA	No	No
72-20-8	Endrin	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	39	0%	0.001	0.0678				NA	<5%D	NA	No	No	NA	No	No
7421-93-4	Endrin Aldehyde	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	39	0%	0.001	0.077				NA	<5%D	NA	No	No	NA	No	No
53494-70-5	Endrin Ketone	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	39	0%	0.001	0.077				NA	<5%D	NA	No	No	NA	No	No
76-44-8	Heptachlor	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	38	3%	0.001	0.0077	0.0004	0.0004	MW16	NA	<5%D	NA	No	No	NA	No	No
72-43-5	Methoxychlor	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	38	3%	0.0014	0.077	0.001	0.001	MW16	NA	<5%D	NA	No	No	NA	No	No
87-61-6	1,2,3-Trichlorobenzene	VOC	mg/kg	3/8/2004	9/12/2005	19	18	5%	0.001	0.0012	0.0836	0.0836	S-23D	NA	0.0836	NA	No	No	NA	No	No
95-63-6	1,2,4-Trimethylbenzene	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.02	0.106				NA	<5%D	NA	No	No	NA	No	No
108-67-8	1,3,5-Trimethylbenzene	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.02	0.106				NA	<5%D	NA	No	No	NA	No	No

Appendix B-1f Soil Summary (<3ft) and Risk Screening

Terminal 4 Slip 1 Operable Unit 2 - Oregon Screening Levels (Receptors - Plants)

Constituents of Interest (COI)				Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels	COI Conc. (max)	Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	CPEC due to Multiple COI Risk? (Q=1) (T&E)	CPEC due to Multiple COI Risk? (Q=5)
				Minimum	Maximum	Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max		Plant Receptors							
CASNo	Analyte	Analyte Group	Units												Cij	Tij			Tij/Tj		
106-46-7	1,4-Dichlorobenzene	SVOC, Halogenated	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				NA	<5%D	NA	No	No	NA	No	No
78-93-3	2-Butanone	VOC	mg/kg	3/8/2004	9/12/2005	19	18	5%	0.02	1.06	0.012	0.012	SB-51	NA	0.012	NA	No	No	NA	No	No
67-64-1	Acetone	VOC	mg/kg	3/8/2004	9/12/2005	19	16	16%	0.02	2.65	0.012	0.096	SB-51	NA	0.096	NA	No	No	NA	No	No
71-43-2	Benzene	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				NA	<5%D	NA	No	No	NA	No	No
56-23-5	Carbon tetrachloride	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				NA	<5%D	NA	No	No	NA	No	No
108-90-7	Chlorobenzene	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				NA	<5%D	NA	No	No	NA	No	No
67-66-3	Chloroform	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				NA	<5%D	NA	No	No	NA	No	No
98-82-8	Cumene (isopropylbenzene)	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.02	0.212				NA	<5%D	NA	No	No	NA	No	No
DRO	Diesel Range	Petroleum Hydrocarbons	mg/kg	3/8/2004	9/13/2005	32	27	16%	14	50	14.9	120	S-14	NA	120	NA	No	No	NA	No	No
100-41-4	Ethylbenzene	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				NA	<5%D	NA	No	No	NA	No	No
GRO	Gasoline Range	Petroleum Hydrocarbons	mg/kg	3/8/2004	8/31/2004	22	20	9%	2.7	20	1.1	1.3	SB-78	NA	1.3	NA	No	No	NA	No	No
87-68-3	Hexachlorobutadiene	SVOC, Halogenated	mg/kg	3/8/2004	9/12/2005	19	18	5%	0.02	0.026	0.226	0.226	S-23D	NA	0.226	NA	No	No	NA	No	No
75-09-2	Methylene chloride	VOC	mg/kg	3/8/2004	9/12/2005	19	5	74%	0.011	0.529	0.0031	0.026	SB-70	NA	0.026	NA	No	No	NA	No	No
104-51-8	n-Butylbenzene	VOC	mg/kg	3/8/2004	9/12/2005	19	18	5%	0.02	0.026	0.0434	0.0434	S-23D	NA	0.0434	NA	No	No	NA	No	No
103-65-1	n-Propylbenzene	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.02	0.106				NA	<5%D	NA	No	No	NA	No	No
95-47-6	o-Xylene	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				1	<5%D	NA	No	No	NA	No	No
108-95-2	Phenol	SVOC, Phenols and Substituted Phenols	mg/kg	8/26/2004	8/30/2004	9	9	0%	0.33	0.34				70	<5%D	NA	No	No	NA	No	No
RRO	Residual Range	Petroleum Hydrocarbons	mg/kg	3/8/2004	9/13/2005	32	24	25%	51	190	26	600	S-14	NA	600	NA	No	No	NA	No	No
135-9-88	sec-Butylbenzene	VOC	mg/kg	3/8/2004	9/12/2005	19	18	5%	0.02	0.026	0.0222	0.0222	S-23D	NA	0.0222	NA	No	No	NA	No	No
127-18-4	Tetrachloroethylene (PCE)	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				10	<5%D	NA	No	No	NA	No	No
108-88-3	Toluene	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				200	<5%D	NA	No	No	NA	No	No
79-01-6	Trichloroethylene (TCE)	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				NA	<5%D	NA	No	No	NA	No	No
1330-20-7	Xylene (mixed)	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.212				100	<5%D	NA	No	No	NA	No	No

Notes:

* All Level II SLV criteria from Oregon DEQ, Table 1, Guidance for Ecological Risk Assessment, December 2001)

VOC - volatile organic compound
SVOC - semi-volatile organic compound
ND - non-detect
mg/kg - milligram per kilogram
min - minimum
max - maximum
NA - not available
Q = 1 for T&E species
Q = 5 for non-T&E species

DEQ - Oregon Department of Environmental Quality
EPA - U.S. Environmental Protection Agency
COI - constituent of interest
CPEC - constituent of potential ecological concern
SLV - screening level value
Cij -concentration of COI i in medium j
Tij - toxicity ratios for COI i in medium j
T&E - listed threatened and endangered species

Tj = Sum of toxicity ratios for all COIs in medium j 129.528
Nij = Number of i COIs in medium j 15.000
1/Nij= 0.067

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Appendix B-1g Soil Summary (<3ft) and Risk Screening

Terminal 4 Slip 1 Operable Unit 2 - Oregon Screening Levels (Receptors - Invertebrates)

Constituents of Interest (COI)				Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels	COI Conc. (max)	Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	CPEC due to Multiple COI Risk? (Q=1) (T&E)	CPEC due to Multiple COI Risk? (Q=5)
CASNo	Analyte	Analyte Group	Units	Minimum	Maximum	Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max		Invertebrate Receptors	Cij	Tij			Tij/Tj		
7440-36-0	Antimony and compounds	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	13	70%	0.03	1.74	0.03	0.89	SB-75	NA	0.89	NA	No	No	NA	No	No
7440-38-2	Arsenic	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	0	100%			1.12	15.7	S-26D	60	15.7	0.262	No	No	0.003	No	No
7440-41-7	Beryllium and compounds	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	0	100%			0.186	0.455	AOC72-S1	NA	0.455	NA	No	No	NA	No	No
7440-43-9	Cadmium and compounds	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	0	100%			0.066	25.3	S-26D	20	25.3	1.265	Yes	No	0.014	No	No
75-15-0	Carbon disulfide	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	1.06				NA	<5%D	NA	No	No	NA	No	No
7440-50-8	Copper and compounds	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	0	100%			11.6	219	S-26D	50	219	4.380	Yes	No	0.049	No	No
7439-92-1	Lead	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	48	0	100%			2.24	1060	SB-77	500	1060	2.120	Yes	No	0.024	No	No
7439-97-6	Mercury and compounds	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	12	72%	0.009	0.131	0.009	0.325	S-26D	0.1	0.325	3.250	Yes	No	0.036	No	No
7440-02-0	Nickel	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	1	98%	4.2	4.2	6.7	46.7	SB-78	200	46.7	0.234	No	No	0.003	No	No
7782-49-2	Selenium	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	9	79%	0.02	1.2	0.06	2.4	SB-78	70	2.4	0.034	No	No	0.000	No	No
7440-22-4	Silver and compounds	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	10	77%	0.02	0.529	0.017	2.1	S-26D	50	2.1	0.042	No	No	0.000	No	No
7440-28-0	Thallium	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	13	70%	0.061	0.529	0.044	0.122	S-26D	NA	0.122	NA	No	No	NA	No	No
7440-47-3	Total Chromium	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	0	100%			5.26	24.7	SB-76	0.4	24.7	61.750	Yes	Yes	0.686	Yes	Yes
7440-66-6	Zinc	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	0	100%			34.5	3320	S-26D	200	3320	16.600	Yes	Yes	0.184	Yes	No
91-57-6	2-Methylnaphthalene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	3/22/2005	25	14	44%	0.0047	0.34	0.0005	0.093	SB-75	NA	0.093	NA	No	No	NA	No	No
83-32-9	Acenaphthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	31	39%	0.0043	0.34	0.0002	1.18	S-30D	NA	1.18	NA	No	No	NA	No	No
208-96-8	Acenaphthylene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	31	39%	0.0043	0.347	0.0003	0.176	S-29	NA	0.176	NA	No	No	NA	No	No
120-12-7	Anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	18	65%	0.0043	0.52	0.0003	1.1	S-14	NA	1.1	NA	No	No	NA	No	No
56-55-3	Benzo[a]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	50	7	86%	0.005	0.34	0.0002	10	S-14	NA	10	NA	No	No	NA	No	No
50-32-8	Benzo[a]pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	8	84%	0.005	0.34	0.0002	16	S-14	NA	16	NA	No	No	NA	No	No
205-99-2	Benzo[b]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	9	82%	0.0047	0.34	0.0002	17	S-14	NA	17	NA	No	No	NA	No	No
191-24-2	Benzo[g,h,i]perylene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	9	82%	0.0047	0.34	0.0002	13	S-14	NA	13	NA	No	No	NA	No	No
207-08-9	Benzo[k]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	10	80%	0.005	0.34	0.0002	12	S-14	NA	12	NA	No	No	NA	No	No
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	SVOC, Phthalate Esters	mg/kg	8/26/2004	9/13/2005	18	16	11%	0.0142	0.34	0.0176	0.047	SB-71	NA	0.047	NA	No	No	NA	No	No
218-01-9	Chrysene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	7	86%	0.005	0.34	0.0002	13	S-14	NA	13	NA	No	No	NA	No	No
99-87-6	Cymene	VOC	mg/kg	3/8/2004	9/12/2005	19	18	5%	0.02	0.026	0.0212	0.0212	S-23D	NA	0.0212	NA	No	No	NA	No	No
53-70-3	Dibenz[ah]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	16	69%	0.0047	0.34	0.0004	2.9	S-14	NA	2.9	NA	No	No	NA	No	No
132-64-9	Dibenzofuran	SVOC, Oxygen-Containing	mg/kg	3/8/2004	9/8/2005	26	15	42%	0.0047	0.347	0.0002	0.2	S-14	NA	0.2	NA	No	No	NA	No	No
84-74-2	Di-n-butyl phthalate	SVOC, Phthalate Esters	mg/kg	8/26/2004	9/13/2005	18	18	0%	0.0142	0.34				NA	<5%D	NA	No	No	NA	No	No
206-44-0	Fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	3	94%	0.33	0.34	0.0004	18	S-14	NA	18	NA	No	No	NA	No	No
86-73-7	Fluorene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	28	45%	0.0047	0.34	0.0002	1.24	S-30D	30	1.24	0.041	No	No	0.000	No	No
193-39-5	Indeno[1,2,3-cd]pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	13	75%	0.0047	0.34	0.0003	15	S-14	NA	15	NA	No	No	NA	No	No
91-20-3	Naphthalene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	70	42	40%	0.0047	0.344	0.0002	6.48	S-30D	NA	6.48	NA	No	No	NA	No	No
85-01-8	Phenanthrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	8	84%	0.005	0.34	0.0003	6.4	S-14	NA	6.4	NA	No	No	NA	No	No
129-00-0	Pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	5	90%	0.005	0.34	0.0004	16	S-14	NA	16	NA	No	No	NA	No	No
11097-69-1	Aroclor 1254	PCBs Aroclors	mg/kg	3/29/2004	9/13/2005	15	14	7%	0.01	0.1	0.11	0.11	S-14	NA	0.11	NA	No	No	NA	No	No
11096-82-5	Aroclor 1260	PCBs Aroclors	mg/kg	3/29/2004	9/13/2005	15	11	27%	0.0335	0.1	0.022	0.12	S-14	NA	0.12	NA	No	No	NA	No	No
309-00-2	Aldrin	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	39	0%	0.001	0.0077				NA	<5%D	NA	No	No	NA	No	No
5103-71-9	alpha-Chlordane	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	39	0%	0.001	0.077				NA	<5%D	NA	No	No	NA	No	No
12789-03-6	Chlordane (technical)	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	38	3%	0.001	0.0077	8E-05	8E-05	MW16	NA	<5%D	NA	No	No	NA	No	No
72-54-8	DDD	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	33	15%	0.0014	0.0077	0.0001	0.0028	S-29	NA	0.00279	NA	No	No	NA	No	No
72-55-9	DDE	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	32	18%	0.0014	0.077	9E-05	0.0078	S-29	NA	0.00784	NA	No	No	NA	No	No
50-29-3	DDT	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	18	54%	0.0014	0.0678	0.0004	0.0968	S-26D	NA	0.0968	NA	No	No	NA	No	No
319-86-8	delta-BHC	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	39	0%	0.001	0.0077				NA	<5%D	NA	No	No	NA	No	No
60-57-1	Dieldrin	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	33	15%	0.001	0.077	0.0003	0.0009	S-30A	NA	0.000896	NA	No	No	NA	No	No
959-98-8	Endosulfan I	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	38	3%	0.001	0.0077	0.0003	0.0003	S-23	NA	<5%D	NA	No	No	NA	No	No
72-20-8	Endrin	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	39	0%	0.001	0.0678				NA	<5%D	NA	No	No	NA	No	No
7421-93-4	Endrin Aldehyde	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	39	0%	0.001	0.077				NA	<5%D	NA	No	No	NA	No	No
53494-70-5	Endrin Ketone	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	39	0%	0.001	0.077				NA	<5%D	NA	No	No	NA	No	No
76-44-8	Heptachlor	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	38	3%	0.001	0.0077	0.0004	0.0004	MW16	NA	<5%D	NA	No	No	NA	No	No
72-43-5	Methoxychlor	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	38	3%	0.0014	0.077	0.001	0.001	MW16	NA	<5%D	NA	No	No	NA	No	No
87-61-6	1,2,3-Trichlorobenzene	VOC	mg/kg	3/8/2004	9/12/2005	19	18	5%	0.001	0.0012	0.0836	0.0836	S-23D	20	0.0836	0.004	No	No	0.000	No	No
95-63-6	1,2,4-Trimethylbenzene	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.02	0.106				NA	<5%D	NA	No	No	NA	No	No
108-67-8	1,3,5-Trimethylbenzene	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.02	0.106				NA	<5%D	NA	No	No	NA	No	No

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Appendix B-1g Soil Summary (<3ft) and Risk Screening

Terminal 4 Slip 1 Operable Unit 2 - Oregon Screening Levels (Receptors - Invertebrates)

Constituents of Interest (COI)				Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels	COI Conc. (max)	Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	CPEC due to Multiple COI Risk? (Q=1) (T&E)	CPEC due to Multiple COI Risk? (Q=5)
				Minimum	Maximum	Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max		Invertebrate Receptors							
CASNo	Analyte	Analyte Group	Units												Cij	Tij			Tij/Tj		
106-46-7	1,4-Dichlorobenzene	SVOC, Halogenated	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				20	<5%D	NA	No	No	NA	No	No
78-93-3	2-Butanone	VOC	mg/kg	3/8/2004	9/12/2005	19	18	5%	0.02	1.06	0.012	0.012	SB-51	NA	0.012	NA	No	No	NA	No	No
67-64-1	Acetone	VOC	mg/kg	3/8/2004	9/12/2005	19	16	16%	0.02	2.65	0.012	0.096	SB-51	NA	0.096	NA	No	No	NA	No	No
71-43-2	Benzene	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				NA	<5%D	NA	No	No	NA	No	No
56-23-5	Carbon tetrachloride	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				1000	<5%D	NA	No	No	NA	No	No
108-90-7	Chlorobenzene	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				40	<5%D	NA	No	No	NA	No	No
67-66-3	Chloroform	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				NA	<5%D	NA	No	No	NA	No	No
98-82-8	Cumene (isopropylbenzene)	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.02	0.212				NA	<5%D	NA	No	No	NA	No	No
DRO	Diesel Range	Petroleum Hydrocarbons	mg/kg	3/8/2004	9/13/2005	32	27	16%	14	50	14.9	120	S-14	NA	120	NA	No	No	NA	No	No
100-41-4	Ethylbenzene	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				NA	<5%D	NA	No	No	NA	No	No
GRO	Gasoline Range	Petroleum Hydrocarbons	mg/kg	3/8/2004	8/31/2004	22	20	9%	2.7	20	1.1	1.3	SB-78	NA	1.3	NA	No	No	NA	No	No
87-68-3	Hexachlorobutadiene	SVOC, Halogenated	mg/kg	3/8/2004	9/12/2005	19	18	5%	0.02	0.026	0.226	0.226	S-23D	NA	0.226	NA	No	No	NA	No	No
75-09-2	Methylene chloride	VOC	mg/kg	3/8/2004	9/12/2005	19	5	74%	0.011	0.529	0.0031	0.026	SB-70	NA	0.026	NA	No	No	NA	No	No
104-51-8	n-Butylbenzene	VOC	mg/kg	3/8/2004	9/12/2005	19	18	5%	0.02	0.026	0.0434	0.0434	S-23D	NA	0.0434	NA	No	No	NA	No	No
103-65-1	n-Propylbenzene	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.02	0.106				NA	<5%D	NA	No	No	NA	No	No
95-47-6	o-Xylene	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				NA	<5%D	NA	No	No	NA	No	No
108-95-2	Phenol	SVOC, Phenols and Substituted Phenols	mg/kg	8/26/2004	8/30/2004	9	9	0%	0.33	0.34				30	<5%D	NA	No	No	NA	No	No
RRO	Residual Range	Petroleum Hydrocarbons	mg/kg	3/8/2004	9/13/2005	32	24	25%	51	190	26	600	S-14	NA	600	NA	No	No	NA	No	No
135-9-88	sec-Butylbenzene	VOC	mg/kg	3/8/2004	9/12/2005	19	18	5%	0.02	0.026	0.0222	0.0222	S-23D	NA	0.0222	NA	No	No	NA	No	No
127-18-4	Tetrachloroethylene (PCE)	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				NA	<5%D	NA	No	No	NA	No	No
108-88-3	Toluene	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				NA	<5%D	NA	No	No	NA	No	No
79-01-6	Trichloroethylene (TCE)	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				NA	<5%D	NA	No	No	NA	No	No
1330-20-7	Xylene (mixed)	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.212				NA	<5%D	NA	No	No	NA	No	No

Notes:

* All Level II SLV criteria from Oregon DEQ, Table 1, Guidance for Ecological Risk Assessment, December 2001)

VOC - volatile organic compound
SVOC - semi-volatile organic compou
ND - non-detect
mg/kg - milligram per kilogram
min - minimum
max - maximum
NA - not available
Q = 1 for T&E species
Q = 5 for non-T&E species

DEQ - Oregon Department of Environmental Quality
EPA - U.S. Environmental Protection Agency
COI - constituent of interest
CPEC - constituent of potential ecological concern
SLV - screening level value
Cij -concentration of COI i in medium j
Tij - toxicity ratios for COI i in medium j
T&E - listed threatened and endangered species

Tj = Sum of toxicity ratios for all COIs in medium j 89.982
Nij = Number of i COIs in medium j 12.000
1/Nij= 0.083

KMB00008516

Appendix B-1h Soil Summary (<3ft) and Risk Screening

Terminal 4 Slip 1 Operable Unit 2 - Oregon Screening Levels (Receptors - Birds)

Constituents of Interest (COI)				Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels	COI Conc. (max)	Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	CPEC due to Multiple COI Risk? (Q=1) (T&E)	CPEC due to Multiple COI Risk? (Q=5)
				Minimum	Maximum	Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max		Bird Receptors							
CASNo	Analyte	Analyte Group	Units												Cij	Tij			Tij/Tj		
7440-36-0	Antimony and compounds	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	13	70%	0.03	1.74	0.03	0.89	SB-75	NA	0.89	NA	No	No	NA	No	No
7440-38-2	*Arsenic*	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	0	100%			1.12	15.7	S-26D	10	15.7	1.570	Yes	No	0.011	No	No
7440-41-7	Beryllium and compounds	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	0	100%			0.186	0.455	AOC72-S1	NA	0.455	NA	No	No	NA	No	No
7440-43-9	*Cadmium and compounds*	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	0	100%			0.066	25.3	S-26D	6	25.3	4.217	Yes	No	0.029	No	No
75-15-0	Carbon disulfide	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	1.06				NA	<5%D	NA	No	No	NA	No	No
7440-50-8	*Copper and compounds*	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	0	100%			11.6	219	S-26D	190	219	1.153	Yes	No	0.008	No	No
7439-92-1	*Lead*	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	48	0	100%			2.24	1060	SB-77	16	1060	66.250	Yes	Yes	0.450	Yes	Yes
7439-97-6	Mercury and compounds	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	12	72%	0.009	0.131	0.009	0.325	S-26D	1.5	0.325	0.217	No	No	0.001	No	No
7440-02-0	Nickel	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	1	98%	4.2	4.2	6.7	46.7	SB-78	320	46.7	0.146	No	No	0.001	No	No
7782-49-2	*Selenium*	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	9	79%	0.02	1.2	0.06	2.4	SB-78	2	2.4	1.200	Yes	No	0.008	No	No
7440-22-4	Silver and compounds	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	10	77%	0.02	0.529	0.017	2.1	S-26D	NA	2.1	NA	No	No	NA	No	No
7440-28-0	Thallium	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	13	70%	0.061	0.529	0.044	0.122	S-26D	NA	0.122	NA	No	No	NA	No	No
7440-47-3	*Total Chromium*	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	0	100%			5.26	24.7	SB-76	4	24.7	6.175	Yes	Yes	0.042	No	No
7440-66-6	*Zinc*	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	0	100%			34.5	3320	S-26D	60	3320	55.333	Yes	Yes	0.376	Yes	Yes
91-57-6	2-Methylnaphthalene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	3/22/2005	25	14	44%	0.0047	0.34	0.0005	0.093	SB-75	NA	0.093	NA	No	No	NA	No	No
83-32-9	Acenaphthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	31	39%	0.0043	0.34	0.0002	1.18	S-30D	NA	1.18	NA	No	No	NA	No	No
208-96-8	Acenaphthylene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	31	39%	0.0043	0.347	0.0003	0.176	S-29	NA	0.176	NA	No	No	NA	No	No
120-12-7	Anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	18	65%	0.0043	0.52	0.0003	1.1	S-14	NA	1.1	NA	No	No	NA	No	No
56-55-3	Benzo[a]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	50	7	86%	0.005	0.34	0.0002	10	S-14	NA	10	NA	No	No	NA	No	No
50-32-8	Benzo[a]pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	8	84%	0.005	0.34	0.0002	16	S-14	NA	16	NA	No	No	NA	No	No
205-99-2	Benzo[b]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	9	82%	0.0047	0.34	0.0002	17	S-14	NA	17	NA	No	No	NA	No	No
191-24-2	Benzo[g,h,i]perylene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	9	82%	0.0047	0.34	0.0002	13	S-14	NA	13	NA	No	No	NA	No	No
207-08-9	Benzo[k]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	10	80%	0.005	0.34	0.0002	12	S-14	NA	12	NA	No	No	NA	No	No
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	SVOC, Phthalate Esters	mg/kg	8/26/2004	9/13/2005	18	16	11%	0.0142	0.34	0.0176	0.047	SB-71	4.5	0.047	0.010	No	No	0.000	No	No
218-01-9	Chrysene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	7	86%	0.005	0.34	0.0002	13	S-14	NA	13	NA	No	No	NA	No	No
99-87-6	Cymene	VOC	mg/kg	3/8/2004	9/12/2005	19	18	5%	0.02	0.026	0.0212	0.0212	S-23D	NA	0.0212	NA	No	No	NA	No	No
53-70-3	Dibenz[ah]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	16	69%	0.0047	0.34	0.0004	2.9	S-14	NA	2.9	NA	No	No	NA	No	No
132-64-9	Dibenzofuran	SVOC, Oxygen-Containing	mg/kg	3/8/2004	9/8/2005	26	15	42%	0.0047	0.347	0.0002	0.2	S-14	NA	0.2	NA	No	No	NA	No	No
84-74-2	Di-n-butyl phthalate	SVOC, Phthalate Esters	mg/kg	8/26/2004	9/13/2005	18	18	0%	0.0142	0.34				0.45	<5%D	NA	No	No	NA	No	No
206-44-0	Fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	3	94%	0.33	0.34	0.0004	18	S-14	NA	18	NA	No	No	NA	No	No
86-73-7	Fluorene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	28	45%	0.0047	0.34	0.0002	1.24	S-30D	NA	1.24	NA	No	No	NA	No	No
193-39-5	Indeno[1,2,3-cd]pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	13	75%	0.0047	0.34	0.0003	15	S-14	NA	15	NA	No	No	NA	No	No
91-20-3	Naphthalene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	70	42	40%	0.0047	0.344	0.0002	6.48	S-30D	NA	6.48	NA	No	No	NA	No	No
85-01-8	Phenanthrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	8	84%	0.005	0.34	0.0003	6.4	S-14	NA	6.4	NA	No	No	NA	No	No
129-00-0	Pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	5	90%	0.005	0.34	0.0004	16	S-14	NA	16	NA	No	No	NA	No	No
11097-69-1	Aroclor 1254	PCBs Aroclors	mg/kg	3/29/2004	9/13/2005	15	14	7%	0.01	0.1	0.11	0.11	S-14	0.7	0.11	0.157	No	No	0.001	No	No
11096-82-5	Aroclor 1260	PCBs Aroclors	mg/kg	3/29/2004	9/13/2005	15	11	27%	0.0335	0.1	0.022	0.12	S-14	NA	0.12	NA	No	No	NA	No	No
309-00-2	Aldrin	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	39	0%	0.001	0.0077				NA	<5%D	NA	No	No	NA	No	No
5103-71-9	alpha-Chlordane	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	39	0%	0.001	0.077				9	<5%D	NA	No	No	NA	No	No
12789-03-6	Chlordane (technical)	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	38	3%	0.001	0.0077	8E-05	8E-05	MW16	9	<5%D	NA	No	No	NA	No	No
72-54-8	DDD	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	33	15%	0.0014	0.0077	0.0001	0.0028	S-29	0.01	0.00279	0.279	No	No	0.002	No	No
72-55-9	DDE	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	32	18%	0.0014	0.077	9E-05	0.0078	S-29	0.01	0.00784	0.784	No	No	0.005	No	No
50-29-3	*pp'DT*	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	18	54%	0.0014	0.0678	0.0004	0.0968	S-26D	0.01	0.0968	9.680	Yes	Yes	0.066	No	No
319-86-8	delta-BHC	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	39	0%	0.001	0.0077				2.5	<5%D	NA	No	No	NA	No	No
60-57-1	Dieldrin	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	33	15%	0.001	0.077	0.0003	0.0009	S-30A	0.3	0.000896	0.003	No	No	0.000	No	No
959-98-8	Endosulfan I	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	38	3%	0.001	0.0077	0.0003	0.0003	S-23	42	<5%D	NA	No	No	NA	No	No
72-20-8	***Endrin***	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	39	0%	0.001	0.0678				0.04	<5%D	NA	***ND>SLV***	***ND>SLV***	NA	No	No
7421-93-4	***Endrin Aldehyde***	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	39	0%	0.001	0.077				0.04	<5%D	NA	***ND>SLV***	***ND>SLV***	NA	No	No
53494-70-5	***Endrin Ketone***	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	39	0%	0.001	0.077				0.04	<5%D	NA	***ND>SLV***	***ND>SLV***	NA	No	No
76-44-8	Heptachlor	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	38	3%	0.001	0.0077	0.0004	0.0004	MW16	NA	<5%D	NA	No	No	NA	No	No
72-43-5	Methoxychlor	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	38	3%	0.0014	0.077	0.001	0.001	MW16	NA	<5%D	NA	No	No	NA	No	No
87-61-6	1,2,3-Trichlorobenzene	VOC	mg/kg	3/8/2004	9/12/2005	19	18	5%	0.001	0.0012	0.0836	0.0836	S-23D	NA	0.0836	NA	No	No	NA	No	No
95-63-6	1,2,4-Trimethylbenzene	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.02	0.106				NA	<5%D	NA	No	No	NA	No	No
108-67-8	1,3,5-Trimethylbenzene	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.02	0.106				NA	<5%D	NA	No	No	NA	No	No

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Appendix B-1h Soil Summary (<3ft) and Risk Screening

Terminal 4 Slip 1 Operable Unit 2 - Oregon Screening Levels (Receptors - Birds)

Constituents of Interest (COI)				Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels	COI Conc. (max)	Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	CPEC due to Multiple COI Risk? (Q=1) (T&E)	CPEC due to Multiple COI Risk? (Q=5)
				Minimum	Maximum	Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max		Bird Receptors							
CASNo	Analyte	Analyte Group	Units												Cij	Tij			Tij/Tj		
106-46-7	1,4-Dichlorobenzene	SVOC, Halogenated	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				NA	<5%D	NA	No	No	NA	No	No
78-93-3	2-Butanone	VOC	mg/kg	3/8/2004	9/12/2005	19	18	5%	0.02	1.06	0.012	0.012	SB-51	NA	0.012	NA	No	No	NA	No	No
67-64-1	Acetone	VOC	mg/kg	3/8/2004	9/12/2005	19	16	16%	0.02	2.65	0.012	0.096	SB-51	NA	0.096	NA	No	No	NA	No	No
71-43-2	Benzene	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				NA	<5%D	NA	No	No	NA	No	No
56-23-5	Carbon tetrachloride	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				NA	<5%D	NA	No	No	NA	No	No
108-90-7	Chlorobenzene	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				NA	<5%D	NA	No	No	NA	No	No
67-66-3	Chloroform	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				NA	<5%D	NA	No	No	NA	No	No
98-82-8	Cumene (isopropylbenzene)	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.02	0.212				NA	<5%D	NA	No	No	NA	No	No
DRO	Diesel Range	Petroleum Hydrocarbons	mg/kg	3/8/2004	9/13/2005	32	27	16%	14	50	14.9	120	S-14	NA	120	NA	No	No	NA	No	No
100-41-4	Ethylbenzene	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				NA	<5%D	NA	No	No	NA	No	No
GRO	Gasoline Range	Petroleum Hydrocarbons	mg/kg	3/8/2004	8/31/2004	22	20	9%	2.7	20	1.1	1.3	SB-78	NA	1.3	NA	No	No	NA	No	No
87-68-3	Hexachlorobutadiene	SVOC, Halogenated	mg/kg	3/8/2004	9/12/2005	19	18	5%	0.02	0.026	0.226	0.226	S-23D	NA	0.226	NA	No	No	NA	No	No
75-09-2	Methylene chloride	VOC	mg/kg	3/8/2004	9/12/2005	19	5	74%	0.011	0.529	0.0031	0.026	SB-70	NA	0.026	NA	No	No	NA	No	No
104-51-8	n-Butylbenzene	VOC	mg/kg	3/8/2004	9/12/2005	19	18	5%	0.02	0.026	0.0434	0.0434	S-23D	NA	0.0434	NA	No	No	NA	No	No
103-65-1	n-Propylbenzene	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.02	0.106				NA	<5%D	NA	No	No	NA	No	No
95-47-6	o-Xylene	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				NA	<5%D	NA	No	No	NA	No	No
108-95-2	Phenol	SVOC, Phenols and Substituted Phenols	mg/kg	8/26/2004	8/30/2004	9	9	0%	0.33	0.34				NA	<5%D	NA	No	No	NA	No	No
RRO	Residual Range	Petroleum Hydrocarbons	mg/kg	3/8/2004	9/13/2005	32	24	25%	51	190	26	600	S-14	NA	600	NA	No	No	NA	No	No
135-9-88	sec-Butylbenzene	VOC	mg/kg	3/8/2004	9/12/2005	19	18	5%	0.02	0.026	0.0222	0.0222	S-23D	NA	0.0222	NA	No	No	NA	No	No
127-18-4	Tetrachloroethylene (PCE)	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				NA	<5%D	NA	No	No	NA	No	No
108-88-3	Toluene	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				NA	<5%D	NA	No	No	NA	No	No
79-01-6	Trichloroethylene (TCE)	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				NA	<5%D	NA	No	No	NA	No	No
1330-20-7	Xylene (mixed)	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.212				NA	<5%D	NA	No	No	NA	No	No

Notes:

* All Level II SLV criteria from Oregon DEQ, Table 1, Guidance for Ecological Risk Assessment, December 2001)

VOC - volatile organic compound
SVOC - semi-volatile organic compound
ND - non-detect
mg/kg - milligram per kilogram
min - minimum
max - maximum
NA - not available
Q = 1 for T&E species
Q = 5 for non-T&E species

DEQ - Oregon Department of Environmental Quality
EPA - U.S. Environmental Protection Agency
COI - constituent of interest
CPEC - constituent of potential ecological concern
SLV - screening level value
Cij -concentration of COI i in medium j
Tij - toxicity ratios for COI i in medium j
T&E - listed threatened and endangered species

Tj = Sum of toxicity ratios for all COIs in medium j 147.174
Nij = Number of i COIs in medium j 15.000
1/Nij= 0.067

Appendix B-1i Soil Summary (<3ft) and Risk Screening

Terminal 4 Slip 1 Operable Unit 2 - Oregon Screening Levels (Receptors - Mammals)

Constituents of Interest (COI)				Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels	COI Conc. (max)	Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	CPEC due to Multiple COI Risk? (Q=1) (T&E)	CPEC due to Multiple COI Risk? (Q=5)
				Minimum	Maximum	Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max		Mammal Receptors							
CASNo	Analyte	Analyte Group	Units												Cij	Tij			Tij/Tj		
7440-36-0	Antimony and compounds	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	13	70%	0.03	1.74	0.03	0.89	SB-75	15	0.89	0.059	No	No	0.001	No	No
7440-38-2	Arsenic	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	0	100%			1.12	15.7	S-26D	29	15.7	0.541	No	No	0.005	No	No
7440-41-7	Beryllium and compounds	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	0	100%			0.186	0.455	AOC72-S1	83	0.455	0.005	No	No	0.000	No	No
7440-43-9	Cadmium and compounds	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	0	100%			0.066	25.3	S-26D	125	25.3	0.202	No	No	0.002	No	No
75-15-0	Carbon disulfide	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	1.06				NA	<5%D	NA	No	No	NA	No	No
7440-50-8	Copper and compounds	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	0	100%			11.6	219	S-26D	390	219	0.562	No	No	0.005	No	No
7439-92-1	Lead	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	48	0	100%			2.24	1060	SB-77	4000	1060	0.265	No	No	0.003	No	No
7439-97-6	Mercury and compounds	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	12	72%	0.009	0.131	0.009	0.325	S-26D	73	0.325	0.004	No	No	0.000	No	No
7440-02-0	Nickel	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	1	98%	4.2	4.2	6.7	46.7	SB-78	625	46.7	0.075	No	No	0.001	No	No
7782-49-2	Selenium	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	9	79%	0.02	1.2	0.06	2.4	SB-78	25	2.4	0.096	No	No	0.001	No	No
7440-22-4	Silver and compounds	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	10	77%	0.02	0.529	0.017	2.1	S-26D	NA	2.1	NA	No	No	NA	No	No
7440-28-0	Thallium	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	13	70%	0.061	0.529	0.044	0.122	S-26D	1	0.122	0.122	No	No	0.001	No	No
7440-47-3	Total Chromium	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	0	100%			5.26	24.7	SB-76	340000	24.7	0.000	No	No	0.000	No	No
7440-66-6	Zinc	Metals/Inorganics	mg/kg	3/8/2004	9/13/2005	43	0	100%			34.5	3320	S-26D	20000	3320	0.166	No	No	0.002	No	No
91-57-6	2-Methylnaphthalene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	3/22/2005	25	14	44%	0.0047	0.34	0.0005	0.093	SB-75	NA	0.093	NA	No	No	NA	No	No
83-32-9	Acenaphthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	31	39%	0.0043	0.34	0.0002	1.18	S-30D	NA	1.18	NA	No	No	NA	No	No
208-96-8	Acenaphthylene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	31	39%	0.0043	0.347	0.0003	0.176	S-29	NA	0.176	NA	No	No	NA	No	No
120-12-7	Anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	18	65%	0.0043	0.52	0.0003	1.1	S-14	NA	1.1	NA	No	No	NA	No	No
56-55-3	Benzo[a]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	50	7	86%	0.005	0.34	0.0002	10	S-14	NA	10	NA	No	No	NA	No	No
50-32-8	Benzo[a]pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	8	84%	0.005	0.34	0.0002	16	S-14	125	16	0.128	No	No	0.001	No	No
205-99-2	Benzo[b]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	9	82%	0.0047	0.34	0.0002	17	S-14	NA	17	NA	No	No	NA	No	No
191-24-2	Benzo[g,h,i]perylene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	9	82%	0.0047	0.34	0.0002	13	S-14	NA	13	NA	No	No	NA	No	No
207-08-9	Benzo[k]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	10	80%	0.005	0.34	0.0002	12	S-14	NA	12	NA	No	No	NA	No	No
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	SVOC, Phthalate Esters	mg/kg	8/26/2004	9/13/2005	18	16	11%	0.0142	0.34	0.0176	0.047	SB-71	1020	0.047	0.000	No	No	0.000	No	No
218-01-9	Chrysene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	7	86%	0.005	0.34	0.0002	13	S-14	NA	13	NA	No	No	NA	No	No
99-87-6	Cymene	VOC	mg/kg	3/8/2004	9/12/2005	19	18	5%	0.02	0.026	0.0212	0.0212	S-23D	NA	0.0212	NA	No	No	NA	No	No
53-70-3	Dibenz[ah]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	16	69%	0.0047	0.34	0.0004	2.9	S-14	NA	2.9	NA	No	No	NA	No	No
132-64-9	Dibenzofuran	SVOC, Oxygen-Containing	mg/kg	3/8/2004	9/8/2005	26	15	42%	0.0047	0.347	0.0002	0.2	S-14	0.002	0.2	100.000	Yes	Yes	0.978	Yes	Yes
84-74-2	Di-n-butyl phthalate	SVOC, Phthalate Esters	mg/kg	8/26/2004	9/13/2005	18	18	0%	0.0142	0.34				30000	<5%D	NA	No	No	NA	No	No
206-44-0	Fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	3	94%	0.33	0.34	0.0004	18	S-14	NA	18	NA	No	No	NA	No	No
86-73-7	Fluorene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	28	45%	0.0047	0.34	0.0002	1.24	S-30D	NA	1.24	NA	No	No	NA	No	No
193-39-5	Indeno[1,2,3-cd]pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	13	75%	0.0047	0.34	0.0003	15	S-14	NA	15	NA	No	No	NA	No	No
91-20-3	Naphthalene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	70	42	40%	0.0047	0.344	0.0002	6.48	S-30D	3900	6.48	0.002	No	No	0.000	No	No
85-01-8	Phenanthrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	8	84%	0.005	0.34	0.0003	6.4	S-14	NA	6.4	NA	No	No	NA	No	No
129-00-0	Pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	3/8/2004	9/13/2005	51	5	90%	0.005	0.34	0.0004	16	S-14	NA	16	NA	No	No	NA	No	No
11097-69-1	Aroclor 1254	PCBs Aroclors	mg/kg	3/29/2004	9/13/2005	15	14	7%	0.01	0.1	0.11	0.11	S-14	4	0.11	0.028	No	No	0.000	No	No
11096-82-5	Aroclor 1260	PCBs Aroclors	mg/kg	3/29/2004	9/13/2005	15	11	27%	0.0335	0.1	0.022	0.12	S-14	NA	0.12	NA	No	No	NA	No	No
309-00-2	Aldrin	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	39	0%	0.001	0.0077				25	<5%D	NA	No	No	NA	No	No
5103-71-9	alpha-Chlordane	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	39	0%	0.001	0.077				250	<5%D	NA	No	No	NA	No	No
12789-03-6	Chlordane (technical)	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	38	3%	0.001	0.0077	8E-05	8E-05	MW16	250	<5%D	NA	No	No	NA	No	No
72-54-8	DDD	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	33	15%	0.0014	0.0077	0.0001	0.0028	S-29	100	0.00279	0.000	No	No	0.000	No	No
72-55-9	DDE	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	32	18%	0.0014	0.077	9E-05	0.0078	S-29	100	0.00784	0.000	No	No	0.000	No	No
50-29-3	DDT	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	18	54%	0.0014	0.0678	0.0004	0.0968	S-26D	100	0.0968	0.001	No	No	0.000	No	No
319-86-8	delta-BHC	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	39	0%	0.001	0.0077				200	<5%D	NA	No	No	NA	No	No
60-57-1	Dieldrin	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	33	15%	0.001	0.077	0.0003	0.0009	S-30A	3	0.000896	0.000	No	No	0.000	No	No
959-98-8	Endosulfan I	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	38	3%	0.001	0.0077	0.0003	0.0003	S-23	20	<5%D	NA	No	No	NA	No	No
72-20-8	Endrin	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	39	0%	0.001	0.0678				5	<5%D	NA	No	No	NA	No	No
7421-93-4	Endrin Aldehyde	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	39	0%	0.001	0.077				5	<5%D	NA	No	No	NA	No	No
53494-70-5	Endrin Ketone	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	39	0%	0.001	0.077				5	<5%D	NA	No	No	NA	No	No
76-44-8	Heptachlor	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	38	3%	0.001	0.0077	0.0004	0.0004	MW16	15	<5%D	NA	No	No	NA	No	No
72-43-5	Methoxychlor	Organochlorine Pesticides	mg/kg	3/29/2004	9/13/2005	39	38	3%	0.0014	0.077	0.001	0.001	MW16	500	<5%D	NA	No	No	NA	No	No
87-61-6	1,2,3-Trichlorobenzene	VOC	mg/kg	3/8/2004	9/12/2005	19	18	5%	0.001	0.0012	0.0836	0.0836	S-23D	NA	0.0836	NA	No	No	NA	No	No
95-63-6	1,2,4-Trimethylbenzene	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.02	0.106				NA	<5%D	NA	No	No	NA	No	No
108-67-8	1,3,5-Trimethylbenzene	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.02	0.106				NA	<5%D	NA	No	No	NA	No	No

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Appendix B-1i Soil Summary (<3ft) and Risk Screening

Terminal 4 Slip 1 Operable Unit 2 - Oregon Screening Levels (Receptors - Mammals)

Constituents of Interest (COI)				Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels	COI Conc. (max)	Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	CPEC due to Multiple COI Risk? (Q=1) (T&E)	CPEC due to Multiple COI Risk? (Q=5)
				Minimum	Maximum	Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max		Mammal Receptors							
CASNo	Analyte	Analyte Group	Units												Cij	Tij			Tij/Tj		
106-46-7	1,4-Dichlorobenzene	SVOC, Halogenated	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				NA	<5%D	NA	No	No	NA	No	No
78-93-3	2-Butanone	VOC	mg/kg	3/8/2004	9/12/2005	19	18	5%	0.02	1.06	0.012	0.012	SB-51	200000	0.012	0.000	No	No	0.000	No	No
67-64-1	Acetone	VOC	mg/kg	3/8/2004	9/12/2005	19	16	16%	0.02	2.65	0.012	0.096	SB-51	1250	0.096	0.000	No	No	0.000	No	No
71-43-2	Benzene	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				3300	<5%D	NA	No	No	NA	No	No
56-23-5	Carbon tetrachloride	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				2000	<5%D	NA	No	No	NA	No	No
108-90-7	Chlorobenzene	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				NA	<5%D	NA	No	No	NA	No	No
67-66-3	Chloroform	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				1875	<5%D	NA	No	No	NA	No	No
98-82-8	Cumene (isopropylbenzene)	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.02	0.212				NA	<5%D	NA	No	No	NA	No	No
DRO	Diesel Range	Petroleum Hydrocarbons	mg/kg	3/8/2004	9/13/2005	32	27	16%	14	50	14.9	120	S-14	NA	120	NA	No	No	NA	No	No
100-41-4	Ethylbenzene	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				NA	<5%D	NA	No	No	NA	No	No
GRO	Gasoline Range	Petroleum Hydrocarbons	mg/kg	3/8/2004	8/31/2004	22	20	9%	2.7	20	1.1	1.3	SB-78	NA	1.3	NA	No	No	NA	No	No
87-68-3	Hexachlorobutadiene	SVOC, Halogenated	mg/kg	3/8/2004	9/12/2005	19	18	5%	0.02	0.026	0.226	0.226	S-23D	NA	0.226	NA	No	No	NA	No	No
75-09-2	Methylene chloride	VOC	mg/kg	3/8/2004	9/12/2005	19	5	74%	0.011	0.529	0.0031	0.026	SB-70	730	0.026	0.000	No	No	0.000	No	No
104-51-8	n-Butylbenzene	VOC	mg/kg	3/8/2004	9/12/2005	19	18	5%	0.02	0.026	0.0434	0.0434	S-23D	NA	0.0434	NA	No	No	NA	No	No
103-65-1	n-Propylbenzene	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.02	0.106				NA	<5%D	NA	No	No	NA	No	No
95-47-6	o-Xylene	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				NA	<5%D	NA	No	No	NA	No	No
108-95-2	Phenol	SVOC, Phenols and Substituted Phenols	mg/kg	8/26/2004	8/30/2004	9	9	0%	0.33	0.34				NA	<5%D	NA	No	No	NA	No	No
RRO	Residual Range	Petroleum Hydrocarbons	mg/kg	3/8/2004	9/13/2005	32	24	25%	51	190	26	600	S-14	NA	600	NA	No	No	NA	No	No
135-9-88	sec-Butylbenzene	VOC	mg/kg	3/8/2004	9/12/2005	19	18	5%	0.02	0.026	0.0222	0.0222	S-23D	NA	0.0222	NA	No	No	NA	No	No
127-18-4	Tetrachloroethylene (PCE)	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				80	<5%D	NA	No	No	NA	No	No
108-88-3	Toluene	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				1440	<5%D	NA	No	No	NA	No	No
79-01-6	Trichloroethylene (TCE)	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106				40	<5%D	NA	No	No	NA	No	No
1330-20-7	Xylene (mixed)	VOC	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.212				120	<5%D	NA	No	No	NA	No	No

Notes:

* All Level II SLV criteria from Oregon DEQ, Table 1, Guidance for Ecological Risk Assessment, December 2001)

VOC - volatile organic compound
SVOC - semi-volatile organic compound
ND - non-detect
mg/kg - milligram per kilogram
min - minimum
max - maximum
NA - not available
Q = 1 for T&E species
Q = 5 for non-T&E species

DEQ - Oregon Department of Environmental Quality
EPA - U.S. Environmental Protection Agency
COI - constituent of interest
CPEC - constituent of potential ecological concern
SLV - screening level value
Cij -concentration of COI i in medium j
Tij - toxicity ratios for COI i in medium j
T&E - listed threatened and endangered species

Tj = Sum of toxicity ratios for all COIs in medium j 102.257
Nij = Number of i COIs in medium j 24.000
1/Nij= 0.042

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APPENDIX B-1j Soil Summary (<3ft) with 90UCLs and Risk Screening

Terminal 4 Slip 1 Operable Unit 2 - Oregon Screening Levels (Receptors - Plants)

Constituents of Interest (COI)			Period of Record		Samples			Detection Limits		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels*	COI Concentration (90 UCL)				Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)
CASNo	Analyte	Units	Minimum	Maximum	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Plant Receptors	Cij	Distribution	Estimation Method	Tij			
7440-43-9	Cadmium and compounds	mg/kg	3/8/2004	9/13/2005	43	0	100%			0.066	25.3	S-26D	4	2.87	Non-parametric	90% Chebyshev	0.717	No	No	
7440-50-8	Copper and compounds	mg/kg	3/8/2004	9/13/2005	43	0	100%			11.6	219	S-26D	100	28.97	Non-parametric	Mod-t (adj for skewness)	0.290	No	No	
7439-92-1	*Lead*	mg/kg	3/8/2004	9/13/2005	48	0	100%			2.24	1060	SB-77	50	183.19	Non-parametric	90% Chebyshev	3.664	*Yes*	No	
7440-02-0	Nickel	mg/kg	3/8/2004	9/13/2005	43	1	98%	4.2	4.2	6.7	46.7	SB-78	30	19.00	Non-parametric	Mod-t (adj for skewness)	0.633	No	No	
7782-49-2	Selenium	mg/kg	3/8/2004	9/13/2005	43	9	79%	0.02	1.2	0.06	2.4	SB-78	1	0.41	Gamma	Approximate Gamma	0.413	No	No	
7440-22-4	Silver and compounds	mg/kg	3/8/2004	9/13/2005	43	10	77%	0.02	0.529	0.017	2.1	S-26D	2	0.32	Non-parametric	90% Chebyshev	0.161	No	No	
7440-66-6	*Zinc*	mg/kg	3/8/2004	9/13/2005	43	0	100%			34.5	3320	S-26D	50	417.73	Non-parametric	90% Chebyshev	8.355	*Yes*	*Yes*	
7440-47-3	*Total Chromium*	mg/kg	3/8/2004	9/13/2005	43	0	100%			5.26	24.7	SB-76	1	15.27	Normal	Student's-t	15.270	*Yes*	*Yes*	
7440-38-2	Arsenic	mg/kg	3/8/2004	9/13/2005	43	0	100%			1.12	15.7	S-26D	10	4.94	Non-parametric	90% Chebyshev	0.494	No	No	
7439-97-6	Mercury and compounds	mg/kg	3/8/2004	9/13/2005	43	12	72%	0.009	0.131	0.009	0.325	S-26D	0.3	0.06	Lognormal/skewed	90% Chebyshev	0.189	No	No	

Terminal 4 Slip 1 Operable Unit 2 - Oregon Screening Levels (Receptors - Invertebrates)

Constituents of Interest (COI)			Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels*	COI Concentration (90 UCL)				Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)
CASNo	Analyte	Units	Minimum	Maximum	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Invertebrate Receptors	Cij	Distribution	Estimation Method	Tij			
7440-43-9	Cadmium and compounds	mg/kg	3/8/2004	9/13/2005	43	0	100%			0.066	25.3	S-26D	20	2.87	Non-parametric	90% Chebyshev	0.143	No	No	
7440-50-8	Copper and compounds	mg/kg	3/8/2004	9/13/2005	43	0	100%			11.6	219	S-26D	50	28.97	Non-parametric	Mod-t (adj for skewness)	0.579	No	No	
7439-92-1	Lead	mg/kg	3/8/2004	9/13/2005	48	0	100%			2.24	1060	SB-77	500	183.19	Non-parametric	90% Chebyshev	0.366	No	No	
7440-66-6	*Zinc*	mg/kg	3/8/2004	9/13/2005	43	0	100%			34.5	3320	S-26D	200	417.73	Non-parametric	90% Chebyshev	2.089	*Yes*	No	
7440-47-3	*Total Chromium*	mg/kg	3/8/2004	9/13/2005	43	0	100%			5.26	24.7	SB-76	0.4	15.27	Normal	Student's-t	38.175	*Yes*	*Yes*	
7439-97-6	Mercury and compounds	mg/kg	3/8/2004	9/13/2005	43	12	72%	0.009	0.131	0.009	0.325	S-26D	0.1	0.06	Lognormal/skewed	90% Chebyshev	0.568	No	No	

Terminal 4 Slip 1 Operable Unit 2 - Oregon Screening Levels (Receptors - Birds)

Constituents of Interest (COI)			Period of Record		Samples			Detection Limits		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels*	COI Concentration (90 UCL)				Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)
CASNo	Analyte	Units	Minimum	Maximum	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Bird Receptors	Cij	Distribution	Estimation Method	Tij			
7440-43-9	Cadmium and compounds	mg/kg	3/8/2004	9/13/2005	43	0	100%			0.066	25.3	S-26D	6	2.87	Non-parametric	90% Chebyshev	0.478	No	No	
7440-50-8	Copper and compounds	mg/kg	3/8/2004	9/13/2005	43	0	100%			11.6	219	S-26D	190	28.97	Non-parametric	Mod-t (adj for skewness)	0.152	No	No	
7439-92-1	*Lead*	mg/kg	3/8/2004	9/13/2005	48	0	100%			2.24	1060	SB-77	16	183.19	Non-parametric	90% Chebyshev	11.450	*Yes*	*Yes*	
7782-49-2	Selenium	mg/kg	3/8/2004	9/13/2005	43	9	79%	0.02	1.2	0.06	2.4	SB-78	2	0.41	Gamma	Approximate Gamma	0.206	No	No	
7440-66-6	*Zinc*	mg/kg	3/8/2004	9/13/2005	43	0	100%			34.5	3320	S-26D	60	417.73	Non-parametric	90% Chebyshev	6.962	*Yes*	*Yes*	
7440-47-3	*Total Chromium*	mg/kg	3/8/2004	9/13/2005	43	0	100%			5.26	24.7	SB-76	4	15.27	Normal	Student's-t	3.818	*Yes*	No	
7440-38-2	Arsenic	mg/kg	3/8/2004	9/13/2005	43	0	100%			1.12	15.7	S-26D	10	4.94	Non-parametric	90% Chebyshev	0.494	No	No	
50-29-3	*DDT*	mg/kg	3/29/2004	9/13/2005	39	18	54%	0.0014	0.0678	0.0004	0.0968	S-26D	0.01	0.02	Non-parametric	90% Chebyshev	1.564	*Yes*	No	

Terminal 4 Slip 1 Operable Unit 2 - Oregon Screening Levels (Receptors - Mammals)

Constituents of Interest (COI)			Period of Record		Samples			Detection Limits		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels*	COI Concentration (90 UCL)				Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)
CASNo	Analyte	Units	Minimum	Maximum	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Mammal Receptors	Cij	Distribution	Estimation Method	Tij			
132-64-9	*Dibenzofuran*	mg/kg	3/8/2004	9/8/2005	26	15	42%	0.0047	0.347	0.0002	0.2	S-14	0.002	0.12	Non-parametric	90% Chebyshev	58.300	*Yes*	*Yes*	

Notes:
90UCL - 90th upper confidence limit
mg/kg - milligram per kilogram
min - minimum
max - maximum
COI - constituent of interest
CPEC - constituent of potential ecological concern
SLV - screening level value
Cij - concentration of COI i in medium j
Tij - toxicity ratios for COI i in medium j
T&E - listed threatened and endangered species
Q = 1 for listed threatened and endangered (T&E) species
Q = 5 for non-T&E species
DEQ - Oregon Department of Environmental Quality
SVOC - semi-volatile organic compound

90UCLs were calculated using ProUCL software and EPA (2002) guidance. Each dataset was tested for distribution (normal, gamma, and lognormal) and the appropriate calculation method was chosen on that basis. Non-parametric methods for calculating the 90UCL were used when the distribution was unknown or wh the lognormal distribution (*) was highly skewed (>2.5).

* All Level II SLV criteria from Oregon DEQ, Table 1, Guidance for Ecological Risk Assessment, December 2001.

EPA 2002 - Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites, OSWER 9285.6-10 (December 2002)

EPA 2004 - ProUCL software, version 3.00.02, Downloaded at http://www.epa.gov/nerlesd1/tsc/form.htm (11/20/05).

Highlights indicate that the 90UCL is greater than SLV; Bold Italics indicate that 90UCL is greater than SLV for non-T/E species (HQ>5).

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Appendix B-1k Soil Summary (<3ft) and Risk Screening

Terminal 4 Slip 1 Operable Unit 2 Riverbank Area - Oregon Screening Levels (Receptors - Plants)

Constituents of Interest (COI)				Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels	COI Conc. (max)	Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	CPEC due to Multiple COI Risk? (Q=1) (T&E)	CPEC due to Multiple COI Risk? (Q=5)
				Minimum	Maximum	Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max		Plant Receptors							
CASNo	Analyte	Analyte Group	Units												Cij	Tij			Tij/Tj		
7440-36-0	Antimony and compounds	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	12	8%	1.48	1.74	0.0728	0.0728	S-26	5	0.0728	0.015	No	No	0.000	No	No
7440-38-2	Arsenic	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			2.23	15.7	S-26D	10	15.7	1.570	Yes	No	0.013	No	No
7440-41-7	Beryllium and compounds	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			0.186	0.352	S-30	10	0.352	0.035	No	No	0.000	No	No
7440-43-9	Cadmium and compounds	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			0.11	25.3	S-26D	4	25.3	6.325	Yes	Yes	0.052	No	No
75-15-0	Carbon disulfide	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	1.06	1.06				NA	<5%D	NA	No	No	NA	No	No
7440-50-8	Copper and compounds	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			12	219	S-26D	100	219	2.190	Yes	No	0.018	No	No
7439-92-1	Lead	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			4.59	868	S-26D	50	868	17.360	Yes	Yes	0.143	Yes	No
7439-97-6	Mercury and compounds	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	6	54%	0.0638	0.131	0.0092	0.325	S-26D	0	0.325	1.083	Yes	No	0.009	No	No
7440-02-0	Nickel	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			16.2	20.5	S-30	30	20.5	0.683	No	No	0.006	No	No
7782-49-2	Selenium	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			0.159	0.479	S-24	1	0.479	0.479	No	No	0.004	No	No
7440-22-4	Silver and compounds	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	8	38%	0.495	0.529	0.0967	2.1	S-26D	2	2.1	1.050	Yes	No	0.009	No	No
7440-28-0	Thallium	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	11	15%	0.495	0.529	0.0624	0.122	S-26D	1	0.122	0.122	No	No	0.001	No	No
7440-47-3	Total Chromium	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			12.3	23.8	S-29	1	23.8	23.800	Yes	Yes	0.195	Yes	No
7440-66-6	Zinc	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			49.6	3320	S-26D	50	3320	66.400	Yes	Yes	0.545	Yes	Yes
83-32-9	Acenaphthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	13	46%	0.0136	0.0773	0.0096	1.18	S-30D	20	1.18	0.059	No	No	0.000	No	No
208-96-8	Acenaphthylene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	16	33%	0.0136	0.347	0.0047	0.176	S-29	NA	0.176	NA	No	No	NA	No	No
120-12-7	Anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	7	71%	0.0138	0.52	0.0034	0.717	S-28A	NA	0.717	NA	No	No	NA	No	No
56-55-3	Benzo[a]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0151	6.58	S-28A	NA	6.58	NA	No	No	NA	No	No
50-32-8	Benzo[a]pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0081	7.79	S-28A	NA	7.79	NA	No	No	NA	No	No
205-99-2	Benzo[b]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0075	8.01	S-28A	NA	8.01	NA	No	No	NA	No	No
191-24-2	Benzo[g,h,i]perylene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	1	96%	0.0139	0.0139	0.0175	4.77	S-28A	NA	4.77	NA	No	No	NA	No	No
207-08-9	Benzo[k]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0053	7.26	S-28A	NA	7.26	NA	No	No	NA	No	No
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	SVOC, Phthalate Esters	mg/kg	9/12/2005	9/13/2005	9	8	11%	0.0142	0.0548	0.0176	0.0176	S-25	NA	0.0176	NA	No	No	NA	No	No
218-01-9	Chrysene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0179	8.19	S-28A	NA	8.19	NA	No	No	NA	No	No
99-87-6	Cymene	VOC	mg/kg	9/12/2005	9/12/2005	1	0	100%			0.0212	0.0212	S-23D	NA	0.0212	NA	No	No	NA	No	No
53-70-3	Dibenz[ah]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	1	96%	0.0139	0.0139	0.0048	1.53	S-28A	NA	1.53	NA	No	No	NA	No	No
84-74-2	Di-n-butyl phthalate	SVOC, Phthalate Esters	mg/kg	9/12/2005	9/13/2005	9	9	0%	0.0142	0.0548				200	<5%D	NA	No	No	NA	No	No
206-44-0	Fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0265	11.3	S-28A	NA	11.3	NA	No	No	NA	No	No
86-73-7	Fluorene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	13	46%	0.0136	0.0773	0.0075	1.24	S-30D	NA	1.24	NA	No	No	NA	No	No
193-39-5	Indeno[1,2,3-cd]pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	1	96%	0.0139	0.0139	0.0154	4.46	S-28A	NA	4.46	NA	No	No	NA	No	No
91-20-3	Naphthalene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	25	14	44%	0.0136	0.344	0.0056	6.48	S-30D	10	6.48	0.648	No	No	0.005	No	No
85-01-8	Phenanthrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0097	6.3	S-28A	NA	6.3	NA	No	No	NA	No	No
129-00-0	Pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0195	8.28	S-28A	NA	8.28	NA	No	No	NA	No	No
11097-69-1	Aroclor 1254	PCBs Aroclors	mg/kg	9/12/2005	9/13/2005	9	9	0%	0.0335	0.0845				NA	<5%D	NA	No	No	NA	No	No
11096-82-5	Aroclor 1260	PCBs Aroclors	mg/kg	9/12/2005	9/13/2005	9	9	0%	0.0335	0.0394				NA	<5%D	NA	No	No	NA	No	No
309-00-2	Aldrin	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.001	0.0077				NA	<5%D	NA	No	No	NA	No	No
5103-71-9	alpha-Chlordane	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.001	0.077				NA	<5%D	NA	No	No	NA	No	No
12789-03-6	Chlordane (technical)	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.001	0.0077				NA	<5%D	NA	No	No	NA	No	No
72-54-8	DDD	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	31	14%	0.0014	0.0077	0.0001	0.0028	S-29	NA	0.00279	NA	No	No	NA	No	No
72-55-9	DDE	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	31	14%	0.0014	0.077	0.0016	0.0078	S-29	NA	0.00784	NA	No	No	NA	No	No
50-29-3	DDT	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	18	50%	0.0014	0.0678	0.0004	0.0968	S-26D	NA	0.0968	NA	No	No	NA	No	No
319-86-8	delta-BHC	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.001	0.0077				NA	<5%D	NA	No	No	NA	No	No
60-57-1	Dieldrin	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	30	17%	0.0014	0.077	0.0003	0.0009	S-30A	NA	0.000896	NA	No	No	NA	No	No
959-98-8	Endosulfan I	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	35	3%	0.001	0.0077	0.0003	0.0003	S-23	NA	<5%D	NA	No	No	NA	No	No
72-20-8	Endrin	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.0014	0.0678				NA	<5%D	NA	No	No	NA	No	No
7421-93-4	Endrin Aldehyde	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.0014	0.077				NA	<5%D	NA	No	No	NA	No	No
53494-70-5	Endrin Ketone	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.0014	0.077				NA	<5%D	NA	No	No	NA	No	No
76-44-8	Heptachlor	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.001	0.0077				NA	<5%D	NA	No	No	NA	No	No
72-43-5	Methoxychlor	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.0014	0.077				NA	<5%D	NA	No	No	NA	No	No
87-61-6	1,2,3-Trichlorobenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	0	100%			0.0836	0.0836	S-23D	NA	0.0836	NA	No	No	NA	No	No
95-63-6	1,2,4-Trimethylbenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
108-67-8	1,3,5-Trimethylbenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
106-46-7	1,4-Dichlorobenzene	SVOC, Halogenated	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
78-93-3	2-Butanone	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	1.06	1.06				NA	<5%D	NA	No	No	NA	No	No

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Appendix B-1k Soil Summary (<3ft) and Risk Screening

Terminal 4 Slip 1 Operable Unit 2 Riverbank Area - Oregon Screening Levels (Receptors - Plants)

Constituents of Interest (COI)				Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels	COI Conc. (max)	Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	CPEC due to Multiple COI Risk? (Q=1) (T&E)	CPEC due to Multiple COI Risk? (Q=5)
				Minimum	Maximum	Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max		Plant Receptors							
CASNo	Analyte	Analyte Group	Units												Cij	Tij			Tij/Tj		
67-64-1	Acetone	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	2.65	2.65				NA	<5%D	NA	No	No	NA	No	No
71-43-2	Benzene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
56-23-5	Carbon tetrachloride	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
108-90-7	Chlorobenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
67-66-3	Chloroform	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
98-82-8	Cumene (isopropylbenzene)	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.212	0.212				NA	<5%D	NA	No	No	NA	No	No
DRO	Diesel Range	Petroleum Hydrocarbons	mg/kg	9/12/2005	9/13/2005	9	6	33%	25.4	29.5	14.9	36.2	S-29	NA	36.2	NA	No	No	NA	No	No
100-41-4	Ethylbenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
87-68-3	Hexachlorobutadiene	SVOC, Halogenated	mg/kg	9/12/2005	9/12/2005	1	0	100%			0.226	0.226	S-23D	NA	0.226	NA	No	No	NA	No	No
75-09-2	Methylene chloride	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.529	0.529				NA	<5%D	NA	No	No	NA	No	No
104-51-8	n-Butylbenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	0	100%			0.0434	0.0434	S-23D	NA	0.0434	NA	No	No	NA	No	No
103-65-1	n-Propylbenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
95-47-6	o-Xylene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				1	<5%D	NA	No	No	NA	No	No
RRO	Residual Range	Petroleum Hydrocarbons	mg/kg	9/12/2005	9/13/2005	9	4	56%	53.1	59	34	138	S-29	NA	138	NA	No	No	NA	No	No
135-9-88	sec-Butylbenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	0	100%			0.0222	0.0222	S-23D	NA	0.0222	NA	No	No	NA	No	No
127-18-4	Tetrachloroethylene (PCE)	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				10	<5%D	NA	No	No	NA	No	No
108-88-3	Toluene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				200	<5%D	NA	No	No	NA	No	No
79-01-6	Trichloroethylene (TCE)	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
1330-20-7	Xylene (mixed)	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.212	0.212				100	<5%D	NA	No	No	NA	No	No

Notes:

* All Level II SLV criteria from Oregon DEQ, Table 1, Guidance for Ecological Risk Assessment, December 2001)

VOC - volatile organic compound
SVOC - semi-volatile organic compound
ND - non-detect
mg/kg - milligram per kilogram
min - minimum
max - maximum
NA - not available
Q = 1 for T&E species
Q = 5 for non-T&E species

DEQ - Oregon Department of Environmental Quality
EPA - U.S. Environmental Protection Agency
COI - constituent of interest
CPEC - constituent of potential ecological concern
SLV - screening level value
Cij -concentration of COI i in medium j
Tij - toxicity ratios for COI i in medium j
T&E - listed threatened and endangered species

Tj = Sum of toxicity ratios for all COIs in medium j 121.819
Nij = Number of i COIs in medium j 15.000
1/Nij= 0.067

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Appendix B-1L Soil Summary (<3ft) and Risk Screening

Terminal 4 Slip 1 Operable Unit 2 Riverbank Area - Oregon Screening Levels (Receptors - Invertebrates)

Constituents of Interest (COI)				Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels	COI Conc. (max)	Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	CPEC due to Multiple COI Risk? (Q=1) (T&E)	CPEC due to Multiple COI Risk? (Q=5)
				Minimum	Maximum	Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max		Invertebrate Receptors							
CASNo	Analyte	Analyte Group	Units												Cij	Tij			Tij/Tj		
7440-36-0	Antimony and compounds	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	12	8%	1.48	1.74	0.0728	0.0728	S-26	NA	0.0728	NA	No	No	NA	No	No
7440-38-2	Arsenic	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			2.23	15.7	S-26D	60	15.7	0.262	No	No	0.003	No	No
7440-41-7	Beryllium and compounds	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			0.186	0.352	S-30	NA	0.352	NA	No	No	NA	No	No
7440-43-9	Cadmium and compounds	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			0.11	25.3	S-26D	20	25.3	1.265	Yes	No	0.015	No	No
75-15-0	Carbon disulfide	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	1.06	1.06				NA	<5%D	NA	No	No	NA	No	No
7440-50-8	Copper and compounds	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			12	219	S-26D	50	219	4.380	Yes	No	0.050	No	No
7439-92-1	Lead	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			4.59	868	S-26D	500	868	1.736	Yes	No	0.020	No	No
7439-97-6	Mercury and compounds	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	6	54%	0.0638	0.131	0.0092	0.325	S-26D	0.1	0.325	3.250	Yes	No	0.037	No	No
7440-02-0	Nickel	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			16.2	20.5	S-30	200	20.5	0.103	No	No	0.001	No	No
7782-49-2	Selenium	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			0.159	0.479	S-24	70	0.479	0.007	No	No	0.000	No	No
7440-22-4	Silver and compounds	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	8	38%	0.495	0.529	0.0967	2.1	S-26D	50	2.1	0.042	No	No	0.000	No	No
7440-28-0	Thallium	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	11	15%	0.495	0.529	0.0624	0.122	S-26D	NA	0.122	NA	No	No	NA	No	No
7440-47-3	Total Chromium	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			12.3	23.8	S-29	0.4	23.8	59.500	Yes	Yes	0.682	Yes	Yes
7440-66-6	Zinc	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			49.6	3320	S-26D	200	3320	16.600	Yes	Yes	0.190	Yes	No
83-32-9	Acenaphthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	13	46%	0.0136	0.0773	0.0096	1.18	S-30D	NA	1.18	NA	No	No	NA	No	No
208-96-8	Acenaphthylene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	16	33%	0.0136	0.347	0.0047	0.176	S-29	NA	0.176	NA	No	No	NA	No	No
120-12-7	Anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	7	71%	0.0138	0.52	0.0034	0.717	S-28A	NA	0.717	NA	No	No	NA	No	No
56-55-3	Benzo[a]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0151	6.58	S-28A	NA	6.58	NA	No	No	NA	No	No
50-32-8	Benzo[a]pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0081	7.79	S-28A	NA	7.79	NA	No	No	NA	No	No
205-99-2	Benzo[b]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0075	8.01	S-28A	NA	8.01	NA	No	No	NA	No	No
191-24-2	Benzo[g,h,i]perylene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	1	96%	0.0139	0.0139	0.0175	4.77	S-28A	NA	4.77	NA	No	No	NA	No	No
207-08-9	Benzo[k]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0053	7.26	S-28A	NA	7.26	NA	No	No	NA	No	No
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	SVOC, Phthalate Esters	mg/kg	9/12/2005	9/13/2005	9	8	11%	0.0142	0.0548	0.0176	0.0176	S-25	NA	0.0176	NA	No	No	NA	No	No
218-01-9	Chrysene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0179	8.19	S-28A	NA	8.19	NA	No	No	NA	No	No
99-87-6	Cymene	VOC	mg/kg	9/12/2005	9/12/2005	1	0	100%			0.0212	0.0212	S-23D	NA	0.0212	NA	No	No	NA	No	No
53-70-3	Dibenz[ah]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	1	96%	0.0139	0.0139	0.0048	1.53	S-28A	NA	1.53	NA	No	No	NA	No	No
84-74-2	Di-n-butyl phthalate	SVOC, Phthalate Esters	mg/kg	9/12/2005	9/13/2005	9	9	0%	0.0142	0.0548				NA	<5%D	NA	No	No	NA	No	No
206-44-0	Fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0265	11.3	S-28A	NA	11.3	NA	No	No	NA	No	No
86-73-7	Fluorene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	13	46%	0.0136	0.0773	0.0075	1.24	S-30D	30	1.24	0.041	No	No	0.000	No	No
193-39-5	Indeno[1,2,3-cd]pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	1	96%	0.0139	0.0139	0.0154	4.46	S-28A	NA	4.46	NA	No	No	NA	No	No
91-20-3	Naphthalene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	25	14	44%	0.0136	0.344	0.0056	6.48	S-30D	NA	6.48	NA	No	No	NA	No	No
85-01-8	Phenanthrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0097	6.3	S-28A	NA	6.3	NA	No	No	NA	No	No
129-00-0	Pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0195	8.28	S-28A	NA	8.28	NA	No	No	NA	No	No
11097-69-1	Aroclor 1254	PCBs Aroclors	mg/kg	9/12/2005	9/13/2005	9	9	0%	0.0335	0.0845				NA	<5%D	NA	No	No	NA	No	No
11096-82-5	Aroclor 1260	PCBs Aroclors	mg/kg	9/12/2005	9/13/2005	9	9	0%	0.0335	0.0394				NA	<5%D	NA	No	No	NA	No	No
309-00-2	Aldrin	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.001	0.0077				NA	<5%D	NA	No	No	NA	No	No
5103-71-9	alpha-Chlordane	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.001	0.077				NA	<5%D	NA	No	No	NA	No	No
12789-03-6	Chlordane (technical)	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.001	0.0077				NA	<5%D	NA	No	No	NA	No	No
72-54-8	DDD	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	31	14%	0.0014	0.0077	0.0001	0.0028	S-29	NA	0.00279	NA	No	No	NA	No	No
72-55-9	DDE	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	31	14%	0.0014	0.077	0.0016	0.0078	S-29	NA	0.00784	NA	No	No	NA	No	No
50-29-3	DDT	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	18	50%	0.0014	0.0678	0.0004	0.0968	S-26D	NA	0.0968	NA	No	No	NA	No	No
319-86-8	delta-BHC	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.001	0.0077				NA	<5%D	NA	No	No	NA	No	No
60-57-1	Dieldrin	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	30	17%	0.0014	0.077	0.0003	0.0009	S-30A	NA	0.000896	NA	No	No	NA	No	No
959-98-8	Endosulfan I	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	35	3%	0.001	0.0077	0.0003	0.0003	S-23	NA	<5%D	NA	No	No	NA	No	No
72-20-8	Endrin	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.0014	0.0678				NA	<5%D	NA	No	No	NA	No	No
7421-93-4	Endrin Aldehyde	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.0014	0.077				NA	<5%D	NA	No	No	NA	No	No
53494-70-5	Endrin Ketone	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.0014	0.077				NA	<5%D	NA	No	No	NA	No	No
76-44-8	Heptachlor	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.001	0.0077				NA	<5%D	NA	No	No	NA	No	No
72-43-5	Methoxychlor	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.0014	0.077				NA	<5%D	NA	No	No	NA	No	No
87-61-6	1,2,3-Trichlorobenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	0	100%			0.0836	0.0836	S-23D	20	0.0836	0.004	No	No	0.000	No	No
95-63-6	1,2,4-Trimethylbenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
108-67-8	1,3,5-Trimethylbenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
106-46-7	1,4-Dichlorobenzene	SVOC, Halogenated	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				20	<5%D	NA	No	No	NA	No	No
78-93-3	2-Butanone	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	1.06	1.06				NA	<5%D	NA	No	No	NA	No	No

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Appendix B-1L Soil Summary (<3ft) and Risk Screening

Terminal 4 Slip 1 Operable Unit 2 Riverbank Area - Oregon Screening Levels (Receptors - Invertebrates)

Constituents of Interest (COI)				Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels	COI Conc. (max)	Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	CPEC due to Multiple COI Risk? (Q=1) (T&E)	CPEC due to Multiple COI Risk? (Q=5)
				Minimum	Maximum	Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max		Invertebrate Receptors							
CASNo	Analyte	Analyte Group	Units												Cij	Tij			Tij/Tj		
67-64-1	Acetone	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	2.65	2.65				NA	<5%D	NA	No	No	NA	No	No
71-43-2	Benzene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
56-23-5	Carbon tetrachloride	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				1000	<5%D	NA	No	No	NA	No	No
108-90-7	Chlorobenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				40	<5%D	NA	No	No	NA	No	No
67-66-3	Chloroform	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
98-82-8	Cumene (isopropylbenzene)	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.212	0.212				NA	<5%D	NA	No	No	NA	No	No
DRO	Diesel Range	Petroleum Hydrocarbons	mg/kg	9/12/2005	9/13/2005	9	6	33%	25.4	29.5	14.9	36.2	S-29	NA	36.2	NA	No	No	NA	No	No
100-41-4	Ethylbenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
87-68-3	Hexachlorobutadiene	SVOC, Halogenated	mg/kg	9/12/2005	9/12/2005	1	0	100%			0.226	0.226	S-23D	NA	0.226	NA	No	No	NA	No	No
75-09-2	Methylene chloride	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.529	0.529				NA	<5%D	NA	No	No	NA	No	No
104-51-8	n-Butylbenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	0	100%			0.0434	0.0434	S-23D	NA	0.0434	NA	No	No	NA	No	No
103-65-1	n-Propylbenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
95-47-6	o-Xylene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
RRO	Residual Range	Petroleum Hydrocarbons	mg/kg	9/12/2005	9/13/2005	9	4	56%	53.1	59	34	138	S-29	NA	138	NA	No	No	NA	No	No
135-9-88	sec-Butylbenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	0	100%			0.0222	0.0222	S-23D	NA	0.0222	NA	No	No	NA	No	No
127-18-4	Tetrachloroethylene (PCE)	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
108-88-3	Toluene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
79-01-6	Trichloroethylene (TCE)	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
1330-20-7	Xylene (mixed)	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.212	0.212				NA	<5%D	NA	No	No	NA	No	No

Notes:

* All Level II SLV criteria from Oregon DEQ, Table 1, Guidance for Ecological Risk Assessment, December 2001)
VOC - volatile organic compound
SVOC - semi-volatile organic compou
ND - non-detect
mg/kg - milligram per kilogram
min - minimum
max - maximum
NA - not available
Q = 1 for T&E species
Q = 5 for non-T&E species

DEQ - Oregon Department of Environmental Quality
EPA - U.S. Environmental Protection Agency
COI - constituent of interest
CPEC - constituent of potential ecological concern
SLV - screening level value
Cij -concentration of COI i in medium j
Tij - toxicity ratios for COI i in medium j
T&E - listed threatened and endangered species

Tj = Sum of toxicity ratios for all COIs in medium j 87.190
Nij = Number of i COIs in medium j 12.000
1/Nij= 0.083

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Appendix B-1m Soil Summary (<3ft) and Risk Screening

Terminal 4 Slip 1 Operable Unit 2 Riverbank Area - Oregon Screening Levels (Receptors - Birds)

Constituents of Interest (COI)				Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels	COI Conc. (max)	Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	CPEC due to Multiple COI Risk? (Q=1) (T&E)	CPEC due to Multiple COI Risk? (Q=5)
				Minimum	Maximum	Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max		Bird Receptors	Cij	Tij			Tij/Tj		
CASNo	Analyte	Analyte Group	Units																		
7440-36-0	Antimony and compounds	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	12	8%	1.48	1.74	0.0728	0.0728	S-26	NA	0.0728	NA	No	No	NA	No	No
7440-38-2	*Arsenic*	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			2.23	15.7	S-26D	10	15.7	1.570	Yes	No	0.012	No	No
7440-41-7	Beryllium and compounds	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			0.186	0.352	S-30	NA	0.352	NA	No	No	NA	No	No
7440-43-9	*Cadmium and compounds*	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			0.11	25.3	S-26D	6	25.3	4.217	Yes	No	0.032	No	No
75-15-0	Carbon disulfide	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	1.06	1.06				NA	<5%D	NA	No	No	NA	No	No
7440-50-8	*Copper and compounds*	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			12	219	S-26D	190	219	1.153	Yes	No	0.009	No	No
7439-92-1	*Lead*	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			4.59	868	S-26D	16	868	54.250	Yes	Yes	0.406	Yes	Yes
7439-97-6	Mercury and compounds	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	6	54%	0.0638	0.131	0.0092	0.325	S-26D	1.5	0.325	0.217	No	No	0.002	No	No
7440-02-0	Nickel	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			16.2	20.5	S-30	320	20.5	0.064	No	No	0.000	No	No
7782-49-2	Selenium	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			0.159	0.479	S-24	2	0.479	0.240	No	No	0.002	No	No
7440-22-4	Silver and compounds	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	8	38%	0.495	0.529	0.0967	2.1	S-26D	NA	2.1	NA	No	No	NA	No	No
7440-28-0	Thallium	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	11	15%	0.495	0.529	0.0624	0.122	S-26D	NA	0.122	NA	No	No	NA	No	No
7440-47-3	*Total Chromium*	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			12.3	23.8	S-29	4	23.8	5.950	Yes	Yes	0.044	No	No
7440-66-6	*Zinc*	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			49.6	3320	S-26D	60	3320	55.333	Yes	Yes	0.414	Yes	Yes
83-32-9	Acenaphthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	13	46%	0.0136	0.0773	0.0096	1.18	S-30D	NA	1.18	NA	No	No	NA	No	No
208-96-8	Acenaphthylene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	16	33%	0.0136	0.347	0.0047	0.176	S-29	NA	0.176	NA	No	No	NA	No	No
120-12-7	Anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	7	71%	0.0138	0.52	0.0034	0.717	S-28A	NA	0.717	NA	No	No	NA	No	No
56-55-3	Benzo[a]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0151	6.58	S-28A	NA	6.58	NA	No	No	NA	No	No
50-32-8	Benzo[a]pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0081	7.79	S-28A	NA	7.79	NA	No	No	NA	No	No
205-99-2	Benzo[b]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0075	8.01	S-28A	NA	8.01	NA	No	No	NA	No	No
191-24-2	Benzo[g,h,i]perylene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	1	96%	0.0139	0.0139	0.0175	4.77	S-28A	NA	4.77	NA	No	No	NA	No	No
207-08-9	Benzo[k]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0053	7.26	S-28A	NA	7.26	NA	No	No	NA	No	No
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	SVOC, Phthalate Esters	mg/kg	9/12/2005	9/13/2005	9	8	11%	0.0142	0.0548	0.0176	0.0176	S-25	5	0.0176	0.004	No	No	0.000	No	No
218-01-9	Chrysene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0179	8.19	S-28A	NA	8.19	NA	No	No	NA	No	No
99-87-6	Cymene	VOC	mg/kg	9/12/2005	9/12/2005	1	0	100%			0.0212	0.0212	S-23D	NA	0.0212	NA	No	No	NA	No	No
53-70-3	Dibenz[ah]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	1	96%	0.0139	0.0139	0.0048	1.53	S-28A	NA	1.53	NA	No	No	NA	No	No
84-74-2	Di-n-butyl phthalate	SVOC, Phthalate Esters	mg/kg	9/12/2005	9/13/2005	9	9	0%	0.0142	0.0548				0	<5%D	NA	No	No	NA	No	No
206-44-0	Fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0265	11.3	S-28A	NA	11.3	NA	No	No	NA	No	No
86-73-7	Fluorene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	13	46%	0.0136	0.0773	0.0075	1.24	S-30D	NA	1.24	NA	No	No	NA	No	No
193-39-5	Indeno[1,2,3-cd]pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	1	96%	0.0139	0.0139	0.0154	4.46	S-28A	NA	4.46	NA	No	No	NA	No	No
91-20-3	Naphthalene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	25	14	44%	0.0136	0.344	0.0056	6.48	S-30D	NA	6.48	NA	No	No	NA	No	No
85-01-8	Phenanthrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0097	6.3	S-28A	NA	6.3	NA	No	No	NA	No	No
129-00-0	Pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0195	8.28	S-28A	NA	8.28	NA	No	No	NA	No	No
11097-69-1	Aroclor 1254	PCBs Aroclors	mg/kg	9/12/2005	9/13/2005	9	9	0%	0.0335	0.0845				1	<5%D	NA	No	No	NA	No	No
11096-82-5	Aroclor 1260	PCBs Aroclors	mg/kg	9/12/2005	9/13/2005	9	9	0%	0.0335	0.0394				NA	<5%D	NA	No	No	NA	No	No
309-00-2	Aldrin	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.001	0.0077				NA	<5%D	NA	No	No	NA	No	No
5103-71-9	alpha-Chlordane	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.001	0.077				9	<5%D	NA	No	No	NA	No	No
12789-03-6	Chlordane (technical)	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.001	0.0077				9	<5%D	NA	No	No	NA	No	No
72-54-8	DDD	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	31	14%	0.0014	0.0077	0.0001	0.0028	S-29	0.01	0.00279	0.279	No	No	0.002	No	No
72-55-9	DDE	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	31	14%	0.0014	0.077	0.0016	0.0078	S-29	0.01	0.00784	0.784	No	No	0.006	No	No
50-29-3	*DDT*	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	18	50%	0.0014	0.0678	0.0004	0.0968	S-26D	0.01	0.0968	9.680	Yes	Yes	0.072	Yes	No
319-86-8	delta-BHC	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.001	0.0077				NA	<5%D	NA	No	No	NA	No	No
60-57-1	Dieldrin	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	30	17%	0.0014	0.077	0.0003	0.0009	S-30A	0.3	0.000896	0.003	No	No	0.000	No	No
959-98-8	Endosulfan I	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	35	3%	0.001	0.0077	0.0003	0.0003	S-23	42	<5%D	NA	No	No	NA	No	No
72-20-8	***Endrin***	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.0014	0.0678				0.04	<5%D	NA	***ND>SLV***	***ND>SLV***	NA	No	No
7421-93-4	***Endrin Aldehyde***	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.0014	0.077				0.04	<5%D	NA	***ND>SLV***	***ND>SLV***	NA	No	No
53494-70-5	***Endrin Ketone***	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.0014	0.077				0.04	<5%D	NA	***ND>SLV***	***ND>SLV***	NA	No	No
76-44-8	Heptachlor	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.001	0.0077				NA	<5%D	NA	No	No	NA	No	No
72-43-5	Methoxychlor	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.0014	0.077				NA	<5%D	NA	No	No	NA	No	No
87-61-6	1,2,3-Trichlorobenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	0	100%			0.0836	0.0836	S-23D	NA	0.0836	NA	No	No	NA	No	No
95-63-6	1,2,4-Trimethylbenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
108-67-8	1,3,5-Trimethylbenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
106-46-7	1,4-Dichlorobenzene	SVOC, Halogenated	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
78-93-3	2-Butanone	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	1.06	1.06				NA	<5%D	NA	No	No	NA	No	No

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Appendix B-1m Soil Summary (<3ft) and Risk Screening

Terminal 4 Slip 1 Operable Unit 2 Riverbank Area - Oregon Screening Levels (Receptors - Birds)

Constituents of Interest (COI)				Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels	COI Conc. (max)	Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	CPEC due to Multiple COI Risk? (Q=1) (T&E)	CPEC due to Multiple COI Risk? (Q=5)
				Minimum	Maximum	Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max		Bird Receptors							
CASNo	Analyte	Analyte Group	Units												Cij	Tij			Tij/Tj		
67-64-1	Acetone	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	2.65	2.65				NA	<5%D	NA	No	No	NA	No	No
71-43-2	Benzene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
56-23-5	Carbon tetrachloride	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
108-90-7	Chlorobenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
67-66-3	Chloroform	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
98-82-8	Cumene (isopropylbenzene)	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.212	0.212				NA	<5%D	NA	No	No	NA	No	No
DRO	Diesel Range	Petroleum Hydrocarbons	mg/kg	9/12/2005	9/13/2005	9	6	33%	25.4	29.5	14.9	36.2	S-29	NA	36.2	NA	No	No	NA	No	No
100-41-4	Ethylbenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
87-68-3	Hexachlorobutadiene	SVOC, Halogenated	mg/kg	9/12/2005	9/12/2005	1	0	100%			0.226	0.226	S-23D	NA	0.226	NA	No	No	NA	No	No
75-09-2	Methylene chloride	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.529	0.529				NA	<5%D	NA	No	No	NA	No	No
104-51-8	n-Butylbenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	0	100%			0.0434	0.0434	S-23D	NA	0.0434	NA	No	No	NA	No	No
103-65-1	n-Propylbenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
95-47-6	o-Xylene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
RRO	Residual Range	Petroleum Hydrocarbons	mg/kg	9/12/2005	9/13/2005	9	4	56%	53.1	59	34	138	S-29	NA	138	NA	No	No	NA	No	No
135-9-88	sec-Butylbenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	0	100%			0.0222	0.0222	S-23D	NA	0.0222	NA	No	No	NA	No	No
127-18-4	Tetrachloroethylene (PCE)	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
108-88-3	Toluene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
79-01-6	Trichloroethylene (TCE)	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
1330-20-7	Xylene (mixed)	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.212	0.212				NA	<5%D	NA	No	No	NA	No	No

Notes:

* All Level II SLV criteria from Oregon DEQ, Table 1, Guidance for Ecological Risk Assessment, December 2001)

VOC - volatile organic compound

SVOC - semi-volatile organic compound

ND - non-detect

mg/kg - milligram per kilogram

min - minimum

max - maximum

NA - not available

Q = 1 for T&E species

Q = 5 for non-T&E species

DEQ - Oregon Department of Environmental Quality

EPA - U.S. Environmental Protection Agency

COI - constituent of interest

CPEC - constituent of potential ecological concern

SLV - screening level value

Cij -concentration of COI i in medium j

Tij - toxicity ratios for COI i in medium j

T&E - listed threatened and endangered species

Tj = Sum of toxicity ratios for all COIs in medium j 133.743

Nij = Number of i COIs in medium j 14.000

1/Nij= 0.071

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Appendix B-1n Soil Summary (<3ft) and Risk Screening

Terminal 4 Slip 1 Operable Unit 2 Riverbank Area - Oregon Screening Levels (Receptors - Mammals)

Constituents of Interest (COI)				Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels	COI Conc. (max)	Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	CPEC due to Multiple COI Risk? (Q=1) (T&E)	CPEC due to Multiple COI Risk? (Q=5)
				Minimum	Maximum	Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max		Mammal Receptors							
CASNo	Analyte	Analyte Group	Units												Cij	Tij			Tij/Tj		
7440-36-0	Antimony and compounds	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	12	8%	1.48	1.74	0.0728	0.0728	S-26	15	0.0728	0.005	No	No	0.003	No	No
7440-38-2	Arsenic	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			2.23	15.7	S-26D	29	15.7	0.541	No	No	0.279	Yes	Yes
7440-41-7	Beryllium and compounds	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			0.186	0.352	S-30	83	0.352	0.004	No	No	0.002	No	No
7440-43-9	Cadmium and compounds	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			0.11	25.3	S-26D	125	25.3	0.202	No	No	0.104	Yes	No
75-15-0	Carbon disulfide	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	1.06	1.06				NA	<5%D	NA	No	No	NA	No	No
7440-50-8	Copper and compounds	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			12	219	S-26D	390	219	0.562	No	No	0.289	Yes	Yes
7439-92-1	Lead	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			4.59	868	S-26D	4000	868	0.217	No	No	0.112	Yes	No
7439-97-6	Mercury and compounds	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	6	54%	0.0638	0.131	0.0092	0.325	S-26D	73	0.325	0.004	No	No	0.002	No	No
7440-02-0	Nickel	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			16.2	20.5	S-30	625	20.5	0.033	No	No	0.017	No	No
7782-49-2	Selenium	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			0.159	0.479	S-24	25	0.479	0.019	No	No	0.010	No	No
7440-22-4	Silver and compounds	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	8	38%	0.495	0.529	0.0967	2.1	S-26D	NA	2.1	NA	No	No	NA	No	No
7440-28-0	Thallium	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	11	15%	0.495	0.529	0.0624	0.122	S-26D	1	0.122	0.122	No	No	0.063	Yes	No
7440-47-3	Total Chromium	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			12.3	23.8	S-29	340000	23.8	0.000	No	No	0.000	No	No
7440-66-6	Zinc	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			49.6	3320	S-26D	20000	3320	0.166	No	No	0.086	Yes	No
83-32-9	Acenaphthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	13	46%	0.0136	0.0773	0.0096	1.18	S-30D	NA	1.18	NA	No	No	NA	No	No
208-96-8	Acenaphthylene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	16	33%	0.0136	0.347	0.0047	0.176	S-29	NA	0.176	NA	No	No	NA	No	No
120-12-7	Anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	7	71%	0.0138	0.52	0.0034	0.717	S-28A	NA	0.717	NA	No	No	NA	No	No
56-55-3	Benzo[a]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0151	6.58	S-28A	NA	6.58	NA	No	No	NA	No	No
50-32-8	Benzo[a]pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0081	7.79	S-28A	125	7.79	0.062	No	No	0.032	No	No
205-99-2	Benzo[b]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0075	8.01	S-28A	NA	8.01	NA	No	No	NA	No	No
191-24-2	Benzo[g,h,i]perylene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	1	96%	0.0139	0.0139	0.0175	4.77	S-28A	NA	4.77	NA	No	No	NA	No	No
207-08-9	Benzo[k]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0053	7.26	S-28A	NA	7.26	NA	No	No	NA	No	No
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	SVOC, Phthalate Esters	mg/kg	9/12/2005	9/13/2005	9	8	11%	0.0142	0.0548	0.0176	0.0176	S-25	1020	0.0176	0.000	No	No	0.000	No	No
218-01-9	Chrysene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0179	8.19	S-28A	NA	8.19	NA	No	No	NA	No	No
99-87-6	Cymene	VOC	mg/kg	9/12/2005	9/12/2005	1	0	100%			0.0212	0.0212	S-23D	NA	0.0212	NA	No	No	NA	No	No
53-70-3	Dibenz[ah]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	1	96%	0.0139	0.0139	0.0048	1.53	S-28A	NA	1.53	NA	No	No	NA	No	No
84-74-2	Di-n-butyl phthalate	SVOC, Phthalate Esters	mg/kg	9/12/2005	9/13/2005	9	9	0%	0.0142	0.0548				30000	<5%D	NA	No	No	NA	No	No
206-44-0	Fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0265	11.3	S-28A	NA	11.3	NA	No	No	NA	No	No
86-73-7	Fluorene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	13	46%	0.0136	0.0773	0.0075	1.24	S-30D	NA	1.24	NA	No	No	NA	No	No
193-39-5	Indeno[1,2,3-cd]pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	1	96%	0.0139	0.0139	0.0154	4.46	S-28A	NA	4.46	NA	No	No	NA	No	No
91-20-3	Naphthalene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	25	14	44%	0.0136	0.344	0.0056	6.48	S-30D	3900	6.48	0.002	No	No	0.001	No	No
85-01-8	Phenanthrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0097	6.3	S-28A	NA	6.3	NA	No	No	NA	No	No
129-00-0	Pyrene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0195	8.28	S-28A	NA	8.28	NA	No	No	NA	No	No
11097-69-1	Aroclor 1254	PCBs Aroclors	mg/kg	9/12/2005	9/13/2005	9	9	0%	0.0335	0.0845				4	<5%D	NA	No	No	NA	No	No
11096-82-5	Aroclor 1260	PCBs Aroclors	mg/kg	9/12/2005	9/13/2005	9	9	0%	0.0335	0.0394				NA	<5%D	NA	No	No	NA	No	No
309-00-2	Aldrin	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.001	0.0077				25	<5%D	NA	No	No	NA	No	No
5103-71-9	alpha-Chlordane	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.001	0.077				250	<5%D	NA	No	No	NA	No	No
12789-03-6	Chlordane (technical)	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.001	0.0077				250	<5%D	NA	No	No	NA	No	No
72-54-8	DDD	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	31	14%	0.0014	0.0077	0.0001	0.0028	S-29	100	0.00279	0.000	No	No	0.000	No	No
72-55-9	DDE	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	31	14%	0.0014	0.077	0.0016	0.0078	S-29	100	0.00784	0.000	No	No	0.000	No	No
50-29-3	DDT	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	18	50%	0.0014	0.0678	0.0004	0.0968	S-26D	100	0.0968	0.001	No	No	0.000	No	No
319-86-8	delta-BHC	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.001	0.0077				NA	<5%D	NA	No	No	NA	No	No
60-57-1	Dieldrin	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	30	17%	0.0014	0.077	0.0003	0.0009	S-30A	3	0.000896	0.000	No	No	0.000	No	No
959-98-8	Endosulfan I	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	35	3%	0.001	0.0077	0.0003	0.0003	S-23	20	<5%D	NA	No	No	NA	No	No
72-20-8	Endrin	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.0014	0.0678				5	<5%D	NA	No	No	NA	No	No
7421-93-4	Endrin Aldehyde	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.0014	0.077				5	<5%D	NA	No	No	NA	No	No
53494-70-5	Endrin Ketone	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.0014	0.077				5	<5%D	NA	No	No	NA	No	No
76-44-8	Heptachlor	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.001	0.0077				15	<5%D	NA	No	No	NA	No	No
72-43-5	Methoxychlor	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.0014	0.077				500	<5%D	NA	No	No	NA	No	No
87-61-6	1,2,3-Trichlorobenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	0	100%			0.0836	0.0836	S-23D	NA	0.0836	NA	No	No	NA	No	No
95-63-6	1,2,4-Trimethylbenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
108-67-8	1,3,5-Trimethylbenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
106-46-7	1,4-Dichlorobenzene	SVOC, Halogenated	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
78-93-3	2-Butanone	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	1.06	1.06				NA	<5%D	NA	No	No	NA	No	No

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Appendix B-1n Soil Summary (<3ft) and Risk Screening

Terminal 4 Slip 1 Operable Unit 2 Riverbank Area - Oregon Screening Levels (Receptors - Mammals)

Constituents of Interest (COI)				Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels	COI Conc. (max)	Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	CPEC due to Multiple COI Risk? (Q=1) (T&E)	CPEC due to Multiple COI Risk? (Q=5)
				Minimum	Maximum	Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max		Mammal Receptors							
CASNo	Analyte	Analyte Group	Units												Cij	Tij			Tij/Tj		
67-64-1	Acetone	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	2.65	2.65				1250	<5%D	NA	No	No	NA	No	No
71-43-2	Benzene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				3300	<5%D	NA	No	No	NA	No	No
56-23-5	Carbon tetrachloride	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				2000	<5%D	NA	No	No	NA	No	No
108-90-7	Chlorobenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
67-66-3	Chloroform	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				1875	<5%D	NA	No	No	NA	No	No
98-82-8	Cumene (isopropylbenzene)	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.212	0.212				NA	<5%D	NA	No	No	NA	No	No
DRO	Diesel Range	Petroleum Hydrocarbons	mg/kg	9/12/2005	9/13/2005	9	6	33%	25.4	29.5	14.9	36.2	S-29	NA	36.2	NA	No	No	NA	No	No
100-41-4	Ethylbenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
87-68-3	Hexachlorobutadiene	SVOC, Halogenated	mg/kg	9/12/2005	9/12/2005	1	0	100%			0.226	0.226	S-23D	NA	0.226	NA	No	No	NA	No	No
75-09-2	Methylene chloride	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.529	0.529				730	<5%D	NA	No	No	NA	No	No
104-51-8	n-Butylbenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	0	100%			0.0434	0.0434	S-23D	NA	0.0434	NA	No	No	NA	No	No
103-65-1	n-Propylbenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
95-47-6	o-Xylene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				NA	<5%D	NA	No	No	NA	No	No
RRO	Residual Range	Petroleum Hydrocarbons	mg/kg	9/12/2005	9/13/2005	9	4	56%	53.1	59	34	138	S-29	NA	138	NA	No	No	NA	No	No
135-9-88	sec-Butylbenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	0	100%			0.0222	0.0222	S-23D	NA	0.0222	NA	No	No	NA	No	No
127-18-4	Tetrachloroethylene (PCE)	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				80	<5%D	NA	No	No	NA	No	No
108-88-3	Toluene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				1440	<5%D	NA	No	No	NA	No	No
79-01-6	Trichloroethylene (TCE)	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				40	<5%D	NA	No	No	NA	No	No
1330-20-7	Xylene (mixed)	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.212	0.212				120	<5%D	NA	No	No	NA	No	No

Notes:

* All Level II SLV criteria from Oregon DEQ, Table 1, Guidance for Ecological Risk Assessment, December 2001)
VOC - volatile organic compound
SVOC - semi-volatile organic compoun
ND - non-detect
mg/kg - milligram per kilogram
min - minimum
max - maximum
NA - not available
Q = 1 for T&E species
Q = 5 for non-T&E species

DEQ - Oregon Department of Environmental Quality
EPA - U.S. Environmental Protection Agency
COI - constituent of interest
CPEC - constituent of potential ecological concern
SLV - screening level value
Cij -concentration of COI i in medium j
Tij - toxicity ratios for COI i in medium j
T&E - listed threatened and endangered species

Tj = Sum of toxicity ratios for all COIs in medium j 1.941
Nij = Number of i COIs in medium j 19.000
1/Nij= 0.053

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APPENDIX B-1o Soil Summary (<3ft) with 90UCLs and Risk Screening

Terminal 4 Slip 1 Operable Unit 2 Riverbank Area - Oregon Screening Levels (Receptors - Plants)

Constituents of Interest (COI)			Period of Record		Samples			Detection Limits		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels*	COI Concentration (90 UCL)				Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)
CASNo	Analyte	Units	Minimum	Maximum	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Plant Receptors	Cij	Distribution	Estimation Method	Tij			
7440-43-9	Cadmium and compounds	mg/kg	9/12/2005	9/13/2005	13	0	100%			0.11	25.3	S-26D	4	9.6	Non-parametric	90% Chebyshev	2.4	Yes	No	
7440-50-8	Copper and compounds	mg/kg	9/12/2005	9/13/2005	13	0	100%			12	219	S-26D	100	91.2	Non-parametric	90% Chebyshev	0.9	No	No	
7439-92-1	Lead	mg/kg	9/12/2005	9/13/2005	13	0	100%			4.59	868	S-26D	50	310.1	Gamma	Adjusted Gamma	6.2	Yes	Yes	
7440-22-4	Silver and compounds	mg/kg	9/12/2005	9/13/2005	13	8	38%	0.495	0.529	0.0967	2.1	S-26D	2	1.0	Non-parametric	90% Chebyshev	0.5	No	No	
7440-66-6	Zinc	mg/kg	9/12/2005	9/13/2005	13	0	100%			49.6	3320	S-26D	50	1281.7	Non-parametric	90% Chebyshev	25.6	Yes	Yes	
7440-38-2	Arsenic	mg/kg	9/12/2005	9/13/2005	13	0	100%			2.23	15.7	S-26D	10	9.5	Non-parametric	90% Chebyshev	1.0	No	No	
7440-47-3	Total Chromium	mg/kg	9/12/2005	9/13/2005	13	0	100%			12.3	23.8	S-29	1	18.1	Gamma	Approximate Gamma	18.1	Yes	Yes	
7439-97-6	Mercury and compounds	mg/kg	9/12/2005	9/13/2005	13	6	54%	0.0638	0.131	0.0092	0.325	S-26D	0.3	0.1	Gamma	Approximate Gamma	0.4	No	No	

Terminal 4 Slip 1 Operable Unit 2 Riverbank Area - Oregon Screening Levels (Receptors - Invertebrates)

Constituents of Interest (COI)			Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels*	COI Concentration (90 UCL)				Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)
CASNo	Analyte	Units	Minimum	Maximum	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Invertebrate Receptors	Cij	Distribution	Estimation Method	Tij			
7440-43-9	Cadmium and compounds	mg/kg	9/12/2005	9/13/2005	13	0	100%			0.11	25.3	S-26D	20	9.6	Non-parametric	90% Chebyshev	0.5	No	No	
7440-50-8	Copper and compounds	mg/kg	9/12/2005	9/13/2005	13	0	100%			12	219	S-26D	50	91.2	Non-parametric	90% Chebyshev	1.8	Yes	No	
7439-92-1	Lead	mg/kg	9/12/2005	9/13/2005	13	0	100%			4.59	868	S-26D	500	310.1	Gamma	Adjusted Gamma	0.6	No	No	
7440-66-6	Zinc	mg/kg	9/12/2005	9/13/2005	13	0	100%			49.6	3320	S-26D	200	1281.7	Non-parametric	90% Chebyshev	6.4	Yes	Yes	
7440-47-3	Total Chromium	mg/kg	9/12/2005	9/13/2005	13	0	100%			12.3	23.8	S-29	0.4	18.1	Gamma	Approximate Gamma	45.3	Yes	Yes	
7439-97-6	Mercury and compounds	mg/kg	9/12/2005	9/13/2005	13	6	54%	0.0638	0.131	0.0092	0.325	S-26D	0.1	0.1	Gamma	Approximate Gamma	1.1	Yes	No	

Terminal 4 Slip 1 Operable Unit 2 Riverbank Area - Oregon Screening Levels (Receptors - Birds)

Constituents of Interest (COI)			Period of Record		Samples			Detection Limits		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels*	COI Concentration (90 UCL)				Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)
CASNo	Analyte	Units	Minimum	Maximum	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Bird Receptors	Cij	Distribution	Estimation Method	Tij			
7440-43-9	Cadmium and compounds	mg/kg	9/12/2005	9/13/2005	13	0	100%			0.11	25.3	S-26D	6	9.6	Non-parametric	90% Chebyshev	1.6	Yes	No	
7440-50-8	Copper and compounds	mg/kg	9/12/2005	9/13/2005	13	0	100%			12	219	S-26D	190	91.2	Non-parametric	90% Chebyshev	0.5	No	No	
7439-92-1	Lead	mg/kg	9/12/2005	9/13/2005	13	0	100%			4.59	868	S-26D	16	310.1	Gamma	Adjusted Gamma	19.4	Yes	Yes	
7440-66-6	Zinc	mg/kg	9/12/2005	9/13/2005	13	0	100%			49.6	3320	S-26D	60	1281.7	Non-parametric	90% Chebyshev	21.4	Yes	Yes	
7440-47-3	Total Chromium	mg/kg	9/12/2005	9/13/2005	13	0	100%			12.3	23.8	S-29	4	18.1	Gamma	Approximate Gamma	4.5	Yes	No	
7440-38-2	Arsenic	mg/kg	9/12/2005	9/13/2005	13	0	100%			2.23	15.7	S-26D	10	9.5	Non-parametric	90% Chebyshev	1.0	No	No	
50-29-3	DDT	mg/kg	9/12/2005	9/13/2005	36	18	50%	0.0014	0.0678	0.0004	0.0968	S-26D	0.01	0.02	Non-parametric	90% Chebyshev	1.7	Yes	No	

Terminal 4 Slip 1 Operable Unit 2 Riverbank Area - Oregon Screening Levels (Receptors - Mammals)

Constituents of Interest (COI)			Period of Record		Samples			Detection Limits		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels*	COI Concentration (90 UCL)				Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)
CASNo	Analyte	Units	Minimum	Maximum	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Mammal Receptors	Cij	Distribution	Estimation Method	Tij			
7440-43-9	Cadmium and compounds	mg/kg	9/12/2005	9/13/2005	13	0	100%			0.11	25.3	S-26D	125	9.6	Non-parametric	90% Chebyshev	0.1	No	No	
7440-50-8	Copper and compounds	mg/kg	9/12/2005	9/13/2005	13	0	100%			12	219	S-26D	390	91.2	Non-parametric	90% Chebyshev	0.2	No	No	
7439-92-1	Lead	mg/kg	9/12/2005	9/13/2005	13	0	100%			4.59	868	S-26D	4000	310.1	Gamma	Adjusted Gamma	0.1	No	No	
7440-66-6	Zinc	mg/kg	9/12/2005	9/13/2005	13	0	100%			49.6	3320	S-26D	20000	1281.7	Non-parametric	90% Chebyshev	0.1	No	No	
7440-38-2	Arsenic	mg/kg	9/12/2005	9/13/2005	13	0	100%			2.23	15.7	S-26D	29	9.5	Non-parametric	90% Chebyshev	0.3	No	No	
7440-28-0	Thallium	mg/kg	9/12/2005	9/13/2005	13	11	15%	0.495	0.529	0.0624	0.122	S-26D	1	0.3	Non-parametric	Mod-t (adj for skewness)	0.3	No	No	

Notes:
90UCL - 90th upper confidence limit
mg/kg - milligram per kilogram
min - minimum
max - maximum
COI - constituent of interest
CPEC - constituent of potential ecological concern
SLV - screening level value
Cij -concentration of COI i in medium j
Tij - toxicity ratios for COI i in medium j
T&E - listed threatened and endangered species
Q = 1 for listed threatened and endangered (T&E) species
Q = 5 for non-T&E species
DEQ - Oregon Department of Environmental Quality
SVOC - semi-volatile organic compound

90UCLs were calculated using ProUCL software and EPA (2002) guidance. Each dataset was tested for distribution (normal, gamma, and lognormal) and the appropriate calculation method was chosen on that basis. Non-parametric methods for calculating the 90UCL were used when the distribution was unknown or when the lognormal distribution (*) was highly skewed (>2.5).

* All Level II SLV criteria from Oregon DEQ, Table 1, Guidance for Ecological Risk Assessment, December 2001.

EPA 2002 - Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites, OSWER 9285.6-10 (December 2002)

EPA 2004 - ProUCL software, version 3.00.02, Downloaded at http://www.epa.gov/nerlesd1/tsc/form.htm (11/20/05).

Highlights indicate that the 90UCL is greater than SLV; Bold Italics indicate that 90UCL is greater than SLV for non-T/E species (HQ>5).

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Appendix B-2

Ecological Groundwater Summary and Risk Screening

Terminal 4 Slip 1 Upland Facility

APPENDIX B-2a Groundwater Summary (downgradient monitoring wells) and Risk Screening

Terminal 4 Slip 1 Operable Unit 1 - Oregon Screening Levels (Receptors - Aquatic)

Constituents of Interest (COI)					Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels*	COI Conc. (max)	Risk Ratio for Individual COI	COPC due to Individual COI Risk? (Q=1) (T&E)	COPC due to Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	CPEC due to Multiple COI Risk? (Q=1) (T&E)	CPEC due to Multiple COI Risk? (Q=5)
					Minimum	Maximum	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Aquatic Receptors							
CASNo	Analyte	Analyte Group	Fraction	Units												Cij	Tij			Tij/Tj		
71-55-6	1,1,1-Trichloroethane	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.0005	0.0005				1.10E-02	<5%D	NA	No	No	NA	No	No
75-34-3	1,1-Dichloroethane	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.0005	0.0005				4.70E-02	<5%D	NA	No	No	NA	No	No
75-35-4	1,1-Dichloroethylene	VOC		mg/L	4/20/2004	5/5/2005	14	13	7%	0.0005	0.0005	3.70E-04	3.70E-04	MW03s	2.50E-02	3.70E-04	0.015	No	No	0.001	No	No
95-63-6	1,2,4-Trimethylbenzene	VOC		mg/L	4/20/2004	5/5/2005	14	13	7%	0.002	0.002	2.00E-03	2.00E-03	MW01s	NA	2.00E-03	NA	No	No	NA	No	No
156-59-2	1,2-Dichloroethylene (cis)	VOC		mg/L	4/20/2004	5/5/2005	14	9	36%	0.0005	0.0005	2.30E-03	8.90E-02	MW03s	5.90E-01	8.90E-02	0.15	No	No	0.01	No	No
156-60-5	1,2-Dichloroethylene (trans)	VOC		mg/L	4/20/2004	5/5/2005	14	11	21%	0.0005	0.0005	2.00E-04	7.80E-04	MW03s	5.90E-01	7.80E-04	0.001	No	No	0.0001	No	No
541-73-1	1,3-Dichlorobenzene	SVOC, Halogenated		mg/L	4/20/2004	5/5/2005	14	14	0%	0.0005	0.0005				7.10E-02	<5%D	NA	No	No	NA	No	No
106-46-7	1,4-Dichlorobenzene	SVOC, Halogenated		mg/L	4/20/2004	5/5/2005	14	14	0%	0.0005	0.0005				1.50E-02	<5%D	NA	No	No	NA	No	No
90-12-0	1-Methylnaphthalene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	2/3/2005	5/5/2005	7	6	14%	0.00002	0.0002	2.80E-05	2.80E-05	MW08	2.10E-03	2.80E-05	0.013	No	No	0.001	No	No
78-93-3	2-Butanone	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.02	0.02				1.40E+01	<5%D	NA	No	No	NA	No	No
91-57-6	2-Methylnaphthalene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	8/27/2004	5/5/2005	13	5	62%	1.2E-05	0.00002	2.90E-06	2.90E-05	MW08	NA	2.90E-05	NA	No	No	NA	No	No
35421-08-0	4-Chloro-3-methylphenol	SVOC, Phenols and Substituted Phenols		mg/L	8/27/2004	2/2/2005	3	2	33%	0.00048	0.0005	3.70E-05	3.70E-05	MW07	NA	3.70E-05	NA	No	No	NA	No	No
106-47-8	4-Chloroaniline	SVOC, Halogenated		mg/L	8/27/2004	2/2/2005	3	2	33%	0.0002	0.0002	2.50E-05	2.50E-05	MW07	NA	2.50E-05	NA	No	No	NA	No	No
106-44-5	4-Methylphenol	SVOC, Phenols and Substituted Phenols		mg/L	8/27/2004	2/2/2005	3	2	33%	0.00048	0.0005	8.80E-05	8.80E-05	MW07	NA	8.80E-05	NA	No	No	NA	No	No
83-32-9	Acenaphthene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	15	21%	8.8E-06	0.0001	4.10E-06	8.27E-05	MW26	5.20E-01	8.27E-05	0.0002	No	No	0.00001	No	No
208-96-8	Acenaphthylene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	15	21%	1.1E-05	0.0001	2.00E-06	4.20E-06	MW08	NA	4.20E-06	NA	No	No	NA	No	No
67-64-1	Acetone	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.02	0.02				1.50E+00	<5%D	NA	No	No	NA	No	No
309-00-2	***Aldrin***	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	11	0%	1.8E-06	0.00008				6.00E-05	<5%D	NA	***ND>SLV***	***ND>SLV***	NA	No	No
5103-71-9	***alpha-Chlordane***	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	11	0%	1.8E-06	0.00004				4.30E-06	<5%D	NA	***ND>SLV***	***ND>SLV***	NA	No	No
120-12-7	Anthracene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	2	89%	0.0001	0.0001	4.50E-06	9.00E-05	MW03s	1.30E-02	9.00E-05	0.007	No	No	0.001	No	No
7440-36-0	Antimony and compounds	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	2	50%	0.00004	0.00005	5.00E-05	1.01E-03	MW08	1.60E+00	1.01E-03	0.001	No	No	0.00005	No	No
7440-36-0	Antimony and compounds	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	4	0%	0.00005	0.003				1.60E+00	<5%D	NA	No	No	NA	No	No
12674-11-2	Aroclor 1016	PCBs Aroclors		mg/L	4/21/2004	5/5/2005	7	7	0%	0.0002	0.00031				NA	<5%D	NA	No	No	NA	No	No
11104-28-2	***Aroclor 1221***	PCBs Aroclors		mg/L	4/21/2004	5/5/2005	7	7	0%	0.00039	0.00062				2.80E-04	<5%D	NA	***ND>SLV***	***ND>SLV***	NA	No	No
11141-16-5	Aroclor 1232	PCBs Aroclors		mg/L	4/21/2004	5/5/2005	7	7	0%	0.0002	0.00031				5.80E-04	<5%D	NA	No	No	NA	No	No
53469-21-9	Aroclor 1242	PCBs Aroclors		mg/L	4/21/2004	5/5/2005	7	7	0%	0.0002	0.00031				5.30E-04	<5%D	NA	No	No	NA	No	No
12672-29-6	***Aroclor 1248***	PCBs Aroclors		mg/L	4/21/2004	5/5/2005	7	7	0%	0.0002	0.00031				8.10E-05	<5%D	NA	***ND>SLV***	***ND>SLV***	NA	No	No
11097-69-1	***Aroclor 1254***	PCBs Aroclors		mg/L	4/21/2004	5/5/2005	7	7	0%	0.0002	0.00031				3.30E-05	<5%D	NA	***ND>SLV***	***ND>SLV***	NA	No	No
11096-82-5	Aroclor 1260	PCBs Aroclors		mg/L	4/21/2004	5/5/2005	7	7	0%	0.0002	0.00031				9.40E-02	<5%D	NA	No	No	NA	No	No
7440-38-2	Arsenic	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	0	100%			1.30E-04	1.08E-02	MW26	1.50E-01	1.08E-02	0.07	No	No	0.005	No	No
7440-38-2	Arsenic	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	1	75%	0.001	0.001	3.80E-04	9.80E-03	MW26	1.50E-01	9.80E-03	0.07	No	No	0.005	No	No
71-43-2	Benzene	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.0005	0.0005				1.30E-01	<5%D	NA	No	No	NA	No	No
56-55-3	*Benzo[a]anthracene*	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	12	37%	1.2E-05	0.0001	2.20E-06	6.70E-05	MW07	2.70E-05	6.70E-05	2.5	Yes	No	0.2	Yes	Yes
50-32-8	*Benzo[a]pyrene*	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	12	37%	1.6E-05	0.0001	1.60E-06	6.90E-05	MW07	1.40E-05	6.90E-05	4.9	Yes	No	0.4	Yes	Yes
205-99-2	Benzo[b]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	12	37%	0.00002	0.0001	2.20E-06	1.10E-04	MW07	NA	1.10E-04	NA	No	No	NA	No	No
191-24-2	Benzo[g,h,i]perylene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	18	5%	0.00002	0.0001	3.40E-05	3.40E-05	MW07	NA	3.40E-05	NA	No	No	NA	No	No
207-08-9	Benzo[k]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	15	21%	0.00002	0.0001	1.50E-06	8.40E-05	MW07	NA	8.40E-05	NA	No	No	NA	No	No
7440-41-7	Beryllium and compounds	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	4	0%	0.00002	0.00011				5.30E-03	<5%D	NA	No	No	NA	No	No
7440-41-7	Beryllium and compounds	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	3	25%	0.001	0.001	3.30E-05	3.30E-05	MW08	5.30E-03	3.30E-05	0.006	No	No	0.0005	No	No
319-84-6	BHC (alpha)	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	10	9%	1.8E-06	0.00004	2.30E-06	2.30E-06	MW08	2.20E-03	2.30E-06	0.001	No	No	0.0001	No	No
319-85-7	BHC (beta)	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	9	18%	1.8E-06	0.001	5.30E-06	7.90E-06	MW03s	2.20E-03	7.90E-06	0.004	No	No	0.0003	No	No
58-89-9	BHC (gamma) Lindane	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	10	9%	1.8E-06	0.00004	1.50E-06	1.50E-06	MW08	8.00E-05	1.50E-06	0.02	No	No	0.001	No	No
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	SVOC, Phthalate Esters		mg/L	8/27/2004	2/2/2005	3	3	0%	0.002	0.002				3.00E-03	<5%D	NA	No	No	NA	No	No
7440-43-9	Cadmium and compounds	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	4	0%	0.00002	0.0001				2.20E-03	<5%D	NA	No	No	NA	No	No
7440-43-9	Cadmium and compounds	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	3	25%	0.001	0.001	2.00E-05	2.00E-05	MW08	2.20E-03	2.00E-05	0.009	No	No	0.001	No	No
75-15-0	*Carbon disulfide*	VOC		mg/L	4/20/2004	5/5/2005	14	10	29%	0.0005	0.0005	2.00E-04	9.40E-04	MW07	9.20E-04	9.40E-04	1.0	Yes	No	0.07	Yes	No
108-90-7	Chlorobenzene	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.0005	0.0005				5.00E-02	<5%D	NA	No	No	NA	No	No
67-66-3	Chloroform	VOC		mg/L	4/20/2004	5/5/2005	14	10	29%	0.0005	0.0005	1.90E-04	5.00E-04	MW01s	1.24E+00	5.00E-04	0.0004	No	No	0.00003	No	No
218-01-9	Chrysene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	12	37%	1.4E-05	0.0001	2.80E-06	5.10E-05	MW07	NA	5.10E-05	NA	No	No	NA	No	No
7440-50-8	Copper and compounds	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	1	75%	0.00018	0.00018	1.20E-04	4.20E-04	MW26	9.00E-03	4.20E-04	0.05	No	No	0.003	No	No
7440-50-8	Copper and compounds	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	2	50%	0.001	0.00376	1.00E-03	1.00E-03	MW08	9.00E-03	1.00E-03	0.1	No	No	0.008	No	No
98-82-8	Cumene (isopropylbenzene)	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.002	0.002				NA	<5%D	NA	No	No	NA	No	No
72-54-8	***DDD***	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	11	0%	1.8E-06	0.00004				1.00E-06	<5%D	NA	***ND>SLV***	***ND>SLV***	NA	No	No
72-55-9	DDE	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	10	9%	1.8E-06	0.00008	4.30E-06	4.30E-06	MW08	NA	4.30E-06	NA	No	No	NA	No	No
50-29-3	***DDT***	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	11	0%	1.8E-06	0.00008				1.00E-06	<5%D	NA	***ND>SLV***	***ND>SLV***	NA	No	No
319-86-8	delta-BHC	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	10	9%	1.8E-06	0.0001	2.80E-06	2.80E-06	MW08	NA	2.80E-06	NA	No	No	NA	No	No
53-70-3	Dibenz[ah]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	18	5%	0.00002	0.0002	2.80E-06	2.80E-06	MW08	NA	2.80E-06	NA	No	No	NA	No	No
132-64-9	Dibenzofuran	SVOC, Oxygen-Containing		mg/L	8/27/2004	5/5/2005	13	13	0%	1.4E-05	0.00002				3.70E-03	<5%D	NA	No	No	NA	No	No

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APPENDIX B-2a Groundwater Summary (downgradient monitoring wells) and Risk Screening

Terminal 4 Slip 1 Operable Unit 1 - Oregon Screening Levels (Receptors - Aquatic)

Constituents of Interest (COI)					Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels*	COI Conc. (max)	Risk Ratio for Individual COI	COPC due to Individual COI Risk? (Q=1) (T&E)	COPC due to Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	CPEC due to Multiple COI Risk? (Q=1) (T&E)	CPEC due to Multiple COI Risk? (Q=5)
					Minimum	Maximum	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Aquatic Receptors							
CASNo	Analyte	Analyte Group	Fraction	Units												Cij	Tij			Tij/Tj		
60-57-1	***Dieldrin***	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	11	0%	1.8E-06	0.00008				5.60E-05	<5%D	NA	***ND>SLV***	***ND>SLV***	NA	No	No
DRO	Diesel Range	Petroleum Hydrocarbons		mg/L	4/20/2004	5/5/2005	18	16	11%	0.24	0.63	2.10E-02	2.80E-02	MW03s	NA	2.80E-02	NA	No	No	NA	No	No
84-66-2	Diethyl phthalate	SVOC, Phthalate Esters		mg/L	8/27/2004	5/4/2005	4	1	75%	0.0002	0.0002	3.40E-05	1.00E-04	MW03s	2.10E-01	1.00E-04	0.0005	No	No	0.00003	No	No
131-11-3	Dimethyl phthalate	SVOC, Phthalate Esters		mg/L	8/27/2004	2/2/2005	3	3	0%	0.0002	0.0002				3.00E-03	<5%D	NA	No	No	NA	No	No
84-74-2	Di-n-butyl phthalate	SVOC, Phthalate Esters		mg/L	8/27/2004	5/4/2005	4	2	50%	0.00019	0.0002	4.10E-05	1.90E-04	MW03s	3.50E-02	1.90E-04	0.005	No	No	0.0004	No	No
959-98-8	Endosulfan I	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	10	9%	1.8E-06	0.00002	1.60E-06	1.60E-06	MW08	5.60E-05	1.60E-06	0.029	No	No	0.002	No	No
33213-65-9	Endosulfan II	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	10	9%	1.8E-06	0.00008	2.20E-06	2.20E-06	MW03s	5.60E-05	2.20E-06	0.039	No	No	0.003	No	No
72-20-8	Endrin	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	10	9%	1.8E-06	0.00008	3.10E-06	3.10E-06	MW08	3.60E-05	3.10E-06	0.09	No	No	0.006	No	No
7421-93-4	***Endrin Aldehyde***	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	11	0%	1.8E-06	0.00016				3.60E-05	<5%D	NA	***ND>SLV***	***ND>SLV***	NA	No	No
53494-70-5	***Endrin Ketone***	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	11	0%	1.8E-06	0.00008				3.60E-05	<5%D	NA	***ND>SLV***	***ND>SLV***	NA	No	No
100-41-4	Ethylbenzene	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.0005	0.0005				7.30E-03	<5%D	NA	No	No	NA	No	No
206-44-0	Fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	9	53%	1.3E-05	0.0001	4.10E-06	3.40E-05	MW08	6.16E-03	3.40E-05	0.006	No	No	0.0004	No	No
86-73-7	Fluorene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	15	21%	1.2E-05	0.0001	4.40E-06	1.00E-05	MW08	3.90E-03	1.00E-05	0.003	No	No	0.0002	No	No
GRO	Gasoline Range	Petroleum Hydrocarbons		mg/L	4/20/2004	5/5/2005	18	15	17%	0.05	0.25	1.40E-02	1.90E-02	MW03s	NA	1.90E-02	NA	No	No	NA	No	No
76-44-8	*Heptachlor*	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	10	9%	1.8E-06	0.00008	2.80E-06	2.80E-06	MW08	3.80E-06	2.80E-06	0.7	No	No	0.05	Yes	No
1024-57-3	*Heptachlor epoxide*	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	10	9%	1.8E-06	0.00004	3.20E-06	3.20E-06	MW08	3.80E-06	3.20E-06	0.842	No	No	0.061	Yes	No
193-39-5	Indeno[1,2,3-cd]pyrene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	17	11%	0.00002	0.0001	2.30E-06	3.10E-06	MW08	NA	3.10E-06	NA	No	No	NA	No	No
78-59-1	Isophorone	SVOC, Oxygen-Containing		mg/L	8/27/2004	2/2/2005	3	3	0%	0.0002	0.0002				2.34E+00	<5%D	NA	No	No	NA	No	No
7439-92-1	Lead	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	3	25%	0.00002	0.00008	1.20E-04	1.20E-04	MW26	2.50E-03	1.20E-04	0.05	No	No	0.003	No	No
7439-92-1	*Lead*	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	3	25%	0.00052	0.001	1.00E-03	1.00E-03	MW08	2.50E-03	1.00E-03	0.4	No	No	0.029	Yes	No
7487-94-7	Mercury and compounds	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	4	0%	0.00005	0.0002				7.70E-04	<5%D	NA	No	No	NA	No	No
7487-94-7	Mercury and compounds	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	4	0%	0.0002	0.0002				7.70E-04	<5%D	NA	No	No	NA	No	No
72-43-5	Methoxychlor	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	10	9%	1.8E-06	0.0005	5.30E-06	5.30E-06	MW08	3.00E-05	5.30E-06	0.18	No	No	0.013	No	No
91-20-3	Naphthalene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	33	20	39%	0.00002	0.002	4.80E-06	7.10E-05	MW08	6.20E-01	7.10E-05	0.0001	No	No	0.00001	No	No
104-51-8	n-Butylbenzene	VOC		mg/L	4/20/2004	5/5/2005	14	13	7%	0.002	0.002	2.00E-03	2.00E-03	MW01s	NA	2.00E-03	NA	No	No	NA	No	No
7440-02-0	Nickel	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	0	100%			4.60E-04	6.89E-03	MW08	5.20E-02	6.89E-03	0.13	No	No	0.01	No	No
7440-02-0	Nickel	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	0	100%			5.40E-04	1.25E-02	MW08	5.20E-02	1.25E-02	0.24	No	No	0.02	No	No
103-65-1	n-Propylbenzene	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.002	0.002				NA	<5%D	NA	No	No	NA	No	No
95-47-6	o-Xylene	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.0005	0.0005				NA	<5%D	NA	No	No	NA	No	No
85-01-8	Phenanthrene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	7	63%	0.00002	0.0001	3.60E-06	4.00E-05	MW08	NA	4.00E-05	NA	No	No	NA	No	No
108-95-2	Phenol	SVOC, Phenols and Substituted Phenols		mg/L	8/27/2004	2/2/2005	3	2	33%	0.00048	0.0005	9.90E-05	9.90E-05	MW07	1.10E-01	9.90E-05	0.001	No	No	0.0001	No	No
129-00-0	Pyrene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	9	53%	1.5E-05	0.0001	4.20E-06	3.10E-05	MW08	NA	3.10E-05	NA	No	No	NA	No	No
RRO	Residual Range	Petroleum Hydrocarbons		mg/L	4/20/2004	5/5/2005	18	15	17%	0.48	0.63	3.20E-02	4.10E-02	MW03s	NA	4.10E-02	NA	No	No	NA	No	No
135-98-8	sec-Butylbenzene	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.002	0.002				NA	<5%D	NA	No	No	NA	No	No
7782-49-2	Selenium	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	2	50%	0.00032	0.001	5.90E-04	7.10E-04	MW26	5.00E-03	7.10E-04	0.142	No	No	0.010	No	No
7782-49-2	Selenium	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	1	75%	0.001	0.001	4.00E-04	1.35E-03	MW26	5.00E-03	1.35E-03	0.27	No	No	0.020	No	No
7440-22-4	Silver and compounds	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	4	0%	0.00002	0.00008				1.20E-04	<5%D	NA	No	No	NA	No	No
7440-22-4	Silver and compounds	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	3	25%	0.001	0.001	6.00E-06	6.00E-06	MW08	1.20E-04	6.00E-06	0.05	No	No	0.004	No	No
127-18-4	Tetrachloroethylene (PCE)	VOC		mg/L	4/20/2004	5/5/2005	14	9	36%	0.0005	0.0005	7.70E-04	1.40E-02	MW03s	8.40E-01	1.40E-02	0.02	No	No	0.001	No	No
7440-28-0	Thallium	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	4	0%	0.00002	0.00008				NA	<5%D	NA	No	No	NA	No	No
7440-28-0	Thallium	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	3	25%	0.001	0.001	2.00E-05	2.00E-05	MW08	NA	2.00E-05	NA	No	No	NA	No	No
108-88-3	Toluene	VOC		mg/L	4/20/2004	5/5/2005	14	8	43%	0.0005	0.0005	1.00E-04	4.80E-04	MW03s	9.80E-03	4.80E-04	0.05	No	No	0.004	No	No
7440-47-3	Total Chromium	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	0	100%			8.00E-05	1.40E-03	MW08	1.10E-02	1.40E-03	0.1	No	No	0.009	No	No
7440-47-3	*Total Chromium*	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	1	75%	0.001	0.001	1.00E-03	1.46E-02	MW08	1.10E-02	1.46E-02	1.3	Yes	No	0.1	Yes	No
79-01-6	Trichloroethylene (TCE)	VOC		mg/L	4/20/2004	5/5/2005	14	9	36%	0.0005	0.0005	2.90E-04	3.50E-03	MW03s	2.19E+01	3.50E-03	0.0002	No	No	0.00001	No	No
75-01-4	Vinyl chloride	VOC		mg/L	4/20/2004	5/5/2005	14	12	14%	0.0005	0.0005	1.30E-03	5.40E-03	MW03s	NA	5.40E-03	NA	No	No	NA	No	No
1330-20-7	Xylene (mixed)	VOC		mg/L	4/20/2004	5/5/2005	14	14	0%	0.0005	0.0005				1.30E-02	<5%D	NA	No	No	NA	No	No
7440-66-6	Zinc	Metals/Inorganics	Dissolved	mg/L	5/4/2005	9/16/2005	4	1	75%	0.00468	0.00468	2.99E-03	4.82E-03	MW26	1.20E-01	4.82E-03	0.04	No	No	0.003	No	No
7440-66-6	Zinc	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	0	100%			3.26E-03	9.38E-03	MW08	1.20E-01	9.38E-03	0.08	No	No	0.006	No	No

Tj = Sum of toxicity ratios for all COIs in medium j: 13.800

Nij = Number of i COIs in medium j: 46.000

1/Nij= 0.022

Notes:

SLV - screening level value
ND - non-detect
mg/L - milligram per kilogram
min - minimum
max - maximum
NA - not available
COI - constituent of interest
VOC - volatile organic compound
SVOC - semi-volatile organic compound
CPEC - constituent of potential ecological concern
Cij -concentration of COI i in medium j
Tij - toxicity ratios for COI i in medium j
T&E - listed threatened and endangered species
Q = 1 for listed threatened and endangered (T&E) species
Q = 5 for non-T&E species
DEQ - Oregon Department of Environmental Quality

* All Level II SLV criteria from Oregon DEQ, Table 1, Guidance for Ecological Risk Assessment, December 2001)

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APPENDIX B-2b Groundwater Summary (downgradient monitoring wells) and Risk Screening

Terminal 4 Slip 1 Operable Unit 2 - Oregon Screening Levels (Receptors - Aquatic)

Constituents of Interest (COI)					Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels*	COI Conc. (max)	Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	CPEC due to Multiple COI Risk? (Q=1) (T&E)	CPEC due to Multiple COI Risk? (Q=5)
					Minimum	Maximum	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Aquatic Receptors							
CASNo	Analyte	Analyte Group	Fraction	Units												Cij	Tij			Tij/Tj		
71-55-6	1,1,1-Trichloroethane	VOC		mg/L	4/16/2004	5/10/2005	24	24	0%	0.0001	0.0005				0.011	<5%D	NA	No	No	NA	No	No
75-34-3	1,1-Dichloroethane	VOC		mg/L	4/16/2004	5/10/2005	24	20	17%	0.0001	0.0005	0.0001	0.0002	MW10	0.047	0.00019	0.00404	No	No	0.000	No	No
75-35-4	1,1-Dichloroethylene	VOC		mg/L	4/16/2004	5/10/2005	24	24	0%	0.0001	0.0005				0.025	<5%D	NA	No	No	NA	No	No
95-63-6	1,2,4-Trimethylbenzene	VOC		mg/L	4/16/2004	5/10/2005	24	22	8%	0.0002	0.002	0.0002	0.001	MW10	NA	0.001	NA	No	No	NA	No	No
156-59-2	1,2-Dichloroethylene (cis)	VOC		mg/L	4/16/2004	5/10/2005	24	21	13%	0.0001	0.0005	0.0001	0.0002	MW10	0.59	0.00019	0.00032	No	No	0.000	No	No
156-60-5	1,2-Dichloroethylene (trans)	VOC		mg/L	4/16/2004	5/10/2005	24	24	0%	0.0002	0.0005				0.59	<5%D	NA	No	No	NA	No	No
541-73-1	1,3-Dichlorobenzene	SVOC, Halogenated		mg/L	4/16/2004	5/10/2005	24	23	4%	0.0001	0.0005	0.0014	0.0014	MW16	0.071	<5%D	NA	No	No	NA	No	No
106-46-7	1,4-Dichlorobenzene	SVOC, Halogenated		mg/L	4/16/2004	5/10/2005	24	23	4%	0.0001	0.0005	0.0001	0.0001	MW09	0.015	<5%D	NA	No	No	NA	No	No
90-12-0	1-Methylnaphthalene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	14	8	43%	2E-05	2E-05	4E-06	1E-05	MW16	0.0021	0.000011	0.00524	No	No	0.000	No	No
78-93-3	2-Butanone	VOC		mg/L	4/16/2004	5/10/2005	24	24	0%	0.002	0.02				14	<5%D	NA	No	No	NA	No	No
91-57-6	2-Methylnaphthalene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	21	6	71%	2E-05	2E-05	3E-06	2E-05	MW11	NA	0.000024	NA	No	No	NA	No	No
83-32-9	Acenaphthene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	22	15%	2E-06	3E-05	3E-06	1E-05	MW16	0.52	9.6E-06	0.00002	No	No	0.000	No	No
208-96-8	Acenaphthylene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	15	42%	2E-05	3E-05	2E-06	6E-06	MW10	NA	6.2E-06	NA	No	No	NA	No	No
67-64-1	Acetone	VOC		mg/L	4/16/2004	5/10/2005	24	24	0%	0.0041	0.02				1.5	<5%D	NA	No	No	NA	No	No
309-00-2	Aldrin	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	10	9%	1E-05	1E-05	1E-06	1E-06	MW11	0.00006	1.2E-06	0.02000	No	No	0.001	No	No
5103-71-9	***alpha-Chlordane***	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	3E-06	1E-05				0.0000043	<5%D	NA	***ND>SLV***	***ND>SLV***	NA	No	No
120-12-7	Anthracene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	2	92%	2E-05	3E-05	4E-06	9E-05	MW10	0.013	0.000094	0.00723	No	No	0.000	No	No
7440-36-0	Antimony and compounds	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	18	33%	2E-05	5E-05	2E-05	0.0002	MW16	1.6	0.00018	0.00011	No	No	0.000	No	No
7440-36-0	Antimony and compounds	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	14	48%	2E-05	0.0001	2E-05	0.0003	MW16	1.6	0.00033	0.00021	No	No	0.000	No	No
12674-11-2	Aroclor 1016	PCBs Aroclors		mg/L	4/19/2004	5/9/2005	11	11	0%	0.0002	0.0003				NA	<5%D	NA	No	No	NA	No	No
11104-28-2	***Aroclor 1221***	PCBs Aroclors		mg/L	4/19/2004	5/9/2005	11	11	0%	0.0004	0.0006				0.00028	<5%D	NA	***ND>SLV***	***ND>SLV***	NA	No	No
11141-16-5	Aroclor 1232	PCBs Aroclors		mg/L	4/19/2004	5/9/2005	11	11	0%	0.0002	0.0003				0.00058	<5%D	NA	No	No	NA	No	No
53469-21-9	***Aroclor 1242***	PCBs Aroclors		mg/L	4/19/2004	5/9/2005	11	11	0%	0.0002	0.0003				0.000053	<5%D	NA	***ND>SLV***	***ND>SLV***	NA	No	No
12672-29-6	***Aroclor 1248***	PCBs Aroclors		mg/L	4/19/2004	5/9/2005	11	11	0%	0.0002	0.0003				0.000081	<5%D	NA	***ND>SLV***	***ND>SLV***	NA	No	No
11097-69-1	***Aroclor 1254***	PCBs Aroclors		mg/L	4/19/2004	5/9/2005	11	11	0%	0.0002	0.0003				0.000033	<5%D	NA	***ND>SLV***	***ND>SLV***	NA	No	No
11096-82-5	Aroclor 1260	PCBs Aroclors		mg/L	4/19/2004	5/9/2005	11	11	0%	0.0002	0.0003				0.094	<5%D	NA	No	No	NA	No	No
7440-38-2	Arsenic	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	3	89%	0.0002	0.01	0.0002	0.0146	MW13	0.15	0.0146	0.09733	No	No	0.003	No	No
7440-38-2	Arsenic	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	3	89%	2E-05	0.01	0.0003	0.017	MW11	0.15	0.017	0.11333	No	No	0.004	No	No
71-43-2	Benzene	VOC		mg/L	4/16/2004	5/10/2005	24	24	0%	0.0001	0.0005				0.13	<5%D	NA	No	No	NA	No	No
56-55-3	*Benzo[a]anthracene*	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	13	50%	2E-06	3E-05	2E-06	8E-05	MW16	0.000027	0.000075	2.77778	Yes	No	0.095	Yes	No
50-32-8	*Benzo[a]pyrene*	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	16	38%	2E-06	3E-05	2E-06	1E-04	MW16	0.000014	0.000095	6.78571	Yes	Yes	0.232	Yes	Yes
205-99-2	Benzo[b]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	17	35%	2E-06	3E-05	3E-06	1E-04	MW16	NA	0.000096	NA	No	No	NA	No	No
191-24-2	Benzo[g,h,i]perylene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	18	31%	2E-05	3E-05	3E-06	8E-05	MW16	NA	0.000079	NA	No	No	NA	No	No
207-08-9	Benzo[k]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	18	31%	1E-06	3E-05	2E-06	9E-05	MW16	NA	0.000087	NA	No	No	NA	No	No
7440-41-7	Beryllium and compounds	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	26	4%	6E-06	2E-05	7E-06	7E-06	MW16	0.0053	<5%D	NA	No	No	NA	No	No
7440-41-7	Beryllium and compounds	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	13	52%	6E-06	2E-05	6E-06	0.0001	MW15	0.0053	0.000112	0.02113	No	No	0.001	No	No
319-84-6	BHC (alpha)	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	1E-05	1E-05				0.0022	<5%D	NA	No	No	NA	No	No
319-85-7	BHC (beta)	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	3E-06	1E-05				0.0022	<5%D	NA	No	No	NA	No	No
58-89-9	BHC (gamma) Lindane	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	1E-05	1E-05				0.00008	<5%D	NA	No	No	NA	No	No
7440-43-9	Cadmium and compounds	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	11	59%	1E-05	2E-05	2E-05	0.0002	MW16	0.0022	0.000202	0.09182	No	No	0.003	No	No
7440-43-9	Cadmium and compounds	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	10	63%	2E-05	7E-05	1E-05	0.0002	MW16	0.0022	0.000222	0.10091	No	No	0.003	No	No
75-15-0	*Carbon disulfide*	VOC		mg/L	4/16/2004	5/10/2005	24	21	13%	0.0002	0.0005	0.0002	0.0017	MW16	0.00092	0.0017	1.84783	Yes	No	0.063	Yes	No
108-90-7	Chlorobenzene	VOC		mg/L	4/16/2004	5/10/2005	24	24	0%	0.0001	0.0005				0.05	<5%D	NA	No	No	NA	No	No
67-66-3	Chloroform	VOC		mg/L	4/16/2004	5/10/2005	24	21	13%	0.0001	0.0005	0.0008	0.0044	MW16	1.24	0.0044	0.00355	No	No	0.000	No	No
218-01-9	Chrysene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	16	38%	1E-06	3E-05	3E-06	0.0001	MW16	NA	0.00011	NA	No	No	NA	No	No
7440-50-8	Copper and compounds	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	3	89%	0.001	0.001	0.0001	0.004	MW16	0.009	0.00402	0.44667	No	No	0.015	No	No
7440-50-8	*Copper and compounds*	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	1	96%	0.001	0.001	0.0003	0.0143	MW16	0.009	0.0143	1.58889	Yes	No	0.054	Yes	No
98-82-8	Cumene (isopropylbenzene)	VOC		mg/L	4/16/2004	5/10/2005	24	24	0%	0.0001	0.002				NA	<5%D	NA	No	No	NA	No	No
72-54-8	*DDD*	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	10	9%	1E-05	1E-05	3E-06	3E-06	MW11	0.000001	2.6E-06	2.60000	Yes	No	0.089	Yes	No
72-55-9	DDE	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	1E-05	1E-05				NA	<5%D	NA	No	No	NA	No	No
50-29-3	*DDT*	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	9	18%	1E-05	1E-05	1E-06	3E-06	MW09	0.000001	0.000003	3.00000	Yes	No	0.103	Yes	No
319-86-8	delta-BHC	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	1E-05	1E-05				NA	<5%D	NA	No	No	NA	No	No
53-70-3	Dibenz[ah]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	21	19%	2E-06	3E-05	2E-06	2E-05	MW11	NA	0.000019	NA	No	No	NA	No	No
132-64-9	Dibenzofuran	SVOC, Oxygen-Containing		mg/L	8/27/2004	5/10/2005	18	18	0%	7E-06	2E-05				0.0037	<5%D	NA	No	No	NA	No	No
60-57-1	Dieldrin	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	10	9%	1E-05	1E-05	4E-06	4E-06	MW10	0.000056	4.4E-06	0.07857	No	No	0.003	No	No

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APPENDIX B-2b Groundwater Summary (downgradient monitoring wells) and Risk Screening

Terminal 4 Slip 1 Operable Unit 2 - Oregon Screening Levels (Receptors - Aquatic)

Constituents of Interest (COI)					Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels*	COI Conc. (max)	Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	CPEC due to Multiple COI Risk? (Q=1) (T&E)	CPEC due to Multiple COI Risk? (Q=5)
					Minimum	Maximum	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Aquatic Receptors							
CASNo	Analyte	Analyte Group	Fraction	Units											Cij		Tij			Tij/Tj		
DRO	Diesel Range	Petroleum Hydrocarbons		mg/L	4/16/2004	5/10/2005	28	25	11%	0.12	0.65	0.021	0.041	MW10	NA	0.041	NA	No	No	NA	No	No
959-98-8	Endosulfan I	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	1E-05	1E-05				0.000056	<5%D	NA	No	No	NA	No	No
33213-65-9	Endosulfan II	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	10	9%	1E-05	1E-05	2E-06	2E-06	MW09	0.000056	1.5E-06	0.02679	No	No	0.001	No	No
72-20-8	Endrin	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	1E-05	1E-05				0.000036	<5%D	NA	No	No	NA	No	No
7421-93-4	Endrin Aldehyde	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	1E-05	1E-05				0.000036	<5%D	NA	No	No	NA	No	No
53494-70-5	Endrin Ketone	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	9	9	0%	1E-05	1E-05				0.000036	<5%D	NA	No	No	NA	No	No
100-41-4	Ethylbenzene	VOC		mg/L	4/16/2004	5/10/2005	24	23	4%	0.0001	0.0005	0.0006	0.0006	MW10	0.0073	<5%D	NA	No	No	NA	No	No
206-44-0	Fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	10	62%	2E-06	3E-05	5E-06	0.0002	MW16	0.00616	0.00015	0.02435	No	No	0.001	No	No
86-73-7	Fluorene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	22	15%	3E-06	3E-05	4E-06	1E-05	MW16	0.0039	9.8E-06	0.00251	No	No	0.000	No	No
GRO	Gasoline Range	Petroleum Hydrocarbons		mg/L	4/16/2004	5/10/2005	28	26	7%	0.05	0.26	0.013	0.051	MW10	NA	0.051	NA	No	No	NA	No	No
76-44-8	***Heptachlor***	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	1E-05	1E-05				0.0000038	<5%D	NA	***ND>SLV***	***ND>SLV***	NA	No	No
1024-57-3	***Heptachlor epoxide***	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	1E-05	1E-05				0.0000038	<5%D	NA	***ND>SLV***	***ND>SLV***	NA	No	No
193-39-5	Indeno[1,2,3-cd]pyrene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	18	31%	2E-06	3E-05	3E-06	9E-05	MW16	NA	0.000094	NA	No	No	NA	No	No
7439-92-1	Lead	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	12	56%	9E-06	2E-05	1E-05	0.0006	MW16	0.0025	0.0006	0.24000	No	No	0.008	No	No
7439-92-1	Lead	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	2	93%	2E-05	8E-05	2E-05	0.0109	MW15	0.0025	0.0109	4.36000	Yes	No	0.149	Yes	Yes
7487-94-7	Mercury and compounds	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	19	30%	0.0001	0.0002	5E-05	9E-05	MW12	0.00077	0.00009	0.11688	No	No	0.004	No	No
7487-94-7	Mercury and compounds	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	20	26%	0.0001	0.0002	4E-05	6E-05	MW12	0.00077	0.00006	0.07792	No	No	0.003	No	No
72-43-5	Methoxychlor	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	1E-05	1E-05				0.00003	<5%D	NA	No	No	NA	No	No
91-20-3	Naphthalene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	50	26	48%	2E-05	0.002	1E-06	0.0003	MW10	0.62	0.00033	0.00053	No	No	0.000	No	No
104-51-8	n-Butylbenzene	VOC		mg/L	4/16/2004	5/10/2005	24	24	0%	0.0002	0.002				NA	<5%D	NA	No	No	NA	No	No
7440-02-0	Nickel	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	0	100%			0.0004	0.0101	MW15	0.052	0.0101	0.19423	No	No	0.007	No	No
7440-02-0	Nickel	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	0	100%			0.0003	0.0204	MW15	0.052	0.0204	0.39231	No	No	0.013	No	No
103-65-1	n-Propylbenzene	VOC		mg/L	4/16/2004	5/10/2005	24	23	4%	1E-04	0.002	0.0001	0.0001	MW10	NA	<5%D	NA	No	No	NA	No	No
95-47-6	o-Xylene	VOC		mg/L	4/16/2004	5/10/2005	24	20	17%	0.0001	0.0005	0.0001	0.0013	MW10	NA	0.0013	NA	No	No	NA	No	No
85-01-8	Phenanthrene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	8	69%	3E-06	3E-05	4E-06	8E-05	MW16	NA	0.000079	NA	No	No	NA	No	No
129-00-0	Pyrene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	8	69%	2E-06	3E-05	4E-06	0.0001	MW16	NA	0.00013	NA	No	No	NA	No	No
RRO	Residual Range	Petroleum Hydrocarbons		mg/L	4/16/2004	5/10/2005	28	22	21%	0.24	0.65	0.035	0.52	MW09	NA	0.52	NA	No	No	NA	No	No
135-9-88	sec-Butylbenzene	VOC		mg/L	4/16/2004	5/10/2005	24	24	0%	0.0001	0.002				NA	<5%D	NA	No	No	NA	No	No
7782-49-2	Selenium	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	17	37%	0.0002	0.005	0.0002	0.0013	MW12	0.005	0.0013	0.26000	No	No	0.009	No	No
7782-49-2	Selenium	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	12	56%	0.0002	0.005	0.0001	0.0018	MW16	0.005	0.0018	0.36000	No	No	0.012	No	No
7440-22-4	Silver and compounds	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	27	0%	9E-06	2E-05				0.00012	<5%D	NA	No	No	NA	No	No
7440-22-4	Silver and compounds	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	23	15%	9E-06	4E-05	6E-06	3E-05	MW16	0.00012	0.00003	0.25000	No	No	0.009	No	No
127-18-4	Tetrachloroethylene (PCE)	VOC		mg/L	4/16/2004	5/10/2005	24	18	25%	0.0001	0.0005	0.0002	0.0005	MW10	0.84	0.00051	0.00061	No	No	0.000	No	No
7440-28-0	Thallium	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	18	33%	4E-06	2E-05	6E-06	4E-05	MW16	NA	0.000039	NA	No	No	NA	No	No
7440-28-0	Thallium	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	15	44%	4E-06	4E-05	4E-06	7E-05	MW16	NA	0.000072	NA	No	No	NA	No	No
108-88-3	Toluene	VOC		mg/L	4/16/2004	5/10/2005	24	13	46%	0.0001	0.0005	0.0001	0.0018	MW10	0.0098	0.0018	0.18367	No	No	0.006	No	No
7440-47-3	Total Chromium	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	2	93%	6E-05	0.0004	9E-05	0.0068	MW15	0.011	0.0068	0.61818	No	No	0.021	No	No
7440-47-3	Total Chromium	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	0	100%			0.0002	0.0219	MW15	0.011	0.0219	1.99091	Yes	No	0.068	Yes	No
79-01-6	Trichloroethylene (TCE)	VOC		mg/L	4/16/2004	5/10/2005	24	20	17%	0.0001	0.0005	0.0002	0.0005	MW09	21.9	0.0005	0.00002	No	No	0.000	No	No
75-01-4	Vinyl chloride	VOC		mg/L	4/16/2004	5/10/2005	24	24	0%	0.0002	0.0005				NA	<5%D	NA	No	No	NA	No	No
1330-20-7	Xylene (mixed)	VOC		mg/L	4/16/2004	5/10/2005	24	20	17%	0.0002	0.0005	0.0003	0.003	MW10	0.013	0.003	0.23077	No	No	0.008	No	No
7440-66-6	Zinc	Metals/Inorganics	Dissolved	mg/L	4/16/2004	5/10/2005	27	3	89%	0.001	0.0016	0.0005	0.0092	MW16	0.12	0.00918	0.07650	No	No	0.003	No	No
7440-66-6	Zinc	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	2	93%	0.002	0.0027	0.0005	0.0315	MW15	0.12	0.0315	0.26250	No	No	0.009	No	No

Notes:

SLV - screening level value
ND - non-detect
mg/L - milligram per kilogram
min - minimum
max - maximum
NA - not available
COI - constituent of interest
VOC - volatile organic compound
SVOC - semi-volatile organic compound
CPEC - constituent of potential ecological concern
Cij -concentration of COI i in medium j
Tij - toxicity ratios for COI i in medium j
T&E - listed threatened and endangered species
Q = 1 for listed threatened and endangered (T&E) species
Q = 5 for non-T&E species
DEQ - Oregon Department of Environmental Quality

Tj = Sum of toxicity ratios for all COIs in medium j 29.259
Nij = Number of i COIs in medium j 43.000
1/Nij= 0.023

* All Level II SLV criteria from Oregon DEQ, Table 1, Guidance for Ecological Risk Assessment, December 2001)

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APPENDIX B-2c Groundwater Summary (downgradient monitoring wells) with 90UCLs and Risk Screening

Terminal 4 Slip 1 Operable Unit 1 - Oregon Screening Levels (Receptors - Aquatic)

Constituents of Interest (COI)					Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels	COI Concentration (90 UCL)			Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)
					Minimum	Maximum	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Aquatic Receptors	Cij	Distribution	Estimation Method	Tij		
CASNo	Analyte	Analyte Group	Fraction	Units																	
56-55-3	Benzo[a]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	12	37%	1.20E-05	1.00E-04	2.20E-06	6.70E-05	MW07	2.70E-05	2.14E-05	Lognormal	90% Chebyshev (MVUE)	0.793	No	No
50-32-8	Benzo(a)pyrene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/20/2004	9/16/2005	19	12	37%	1.60E-05	1.00E-04	1.60E-06	6.90E-05	MW07	1.40E-05	2.64E-05	Non-parametric	90% Chebyshev	1.889	Yes	No
75-15-0	Carbon disulfide	VOC		mg/L	4/20/2004	5/5/2005	14	10	29%	5.00E-04	5.00E-04	2.00E-04	9.40E-04	MW07	9.20E-04	4.28E-04	Non-parametric	Mod-t (adj for skewness)	0.465	No	No
76-44-8	Heptachlor	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	10	9%	1.80E-06	8.00E-05	2.80E-06	2.80E-06	MW08	3.80E-06	--	--	--	--	--	--
1024-57-3	Heptachlor epoxide	Organochlorine Pesticides		mg/L	4/21/2004	9/16/2005	11	10	9%	0.0000018	0.00004	3.20E-06	3.20E-06	MW08	3.80E-06	--	--	--	--	--	--
7439-92-1	Lead	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	3	25%	5.20E-04	1.00E-03	1.00E-03	1.00E-03	MW08	2.50E-03	--	--	--	--	--	--
7440-47-3	Total Chromium	Metals/Inorganics	Total	mg/L	5/4/2005	9/16/2005	4	1	75%	1.00E-03	1.00E-03	1.00E-03	1.46E-02	MW08	1.10E-02	--	--	--	--	--	--

Terminal 4 Slip 1 Operable Unit 2 - Oregon Screening Levels (Receptors - Aquatic)

Constituents of Interest (COI)					Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	Oregon Screening Levels	COI Concentration (90 UCL)			Risk Ratio for Individual COI	CPEC due to Individual COI Risk? (Q=1) (T&E)	CPEC due to Individual COI Risk? (Q=5)
					Minimum	Maximum	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Aquatic Receptors	Cij	Distribution	Estimation Method	Tij		
CASNo	Analyte	Analyte Group	Fraction	Units																	
11097-69-1	Aroclor 1254	PCBs Aroclors		mg/L	4/19/2004	5/9/2005	11	11	0%	0.00019	0.00031				3.30E-05	1.14E-04	Non-parametric	Mod-t (adj for skewness)	3.443	Yes	No
56-55-3	Benzo[a]anthracene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	13	50%	0.0000021	0.000027	2.20E-06	7.50E-05	MW16	2.70E-05	1.88E-05	Non-parametric	90% Chebyshev	0.697	No	No
50-32-8	Benzo(a)pyrene	SVOC, Polycyclic Aromatic Hydrocarbons		mg/L	4/16/2004	5/10/2005	26	16	38%	0.0000016	0.000027	1.80E-06	9.50E-05	MW16	1.40E-05	2.20E-05	Non-parametric	90% Chebyshev	1.569	Yes	No
75-15-0	Carbon disulfide	VOC		mg/L	4/16/2004	5/10/2005	24	21	13%	0.00016	0.0005	1.90E-04	1.70E-03	MW16	9.20E-04	4.88E-04	Non-parametric	90% Chebyshev	0.531	No	No
7440-50-8	Copper and compounds	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	1	96%	0.001	0.001	2.90E-04	1.43E-02	MW16	9.00E-03	4.07E-03	Lognormal	90% Chebyshev (MVUE)	0.453	No	No
72-54-8	DDD	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	10	9%	0.0000095	0.000012	2.60E-06	2.60E-06	MW11	1.00E-06	--	--	--	--	--	--
50-29-3	DDT	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	9	18%	0.0000096	0.000013	1.40E-06	3.00E-06	MW09	1.00E-06	--	--	--	--	--	--
76-44-8	Heptachlor	Organochlorine Pesticides		mg/L	4/19/2004	5/10/2005	11	11	0%	0.0000095	0.000013				3.80E-06	5.47E-06	Non-parametric	Mod-t (adj for skewness)	1.438	Yes	No
7439-92-1	Lead	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	2	93%	0.00002	0.000075	1.60E-05	1.09E-02	MW15	2.50E-03	1.31E-03	Lognormal	90% Chebyshev (MVUE)	0.524	No	No
7440-47-3	Total Chromium	Metals/Inorganics	Total	mg/L	4/16/2004	5/10/2005	27	0	100%			2.30E-04	2.19E-02	MW15	1.10E-02	4.14E-03	Lognormal	90% Chebyshev (MVUE)	0.376	No	No

Notes:
90UCL - 90th upper confidence limit
mg/L - milligram per liter
min - minimum
max - maximum
COI - constituent of interest
CPEC - constituent of potential ecological concern
SLV - screening level value
Cij -concentration of COI i in medium j
Tij - toxicity ratios for COI i in medium j
MDC - maximum detected concentration
T&E - listed threatened and endangered species
Q = 1 for listed threatened and endangered (T&E) species
Q = 5 for non-T&E species
DEQ - Oregon Department of Environmental Quality
SVOC - semi-volatile organic compound

90UCLs were calculated using ProUCL software and EPA (2002) guidance. Each dataset was tested for distribution (normal, gamma, and lognormal) and the appropriate calculation method was chosen on that basis. Non-parametric methods for calculating the 90UCL were used when the distribution was unknown or when the lognormal distribution (*) was highly skewed (>2.5).

-- = no 90UCL calculated due to too few samples or 90UCL exceeds MDC

* All Level II SLV criteria from Oregon DEQ, Table 1, Guidance for Ecological Risk Assessment, December 2001.

EPA 2002 - Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites, OSWER 9285.6-10 (December 2002)
EPA 2004 - ProUCL software, version 3.00.02, Downloaded at http://www.epa.gov/nerlesd1/tsc/form.htm (11/20/05).

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Appendix C-1

Human Health Soil Summary and Risk Screening

Terminal 4 Slip 1 Upland Facility

Appendix C-1a Soil Summary and Risk Screening for OU1

All soil samples less than or equal to 15 feet in depth

Constituents of Interest (COI)			Samples Period of Record		Samples			Detection Limits		Detected Concentrations		Maximum Detection Location	Bkg Soil Conc.*	Direct Contact Industrial Soil PRG**	COI Conc.	Risk Ratio for Individual COI	COPC due to Individual COI Risk?	Risk Ratio for Multiple COIs	COPC due to Multiple COI Risk?
CASNo	Analyte	Units	Min	Max	Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max	Boring			Cij	Rij		Rij/Rj	
7440-36-0	Antimony and compounds	mg/kg	8/23/2004	3/22/2005	14		100%			0.05	1.15	SB-23		4.1E+02	1.15	2.8E-03	No	6E-05	No
7440-38-2	*Arsenic*	mg/kg	8/23/2004	9/7/2005	20		100%			1.63	6.95	S-5		1.6E+00	6.95	4.4E+00	Yes	9E-02	Yes
7440-41-7	Beryllium and compounds	mg/kg	8/23/2004	9/7/2005	20		100%			0.201	0.645	SB-21	2.07	1.9E+03	<Bkg	NA	No	NA	No
7440-43-9	Cadmium and compounds	mg/kg	8/23/2004	9/7/2005	20		100%			0.065	1.95	S-7	0.93	4.5E+02	1.95	4.3E-03	No	9E-05	No
75-15-0	Carbon disulfide	mg/kg	8/24/2004	9/8/2004	16	15	6%	0.0048	0.0066	0.003	0.003	SB-23		7.2E+02	0.003	4.2E-06	No	8E-08	No
7440-50-8	Copper and compounds	mg/kg	8/23/2004	9/7/2005	20		100%			10.9	70.3	S-7	34.43	4.1E+04	70.3	1.7E-03	No	4E-05	No
7439-92-1	Lead	mg/kg	8/23/2004	9/7/2005	20		100%			2.4	258	SB-23	16.83	8.0E+02	258	3.2E-01	No	7E-03	No
7487-94-7	Mercury and compounds	mg/kg	8/23/2004	9/7/2005	20	7	65%	0.02	0.162	0.01	0.215	S-7	0.04	3.1E+02	0.215	7.0E-04	No	1E-05	No
7440-02-0	Nickel	mg/kg	8/23/2004	9/7/2005	20		100%			13.7	34.5	SB-23	21.04	2.0E+04	34.5	1.7E-03	No	3E-05	No
7782-49-2	Selenium	mg/kg	8/23/2004	9/7/2005	20	2	90%	0.1	0.1	0.1	0.593	SB-93		5.1E+03	0.593	1.2E-04	No	2E-06	No
7440-22-4	Silver and compounds	mg/kg	8/23/2004	9/7/2005	20	3	85%	0.465	0.568	0.016	1.33	S-7		5.1E+03	1.33	2.6E-04	No	5E-06	No
7440-28-0	Thallium	mg/kg	8/23/2004	9/7/2005	20	5	75%	0.465	0.568	0.04	0.118	S-7		6.7E+01	0.118	1.7E-03	No	4E-05	No
7440-47-3	Total Chromium	mg/kg	8/23/2004	9/7/2005	20		100%			10.3	152	S-7	26.57	4.5E+02	152	3.4E-01	No	7E-03	No
7440-66-6	Zinc	mg/kg	8/23/2004	9/7/2005	20		100%			40.6	533	SB-23	95.52	1.0E+05	533	5.3E-03	No	1E-04	No
91-57-6	2-Methylnaphthalene	mg/kg	8/23/2004	3/22/2005	29	2	93%	0.33	0.33	0.00064	0.21	SB-23		3.6E+02	0.21	5.8E-04	No	1E-05	No
83-32-9	Acenaphthene	mg/kg	8/23/2004	9/7/2005	47	19	60%	0.00353	0.34	0.00028	0.35	S-7		2.9E+04	0.35	1.2E-05	No	2E-07	No
208-96-8	Acenaphthylene	mg/kg	8/23/2004	9/7/2005	47	15	68%	0.00353	0.33	0.00027	0.35	SB-23		5.9E+02	0.35	5.9E-04	No	1E-05	No
120-12-7	Anthracene	mg/kg	8/23/2004	9/7/2005	47	7	85%	0.005	0.0152	0.00032	1	SB-23		1.0E+05	1	1.0E-05	No	2E-07	No
56-55-3	*Benzo[a]anthracene*	mg/kg	8/23/2004	9/7/2005	47	2	96%	0.0143	0.0144	0.00033	3.9	S-12		2.1E+00	3.9	1.8E+00	Yes	4E-02	Yes
50-32-8	*Benzo(a)pyrene*	mg/kg	8/23/2004	9/7/2005	47		100%			0.00038	6	S-12		2.1E-01	6	2.8E+01	Yes	6E-01	Yes
205-99-2	*Benzo[b]fluoranthene*	mg/kg	8/23/2004	9/7/2005	47	3	94%	0.0039	0.0143	0.001	6.2	S-12		2.1E+00	6.2	2.9E+00	Yes	6E-02	Yes
191-24-2	Benzo[g,h,i]perylene	mg/kg	8/23/2004	9/7/2005	47	1	98%	0.0143	0.0143	0.00049	5	S-12		1.7E+04	5	3.0E-04	No	6E-06	No
207-08-9	Benzo[k]fluoranthene	mg/kg	8/23/2004	9/7/2005	47	4	91%	0.0039	0.0144	0.00066	4.2	S-12		2.1E+01	4.2	2.0E-01	No	4E-03	No
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	mg/kg	8/24/2004	3/22/2005	8	4	50%	0.33	0.33	0.06	0.72	S-11		1.2E+02	0.72	5.8E-03	No	1E-04	No
218-01-9	Chrysene	mg/kg	8/23/2004	9/7/2005	47	3	94%	0.0039	0.0143	0.00091	4.9	S-12		2.1E+02	4.9	2.3E-02	No	5E-04	No
99-87-6	Cymene	mg/kg	8/24/2004	9/8/2004	16	16	0%	0.02	0.035					2.0E+03	<5%D	NA	No	NA	No
53-70-3	*Dibenz[ah]anthracene*	mg/kg	8/23/2004	9/7/2005	47	11	77%	0.0039	*0.33*	0.0003	1.1	S-12		2.1E-01	1.1	5.2E+00	Yes	1E-01	Yes
132-64-9	Dibenzofuran	mg/kg	8/23/2004	3/22/2005	27	7	74%	0.0049	0.34	0.00023	0.1	S-7		1.6E+03	0.1	6.4E-05	No	1E-06	No
84-74-2	Di-n-butyl phthalate	mg/kg	8/24/2004	3/22/2005	8	4	50%	0.33	0.33	0.019	0.071	S-11		6.2E+04	0.071	1.2E-06	No	2E-08	No
206-44-0	Fluoranthene	mg/kg	8/23/2004	9/7/2005	47	1	98%	0.0143	0.0143	0.00091	6.4	S-12		2.2E+04	6.4	2.9E-04	No	6E-06	No
86-73-7	Fluorene	mg/kg	8/23/2004	9/7/2005	47	20	57%	0.00353	0.34	0.00033	0.63	SB-23		2.6E+04	0.63	2.4E-05	No	5E-07	No
193-39-5	*Indeno[1,2,3-cd]pyrene*	mg/kg	8/23/2004	9/7/2005	47	2	96%	0.0143	0.0144	0.00037	5.4	S-12		2.1E+00	5.4	2.6E+00	Yes	5E-02	Yes
91-20-3	Naphthalene	mg/kg	8/23/2004	9/7/2005	63	30	52%	0.00719	0.33	0.0011	0.22	SB-23		1.9E+02	0.22	1.2E-03	No	2E-05	No
85-01-8	Phenanthrene	mg/kg	8/23/2004	9/7/2005	47	2	96%	0.0143	0.0144	0.00056	3.8	SB-23		1.4E+02	3.8	2.6E-02	No	5E-04	No
129-00-0	Pyrene	mg/kg	8/23/2004	9/7/2005	47		100%			0.0012	5.8	S-12		2.9E+04	5.8	2.0E-04	No	4E-06	No
11097-69-1	Aroclor 1254	mg/kg	8/23/2004	9/13/2004	21	11	48%	0.036	0.13	0.014	0.69	S-2		7.4E-01	0.69	9.3E-01	No	2E-02	Yes
11096-82-5	Aroclor 1260	mg/kg	8/23/2004	9/13/2004	21	12	43%	0.036	0.1	0.033	0.53	S-3		7.4E-01	0.53	7.1E-01	No	1E-02	No
37324-23-5	Aroclor 1262	mg/kg	9/2/2004	9/2/2004	4	3	25%	0.037	0.045	0.047	0.047	SB-23		7.4E-01	0.047	6.3E-02	No	1E-03	No
11100-14-4	Aroclor 1268	mg/kg	9/2/2004	9/2/2004	4	3	25%	0.037	0.045	0.03	0.03	SB-23		7.4E-01	0.03	4.0E-02	No	8E-04	No
309-00-2	Aldrin	mg/kg	8/23/2004	9/7/2005	27	26	4%	0.001	0.067	0.0015	0.0015	SB-23		1.0E-01	<5%D	NA	No	NA	No
5103-71-9	alpha-Chlordane	mg/kg	8/23/2004	9/7/2005	27	23	15%	0.001	0.067	0.000334	0.0034	SB-25		6.5E+00	0.0034	5.3E-04	No	1E-05	No
12789-03-6	Chlordane (technical)	mg/kg	8/23/2004	9/7/2005	27	23	15%	0.001	0.134	0.000418	0.0048	SB-25		6.5E+00	0.0048	7.4E-04	No	2E-05	No
72-54-8	DDD	mg/kg	8/23/2004	9/7/2005	27	24	11%	0.002	0.134	0.000381	0.035	SB-23		1.0E+01	0.035	3.5E-03	No	7E-05	No
72-55-9	DDE	mg/kg	8/23/2004	9/7/2005	27	18	33%	0.0018	0.134	0.000888	0.054	SB-23		7.0E+00	0.054	7.7E-03	No	2E-04	No
50-29-3	DDT	mg/kg	8/23/2004	9/7/2005	27	15	44%	0.0018	0.134	0.000176	0.00887	SB-95		7.0E+00	0.00887	1.3E-03	No	3E-05	No
319-86-8	delta-BHC	mg/kg	8/23/2004	9/7/2005	27	27	0%	0.001	0.134					3.6E-01	<5%D	NA	No	NA	No
60-57-1	Dieldrin	mg/kg	8/23/2004	9/7/2005	27	21	22%	0.0018	*0.134*	0.000353	0.00115	SB-95		1.1E-01	0.00115	1.1E-02	No	2E-04	No
959-98-8	Endosulfan I	mg/kg	8/23/2004	9/7/2005	27	27	0%	0.001	0.067					3.7E+03	<5%D	NA	No	NA	No
72-20-8	Endrin	mg/kg	8/23/2004	9/7/2005	27	25	7%	0.0018	0.134	0.0017	0.0022	SB-25		1.8E+02	0.0022	1.2E-05	No	2E-07	No
7421-93-4	Endrin Aldehyde	mg/kg	8/23/2004	9/7/2005	27	25	7%	0.0018	0.134	0.000436	0.0014	SB-27		1.8E+02	0.0014	7.6E-06	No	2E-07	No
53494-70-5	Endrin Ketone	mg/kg	8/23/2004	9/7/2005	27	26	4%	0.0018	0.134	0.0019	0.0019	SB-27		1.8E+02	<5%D	NA	No	NA	No

Appendix C-1a Soil Summary and Risk Screening for OU1

All soil samples less than or equal to 15 feet in depth

Constituents of Interest (COI)			Samples Period of Record		Samples			Detection Limits		Detected Concentrations		Maximum Detection Location	Bkg Soil Conc.*	Direct Contact Industrial Soil PRG**	COI Conc.	Risk Ratio for Individual COI	COPC due to Individual COI Risk?	Risk Ratio for Multiple COIs	COPC due to Multiple COI Risk?
CASNo	Analyte	Units	Min	Max	Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max	Boring			Cij	Rij		Rij/Rj	
76-44-8	Heptachlor	mg/kg	8/23/2004	9/7/2005	27	27	0%	0.001	0.067					3.8E-01	<5%D	NA	No	NA	No
72-43-5	Methoxychlor	mg/kg	8/23/2004	9/7/2005	27	26	4%	0.002	0.134	0.0045	0.0045	SB-26		3.1E+03	<5%D	NA	No	NA	No
87-61-6	1,2,3-Trichlorobenzene	mg/kg	8/24/2004	9/8/2004	16	16	0%	0.00095	0.0017					2.2E+02	<5%D	NA	No	NA	No
95-63-6	1,2,4-Trimethylbenzene	mg/kg	8/24/2004	9/8/2004	16	16	0%	0.02	0.035					1.7E+02	<5%D	NA	No	NA	No
108-67-8	1,3,5-Trimethylbenzene	mg/kg	8/24/2004	9/8/2004	16	16	0%	0.02	0.035					7.0E+01	<5%D	NA	No	NA	No
106-46-7	1,4-Dichlorobenzene	mg/kg	8/24/2004	9/8/2004	16	15	6%	0.0048	0.0066	0.29	0.29	SB-23		7.9E+00	0.29	3.7E-02	No	8E-04	No
78-93-3	2-Butanone	mg/kg	8/24/2004	9/8/2004	16	15	6%	0.02	0.027	0.043	0.043	SB-23		1.1E+05	0.043	3.8E-07	No	8E-09	No
67-64-1	Acetone	mg/kg	8/24/2004	9/8/2004	16	5	69%	0.02	0.023	0.012	0.21	SB-23		5.4E+04	0.21	3.9E-06	No	8E-08	No
71-43-2	Benzene	mg/kg	8/24/2004	9/8/2004	16	16	0%	0.0048	0.0088					1.4E+00	<5%D	NA	No	NA	No
56-23-5	Carbon tetrachloride	mg/kg	8/24/2004	9/8/2004	16	15	6%	0.0048	0.0088	0.0011	0.0011	SB-22		5.5E-01	0.0011	2.0E-03	No	4E-05	No
108-90-7	Chlorobenzene	mg/kg	8/24/2004	9/8/2004	16	15	6%	0.0048	0.0066	0.5	0.5	SB-23		5.3E+02	0.5	9.4E-04	No	2E-05	No
67-66-3	Chloroform	mg/kg	8/24/2004	9/8/2004	16	15	6%	0.0048	0.0088	0.0013	0.0013	SB-22		4.7E-01	0.0013	2.8E-03	No	6E-05	No
98-82-8	Cumene (isopropylbenzene)	mg/kg	8/24/2004	9/8/2004	16	16	0%	0.02	0.035					2.0E+03	<5%D	NA	No	NA	No
DRO	Diesel Range	mg/kg	8/23/2004	9/7/2005	61	53	13%	18	50	15	4700	SB-22		2.3E+04	4700	2.0E-01	No	4E-03	No
100-41-4	Ethylbenzene	mg/kg	8/24/2004	9/8/2004	16	16	0%	0.0048	0.0088					4.0E+02	<5%D	NA	No	NA	No
GRO	Gasoline Range	mg/kg	8/23/2004	3/22/2005	39	34	13%	3.3	20	1.4	100	SB-22		1.3E+04	100	7.7E-03	No	2E-04	No
87-68-3	Hexachlorobutadiene	mg/kg	8/24/2004	9/8/2004	16	16	0%	0.02	0.035					2.2E+01	<5%D	NA	No	NA	No
75-09-2	Methylene chloride	mg/kg	8/24/2004	9/8/2004	16	1	94%	0.011	0.011	0.0012	0.032	SB-22		2.1E+01	0.032	1.6E-03	No	3E-05	No
104-51-8	n-Butylbenzene	mg/kg	8/24/2004	9/8/2004	16	16	0%	0.02	0.035					2.4E+02	<5%D	NA	No	NA	No
103-65-1	n-Propylbenzene	mg/kg	8/24/2004	9/8/2004	16	16	0%	0.02	0.035					2.4E+02	<5%D	NA	No	NA	No
95-47-6	o-Xylene	mg/kg	8/24/2004	9/8/2004	16	16	0%	0.0048	0.0088					4.2E+02	<5%D	NA	No	NA	No
108-95-2	Phenol	mg/kg	8/24/2004	3/22/2005	8	5	38%	0.33	0.33	0.024	0.05	S-11		1.0E+05	0.05	5.0E-07	No	1E-08	No
RRO	Residual Range	mg/kg	8/23/2004	9/7/2005	58	40	31%	53	170	8.3	16000	SB-22		2.3E+04	16000	7.0E-01	No	1E-02	No
135-9-88	sec-Butylbenzene	mg/kg	8/24/2004	9/8/2004	16	16	0%	0.02	0.035					2.2E+02	<5%D	NA	No	NA	No
127-18-4	Tetrachloroethylene (PCE)	mg/kg	8/24/2004	9/8/2004	16	16	0%	0.0048	0.0088					1.3E+00	<5%D	NA	No	NA	No
108-88-3	Toluene	mg/kg	8/24/2004	9/8/2004	16	16	0%	0.0048	0.0088					5.2E+02	<5%D	NA	No	NA	No
79-01-6	Trichloroethylene (TCE)	mg/kg	8/24/2004	9/8/2004	16	14	13%	0.0053	0.0088	0.00081	0.0022	SB-83		1.1E-01	0.0022	1.9E-02	No	4E-04	No
1330-20-7	Xylene (mixed)	mg/kg	8/24/2004	9/8/2004	16	16	0%	0.0048	0.0088					4.2E+02	<5%D	NA	No	NA	No

Notes:

*Background soil concentrations from Clark County, Washington. Natural Background Soil Metals Concentrations in Washington State, October 1994 Publication No. 94-115

**PRGs for COIs listed on Table 3-1 were calculated using the equations provided in the EPA Region 9 PRG table reference guide and the RfDo for the analyte provided in the EPA IRIS database or were used the listed surrogate's PRG

PRG for Gasoline Range and Diesel Range are RBCs for soil exposure for construction worker listed in Appendix A of the DEQ Risk-Based Decision Making for the Remediation of Petroleum-Contaminated Sites. The criteria for Diesel Range was also applied to Residual Range.

Cij = concentration of contaminant i in medium j.

Rij = risk ratio for contaminant i in medium j; where the risk ratio is Cij/PRG

Rj = summation of all Rij.

Nij = total number of i constituents in medium j.

Rj=	49.1
Nij=	57
1/Nij=	1.8E-02

APPENDIX C-1b Soil Summary and Risk Screening for OU2

All soil samples less than or equal to 15 feet in depth

Constituents of Interest (COI)			Samples		Samples			Detection Limits		Detected Concentrations		Maximum Detection Location	Bkg Soil Conc.*	Direct Contact Industrial Soil PRG**	COI Conc.	Risk Ratio for Individual COI	COPC due to Individual COI Risk?	Risk Ratio for Multiple COIs	COPC due to Multiple COI Risk?
			Period of Record		Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max	Boring							
CASNo	Analyte	Units	Min	Max											Cij	Rij		Rij/Rj	
7440-36-0	Antimony and compounds	mg/kg	3/8/2004	9/13/2005	43	13	70%	0.03	1.74	0.03	0.89	SB-75		4.1E+02	0.89	2.2E-03	No	2E-05	No
7440-38-2	Arsenic	mg/kg	3/8/2004	9/13/2005	43		100%			1.12	15.7	S-26D	5.81	1.9E+00	15.7	9.9E+00	Yes	8E-02	Yes
7440-41-7	Beryllium and compounds	mg/kg	3/8/2004	9/13/2005	43		100%			0.186	0.455	AOC72-S1	2.07	1.9E+03	<Bkg	NA	No	NA	No
7440-43-9	Cadmium and compounds	mg/kg	3/8/2004	9/13/2005	43		100%			0.066	25.3	S-26D	0.93	4.5E+02	25.3	5.6E-02	No	5E-04	No
75-15-0	Carbon disulfide	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	1.06					7.2E+02	<5%D	NA	No	NA	No
7440-50-8	Copper and compounds	mg/kg	3/8/2004	9/13/2005	43		100%			11.6	219	S-26D	34.43	4.1E+04	219	5.4E-03	No	4E-05	No
7439-92-1	Lead	mg/kg	3/8/2004	9/13/2005	48		100%			2.24	1060	SB-77	24.02	8.0E+02	1060	1.3E+00	Yes	1E-02	No
7487-94-7	Mercury and compounds	mg/kg	3/8/2004	9/13/2005	43	12	72%	0.009	0.131	0.009	0.325	S-26D	0.04	3.1E+02	0.325	1.1E-03	No	9E-06	No
7440-02-0	Nickel	mg/kg	3/8/2004	9/13/2005	43	1	98%	4.2	4.2	6.7	46.7	SB-78	21.04	2.0E+04	46.7	2.3E-03	No	2E-05	No
7782-49-2	Selenium	mg/kg	3/8/2004	9/13/2005	43	9	79%	0.02	1.2	0.06	2.4	SB-78		5.1E+03	2.4	4.7E-04	No	4E-06	No
7440-22-4	Silver and compounds	mg/kg	3/8/2004	9/13/2005	43	10	77%	0.02	0.529	0.017	2.1	S-26D		5.1E+03	2.1	4.1E-04	No	3E-06	No
7440-28-0	Thallium	mg/kg	3/8/2004	9/13/2005	43	13	70%	0.061	0.529	0.044	0.122	S-26D		6.7E+01	0.122	1.8E-03	No	1E-05	No
7440-47-3	Total Chromium	mg/kg	3/8/2004	9/13/2005	43		100%			5.26	24.7	SB-76	26.57	4.5E+02	<Bkg	NA	No	NA	No
7440-66-6	Zinc	mg/kg	3/8/2004	9/13/2005	43		100%			34.5	3320	S-26D	95.52	1.0E+05	3320	3.3E-02	No	3E-04	No
91-57-6	2-Methylnaphthalene	mg/kg	3/8/2004	3/22/2005	25	14	44%	0.0047	0.34	0.0005	0.093	SB-75		3.6E+02	0.093	2.5E-04	No	2E-06	No
83-32-9	Acenaphthene	mg/kg	3/8/2004	9/13/2005	52	32	38%	0.0043	0.34	0.00021	1.18	S-30D		2.9E+04	1.18	4.0E-05	No	3E-07	No
208-96-8	Acenaphthylene	mg/kg	3/8/2004	9/13/2005	52	32	38%	0.0043	0.347	0.00025	0.176	S-29		5.9E+02	0.176	3.0E-04	No	2E-06	No
120-12-7	Anthracene	mg/kg	3/8/2004	9/13/2005	52	18	65%	0.0043	0.52	0.00033	1.1	S-14		1.0E+05	1.1	1.1E-05	No	9E-08	No
56-55-3	Benzo[a]anthracene	mg/kg	3/8/2004	9/13/2005	51	7	86%	0.005	0.34	0.00021	10	S-14		2.1E+00	10	4.7E+00	Yes	4E-02	Yes
50-32-8	Benzo[a]pyrene	mg/kg	3/8/2004	9/13/2005	52	8	85%	0.005	0.34	0.00019	16	S-14		2.1E+01	16	7.6E+01	Yes	6E-01	Yes
205-99-2	Benzo[b]fluoranthene	mg/kg	3/8/2004	9/13/2005	52	9	83%	0.0047	0.34	0.00016	17	S-14		2.1E+00	17	8.1E+00	Yes	7E-02	Yes
191-24-2	Benzo[g,h,i]perylene	mg/kg	3/8/2004	9/13/2005	52	9	83%	0.0047	0.34	0.00015	13	S-14		1.7E+04	13	7.9E-04	No	6E-06	No
207-08-9	Benzo[k]fluoranthene	mg/kg	3/8/2004	9/13/2005	52	10	81%	0.005	0.34	0.00018	12	S-14		2.1E+01	12	5.7E-01	No	5E-03	No
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	mg/kg	8/26/2004	9/13/2005	18	16	11%	0.0142	0.34	0.0176	0.047	SB-71		1.2E+02	0.047	3.8E-04	No	3E-06	No
218-01-9	Chrysene	mg/kg	3/8/2004	9/13/2005	52	7	87%	0.005	0.34	0.00021	13	S-14		2.1E+02	13	6.2E-02	No	5E-04	No
99-87-6	Cymene	mg/kg	3/8/2004	9/12/2005	19	18	5%	0.02	0.026	0.0212	0.0212	S-23D		2.0E+03	0.0212	1.1E-05	No	9E-08	No
53-70-3	Dibenz[a,h]anthracene	mg/kg	3/8/2004	9/13/2005	52	17	67%	0.0047	0.34	0.00035	2.9	S-14		2.1E+01	2.9	1.4E+01	Yes	1E-01	Yes
132-64-9	Dibenzofuran	mg/kg	3/8/2004	9/8/2005	26	15	42%	0.0047	0.347	0.00022	0.2	S-14		1.6E+03	0.2	1.3E-04	No	1E-06	No
84-74-2	Di-n-butyl phthalate	mg/kg	8/26/2004	9/13/2005	18	18	0%	0.0142	0.34					6.2E+04	<5%D	NA	No	NA	No
206-44-0	Fluoranthene	mg/kg	3/8/2004	9/13/2005	52	3	94%	0.33	0.34	0.00039	18	S-14		2.2E+04	18	8.2E-04	No	7E-06	No
86-73-7	Fluorene	mg/kg	3/8/2004	9/13/2005	52	29	44%	0.0047	0.34	0.0002	1.24	S-30D		2.6E+04	1.24	4.7E-05	No	4E-07	No
193-39-5	Indeno[1,2,3-cd]pyrene	mg/kg	3/8/2004	9/13/2005	52	13	75%	0.0047	0.34	0.00028	15	S-14		2.1E+00	15	7.1E+00	Yes	6E-02	Yes
91-20-3	Naphthalene	mg/kg	3/8/2004	9/13/2005	71	43	39%	0.0047	0.344	0.00024	6.48	S-30D		1.9E+02	6.48	3.5E-02	No	3E-04	No
85-01-8	Phenanthrene	mg/kg	3/8/2004	9/13/2005	52	8	85%	0.005	0.34	0.00025	6.4	S-14		1.4E+02	6.4	4.5E-02	No	4E-04	No
129-00-0	Pyrene	mg/kg	3/8/2004	9/13/2005	52	5	90%	0.005	0.34	0.0004	16	S-14		2.9E+04	16	5.5E-04	No	5E-06	No
11097-69-1	Aroclor 1254	mg/kg	3/29/2004	9/13/2005	15	14	7%	0.01	0.1	0.11	0.11	S-14		7.4E-01	0.11	1.5E-01	No	1E-03	No
11096-82-5	Aroclor 1260	mg/kg	3/29/2004	9/13/2005	15	11	27%	0.0335	0.1	0.022	0.12	S-14		7.4E-01	0.12	1.6E-01	No	1E-03	No
309-00-2	Aldrin	mg/kg	3/29/2004	9/13/2005	39	39	0%	0.001	0.0077					1.0E-01	<5%D	NA	No	NA	No
5103-71-9	alpha-Chlordane	mg/kg	3/29/2004	9/13/2005	39	39	0%	0.001	0.077					6.5E+00	<5%D	NA	No	NA	No
12789-03-6	Chlordane (technical)	mg/kg	3/29/2004	9/13/2005	39	38	3%	0.00101	0.0077	0.000084	0.000084	MW16		6.5E+00	<5%D	NA	No	NA	No
72-54-8	DDD	mg/kg	3/29/2004	9/13/2005	39	33	15%	0.00135	0.0077	0.000137	0.00279	S-29		1.0E+01	0.00279	2.8E-04	No	2E-06	No
72-55-9	DDE	mg/kg	3/29/2004	9/13/2005	39	32	18%	0.00135	0.077	0.000092	0.00784	S-29		7.0E+00	0.00784	1.1E-03	No	9E-06	No
50-29-3	DDT	mg/kg	3/29/2004	9/13/2005	39	18	54%	0.00135	0.0678	0.000402	0.0968	S-26D		7.0E+00	0.0968	1.4E-02	No	1E-04	No
319-86-8	delta-BHC	mg/kg	3/29/2004	9/13/2005	39	39	0%	0.001	0.0077					3.6E-01	<5%D	NA	No	NA	No
60-57-1	Dieldrin	mg/kg	3/29/2004	9/13/2005	39	33	15%	0.001	0.077	0.000274	0.000896	S-30A		1.1E-01	0.000896	8.3E-03	No	7E-05	No
959-98-8	Endosulfan I	mg/kg	3/29/2004	9/13/2005	39	38	3%	0.001	0.0077	0.000329	0.000329	S-23		3.7E+03	<5%D	NA	No	NA	No
72-20-8	Endrin	mg/kg	3/29/2004	9/13/2005	39	39	0%	0.001	0.0678					1.8E+02	<5%D	NA	No	NA	No
7421-93-4	Endrin Aldehyde	mg/kg	3/29/2004	9/13/2005	39	39	0%	0.001	0.077					1.8E+02	<5%D	NA	No	NA	No
53494-70-5	Endrin Ketone	mg/kg	3/29/2004	9/13/2005	39	39	0%	0.001	0.077					1.8E+02	<5%D	NA	No	NA	No
76-44-8	Heptachlor	mg/kg	3/29/2004	9/13/2005	39	38	3%	0.00101	0.0077	0.00035	0.00035	MW16		3.8E-01	<5%D	NA	No	NA	No
72-43-5	Methoxychlor	mg/kg	3/29/2004	9/13/2005	39	38	3%	0.00135	0.077	0.00099	0.00099	MW16		3.1E+03	<5%D	NA	No	NA	No
87-61-6	1,2,3-Trichlorobenzene	mg/kg	3/8/2004	9/12/2005	19	18	5%	0.00095	0.0012	0.0836	0.0836	S-23D		2.2E+02	0.0836	3.9E-04	No	3E-06	No
95-63-6	1,2,4-Trimethylbenzene	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.02	0.106					1.7E+02	<5%D	NA	No	NA	No
108-67-8	1,3,5-Trimethylbenzene	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.02	0.106					7.0E+01	<5%D	NA	No	NA	No
106-46-7	1,4-Dichlorobenzene	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106					7.9E+00	<5%D	NA	No	NA	No
78-93-3	2-Butanone	mg/kg	3/8/2004	9/12/2005	19	18	5%	0.02	1.06	0.012	0.012	SB-51		1.1E+05	0.012	1.1E-07	No	9E-10	No
67-64-1	Acetone	mg/kg	3/8/2004	9/12/2005	19	16	16%	0.02	2.65	0.012	0.096	SB-51		5.4E+04	0.096	1.8E-06	No	1E-08	No
71-43-2	Benzene	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106					1.4E+00	<5%D	NA	No	NA	No
56-23-5	Carbon tetrachloride	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106					5.5E-01	<5%D	NA	No	NA	No
108-90-7	Chlorobenzene	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106					5.3E+02	<5%D	NA	No	NA	No
67-66-3	Chloroform	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106					4.7E-01	<5%D	NA	No	NA	No
98-82-8	Cumene (isopropylbenzene)	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.02	0.212					2.0E+03	<5%D	NA	No	NA	No
DRO	Diesel Range	mg/kg	3/8/2004	9/13/2005	39	34	13%	14	50	14.9	120	S-14		2.3E+04	120	5.2E-03	No	4E-05	No
100-41-4	Ethylbenzene	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106					4.0E+02	<5%D	NA	No	NA	No
GRO	Gasoline Range	mg/kg	3/8/2004	8/31/2004	28	26	7%	2.7	20	1.1	1.3	SB-78		1.3E+04	1.3	1.0E-04	No	8E-07	No
87-68-3	Hexachlorobutadiene	mg/kg	3/8/2004	9/12/2005	19	18	5%	0.02	0.026	0.226	0.226	S-23D		2.2E+01	0.226	1.0E-02	No	8E-05	No
75-09-2	Methylene chloride	mg/kg	3/8/2004	9/12/2005	19	5	74%	0.011	0.529	0.0031	0.026	SB-70		2.1E+01	0.026	1.3E-03	No	1E-05	No
104-51-8	n-Butylbenzene	mg/kg	3/8/2004	9/12/2005	19	18	5%	0.02	0.026	0.0434	0.0434	S-23D		2.4E+02	0.0434	1.8E-04	No	1E-06	No
103-65-1	n-Propylbenzene	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.02	0.106					2.4E+02	<5%D	NA	No	NA	No
95-47-6	o-Xylene	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106					4.2E+02	<5%D	NA	No	NA	No
108-95-2	Phenol	mg/kg	8/26/2004	8/30/2004	9	9	0%	0.33	0.34					1.0E+05	<5%D	NA	No	NA	No
RRO	Residual Range	mg/kg	3/8/2004	9/13/2005	39	31	21%	51	190	26	600	S-14		2.3E+04	600	2.6E-02	No	2E-04	No
135-9-88	sec-Butylbenzene	mg/kg	3/8/2004	9/12/2005	19	18	5%	0.02	0.026	0.0222	0.0222	S-23D		2.2E+02	0.0222	1.0E-04	No	8E-07	No
127-18-4	Tetrachloroethylene (PCE)	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106					1.3E+00	<5%D	NA	No	NA	No
108-88-3	Toluene	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106					5.2E+02	<5%D	NA	No	NA	No
79-01-6	Trichloroethylene (TCE)	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.106					1.1E-01	<5%D	NA	No	NA	No
1330-20-7	Xylene (mixed)	mg/kg	3/8/2004	9/12/2005	19	19	0%	0.0049	0.212					4.2E+02	<5%D	NA	No	NA	No

Notes:

*Background soil concentrations from Clark County, Washington. Natural Background Soil Metals Concentrations in Washington State, October 1994 Publication No. 94-115

**PRGs for COIs listed on Table OU2-4 were calculated using the equations provided in the EPA Region 9 PRG table reference guide and the RfDo for the analyte provided in the EPA IRIS database or were used the listed surrogate's PRG

PRG for Gasoline Range and Diesel Range are RBCs for soil exposure for construction worker listed in Appendix A of the DEQ Risk-Based Decision Making for the Remediation of Petroleum-Contaminated Sites. The criteria for Diesel Range was also applied to Residual Range.

Cij = concentration of contaminant i in medium j.

Rij = risk ratio for contaminant i in medium j, where the risk ratio is Cij/PRG

Rj = summation of all Rij.

Nij = total number of i constituents in medium j.

Rj= 121.9

Nij= 47

1/Nij= 2.1E-02

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APPENDIX C-1c Soil COPC screen using 90UCL

OU1: Soils from less than or equal to 15 feet

Constituents of Potential Concern (COPCs)		Number of Samples	Detection Frequency	Maximum Detection (mg/kg)	Mean Conc. (mg/kg)	90UCL		Bkg Soil Conc.	Direct Contact Industrial Soil PRG	COPC Conc.	Risk Ratio for Individual COPC	COPC due to Individual COPC Risk?	Risk Ratio for Multiple COPCs	COPC due to Multiple COPC Risk?
						Value (mg/kg)	Data Distribution			Cij	Rij		Rij/Rj	
Metals														
7440-38-2	Arsenic	20	100%	6.95	3.26	4.08	lognormal	5.81	**1.6E+00**	<Bkg	NA	No	NA	No
Semivolatile Organics (PAHs)														
56-55-3	Benzo[a]anthracene	47	96%	3.9	0.35	0.70	lognormal*		2.1E+00	0.70	3.3E-01	No	4.6E-02	No
50-32-8	*Benzo[a]pyrene*	47	100%	6	0.50	1.00	lognormal*		**2.1E-01**	1.00	4.8E+00	*Yes*	6.5E-01	*Yes*
205-99-2	Benzo[b]fluoranthene	47	94%	6.2	0.57	1.14	unknown		2.1E+00	1.14	5.4E-01	No	7.4E-02	No
53-70-3	Dibenz[ah]anthracene	47	77%	1.1	0.10	0.20	lognormal*		2.1E-01	0.20	9.6E-01	No	1.3E-01	No
193-39-5	Indeno[1,2,3-cd]pyrene	47	96%	5.4	0.40	0.86	lognormal*		2.1E+00	0.86	4.1E-01	No	5.6E-02	No
PCBs														
11097-69-1	Aroclor 1254	21	48%	0.69	0.13	0.21	lognormal		7.4E-01	0.21	2.9E-01	No	3.9E-02	No

Notes:

Each data set was tested for normality and lognormality; 90UCL was calculated per EPA 2002. Non parametric methods for calculating the 90UCL were used when the distribution was unknown or when the lognormal distribution was highly skewed (>2.5)

Bolded and highlighted PRGs are less than the 90UCL for the respective COPC

Rj= 7.3

Nij= 6

1/Nij= 1.7E-01

KMB00008543

APPENDIX C-1d Soil COPC screen using 90UCL

OU2: Soils from less than or equal to 15 feet

Constituents of Potential Concern (COPCs)		Number of Samples	Detection Frequency	Maximum Detection (mg/kg)	Mean Conc. (mg/kg)	90UCL		Bkg Soil Conc.	Direct Contact Industrial Soil PRG	COPC Conc.	Risk Ratio for Individual COPC	COPC due to Individual COPC Risk?	Risk Ratio for Multiple COPCs	COPC due to Multiple COPC Risk?
						Value (mg/kg)	Data Distribution							
CASNo	Analyte									Cij	Rij		Rij/Rj	
Metals														
7440-38-2	Arsenic	41	100%	15.7	3.44	4.94	unknown	5.81	1.6	<Bkg	NA	No	NA	No
7439-92-1	Lead	46	100%	1060	88.2	183	unknown	24.02	800.0	183	2.3E-01	No	3.8E-02	No
Semivolatile Organics (PAHs)														
56-55-3	Benzo[a]anthracene	46	85%	10	0.73	1.55	lognormal*		2.1	1.55	7.4E-01	No	1.2E-01	No
50-32-8	*Benzo[a]pyrene*	47	83%	16	0.95	2.1	lognormal*		0.2	2.1	1.0E+01	Yes	1.7E+00	Yes
205-99-2	*Benzo[b]fluoranthene*	47	81%	17	0.97	2.21	lognormal*		2.1	2.21	1.0E+00	Yes	1.7E-01	Yes
53-70-3	*Dibenz[ah]anthracene*	47	64%	2.9	0.20	0.42	lognormal*		0.2	0.42	2.0E+00	Yes	3.3E-01	Yes
193-39-5	Indeno[1,2,3-cd]pyrene	47	77%	15	0.69	1.70	lognormal*		2.1	1.70	8.1E-01	No	1.3E-01	No

Notes:

Each data set was tested for distribution (norma, gamma, and lognormal); 90UCL was calculated per EPA 2002. Non parametric methods for calculating the 90UCL were used when the distribution was unknown or when the lognormal distribution (*) was highly skewed (>2.5)

Bolded and highlighted PRGs or RBCs are less than the 90UCL for the respective COPC

Rj= 14.9

Nij= 6

1/Nij= 1.7E-01

KMB00008544

Appendix C-2

Human Health Groundwater Summary and Risk Screening (Fish Consumption)

Terminal 4 Slip 1 Upland Facility

APPENDIX C-2a Groundwater Summary and Risk Screening for OU1

OU1, Downgradient Wells, Groundwater Concentrations

Constituents of Interest (COI)				Samples					Detection Limits		Detected Concentrations		Maximum Detection Location		Human Health Screening Values [1]	COI Conc.	Risk Ratio for Individual COI	COPC due to Individual COI Risk?	Risk Ratio for Multiple COIs	COPC due to Multiple COI Risk?
				Period of Record		Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max	Well	Date	Fish Consumption Only					
CASNo	Analyte		Units	Min	Max											Cij	Rij		Rij/Rj	
71-55-6	1,1,1-Trichloroethane		ug/L	4/20/2004	5/5/2005	14	14		0.5	0.5					NA	<5%D	NA	No	NA	No
75-34-3	1,1-Dichloroethane		ug/L	4/20/2004	5/5/2005	14	14		0.5	0.5					NA	<5%D	NA	No	NA	No
75-35-4	1,1-Dichloroethylene		ug/L	4/20/2004	5/5/2005	14	13	7%	0.5	0.5	0.37	0.37	MW03s	8/30/2004	7.1E+03	0.37	5.2E-05	No	2.3E-07	No
95-63-6	***1,2,4-Trimethylbenzene***		ug/L	4/20/2004	5/5/2005	14	13	7%	2	2	2	2	MW01s	4/21/2004	NA	2	NA	No Screen	NA	No
156-59-2	***1,2-Dichloroethylene (cis)***		ug/L	4/20/2004	5/5/2005	14	9	36%	0.5	0.5	2.3	89	MW03s	8/30/2004	NA	89	NA	No Screen	NA	No
156-60-5	1,2-Dichloroethylene (trans)		ug/L	4/20/2004	5/5/2005	14	11	21%	0.5	0.5	0.2	0.78	MW03s	8/30/2004	1.0E+04	0.78	7.8E-05	No	3.4E-07	No
541-73-1	1,3-Dichlorobenzene		ug/L	4/20/2004	5/5/2005	14	14		0.5	0.5					9.6E+02	<5%D	NA	No	NA	No
106-46-7	1,4-Dichlorobenzene		ug/L	4/20/2004	5/5/2005	14	14		0.5	0.5					1.9E+02	<5%D	NA	No	NA	No
90-12-0	***1-Methylnaphthalene***		ug/L	2/3/2005	5/5/2005	7	6	14%	0.02	0.2	0.028	0.028	MW08	2/3/2005	NA	0.028	NA	No Screen	NA	No
78-93-3	2-Butanone		ug/L	4/20/2004	5/5/2005	14	14		20	20					NA	<5%D	NA	No	NA	No
91-57-6	***2-Methylnaphthalene***		ug/L	8/27/2004	5/5/2005	13	5	62%	0.012	0.02	0.0029	0.029	MW08	2/3/2005	NA	0.029	NA	No Screen	NA	No
35421-08-0	***4-Chloro-3-methylphenol***		ug/L	8/27/2004	2/2/2005	3	2	33%	0.48	0.5	0.037	0.037	MW07	8/27/2004	NA	0.037	NA	No Screen	NA	No
106-47-8	***4-Chloroaniline***		ug/L	8/27/2004	2/2/2005	3	2	33%	0.2	0.2	0.025	0.025	MW07	8/27/2004	NA	0.025	NA	No Screen	NA	No
106-44-5	***4-Methylphenol***		ug/L	8/27/2004	2/2/2005	3	2	33%	0.48	0.5	0.088	0.088	MW07	8/27/2004	NA	0.088	NA	No Screen	NA	No
83-32-9	Acenaphthene		ug/L	4/20/2004	9/16/2005	19	15	21%	0.0088	0.1	0.0041	0.0827	MW26	9/16/2005	9.9E+02	0.0827	8.4E-05	No	3.6E-07	No
208-96-8	***Acenaphthylene***		ug/L	4/20/2004	9/16/2005	19	15	21%	0.011	0.1	0.002	0.0042	MW08	2/3/2005	NA	0.0042	NA	No Screen	NA	No
67-64-1	Acetone		ug/L	4/20/2004	5/5/2005	14	14		20	20					NA	<5%D	NA	No	NA	No
309-00-2	Aldrin		ug/L	4/21/2004	9/16/2005	11	11		0.0018	0.08					5.0E-05	<5%D	NA	No	NA	No
5103-71-9	alpha-Chlordane		ug/L	4/21/2004	9/16/2005	11	11		0.0018	0.04					8.1E-04	<5%D	NA	No	NA	No
120-12-7	Anthracene		ug/L	4/20/2004	9/16/2005	19	2	89%	0.1	0.1	0.0045	0.09	MW03s	1/31/2005	4.0E+04	0.09	2.3E-06	No	9.7E-09	No
7440-36-0	Antimony and compounds	Total	ug/L	5/4/2005	9/16/2005	4	4		0.05	3					6.4E+02	<5%D	NA	No	NA	No
7440-36-0	Antimony and compounds	Dissolved	ug/L	5/4/2005	9/16/2005	4	2	50%	0.04	0.05	0.05	1.01	MW08	9/16/2005	6.4E+02	1.01	1.6E-03	No	6.8E-06	No
12674-11-2	Aroclor 1016		ug/L	4/21/2004	5/5/2005	7	7		0.2	0.31					6.4E-05	<5%D	NA	No	NA	No
11104-28-2	Aroclor 1221		ug/L	4/21/2004	5/5/2005	7	7		0.39	0.62					6.4E-05	<5%D	NA	No	NA	No
11141-16-5	Aroclor 1232		ug/L	4/21/2004	5/5/2005	7	7		0.2	0.31					6.4E-05	<5%D	NA	No	NA	No
53469-21-9	Aroclor 1242		ug/L	4/21/2004	5/5/2005	7	7		0.2	0.31					6.4E-05	<5%D	NA	No	NA	No
12672-29-6	Aroclor 1248		ug/L	4/21/2004	5/5/2005	7	7		0.2	0.31					6.4E-05	<5%D	NA	No	NA	No
11097-69-1	Aroclor 1254		ug/L	4/21/2004	5/5/2005	7	7		0.2	0.31					6.4E-05	<5%D	NA	No	NA	No
11096-82-5	Aroclor 1260		ug/L	4/21/2004	5/5/2005	7	7		0.2	0.31					6.4E-05	<5%D	NA	No	NA	No
7440-38-2	*Arsenic*	Total	ug/L	5/4/2005	9/16/2005	4	1	75%	1	1	0.38	9.8	MW26	9/16/2005	*1.4E-01*	9.8	7.0E+01	Yes	3.0E-01	Yes
7440-38-2	*Arsenic*	Dissolved	ug/L	5/4/2005	9/16/2005	4		100%		-	0.13	10.8	MW26	9/16/2005	*1.4E-01*	10.8	7.7E+01	Yes	3.3E-01	Yes
71-43-2	Benzene		ug/L	4/20/2004	5/5/2005	14	14		0.5	0.5					5.1E+01	<5%D	NA	No	NA	No
56-55-3	*Benzo[a]anthracene*		ug/L	4/20/2004	9/16/2005	19	12	37%	0.012	0.1	0.0022	0.067	MW07	2/2/2005	*1.6E-02*	0.067	3.7E+00	Yes	1.6E-02	No
50-32-8	*Benzo[a]pyrene*		ug/L	4/20/2004	9/16/2005	19	12	37%	0.016	0.1	0.0016	0.069	MW07	2/2/2005	*1.6E-02*	0.069	3.8E+00	Yes	1.7E-02	No
205-99-2	*Benzo(b)fluoranthene*		ug/L	4/20/2004	9/16/2005	19	12	37%	0.02	0.1	0.0022	0.11	MW07	2/2/2005	*1.6E-02*	0.11	6.1E+00	Yes	2.6E-02	Yes
191-24-2	***Benzo[g,h,i]perylene***		ug/L	4/20/2004	9/16/2005	19	18	5%	0.02	0.1	0.034	0.034	MW07	2/2/2005	NA	0.034	NA	No Screen	NA	No
207-08-9	*Benzo[j]fluoranthene*		ug/L	4/20/2004	9/16/2005	19	15	21%	0.02	0.1	0.0015	0.084	MW07	2/2/2005	*1.6E-02*	0.084	4.7E+00	Yes	2.0E-02	No
7440-41-7	***Beryllium and compounds***	Total	ug/L	5/4/2005	9/16/2005	4	3	25%	1	1	0.033	0.033	MW08	5/4/2005	NA	0.033	NA	No Screen	NA	No
7440-41-7	Beryllium and compounds	Dissolved	ug/L	5/4/2005	9/16/2005	4	4		0.02	0.11					NA	<5%D	NA	No	NA	No
319-84-6	BHC (alpha)		ug/L	4/21/2004	9/16/2005	11	10	9%	0.0018	0.04	0.0023	0.0023	MW08	4/21/2004	4.9E-03	0.0023	4.7E-01	No	2.0E-03	No
319-85-7	BHC (beta)		ug/L	4/21/2004	9/16/2005	11	9	18%	0.0018	1	0.0053	0.0079	MW03s	5/5/2005	1.7E-02	0.0079	4.6E-01	No	2.0E-03	No
58-89-9	BHC (gamma) Lindane		ug/L	4/21/2004	9/16/2005	11	10	9%	0.0018	0.04	0.0015	0.0015	MW08	4/21/2004	1.8E+00	0.0015	8.3E-04	No	3.6E-06	No
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)		ug/L	8/27/2004	2/2/2005	3	3		2	2					2.2E+00	<5%D	NA	No	NA	No
7440-43-9	***Cadmium and compounds***	Total	ug/L	5/4/2005	9/16/2005	4	3	25%	1	1	0.02	0.02	MW08	5/4/2005	NA	0.02	NA	No Screen	NA	No
7440-43-9	Cadmium and compounds	Dissolved	ug/L	5/4/2005	9/16/2005	4	4		0.02	0.1					NA	<5%D	NA	No	NA	No
75-15-0	***Carbon disulfide***		ug/L	4/20/2004	5/5/2005	14	10	29%	0.5	0.5	0.2	0.94	MW07	8/27/2004	NA	0.94	NA	No Screen	NA	No
108-90-7	Chlorobenzene		ug/L	4/20/2004	5/5/2005	14	14		0.5	0.5					1.6E+03	<5%D	NA	No	NA	No
67-66-3	Chloroform		ug/L	4/20/2004	5/5/2005	14	10	29%	0.5	0.5	0.19	0.5	MW01s	4/21/2004	4.7E+02	0.5	1.1E-03	No	4.6E-06	No
218-01-9	*Chrysene*		ug/L	4/20/2004	9/16/2005	19	12	37%	0.014	0.1	0.0028	0.051	MW07	2/2/2005	*1.6E-02*	0.051	2.8E+00	Yes	1.2E-02	No
7440-50-8	***Copper and compounds***	Total	ug/L	5/4/2005	9/16/2005	4	2	50%	1	3.76	1	1	MW08	9/16/2005	NA	1	NA	No Screen	NA	No
7440-50-8	***Copper and compounds***	Dissolved	ug/L	5/4/2005	9/16/2005	4	1	75%	0.18	0.18	0.12	0.42	MW26	9/16/2005	NA	0.42	NA	No Screen	NA	No

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APPENDIX C-2a Groundwater Summary and Risk Screening for OU1

OU1, Downgradient Wells, Groundwater Concentrations

Constituents of Interest (COI)				Samples					Detection Limits		Detected Concentrations		Maximum Detection Location		Human Health Screening Values [1]	COI Conc.	Risk Ratio for Individual COI	COPC due to Individual COI Risk?	Risk Ratio for Multiple COIs	COPC due to Multiple COI Risk?
				Period of Record		Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max	Well	Date	Fish Consumption Only					
CASNo	Analyte		Units	Min	Max											Cij	Rij		Rij/Rj	
98-82-8	Cumene (isopropylbenzene)		ug/L	4/20/2004	5/5/2005	14	14		2	2					NA	<5%D	NA	No	NA	No
72-54-8	DDD		ug/L	4/21/2004	9/16/2005	11	11		0.0018	0.04					3.1E-04	<5%D	NA	No	NA	No
72-55-9	*DDE*		ug/L	4/21/2004	9/16/2005	11	10	9%	0.0018	0.08	0.0043	0.0043	MW08	4/21/2004	*2.2E-04*	0.0043	2.0E+01	Yes	8.5E-02	Yes
50-29-3	DDT		ug/L	4/21/2004	9/16/2005	11	11		0.0018	0.08					2.2E-04	<5%D	NA	No	NA	No
319-86-8	***delta-BHC***		ug/L	4/21/2004	9/16/2005	11	10	9%	0.0018	0.1	0.0028	0.0028	MW08	4/21/2004	NA	0.0028	NA	No Screen	NA	No
53-70-3	Dibenz[ah]anthracene		ug/L	4/20/2004	9/16/2005	19	18	5%	0.02	0.2	0.0028	0.0028	MW08	8/30/2004	1.8E-02	0.0028	1.6E-01	No	6.7E-04	No
132-64-9	Dibenzofuran		ug/L	8/27/2004	5/5/2005	13	13		0.014	0.02					NA	<5%D	NA	No	NA	No
60-57-1	Dieldrin		ug/L	4/21/2004	9/16/2005	11	11		0.0018	0.08					5.4E-05	<5%D	NA	No	NA	No
DRO	***Diesel Range***		ug/L	4/20/2004	5/5/2005	18	16	11%	240	630	21	28	MW03s	1/31/2005	NA	28	NA	No Screen	NA	No
84-66-2	Diethyl phthalate		ug/L	8/27/2004	5/4/2005	4	1	75%	0.2	0.2	0.034	0.1	MW03s	1/31/2005	4.4E+04	0.1	2.3E-06	No	9.8E-09	No
131-11-3	Dimethyl phthalate		ug/L	8/27/2004	2/2/2005	3	3		0.2	0.2					1.1E+06	<5%D	NA	No	NA	No
84-74-2	Di-n-butyl phthalate		ug/L	8/27/2004	5/4/2005	4	2	50%	0.19	0.2	0.041	0.19	MW03s	1/31/2005	4.5E+03	0.19	4.2E-05	No	1.8E-07	No
959-98-8	Endosulfan I		ug/L	4/21/2004	9/16/2005	11	10	9%	0.0018	0.02	0.0016	0.0016	MW08	4/21/2004	8.9E+01	0.0016	1.8E-05	No	7.8E-08	No
33213-65-9	Endosulfan II		ug/L	4/21/2004	9/16/2005	11	10	9%	0.0018	0.08	0.0022	0.0022	MW03s	4/21/2004	8.9E+01	0.0022	2.5E-05	No	1.1E-07	No
72-20-8	Endrin		ug/L	4/21/2004	9/16/2005	11	10	9%	0.0018	0.08	0.0031	0.0031	MW08	4/21/2004	6.0E-02	0.0031	5.2E-02	No	2.2E-04	No
7421-93-4	Endrin Aldehyde		ug/L	4/21/2004	9/16/2005	11	11		0.0018	0.16					3.0E-01	<5%D	NA	No	NA	No
53494-70-5	Endrin Ketone		ug/L	4/21/2004	9/16/2005	11	11		0.0018	0.08					NA	<5%D	NA	No	NA	No
100-41-4	Ethylbenzene		ug/L	4/20/2004	5/5/2005	14	14		0.5	0.5					2.1E+03	<5%D	NA	No	NA	No
206-44-0	Fluoranthene		ug/L	4/20/2004	9/16/2005	19	9	53%	0.013	0.1	0.0041	0.034	MW08	4/21/2004	1.4E+02	0.034	2.4E-04	No	1.1E-06	No
86-73-7	Fluorene		ug/L	4/20/2004	9/16/2005	19	15	21%	0.012	0.1	0.0044	0.01	MW08	4/21/2004	5.3E+03	0.01	1.9E-06	No	8.2E-09	No
GRO	***Gasoline Range***		ug/L	4/20/2004	5/5/2005	18	15	17%	50	250	14	19	MW03s	1/31/2005	NA	19	NA	No Screen	NA	No
76-44-8	*Heptachlor*		ug/L	4/21/2004	9/16/2005	11	10	9%	0.0018	0.08	0.0028	0.0028	MW08	4/21/2004	*7.9E-05*	0.0028	3.5E+01	Yes	1.5E-01	Yes
1024-57-3	***Heptachlor epoxide***		ug/L	4/21/2004	9/16/2005	11	10	9%	0.0018	0.04	0.0032	0.0032	MW08	4/21/2004	NA	0.0032	NA	No Screen	NA	No
193-39-5	Indeno[1,2,3-cd]pyrene		ug/L	4/20/2004	9/16/2005	19	17	11%	0.02	0.1	0.0023	0.0031	MW08	5/4/2005	1.8E-02	0.0031	1.7E-01	No	7.4E-04	No
78-59-1	Isophorone		ug/L	8/27/2004	2/2/2005	3	3		0.2	0.2					9.6E+02	<5%D	NA	No	NA	No
7439-92-1	***Lead***	Total	ug/L	5/4/2005	9/16/2005	4	3	25%	0.52	1	1	1	MW08	9/16/2005	NA	1	NA	No Screen	NA	No
7439-92-1	***Lead***	Dissolved	ug/L	5/4/2005	9/16/2005	4	3	25%	0.02	0.08	0.12	0.12	MW26	9/16/2005	NA	0.12	NA	No Screen	NA	No
7487-94-7	Mercury and compounds	Total	ug/L	5/4/2005	9/16/2005	4	4		0.2	0.2					3.0E+02	<5%D	NA	No	NA	No
7487-94-7	Mercury and compounds	Dissolved	ug/L	5/4/2005	9/16/2005	4	4		0.05	0.2					3.0E+02	<5%D	NA	No	NA	No
72-43-5	***Methoxychlor***		ug/L	4/21/2004	9/16/2005	11	10	9%	0.0018	0.5	0.0053	0.0053	MW08	4/21/2004	NA	0.0053	NA	No Screen	NA	No
91-20-3	***Naphthalene***		ug/L	4/20/2004	9/16/2005	33	20	39%	0.02	2	0.0048	0.071	MW08	2/3/2005	NA	0.071	NA	No Screen	NA	No
104-51-8	***n-Butylbenzene***		ug/L	4/20/2004	5/5/2005	14	13	7%	2	2	2	2	MW01s	4/21/2004	NA	2	NA	No Screen	NA	No
7440-02-0	Nickel	Total	ug/L	5/4/2005	9/16/2005	4		100%		-	0.54	12.5	MW08	5/4/2005	4.6E+03	12.5	2.7E-03	No	1.2E-05	No
7440-02-0	Nickel	Dissolved	ug/L	5/4/2005	9/16/2005	4		100%		-	0.46	6.89	MW08	5/4/2005	4.6E+03	6.89	1.5E-03	No	6.5E-06	No
103-65-1	n-Propylbenzene		ug/L	4/20/2004	5/5/2005	14	14		2	2					NA	<5%D	NA	No	NA	No
95-47-6	o-Xylene		ug/L	4/20/2004	5/5/2005	14	14		0.5	0.5					NA	<5%D	NA	No	NA	No
85-01-8	***Phenanthrene***		ug/L	4/20/2004	9/16/2005	19	7	63%	0.02	0.1	0.0036	0.04	MW08	4/21/2004	NA	0.04	NA	No Screen	NA	No
108-95-2	Phenol		ug/L	8/27/2004	2/2/2005	3	2	33%	0.48	0.5	0.099	0.099	MW07	8/27/2004	1.7E+06	0.099	5.8E-08	No	2.5E-10	No
129-00-0	Pyrene		ug/L	4/20/2004	9/16/2005	19	9	53%	0.015	0.1	0.0042	0.031	MW08	4/21/2004	4.0E+03	0.031	7.8E-06	No	3.4E-08	No
RRO	***Residual Range***		ug/L	4/20/2004	5/5/2005	18	15	17%	480	630	32	41	MW03s	1/31/2005	NA	41	NA	No Screen	NA	No
135-9-88	sec-Butylbenzene		ug/L	4/20/2004	5/5/2005	14	14		2	2					NA	<5%D	NA	No	NA	No
7782-49-2	Selenium	Total	ug/L	5/4/2005	9/16/2005	4	1	75%	1	1	0.4	1.35	MW26	9/16/2005	4.2E+03	1.35	3.2E-04	No	1.4E-06	No
7782-49-2	Selenium	Dissolved	ug/L	5/4/2005	9/16/2005	4	2	50%	0.32	1	0.59	0.71	MW26	9/16/2005	4.2E+03	0.71	1.7E-04	No	7.3E-07	No
7440-22-4	***Silver and compounds***	Total	ug/L	5/4/2005	9/16/2005	4	3	25%	1	1	0.006	0.006	MW08	5/4/2005	NA	0.006	NA	No Screen	NA	No
7440-22-4	Silver and compounds	Dissolved	ug/L	5/4/2005	9/16/2005	4	4		0.02	0.08					NA	<5%D	NA	No	NA	No
127-18-4	*Tetrachloroethylene (PCE)*		ug/L	4/20/2004	5/5/2005	14	9	36%	0.5	0.5	0.77	14	MW03s	1/31/2005	*3.3E+00*	14	4.2E+00	Yes	1.8E-02	No
7440-28-0	***Thallium***	Total	ug/L	5/4/2005	9/16/2005	4	3	25%	1	1	0.02	0.02	MW08	5/4/2005	NA	0.02	NA	No Screen	NA	No
7440-28-0	Thallium	Dissolved	ug/L	5/4/2005	9/16/2005	4	4		0.02	0.08					NA	<5%D	NA	No	NA	No
108-88-3	Toluene		ug/L	4/20/2004	5/5/2005	14	8	43%	0.5	0.5	0.1	0.48	MW03s	1/31/2005	1.5E+04	0.48	3.2E-05	No	1.4E-07	No
7440-47-3	***Total Chromium***	Total	ug/L	5/4/2005	9/16/2005	4	1	75%	1	1	1	14.6	MW08	5/4/2005	NA	14.6	NA	No Screen	NA	No
7440-47-3	***Total Chromium***	Dissolved	ug/L	5/4/2005	9/16/2005	4		100%		-	0.08	1.4	MW08	5/4/2005	NA	1.4	NA	No Screen	NA	No

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APPENDIX C-2a Groundwater Summary and Risk Screening for OU1

OU1, Downgradient Wells, Groundwater Concentrations

Constituents of Interest (COI)				Samples					Detection Limits		Detected Concentrations		Maximum Detection Location		Human Health Screening Values (1)	COI Conc.	Risk Ratio for Individual COI	COPC due to Individual COI Risk?	Risk Ratio for Multiple COIs	COPC due to Multiple COI Risk?
				Period of Record		Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max	Well	Date	Fish Consumption Only					
CASNo	Analyte		Units	Min	Max											Cij	Rij		Rij/Rj	
79-01-6	Trichloroethylene (TCE)		ug/L	4/20/2004	5/5/2005	14	9	36%	0.5	0.5	0.29	3.5	MW03s	1/31/2005	3.0E+01	3.5	1.2E-01	No	5.0E-04	No
75-01-4	Vinyl chloride		ug/L	4/20/2004	5/5/2005	14	12	14%	0.5	0.5	1.3	5.4	MW03s	8/30/2004	2.4E+00	5.4	2.3E+00	Yes	9.7E-03	No
1330-20-7	Xylene (mixed)		ug/L	4/20/2004	5/5/2005	14	14		0.5	0.5					NA	<5%D	NA	No	NA	No
7440-66-6	Zinc	Total	ug/L	5/4/2005	9/16/2005	4		100%		-	3.26	9.38	MW08	5/4/2005	2.6E+04	9.38	3.6E-04	No	1.6E-06	No
7440-66-6	Zinc	Dissolved	ug/L	5/4/2005	9/16/2005	4	1	75%	4.68	4.68	2.99	4.82	MW26	9/16/2005	2.6E+04	4.82	1.9E-04	No	8.0E-07	No

Notes:

(1) Fish Consumption Only from EPA 2004, National Recommended Water Quality Criteria for Human Health For Consumption of Organism Only

Cij = concentration of contaminant i in medium j.

Rij = risk ratio for contaminant i in medium j; where the risk ratio is Cij/Screen Conc

Rj = summation of all Rij.

Nij = total number of i constituents in medium j.

Rj= 231.2

Nij= 39

1/Nij= 0.025641

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APPENDIX C-2b Groundwater Summary and Risk Screening

OU2, Downgradient Wells, Groundwater Concentrations

Constituents of Interest (COI)				Samples					Detection Limits		Detected Concentrations		Maximum Detection Location		Human Health Screening Values [1]	COI Conc.	Risk Ratio for Individual COI	COPC due to Individual COI Risk?	Risk Ratio for Multiple COIs	COPC due to Multiple COI Risk?
				Period of Record		Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max	Well	Date	Fish Consumption Only					
CASNo	Analyte		Units	Min	Max											Cij	Rij		Rij/Rj	
71-55-6	1,1,1-Trichloroethane		ug/L	4/16/2004	5/10/2005	24	24		0.12	0.5					NA	<5%D	NA	No	NA	No
75-34-3	**1,1-Dichloroethane**		ug/L	4/16/2004	5/10/2005	24	20	17%	0.11	0.5	0.1	0.19	MW10	2/4/2005	NA	0.19	NA	No Screen	NA	No
75-35-4	1,1-Dichloroethylene		ug/L	4/16/2004	5/10/2005	24	24		0.13	0.5					7.1E+03	<5%D	NA	No	NA	No
95-63-6	**1,2,4-Trimethylbenzene**		ug/L	4/16/2004	5/10/2005	24	22	8%	0.15	2	0.2	1	MW10	5/9/2005	NA	1	NA	No Screen	NA	No
156-59-2	**1,2-Dichloroethylene (cis)**		ug/L	4/16/2004	5/10/2005	24	21	13%	0.12	0.5	0.13	0.19	MW10	4/19/2004	NA	0.19	NA	No Screen	NA	No
156-60-5	1,2-Dichloroethylene (trans)		ug/L	4/16/2004	5/10/2005	24	24		0.15	0.5					1.0E+04	<5%D	NA	No	NA	No
541-73-1	1,3-Dichlorobenzene		ug/L	4/16/2004	5/10/2005	24	23	4%	0.11	0.5	1.4	1.4	MW16	4/19/2004	9.6E+02	<5%D	NA	No	NA	No
106-46-7	1,4-Dichlorobenzene		ug/L	4/16/2004	5/10/2005	24	23	4%	0.12	0.5	0.12	0.12	MW09	5/9/2005	1.9E+02	<5%D	NA	No	NA	No
90-12-0	**1-Methylnaphthalene**		ug/L	4/16/2004	5/10/2005	14	8	43%	0.02	0.023	0.0039	0.011	MW16	2/10/2005	NA	0.011	NA	No Screen	NA	No
78-93-3	2-Butanone		ug/L	4/16/2004	5/10/2005	24	24		2	20					NA	<5%D	NA	No	NA	No
91-57-6	**2-Methylnaphthalene**		ug/L	4/16/2004	5/10/2005	21	6	71%	0.02	0.023	0.0028	0.024	MW11	9/1/2004	NA	0.024	NA	No Screen	NA	No
83-32-9	Acenaphthene		ug/L	4/16/2004	5/10/2005	26	22	15%	0.002	0.027	0.0028	0.0096	MW16	5/10/2005	9.9E+02	0.0096	9.7E-06	No	2.5E-08	No
208-96-8	**Acenaphthylene**		ug/L	4/16/2004	5/10/2005	26	15	42%	0.019	0.025	0.0018	0.0062	MW10	2/4/2005	NA	0.0062	NA	No Screen	NA	No
67-64-1	Acetone		ug/L	4/16/2004	5/10/2005	24	24		4.1	20					NA	<5%D	NA	No	NA	No
309-00-2	*Aldrin*		ug/L	4/19/2004	5/10/2005	11	10	9%	0.0095	0.013	0.0012	0.0012	MW11	9/1/2004	5.0E-05	0.0012	2.4E+01	Yes	6.2E-02	Yes
5103-71-9	alpha-Chlordane		ug/L	4/19/2004	5/10/2005	11	11		0.0028	0.013					8.1E-04	<5%D	NA	No	NA	No
120-12-7	Anthracene		ug/L	4/16/2004	5/10/2005	26	2	92%	0.023	0.025	0.0036	0.094	MW10	9/1/2004	4.0E+04	0.094	2.4E-06	No	6.1E-09	No
7440-36-0	Antimony and compounds	Total	ug/L	4/16/2004	5/10/2005	27	14	48%	0.02	0.1	0.02	0.33	MW16	8/27/2004	6.4E+02	0.33	5.2E-04	No	1.3E-06	No
7440-36-0	Antimony and compounds	Dissolved	ug/L	4/16/2004	5/10/2005	27	18	33%	0.02	0.05	0.02	0.18	MW16	4/19/2004	6.4E+02	0.18	2.8E-04	No	7.3E-07	No
12674-11-2	Aroclor 1016		ug/L	4/19/2004	5/9/2005	11	11		0.19	0.31					6.4E-05	<5%D	NA	No	NA	No
11104-28-2	Aroclor 1221		ug/L	4/19/2004	5/9/2005	11	11		0.38	0.62					6.4E-05	<5%D	NA	No	NA	No
11141-16-5	Aroclor 1232		ug/L	4/19/2004	5/9/2005	11	11		0.19	0.31					6.4E-05	<5%D	NA	No	NA	No
53469-21-9	Aroclor 1242		ug/L	4/19/2004	5/9/2005	11	11		0.19	0.31					6.4E-05	<5%D	NA	No	NA	No
12672-29-6	Aroclor 1248		ug/L	4/19/2004	5/9/2005	11	11		0.19	0.31					6.4E-05	<5%D	NA	No	NA	No
11097-69-1	Aroclor 1254		ug/L	4/19/2004	5/9/2005	11	11		0.19	0.31					6.4E-05	<5%D	NA	No	NA	No
11096-82-5	Aroclor 1260		ug/L	4/19/2004	5/9/2005	11	11		0.19	0.31					6.4E-05	<5%D	NA	No	NA	No
7440-38-2	*Arsenic*	Total	ug/L	4/16/2004	5/10/2005	27	3	89%	0.02	10	0.3	17	MW11	9/1/2004	1.4E-01	17	1.2E+02	Yes	3.2E-01	Yes
7440-38-2	*Arsenic*	Dissolved	ug/L	4/16/2004	5/10/2005	27	3	89%	0.2	10	0.2	14.6	MW13	4/16/2004	1.4E-01	14.6	1.0E+02	Yes	2.7E-01	Yes
71-43-2	Benzene		ug/L	4/16/2004	5/10/2005	24	24		0.14	0.5					5.1E+01	<5%D	NA	No	NA	No
56-55-3	*Benzo(a)anthracene*		ug/L	4/16/2004	5/10/2005	26	13	50%	0.0021	0.027	0.0022	0.075	MW16	5/10/2005	1.8E-02	0.075	4.2E+00	Yes	1.1E-02	No
50-32-8	*Benzo[a]pyrene*		ug/L	4/16/2004	5/10/2005	26	16	38%	0.0016	0.027	0.0018	0.095	MW16	5/10/2005	1.8E-02	0.095	5.3E+00	Yes	1.4E-02	No
205-99-2	*Benzo[b]fluoranthene*		ug/L	4/16/2004	5/10/2005	26	17	35%	0.002	0.027	0.0026	0.096	MW16	5/10/2005	1.8E-02	0.096	5.3E+00	Yes	1.4E-02	No
191-24-2	**Benzo[g,h,i]perylene**		ug/L	4/16/2004	5/10/2005	26	18	31%	0.019	0.027	0.0034	0.079	MW16	5/10/2005	NA	0.079	NA	No Screen	NA	No
207-08-9	*Benzo[k]fluoranthene*		ug/L	4/16/2004	5/10/2005	26	18	31%	0.0014	0.027	0.0018	0.087	MW16	5/10/2005	1.8E-02	0.087	4.8E+00	Yes	1.3E-02	No
7440-41-7	**Beryllium and compounds**	Total	ug/L	4/16/2004	5/10/2005	27	13	52%	0.006	0.02	0.006	0.112	MW15	5/10/2005	NA	0.112	NA	No Screen	NA	No
7440-41-7	Beryllium and compounds	Dissolved	ug/L	4/16/2004	5/10/2005	27	26	4%	0.006	0.02	0.007	0.007	MW16	8/27/2004	NA	<5%D	NA	No	NA	No
319-84-6	BHC (alpha)		ug/L	4/19/2004	5/10/2005	11	11		0.0095	0.013					4.9E-03	<5%D	NA	No	NA	No
319-85-7	BHC (beta)		ug/L	4/19/2004	5/10/2005	11	11		0.0033	0.0097					1.7E-02	<5%D	NA	No	NA	No
58-89-9	BHC (gamma) Lindane		ug/L	4/19/2004	5/10/2005	11	11		0.0095	0.013					1.8E+00	<5%D	NA	No	NA	No
7440-43-9	**Cadmium and compounds**	Total	ug/L	4/16/2004	5/10/2005	27	10	63%	0.02	0.069	0.01	0.222	MW16	2/10/2005	NA	0.222	NA	No Screen	NA	No
7440-43-9	**Cadmium and compounds**	Dissolved	ug/L	4/16/2004	5/10/2005	27	11	59%	0.01	0.02	0.02	0.202	MW16	2/10/2005	NA	0.202	NA	No Screen	NA	No
75-15-0	**Carbon disulfide**		ug/L	4/16/2004	5/10/2005	24	21	13%	0.16	0.5	0.19	1.7	MW16	2/10/2005	NA	1.7	NA	No Screen	NA	No
108-90-7	Chlorobenzene		ug/L	4/16/2004	5/10/2005	24	24		0.14	0.5					1.6E+03	<5%D	NA	No	NA	No
67-66-3	Chloroform		ug/L	4/16/2004	5/10/2005	24	21	13%	0.14	0.5	0.75	4.4	MW16	2/10/2005	4.7E+02	4.4	9.4E-03	No	2.4E-05	No
218-01-9	*Chrysene*		ug/L	4/16/2004	5/10/2005	26	16	38%	0.0013	0.027	0.0028	0.11	MW16	5/10/2005	1.8E-02	0.11	6.1E+00	Yes	1.6E-02	No
7440-50-8	**Copper and compounds**	Total	ug/L	4/16/2004	5/10/2005	27	1	96%	1	1	0.29	14.3	MW16	8/27/2004	NA	14.3	NA	No Screen	NA	No
7440-50-8	**Copper and compounds**	Dissolved	ug/L	4/16/2004	5/10/2005	27	3	89%	1	1	0.12	4.02	MW16	4/19/2004	NA	4.02	NA	No Screen	NA	No
98-82-8	Cumene (isopropylbenzene)		ug/L	4/16/2004	5/10/2005	24	24		0.11	2					NA	<5%D	NA	No	NA	No
72-54-8	*DDD*		ug/L	4/19/2004	5/10/2005	11	10	9%	0.0095	0.012	0.0026	0.0026	MW11	4/19/2004	3.1E-04	0.0026	8.4E+00	Yes	2.2E-02	No
72-55-9	DDE		ug/L	4/19/2004	5/10/2005	11	11		0.0095	0.013					2.2E-04	<5%D	NA	No	NA	No
50-29-3	*DDT*		ug/L	4/19/2004	5/10/2005	11	9	18%	0.0096	0.013	0.0014	0.003	MW09	2/3/2005	2.2E-04	0.003	1.4E+01	Yes	3.5E-02	Yes
319-86-8	delta-BHC		ug/L	4/19/2004	5/10/2005	11	11		0.0095	0.013					NA	<5%D	NA	No	NA	No
53-70-3	*Dibenz[a,h]anthracene*		ug/L	4/16/2004	5/10/2005	26	21	19%	0.0017	0.027	0.0023	0.019	MW11	2/8/2005	1.8E-02	0.019	1.1E+00	Yes	2.7E-03	No

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APPENDIX C-2b Groundwater Summary and Risk Screening

OU2, Downgradient Wells, Groundwater Concentrations

Constituents of Interest (COI)				Samples					Detection Limits		Detected Concentrations		Maximum Detection Location		Human Health Screening Values [1]	COI Conc.	Risk Ratio for Individual COI	COPC due to Individual COI Risk?	Risk Ratio for Multiple COIs	COPC due to Multiple COI Risk?
				Period of Record		Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max	Well	Date	Fish Consumption Only					
CASNo	Analyte		Units	Min	Max											Cij	Rij		Rij/Rj	
132-64-9	Dibenzofuran		ug/L	8/27/2004	5/10/2005	18	18		0.0071	0.02					NA	<5%D	NA	No	NA	No
60-57-1	*Dieldrin*		ug/L	4/19/2004	5/10/2005	11	10	9%	0.0095	0.013	0.0044	0.0044	MW10	4/19/2004	5.4E-05	0.0044	8.1E+01	Yes	2.1E-01	Yes
DRO	**Diesel Range**		ug/L	4/16/2004	5/10/2005	28	25	11%	120	650	21	41	MW10	5/9/2005	NA	41	NA	No Screen	NA	No
959-98-8	Endosulfan I		ug/L	4/19/2004	5/10/2005	11	11		0.0095	0.013					8.9E+01	<5%D	NA	No	NA	No
33213-65-9	Endosulfan II		ug/L	4/19/2004	5/10/2005	11	10	9%	0.0095	0.013	0.0015	0.0015	MW09	4/20/2004	8.9E+01	0.0015	1.7E-05	No	4.4E-08	No
72-20-8	Endrin		ug/L	4/19/2004	5/10/2005	11	11		0.0095	0.013					6.0E-02	<5%D	NA	No	NA	No
7421-93-4	Endrin Aldehyde		ug/L	4/19/2004	5/10/2005	11	11		0.0095	0.013					3.0E-01	<5%D	NA	No	NA	No
53494-70-5	Endrin Ketone		ug/L	4/19/2004	5/10/2005	9	9		0.0096	0.013					NA	<5%D	NA	No	NA	No
100-41-4	Ethylbenzene		ug/L	4/16/2004	5/10/2005	24	23	4%	0.13	0.5	0.63	0.63	MW10	5/9/2005	2.1E+03	<5%D	NA	No	NA	No
206-44-0	Fluoranthene		ug/L	4/16/2004	5/10/2005	26	10	62%	0.0024	0.025	0.0052	0.15	MW16	5/10/2005	1.4E+02	0.15	1.1E-03	No	2.8E-06	No
86-73-7	Fluorene		ug/L	4/16/2004	5/10/2005	26	22	15%	0.0026	0.027	0.0037	0.0098	MW16	4/19/2004	5.3E+03	0.0098	1.8E-06	No	4.8E-09	No
GRO	**Gasoline Range**		ug/L	4/16/2004	5/10/2005	28	26	7%	50	260	13	51	MW10	5/9/2005	NA	51	NA	No Screen	NA	No
76-44-8	Heptachlor		ug/L	4/19/2004	5/10/2005	11	11		0.0095	0.013					7.9E-05	<5%D	NA	No	NA	No
1024-57-3	Heptachlor epoxide		ug/L	4/19/2004	5/10/2005	11	11		0.0095	0.013					NA	<5%D	NA	No	NA	No
193-39-5	*Indeno[1,2,3-cd]pyrene*		ug/L	4/16/2004	5/10/2005	26	18	31%	0.0021	0.027	0.0025	0.094	MW16	5/10/2005	1.8E-02	0.094	5.2E+00	Yes	1.4E-02	No
7439-92-1	**Lead**	Total	ug/L	4/16/2004	5/10/2005	27	2	93%	0.02	0.075	0.016	10.9	MW15	5/10/2005	NA	10.9	NA	No Screen	NA	No
7439-92-1	**Lead**	Dissolved	ug/L	4/16/2004	5/10/2005	27	12	56%	0.009	0.023	0.01	0.6	MW16	2/10/2005	NA	0.6	NA	No Screen	NA	No
7487-94-7	Mercury and compounds	Total	ug/L	4/16/2004	5/10/2005	27	20	26%	0.1	0.2	0.04	0.06	MW12	2/7/2005	3.0E+02	0.06	2.0E-04	No	5.2E-07	No
7487-94-7	Mercury and compounds	Dissolved	ug/L	4/16/2004	5/10/2005	27	19	30%	0.1	0.2	0.05	0.09	MW12	2/7/2005	3.0E+02	0.09	3.0E-04	No	7.8E-07	No
72-43-5	Methoxychlor		ug/L	4/19/2004	5/10/2005	11	11		0.0095	0.013					NA	<5%D	NA	No	NA	No
91-20-3	**Naphthalene**		ug/L	4/16/2004	5/10/2005	50	26	48%	0.02	2	0.0014	0.33	MW10	5/9/2005	NA	0.33	NA	No Screen	NA	No
104-51-8	n-Butylbenzene		ug/L	4/16/2004	5/10/2005	24	24		0.23	2					NA	<5%D	NA	No	NA	No
7440-02-0	Nickel	Total	ug/L	4/16/2004	5/10/2005	27		100%		-	0.3	20.4	MW15	5/10/2005	4.6E+03	20.4	4.4E-03	No	1.2E-05	No
7440-02-0	Nickel	Dissolved	ug/L	4/16/2004	5/10/2005	27		100%		-	0.4	10.1	MW15	2/9/2005	4.6E+03	10.1	2.2E-03	No	5.7E-06	No
103-65-1	n-Propylbenzene		ug/L	4/16/2004	5/10/2005	24	23	4%	0.098	2	0.14	0.14	MW10	5/9/2005	NA	<5%D	NA	No	NA	No
95-47-6	**o-Xylene**		ug/L	4/16/2004	5/10/2005	24	20	17%	0.11	0.5	0.14	1.3	MW10	5/9/2005	NA	1.3	NA	No Screen	NA	No
85-01-8	**Phenanthrene**		ug/L	4/16/2004	5/10/2005	26	8	69%	0.0032	0.025	0.0042	0.079	MW16	5/10/2005	NA	0.079	NA	No Screen	NA	No
129-00-0	Pyrene		ug/L	4/16/2004	5/10/2005	26	8	69%	0.0023	0.025	0.0042	0.13	MW16	5/10/2005	4.0E+03	0.13	3.3E-05	No	8.4E-08	No
RRO	**Residual Range**		ug/L	4/16/2004	5/10/2005	28	22	21%	240	650	35	520	MW09	4/20/2004	NA	520	NA	No Screen	NA	No
135-9-88	sec-Butylbenzene		ug/L	4/16/2004	5/10/2005	24	24		0.13	2					NA	<5%D	NA	No	NA	No
7782-49-2	Selenium	Total	ug/L	4/16/2004	5/10/2005	27	12	56%	0.2	5	0.1	1.8	MW16	4/19/2004	4.2E+03	1.8	4.3E-04	No	1.1E-06	No
7782-49-2	Selenium	Dissolved	ug/L	4/16/2004	5/10/2005	27	17	37%	0.2	5	0.2	1.3	MW12	4/19/2004	4.2E+03	1.3	3.1E-04	No	8.0E-07	No
7440-22-4	**Silver and compounds**	Total	ug/L	4/16/2004	5/10/2005	27	23	15%	0.009	0.04	0.006	0.03	MW16	4/19/2004	NA	0.03	NA	No Screen	NA	No
7440-22-4	Silver and compounds	Dissolved	ug/L	4/16/2004	5/10/2005	27	27		0.009	0.02					NA	<5%D	NA	No	NA	No
127-18-4	Tetrachloroethylene (PCE)		ug/L	4/16/2004	5/10/2005	24	18	25%	0.13	0.5	0.15	0.51	MW10	2/4/2005	3.3E+00	0.51	1.5E-01	No	4.0E-04	No
7440-28-0	**Thallium**	Total	ug/L	4/16/2004	5/10/2005	27	15	44%	0.004	0.04	0.004	0.072	MW16	4/19/2004	NA	0.072	NA	No Screen	NA	No
7440-28-0	**Thallium**	Dissolved	ug/L	4/16/2004	5/10/2005	27	18	33%	0.004	0.02	0.006	0.039	MW16	4/19/2004	NA	0.039	NA	No Screen	NA	No
108-88-3	Toluene		ug/L	4/16/2004	5/10/2005	24	13	46%	0.11	0.5	0.13	1.8	MW10	5/9/2005	1.5E+04	1.8	1.2E-04	No	3.1E-07	No
7440-47-3	**Total Chromium**	Total	ug/L	4/16/2004	5/10/2005	27		100%		-	0.23	21.9	MW15	5/10/2005	NA	21.9	NA	No Screen	NA	No
7440-47-3	**Total Chromium**	Dissolved	ug/L	4/16/2004	5/10/2005	27	2	93%	0.06	0.38	0.09	6.8	MW15	8/27/2004	NA	6.8	NA	No Screen	NA	No
79-01-6	Trichloroethylene (TCE)		ug/L	4/16/2004	5/10/2005	24	20	17%	0.14	0.5	0.19	0.5	MW09	4/20/2004	3.0E+01	0.5	1.7E-02	No	4.3E-05	No
75-01-4	Vinyl chloride		ug/L	4/16/2004	5/10/2005	24	24		0.22	0.5					2.4E+00	<5%D	NA	No	NA	No
1330-20-7	**Xylene (mixed)**		ug/L	4/16/2004	5/10/2005	24	20	17%	0.22	0.5	0.34	3	MW10	5/9/2005	NA	3	NA	No Screen	NA	No
7440-66-6	Zinc	Total	ug/L	4/16/2004	5/10/2005	27	2	93%	1.95	2.73	0.5	31.5	MW15	5/10/2005	2.6E+04	31.5	1.2E-03	No	3.1E-06	No
7440-66-6	Zinc	Dissolved	ug/L	4/16/2004	5/10/2005	27	3	89%	1.01	1.6	0.5	9.18	MW16	4/19/2004	2.6E+04	9.18	3.5E-04	No	9.2E-07	No

Notes:

(1) Fish Consumption Only from EPA 2004, National Recommended Water Quality Criteria for Human Health For Consumption of Organism Only

Cij = concentration of contaminant i in medium j.

Rij = risk ratio for contaminant i in medium j; where the risk ratio is Cij/PRG

Rj = summation of all Rij.

Nij = total number of i constituents in medium j.

Rj= 385.4

Nij= 33

1/Nij= 0.030303

KMB00008552

APPENDIX C-2c Groundwater COPC screen using 90UCL

OU1, Downgradient Wells only

Constituents of Potential Concern (COPCs)		Number of Samples	Detection Frequency	Maximum Detection (ug/L)	Location of Maximum Detection	Mean Conc. (ug/L)	90UCL		Human Health Screening for Fish Consumption Only	COPC Conc.	Risk Ratio for Individual COPC	COPC due to Individual COPC Risk?	Risk Ratio for Multiple COPCs	COPC due to Multiple COPC Risk?
CASNo	Analyte						Value (ug/L)	Data Distribution		Cij	Rij		Rij/Rj	
Metals														
7440-38-2	Arsenic (total)	4	75%	9.8	MW26	3.6	(1)	lognormal	1.4E-01	9.8	7.0E+01	Yes	1.1E+00	Yes
7440-38-2	Arsenic (dissolved)	4	100%	10.8	MW26	3.7	(1)	unknown	1.4E-01	10.8	7.7E+01	Yes	1.3E+00	Yes
Volatile Organics														
127-18-4	Tetrachloroethylene (PCE)	14	36%	14	MW03s	1.59	4.73	unknown	3.3E+00	4.73	1.4E+00	Yes	2.3E-02	No
75-01-4	Vinyl chloride	14	14%	5.4	MW03s	0.73	1.92	unknown	2.4E+00	1.92	8.0E-01	No	1.3E-02	No
Semivolatile Organics (PAHs)														
56-55-3	Benzo[a]anthracene	19	37%	0.067	MW07	0.013	0.026	lognormal*	1.8E-02	0.026	1.5E+00	Yes	2.4E-02	No
50-32-8	Benzo[a]pyrene	19	37%	0.069	MW07	0.013	0.026	unknown	1.8E-02	0.026	1.5E+00	Yes	2.4E-02	No
205-99-2	Benzo[b]fluoranthene	19	37%	0.11	MW07	0.016	0.035	unknown	1.8E-02	0.035	2.0E+00	Yes	3.2E-02	No
207-08-9	Benzo[k]fluoranthene	19	21%	0.084	MW07	0.016	0.031	unknown	1.8E-02	0.031	1.7E+00	Yes	2.8E-02	No
218-01-9	Chrysene	19	37%	0.051	MW07	0.013	0.024	unknown	1.8E-02	0.024	1.3E+00	Yes	2.1E-02	No
Pesticides														
72-55-9	DDE	11	9%	0.0043	MW08	0.012	0.028	unknown	2.2E-04	***0.0043***	2.0E+01	Yes	3.2E-01	Yes
76-44-8	Heptachlor	11	9%	0.0028	MW08	0.012	0.026	lognormal	7.9E-05	***0.0028***	3.5E+01	Yes	5.8E-01	Yes

Notes:

Each data set was tested for normality and lognormality; 90UCL was calculated per EPA 2002. Non parametric methods for calculating the 90UCL were used when the distribution was unknown or when the lognormal distribution was highly skewed (>2.5)

Bolded and highlighted PRGs or RBCs are less than the 90UCL for the respective COPC

(1) Too few observations to allow for data distribution testing, Maximum concentration is used as the Cij

The COPC concentration is the lesser of the maximum concentration or the calculated 90UCL; bold italics indicates that the maximum concentration was used

Rj= 61.4

Nij= 6

1/Nij= 1.7E-01

KMB00008553

APPENDIX C-2d Groundwater COPC screen using 90UCL

OU2, Downgradient Wells only

Constituents of Potential Concern (COPCs)		Number of Samples	Detection Frequency	Maximum Detection (mg/kg)	Location of Maximum Detection	Mean Conc. (ug/L)	90UCL		Human Health Screening for Fish Consumption Only	COPC Conc.	Risk Ratio for Individual COPC	COPC due to Individual COPC Risk?	Risk Ratio for Multiple COPCs	COPC due to Multiple COPC Risk?
CASNo	Analyte						Value (ug/L)	Data Distribution		Cij	Rij		Rij/Rj	
Metals														
7440-38-2	*Arsenic (total)*	27	89%	17	MW11	5.8	8.3	gamma	1.4E-01	8.3	6.0E+01	*Yes*	2.4E-01	Yes
7440-38-2	*Arsenic (dissolved)*	33	88%	14.6	MW13	4.9	7.8	unknown	1.4E-01	7.8	5.6E+01	*Yes*	2.2E-01	Yes
Semivolatile Organics (PAHs)														
56-55-3	*Benzo[a]anthracene*	26	50%	0.075	MW16	0.011	0.019	unknown	1.8E-02	0.019	1.0E+00	*Yes*	4.2E-03	No
50-32-8	*Benzo[a]pyrene*	26	38%	0.095	MW16	0.012	0.022	unknown	1.8E-02	0.022	1.2E+00	*Yes*	4.9E-03	No
205-99-2	*Benzo[b]fluoranthene*	26	35%	0.096	MW16	0.012	0.022	unknown	1.8E-02	0.022	1.2E+00	*Yes*	4.9E-03	No
207-08-9	*Benzo[k]fluoranthene*	26	31%	0.087	MW16	0.012	0.021	unknown	1.8E-02	0.021	1.2E+00	*Yes*	4.7E-03	No
218-01-9	*Chrysene*	26	38%	0.11	MW16	0.013	0.025	unknown	1.8E-02	0.025	1.4E+00	*Yes*	5.5E-03	No
53-70-3	Dibenz[ah]anthracene	26	19%	0.019	MW11	0.009	0.011	unknown	1.8E-02	0.011	6.3E-01	No	2.5E-03	No
193-39-5	*Indeno[1,2,3-cd]pyrene*	26	31%	0.094	MW16	0.012	0.022	unknown	1.8E-02	0.022	1.2E+00	*Yes*	4.9E-03	No
Pesticides														
309-00-2	*Aldrin*	11	9%	0.0012	MW11	0.0049	0.0063	unknown	5.0E-05	***0.0012***	2.4E+01	*Yes*	9.6E-02	Yes
72-54-8	*DDD*	11	9%	0.0026	MW11	0.0048	0.0056	unknown	3.1E-04	***0.0026***	8.4E+00	*Yes*	3.3E-02	No
50-29-3	*DDT*	11	18%	0.003	MW09	0.0047	0.0060	unknown	2.2E-04	***0.0030***	1.4E+01	*Yes*	5.4E-02	No
60-57-1	*Dieldrin*	11	9%	0.0044	MW10	0.0050	0.0056	unknown	5.4E-05	***0.0044***	8.1E+01	*Yes*	3.2E-01	Yes

Notes:

Rj= 2.5E+02

Each data set was tested for normality and lognormality; 90UCL was calculated per EPA 2002. Non parametric methods for calculating the 90UCL were used when the distribution was unknown or when the lognormal distribution (*) was highly skewed (>2.5)

Nij= 13

Bolded and highlighted Screening Values are less than the 90UCL for the respective COPC

1/Nij= 7.7E-02

The COPC concentration is the lesser of the maximum concentration or the calculated 90UCL; bold italics indicates that the maximum concentration was used.

Appendix C-3

Human Health Multiple Media Risk Screening

Terminal 4 Slip 1 Upland Facility

APPENDIX C-3a Multiple Media Risk Screening

OU1, Groundwater and Soil

Constituents of Interest (COI)		Groundwater Individual COI Risk Ratio	Soil COI Risk Ratio	Cumulative Media Risk Ratio	COPC due to Multiple Media Risk?
CASNo		Rij-gw	Rij-so	SRij	
71-55-6	1,1,1-Trichloroethane	NA	NA	NA	No
75-34-3	1,1-Dichloroethane	NA	NA	NA	No
75-35-4	1,1-Dichloroethylene	5.2E-05	NA	5E-05	No
87-61-6	1,2,3-Trichlorobenzene	NA	NA	NA	No
95-63-6	1,2,4-Trimethylbenzene	NA	NA	NA	No
156-59-2	1,2-Dichloroethylene (cis)	NA	NA	NA	No
156-60-5	1,2-Dichloroethylene (trans)	7.8E-05	NA	8E-05	No
108-67-8	1,3,5-Trimethylbenzene	NA	NA	NA	No
541-73-1	1,3-Dichlorobenzene	NA	NA	NA	No
106-46-7	1,4-Dichlorobenzene	NA	3.7E-02	4E-02	No
90-12-0	1-Methylnaphthalene	NA	NA	NA	No
78-93-3	2-Butanone	NA	3.8E-07	4E-07	No
91-57-6	2-Methylnaphthalene	NA	5.8E-04	6E-04	No
35421-08-0	4-Chloro-3-methylphenol	NA	NA	NA	No
106-47-8	4-Chloroaniline	NA	NA	NA	No
106-44-5	4-Methylphenol	NA	NA	NA	No
83-32-9	Acenaphthene	8.4E-05	1.2E-05	1E-04	No
208-96-8	Acenaphthylene	NA	5.9E-04	6E-04	No
67-64-1	Acetone	NA	3.9E-06	4E-06	No
309-00-2	Aldrin	NA	NA	NA	No
5103-71-9	alpha-Chlordane	NA	5.3E-04	5E-04	No
120-12-7	Anthracene	2.3E-06	1.0E-05	1E-05	No
7440-36-0	Antimony and compounds	NA	2.8E-03	3E-03	No
12674-11-2	Aroclor 1016	NA	NA	NA	No
11104-28-2	Aroclor 1221	NA	NA	NA	No
11141-16-5	Aroclor 1232	NA	NA	NA	No
53469-21-9	Aroclor 1242	NA	NA	NA	No
12672-29-6	Aroclor 1248	NA	NA	NA	No
11097-69-1	Aroclor 1254	NA	9.3E-01	9E-01	No
11096-82-5	Aroclor 1260	NA	7.1E-01	7E-01	No
37324-23-5	Aroclor 1262	NA	6.3E-02	6E-02	No
11100-14-4	Aroclor 1268	NA	4.0E-02	4E-02	No
7440-38-2	Arsenic	**7.0E+01**	**4.4E+00**	7E+01	Yes
71-43-2	Benzene	NA	NA	NA	No
56-55-3	Benzo[a]anthracene	**3.7E+00**	**1.8E+00**	6E+00	Yes
50-32-8	Benzo[a]pyrene	**3.8E+00**	**2.8E+01**	3E+01	Yes
205-99-2	Benzo[b]fluoranthene	**6.1E+00**	**2.9E+00**	9E+00	Yes
191-24-2	Benzo[g,h,i]perylene	NA	3.0E-04	3E-04	No
207-08-9	Benzo[k]fluoranthene	**4.7E+00**	2.0E-01	5E+00	Yes
7440-41-7	Beryllium and compounds	NA	NA	NA	No
319-84-6	BHC (alpha)	4.7E-01	NA	5E-01	No
319-85-7	BHC (beta)	4.6E-01	NA	5E-01	No
58-89-9	BHC (gamma) Lindane	8.3E-04	NA	8E-04	No
117-81-7	(DEHP)	NA	5.8E-03	6E-03	No
7440-43-9	Cadmium and compounds	NA	4.3E-03	4E-03	No
75-15-0	Carbon disulfide	NA	4.2E-06	4E-06	No
56-23-5	Carbon tetrachloride	NA	2.0E-03	2E-03	No
12789-03-6	Chlordane (technical)	NA	7.4E-04	7E-04	No
108-90-7	Chlorobenzene	NA	9.4E-04	9E-04	No
67-66-3	Chloroform	1.1E-03	2.8E-03	4E-03	No
218-01-9	Chrysene	**2.8E+00**	2.3E-02	3E+00	Yes
7440-50-8	Copper and compounds	NA	1.7E-03	2E-03	No
98-82-8	Cumene (isopropylbenzene)	NA	NA	NA	No

KMB00008558

APPENDIX C-3a Multiple Media Risk Screening

OU1, Groundwater and Soil

Constituents of Interest (COI)		Groundwater Individual COI Risk Ratio	Soil COI Risk Ratio	Cumulative Media Risk Ratio	COPC due to Multiple Media Risk?
CASNo		Rij-gw	Rij-so	SRij	
99-87-6	Cymene	NA	NA	NA	No
72-54-8	DDD	NA	3.5E-03	4E-03	No
72-55-9	DDE	**2.0E+01**	7.7E-03	2E+01	Yes
50-29-3	DDT	NA	1.3E-03	1E-03	No
319-86-8	delta-BHC	NA	NA	NA	No
53-70-3	Dibenz[ah]anthracene	1.6E-01	**5.2E+00**	5E+00	Yes
132-64-9	Dibenzofuran	NA	6.4E-05	6E-05	No
60-57-1	Dieldrin	NA	1.1E-02	1E-02	No
DRO	Diesel Range	NA	2.0E-01	2E-01	No
84-66-2	Diethyl phthalate	2.3E-06	NA	2E-06	No
131-11-3	Dimethyl phthalate	NA	NA	NA	No
84-74-2	Di-n-butyl phthalate	4.2E-05	1.2E-06	4E-05	No
959-98-8	Endosulfan I	1.8E-05	NA	2E-05	No
33213-65-9	Endosulfan II	2.5E-05	NA	2E-05	No
72-20-8	Endrin	5.2E-02	1.2E-05	5E-02	No
7421-93-4	Endrin Aldehyde	NA	7.6E-06	8E-06	No
53494-70-5	Endrin Ketone	NA	NA	NA	No
100-41-4	Ethylbenzene	NA	NA	NA	No
206-44-0	Fluoranthene	2.4E-04	2.9E-04	5E-04	No
86-73-7	Fluorene	1.9E-06	2.4E-05	3E-05	No
GRO	Gasoline Range	NA	7.7E-03	8E-03	No
76-44-8	Heptachlor	**3.5E+01**	NA	4E+01	Yes
102-45-73	Heptachlor epoxide	NA	NA	NA	No
87-68-3	Hexachlorobutadiene	NA	NA	NA	No
193-39-5	Indeno[1,2,3-cd]pyrene	1.7E-01	**2.6E+00**	3E+00	Yes
78-59-1	Isophorone	NA	NA	NA	No
7439-92-1	Lead	NA	3.2E-01	3E-01	No
7487-94-7	Mercury and compounds	NA	7.0E-04	7E-04	No
72-43-5	Methoxychlor	NA	NA	NA	No
75-09-2	Methylene chloride	NA	1.6E-03	2E-03	No
91-20-3	Naphthalene	NA	1.2E-03	1E-03	No
104-51-8	n-Butylbenzene	NA	NA	NA	No
7440-02-0	Nickel	2.7E-03	1.7E-03	4E-03	No
103-65-1	n-Propylbenzene	NA	NA	NA	No
95-47-6	o-Xylene	NA	NA	NA	No
85-01-8	Phenanthrene	NA	2.6E-02	3E-02	No
108-95-2	Phenol	5.8E-08	5.0E-07	6E-07	No
129-00-0	Pyrene	7.8E-06	2.0E-04	2E-04	No
RRO	Residual Range	NA	7.0E-01	7E-01	No
135-9-88	sec-Butylbenzene	NA	NA	NA	No
7782-49-2	Selenium	3.2E-04	1.2E-04	4E-04	No
7440-22-4	Silver and compounds	NA	2.6E-04	3E-04	No
127-18-4	Tetrachloroethylene (PCE)	**4.2E+00**	NA	4E+00	Yes
7440-28-0	Thallium	NA	1.7E-03	2E-03	No
108-88-3	Toluene	3.2E-05	NA	3E-05	No
7440-47-3	Total Chromium	NA	3.4E-01	3E-01	No
79-01-6	Trichloroethylene (TCE)	1.2E-01	1.9E-02	1E-01	No
75-01-4	Vinyl chloride	**2.3E+00**	NA	2E+00	Yes
1330-20-7	Xylene (mixed)	NA	NA	NA	No
7440-66-6	Zinc	3.6E-04	5.3E-03	6E-03	No

Notes:

Groundwater Individual COI Risk Ratios are calculated in Appendix C-2. Total Metal are included in this table.

Soil individual COI Risk Ratios are calculated on Appendix C-1.

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APPENDIX C-3b Multiple Media Risk Screening

OU2, Groundwater and Soil

Constituents of Interest (COI)		Groundwater Individual COI Risk Ratio	Soil Individual COI Risk Ratio	Cumulative Media Risk Ratio	COPC due to Multiple Media Risk?
CASNo	Analyte	Rij-gw	Rij-so	SRij	
71-55-6	1,1,1-Trichloroethane	NA	NA	NA	No
75-34-3	1,1-Dichloroethane	NA	NA	NA	No
75-35-4	1,1-Dichloroethylene	NA	NA	NA	No
87-61-6	1,2,3-Trichlorobenzene	NA	3.9E-04	4E-04	No
95-63-6	1,2,4-Trimethylbenzene	NA	NA	NA	No
108-67-8	1,3,5-Trimethylbenzene	NA	NA	NA	No
156-59-2	1,2-Dichloroethylene (cis)	NA	NA	NA	No
156-60-5	1,2-Dichloroethylene (trans)	NA	NA	NA	No
541-73-1	1,3-Dichlorobenzene	NA	NA	NA	No
106-46-7	1,4-Dichlorobenzene	NA	NA	NA	No
832-69-9	1-Methylphenanthrene	NA	NA	NA	No
78-93-3	2-Butanone	NA	1.1E-07	1E-07	No
91-57-6	2-Methylnaphthalene	NA	2.5E-04	3E-04	No
83-32-9	Acenaphthene	9.7E-06	4.0E-05	5E-05	No
208-96-8	Acenaphthylene	NA	3.0E-04	3E-04	No
67-64-1	Acetone	NA	1.8E-06	2E-06	No
309-00-2	*Aldrin*	**2.4E+01**	NA	2E+01	Yes
5103-71-9	alpha-Chlordane	NA	NA	NA	No
120-12-7	Anthracene	2.4E-06	1.1E-05	1E-05	No
7440-36-0	Antimony and compounds	5.2E-04	2.2E-03	3E-03	No
12674-11-2	Aroclor 1016	NA	NA	NA	No
11104-28-2	Aroclor 1221	NA	NA	NA	No
11141-16-5	Aroclor 1232	NA	NA	NA	No
53469-21-9	Aroclor 1242	NA	NA	NA	No
12672-29-6	Aroclor 1248	NA	NA	NA	No
11097-69-1	Aroclor 1254	NA	1.5E-01	1E-01	No
11096-82-5	Aroclor 1260	NA	1.6E-01	2E-01	No
7440-38-2	*Arsenic*	**1.2E+02**	**9.9E+00**	1E+02	Yes
71-43-2	Benzene	NA	NA	NA	No
56-55-3	*Benzo[a]anthracene*	**4.2E+00**	**4.7E+00**	9E+00	Yes
50-32-8	*Benzo[a]pyrene*	**5.3E+00**	**7.6E+01**	8E+01	Yes
205-99-2	*Benzo[b]fluoranthene*	**5.3E+00**	**8.1E+00**	1E+01	Yes
191-24-2	Benzo[g,h,i]perylene	NA	7.9E-04	8E-04	No
207-08-9	*Benzo[k]fluoranthene*	**4.8E+00**	5.7E-01	5E+00	Yes
7440-41-7	Beryllium and compounds	NA	NA	NA	No
319-84-6	BHC (alpha)	NA	NA	NA	No
319-85-7	BHC (beta)	NA	NA	NA	No
58-89-9	BHC (gamma) Lindane	NA	NA	NA	No
117-81-7	(DEHP)	NA	3.8E-04	4E-04	No
85-68-7	Butyl benzyl phthalate	NA	NA	NA	No
7440-43-9	Cadmium and compounds	NA	5.6E-02	6E-02	No
75-15-0	Carbon disulfide	NA	NA	NA	No
56-23-5	Carbon tetrachloride	NA	NA	NA	No
12789-03-6	Chlordane (technical)	NA	NA	NA	No
108-90-7	Chlorobenzene	NA	NA	NA	No
67-66-3	Chloroform	9.4E-03	NA	9E-03	No
218-01-9	*Chrysene*	**6.1E+00**	6.2E-02	6E+00	Yes
7440-50-8	Copper and compounds	NA	5.4E-03	5E-03	No
98-82-8	Cumene (isopropylbenzene)	NA	NA	NA	No
99-87-6	Cymene	NA	1.1E-05	1E-05	No
72-54-8	*DDD*	**8.4E+00**	2.8E-04	8E+00	Yes
72-55-9	DDE	NA	1.1E-03	1E-03	No
50-29-3	*DDT*	**1.4E+01**	1.4E-02	1E+01	Yes

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APPENDIX C-3b Multiple Media Risk Screening

OU2, Groundwater and Soil

Constituents of Interest (COI)		Groundwater Individual COI Risk Ratio	Soil Individual COI Risk Ratio	Cumulative Media Risk Ratio	COPC due to Multiple Media Risk?
CASNo	Analyte	Rij-gw	Rij-so	SRij	
319-86-8	delta-BHC	NA	NA	NA	No
53-70-3	*Dibenz[ah]anthracene*	**1.1E+00**	**1.4E+01**	1E+01	Yes
132-64-9	Dibenzofuran	NA	1.3E-04	1E-04	No
60-57-1	*Dieldrin*	**8.1E+01**	8.3E-03	8E+01	Yes
DRO	Diesel Range	NA	5.2E-03	5E-03	No
84-66-2	Diethyl phthalate	NA	NA	NA	No
131-11-3	Dimethyl phthalate	NA	NA	NA	No
84-74-2	Di-n-butyl phthalate	NA	NA	NA	No
117-84-0	Di-n-octyl phthalate	NA	NA	NA	No
959-98-8	Endosulfan I	NA	NA	NA	No
33213-65-9	Endosulfan II	1.7E-05	NA	2E-05	No
72-20-8	Endrin	NA	NA	NA	No
7421-93-4	Endrin Aldehyde	NA	NA	NA	No
53494-70-5	Endrin Ketone	NA	NA	NA	No
100-41-4	Ethylbenzene	NA	NA	NA	No
206-44-0	Fluoranthene	1.1E-03	8.2E-04	2E-03	No
86-73-7	Fluorene	1.8E-06	4.7E-05	5E-05	No
GRO	Gasoline Range	NA	1.0E-04	1E-04	No
76-44-8	Heptachlor	NA	NA	NA	No
102-45-73	Heptachlor epoxide	NA	NA	NA	No
87-68-3	Hexachlorobutadiene	NA	1.0E-02	1E-02	No
193-39-5	*Indeno[1,2,3-cd]pyrene*	**5.2E+00**	**7.1E+00**	1E+01	Yes
7439-92-1	*Lead*	NA	**1.3E+00**	1E+00	Yes
7487-94-7	Mercury and compounds	2.0E-04	1.1E-03	1E-03	No
72-43-5	Methoxychlor	NA	NA	NA	No
1634-04-4	Methyl tertbutyl ether (MTBE)	NA	NA	NA	No
75-09-2	Methylene chloride	NA	1.3E-03	1E-03	No
91-20-3	Naphthalene	NA	3.5E-02	3E-02	No
104-51-8	n-Butylbenzene	NA	1.8E-04	2E-04	No
7440-02-0	Nickel	4.4E-03	2.3E-03	7E-03	No
103-65-1	n-Propylbenzene	NA	NA	NA	No
95-47-6	o-Xylene	NA	NA	NA	No
85-01-8	Phenanthrene	NA	4.5E-02	4E-02	No
108-95-2	Phenol	NA	NA	NA	No
129-00-0	Pyrene	3.3E-05	5.5E-04	6E-04	No
RRO	Residual Range	NA	2.6E-02	3E-02	No
135-9-88	sec-Butylbenzene	NA	1.0E-04	1E-04	No
7782-49-2	Selenium	4.3E-04	4.7E-04	9E-04	No
7440-22-4	Silver and compounds	NA	4.1E-04	4E-04	No
127-18-4	Tetrachloroethylene (PCE)	1.5E-01	NA	2E-01	No
7440-28-0	Thallium	NA	1.8E-03	2E-03	No
108-88-3	Toluene	1.2E-04	NA	1E-04	No
7440-47-3	Total Chromium	NA	NA	NA	No
79-01-6	Trichloroethylene (TCE)	1.7E-02	NA	2E-02	No
75-01-4	Vinyl chloride	NA	NA	NA	No
1330-20-7	Xylene (mixed)	NA	NA	NA	No
7440-66-6	Zinc	1.2E-03	3.3E-02	3E-02	No

Notes:

Groundwater Individual COI Risk Ratios are calculated in Appendix C-2. Total Metals are included in this table.
Soil individual COI Risk Ratios are calculated in Appendix C-1.

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Appendix C-4

Human Health Groundwater Summary and Risk Screening (Inhalation of Volatiles)

Terminal 4 Slip 1 Upland Facility

APPENDIX C-4a Groundwater Summary and Risk Screening for Inhalation of Volatiles

OU1, Site-wide Groundwater Concentrations

Constituents of Interest (COI) (ug/L)	Number of Samples	Number of ND	Detection Frequency	Maximum Detection	Maximum Reporting Limit	RBC for Groundwater based on risk of indoor vapors from Groundwater		Minimum RBC for indoor vapor	COI Conc.	Risk Ratio for Individual COI	COPC due to Individual COI Risk?	Risk Ratio for Multiple COIs	COPC due to Multiple COI Risk?
						EPA 2002 [a]	DEQ 2003 [b]		Cij	Rij		Rij/Rj	
1,1,1-Trichloroethane (TCA)	39	39	0%	0	0.50	3100	-	3100	<5%D	NA	No	NA	No
1,1-Dichloroethane (1,1-DCA)	39	39	0%	0	0.50	2200	NA	2200	<5%D	NA	No	NA	No
1,1-Dichloroethene (1,1-DCE)	39	34	13%	1.10	0.50	190	330000	190	1.1	5.8E-03	No	2.2E-04	No
1,2,4-Trimethylbenzene	39	38	3%	2.00	2.00	24	51000	24	<5%D	NA	No	NA	No
1,3-Dichlorobenzene	39	38	3%	0.21	0.50	830	NA	830	<5%D	NA	No	NA	No
1,4-Dichlorobenzene	39	38	3%	0.12	0.50	8200	NA	8200	<5%D	NA	No	NA	No
2-Butanone (MEK)	39	39	0%	0	20.00	440000	NA	440000	<5%D	NA	No	NA	No
Acetone	39	38	3%	17.00	20.00	220000	NA	220000	<5%D	NA	No	NA	No
Benzene	39	39	0%	0	0.50	5	2700	5	<5%D	NA	No	NA	No
Carbon Disulfide	39	35	10%	0.94	0.50	560	NA	560	0.94	1.7E-03	No	6.3E-05	No
Chlorobenzene	39	39	0%	0	0.50	390	NA	390	<5%D	NA	No	NA	No
Chloroform	39	35	10%	0.50	0.50	80	NA	80	0.5	6.3E-03	No	2.4E-04	No
cis-1,2-Dichloroethene	39	27	31%	89.00	0.50	210	410000	210	89	4.2E-01	No	1.6E-02	No
Ethylbenzene	39	39	0%	0	0.50	700	-	700	<5%D	NA	No	NA	No
Isopropylbenzene	39	39	0%	0	2.00	8.4	-	8.4	<5%D	NA	No	NA	No
Naphthalene	83	54	35%	0.11	2.00	150	-	150	0.11	7.3E-04	No	2.8E-05	No
n-Butylbenzene	39	38	3%	2.00	2.00	260	NA	260	<5%D	NA	No	NA	No
n-Propylbenzene	39	39	0%	0	2.00	320	-	320	<5%D	NA	No	NA	No
m,p-Xylenes	39	38	3%	0.25	0.50	22000	NA	22000	<5%D	NA	No	NA	No
o-Xylene	39	38	3%	0.12	0.50	33000	NA	33000	<5%D	NA	No	NA	No
sec-Butylbenzene	39	39	0%	0	2.00	250	NA	250	<5%D	NA	No	NA	No
Tetrachloroethene (PCE)	39	26	33%	34.00	0.50	5	1300	5	34	6.8E+00	Yes	2.6E-01	Yes
Toluene	39	21	46%	1.30	0.50	1500	-	1500	1.3	8.7E-04	No	3.3E-05	No
trans-1,2-Dichloroethene	39	32	18%	1.20	0.50	180	390000	180	1.2	6.7E-03	No	2.5E-04	No
Trichloroethene (TCE)	39	27	31%	83.00	0.50	5	110	5	83	1.7E+01	Yes	6.3E-01	Yes
Vinyl Chloride	39	32	18%	5.40	0.50	2	840	2	5.4	2.7E+00	Yes	1.0E-01	Yes
1-Methylnaphthalene	19	8	58%	0.03	0.20	NA	NA	NA	0.033	NA	No Screen	NA	No
2-Methylnaphthalene	35	10	71%	0.03	0.04	3300	NA	3300	0.029	8.8E-06	No	3.3E-07	No
Acenaphthene	44	36	18%	0.08	0.10	**	-	NA	0.0827	NA	No Screen	NA	No
Acenaphthylene	44	33	25%	0	0.10	NA	NA	NA	0	NA	No Screen	NA	No
Anthracene	44	3	93%	0.09	0.10	NA	-	NA	0.09	NA	No Screen	NA	No
Benz(a)anthracene	44	29	34%	0.07	0.10	NA	-	NA	0.067	NA	No Screen	NA	No
Benzo(a)pyrene	44	28	36%	0.14	0.10	NA	-	NA	0.14	NA	No Screen	NA	No
Benzo(b)fluoranthene	44	28	36%	0.14	0.10	**	-	NA	0.14	NA	No Screen	NA	No
Benzo(g,h,i)perylene	44	42	5%	0.06	0.10	NA	NA	NA	<5%D	NA	No	NA	No
Benzo(k)fluoranthene	44	32	27%	0.13	0.10	NA	-	NA	0.13	NA	No Screen	NA	No
Chrysene	44	25	43%	0.05	0.10	**	-	NA	0.051	NA	No Screen	NA	No
Dibenz(a,h)anthracene	44	40	9%	0.04	0.20	NA	-	NA	0.042	NA	No Screen	NA	No
Dibenzofuran	35	35	0%	0	0.04	**	NA	NA	<5%D	NA	No	NA	No
Fluoranthene	44	18	59%	0.05	0.10	NA	-	NA	0.049	NA	No Screen	NA	No
Fluorene	44	32	27%	0.01	0.10	**	-	NA	0.01	NA	No Screen	NA	No
Indeno(1,2,3-cd)pyrene	44	35	20%	0.06	0.10	NA	-	NA	0.057	NA	No Screen	NA	No

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APPENDIX C-4a Groundwater Summary and Risk Screening for Inhalation of Volatiles

OU1, Site-wide Groundwater Concentrations

Constituents of Interest (COI) (ug/L)	Number of Samples	Number of ND	Detection Frequency	Maximum Detection	Maximum Reporting Limit	RBC for Groundwater based on risk of indoor vapors from Groundwater		Minimum RBC for indoor vapor	COI Conc.	Risk Ratio for Individual COI	COPC due to Individual COI Risk?	Risk Ratio for Multiple COIs	COPC due to Multiple COI Risk?
						EPA 2002 [a]	DEQ 2003 [b]		Cij	Rij		Rij/Rj	
Naphthalene	83	54	35%	0.11	2.00	150	-	150	0.11	7.3E-04	No	2.8E-05	No
Phenanthrene	44	11	75%	0.04	0.10	NA	NA	NA	0.044	NA	No Screen	NA	No
Pyrene	44	17	61%	0.06	0.10	**	-	NA	0.056	NA	No Screen	NA	No
Diesel Range	43	32	26%	65.00	630.00	NA	-	NA	65	NA	No Screen	NA	No
Gasoline Range	43	36	16%	26.00	250.00	NA	-	NA	26	NA	No Screen	NA	No
Residual Range	43	32	26%	190.00	630.00	NA	-	NA	190	NA	No Screen	NA	No
4-Chloro-3-methylphenol	9	6	33%	0.07	9.60	NA	NA	NA	0.068	NA	No Screen	NA	No
4-Chloroaniline	9	8	11%	0.03	9.60	NA	NA	NA	0.025	NA	No Screen	NA	No
4-Methyl phenol	9	7	22%	1.20	9.60	NA	NA	NA	1.2	NA	No Screen	NA	No
Bis(2-ethylhexyl) Phthalate	9	7	22%	0.35	9.60	NA	NA	NA	0.35	NA	No Screen	NA	No
Diethyl Phthalate	10	5	50%	0.13	9.60	NA	NA	NA	0.13	NA	No Screen	NA	No
Dimethyl Phthalate	9	9	0%	0	9.60	NA	NA	NA	<5%D	NA	No	NA	No
Di-n-butyl Phthalate	10	6	40%	0.19	9.60	NA	NA	NA	0.19	NA	No Screen	NA	No
Isophorone	9	9	0%	0	9.60	NA	NA	NA	<5%D	NA	No	NA	No
Phenol	9	7	22%	0.82	9.60	NA	NA	NA	0.82	NA	No Screen	NA	No
4,4'-DDD	15	15	0%	0	0.04	NA	NA	NA	<5%D	NA	No	NA	No
4,4'-DDE	15	14	7%	0	0.08	29	NA	29	0	0.0E+00	No	0.0E+00	No
4,4'-DDT	15	15	0%	0	0.08	NA	NA	NA	<5%D	NA	No	NA	No
Aldrin	15	15	0%	0	0.08	0.071	NA	0.071	<5%D	NA	No	NA	No
alpha-BHC	15	14	7%	0	0.04	3.1	NA	3.1	0	0.0E+00	No	0.0E+00	No
alpha-Chlordane	15	15	0%	0	0.04	NA	NA	NA	<5%D	NA	No	NA	No
beta-BHC	15	13	13%	0.01	1.00	NA	NA	NA	0.0079	NA	No Screen	NA	No
delta-BHC	15	14	7%	0	0.10	NA	NA	NA	0	NA	No Screen	NA	No
Dieldrin	15	15	0%	0	0.08	0.86	NA	0.86	<5%D	NA	No	NA	No
Endosulfan I	15	14	7%	0	0.02	NA	NA	NA	0	NA	No Screen	NA	No
Endosulfan II	15	14	7%	0	0.08	NA	NA	NA	0	NA	No Screen	NA	No
Endrin	15	12	20%	0.01	0.08	NA	NA	NA	0.0056	NA	No Screen	NA	No
Endrin Aldehyde	15	14	7%	0	0.16	NA	NA	NA	0	NA	No Screen	NA	No
Endrin Ketone	15	12	20%	0.03	0.08	NA	NA	NA	0.031	NA	No Screen	NA	No
gamma-BHC (Lindane)	15	14	7%	0	0.04	11	NA	11	0	0.0E+00	No	0.0E+00	No
Heptachlor	15	14	7%	0	0.08	0.4	NA	0.4	0	0.0E+00	No	0.0E+00	No
Heptachlor Epoxide	15	14	7%	0	0.04	NA	NA	NA	0	NA	No Screen	NA	No
Methoxychlor	15	14	7%	0.01	0.50	**	NA	NA	0.0053	NA	No Screen	NA	No
Aroclor 1016	11	11	0%	0	0.31	NA	NA	NA	<5%D	NA	No	NA	No
Aroclor 1221	11	11	0%	0	0.62	NA	NA	NA	<5%D	NA	No	NA	No
Aroclor 1232	11	11	0%	0	0.31	NA	NA	NA	<5%D	NA	No	NA	No
Aroclor 1242	11	11	0%	0	0.31	NA	NA	NA	<5%D	NA	No	NA	No
Aroclor 1248	11	11	0%	0	0.31	NA	NA	NA	<5%D	NA	No	NA	No
Aroclor 1254	11	11	0%	0	0.31	NA	NA	NA	<5%D	NA	No	NA	No
Aroclor 1260	11	11	0%	0	0.31	NA	NA	NA	<5%D	NA	No	NA	No
Antimony, Total	19	8	58%	0.264	3	NA	NA	NA	0.264	NA	No Screen	NA	No
Arsenic, Total	19	3	84%	9.8	1	NA	NA	NA	9.8	NA	No Screen	NA	No

APPENDIX C-4a Groundwater Summary and Risk Screening for Inhalation of Volatiles

OU1, Site-wide Groundwater Concentrations

Constituents of Interest (COI) (ug/L)	Number of Samples	Number of ND	Detection Frequency	Maximum Detection	Maximum Reporting Limit	RBC for Groundwater based on risk of indoor vapors from Groundwater		Minimum RBC for indoor vapor	COI Conc.	Risk Ratio for Individual COI	COPC due to Individual COI Risk?	Risk Ratio for Multiple COIs	COPC due to Multiple COI Risk?
						EPA 2002 [a]	DEQ 2003 [b]		Cij	Rij		Rij/Rj	
Beryllium, Total	19	7	63%	0.076	1	NA	NA	NA	0.076	NA	No Screen	NA	No
Cadmium, Total	19	7	63%	0.287	1	NA	NA	NA	0.287	NA	No Screen	NA	No
Chromium, Total	19	5	74%	14.6	1	NA	NA	NA	14.6	NA	No Screen	NA	No
Copper, Total	19	2	89%	5.24	3.76	NA	NA	NA	5.24	NA	No Screen	NA	No
Lead, Total	19	4	79%	1.16	1	NA	NA	NA	1.16	NA	No Screen	NA	No
Mercury, Total	19	18	5%	0.14	0.2	NA	NA	NA	0.14	NA	No Screen	NA	No
Nickel, Total	19	0	100%	13.4	-	NA	NA	NA	13.4	NA	No Screen	NA	No
Selenium, Total	19	10	47%	3	5	NA	NA	NA	3	NA	No Screen	NA	No
Silver, Total	19	15	21%	0.024	1	NA	NA	NA	0.024	NA	No Screen	NA	No
Thallium, Total	19	12	37%	0.02	1	NA	NA	NA	0.02	NA	No Screen	NA	No
Zinc, Total	19	0	100%	14.1	-	NA	NA	NA	14.1	NA	No Screen	NA	No
Antimony, Dissolved	19	8	58%	1.01	0.05	NA	NA	NA	1.01	NA	No Screen	NA	No
Arsenic, Dissolved	19	1	95%	10.8	0.5	NA	NA	NA	10.8	NA	No Screen	NA	No
Beryllium, Dissolved	19	13	32%	0.014	0.11	NA	NA	NA	0.014	NA	No Screen	NA	No
Cadmium, Dissolved	19	9	53%	0.158	0.1	NA	NA	NA	0.158	NA	No Screen	NA	No
Chromium, Dissolved	19	2	89%	2.89	0.2	NA	NA	NA	2.89	NA	No Screen	NA	No
Copper, Dissolved	19	1	95%	2.75	0.18	NA	NA	NA	2.75	NA	No Screen	NA	No
Lead, Dissolved	19	6	68%	1.78	0.08	NA	NA	NA	1.78	NA	No Screen	NA	No
Mercury, Dissolved	19	19	0%	0	0.2	NA	NA	NA	<5%D	NA	No	NA	No
Nickel, Dissolved	19	0	100%	15	-	NA	NA	NA	15	NA	No Screen	NA	No
Selenium, Dissolved	19	11	42%	3.6	5	NA	NA	NA	3.6	NA	No Screen	NA	No
Silver, Dissolved	19	18	5%	0.007	0.08	NA	NA	NA	0.007	NA	No Screen	NA	No
Thallium, Dissolved	19	15	21%	0.015	0.08	NA	NA	NA	0.015	NA	No Screen	NA	No
Zinc, Dissolved	19	1	95%	15.4	4.68	NA	NA	NA	15.4	NA	No Screen	NA	No

Notes:

EPA 2002 OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance), Draft Guidance, EPA 530-D-02-004, November 2002

DEQ, 2003 Risk-Based Decision Making for the Remediation of Petroleum-Contaminated Sites

(a) Table 2c, Question 4 Generic Screening Levels and Summary Sheet, Risk = 1 x 10^{-6}; Target Groundwater Concentration C_{gw}

(b) Appendix A: Table of RBCs, Groundwater RBC for Vapor Intrusion into Buildings, RBC_{wi} for Occupational Workers

RBC - Risk-Based Concentration

Rj=	26.5
Nij=	16
1/Nij=	0.0625

APPENDIX C-4b Groundwater Summary and Risk Screening for Inhalation of Volatiles

OU1, Groundwater Concentrations (excluding MW-03s, MW-22, and MW-23)

Constituents of Interest (COI) (ug/L)	Number of Samples	Number of ND	Detection Frequency	Maximum Detection	Maximum Reporting Limit	RBC for Groundwater based on risk of indoor vapors from Groundwater		Minimum RBC for indoor vapor	COI Conc.	Risk Ratio for Individual COI	COPC due to Individual COI Risk?
						EPA 2002 [a]	DEQ 2003 [b]		Cij	Rij	
1,1,1-Trichloroethane (TCA)	27	27	0%	0	0.5	3100	-	3100	<5%D	NA	No
1,1-Dichloroethane (1,1-DCA)	27	27	0%	0	0.5	2200	NA	2200	<5%D	NA	No
1,1-Dichloroethene (1,1-DCE)	27	27	0%	0	0.5	190	330000	190	<5%D	NA	No
1,2,4-Trimethylbenzene	27	27	0%	0	2	24	51000	24	<5%D	NA	No
1,3-Dichlorobenzene	27	27	0%	0	0.5	830	NA	830	<5%D	NA	No
1,4-Dichlorobenzene	27	26	4%	0.12	0.5	8200	NA	8200	<5%D	NA	No
2-Butanone (MEK)	27	27	0%	0	20	440000	NA	440000	<5%D	NA	No
Acetone	27	26	4%	17	20	220000	NA	220000	<5%D	NA	No
Benzene	27	27	0%	0	0.5	5	2700	5	<5%D	NA	No
Carbon Disulfide	27	23	15%	0.94	0.5	560	NA	560	0.94	1.7E-03	No
Chlorobenzene	27	27	0%	0	0.5	390	NA	390	<5%D	NA	No
Chloroform	27	27	0%	0	0.5	80	NA	80	<5%D	NA	No
cis-1,2-Dichloroethene	27	27	0%	0	0.5	210	410000	210	<5%D	NA	No
Ethylbenzene	27	27	0%	0	0.5	700	-	700	<5%D	NA	No
Isopropylbenzene	27	27	0%	0	2	8.4	-	8.4	<5%D	NA	No
Naphthalene	27	27	0%	0	2	150	-	150	<5%D	NA	No
n-Butylbenzene	27	27	0%	0	2	260	NA	260	<5%D	NA	No
n-Propylbenzene	27	27	0%	0	2	320	-	320	<5%D	NA	No
m,p-Xylenes	27	26	4%	0.25	0.5	22000	NA	22000	<5%D	NA	No
o-Xylene	27	26	4%	0.12	0.5	33000	NA	33000	<5%D	NA	No
sec-Butylbenzene	27	27	0%	0	2	250	NA	250	<5%D	NA	No
Tetrachloroethene (PCE)	27	26	4%	0.21	0.5	5	1300	5	<5%D	NA	No
Toluene	27	14	48%	1.3	0.5	1500	-	1500	1.3	8.7E-04	No
trans-1,2-Dichloroethene	27	27	0%	0	0.5	180	390000	180	<5%D	NA	No
Trichloroethene (TCE)	27	27	0%	0	0.5	5	110	5	<5%D	NA	No
Vinyl Chloride	27	27	0%	0	0.5	2	840	2	<5%D	NA	No
1-Methylnaphthalene	12	6	50%	0.028	0.2	NA	NA	NA	0.028	NA	No Screen
2-Methylnaphthalene	24	8	67%	0.029	0.04	3300	NA	3300	0.029	8.8E-06	No
Acenaphthene	32	25	22%	0.0827	0.1	**	-	NA	0.0827	NA	No Screen
Acenaphthylene	32	27	16%	0.0047	0.1	NA	NA	NA	0.0047	NA	No Screen
Anthracene	32	3	91%	0.065	0.1	NA	-	NA	0.065	NA	No Screen
Benz(a)anthracene	32	21	34%	0.067	0.1	NA	-	NA	0.067	NA	No Screen
Benzo(a)pyrene	32	21	34%	0.14	0.1	NA	-	NA	0.14	NA	No Screen
Benzo(b)fluoranthene	32	21	34%	0.14	0.1	**	-	NA	0.14	NA	No Screen
Benzo(g,h,i)perylene	32	30	6%	0.062	0.1	NA	NA	NA	0.062	NA	No Screen
Benzo(k)fluoranthene	32	22	31%	0.13	0.1	NA	-	NA	0.13	NA	No Screen
Chrysene	32	19	41%	0.051	0.1	**	-	NA	0.051	NA	No Screen
Dibenz(a,h)anthracene	32	29	9%	0.042	0.2	NA	-	NA	0.042	NA	No Screen
Dibenzofuran	24	24	0%	0	0.04	**	NA	NA	<5%D	NA	No

APPENDIX C-4b Groundwater Summary and Risk Screening for Inhalation of Volatiles

OU1, Groundwater Concentrations (excluding MW-03s, MW-22, and MW-23)

Constituents of Interest (COI) (ug/L)	Number of Samples	Number of ND	Detection Frequency	Maximum Detection	Maximum Reporting Limit	RBC for Groundwater based on risk of indoor vapors from Groundwater		Minimum RBC for indoor vapor	COI Conc.	Risk Ratio for Individual COI	COPC due to Individual COI Risk?
						EPA 2002 [a]	DEQ 2003 [b]		Cij	Rij	
Fluoranthene	32	12	63%	0.049	0.1	NA	-	NA	0.049	NA	No Screen
Fluorene	32	23	28%	0.01	0.1	**	-	NA	0.01	NA	No Screen
Indeno(1,2,3-cd)pyrene	32	26	19%	0.057	0.1	NA	-	NA	0.057	NA	No Screen
Naphthalene	32	11	66%	0.071	2	150	-	150	0.071	4.7E-04	No
Phenanthrene	32	9	72%	0.044	0.1	NA	NA	NA	0.044	NA	No Screen
Pyrene	32	12	63%	0.056	0.1	**	-	NA	0.056	NA	No Screen
Diesel Range	24	17	29%	64	310	NA	-	NA	64	NA	No Screen
Gasoline Range	24	20	17%	26	250	NA	-	NA	26	NA	No Screen
Residual Range	24	17	29%	51	610	NA	-	NA	51	NA	No Screen
4-Chloro-3-methylphenol	8	5	38%	9.6	0	NA	NA	NA	9.6	NA	No Screen
4-Chloroaniline	8	7	13%	9.6	0	NA	NA	NA	9.6	NA	No Screen
4-Methyl phenol	8	6	25%	9.6	0	NA	NA	NA	9.6	NA	No Screen
Bis(2-ethylhexyl) Phthalate	8	6	25%	9.6	0	NA	NA	NA	9.6	NA	No Screen
Diethyl Phthalate	9	5	44%	9.6	0	NA	NA	NA	9.6	NA	No Screen
Dimethyl Phthalate	8	8	0%	9.6	0	NA	NA	NA	<5%D	NA	No
Di-n-butyl Phthalate	9	6	33%	9.6	0	NA	NA	NA	9.6	NA	No Screen
Isophorone	8	8	0%	9.6	0	NA	NA	NA	<5%D	NA	No
Phenol	8	6	25%	9.6	0	NA	NA	NA	9.6	NA	No Screen
4,4'-DDD	10	10	0%	0.04	0.012	NA	NA	NA	<5%D	NA	No
4,4'-DDE	10	9	10%	0.08	0	29	NA	29	0.08	2.8E-03	No
4,4'-DDT	10	10	0%	0.08	0.012	NA	NA	NA	<5%D	NA	No
Aldrin	10	10	0%	0.08	0.017	0.071	NA	0.071	<5%D	NA	No
alpha-BHC	10	9	10%	0.04	0	3.1	NA	3.1	0.04	1.3E-02	No
alpha-Chlordane	10	10	0%	0.04	0	NA	NA	NA	<5%D	NA	No
beta-BHC	10	10	0%	1	0	NA	NA	NA	<5%D	NA	No
delta-BHC	10	9	10%	0.1	0	NA	NA	NA	0.1	NA	No Screen
Dieldrin	10	10	0%	0.08	0.0013	0.86	NA	0.86	<5%D	NA	No
Endosulfan I	10	9	10%	0.02	0	NA	NA	NA	0.02	NA	No Screen
Endosulfan II	10	10	0%	0.08	0	NA	NA	NA	<5%D	NA	No
Endrin	10	7	30%	0.08	0	NA	NA	NA	0.08	NA	No Screen
Endrin Aldehyde	10	9	10%	0.16	0	NA	NA	NA	0.16	NA	No Screen
Endrin Ketone	10	7	30%	0.08	0.012	NA	NA	NA	0.08	NA	No Screen
gamma-BHC (Lindane)	10	9	10%	0.04	0	11	NA	11	0.04	3.6E-03	No
Heptachlor	10	9	10%	0.08	0.012	0.4	NA	0.4	0.08	2.0E-01	No
Heptachlor Epoxide	10	9	10%	0.04	0	NA	NA	NA	0.04	NA	No Screen
Methoxychlor	10	9	10%	0.5	0.011	**	NA	NA	0.5	NA	No Screen
Aroclor 1016	11	11	0%	0.31	0	NA	NA	NA	<5%D	NA	No
Aroclor 1221	11	11	0%	0.62	0	NA	NA	NA	<5%D	NA	No
Aroclor 1232	11	11	0%	0.31	0	NA	NA	NA	<5%D	NA	No

APPENDIX C-4b Groundwater Summary and Risk Screening for Inhalation of Volatiles

OU1, Groundwater Concentrations (excluding MW-03s, MW-22, and MW-23)

Constituents of Interest (COI) (ug/L)	Number of Samples	Number of ND	Detection Frequency	Maximum Detection	Maximum Reporting Limit	RBC for Groundwater based on risk of indoor vapors from Groundwater		Minimum RBC for indoor vapor	COI Conc.	Risk Ratio for Individual COI	COPC due to Individual COI Risk?
						EPA 2002 [a]	DEQ 2003 [b]		Cij	Rij	
Aroclor 1242	11	11	0%	0.31	0	NA	NA	NA	<5%D	NA	No
Aroclor 1248	11	11	0%	0.31	0	NA	NA	NA	<5%D	NA	No
Aroclor 1254	11	11	0%	0.31	0	NA	NA	NA	<5%D	NA	No
Aroclor 1260	11	11	0%	0.31	0	NA	NA	NA	<5%D	NA	No
Antimony, Total	12	5	58%	3	0	NA	NA	NA	3	NA	No Screen
Arsenic, Total	12	3	75%	9.8	0	NA	NA	NA	9.8	NA	No Screen
Beryllium, Total	12	5	58%	1	0	NA	NA	NA	1	NA	No Screen
Cadmium, Total	12	4	67%	1	0	NA	NA	NA	1	NA	No Screen
Chromium, Total	12	2	83%	14.6	0	NA	NA	NA	14.6	NA	No Screen
Copper, Total	12	2	83%	5.24	0	NA	NA	NA	5.24	NA	No Screen
Lead, Total	12	4	67%	1.16	0	NA	NA	NA	1.16	NA	No Screen
Mercury, Total	12	11	8%	0.2	0.2	NA	NA	NA	0.2	NA	No Screen
Nickel, Total	12		100%	13.4	0	NA	NA	NA	13.4	NA	No Screen
Selenium, Total	12	3	75%	5	0	NA	NA	NA	5	NA	No Screen
Silver, Total	12	9	25%	1	0	NA	NA	NA	1	NA	No Screen
Thallium, Total	12	8	33%	1	0.02	NA	NA	NA	1	NA	No Screen
Zinc, Total	12		100%	14.1	0	NA	NA	NA	14.1	NA	No Screen
Antimony, Dissolved	12	4	67%	1.01	0	NA	NA	NA	1.01	NA	No Screen
Arsenic, Dissolved	12	1	92%	10.8	0	NA	NA	NA	10.8	NA	No Screen
Beryllium, Dissolved	12	7	42%	0.11	0	NA	NA	NA	0.11	NA	No Screen
Cadmium, Dissolved	12	5	58%	0.1	0	NA	NA	NA	0.1	NA	No Screen
Chromium, Dissolved	12		100%	2.89	0	NA	NA	NA	2.89	NA	No Screen
Copper, Dissolved	12	1	92%	2.75	0	NA	NA	NA	2.75	NA	No Screen
Lead, Dissolved	12	5	58%	1.78	0	NA	NA	NA	1.78	NA	No Screen
Mercury, Dissolved	12	12	0%	0.2	0.2	NA	NA	NA	<5%D	NA	No
Nickel, Dissolved	12		100%	15	0	NA	NA	NA	15	NA	No Screen
Selenium, Dissolved	12	6	50%	5	0	NA	NA	NA	5	NA	No Screen
Silver, Dissolved	12	11	8%	0.08	0	NA	NA	NA	0.08	NA	No Screen
Thallium, Dissolved	12	10	17%	0.08	0.02	NA	NA	NA	0.08	NA	No Screen
Zinc, Dissolved	12	1	92%	15.4	0	NA	NA	NA	15.4	NA	No Screen

Notes:

EPA 2002 OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance), Draft Guidance, EPA 530-D-02-004, November 2002

DEQ, 2003 Risk-Based Decision Making for the Remediation of Petroleum-Contaminated Sites

(a) Table 2c, Question 4 Generic Screening Levels and Summary Sheet, Risk = 1 x 10^{-6}; Target Groundwater Concentration C_{gw}

(b) Appendix A: Table of RBCs, Groundwater RBC for Vapor Intrusion into Buildings, RBC_{wi} for Occupational Workers

(c) Multiple COI Risk not evaluated as Rj<1

RBC - Risk-Based Concentration

Rj= 0.2 [c]

KMB00008569

APPENDIX C-4c Groundwater Summary and Risk Screening for Inhalation of Volatiles

OU2, Site-wide Groundwater Concentrations

Constituents of Interest (COI) (ug/L)	Number of Samples	Number of ND	Detection Frequency	Maximum Detection	Maximum Reporting Limit	RBC for Groundwater based on risk of indoor vapors from Groundwater		Minimum RBC for indoor vapor	COI Conc.	Risk Ratio for Individual COI	COPC due to Individual COI Risk?
						EPA 2002 [a]	DEQ 2003 [b]		Cij	Rij	
1,1,1-Trichloroethane (TCA)	34	34	0%	0	0.5	3100	-	3100	<5%D	NA	No
1,1-Dichloroethane (1,1-DCA)	34	30	12%	0.19	0.5	2200	NA	2200	0.19	8.6E-05	No
1,1-Dichloroethene (1,1-DCE)	34	34	0%	0	0.5	190	330000	190	<5%D	NA	No
1,2,4-Trimethylbenzene	34	31	9%	3.1	2	24	51000	24	3.1	1.3E-01	No
1,3-Dichlorobenzene	34	33	3%	1.4	0.5	830	NA	830	<5%D	NA	No
1,4-Dichlorobenzene	34	33	3%	0.12	0.5	8200	NA	8200	<5%D	NA	No
2-Butanone (MEK)	34	34	0%	0	20	440000	NA	440000	<5%D	NA	No
Acetone	34	34	0%	0	20	220000	NA	220000	<5%D	NA	No
Benzene	34	34	0%	0	0.5	5	2700	5	<5%D	NA	No
Carbon Disulfide	34	27	21%	1.7	0.5	560	NA	560	1.7	3.0E-03	No
Chlorobenzene	34	34	0%	0	0.5	390	NA	390	<5%D	NA	No
Chloroform	34	31	9%	4.4	0.5	80	NA	80	4.4	5.5E-02	No
cis-1,2-Dichloroethene	34	31	9%	0.19	0.5	210	410000	210	0.19	9.0E-04	No
Ethylbenzene	34	32	6%	0.63	0.5	700	-	700	0.63	9.0E-04	No
Isopropylbenzene	34	34	0%	0	2	8.4	-	8.4	<5%D	NA	No
Naphthalene	34	32	6%	1.6	2	150	-	150	1.6	1.1E-02	No
n-Butylbenzene	34	34	0%	0	2	260	NA	260	<5%D	NA	No
n-Propylbenzene	34	32	6%	0.34	2	320	-	320	0.34	1.1E-03	No
m,p-Xylenes	34	28	18%	3	0.5	22000	NA	22000	3	1.4E-04	No
o-Xylene	34	28	18%	1.3	0.5	33000	NA	33000	1.3	3.9E-05	No
sec-Butylbenzene	34	34	0%	0	2	250	NA	250	<5%D	NA	No
Tetrachloroethene (PCE)	34	28	18%	0.51	0.5	5	1300	5	0.51	1.0E-01	No
Toluene	34	17	50%	1.8	0.5	1500	-	1500	1.8	1.2E-03	No
trans-1,2-Dichloroethene	34	34	0%	0	0.5	180	390000	180	<5%D	NA	No
Trichloroethene (TCE)	34	30	12%	0.5	0.5	5	110	5	0.5	1.0E-01	No
Vinyl Chloride	34	34	0%	0	0.5	2	840	2	<5%D	NA	No
1-Methylnaphthalene	19	9	53%	0.026	0.023	NA	NA	NA	0.026	NA	No Screen
2-Methylnaphthalene	31	8	74%	0.027	0.025	3300	NA	3300	0.027	8.2E-06	No
Acenaphthene	37	30	19%	0.018	0.476	**	-	NA	0.018	NA	No Screen
Acenaphthylene	37	22	41%	0.0099	0.476	NA	NA	NA	0.0099	NA	No Screen
Anthracene	37	6	84%	0.094	0.0952	NA	-	NA	0.094	NA	No Screen
Benz(a)anthracene	37	21	43%	0.075	0.0952	NA	-	NA	0.075	NA	No Screen
Benzo(a)pyrene	37	24	35%	0.095	0.0952	NA	-	NA	0.095	NA	No Screen
Benzo(b)fluoranthene	37	25	32%	0.096	0.0952	**	-	NA	0.096	NA	No Screen
Benzo(g,h,i)perylene	37	27	27%	0.079	0.0952	NA	NA	NA	0.079	NA	No Screen
Benzo(k)fluoranthene	37	26	30%	0.087	0.0952	NA	-	NA	0.087	NA	No Screen
Chrysene	37	23	38%	0.11	0.0952	**	-	NA	0.11	NA	No Screen

APPENDIX C-4c Groundwater Summary and Risk Screening for Inhalation of Volatiles

OU2, Site-wide Groundwater Concentrations

Constituents of Interest (COI) (ug/L)	Number of Samples	Number of ND	Detection Frequency	Maximum Detection	Maximum Reporting Limit	RBC for Groundwater based on risk of indoor vapors from Groundwater		Minimum RBC for indoor vapor	COI Conc.	Risk Ratio for Individual COI	COPC due to Individual COI Risk?
						EPA 2002 [a]	DEQ 2003 [b]		Cij	Rij	
Dibenz(a,h)anthracene	37	31	16%	0.019	0.19	NA	-	NA	0.019	NA	No Screen
Dibenzofuran	27	26	4%	0.005	0.02	**	NA	NA	<5%D	NA	No
Fluoranthene	37	14	62%	0.15	0.0952	NA	-	NA	0.15	NA	No Screen
Fluorene	37	27	27%	0.244	0.027	**	-	NA	0.244	NA	No Screen
Indeno(1,2,3-cd)pyrene	37	26	30%	0.094	0.0952	NA	-	NA	0.094	NA	No Screen
Naphthalene	37	4	89%	0.14	0.476	150	-	150	0.14	9.3E-04	No
Phenanthrene	37	12	68%	0.079	0.0952	NA	NA	NA	0.079	NA	No Screen
Pyrene	37	12	68%	0.13	0.0952	**	-	NA	0.13	NA	No Screen
Diesel Range	33	28	15%	41	330	NA	-	NA	41	NA	No Screen
Gasoline Range	33	30	9%	51	250	NA	-	NA	51	NA	No Screen
Residual Range	33	24	27%	520	650	NA	-	NA	520	NA	No Screen
4,4'-DDD	11	10	9%	0.0026	0.012	NA	NA	NA	0.0026	NA	No Screen
4,4'-DDE	11	11	0%	0	0.013	29	NA	29	<5%D	NA	No
4,4'-DDT	11	9	18%	0.003	0.013	NA	NA	NA	0.003	NA	No Screen
Aldrin	11	10	9%	0.0012	0.013	0.071	NA	0.071	0.0012	1.7E-02	No
alpha-BHC	11	11	0%	0	0.013	3.1	NA	3.1	<5%D	NA	No
alpha-Chlordane	11	11	0%	0	0.013	NA	NA	NA	<5%D	NA	No
beta-BHC	11	11	0%	0	0.0097	NA	NA	NA	<5%D	NA	No
delta-BHC	11	11	0%	0	0.013	NA	NA	NA	<5%D	NA	No
Dieldrin	11	10	9%	0.0044	0.013	0.86	NA	0.86	0.0044	5.1E-03	No
Endosulfan I	11	11	0%	0	0.013	NA	NA	NA	<5%D	NA	No
Endosulfan II	11	10	9%	0.0015	0.013	NA	NA	NA	0.0015	NA	No Screen
Endrin	11	11	0%	0	0.013	NA	NA	NA	<5%D	NA	No
Endrin Aldehyde	11	11	0%	0	0.013	NA	NA	NA	<5%D	NA	No
Endrin Ketone	9	9	0%	0	0.013	NA	NA	NA	<5%D	NA	No
gamma-BHC (Lindane)	11	11	0%	0	0.013	11	NA	11	<5%D	NA	No
Heptachlor	11	11	0%	0	0.013	0.4	NA	0.4	<5%D	NA	No
Heptachlor Epoxide	11	11	0%	0	0.013	NA	NA	NA	<5%D	NA	No
Methoxychlor	11	11	0%	0	0.013	**	NA	NA	<5%D	NA	No
Aroclor 1016	11	11	0%	0	0.31	NA	NA	NA	<5%D	NA	No
Aroclor 1221	11	11	0%	0	0.62	NA	NA	NA	<5%D	NA	No
Aroclor 1232	11	11	0%	0	0.31	NA	NA	NA	<5%D	NA	No
Aroclor 1242	11	11	0%	0	0.31	NA	NA	NA	<5%D	NA	No
Aroclor 1248	11	11	0%	0	0.31	NA	NA	NA	<5%D	NA	No
Aroclor 1254	11	11	0%	0	0.31	NA	NA	NA	<5%D	NA	No
Aroclor 1260	11	11	0%	0	0.31	NA	NA	NA	<5%D	NA	No
Antimony, Total	33	20	39%	0.33	0.1	NA	NA	NA	0.33	NA	No Screen

APPENDIX C-4c Groundwater Summary and Risk Screening for Inhalation of Volatiles

OU2, Site-wide Groundwater Concentrations

Constituents of Interest (COI) (ug/L)	Number of Samples	Number of ND	Detection Frequency	Maximum Detection	Maximum Reporting Limit	RBC for Groundwater based on risk of indoor vapors from Groundwater		Minimum RBC for indoor vapor	COI Conc.	Risk Ratio for Individual COI	COPC due to Individual COI Risk?
						EPA 2002 [a]	DEQ 2003 [b]		Cij	Rij	
Arsenic, Total	33	4	88%	17	10	NA	NA	NA	17	NA	No Screen
Beryllium, Total	33	15	55%	0.112	0.035	NA	NA	NA	0.112	NA	No Screen
Cadmium, Total	33	12	64%	0.397	0.095	NA	NA	NA	0.397	NA	No Screen
Chromium, Total	33	2	94%	21.9	0.24	NA	NA	NA	21.9	NA	No Screen
Copper, Total	33	1	97%	14.3	1	NA	NA	NA	14.3	NA	No Screen
Lead, Total	33	2	94%	10.9	0.075	NA	NA	NA	10.9	NA	No Screen
Mercury, Total	33	26	21%	0.06	0.2	NA	NA	NA	0.06	NA	No Screen
Nickel, Total	33	0	100%	20.4	0	NA	NA	NA	20.4	NA	No Screen
Selenium, Total	33	14	58%	1.8	5	NA	NA	NA	1.8	NA	No Screen
Silver, Total	33	28	15%	0.03	0.04	NA	NA	NA	0.03	NA	No Screen
Thallium, Total	33	17	48%	0.072	0.04	NA	NA	NA	0.072	NA	No Screen
Zinc, Total	33	4	88%	31.5	5.78	NA	NA	NA	31.5	NA	No Screen
Antimony, Dissolved	33	23	30%	0.18	0.05	NA	NA	NA	0.18	NA	No Screen
Arsenic, Dissolved	33	4	88%	14.6	10	NA	NA	NA	14.6	NA	No Screen
Beryllium, Dissolved	33	28	15%	0.014	0.02	NA	NA	NA	0.014	NA	No Screen
Cadmium, Dissolved	33	12	64%	0.202	0.027	NA	NA	NA	0.202	NA	No Screen
Chromium, Dissolved	33	2	94%	6.8	0.38	NA	NA	NA	6.8	NA	No Screen
Copper, Dissolved	33	5	85%	4.02	1	NA	NA	NA	4.02	NA	No Screen
Lead, Dissolved	33	14	58%	0.6	0.023	NA	NA	NA	0.6	NA	No Screen
Mercury, Dissolved	33	25	24%	0.09	0.2	NA	NA	NA	0.09	NA	No Screen
Nickel, Dissolved	33	0	100%	19.9	0	NA	NA	NA	19.9	NA	No Screen
Selenium, Dissolved	33	20	39%	1.3	5	NA	NA	NA	1.3	NA	No Screen
Silver, Dissolved	33	33	0%	0	0.02	NA	NA	NA	<5%D	NA	No
Thallium, Dissolved	33	21	36%	0.039	0.02	NA	NA	NA	0.039	NA	No Screen
Zinc, Dissolved	33	5	85%	9.18	3.26	NA	NA	NA	9.18	NA	No Screen

Notes:

EPA 2002 OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance), Draft Guidance, EPA 530-D-02-004, November 2002

DEQ, 2003 Risk-Based Decision Making for the Remediation of Petroleum-Contaminated Sites

(a) Table 2c, Question 4 Generic Screening Levels and Summary Sheet, Risk = 1 x 10^{-6}; Target Groundwater Concentration C_{gw}

(b) Appendix A: Table of RBCs, Groundwater RBC for Vapor Intrusion into Buildings, RBC_{wi} for Occupational Workers

(c) Multiple COI Risk not evaluated as Rj<1

RBC - Risk-Based Concentration

Rj= 0.4 [c]

Appendix C-5

Human Health Risk Evaluation – Supporting Information

Terminal 4 Slip 1 Upland Facility

Appendix C-5a Summary of Toxicity Values

Terminal 4 Slip 1, OU1 and OU2

Constituents of Potential Concern (COPCs)		Oral Slope Factor 1/(mg/kg-d)	Oral Reference Dose (Chronic) (mg/kg-d)	Inhalation Slope Factor 1/(mg/kg-d)	Inhalation Reference Dose (Chronic) (mg/kg-d)	Gastrointestinal Absorption Adjustment of Dermal Toxicity Factors	Dermal Absorption Fraction from Soil
CASNo	Analyte	SFo	RfDo	SFi	RfDi	ABSgi	ABSd
56-55-3	Benzo[a]anthracene	0.73		0.73		1	0.13
50-32-8	Benzo[a]pyrene	7.3		7.3		1	0.13
205-99-2	Benzo[b]fluoranthene	0.73		0.73		1	0.13
53-70-3	Dibenz[ah]anthracene	7.3		7.3		1	0.13
193-39-5	Indeno[1,2,3-cd]pyrene	0.73		0.73		1	0.13

number of carcinogens 5

Notes

Values from EPA Region 9 PRG table and cross checked to Oregon DEQ (2000)

EPA. 2004. Region 9 PRGs Table 2004 Update. Editor: Stanford J. Smucker, Ph.D. Regional Toxicologist, Technical Support Team. U.S. Environmental Protection Agency, Region IX, San Francisco, CA 94105.

Oregon DEQ. 2000. Guidance for Conduct of Deterministic Human Health Risk Assessments, Final December 1998, Updated May 2000.

Appendix C-5b Worker Exposure Parameters

Terminal 4 Slip 1 OU1 and OU2

Occupational Worker

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	Rationale/Reference
Adult					
General	BW	Body Weight	kg	70	Recommended value for adults (Oregon DEQ 2000, EPA 1989)
	EF	Exposure Frequency	days/yr	225	Recommended value for Outdoor workers (EPA 2002)
	ED	Exposure Duration	years	25	Recommended value for Outdoor workers (EPA 2002)
	ATc	Averaging time, cancer	days	25,550	Recommended value (EPA 1989 and Oregon DEQ 2000)
	ATnc	Averaging time, noncancer	days	9,125	Recommended value (EPA 1989 and Oregon DEQ 2000)
	CF	Conversion Factor	kg/mg	0.000001	
Ingestion	SIR	Soil Ingestion Rate	mg/day	100	Recommended value for construction workers (EPA 2002)
Inhalation	IRa	Inhalation Rate	m3/day	20	Recommended value for construction workers (EPA 2002)
	EFh	Hours of exposure	hrs/day	8	Standard work day
Dermal	SA	Exposure skin surface area per day	cm^2/day	3,300	Recommended value for construction workers (EPA 2002, 2004)
	AF	Adherence factor	mg/cm^2	0.20	Recommended value for construction workers (EPA 2002, 2004)

Excavation/Constuction Worker

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	Rationale/Reference
General	BW	Body Weight	kg	70	Recommended value for adults (Oregon DEQ 2000, EPA 1989)
	EF	Exposure Frequency	days/yr	9	Recommended RME value for excavation workers (Oregon DEQ 2000)
	ED	Exposure Duration	years	1	Recommended RME value for excavation workers (Oregon DEQ 2000)
	ATc	Averaging time, cancer	days	25,550	Recommended value (EPA 1989 and Oregon DEQ 2000)
	ATnc	Averaging time, noncancer	days	365	Recommended value (EPA 1989 and Oregon DEQ 2000)
	CF	Conversion Factor	kg/mg	0.000001	
Ingestion	SIR	Soil Ingestion Rate	mg/day	330	Recommended value for construction workers (EPA 2002)
Inhalation	IRa	Inhalation Rate	m3/day	20.0	Recommended value for construction workers (EPA 2002)
	EFh	Hours of exposure	hrs/day	8	Standard work day
Dermal	SA	Exposure skin surface area per day	cm^2/day	3,300	Recommended value for construction workers (EPA 2002, 2004)
	AF	Adherence factor	mg/cm^2	0.30	Recommended value for construction workers (EPA 2002, 2004)

Notes:

RME - reasonable maximum exposure

EPA. 1989. Risk Assessment Guidance for Superfund. Volume I, Human Health Evaluation Manual (Part A). Interim Final. EPA/540/1-89/002.

EPA. 2002. OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance), Draft Guidance, EPA 530-D-02-004, November 2002.

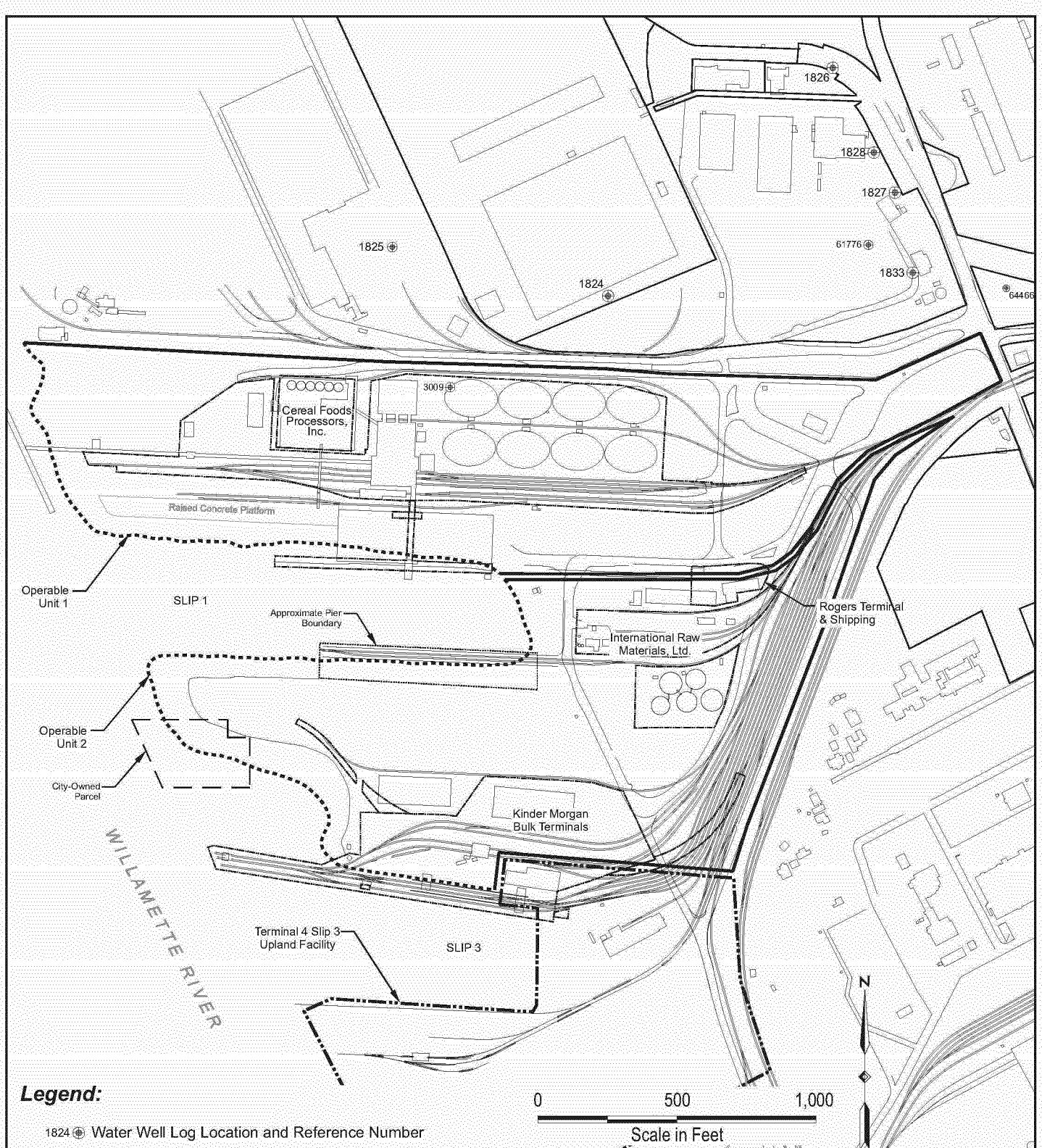
EPA. 2004. Risk Assesment Guidance for Superfund Sites Volume I: Human Health Evaluation Manual Part E, Suipplemental Guidance for Dermal Risk Assessment

Oregon DEQ. 2000. Guidance for Conduct of Deterministic Human Health Risk Assessments, Final December 1998, Updated May 2000.

Appendix B

Beneficial Land and Water Use Supporting Documentation

KMB00008578



Legend:

- 1824 ⊕ Water Well Log Location and Reference Number
- 61776 ⊕ Abandoned Water Well Log Location and Multnomah County Log Number
- Operable Unit Boundary As Defined By Ordinary Low Water Level (3.4 Ft Ngvd)
- Terminal 4 Slip 3 Upland Facility Boundary
- Operable Unit Boundary - Upland
- Leasehold Boundary
- City-owned Parcel Boundary

Notes: 1) Base map prepared from the URS Draft T4 Slip 1 RI Work Plan, dated May 2004.
2) Horizontal Datum: State Plane Coordinates, Oregon North, NAD 83. Vertical Datum: NVGD 29.

Water Supply Well Locations

Remedial Investigation
Terminal 4 Slip 1 Upland Facility
Portland, Oregon

Project Number	1065-00	August 2007	Figure
Ash Creek Associates, Inc. Environmental and Geotechnical Consultants	NEWFIELDS		B-1

KMB00008579

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the
STATE ENGINEER, SALEM, OREGON 97310 within 30 days from the date of well completion.

MULT 001824

WATER WELL REPORT

STATE OF OREGON (Please type or print) (Do not write above this line)

RECEIVED JAN 29 1973 STATE ENGINEER SALEM, OREGON

State Well No. 2N/1W-35

State Permit No.

(1) OWNER:

Name Beall Pipe & Tank Corp.

Address 12005 N. Burgard Rd.
Portland, Oregon

(2) TYPE OF WORK (check):

New Well ☐ Deepening ☒ Reconditioning ☐ Abandon ☐

If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:

Rotary ☐ Driven ☐
Cable ☒ Jetted ☐
Dug ☐ Bored ☐

(4) PROPOSED USE (check):

Domestic ☐ Industrial ☒ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

CASING INSTALLED:

Threaded ☐ Welded ☒

8 " Diam. from 0 ft. to 216 ft. Gage .250

" Diam. from ft. to ft. Gage

" Diam. from ft. to ft. Gage

PERFORATIONS:

Perforated? ☒ Yes ☐ No

Type of perforator used Mills Knife

Size of perforations 1/8 in. by 3 in.

72 perforations from 195 ft. to 201 ft.

perforations from ft. to ft.

perforations from ft. to ft.

(7) SCREENS:

Well screen installed? ☒ Yes ☐ No

Manufacturer's Name UOP Johnson

Type 8" Telescoping Stainless Model No. 304

Diam. 8" Slot size .020 Set from 215 ft. to 220 ft.

Diam. Slot size Set from ft. to ft.

#5 ft. of 6" Casing on top of screen with self sealing packer on top.

(8) WELL TESTS:

Drawdown is amount water level is lowered below static level

Was a pump test made? ☒ Yes ☐ No If yes, by whom?

Yield: 204 gal./min. with 19 ft. drawdown after 1 hrs.
290 " 28 " 1 "
440 " 42 " 1 "

Bailer test gal./min. with ft. drawdown after hrs.

Artesian flow g.p.m.

Temperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION:

Well seal—Material used Bentonite

Well sealed from land surface to 30 ft.

Diameter of well bore to bottom of seal 12" in.

Diameter of well bore below seal 8 in.

Number of sacks of cement used in well seal 0 sacks

Number of sacks of bentonite used in well seal 5 sacks

Brand name of bentonite International Gel

Number of pounds of bentonite per 100 gallons of water 50 lbs./100 gals.

Was a drive shoe used? ☒ Yes ☐ No Plugs Size: location ft.

Did any strata contain unusable water? ☐ Yes ☒ No

Type of water? depth of strata

Method of sealing strata off

Was well gravel packed? ☐ Yes ☒ No Size of gravel:

Gravel placed from ft. to ft.

(10) LOCATION OF WELL:

County Multnomah Driller's well number

¼ ¼ Section 35 T. 2N R. 1 W. W.M.

Bearing and distance from section or subdivision corner

(11) WATER LEVEL: Completed well.

Depth at which water was first found 198 ft.

Static level 16 ft. below land surface. Date 1/22/73

Artesian pressure lbs. per square inch. Date

(12) WELL LOG:

Diameter of well below casing 8"

Depth drilled 258 ft. Depth of completed well 220 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. *Report each change in position of Static Water Level and indicate principal water-bearing strata.*

MATERIAL	From	To	SWL
Previously drilled	0	25	
Silty gray clay-soft	25	46	
Fine gray sand	46	64	
Gray silty clay	64	98	
Fine gray sand	98	118	
Gray silty clay	118	129	
Fine gray sand	129	133	
Gray silty clay	133	161	
Fine gray sand	161	174	
Cemented gravel	174	198	
Coarse sand & gravel	198	203	
Fine brown sand	203	209	
Fine black sand	209	212	
Med. fine & coars sand w/some fine gravel	212	221	
Blue silty clay/gravel seams	221	229	
Gray clay (soft)	229	240	
Firm gray-brown clay	240	258	
Soft gray clay	258		

Work started 11/3/72 19 Completed 1/22/73 19

Date well drilling machine moved off of well 1/22/73 19

Drilling Machine Operator's Certification:

This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.

[Signed] (Drilling Machine Operator) Date 1/24/73 19

Drilling Machine Operator's License No. 751

Water Well Contractor's Certification:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Name A. M. Jannsen Drilling Co.
(Person, firm or corporation) (Type or print)

Address 21075 S. W. Tualatin Valley Hwy. Aloha, Ore.

[Signed] (Water Well Contractor)

Contractor's License No. 79 Date 1/24/73, 19

(USE ADDITIONAL SHEETS IF NECESSARY)

SP*45656-119

KMB00008580

STATE OF OREGON

WATER WELL REPORT

(as required by ORS 537.765)

MULT 3009

MAY -4 1992

WATER RESOURCES DEPT SALEM, OREGON

2N/1W/35d

(START CARD) # 36168

(1) OWNER: Well Number 46

Name Cargill Inc.

Address Terminal 4 Foot of N. Lombard

City Portland State OR. Zip 97203

(2) TYPE OF WORK:

☐ New Well ☐ Deepen ☐ Recondition ☒ Abandon

(3) DRILL METHOD:

☒ Rotary Air ☐ Rotary Mud ☐ Cable

☐ Other

(4) PROPOSED USE:

☐ Domestic ☐ Community ☒ Industrial ☐ Irrigation

☐ Thermal ☐ Injection ☐ Other

(5) BORE HOLE CONSTRUCTION:

Special Construction approval ☐ Yes ☐ No Depth of Completed Well ____ ft.

Explosives used ☐ Yes ☐ No Type ____ Amount ____

HOLE Diameter	From	To	SEAL Material	From	To	Amount sacks or pounds

How was seal placed: Method ☐ A ☐ B ☐ C ☐ D ☐ E

☐ Other

Backfill placed from ____ ft. to ____ ft. Material ____

Gravel placed from ____ ft. to ____ ft. Size of gravel ____

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	14	0	244	.50	☒	☐	☒	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Final location of shoe(s)

(7) PERFORATIONS/SCREENS:

☒ Perforations Method Air

☐ Screens Type ____ Material ____

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
-5	244	½/1	2000	14		☒	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour

☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
			1 hr.

Temperature of Water ____ Depth Artesian Flow Found ____

Was a water analysis done? ☐ Yes By whom ____

Did any strata contain water not suitable for intended use? ☐ Too little

☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other ____

Depth of strata: ____

(9) LOCATION OF WELL by legal description:

County Multnomah Latitude ____ Longitude ____

Township 2 N or S. Range 1 E or W. WM.

Section 35 SW ¼ SE ¼

Tax Lot ____ Lot ____ Block ____ Subdivision ____

Street Address of Well (or nearest address) Same AS Above

(10) STATIC WATER LEVEL:

32 ft. below land surface. Date 4/23/92

Artesian pressure ____ lb. per square inch. Date ____

(11) WATER BEARING ZONES:

Depth at which water was first found ____

From	To	Estimated Flow Rate	SWL

(12) WELL LOG:

Ground elevation ____

Material	From	To	SWL
After Rx perforating the casing from top to bottom we pumped cement down through a 1½ pipe and fild the hole up we used 243 sack			

Date started 4/20/92 Completed 4/23/92

(unbonded) Water Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to my best knowledge and belief.

WWC Number ____

Signed ____ Date ____

(bonded) Water Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

WWC Number 663

Signed Rodney C. Eder Date 4/27/92

ORIGINAL & FIRST COPY - WATER RESOURCES DEPARTMENT SECOND COPY - CONSTRUCTOR THIRD COPY - CUSTOMER 9809C 10/91

KMB00008581

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the
WATER RESOURCES DEPARTMENT,
SALEM, OREGON 97310
within 30 days from the date of well completion.

RECEIVED
APR 18 1979
WATER RESOURCES DEPT.
SALEM, OREGON

WATER WELL REPORT
STATE OF OREGON
(Please type or print)
(Do not write above this line)

State Well No. 2N/1W-35 MULT
State Permit No. 001825

(1) OWNER:
Name Schnitzer Leasing Inc.
Address 3300 N. W. Yeon Ave, P. O. Box 10047
Portland, Oregon 97210 224-9900

(2) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☒ Jetted ☐
Dug ☐ Bored ☐

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☒ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(5) CASING INSTALLED:
Threaded ☐ Welded ☒
6 " Diam. from 0 ft. to 19 ft. Gage .280
6 " Diam. from 19 ft. to 135 ft. Gage .312
" Diam. from ft. to ft. Gage

(6) PERFORATIONS:
Perforated? ☐ Yes ☒ No.
Type of perforator used
Size of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS:
Well screen installed? ☒ Yes ☐ No
Manufacturer's Name UPO Johnson
Type Stainless Steel Model No.
Diam. 5" Slot size 18 Set from 132 ft. to 142 ft.
Diam. Slot size Set from ft. to ft.

(8) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☒ No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "
Bailer test 75 gal./min. with 1 ft. drawdown after 1 hrs.
Artesian flow g.p.m.
Temperature of water 53° Depth artesian flow encountered ft.

(9) CONSTRUCTION:
Well seal—Material used Cement grout
Well sealed from land surface to 20 ft.
Diameter of well bore to bottom of seal 10 in.
Diameter of well bore below seal 6 in.
Number of sacks of cement used in well seal 16 sacks
How was cement grout placed? Pumped through one inch plastic pipe between 10-inch hole and 6-inch casing.

Was a drive shoe used? ☒ Yes ☐ No Plugs Size: location ft.
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? depth of strata
Method of sealing strata off
Was well gravel packed? ☐ Yes ☒ No Size of gravel:
Gravel placed from ft. to ft.

(10) LOCATION OF WELL:
County Multnomah Driller's well number 10-79
¼ ¼ Section 35 T. 2N R. 1W W.M.
Bearing and distance from section or subdivision corner
Scrap metal shredder/chopper
Terminal 4, Port of Portland

(11) WATER LEVEL: Completed well.
Depth at which water was first found 124 ft.
Static level 21 ft. below land surface. Date 4/11/79
Artesian pressure lbs. per square inch. Date

(12) WELL LOG:
Diameter of well below casing --
Depth drilled 142 ft. Depth of completed well 142 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

MATERIAL	From	To	SWL
Sand; brown	0	27	
Sand and silt; gray	27	76	
Sand; gray, fine	76	124	
Sand and gravel; gray	124	142	21

Work started April 3, 1979 Completed April 11, 1979
Date well drilling machine moved off of well April 13, 1979

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] Ronald F. McConnell (Drilling Machine Operator) Date April 16, 1979
Ronald F. McConnell
Drilling Machine Operator's License No. 398

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name Steinman Bros. Drilling Co.
(Person, firm or corporation) (Type or print)
Address 3023 S. E. Holly Avenue, Milwaukie, Oregon 97222
[Signed] Ronald F. McConnell (Water Well Contractor)
Contractor's License No. 626 Date April 16, 1979

(USE ADDITIONAL SHEETS IF NECESSARY)

KMB00008582

Appendix C

Field Procedures

KMB00008583

1. Field and Sampling Procedures

This appendix presents the procedures that URS (Phase I), Hart Crowser (Phase II), and BBL/Ash Creek/NewFields (Phase III) used to complete the fieldwork for the Remedial Investigation (RI) activities. The procedures discussed in this appendix include:

- Surface soil sampling;
- Push probe explorations, including soil and groundwater sampling and monitoring well installation;
- Field screening methods;
- Water Level Measurements;
- Groundwater monitoring;
- Surveying and locating explorations;
- Sample management (e.g., containers, storage, and shipment);
- Decontamination procedures; and
- Investigation-derived waste (IDW) disposal documentation.

Boring and monitoring well logs are included in Appendix C.

1.1 Surface and Near Surface Sampling

Soil samples were obtained using a stainless steel spoon or hand auger from the ground surface to 2.5 feet bgs. With the exception of the riverbank sampling area (AOC 83 in OU2), discrete surface soil samples were collected for analysis.

Composite sampling was initially conducted in the riverbank area of OU2. To complete the composite sampling, the riverbank area of OU2 that has potentially erodable soil was divided into eight equidistance areas, each covering approximately 150 lineal feet of riverbank (or slip bank). A four-point composite surface soil sample was collected from each area. The four sub-sample locations within each composite sample area were located at equally spaced distances of approximately 38 feet in a staggered pattern on the face of the slope (i.e., two top, two bottom). The composite sample areas and sub-sample locations are illustrated on Figure 6.

Surface soil was collected from a depth of 0 to 1 foot at the four discrete sub-sample locations within each of the eight composite sample areas. A portion of each of the four discrete samples was combined into a single sample in a pre-cleaned stainless steel bowl. The combined soil was thoroughly mixed then placed in sample jars supplied by the analytical laboratory and labeled (e.g., T4S1S-23 through T4S1S-30). The discrete samples were maintained in sample jars, individually

labeled (e.g., T4S1S-23A, T4S1S-23B T4S1S-23C T4S1S-23D, for the sub-samples collected from composite soil area T4S1S-23, etc) and retained for potential future analysis.

In general, loose soil and vegetation were removed with a stainless steel spoon prior to sampling. Soil was placed into a stainless steel bowl and mixed. The finer material was then transferred into laboratory-supplied sample jars using the stainless steel spoon. Sample locations were staked and located relative to site features.

1.2 Push Probe Explorations

Geo-Tech Explorations, Inc., of Tualatin, Oregon, completed the probes under subcontract to URS, Hart Crowser, and BBL. A field representative was present to observe and document the exploration activities. The probes were completed in accordance with Oregon Water Resources Department (OWRD) regulations using the procedures below.

Site Health and Safety Plan. Each company that performed site activities prepared a site-specific Health and Safety Plan (HSP).

Underground Utility Location. Prior to conducting field activities, the Oregon Utility Notification Center was called, who in turn notified the various utilities in the area to mark any underground installations in the vicinity of the site. An underground utility locate was also conducted by Port of Portland (Port) personnel prior to performing any subsurface work.

Exploration Probing. All probes were completed using a push probe rig. The probes were advanced to depths between 2.5 and 30 feet bgs. Field logs were prepared for each probe and are presented in this appendix.

Soil Sampling. Soil cores were typically obtained using a 5-foot-long push probe soil sampler. Soil samples from the push probe explorations were collected continuously over the depth of each exploration. The push probe sampling procedure involved driving the soil sampler using a combination of hydraulic pressure and mechanical hammer blows. After driving the sampler 5 feet, it was removed from the hole, and the sample core was removed (the core was contained in a clear, plastic sleeve inside the sampler barrel). The sampler was then prepared for driving the next 5-foot-depth sample interval.

The plastic sleeve was cut open for soil description and sampling. One or more soil samples were collected from each core, depending on the recovered soil volume and the uniformity of the soil core (additional samples were collected if the soil strata or evidence of contamination varied significantly in a core). Soil for samples was transferred into laboratory-supplied sample jars using a stainless steel spoon. Sample jars were fully filled, leaving no headspace. Any soil generated during probing activities was placed in a labeled drum for later disposal (as described in Section 1.7).

Groundwater Sampling. Groundwater samples were generally collected from each exploration not converted to a groundwater-monitoring well (those explorations were sampled as monitoring wells, as described below). The groundwater sampling procedure generally consisted of driving a 1-inch-outside diameter, hollow rod with a 4-foot-long groundwater sampling attachment into the soil. After driving the sampling attachment to the desired depth, the attachment was withdrawn about 4 feet,

exposing the inner sampling screen (housed within the attachment during driving). Exposing the screen allowed groundwater to flow inside the sampling attachment. In this way, the push probe sampler and rod served as a temporary monitoring well.

After placement of the groundwater sampling attachment, the depth to groundwater was measured to the nearest 0.1 foot using an electronic probe. The groundwater sampling attachment was purged using disposable tubing with a low-flow peristaltic pump. Purging was considered complete when the water quality parameters (pH, temperature, specific conductance, dissolved oxygen, and turbidity) stabilized within 10 percent of the previous readings. During purging, the purge water characteristics (e.g., color, turbidity, sheens) and purge volumes were documented. Purge water was placed in a labeled drum, pending disposal (as described in Section 1.7).

All groundwater samples, except for volatile organic compounds (VOCs), were collected using a low-flow peristaltic pump and disposable tubing. For VOC analyses, groundwater samples were collected using a disposable polyethylene bailer. For dissolved metals analysis, samples were collected using the peristaltic pump to transfer the water through a 0.045-micron filter and into laboratory supplied-containers. Groundwater was collected in laboratory-supplied sample containers including preservative, if required. Field parameters (pH, specific conductance, temperature, dissolved oxygen, and turbidity) were measured upon completion of sampling activities.

Field Screening. Soil samples were field screened for VOCs using a photoionization detector (PID). See Section 1.2 for a description of field screening methods.

Exploration Abandonment. After completion of each exploration not converted to a monitoring well, the hole was filled with bentonite grout. For paved areas, a cold asphalt or concrete patch was placed in the hole at the ground surface.

Monitoring Well Construction. For the 24 push probe explorations that were converted to groundwater monitoring wells (T4S1MW-01S through T4S1MW-04S and T4S1MW-07 through T4S1MW-26), the wells were installed in the boring to depths between 25 and 43 feet bgs. The monitoring wells were screened in the bottom 5 to 10 feet of the boring. The well construction information is summarized in Table B-2.

The screened portion of the each well was constructed using 5-foot lengths of prepacked well screen (2-inch inside diameter). A prepacked well screen generally consists of an inner PVC well screen and an outer stainless steel wire mesh. The sand filter pack is housed between the inner screen and outer wire mesh. The inner screen has machine cut 0.010-inch slots. Silica sand was placed to about 1 foot above the prepacked well screen, and a bentonite seal was placed above the sand to about 1 foot bgs. A concrete surface seal with a flush-mounted, traffic-rated monument completed the monitoring well at the ground surface. A watertight locking cap and lock secured the wellhead, and bolts secured the monument cover. All monuments were permanently marked with well identification numbers. Table B-1 summarizes the well construction details. Detailed well construction logs are presented in Appendix C.

Monitoring Well Development. Prior to development, the depth to water and total depth of the well were measured using an electronic probe. The monitoring wells were developed by purging groundwater from the well using a submersible pump. Development was considered complete after the discharge water appeared reasonably free of sediment, the field quality parameters (pH, temperature, specific conductance, and dissolved oxygen) stabilized to within 10 percent of the

previous reading, and turbidity ceased to significantly improve with continued development. Upon completion of well development, the total depth of the well was measured to determine whether sediment had accumulated in the bottom of the well casing. Development water was placed in labeled drums pending disposal (as described in Section 1.7).

1.3 Field Screening Methods

PID Headspace Measurements. Headspace vapor measurements were made on soil samples using an H-Nu® PID to assess the possible presence of VOCs. The PID is not compound- or concentration-specific, but only provides a qualitative indication of the presence of VOCs. Soil was placed in plastic bags and allowed to warm to ambient temperatures. PID measurements were made within 30 minutes of collection by inserting the nozzle into the plastic bag. Measurements were recorded on the field logs. The PID was calibrated using a manufacturer-supplied standard gas.

1.4 Water Level Measurements and Groundwater Monitoring

Measurement of Groundwater Levels. Groundwater level measurements were collected from on-site monitoring wells for a period of one year on a monthly basis (September 2004 through September 2005). The 2005 groundwater level measurements were completed by two field personnel in an effort to minimize the effect of river stage. BBL indicated that the river stage varied approximately 0.7 feet over a 4-hour period during the April 29, 2004 water level collection event (BBL, 2004). The 2005 water levels were collected in a period of approximately two hours.

Groundwater levels were measured and recorded for the purpose of determining groundwater elevations and gradient. The wells were opened, and water levels were allowed to equilibrate before measurements were taken. Measurements were made to the nearest 0.01 foot using an electronic probe.

Purging and Sampling. When the wells were sampled, they were purged using a peristaltic pump (after groundwater levels were measured). Purging was considered complete when the water quality parameters (pH, temperature, specific conductance, dissolved oxygen, and turbidity) stabilized within 10 percent of the previous readings. During purging, the purge water characteristics (e.g., color, turbidity, sheens) and purge volumes were documented.

After purging was completed, the wells were sampled. All groundwater samples, except for VOCs, were collected using a low-flow peristaltic pump and disposable tubing. For VOC analyses, groundwater samples were collected using a disposable polyethylene bailer. For dissolved metals analysis, samples were collected using the peristaltic pump to transfer the water through a 0.045-micron filter and into laboratory supplied-containers. Field parameters (pH, specific conductance, temperature, dissolved oxygen, and turbidity) were measured upon completion of sampling activities. Purge water was placed in labeled drums pending disposal.

1.5 Surveying

Surveying. The locations of the borings and newly installed monitoring wells were surveyed by the Port surveyors. The boring and monitoring wells were surveyed horizontally relative to the NAD 83 (98) and vertically to the NAVD 1929 (47) datum. The elevation of each monitoring well was determined at the top of the PVC casing and the rim of the monument to the nearest 0.01 foot. The ground elevation of the borings was determined to the nearest 0.01 foot. The horizontal locations of the boring and monitoring wells were determined to the nearest 0.1 foot. The surveying data is summarized in Table B-1.

1.6 Sample Management

Clean sample containers were provided by the analytical laboratory ready for sample collection, including preservative if required. Samples for VOC analyses were fully filled, leaving no headspace. Lids were equipped with Teflon liners to reduce loss of VOCs. A sample label was affixed to each sample container and was marked with a unique sample number, date of collection, project number, and sampler's initials. Samples were placed in a cooler with ice until they were transported to our office or the laboratory for refrigeration. Chain of custody was maintained and documented at all times.

1.7 Decontamination Procedures

To prevent cross-contamination between sampling events, clean, dedicated sampling equipment (e.g., groundwater sampling tubing) was used when possible for each sampling event and was discarded after use. Cleaning of non-disposable items (e.g., stainless steel spoons) consisted of washing in a detergent (Alconox®) solution, rinsing with tap water, washing with methanol or n-propyl, rinsing with potable water, washing with nitric acid, and rinsing with deionized water (in order as presented). To reduce the chance for cross-contamination between explorations and well installations, the push probe was cleaned with a high-pressure washer before and after each exploration. Decontamination water was drummed pending disposal.

1.8 IDW Disposal

IDW consisted of drill cuttings (extra soil from the soil sampler that was not placed in a sample jar), decontamination water, development water, purge water, and personal protective equipment (PPE). Decontamination water contained minute quantities of nitric acid and alcohol used for equipment decontamination. PPE was disposed of as solid waste. IDW soil and water were temporarily drummed in properly labeled Department of Transportation (DOT) approved 55-gallon drums. Each drum was labeled with the project name, general contents, and date, and was stored at the site pending disposal.

1.9 Cultural Resources Monitoring

As part of the Phase I, Phase II, and Phase IIII site investigation activities Archaeological Investigations Northwest (AINW) monitored the installation of 7 monitoring wells and 28 soil borings at locations adjacent to the former banks of the Willamette River and Gatton slough. Monitoring was conducted in accordance with the draft Archaeological Monitoring Protocol, Terminal 4, Portland, Oregon (AINW, 2004). No evidence of cultural resources was observed. The AINW monitoring report is included in Appendix F.

TABLE C-1
WELL CONSTRUCTION DETAILS

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Well ID	Completion Date	Operating Unit	Northing	Easting	Screen Interval (ft bgs)	Sandpack Interval (ft bgs)	Bentonite Seal/Backfill (ft bgs)	Total Depth of Boring (ft bgs)
T4S1MW-01s	4/6/2004	OU1	715157.7	7618979.3	25-35	24-35	0.5-24	35
T4S1MW-02s	4/8/2004	OU1	714999.8	7621229	20-30	19-30	0.5-19	30
T4S1MW-03s	4/6/2004	OU1	714749.8	7620500.8	20-30	19-30	0.5-19	30
T4S1MW-07	4/5/2004	OU1	714952.7	7618940.6	29-39	28-39	0.5-28	40
T4S1MW-08	4/7/2004	OU1	714907.7	7619696.7	20-30	19-30	0.5-19	30
T4S1MW-17	4/7/2004	OU1	715070.4	7620055.6	17-27	16-27	0.5-16	27
T4S1MW-19	9/10/2004	OU1	715121.3	7621556.7	22-32	20-35	1-20	35
T4S1MW-22	8/24/2004	OU1	715327.7	7621108.5	13-23	11-30	1-11	30
T4S1MW-23	8/24/2004	OU1	715368.4	7620360.1	15-25	13-30	1-13	30
T4S1MW-24	8/24/2004	OU1	715419.1	7619301.4	20-29.5	17-30	1-18	30
T4S1MW-26	9/7/2005	OU1	714886.2	7620070.6	15-25	13-25	3-13	25
T4S1MW-04s	3/29/2004	OU2	714009.9	7619894	33-43	32-43	0.5-32	43
T4S1MW-09	4/7/2004	OU2	714627.9	7620525.8	20-30	19-30	0.5-19	30
T4S1MW-10	4/7/2004	OU2	714471.7	7620519.9	10-20	9-20	0.5-9	20
T4S1MW-11	3/30/2004	OU2	714223.3	7620492.2	17-27	16-27	0.5-16	30
T4S1MW-12	3/30/2004	OU2	714247.9	7619783	30-40	29-40	0.5-29	40
T4S1MW-13	4/1/2004	OU2	714225.7	7619281.2	30-35	29-35	0.5-29	35
T4S1MW-14	4/1/2004	OU2	714031.6	7619687.1	24-29	23-29	0.5-23	50
T4S1MW-15	3/29/2004	OU2	713644.7	7619834.2	30-40	29-40	0.5-29	40
T4S1MW-16	3/29/2004	OU2	713565.2	7620296.1	22-27	20-27	0.5-20	35
T4S1MW-18	4/6/2004	OU2	715140.6	7619354.3	27-32	26-32	0.5-26	35
T4S1MW-20	8/25/2004	OU2	714335.7	7621441.4	15-25	13-30	1-13	30
T4S1MW-21	8/25/2004	OU2	713826.0	7621247.3	15-25	13-30	1-13	30
T4S1MW-25	9/7/2005	OU2	714520.1	7620895.8	10-20	8.5-20	3-8.5	20

Notes:
1. Vertical Datum: NGVD 29 (47) UNITS: U.S. Survey Feet (ft)
2. Horizontal Datum: NAD 83 (98) UNITS: International Feet
3. bgs = Below ground surface.

Appendix D

Lithologic Boring Logs

KMB00008591

Key to Exploration Logs
Phase I Data Summary Report
T4 S1 Upland Facility Remedial Investigation

Sample Description

Classification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. Visual-manual classification methods of ASTM D 2488 were used as an identification guide.

Soil descriptions consist of the following:
Density/consistency, moisture, color, minor constituents, MAJOR CONSTITUENT, additional remarks.

Density/Consistency

Soil density/consistency in borings is related primarily to the Standard Penetration Resistance.
Soil density/consistency in test pits is estimated based on visual observation and is presented parenthetically on the test pit logs.

SAND or GRAVEL Density	Standard Penetration Resistance (N) in Blows/Foot	SILT or CLAY Consistency	Standard Penetration Resistance (N) in Blows/Foot	Approximate Shear Strength in TSF
Very loose	0 - 4	Very soft	0 - 2	<0.125
Loose	4 - 10	Soft	2 - 4	0.125 - 0.25
Medium dense	10 - 30	Medium stiff	4 - 8	0.25 - 0.5
Dense	30 - 50	Stiff	8 - 15	0.5 - 1.0
Very dense	>50	Very stiff	15 - 30	1.0 - 2.0
		Hard	>30	>2.0

Moisture

Dry	Little perceptible moisture
Damp	Some perceptible moisture, probably below optimum
Moist	Probably near optimum moisture content
Wet	Much perceptible moisture, probably above optimum

Minor Constituents

	Estimated Percentage
Not identified in description	0 - 5
Slightly (clayey, silty, etc.)	5 - 12
Clayey, silty, sandy, gravelly	12 - 30
Very (clayey, silty, etc.)	30 - 50

Legends

Sampling Test Symbols

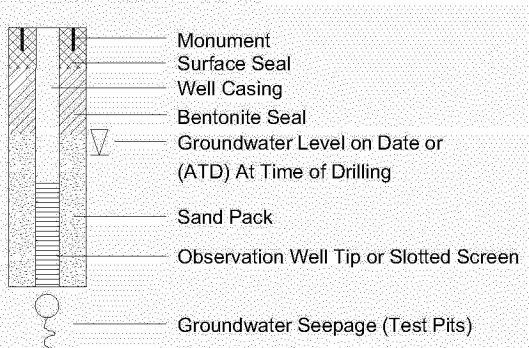
BORING SAMPLES

- Split Spoon
- Tube (Shelby, Push Probe)
- Cuttings
- Core Run
- * No Sample Recovery
- P Tube Pushed, Not Driven

TEST PIT SAMPLES

- Grab (Jar)
- Bag
- Shelby Tube

Groundwater Observations



Test Symbols

NS	No Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen
TCD	Triaxial Consolidated Drained
QU	Unconfined Compression
DS	Direct Shear
K	Permeability
PP	Pocket Penetrometer Approximate Compressive Strength in TSF
TV	Torvane Approximate Shear Strength in TSF
CBR	California Bearing Ratio
MD	Moisture Density Relationship
AL	Atterberg Limits
	Water Content in Percent
	Liquid Limit
	Natural
	Plastic Limit
PID	Photoionization Detector Reading
CA	Chemical Analysis
DT	In Situ Density Test

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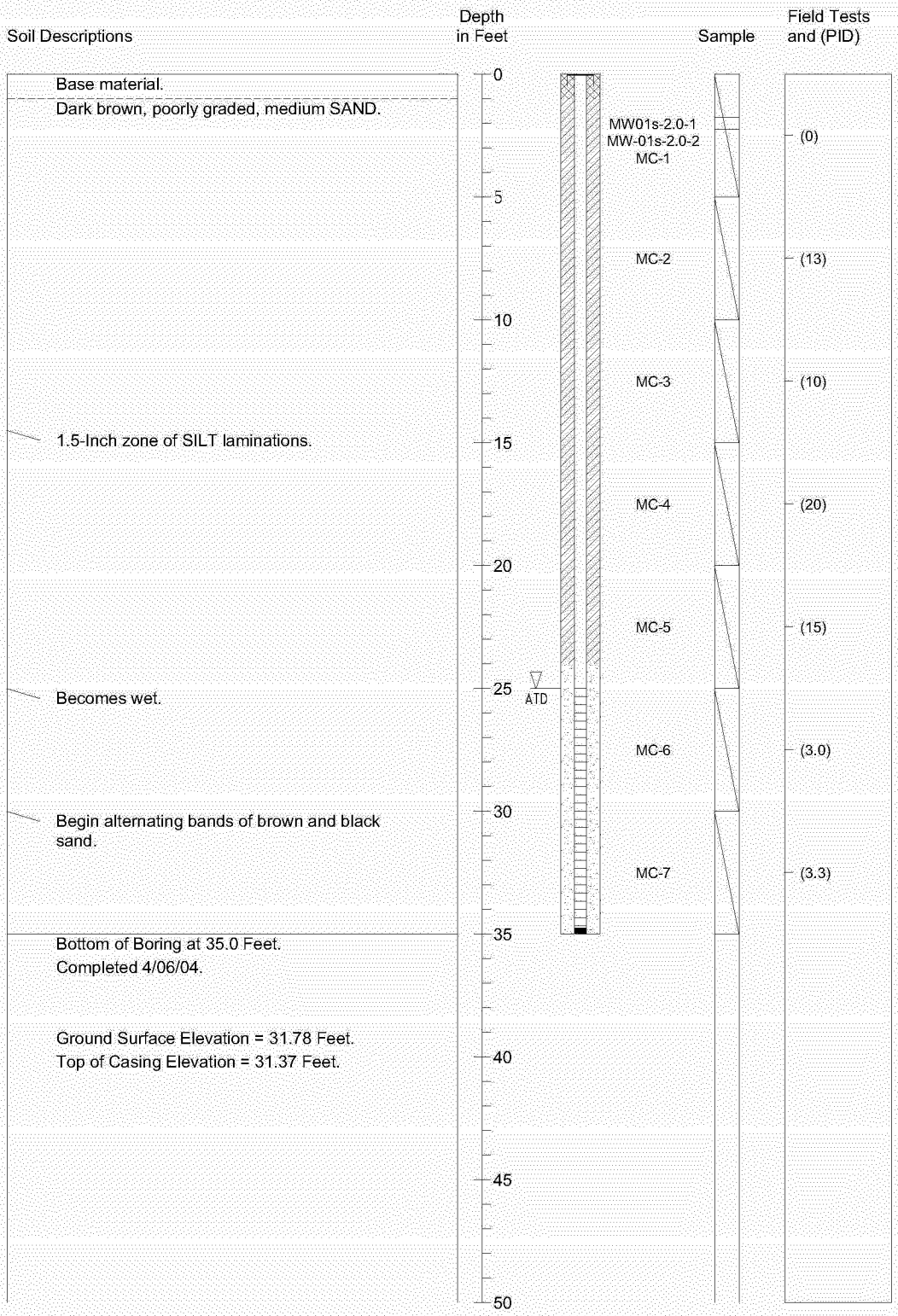
15533-00 4/04

Figure B-1

KMB00008592

Monitoring Well Log MW-01s
Phase I Data Summary Report
T4 S1 Upland Facility Remedial Investigation



1. Refer to Figure B-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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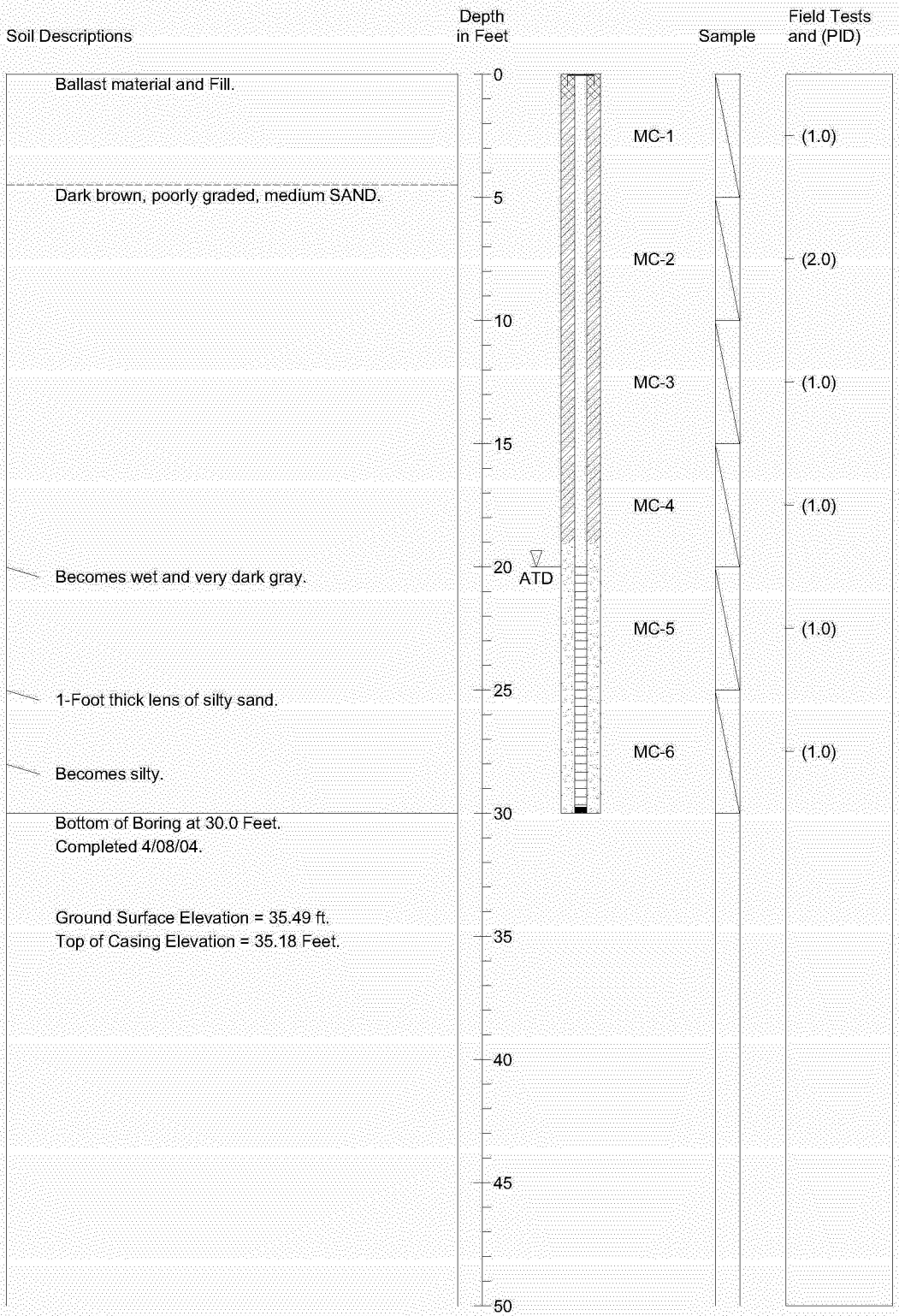
Figure B-2

Monitoring Well Log MW-02s
Phase I Data Summary Report
T4 S1 Upland Facility Remedial Investigation



1. Refer to Figure B-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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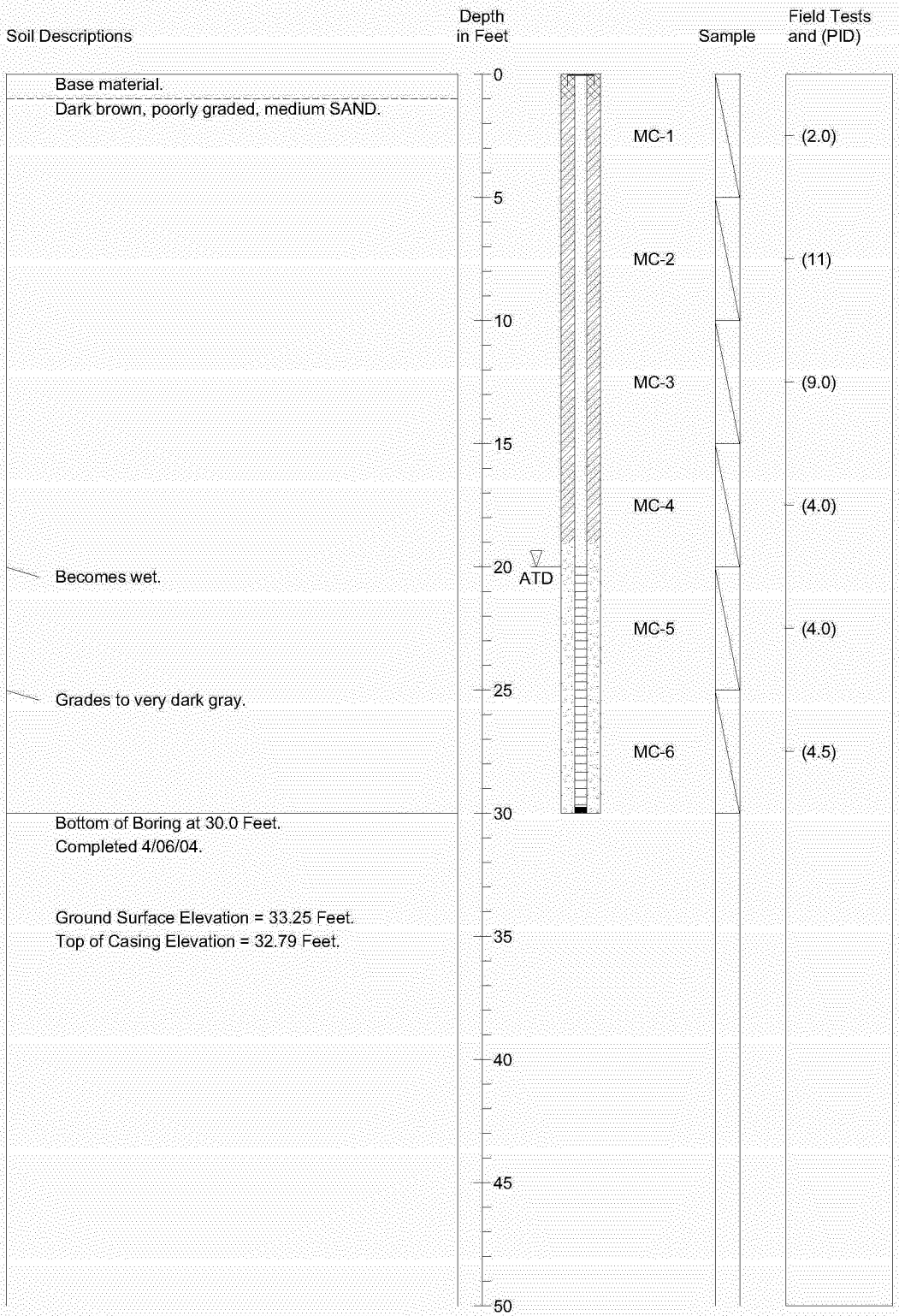
Figure B-3

Monitoring Well Log MW-03s
Phase I Data Summary Report
T4 S1 Upland Facility Remedial Investigation



1. Refer to Figure B-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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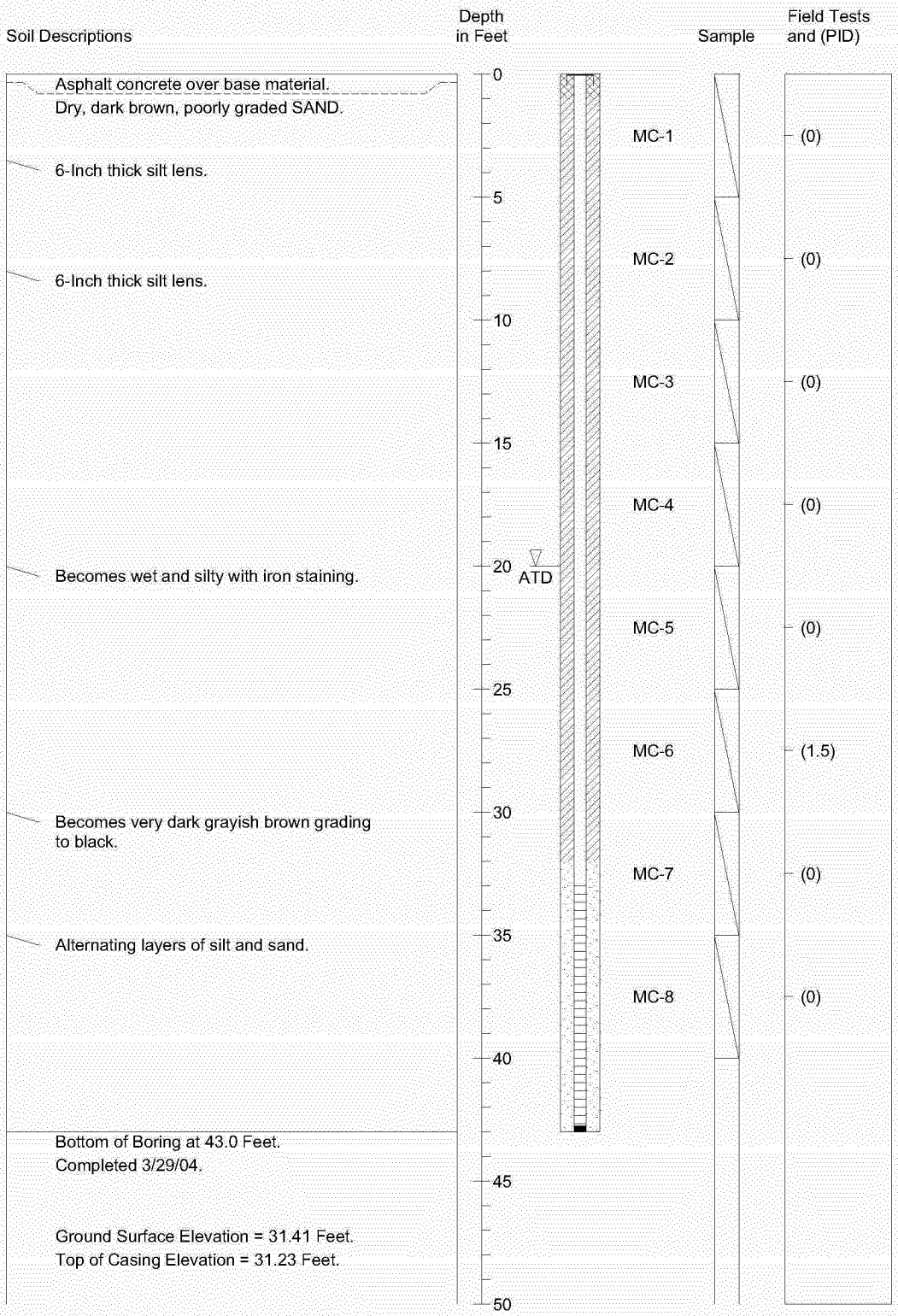
Figure B-4

Monitoring Well Log MW-04s
Phase I Data Summary Report
T4 S1 Upland Facility Remedial Investigation



1. Refer to Figure B-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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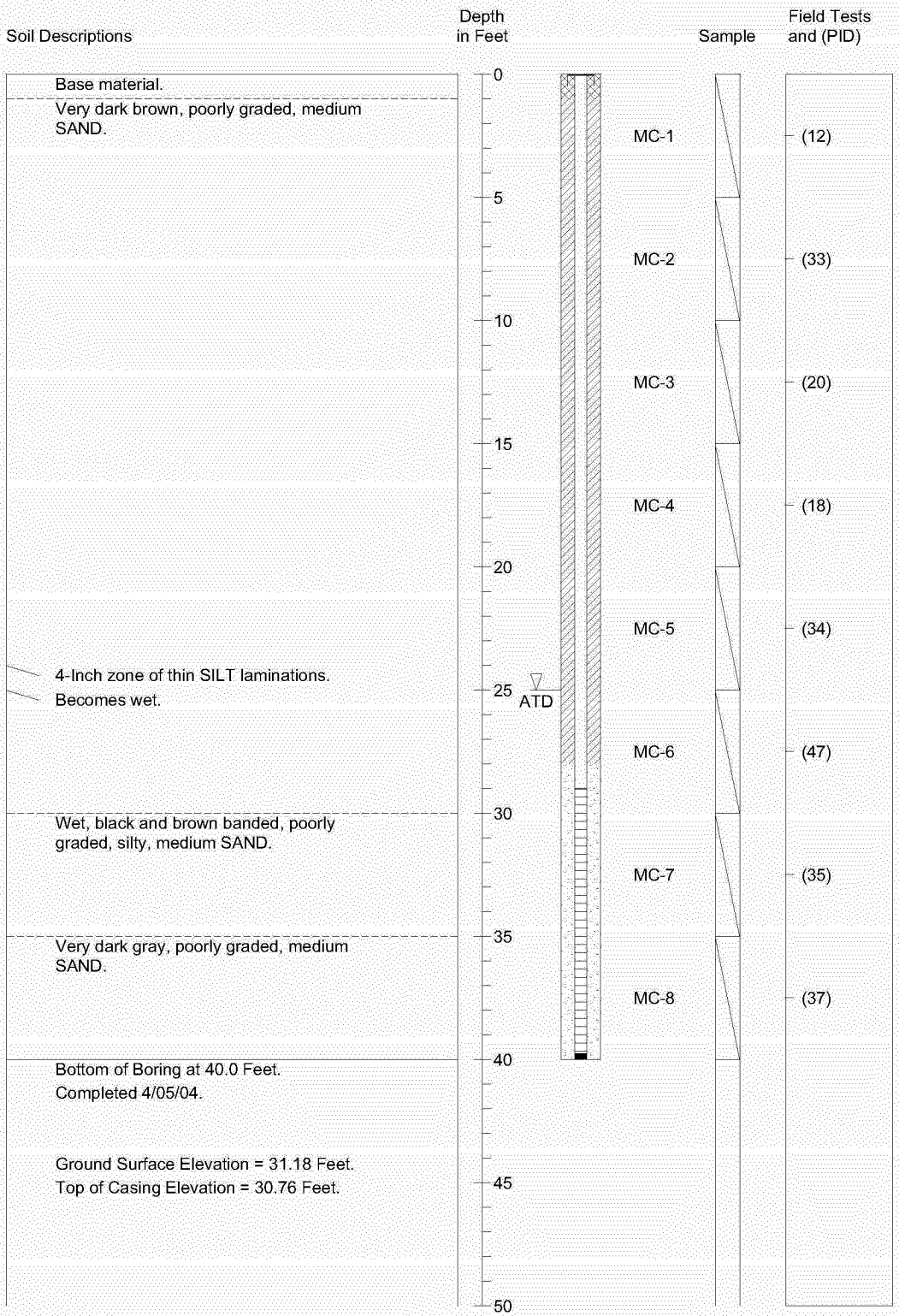
Figure B-5

Monitoring Well Log MW-07
Phase I Data Summary Report
T4 S1 Upland Facility Remedial Investigation



1. Refer to Figure B-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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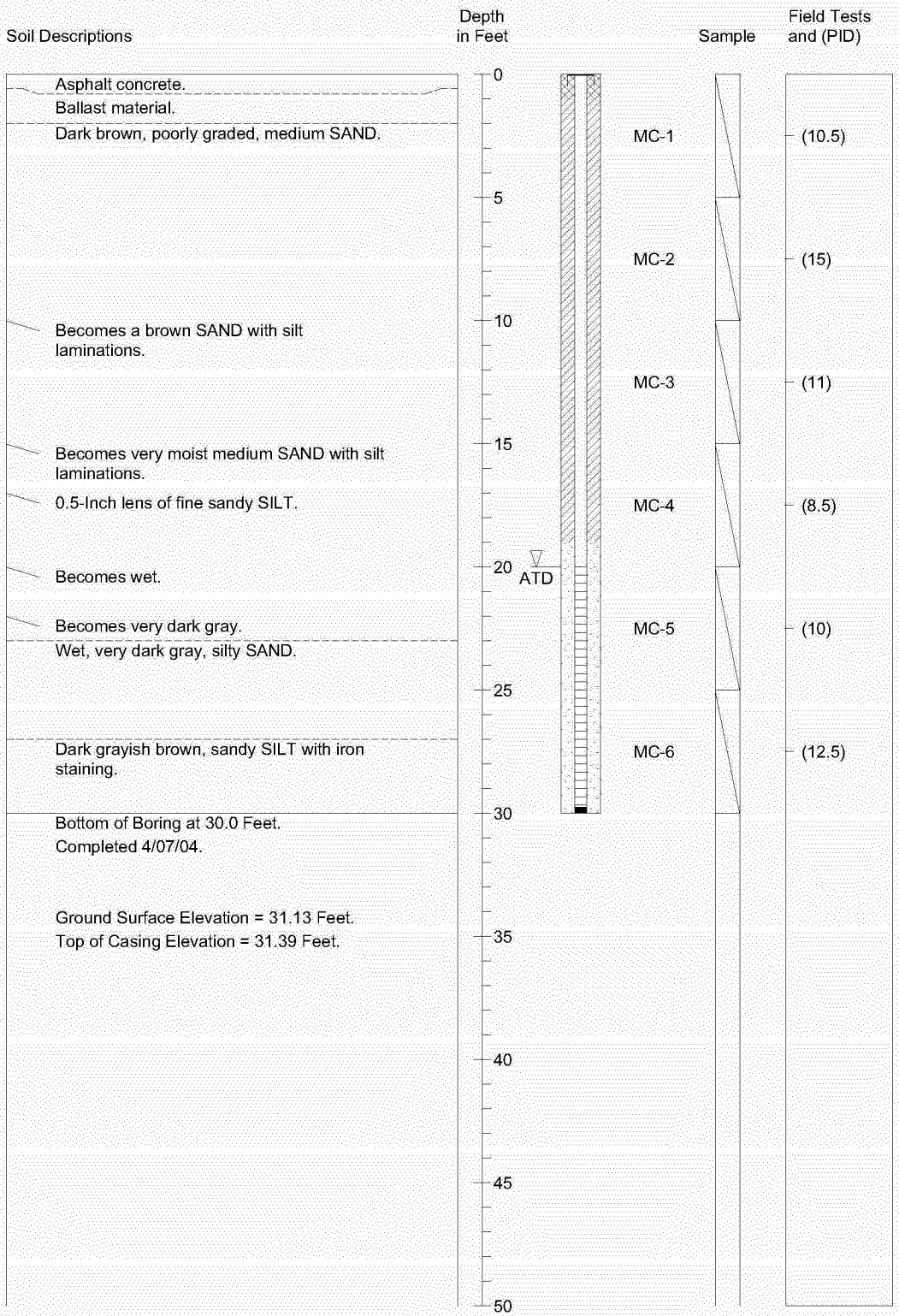
Figure B-6

Monitoring Well Log MW-08
Phase I Data Summary Report
T4 S1 Upland Facility Remedial Investigation



1. Refer to Figure B-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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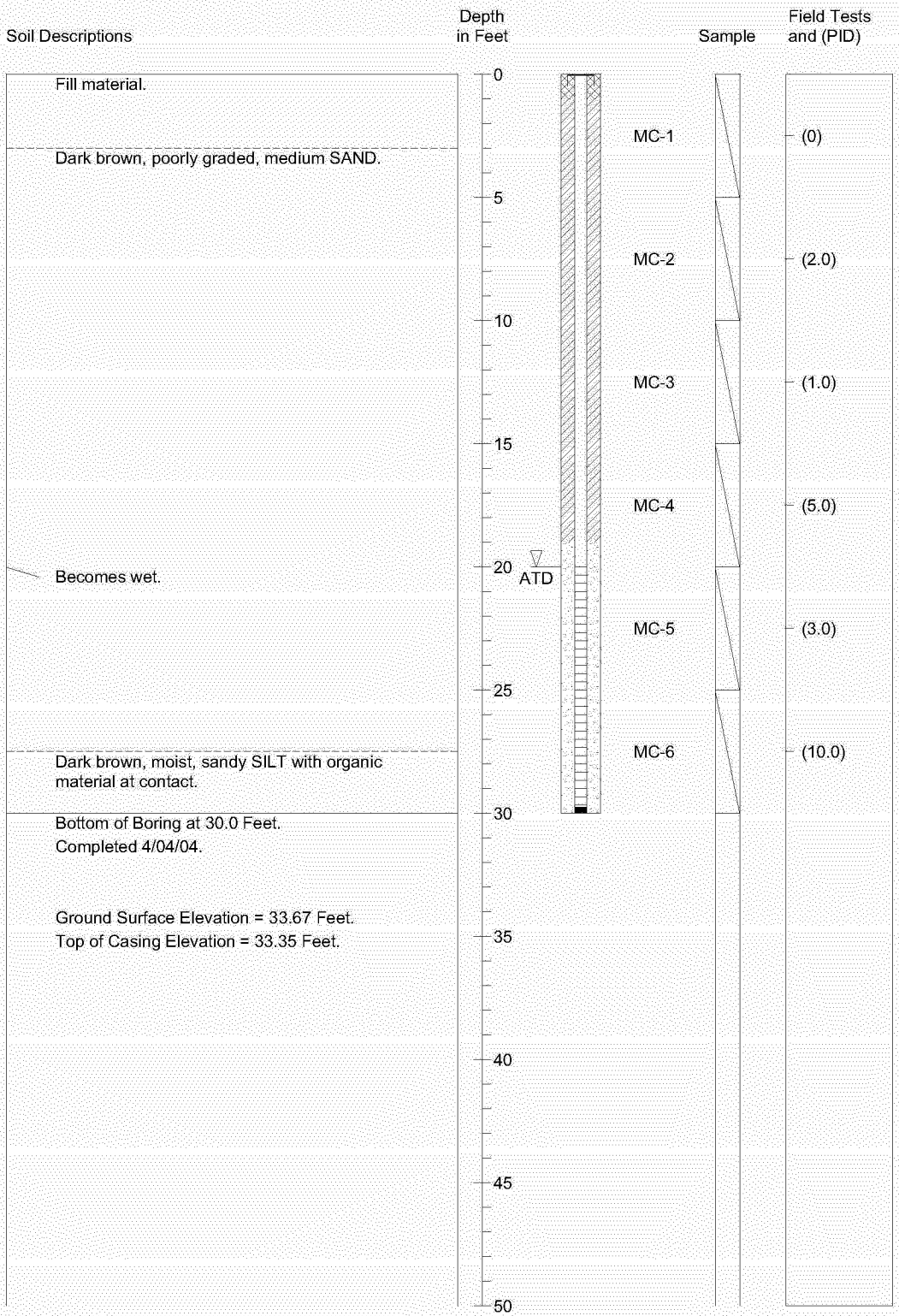
Figure B-7

Monitoring Well Log MW-09
Phase I Data Summary Report
T4 S1 Upland Facility Remedial Investigation



1. Refer to Figure B-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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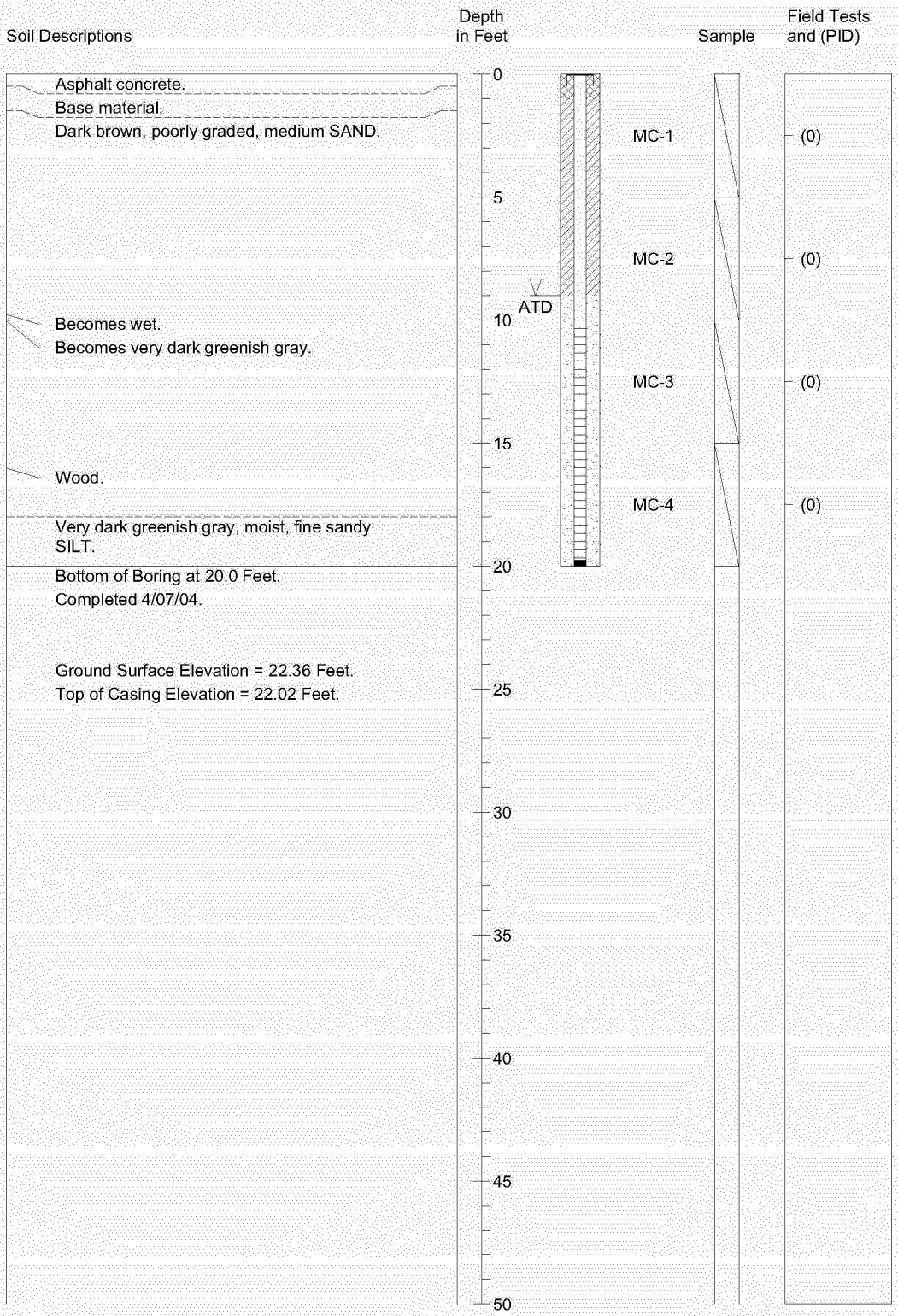
Figure B-8

Monitoring Well Log MW-10
Phase I Data Summary Report
T4 S1 Upland Facility Remedial Investigation



1. Refer to Figure B-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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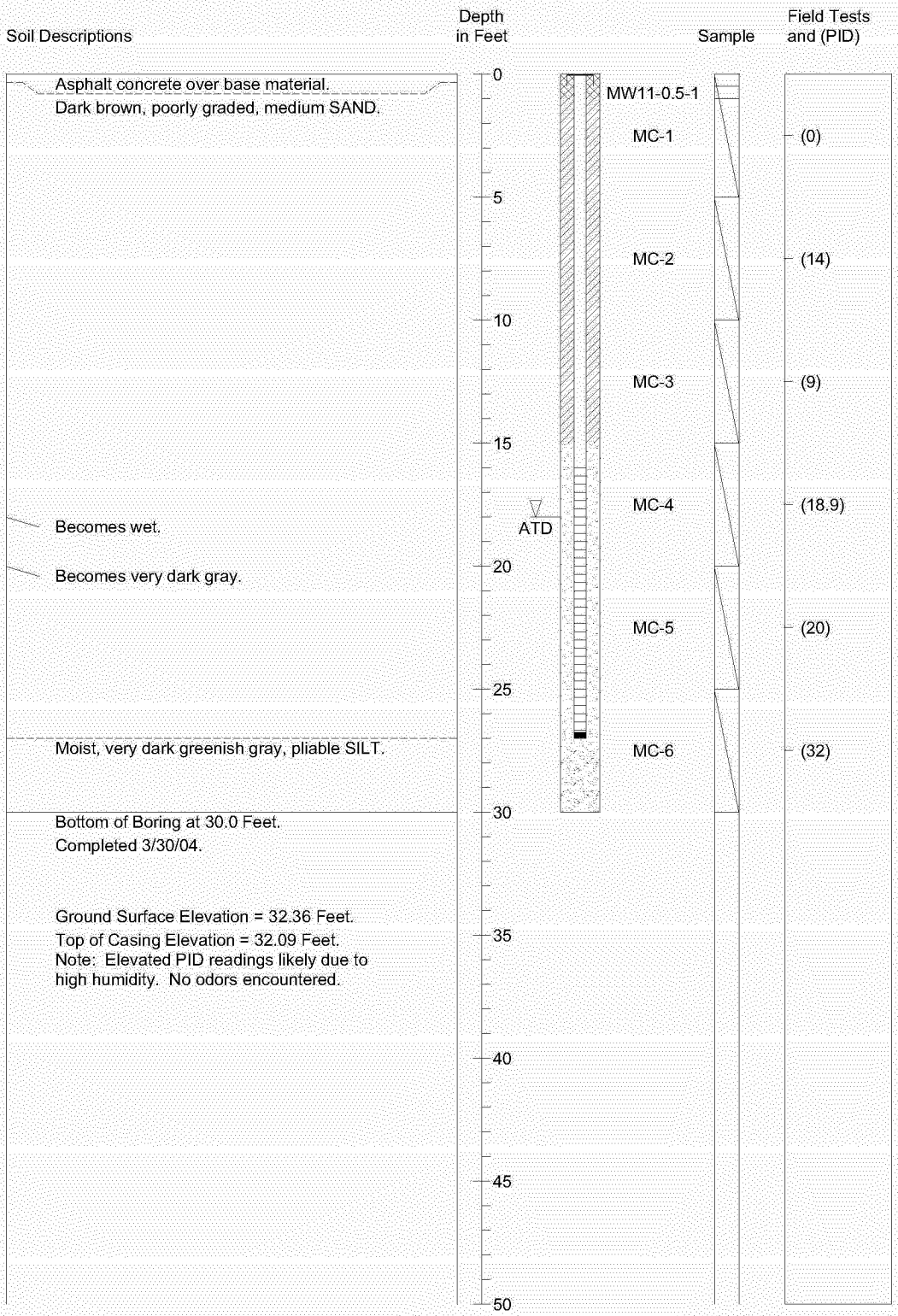
15533-00 *4/04*

Figure B-9

Monitoring Well Log MW-11
Phase I Data Summary Report
T4 S1 Upland Facility Remedial Investigation



1. Refer to Figure B-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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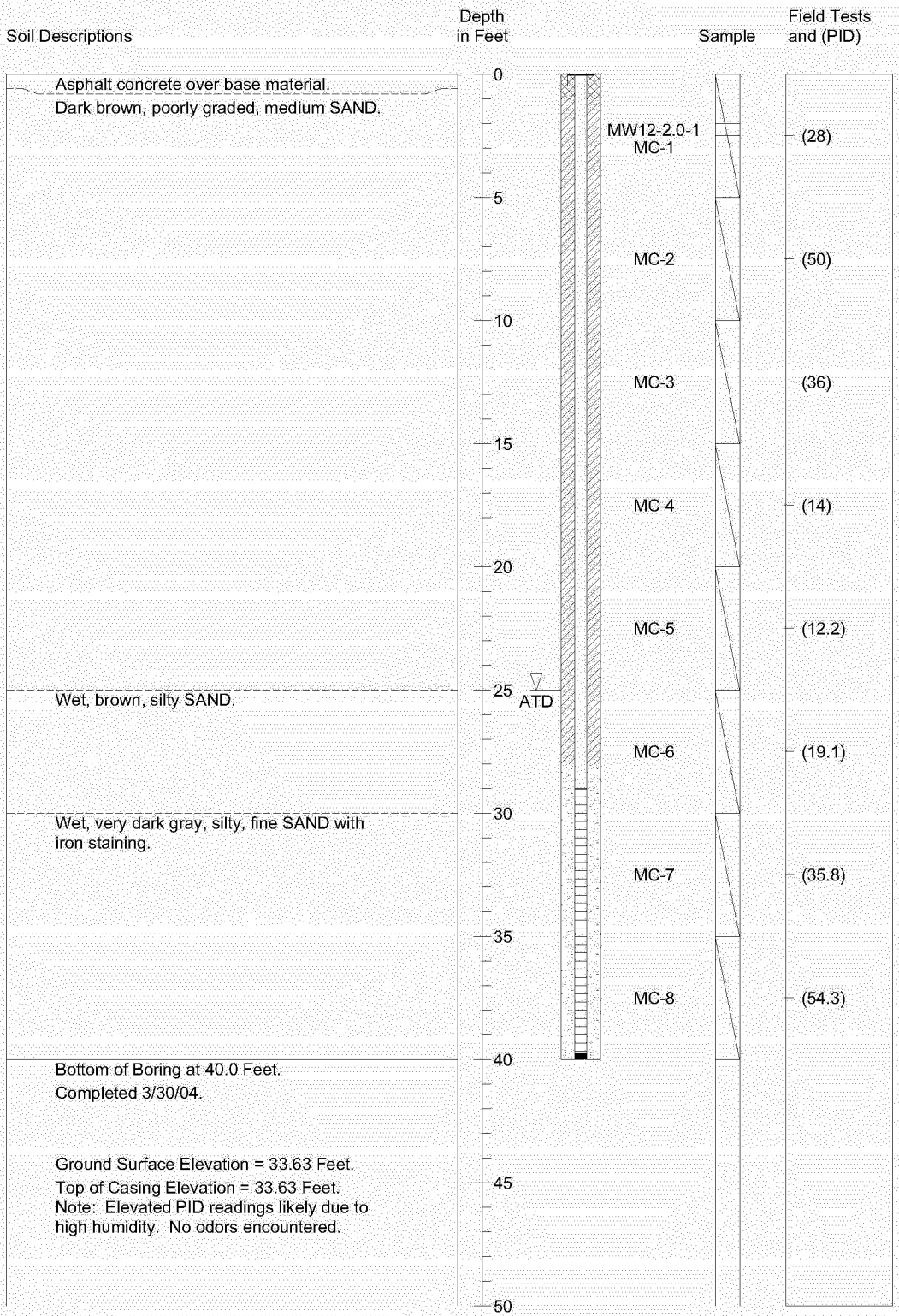
15533-00 *4/04*

Figure B-10

Monitoring Well Log MW-12
Phase I Data Summary Report
T4 S1 Upland Facility Remedial Investigation



1. Refer to Figure B-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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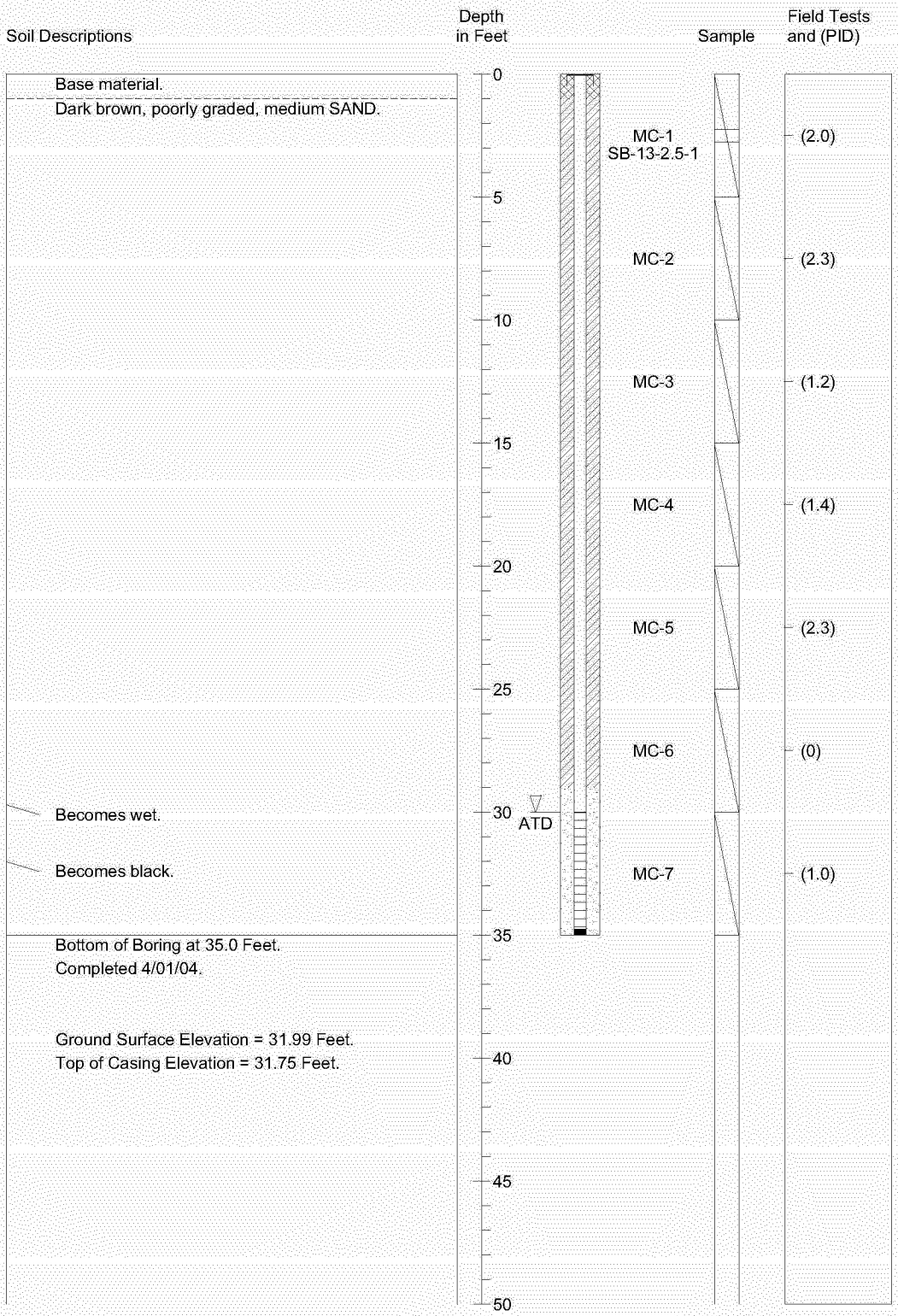
15533-00 4/04

Figure B-11

Monitoring Well Log MW-13
Phase I Data Summary Report
T4 S1 Upland Facility Remedial Investigation



1. Refer to Figure B-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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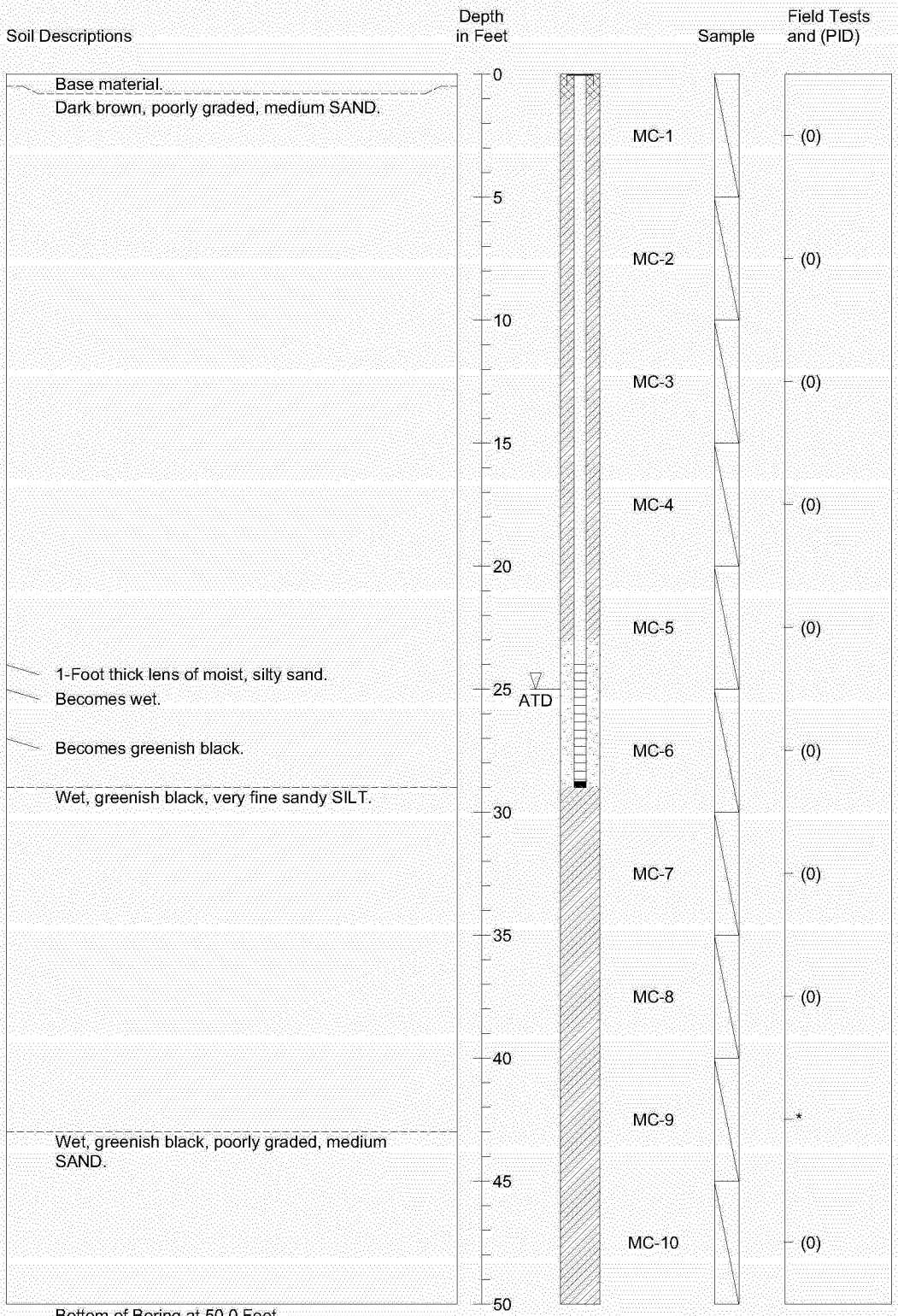
Figure B-12

Monitoring Well Log MW-14
Phase I Data Summary Report
T4 S1 Upland Facility Remedial Investigation



Ground Surface Elevation = 29.31 Feet.
Top of Casing Elevation = 28.97 Feet.

1. Refer to Figure B-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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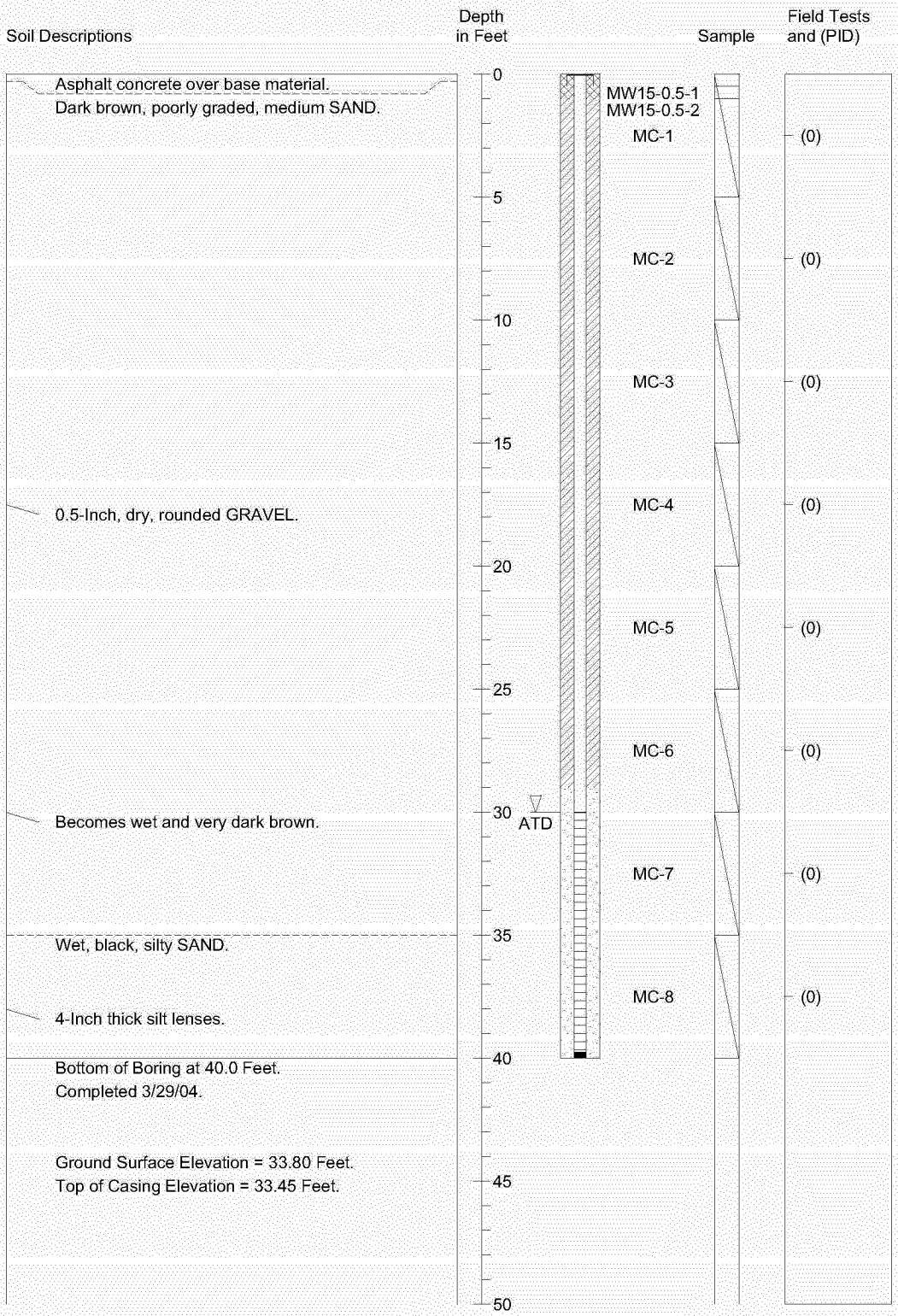
Figure B-13

Monitoring Well Log MW-15
Phase I Data Summary Report
T4 S1 Upland Facility Remedial Investigation



1. Refer to Figure B-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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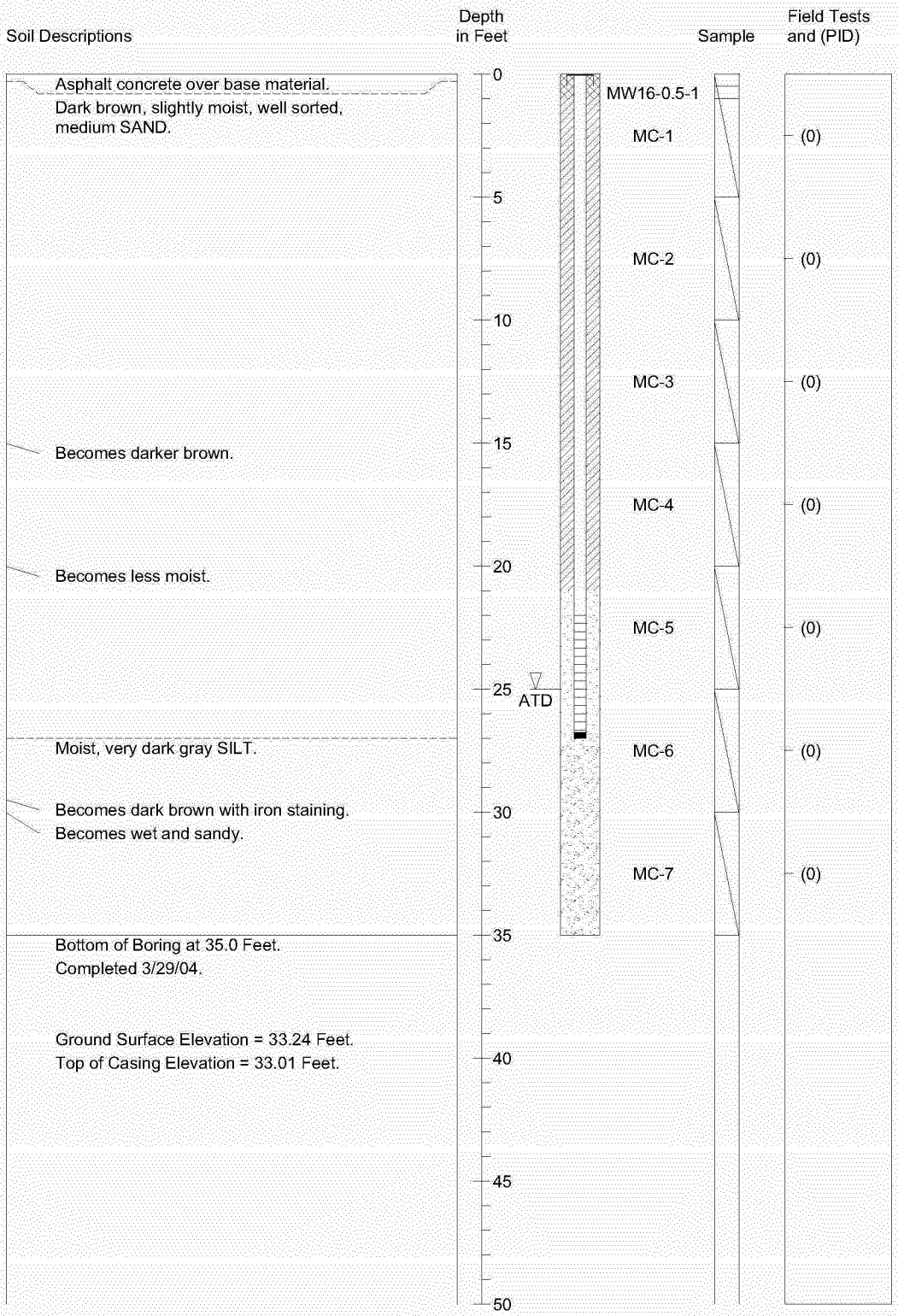
Figure B-14

Monitoring Well Log MW-16
Phase I Data Summary Report
T4 S1 Upland Facility Remedial Investigation



1. Refer to Figure B-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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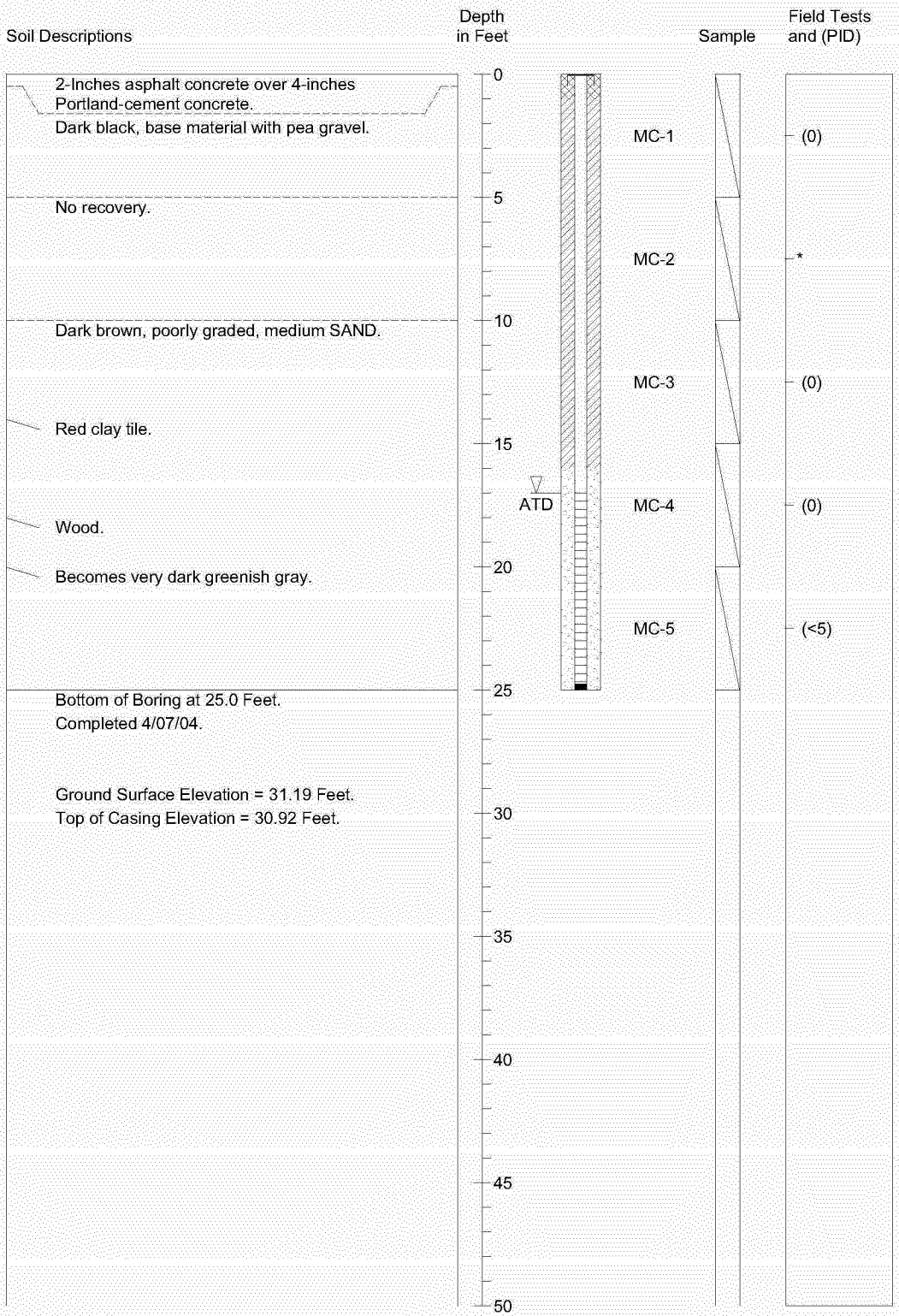
Figure B-15

Monitoring Well Log MW-17
Phase I Data Summary Report
T4 S1 Upland Facility Remedial Investigation



1. Refer to Figure B-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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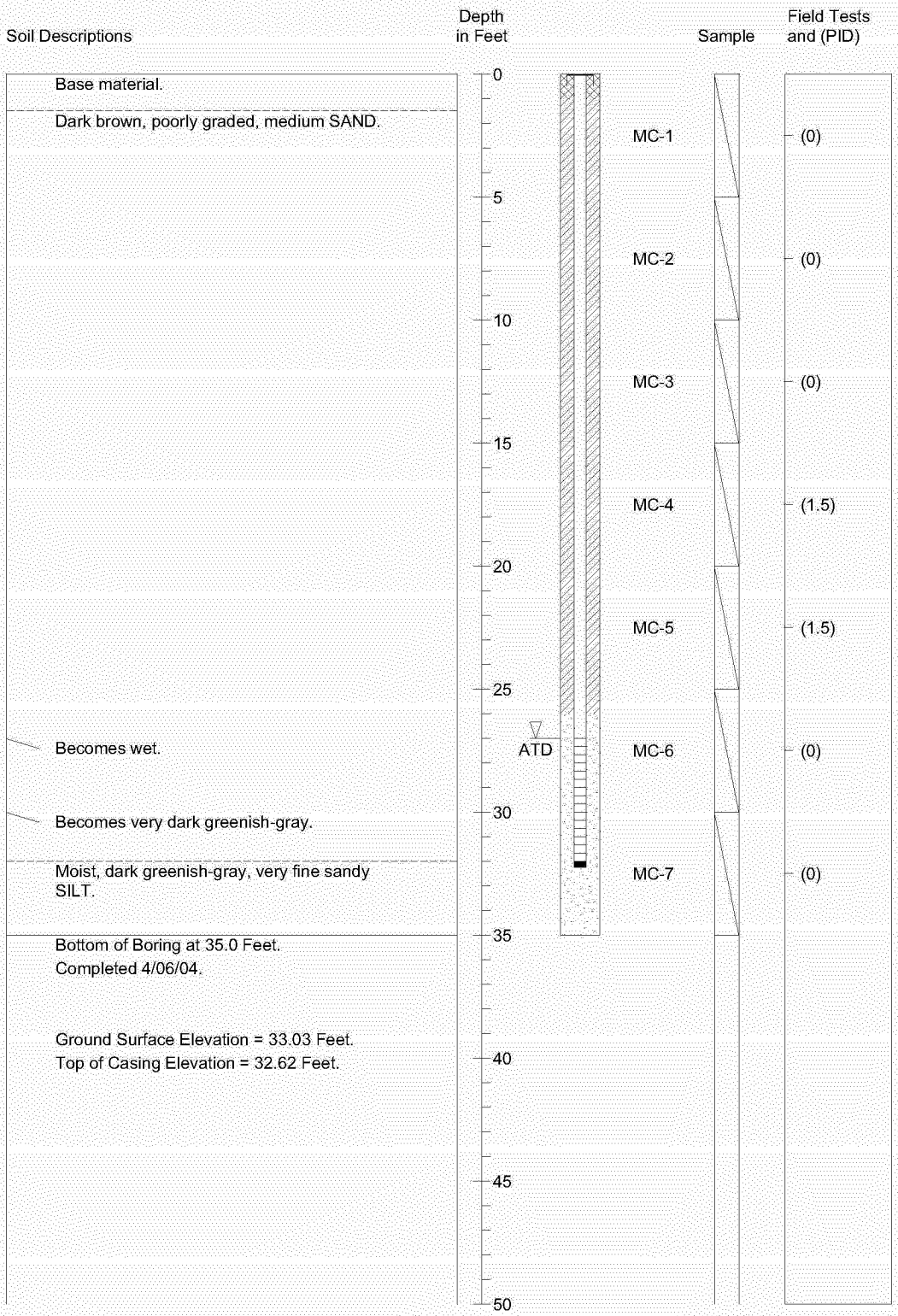
Figure B-16

Monitoring Well Log MW-18
Phase I Data Summary Report
T4 S1 Upland Facility Remedial Investigation



1. Refer to Figure B-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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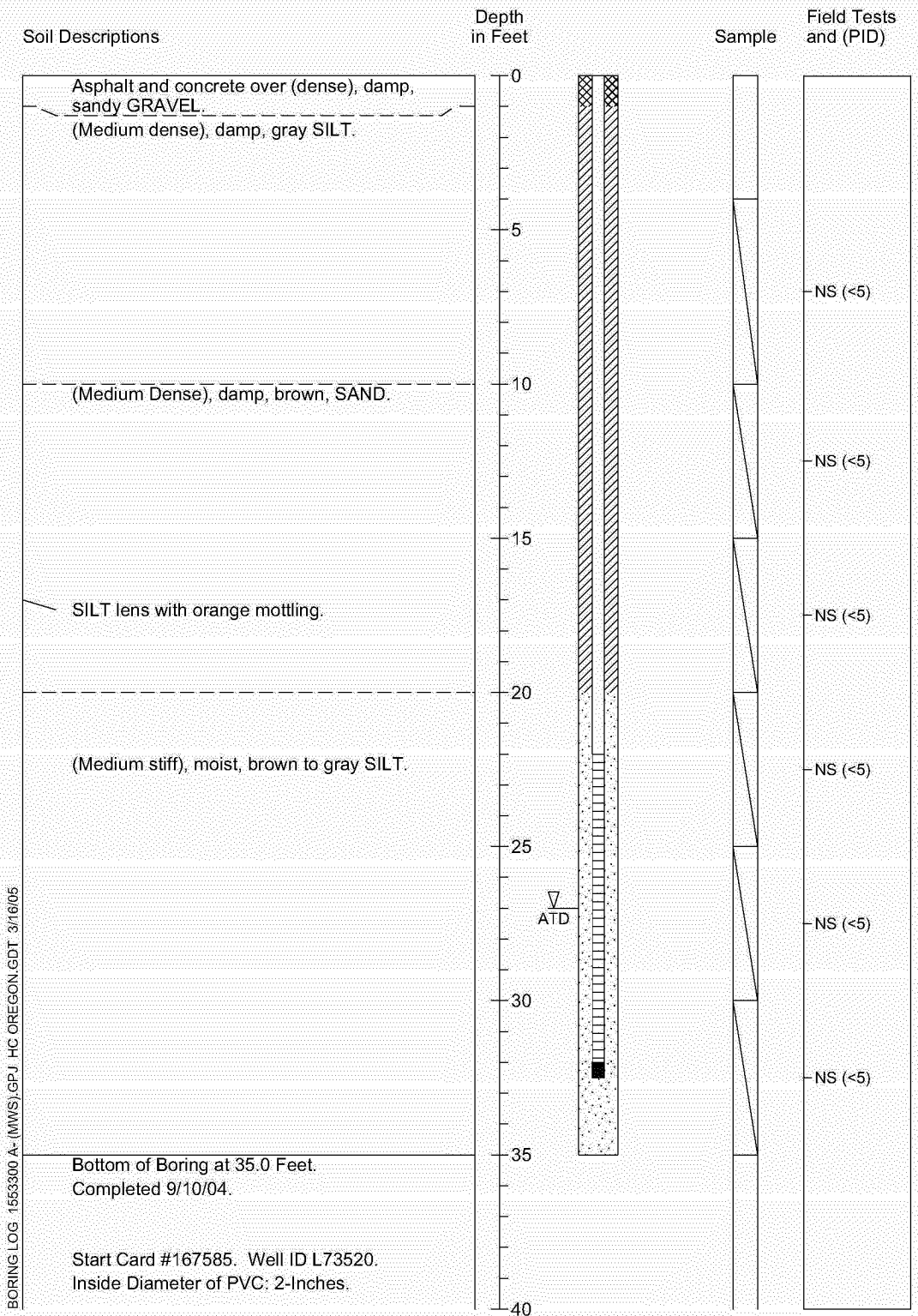
15533-00 4/04

Figure B-17

Boring Log and Construction Data for Monitoring Well MW-19



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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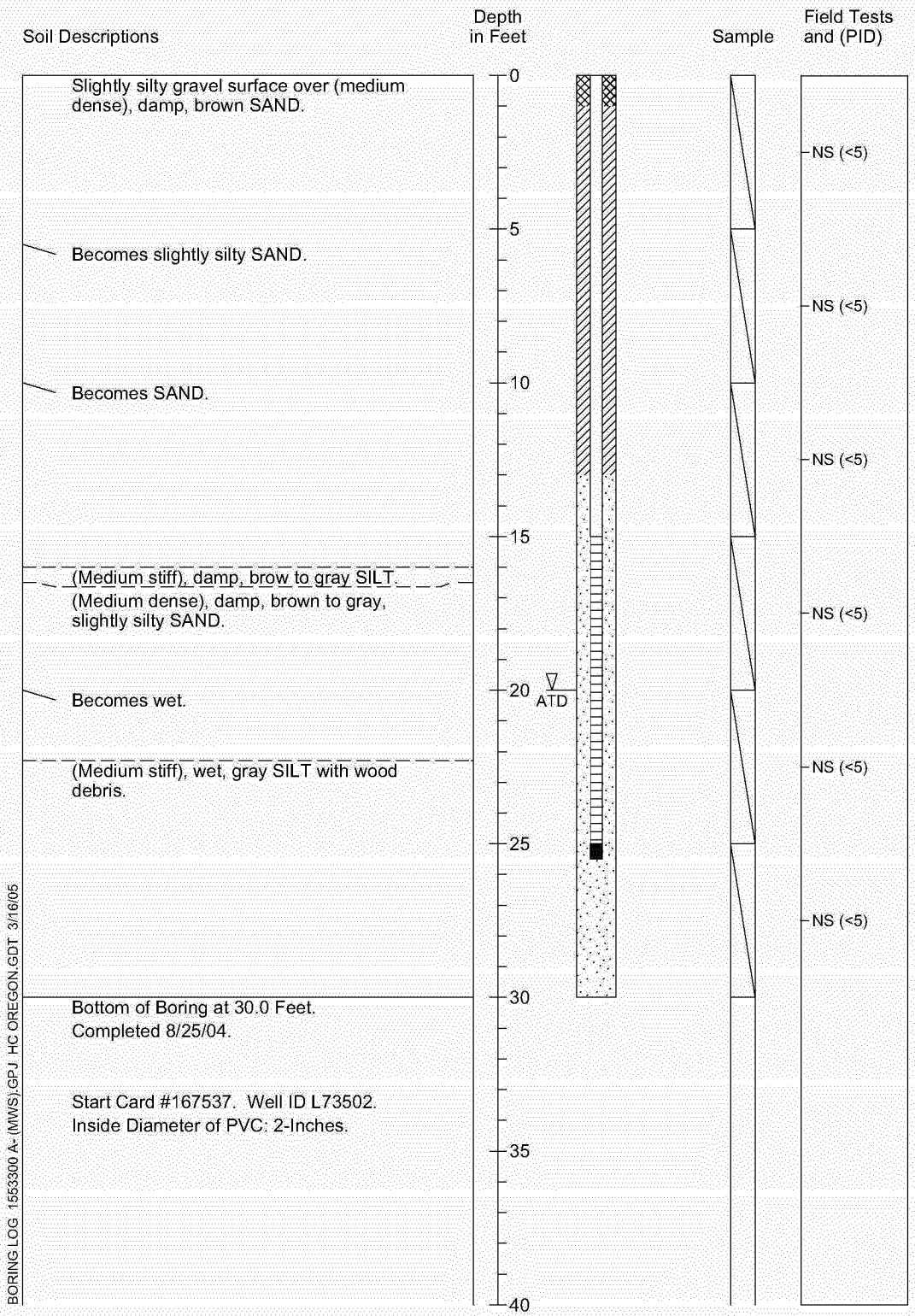
Figure A-80

Boring Log and Construction Data for Monitoring Well MW-20



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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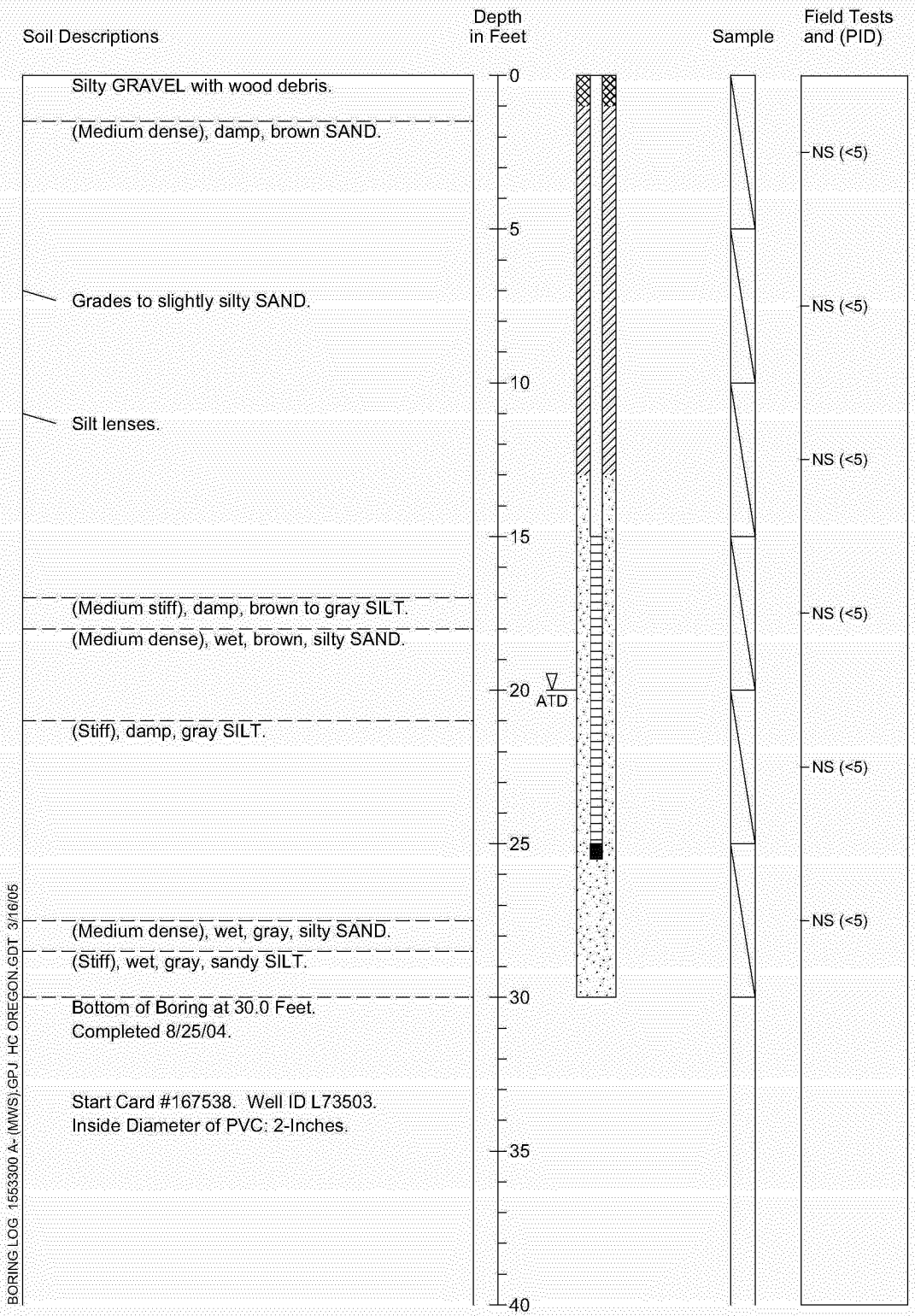
Figure A-81

Boring Log and Construction Data for Monitoring Well MW-21



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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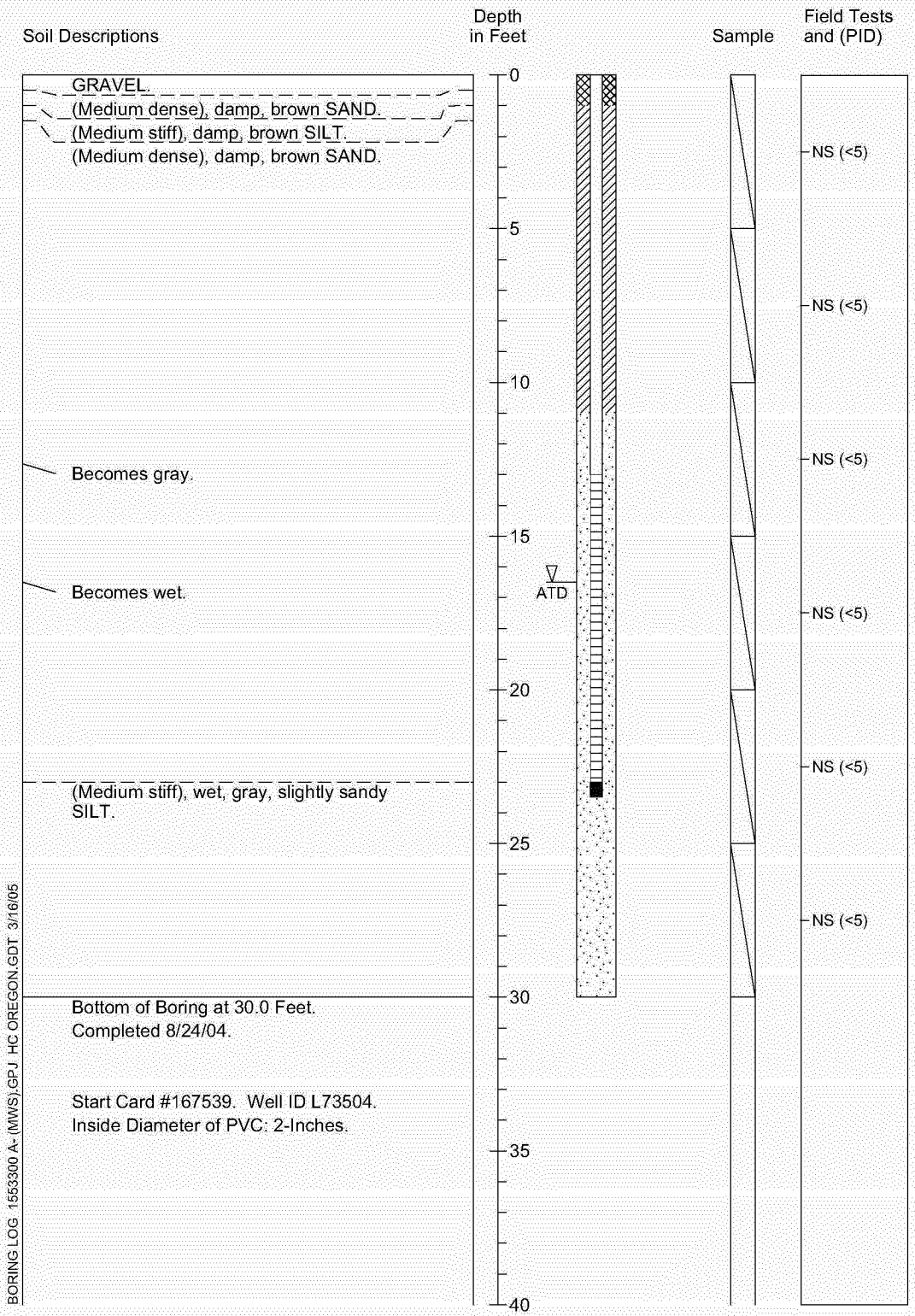
15533-00 *8/04*

Figure A-82

Boring Log and Construction Data for Monitoring Well MW-22



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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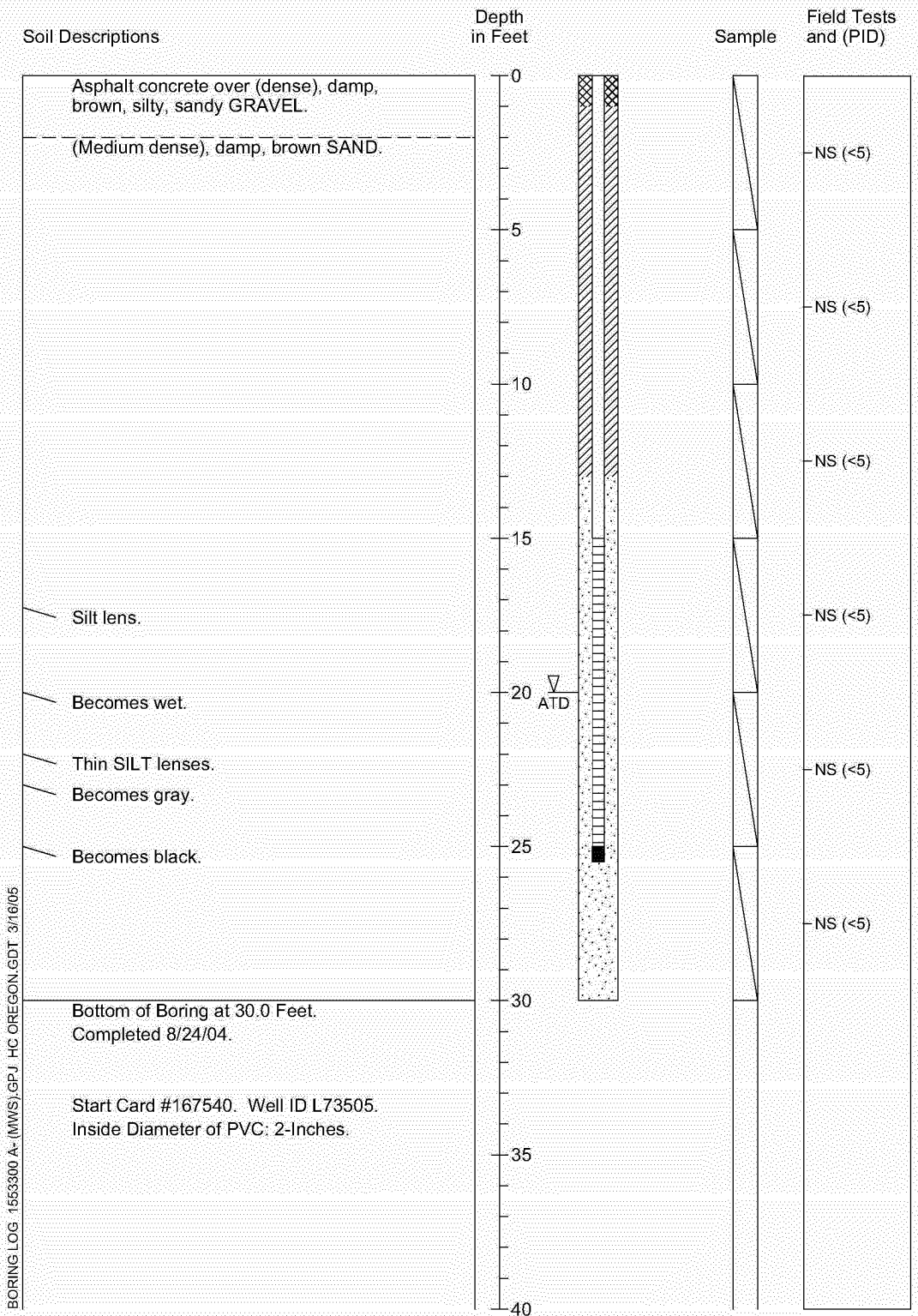
15533-00 *8/04*

Figure A-83

Boring Log and Construction Data for Monitoring Well MW-23



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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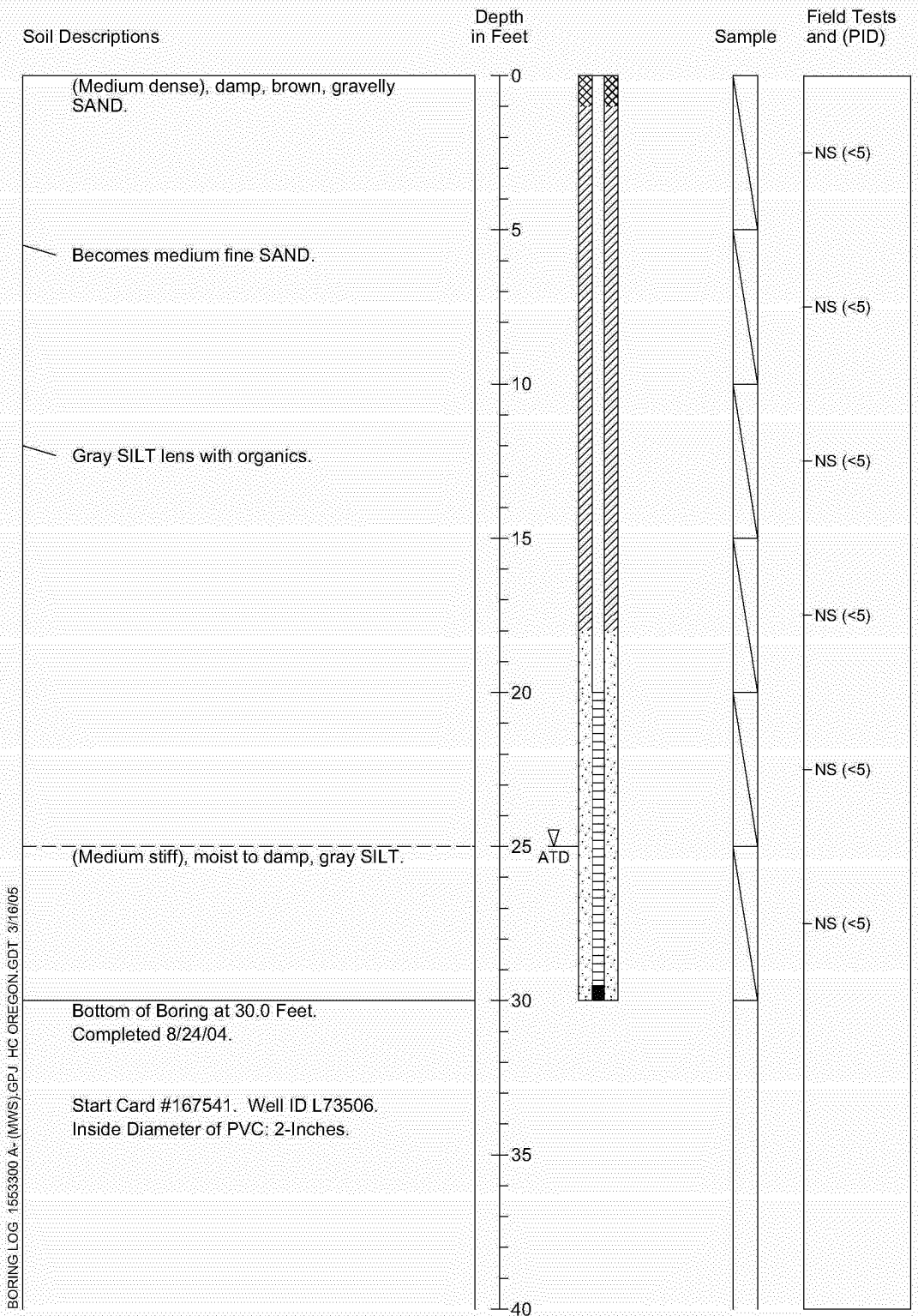
15533-00 *8/04*

Figure A-84

Boring Log and Construction Data for Monitoring Well MW-24



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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15533-00 *8/04*

Figure A-85

Ash Creek Associates, Inc.
Environmental and Geotechnical Consultants

Terminal 4 Slip 1
Remedial Investigation
Phase III

Project Number 1065-00
1066-00

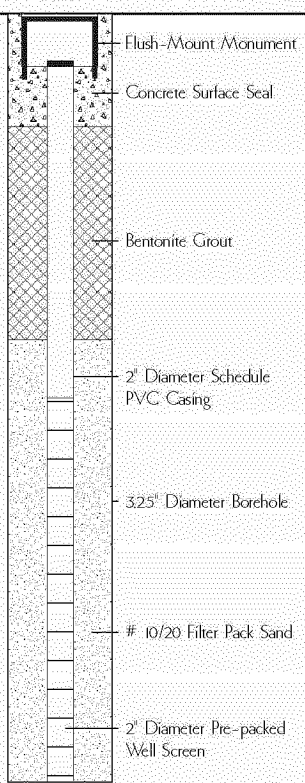
Boring Number MW-25

Boring Location: East of Slip 1 (Near Bulk Foods Center)
Contractor: Geotech
Equipment: Geoprobe 6600

Surface Elevation: 31.25 ft
Date Started: 9/7/05
Date Finished: 9/7/05
Logged By: JRS of BBL
Casing Elevation/Stickup: 30.83 ft
Well Depth: 9/7/05
Depth to Water (ATD): 16.4'

Depth, feet	Sample ID	Sample	Sheen	VOC	Material Description
					Asphalt and gravel road bed fill.
	MW-25-2.5-1		No	0.0	(Loose), moist, brown, fine to medium SAND with trace medium-coarse gravel.
5	MW-25-5-1		No	0.0	
	MW-25-7.5-1		No	0.0	Becomes fine SAND.
10	MW-25-10-1		No	0.0	
	MW-25-12.5-1		No	0.0	
15	MW-25-15-1		No	0.0	
	MW-25-17.5-1		No	0.0	Very wet, dark gray, fine SAND with a moderate hydrocarbon odor.
	MW-25-18.5-1		No	0.0	Very wet, brown, compact, fine SAND with a light hydrocarbon odor.
20					Bottom of Boring at 20.0 Feet.
					Start Card #: 180917
					Well ID#: L79842
25					
30					
35					

Well Construction Details



Note: Boring number prefix "T4S1" removed for clarity.

Ash Creek Associates, Inc.
Environmental and Geotechnical Consultants

Terminal 4 Slip 1
Remedial Investigation
Phase III

Project Number 1065-00
1066-00

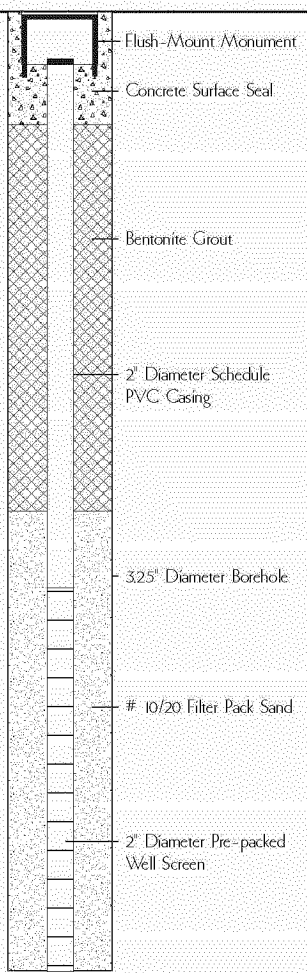
Boring Number MW-26

Boring Location: North Side of Slip 1
Contractor: Geotech
Equipment: Geoprobe 6600

Surface Elevation: 30.06 ft
Date Started: 9/7/05
Date Finished: 9/7/05
Logged By: JRS of BBL
Casing Elevation/Stickup: 29.63 ft
Well Depth: 9/7/05
Depth to Water (ATD): 22.0'

Depth, feet	Sample ID	Sample	Sheen	VOC	Material Description
					6" Asphalt.
					(Loose), moist, brown GRAVEL with some coarse sand and fine sand and silt.
					Fine SAND and trace fine gravel and silt.
	MW-26-2.5-1		No	0.1	Fine to medium GRAVEL lens.
5					(Loose), brown, fine SAND with some medium sand.
	MW-26-5-1		No	0.0	
	MW-26-7.5-1		No	0.0	
10					
	MW-26-10-1		No	0.0	
	MW-26-12.5-1		No	0.0	
15					Moist, gray, compact SILT with trace clay (medium plasticity).
	MW-26-15-1		No	0.0	(Loose), moist, brown, fine SAND with trace medium sand and fine gravel.
	MW-26-17.5-1		No	0.0	
20					Moist, gray SILT with trace clay (medium plasticity).
	MW-26-20-1		No	0.0	Moist, gray SILT with fine sand and trace clay (medium plasticity).
	MW-26-22.5-1		No	0.0	
25					Bottom of Boring at 25.0 Feet.
					Start Card #: 180916
					Well ID#: L79841
30					
35					

Well Construction Details



Note: Boring number prefix "T4S1" removed for clarity.

Key to Exploration Logs

Sample Description

Classification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. Visual-manual classification methods of ASTM D 2488 were used as an identification guide.

Soil descriptions consist of the following:
Density/consistency, moisture, color, minor constituents, MAJOR CONSTITUENT, additional remarks.

Density/Consistency

Soil density/consistency in borings is related primarily to the Standard Penetration Resistance.
Soil density/consistency in test pits is estimated based on visual observation and is presented parenthetically on the test pit logs.

SAND or GRAVEL Density	Standard Penetration Resistance (N) in Blows/Foot	SILT or CLAY Consistency	Standard Penetration Resistance (N) in Blows/Foot	Approximate Shear Strength in TSF
Very loose	0 - 4	Very soft	0 - 2	<0.125
Loose	4 - 10	Soft	2 - 4	0.125 - 0.25
Medium dense	10 - 30	Medium stiff	4 - 8	0.25 - 0.5
Dense	30 - 50	Stiff	8 - 15	0.5 - 1.0
Very dense	>50	Very stiff	15 - 30	1.0 - 2.0
		Hard	>30	>2.0

Moisture

Dry	Little perceptible moisture
Damp	Some perceptible moisture, probably below optimum
Moist	Probably near optimum moisture content
Wet	Much perceptible moisture, probably above optimum

Minor Constituents

	Estimated Percentage
Not identified in description	0 - 5
Slightly (clayey, silty, etc.)	5 - 12
Clayey, silty, sandy, gravelly	12 - 30
Very (clayey, silty, etc.)	30 - 50

Legends

Sampling Test Symbols

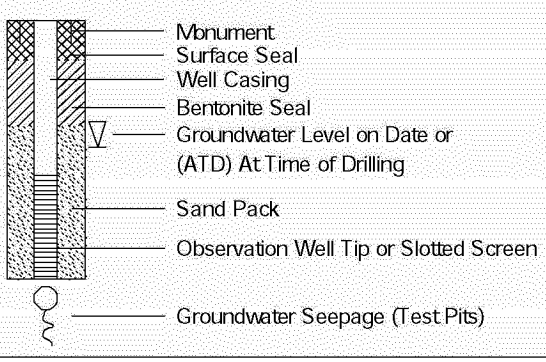
BORING SAMPLES

- Split Spoon
- Tube (Shelby, Push Probe)
- Cuttings
- Core Run
- * No Sample Recovery
- P Tube Pushed, Not Driven

TEST PIT SAMPLES

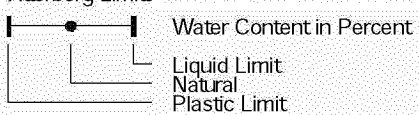
- Grab (Jar)
- Bag
- Shelby Tube

Groundwater Observations



Test Symbols

NS	No Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen
TCD	Triaxial Consolidated Drained
QU	Unconfined Compression
DS	Direct Shear
K	Permeability
PP	Pocket Penetrometer Approximate Compressive Strength in TSF
TV	Torvane Approximate Shear Strength in TSF
CBR	California Bearing Ratio
MD	Moisture Density Relationship
AL	Atterberg Limits



PID	Photoionization Detector Reading
CA	Chemical Analysis
DT	*In Situ* Density Test

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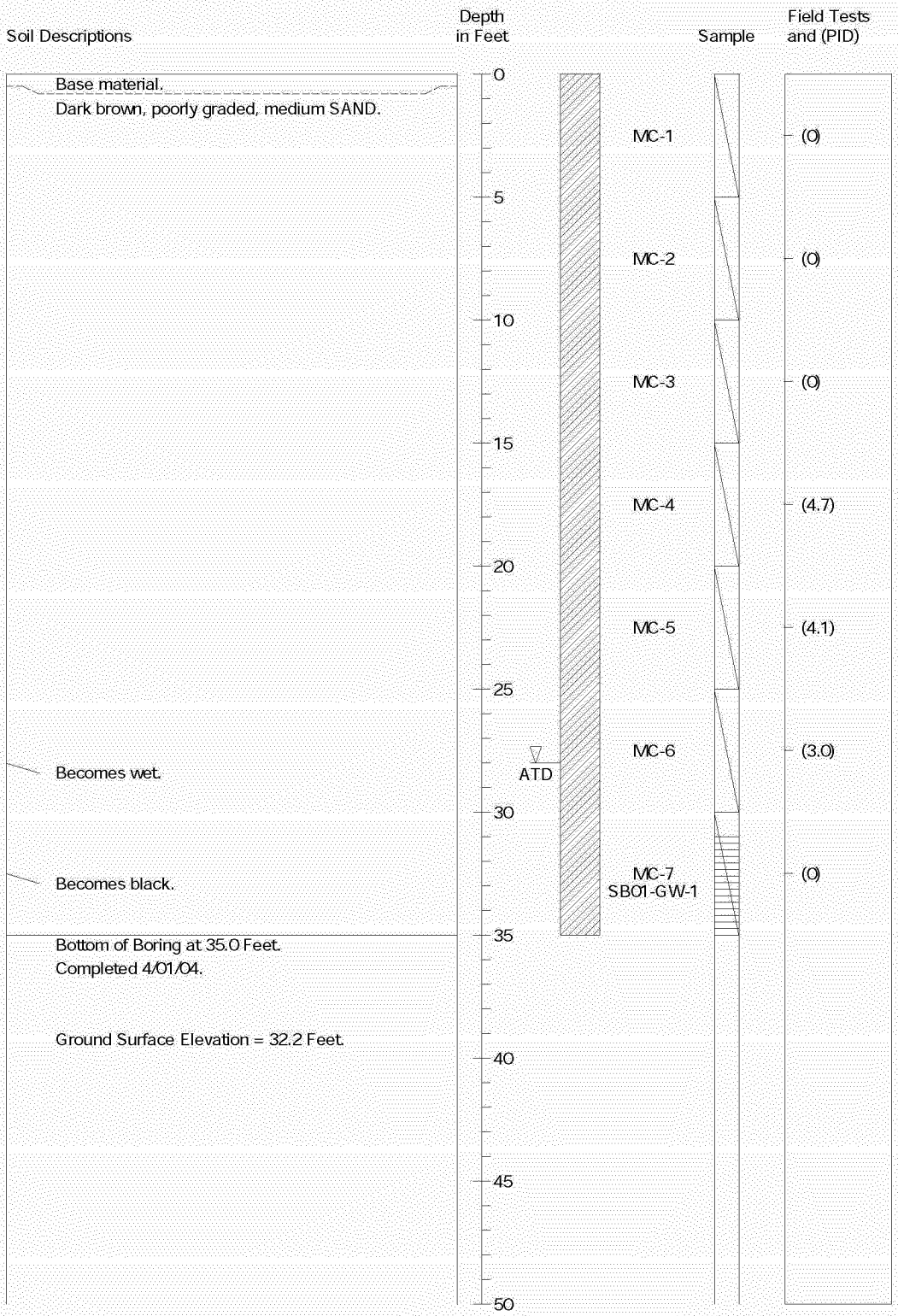
15533-00 *8/04*

Figure A-1

KEY SHEET 1553300A- (GEOPROBES).GPJ HC OREGON.GDT 11/3/05

Geoprobe Boring Log SB-01
Phase I Data Summary Report
T4 S1 Upland Facility Remedial Investigation



1. Refer to Figure B-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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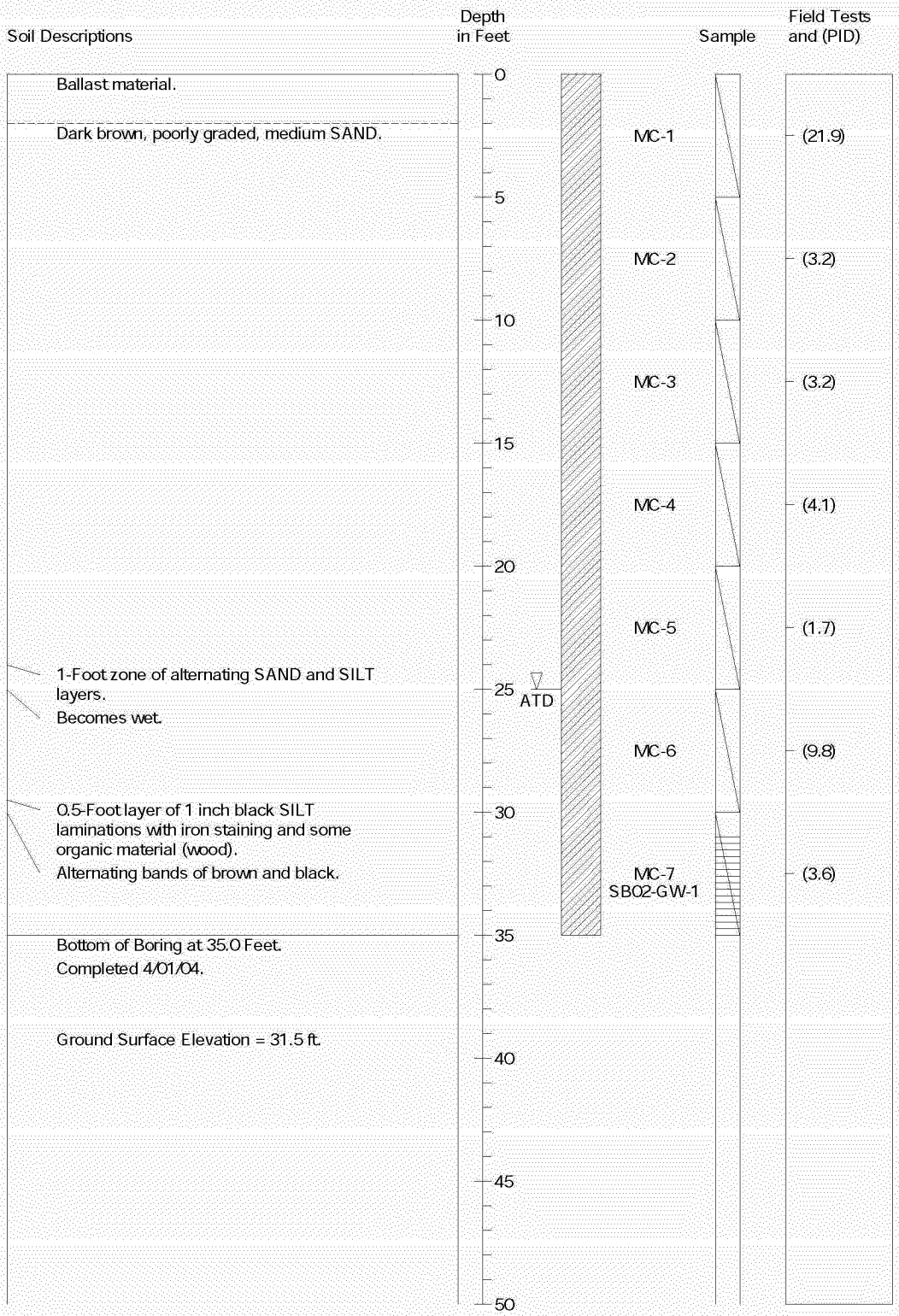
15533-00 *4/04*

Figure B-18

Geoprobe Boring Log SB-02
Phase I Data Summary Report
T4 S1 Upland Facility Remedial Investigation



1. Refer to Figure B-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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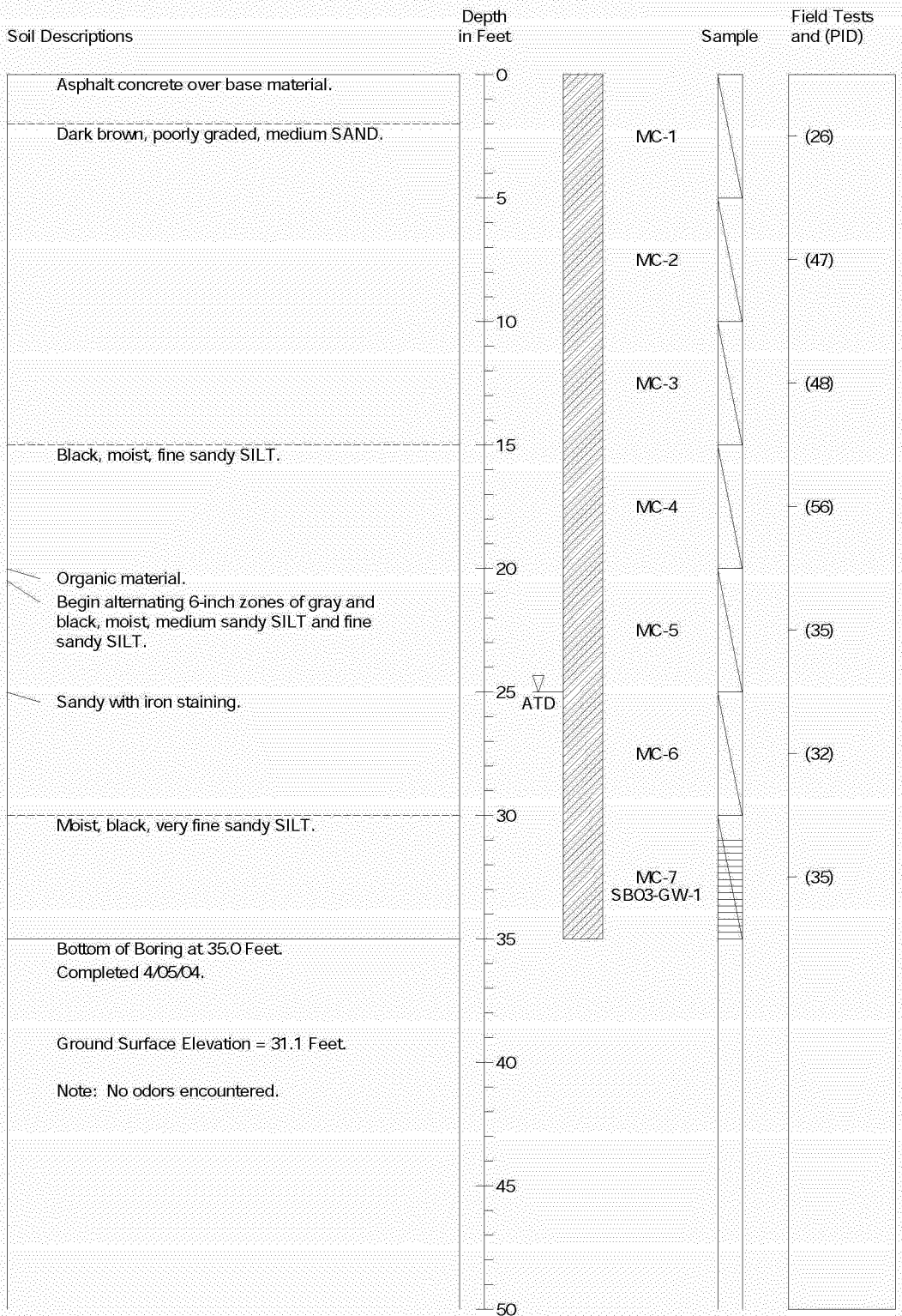
15533-00 *4/04*

Figure B-19

Geoprobe Boring Log SB-03
Phase I Data Summary Report
T4 S1 Upland Facility Remedial Investigation



1. Refer to Figure B-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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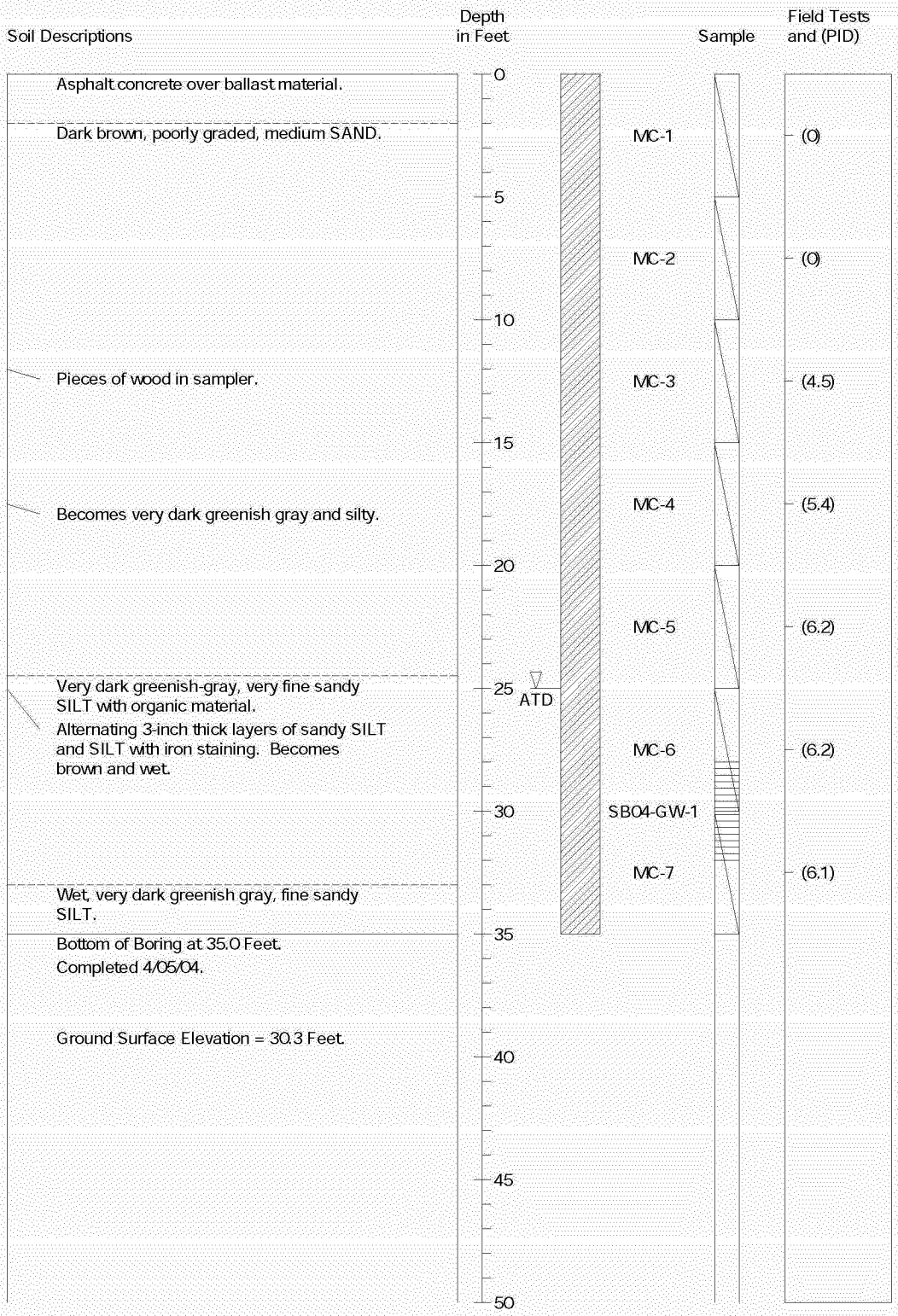
15533-00 *4/04*

Figure B-20

Geoprobe Boring Log SB-04
Phase I Data Summary Report
T4 S1 Upland Facility Remedial Investigation



1. Refer to Figure B-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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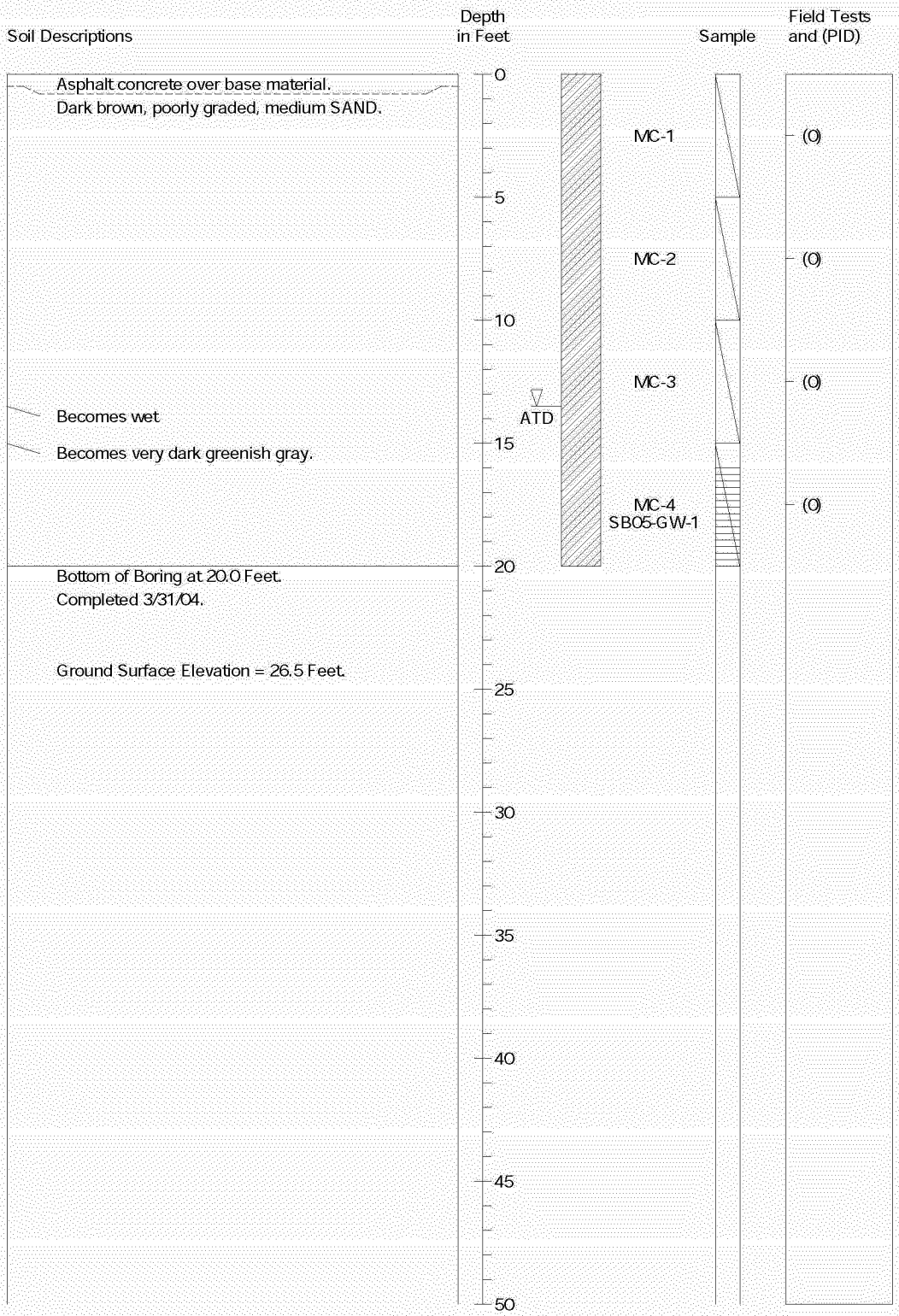
Figure B-21

Geoprobe Boring Log SB-05
Phase I Data Summary Report
T4 S1 Upland Facility Remedial Investigation



1. Refer to Figure B-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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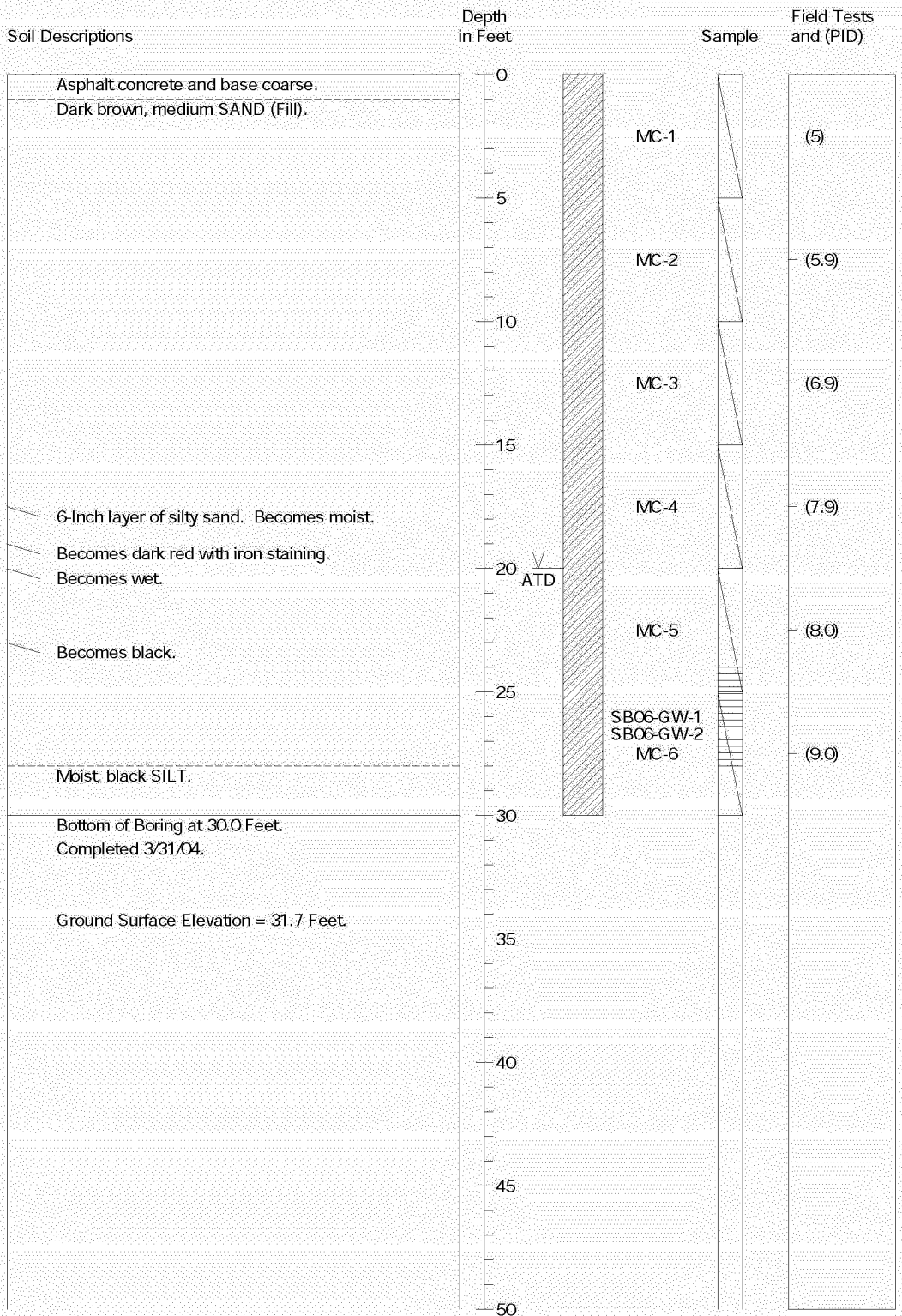
15533-00 *4/04*

Figure B-22

Geoprobe Boring Log SB-06
Phase I Data Summary Report
T4 S1 Upland Facility Remedial Investigation



1. Refer to Figure B-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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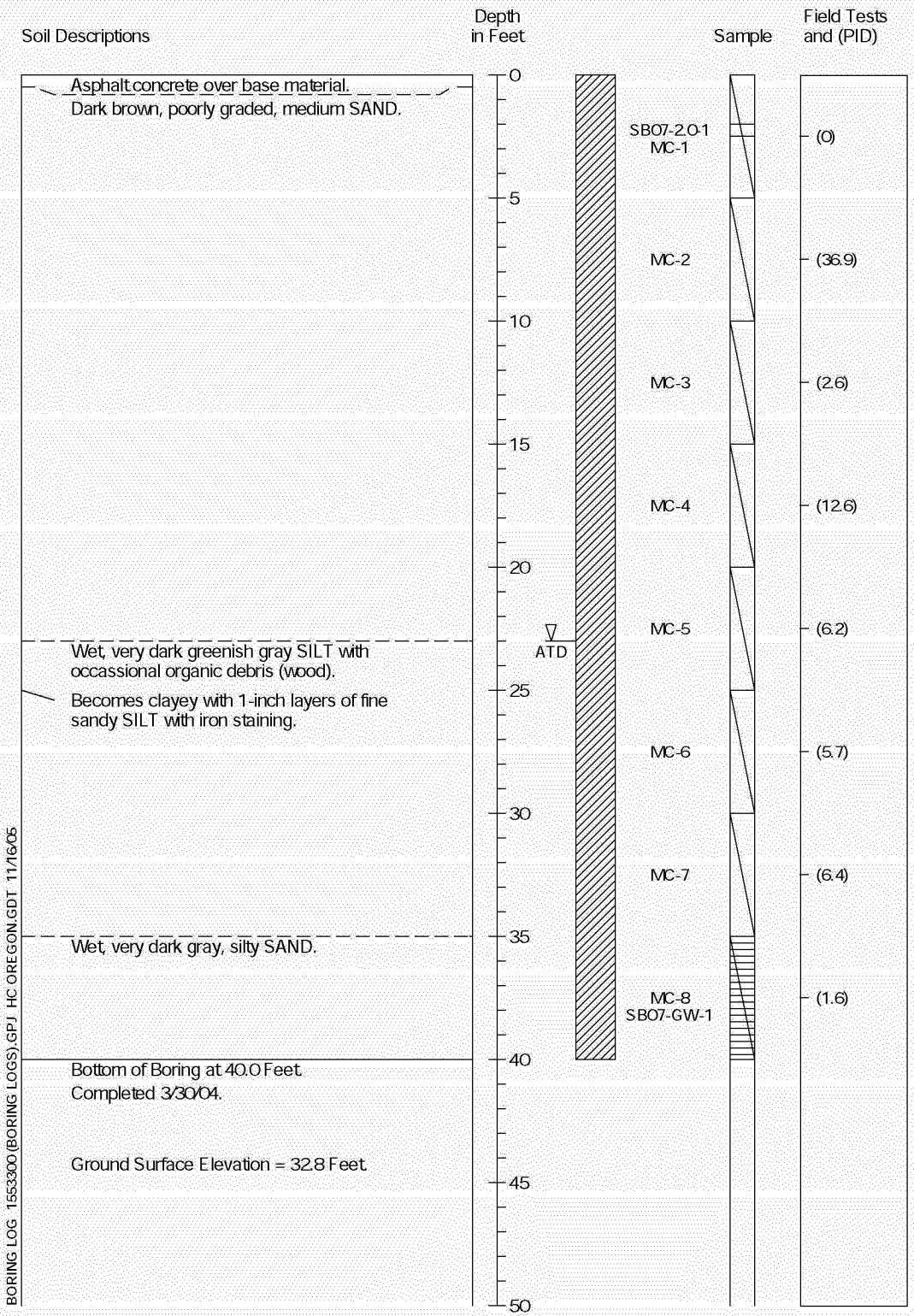
15533-00 *4/04*

Figure B-23

Geoprobe Boring Log SB-07



1. Refer to Figure B-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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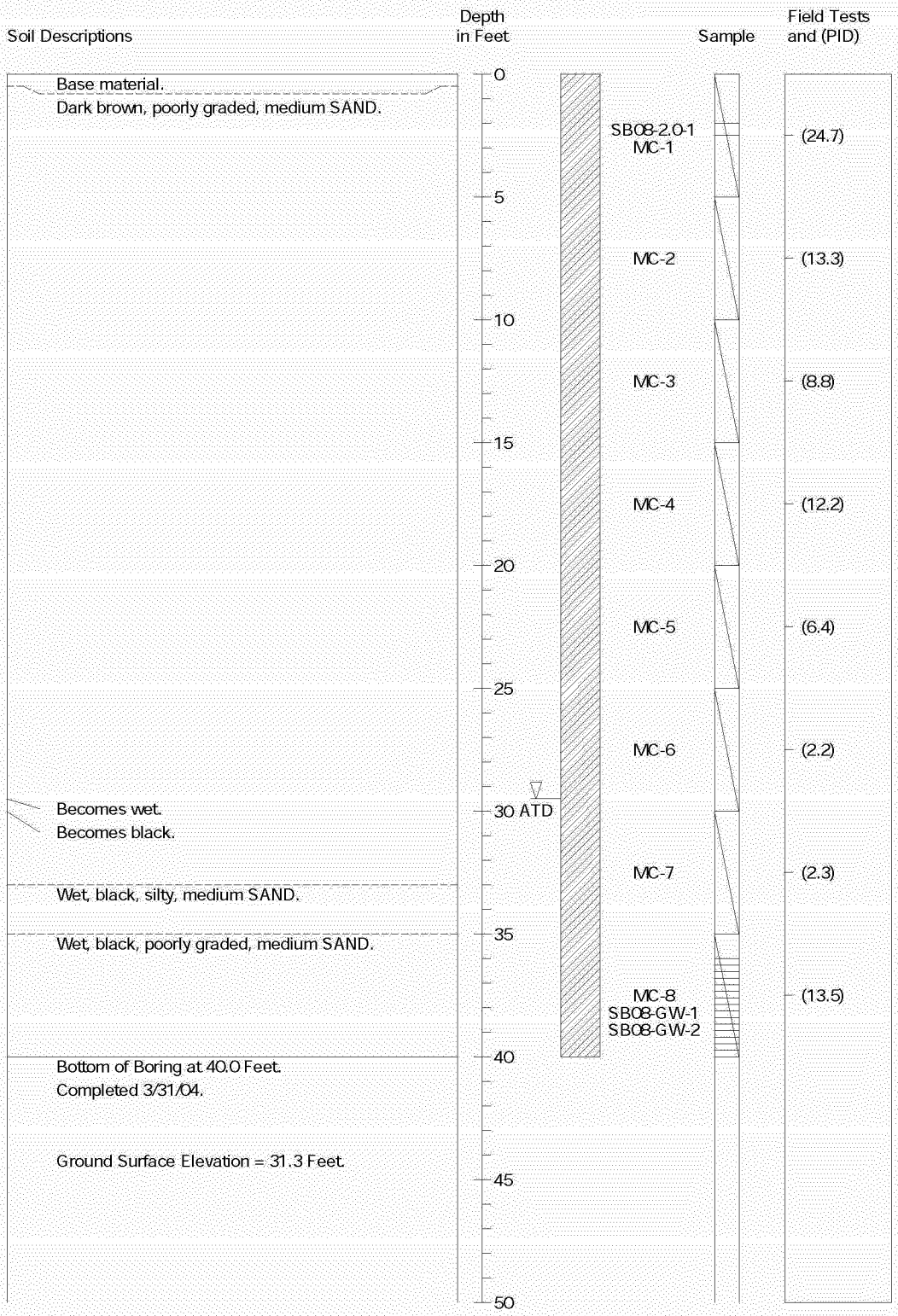
15533-00 *3/04*

Figure B-24

Geoprobe Boring Log SB-08
Phase I Data Summary Report
T4 S1 Upland Facility Remedial Investigation



1. Refer to Figure B-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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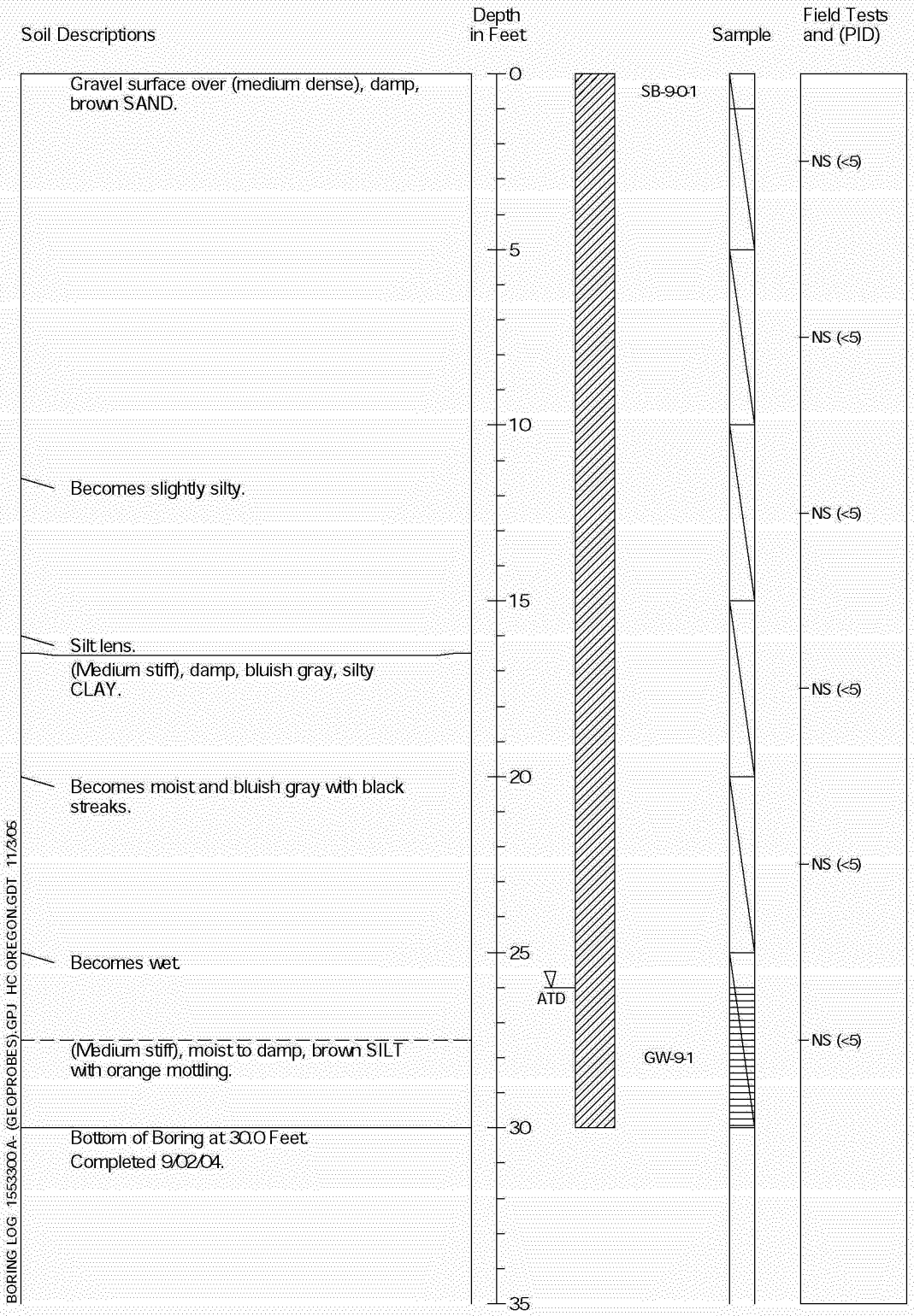
15533-00 *4/04*

Figure B-25

Push Probe Exploration SB-9



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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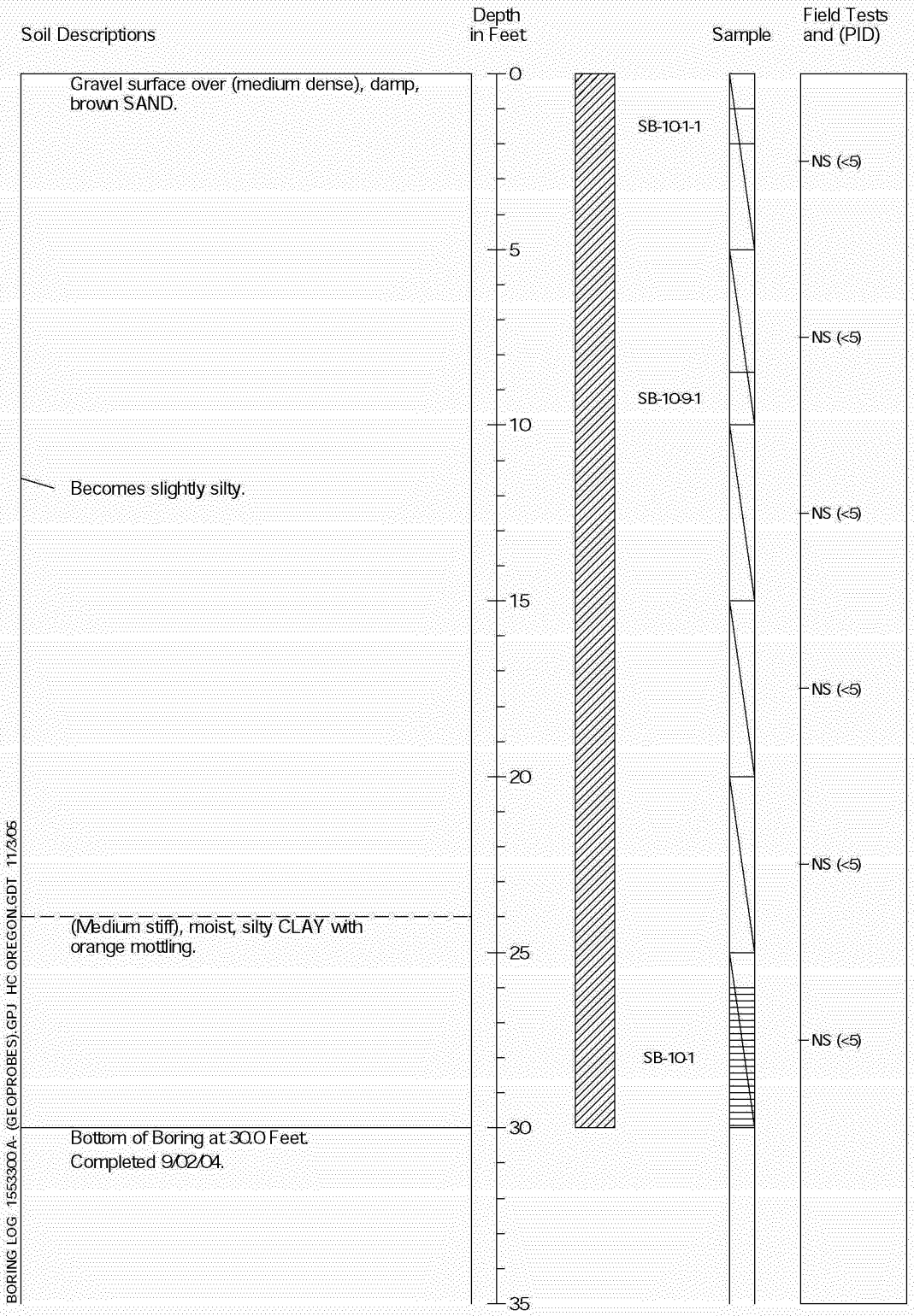
15533-00 *9/04*

Figure A-2

Push Probe Exploration SB-10



BORING LOG 15533000 A- (GEOPROBES).GPJ HC OREGON.GDT 11/3/05

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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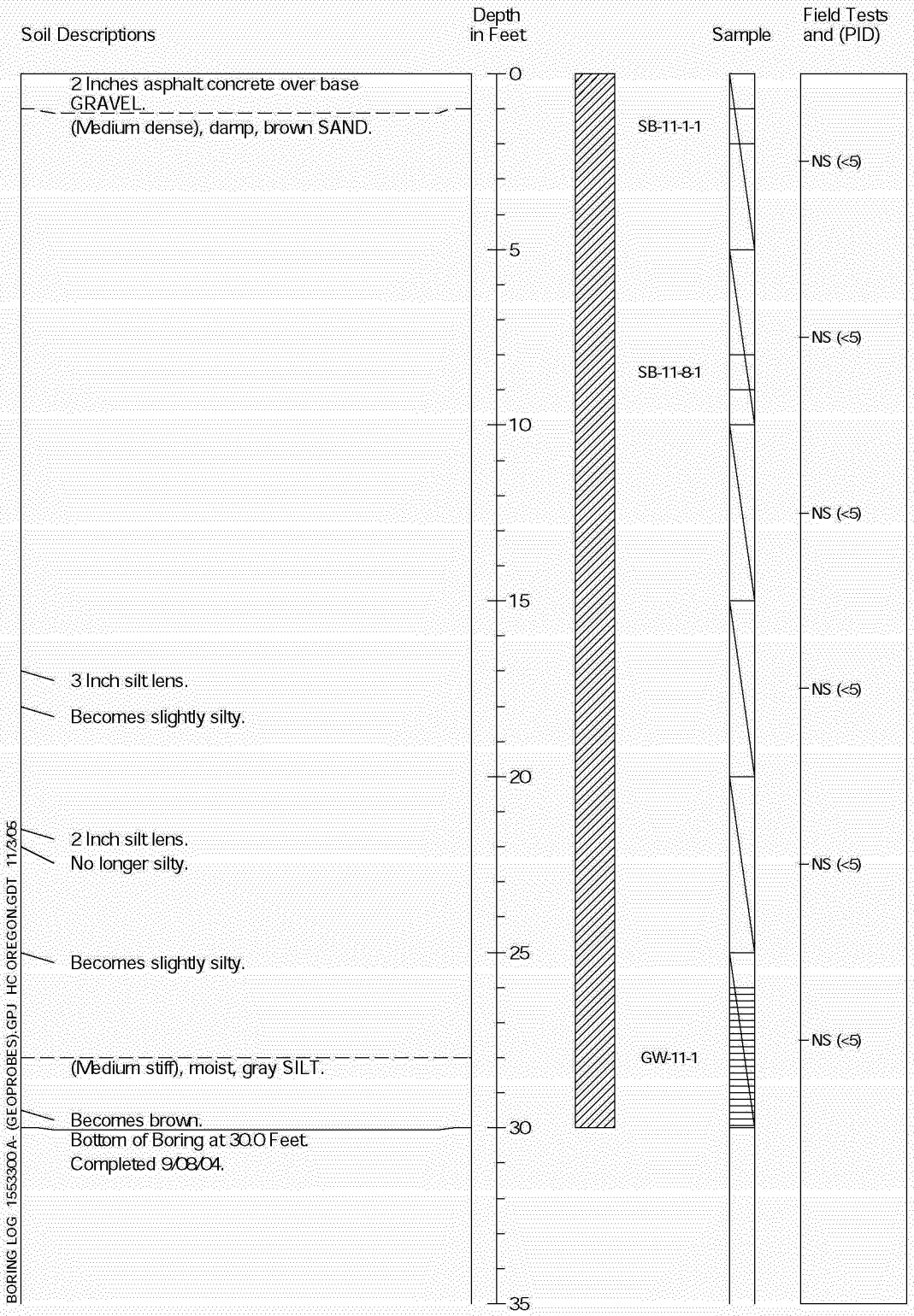
15533-00 *9/04*

Figure A-3

Push Probe Exploration SB-11



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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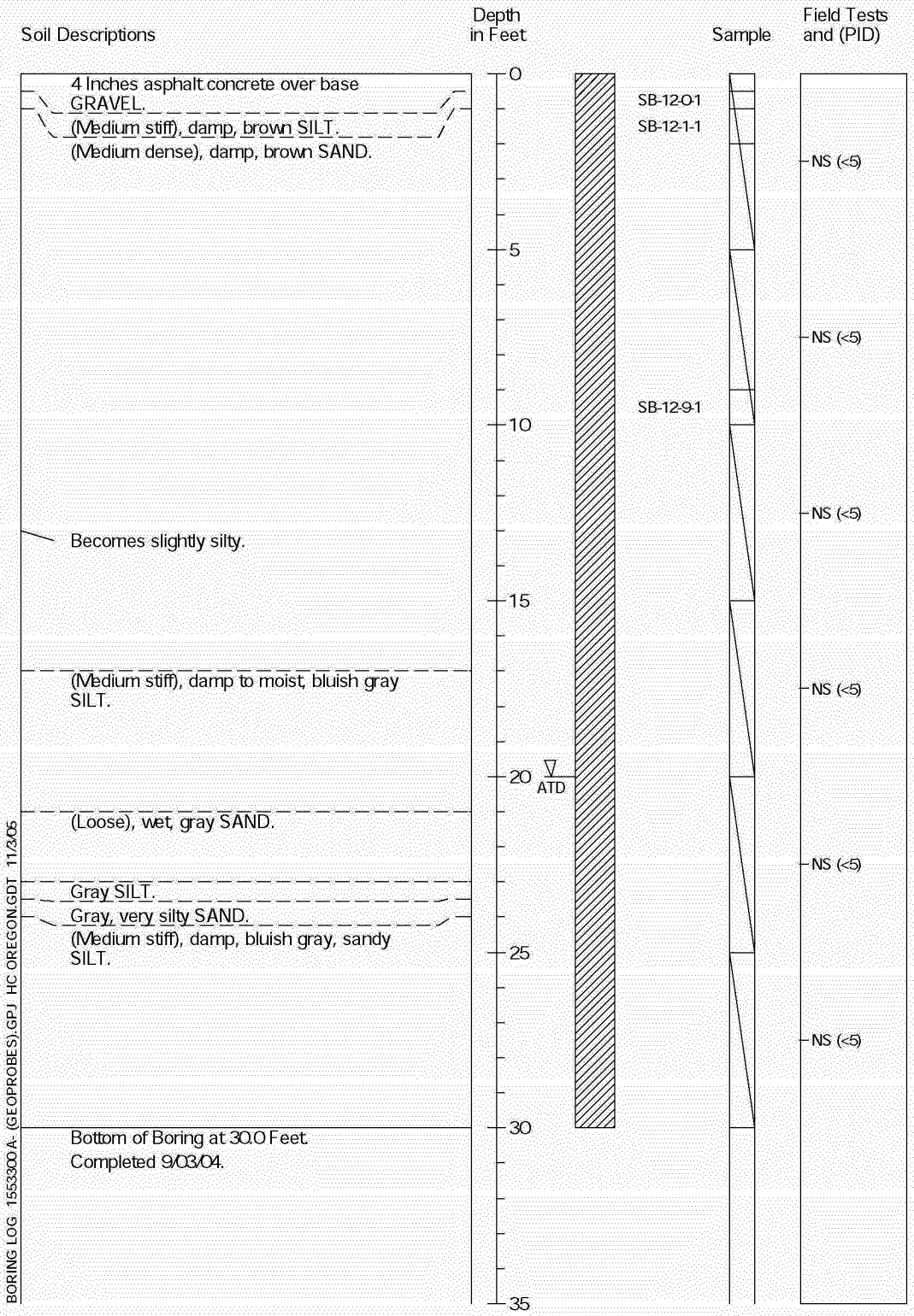
Figure A-4

Push Probe Exploration SB-12



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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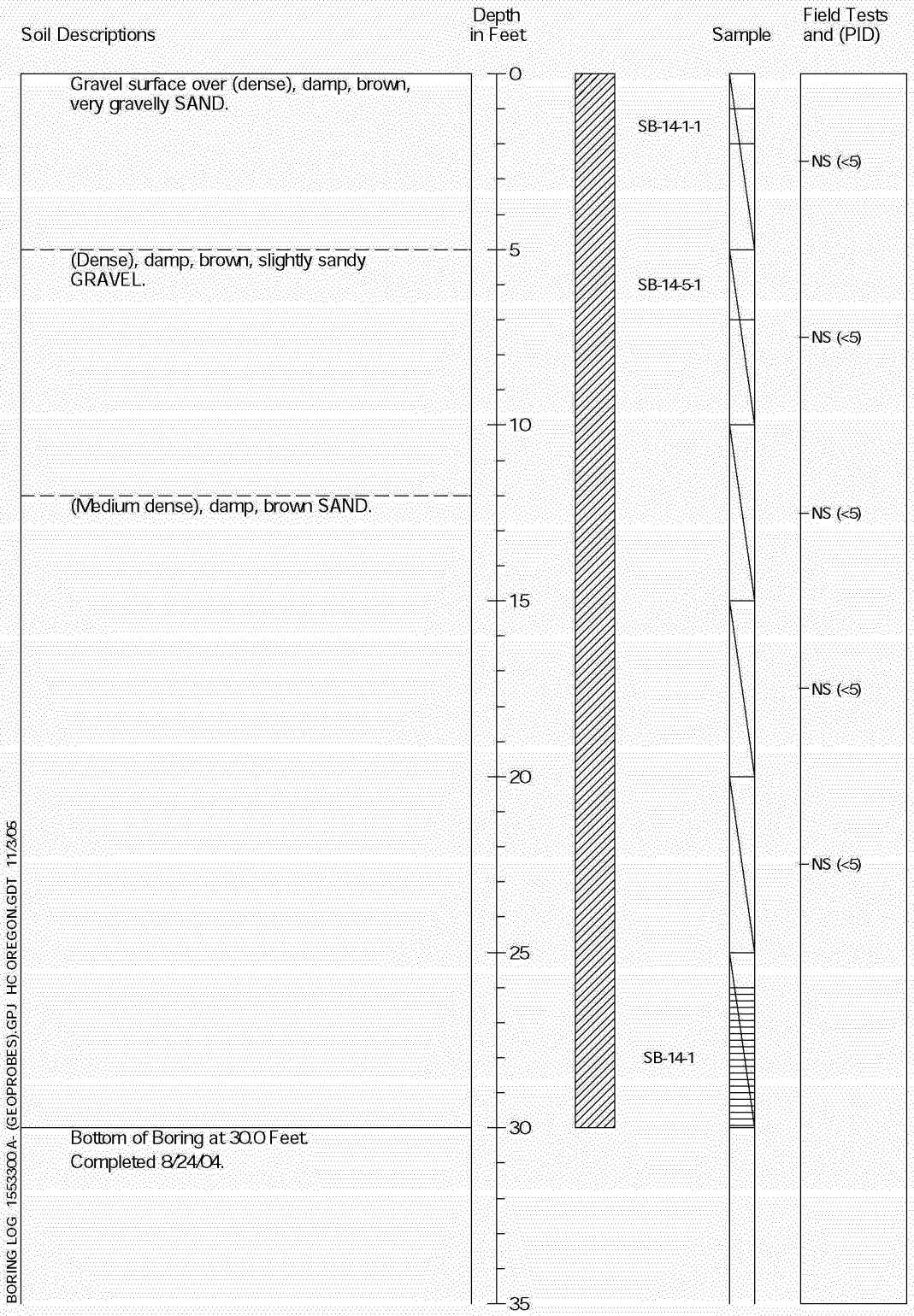
Figure A-5

Push Probe Exploration SB-14



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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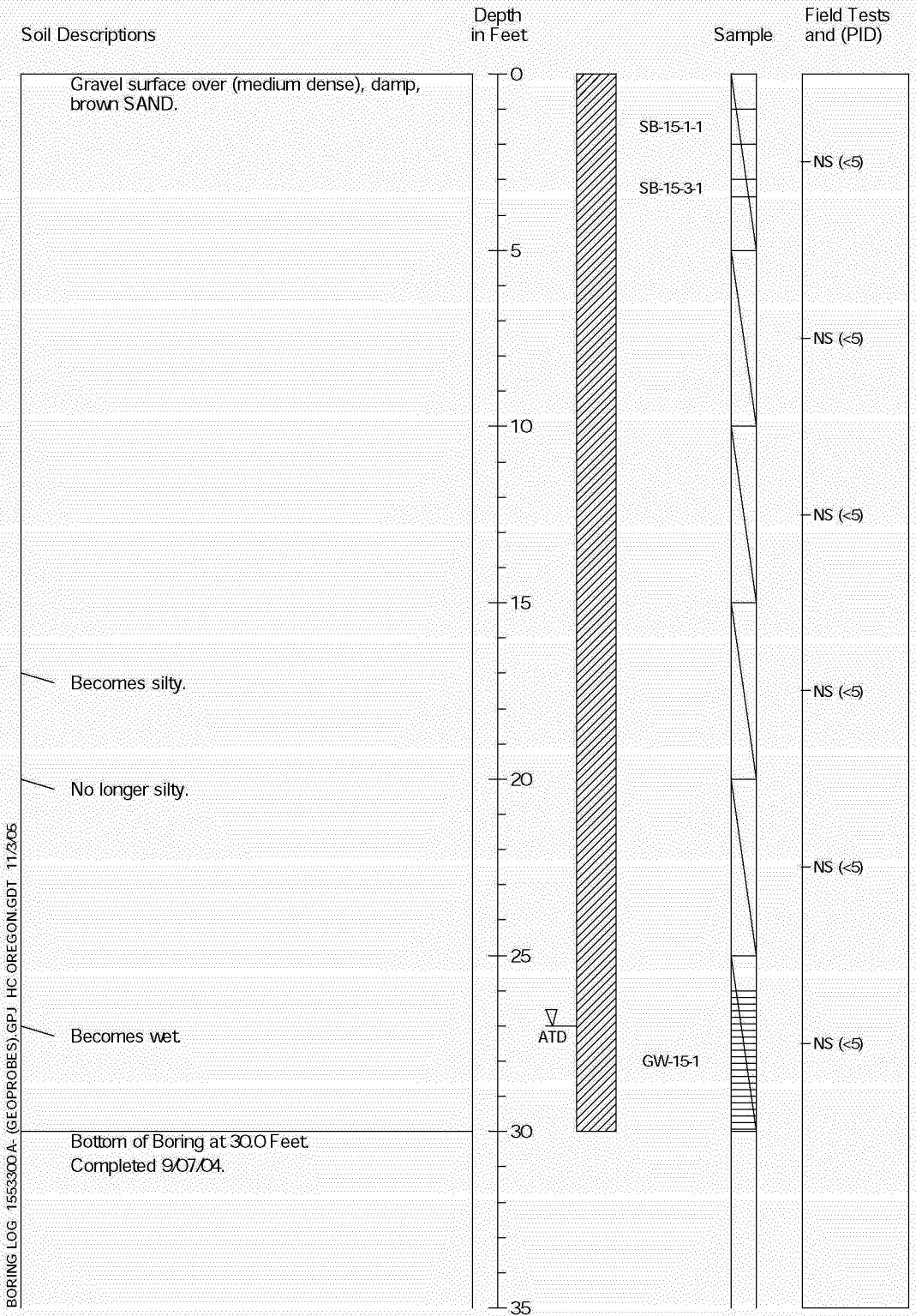
Figure A-6

Push Probe Exploration SB-15



BORING LOG 1553300 A- (GEOPROBES).GPJ HC OREGON.GDT 11/3/05

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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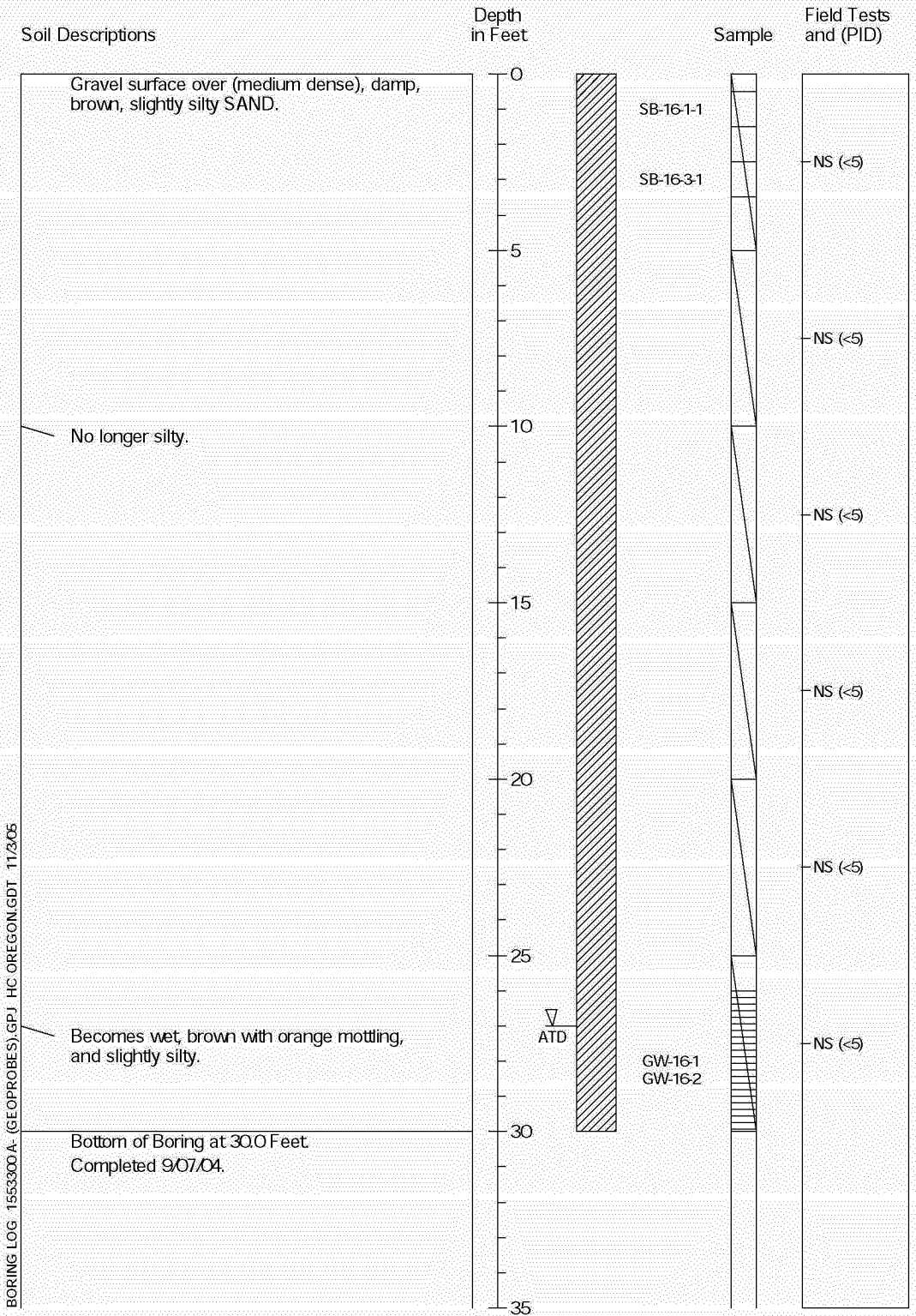
Figure A-7

Push Probe Exploration SB-16



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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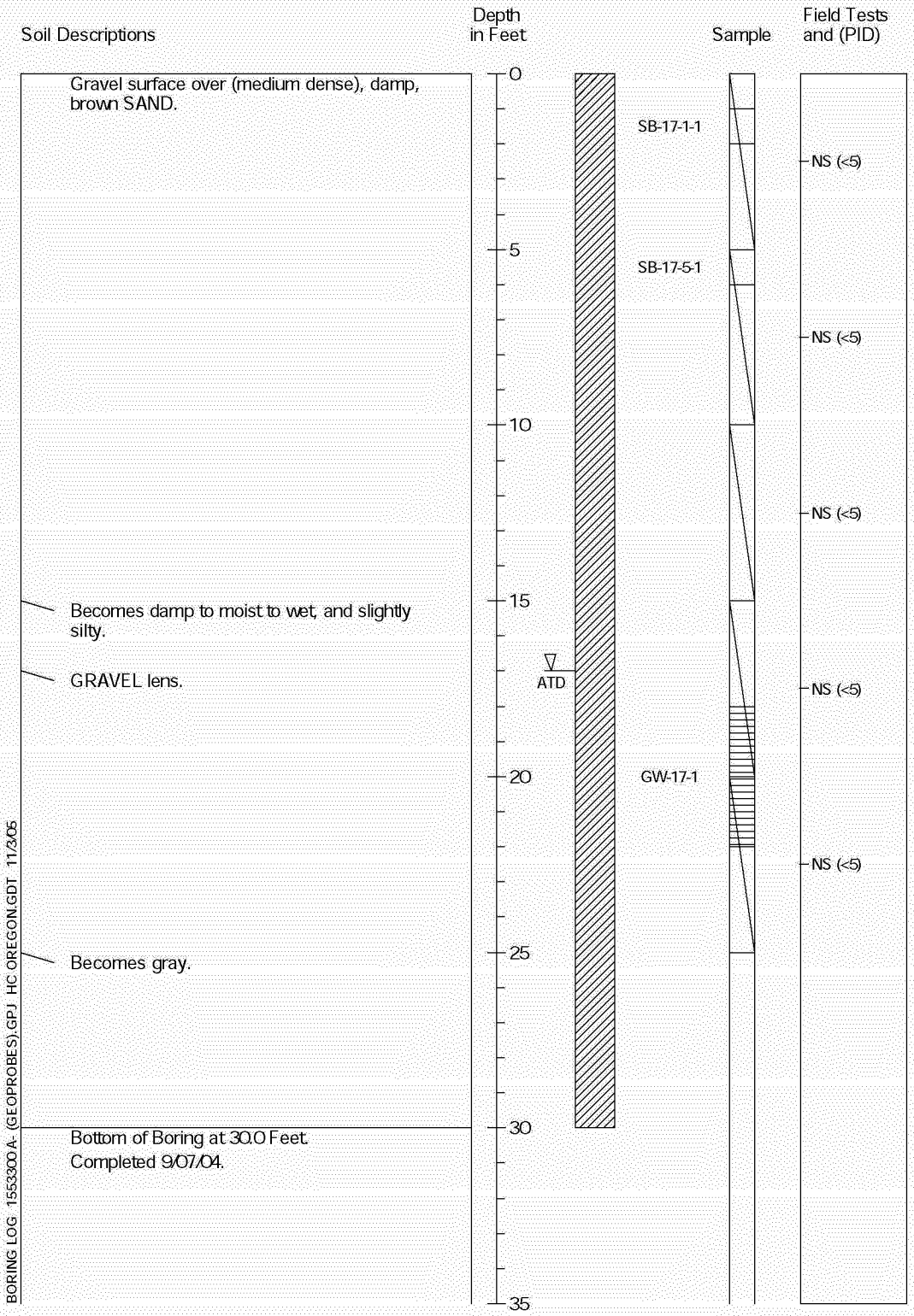
15533-00 *9/04*

Figure A-8

Push Probe Exploration SB-17



BORING LOG 15533000 A- (GEOPROBES).GPJ HC OREGON.GDT 11/3/05

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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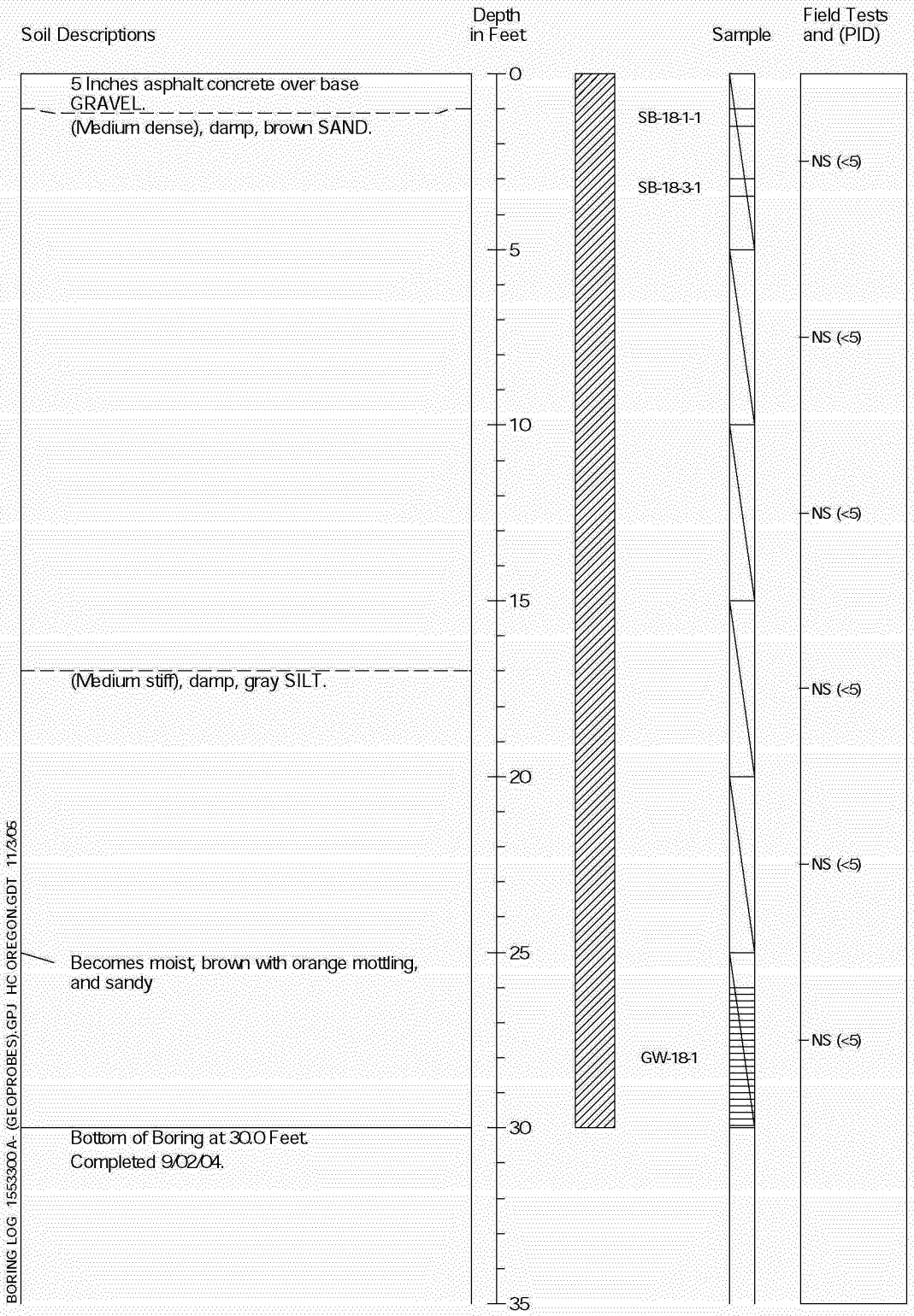
15533-00 *9/04*

Figure A-9

Push Probe Exploration SB-18



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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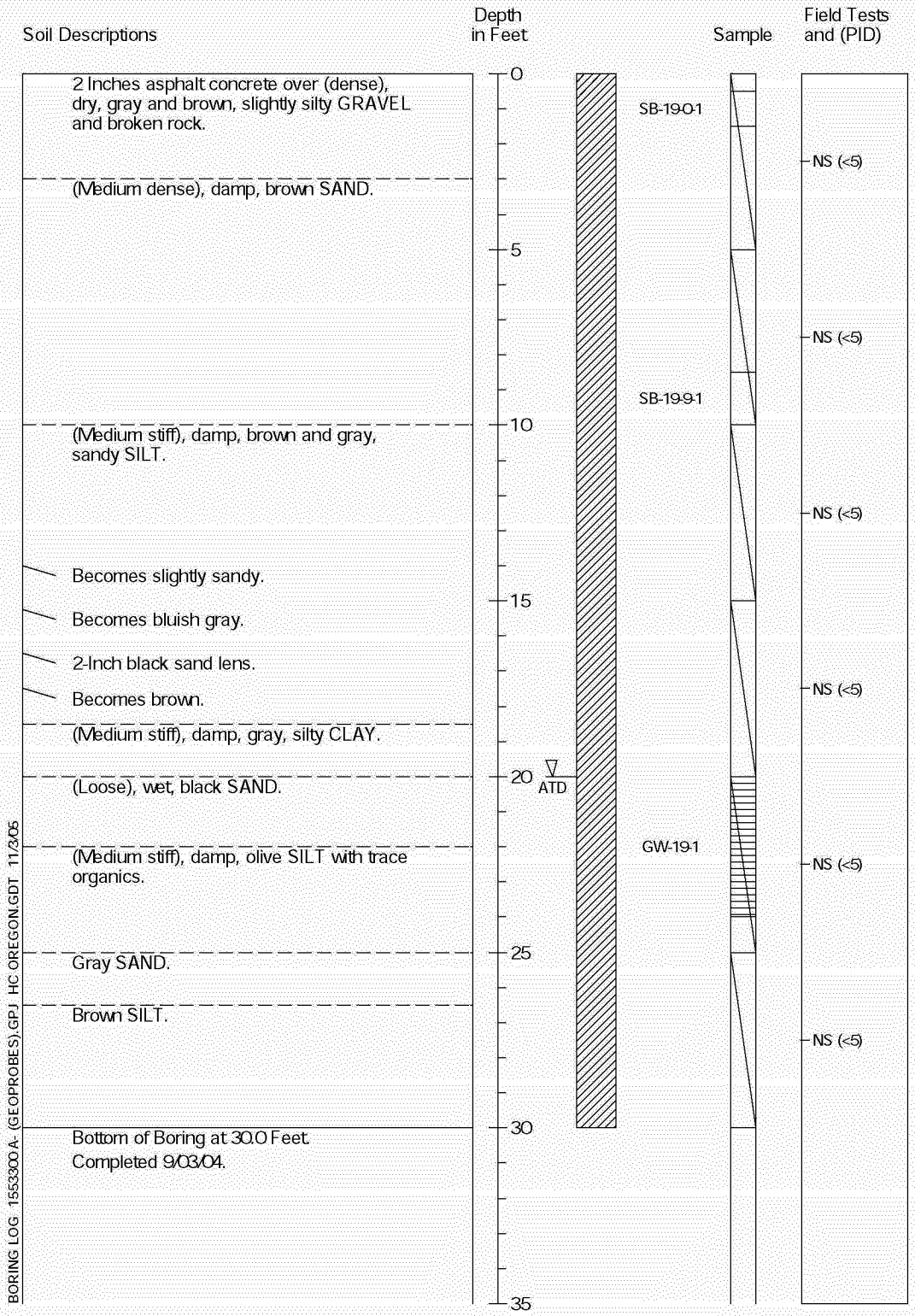
Figure A-10

Push Probe Exploration SB-19



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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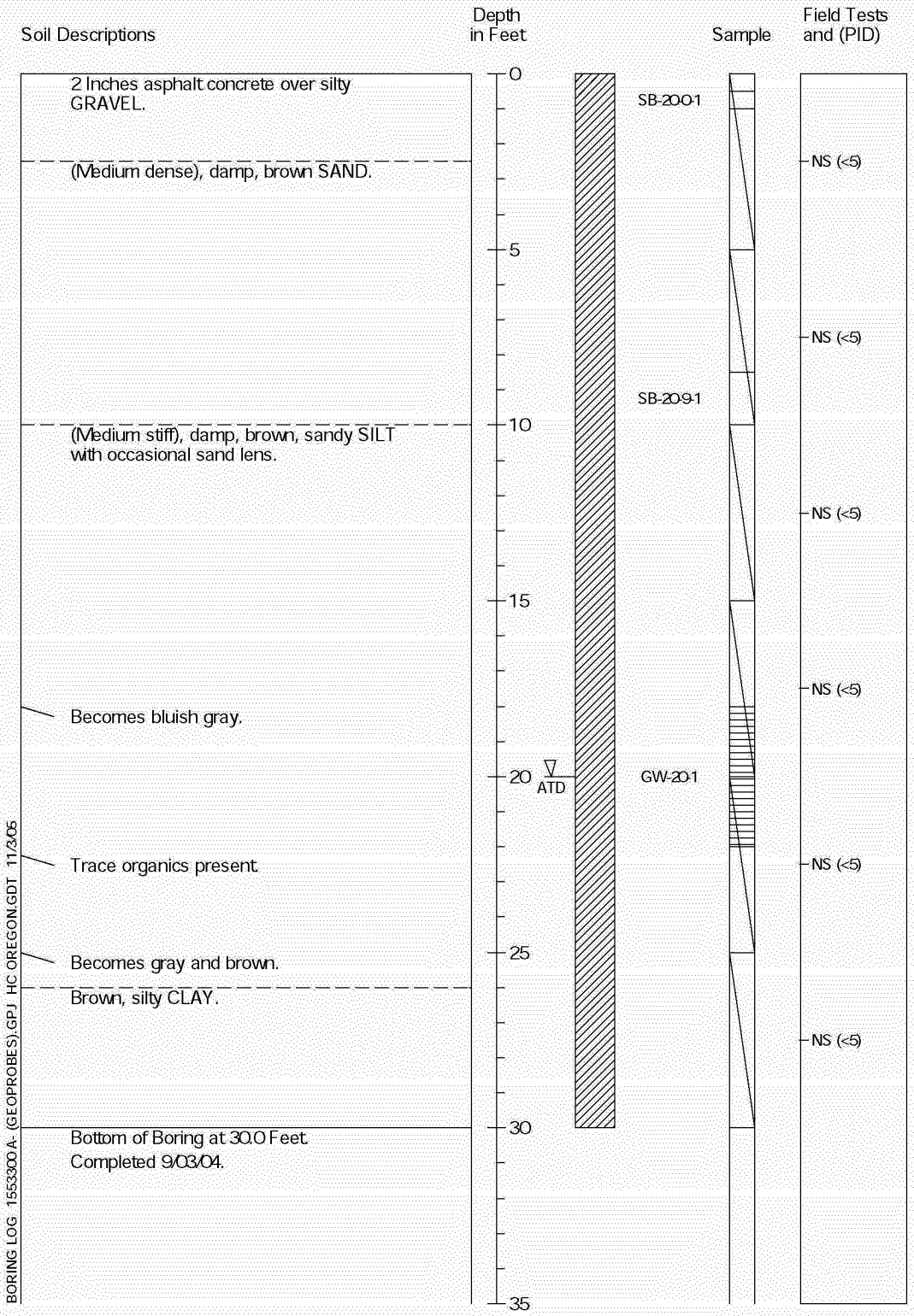
Figure A-11

Push Probe Exploration SB-20



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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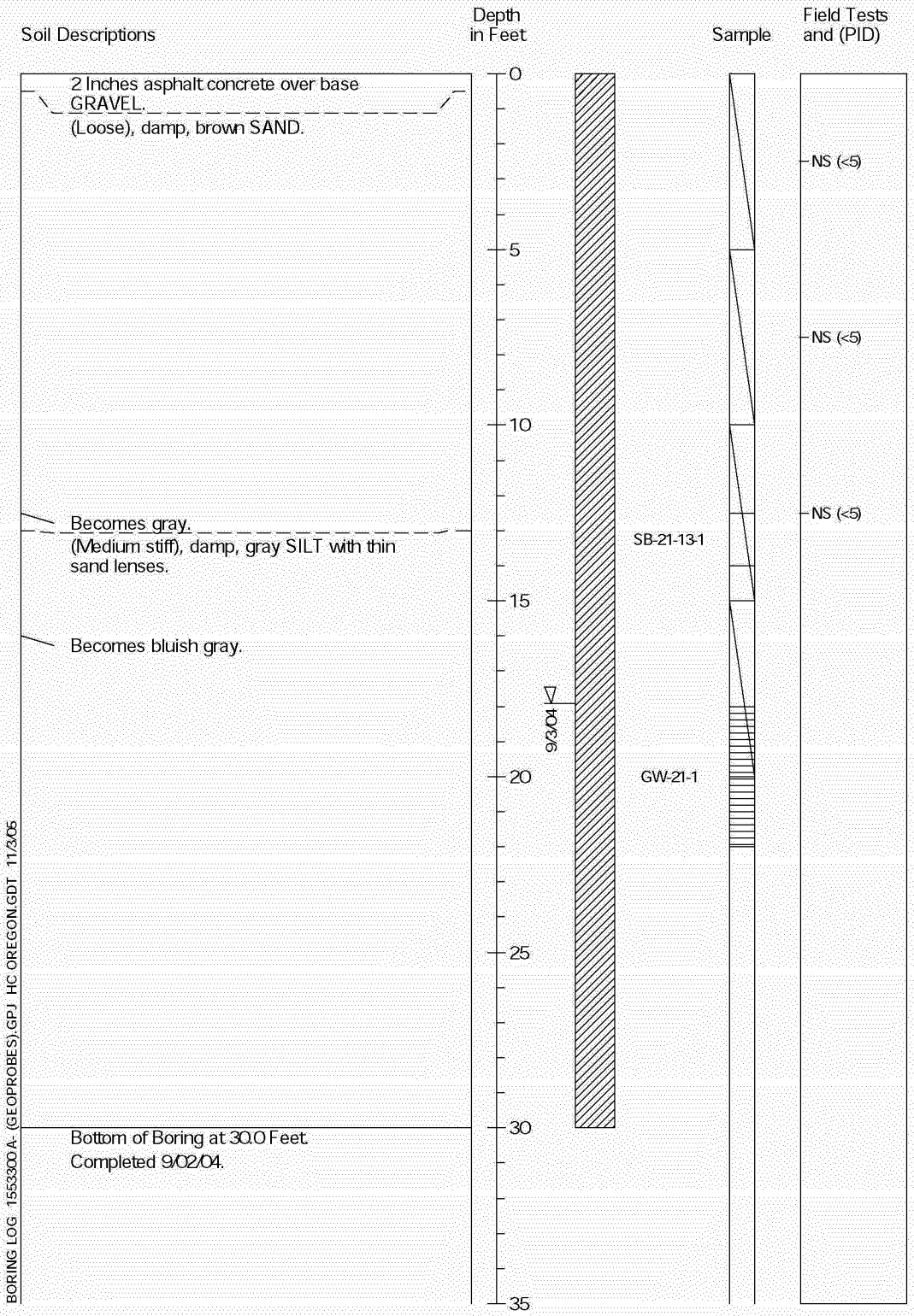
Figure A-12

Push Probe Exploration SB-21



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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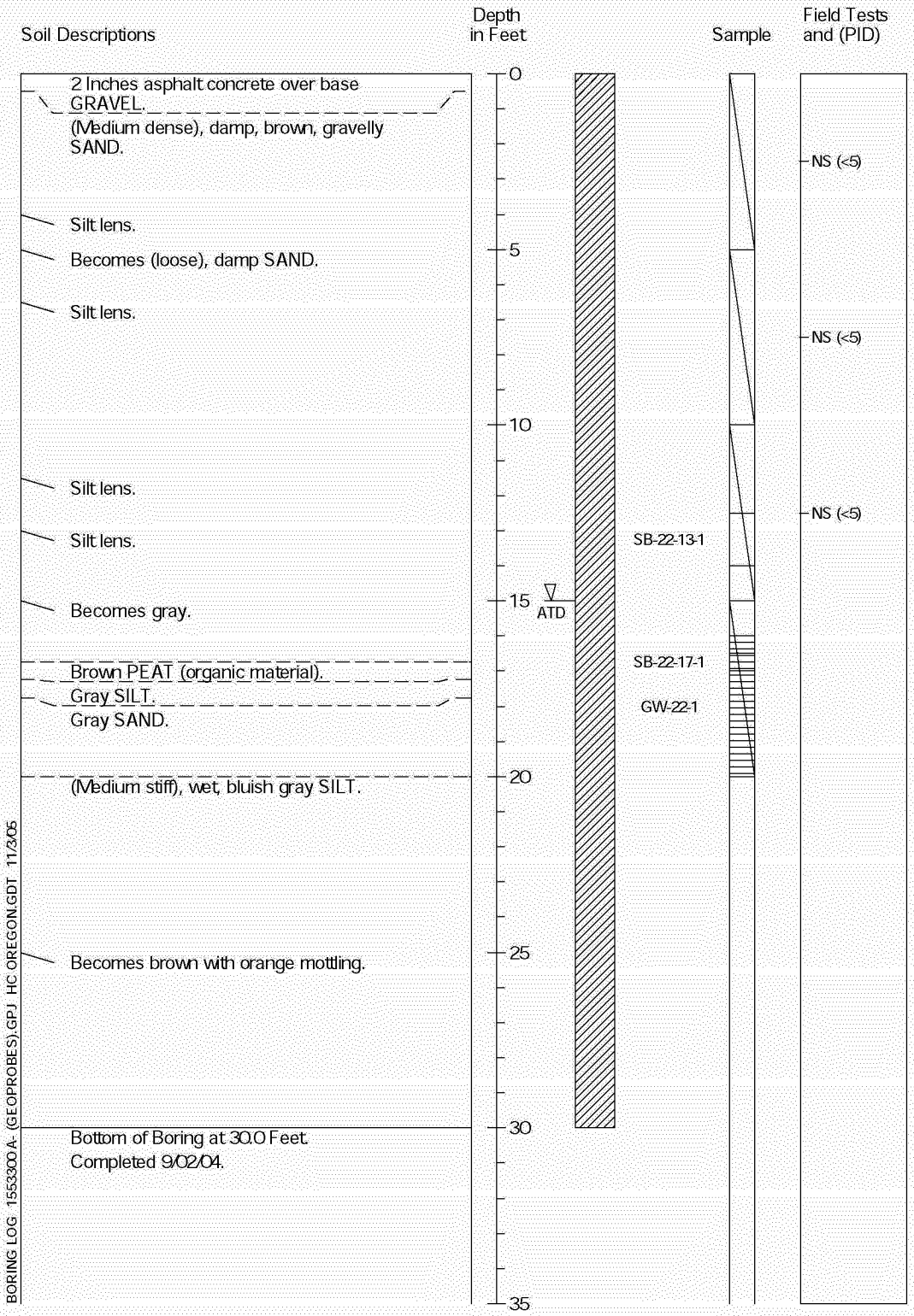
Figure A-13

Push Probe Exploration SB-22



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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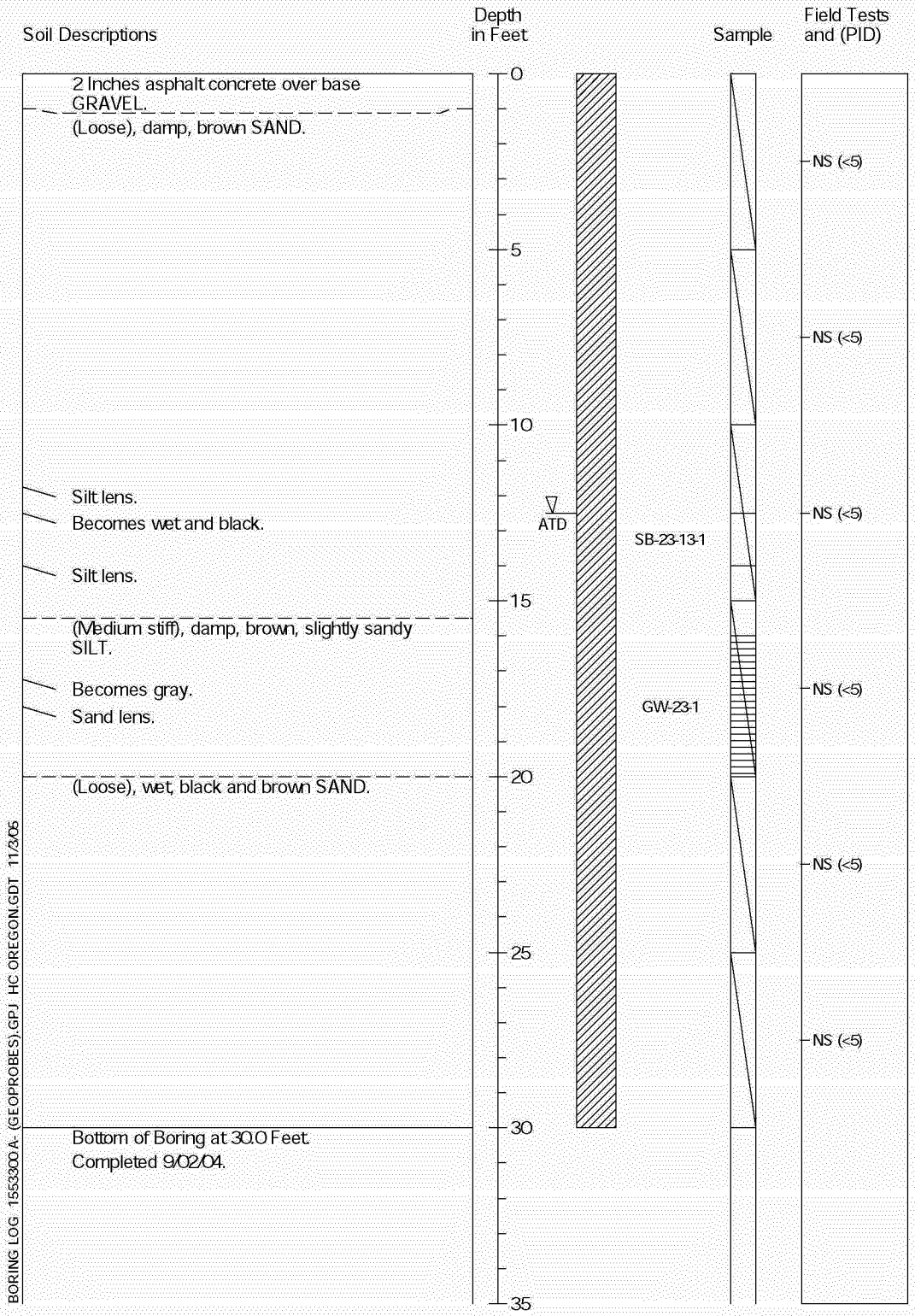
15533-00 *9/04*

Figure A-14

Push Probe Exploration SB-23



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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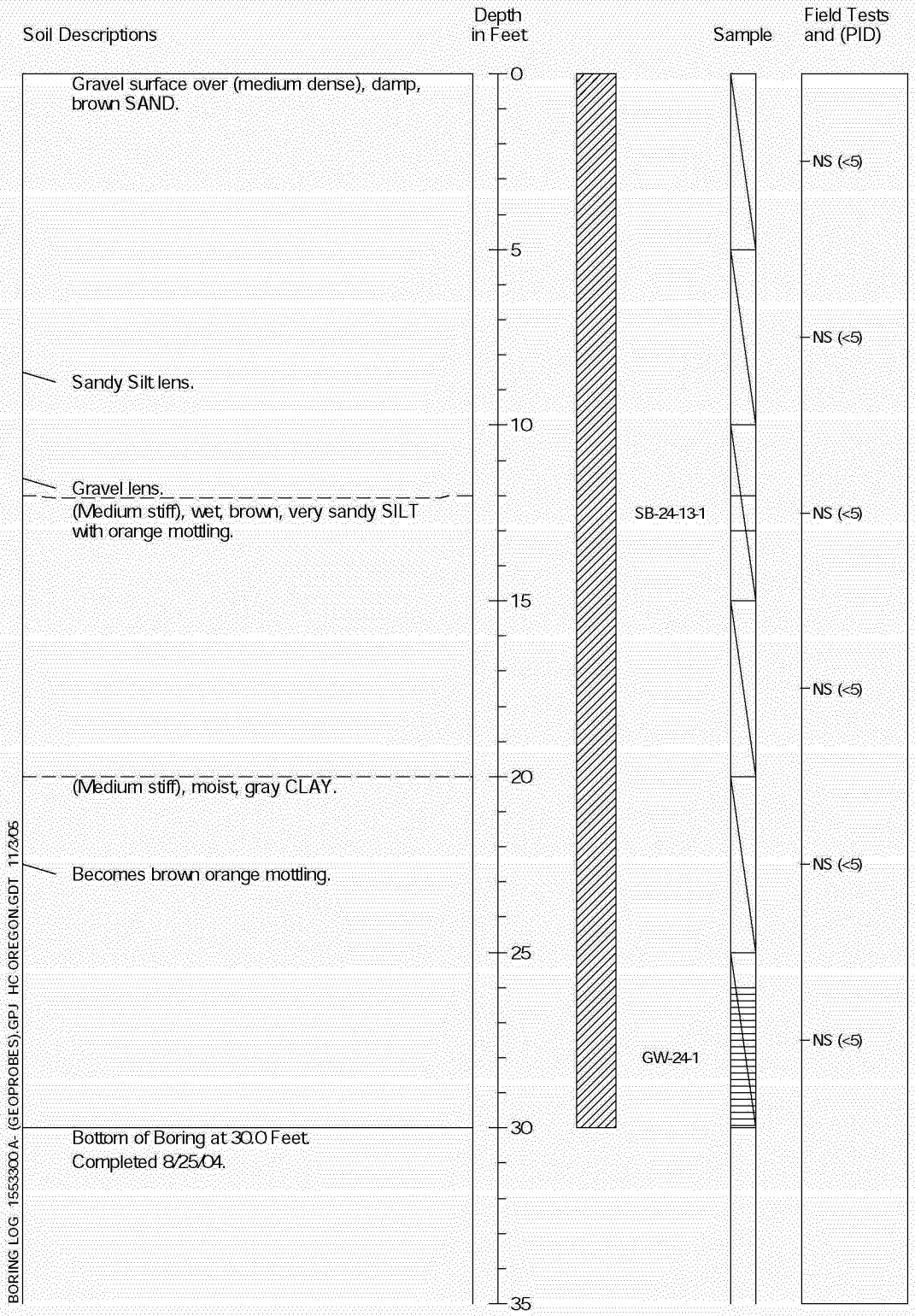
15533-00 *9/04*

Figure A-15

Push Probe Exploration SB-24



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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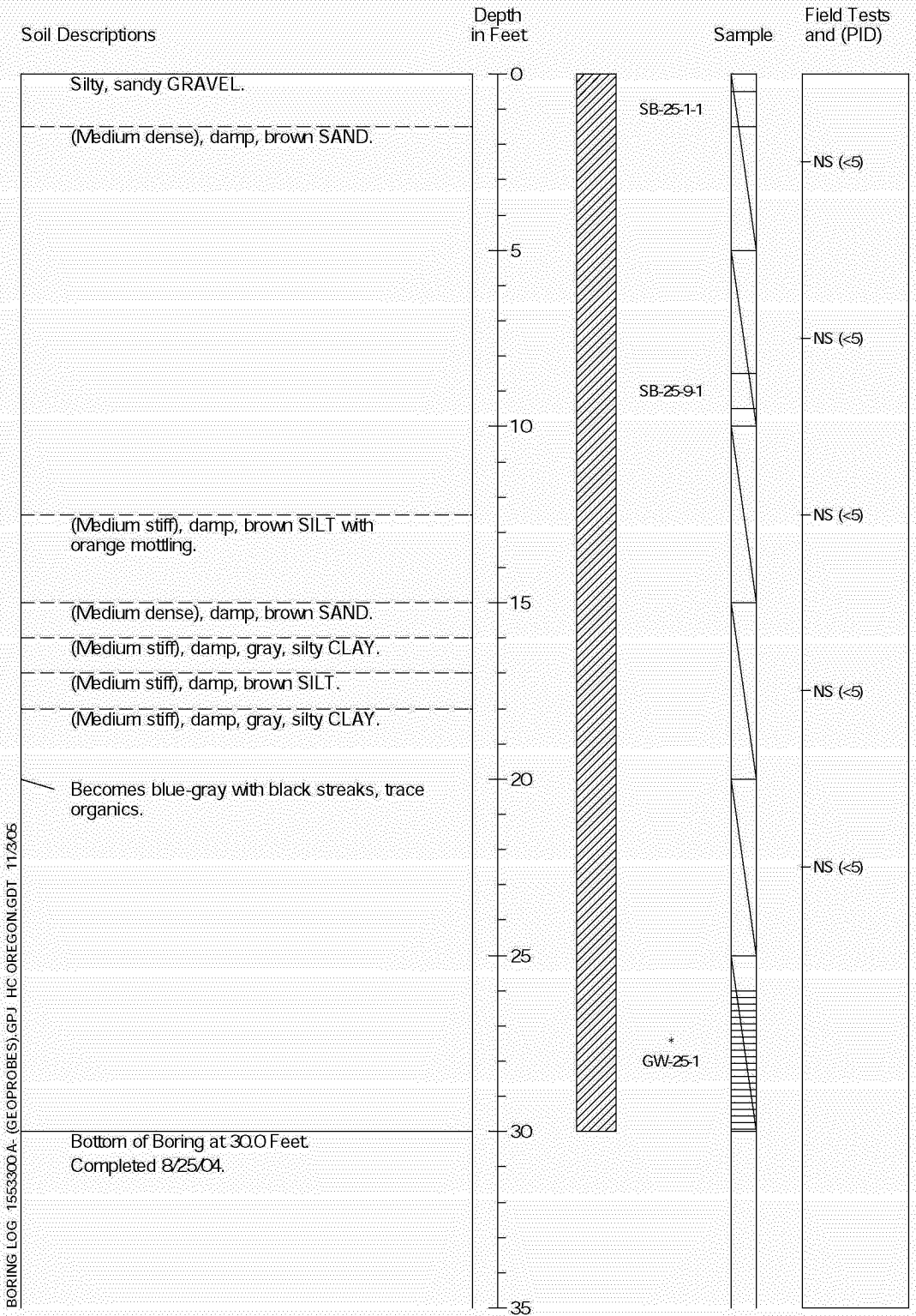
15533-00 *8/04*

Figure A-16

Push Probe Exploration SB-25



BORING LOG 15533000.A (GEOPROBES).GPJ HC OREGON.GDT 11/3/05

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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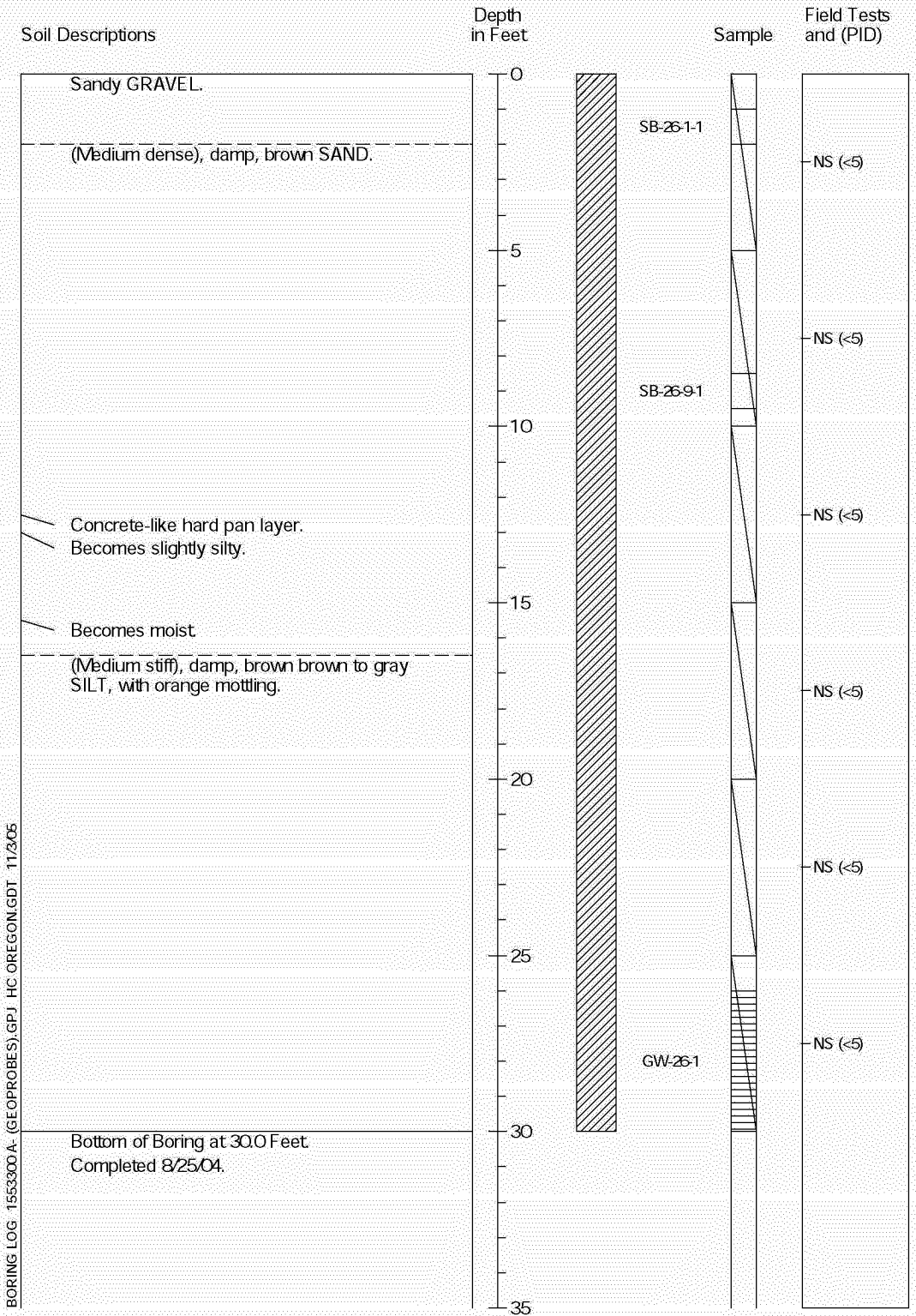
15533-00 *8/04*

Figure A-17

Push Probe Exploration SB-26



BORING LOG 15533000.A (GEOPROBES).GPJ HC OREGON.GDT 11/3/05

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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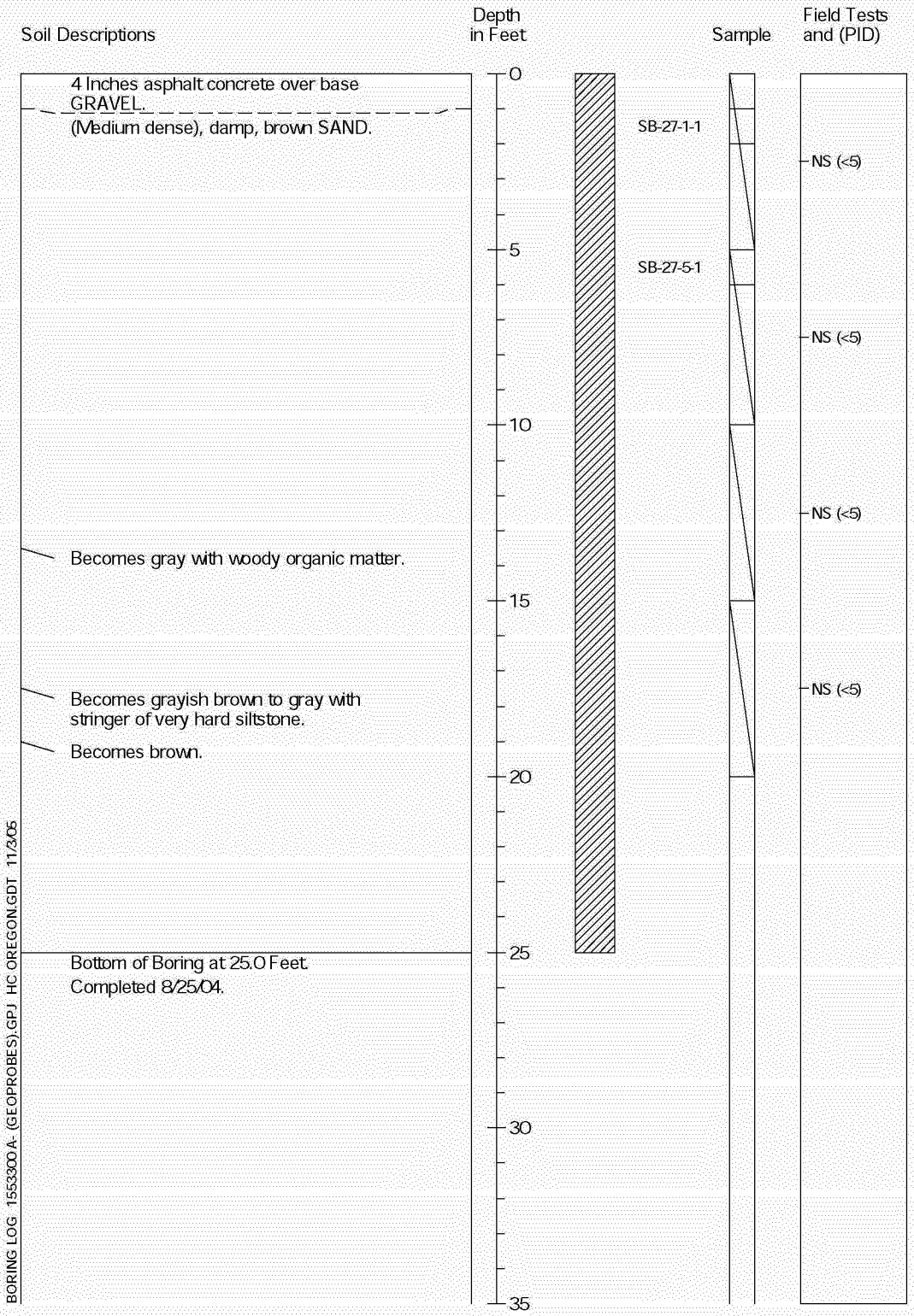
15533-00 *8/04*

Figure A-18

Push Probe Exploration SB-27



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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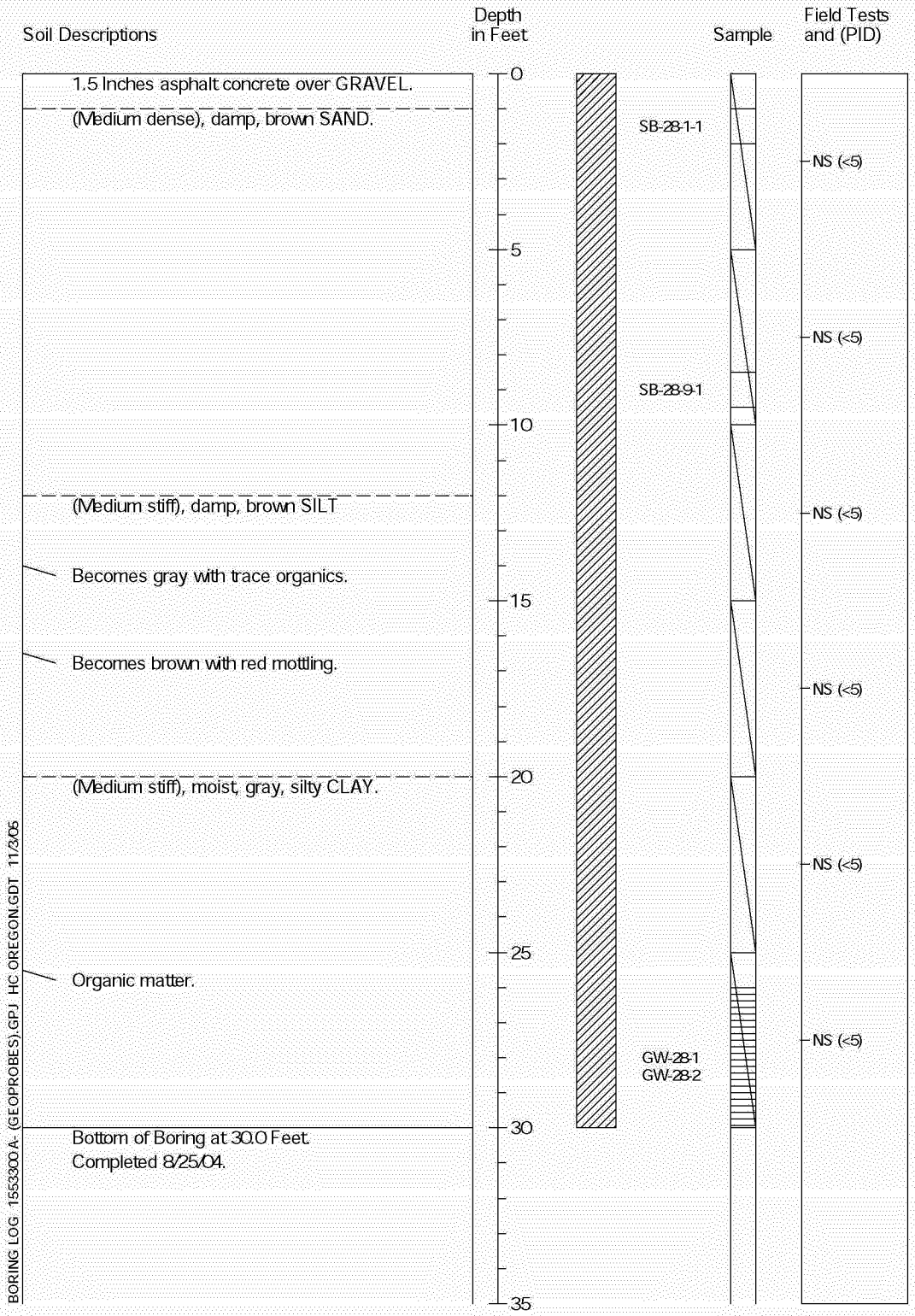
Figure A-19

Push Probe Exploration SB-28



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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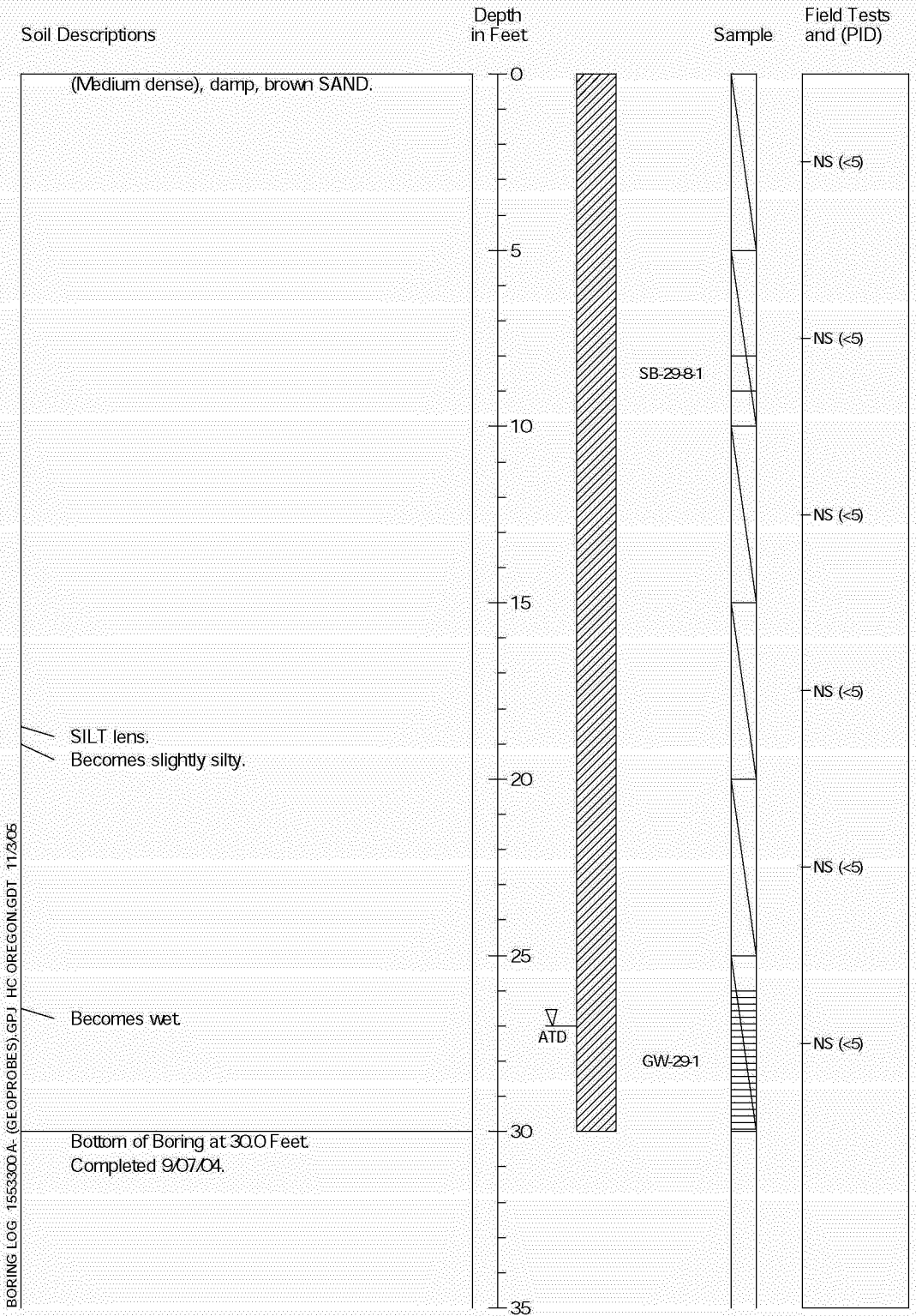
15533-00 *8/04*

Figure A-20

Push Probe Exploration SB-29



BORING LOG 15533000 A- (GEOPROBES).GPJ HC OREGON.GDT 11/3/05

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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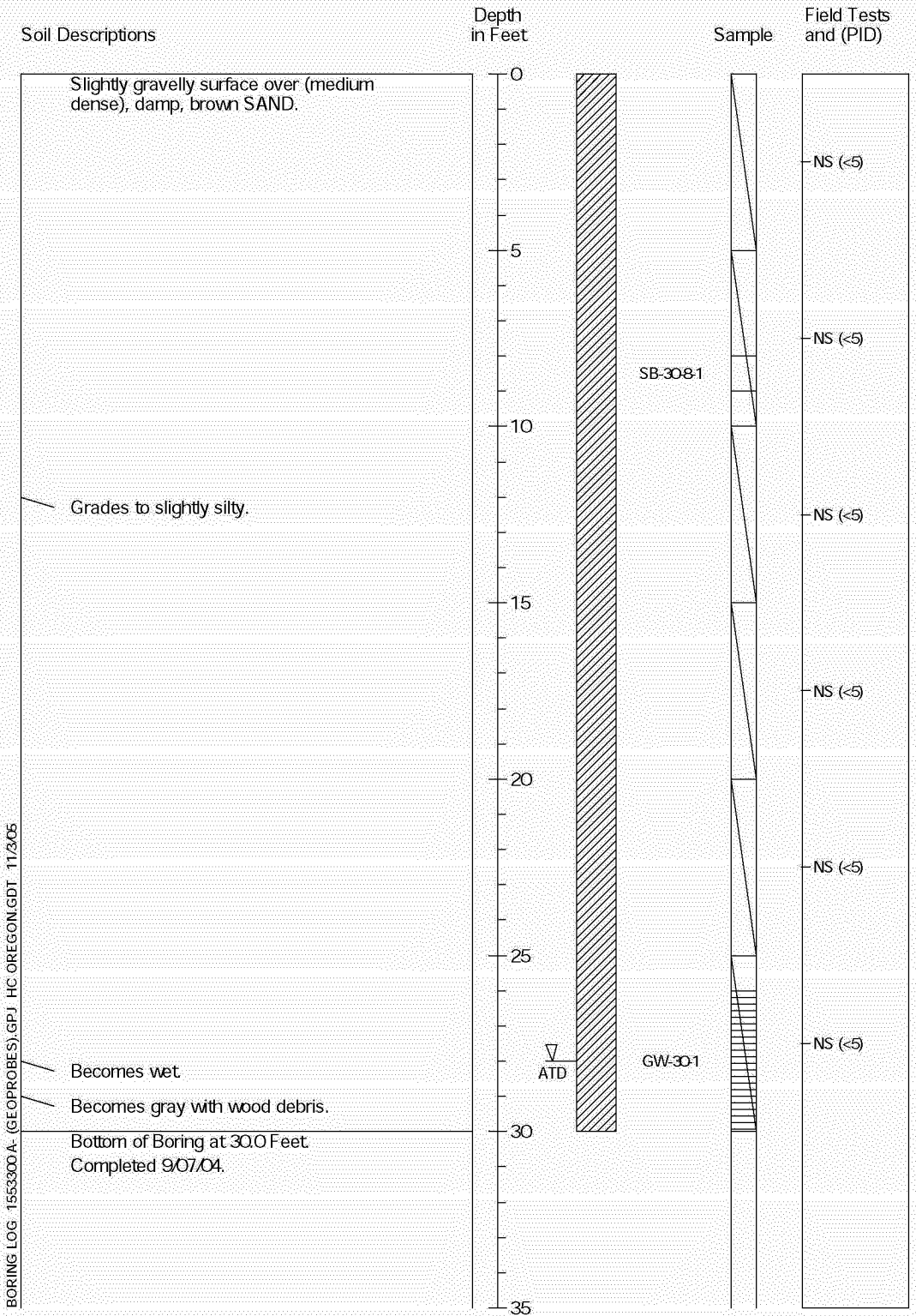
15533-00 *9/04*

Figure A-21

Push Probe Exploration SB-30



BORING LOG 15533000 A- (GEOPROBES).GPJ HC OREGON.GDT 11/3/05

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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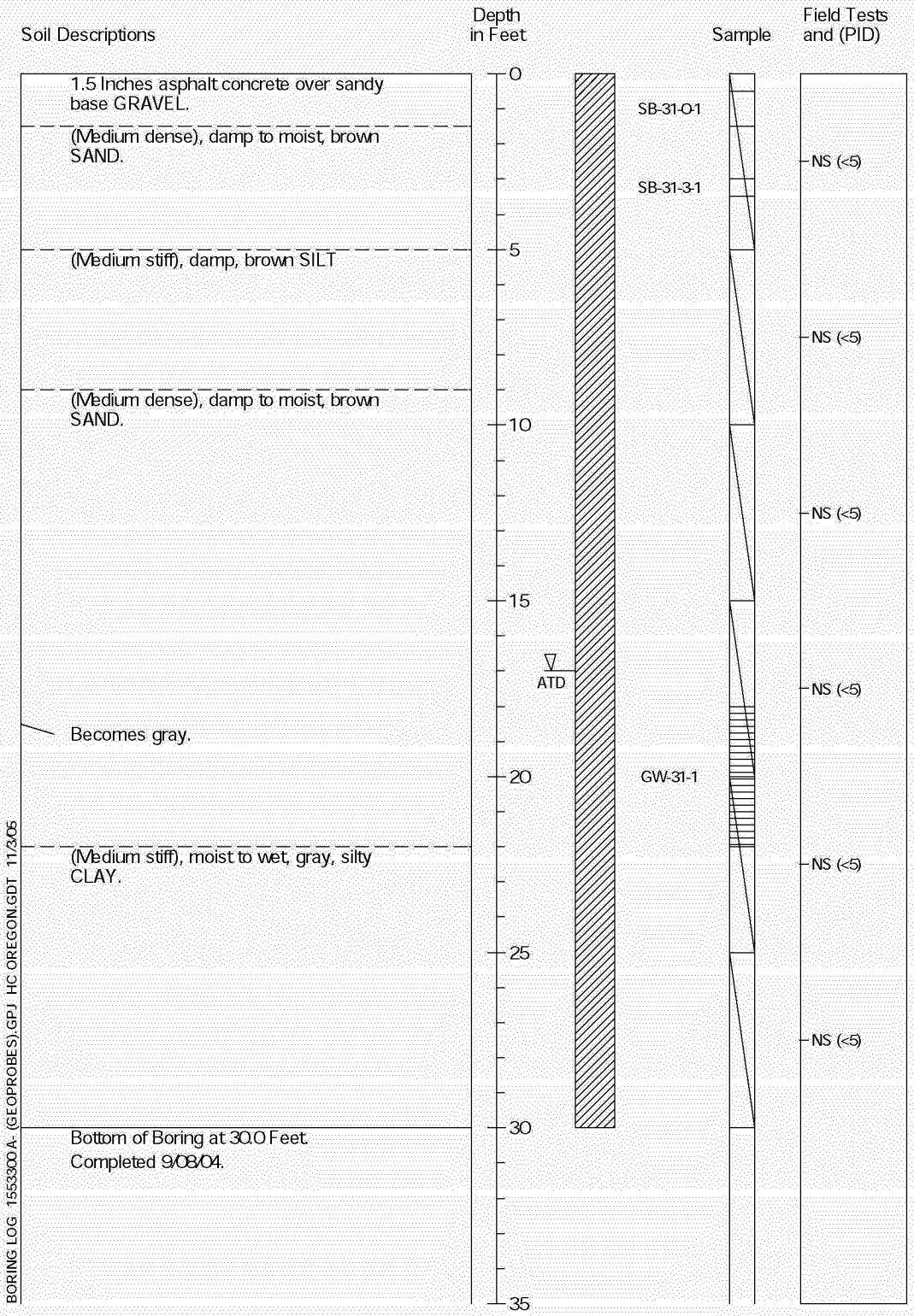
15533-00 *9/04*

Figure A-22

Push Probe Exploration SB-31



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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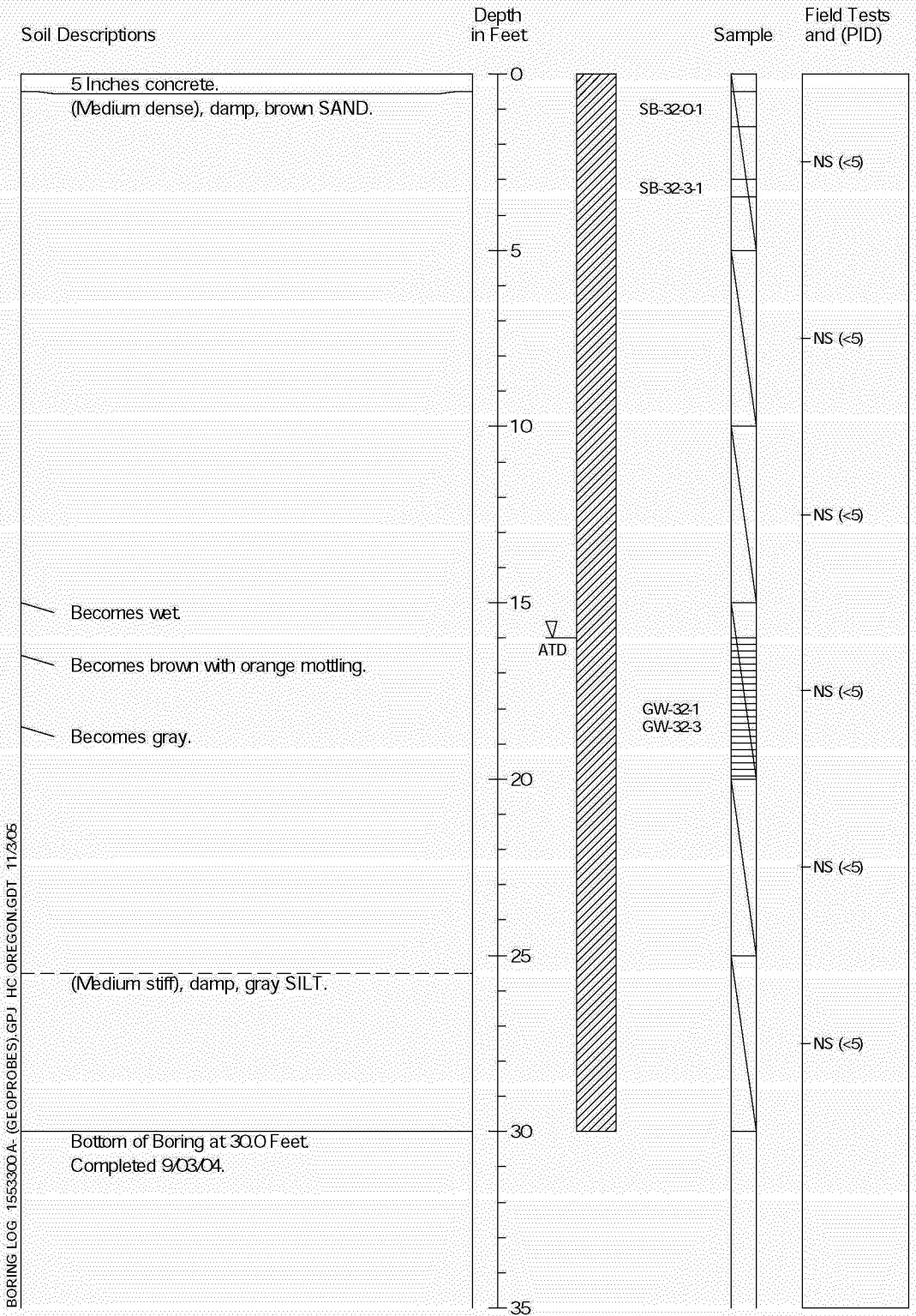
Figure A-23

Push Probe Exploration SB-32



BORING LOG 1553300 A- (GEOPROBES).GPJ HC OREGON.GDT 11/3/05

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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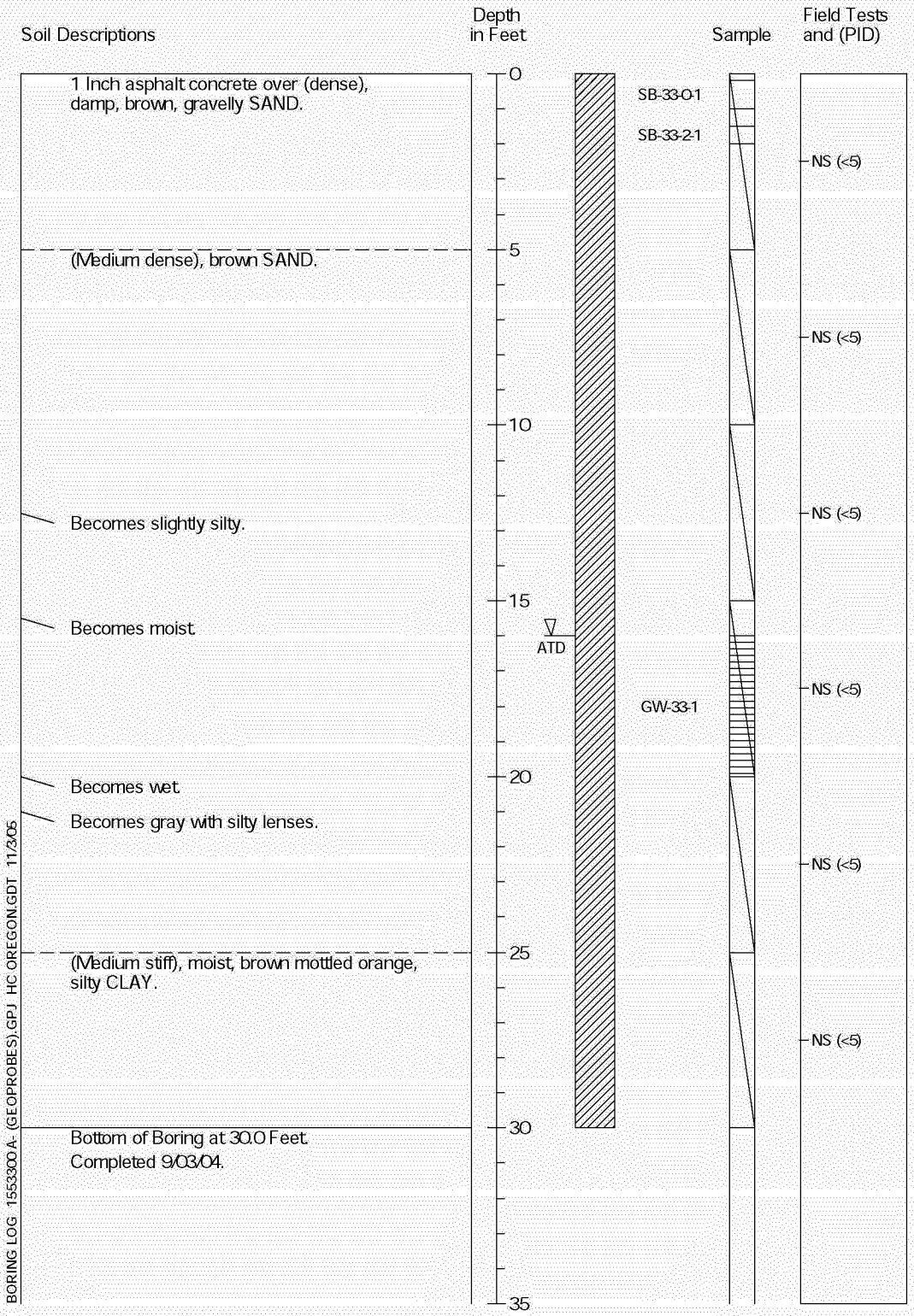
Figure A-24

Push Probe Exploration SB-33



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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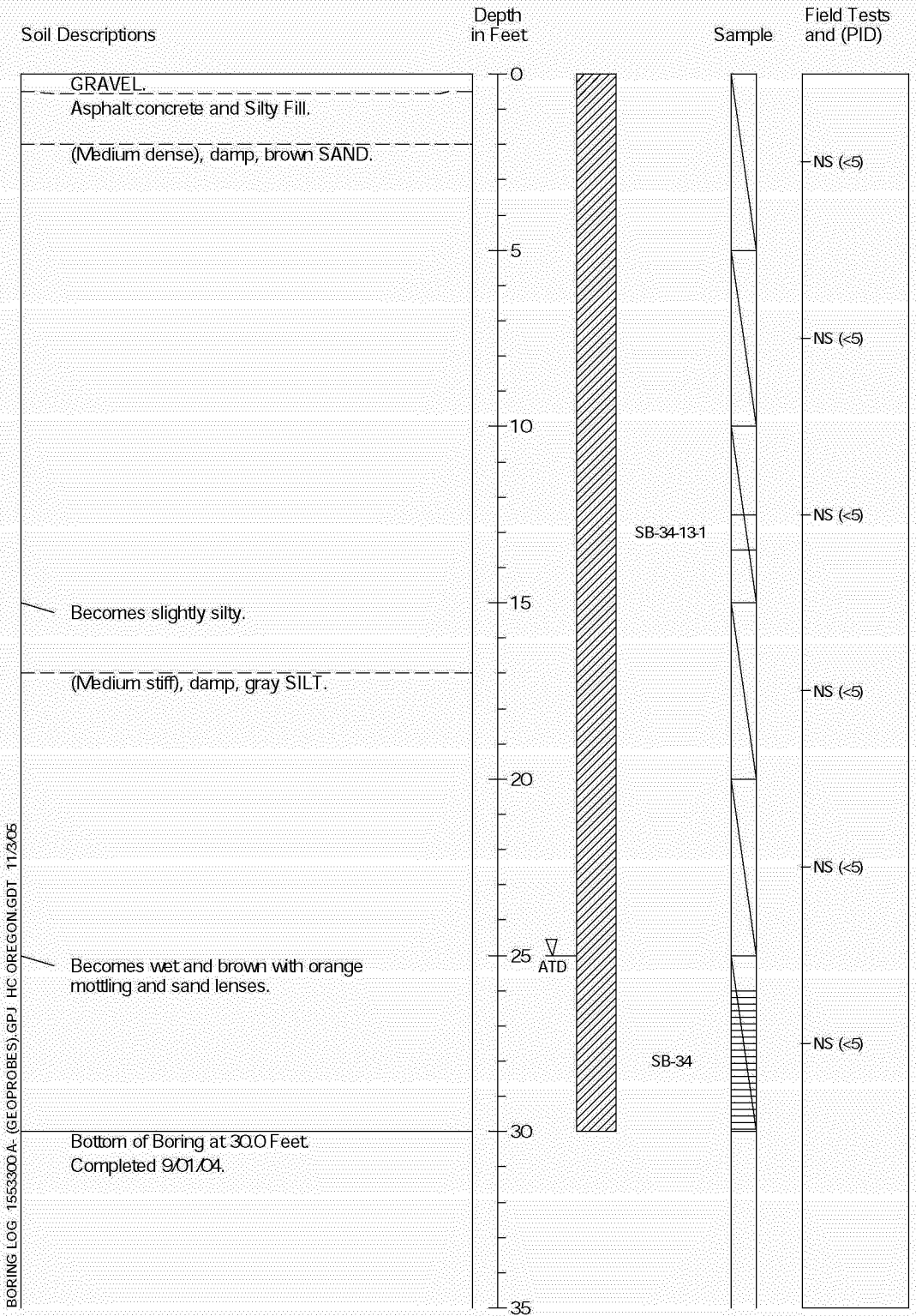
Figure A-25

Push Probe Exploration SB-34



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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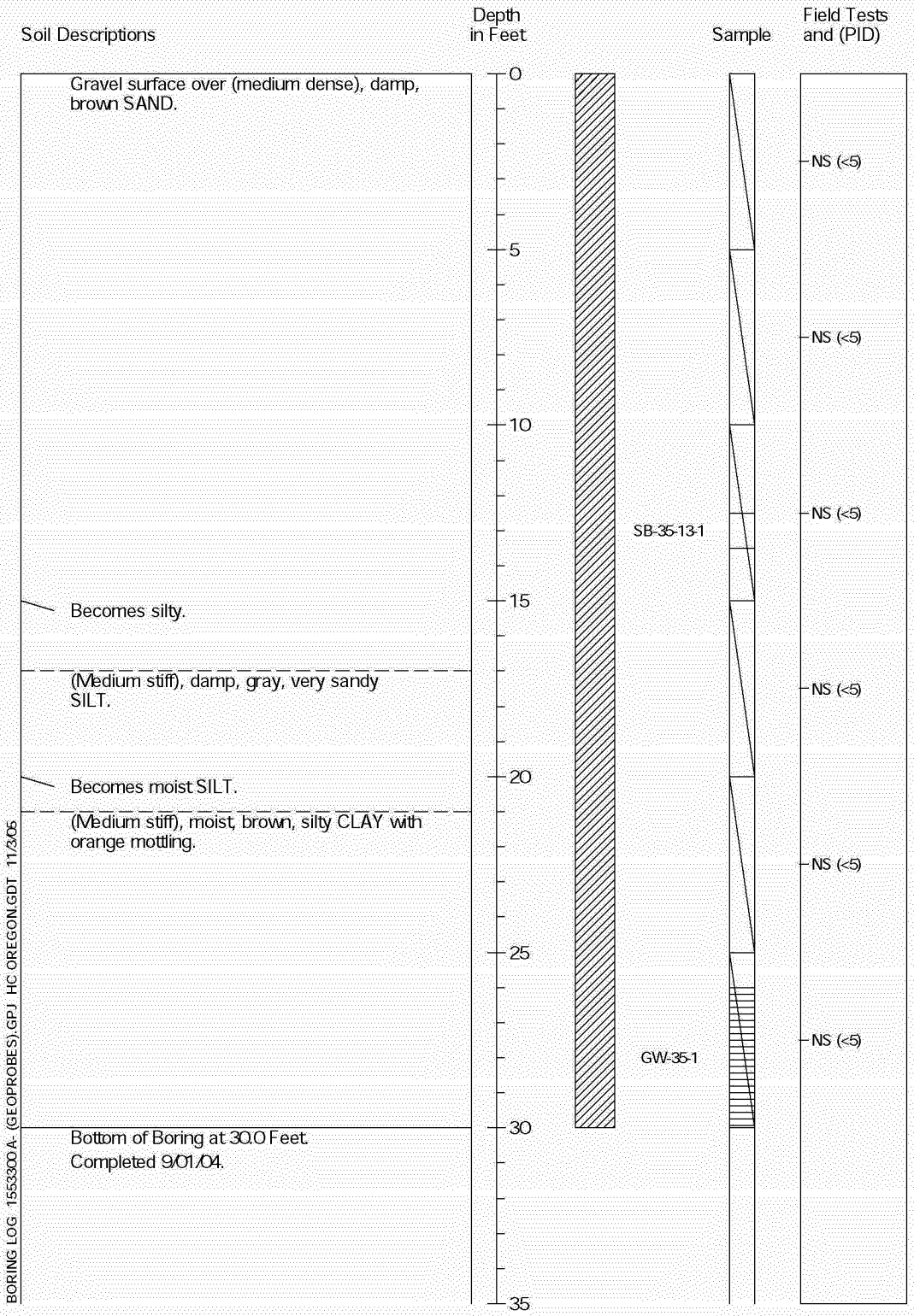
Figure A-26

Push Probe Exploration SB-35



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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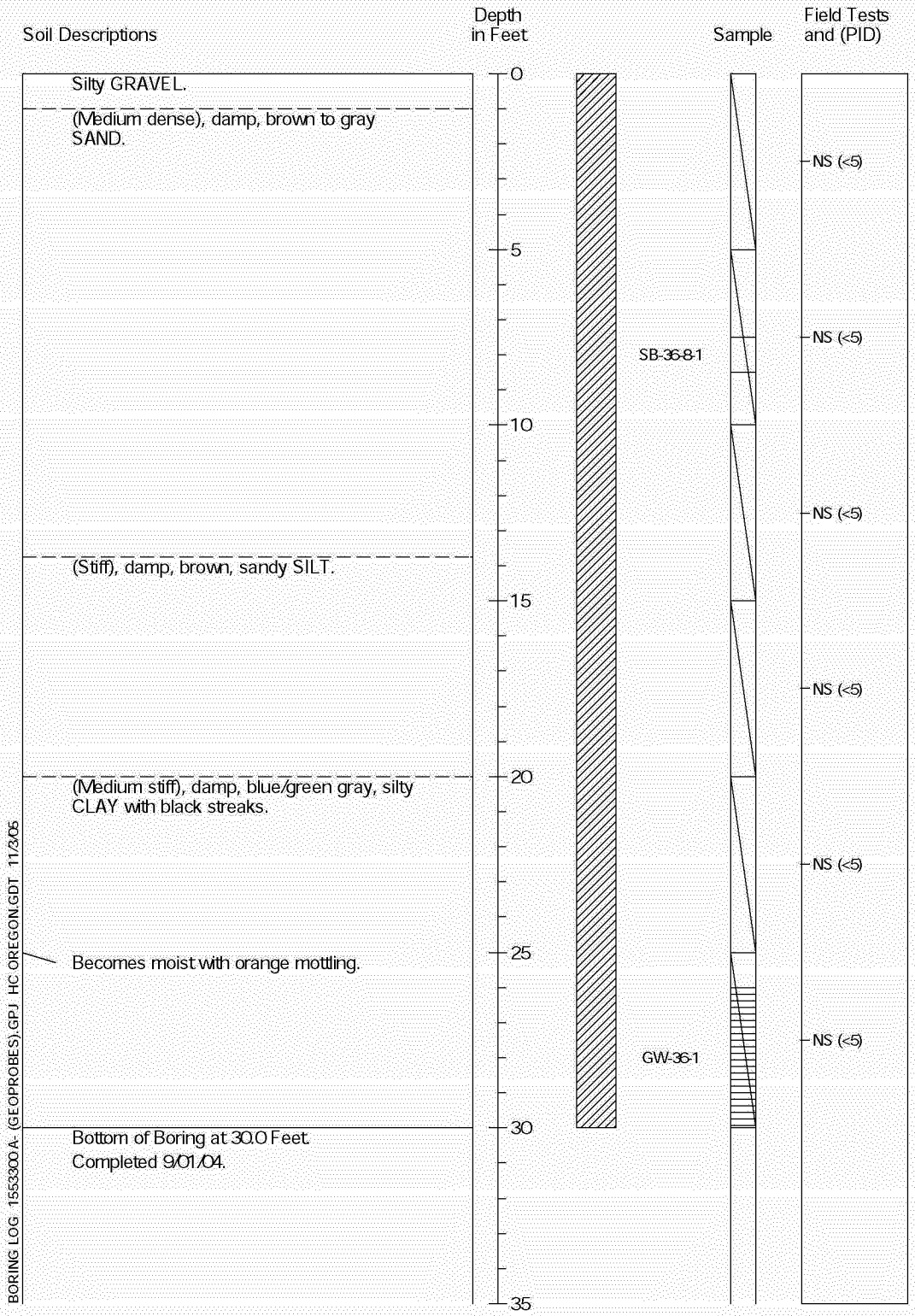
Figure A-27

Push Probe Exploration SB-36



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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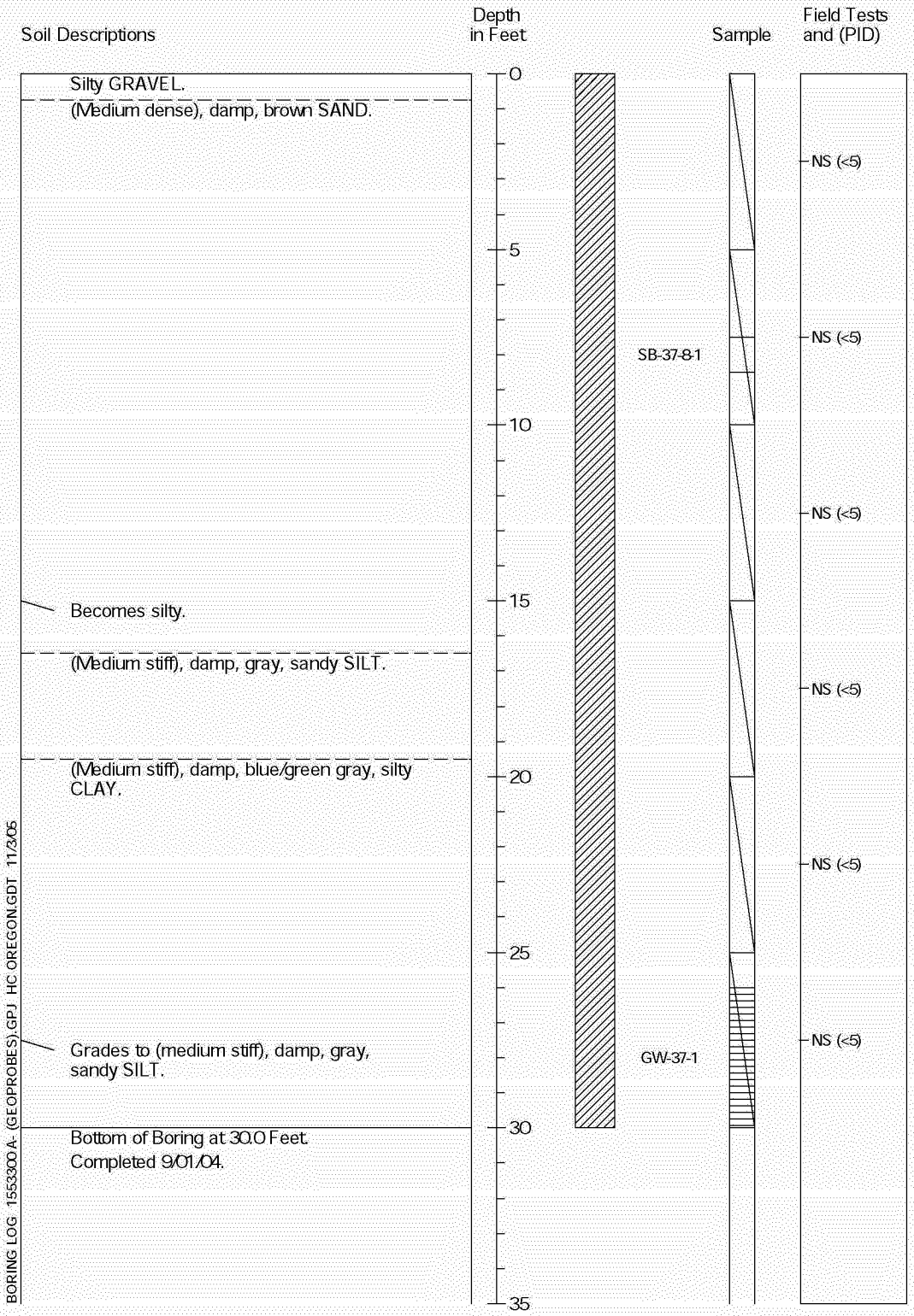
Figure A-28

Push Probe Exploration SB-37



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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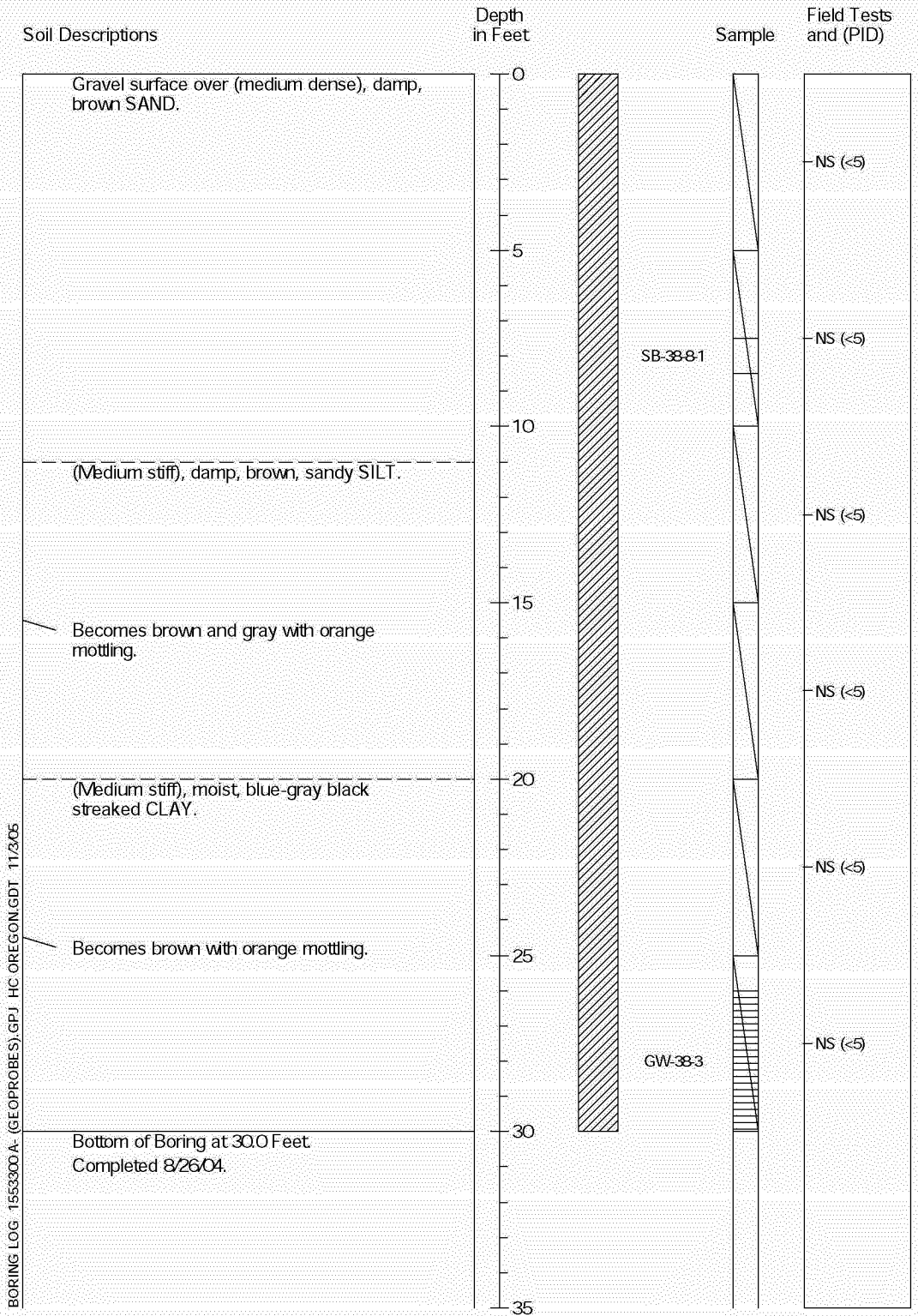
15533-00 *9/04*

Figure A-29

Push Probe Exploration SB-38



BORING LOG 1553300 A- (GEOPROBES).GPJ HC OREGON.GDT 11/3/05

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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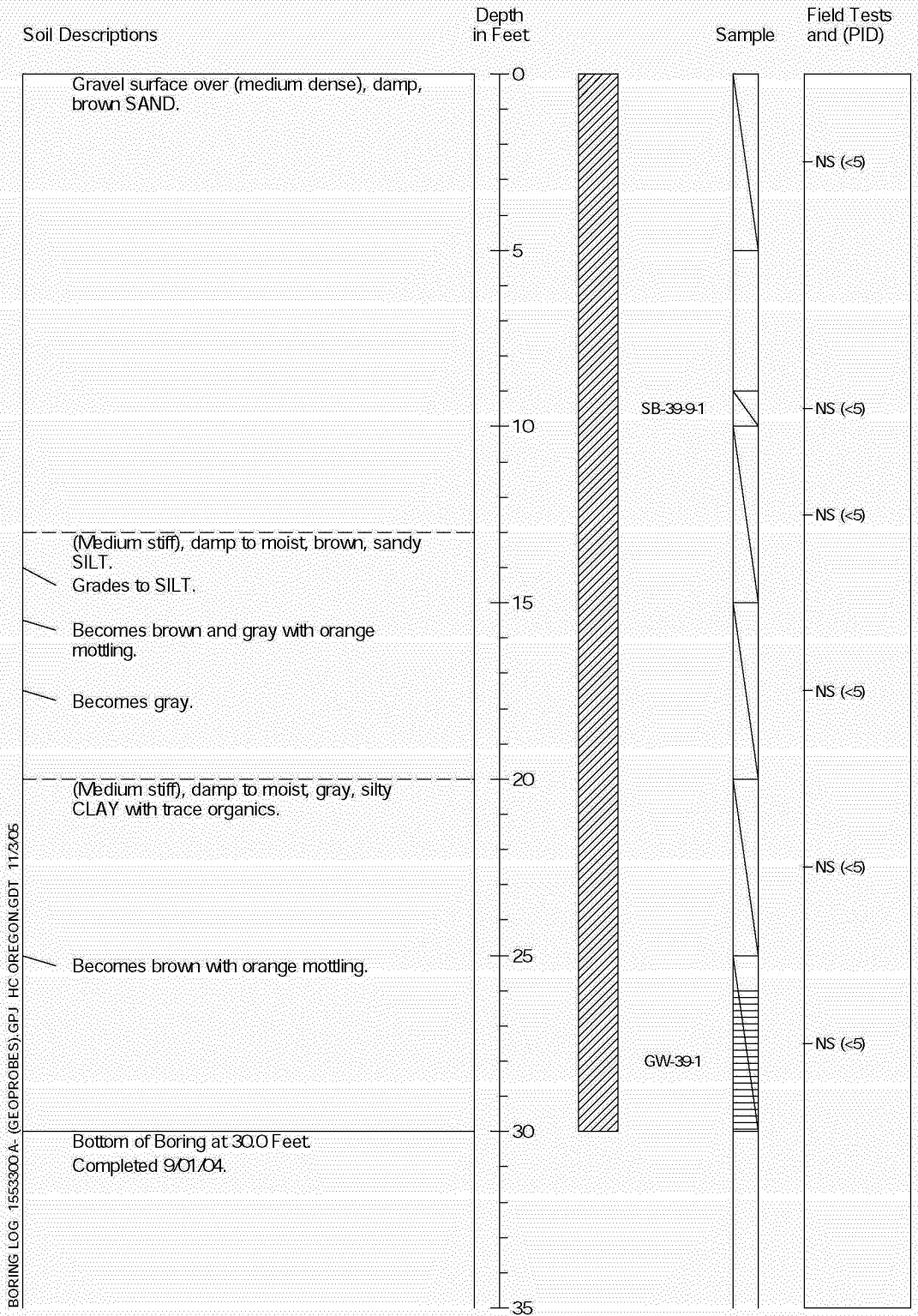
Figure A-30

Push Probe Exploration SB-39



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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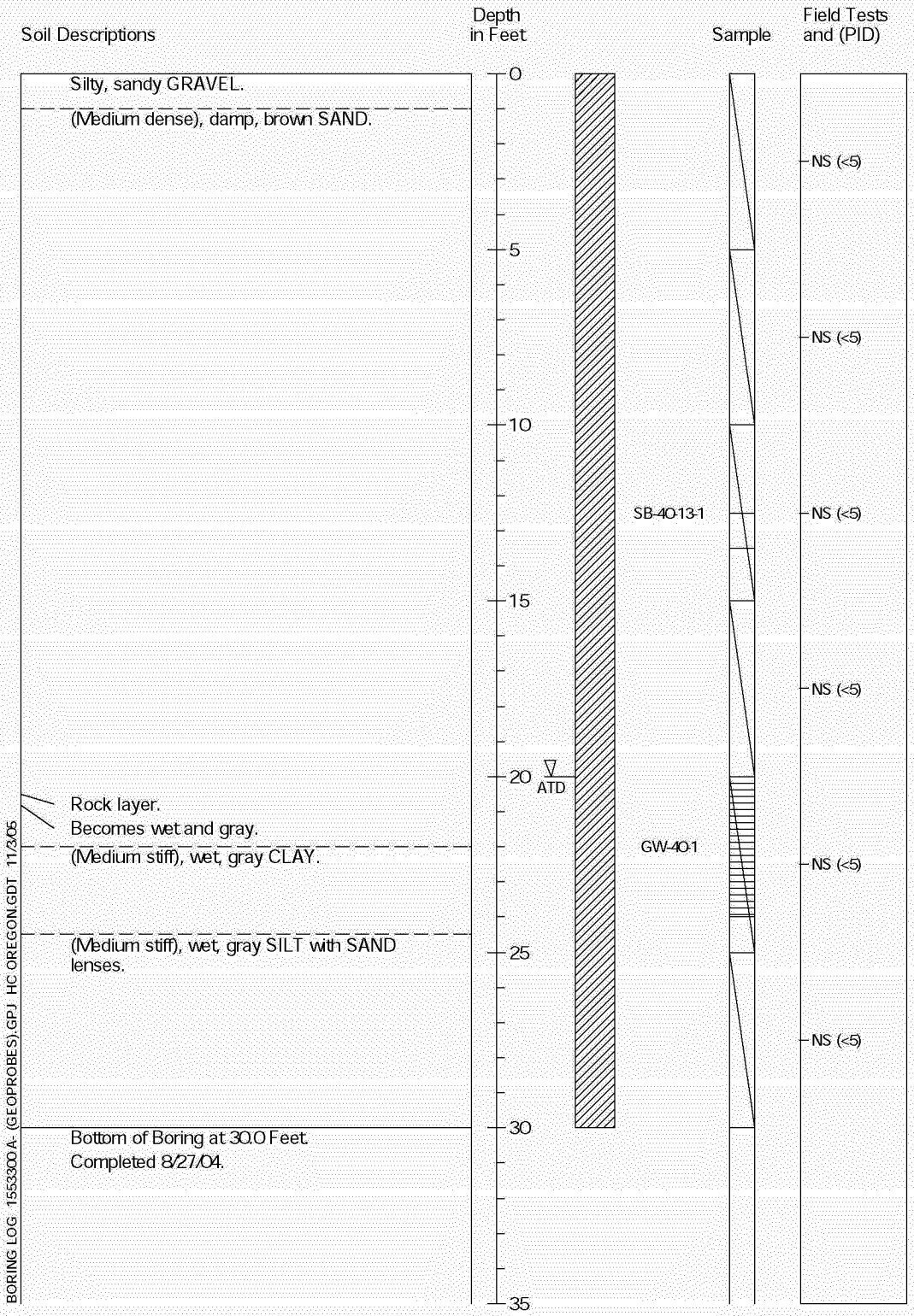
Figure A-31

Push Probe Exploration SB-40



BORING LOG 15533000.A. (GEOPROBES).GPJ HC OREGON.GDT 11/3/05

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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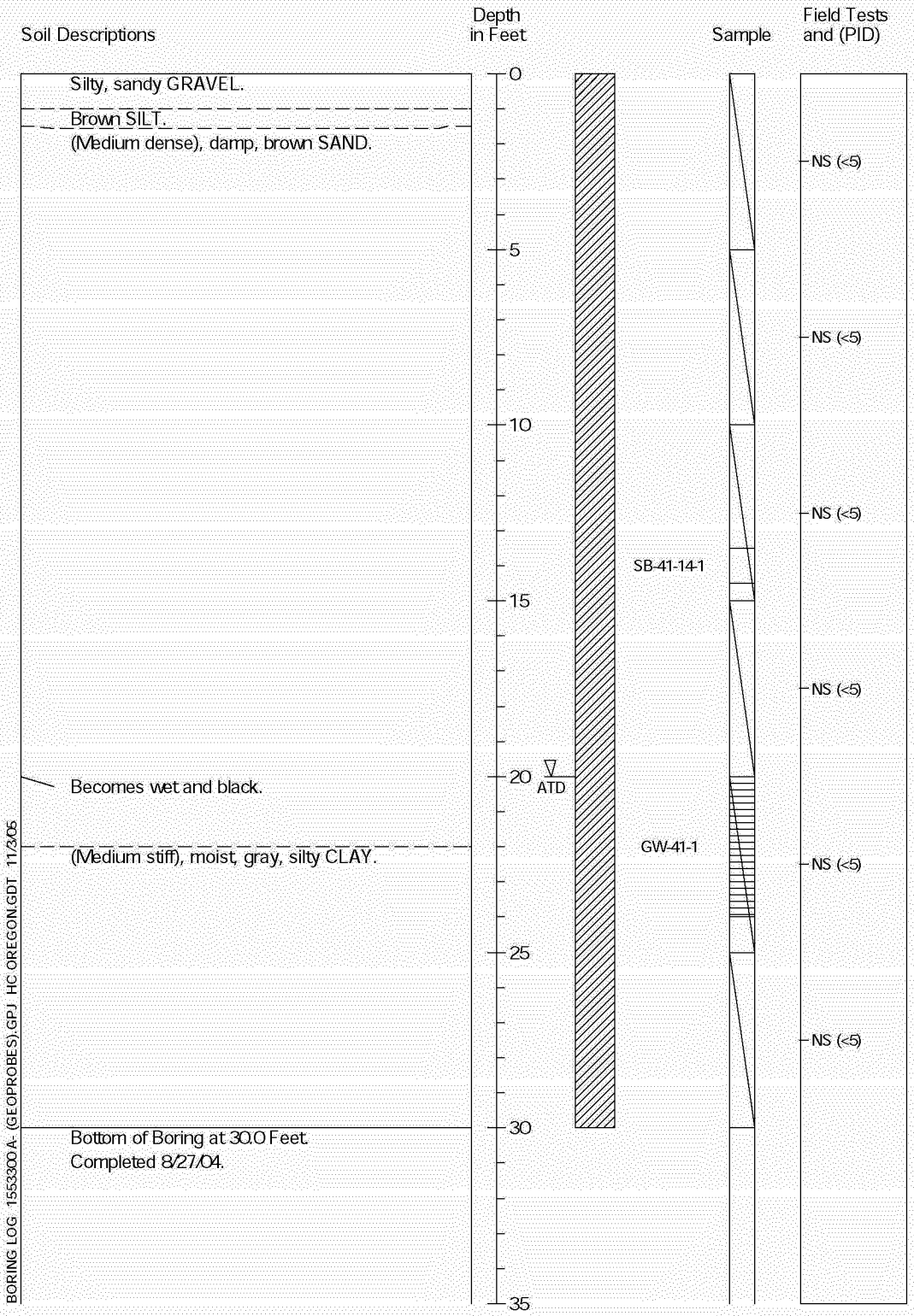
15533-00 *8/04*

Figure A-32

Push Probe Exploration SB-41



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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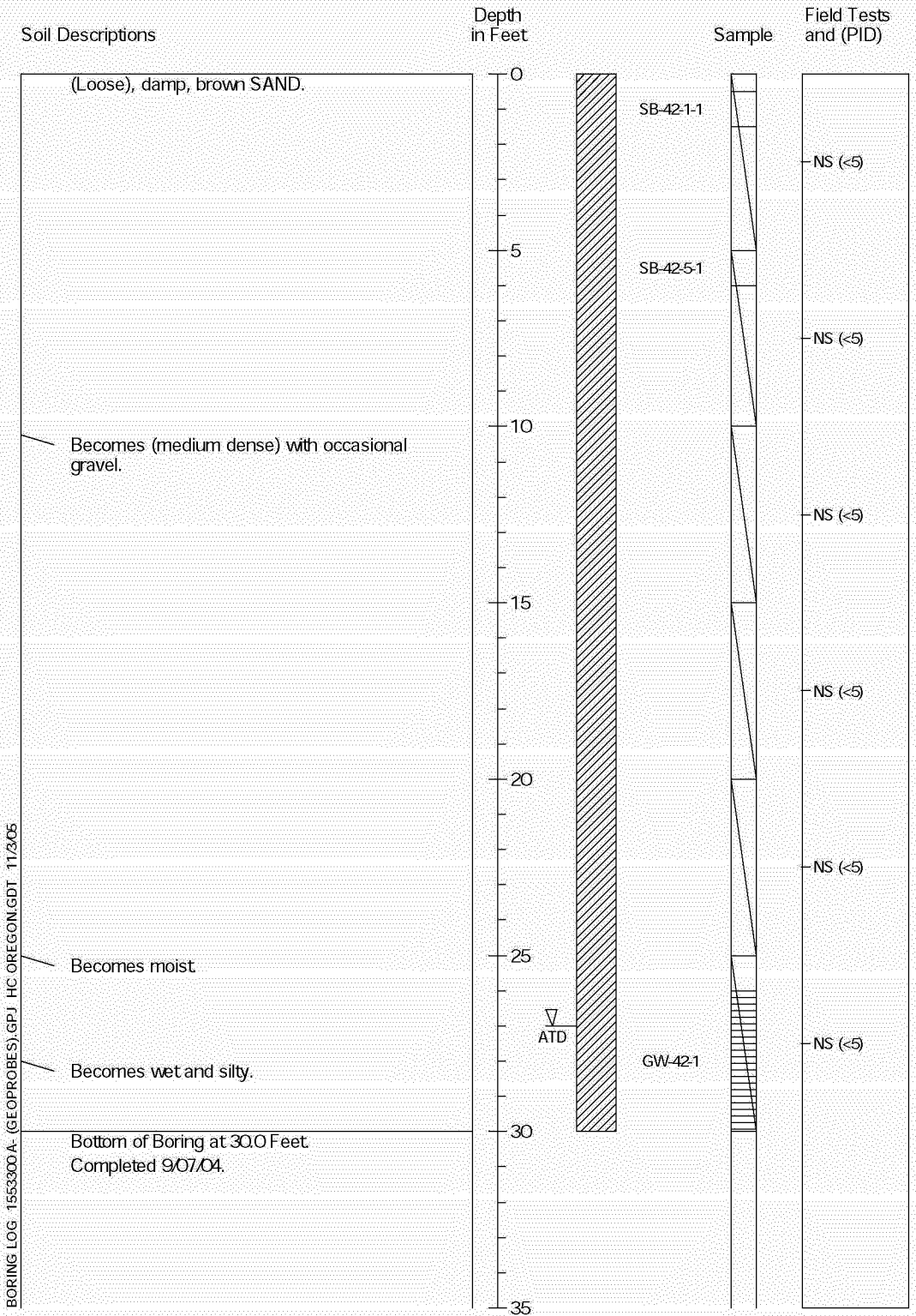
15533-00 *8/04*

Figure A-33

Push Probe Exploration SB-42



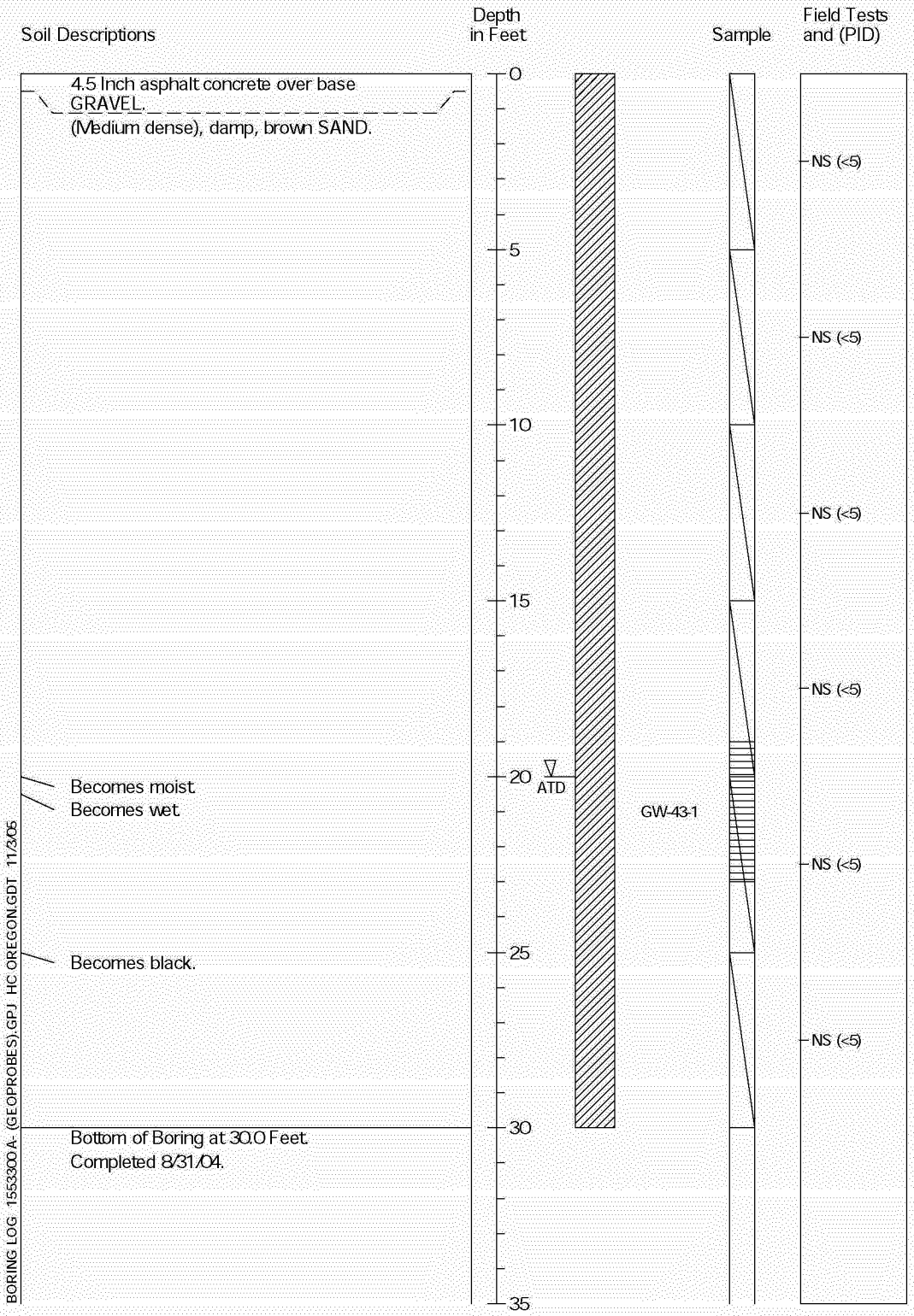
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

HARTCROWSER

15533-00 *9/04*

Figure A-34

Push Probe Exploration SB-43



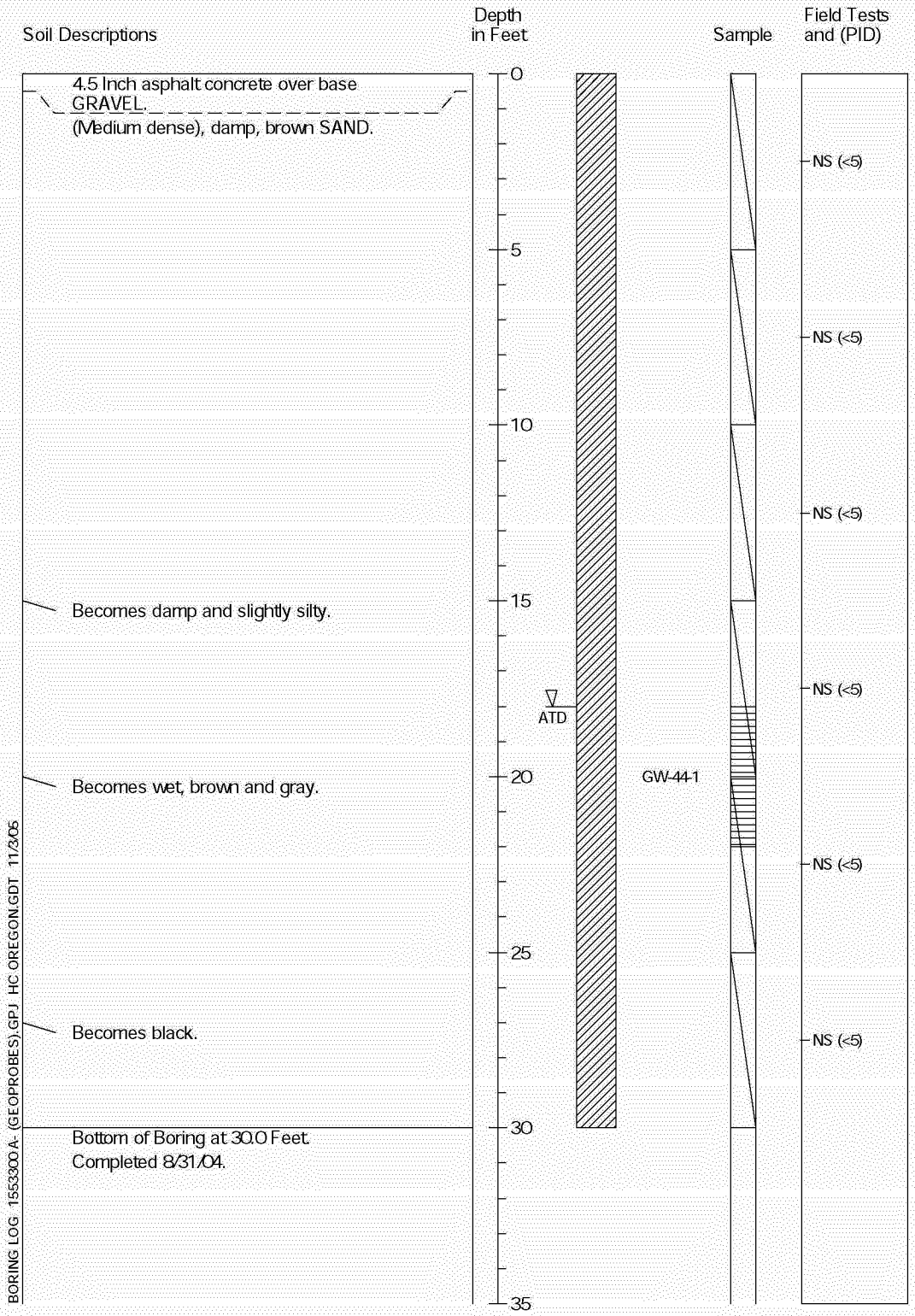
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

HARTCROWSER

15533-00 *8/04*

Figure A-35

Push Probe Exploration SB-44



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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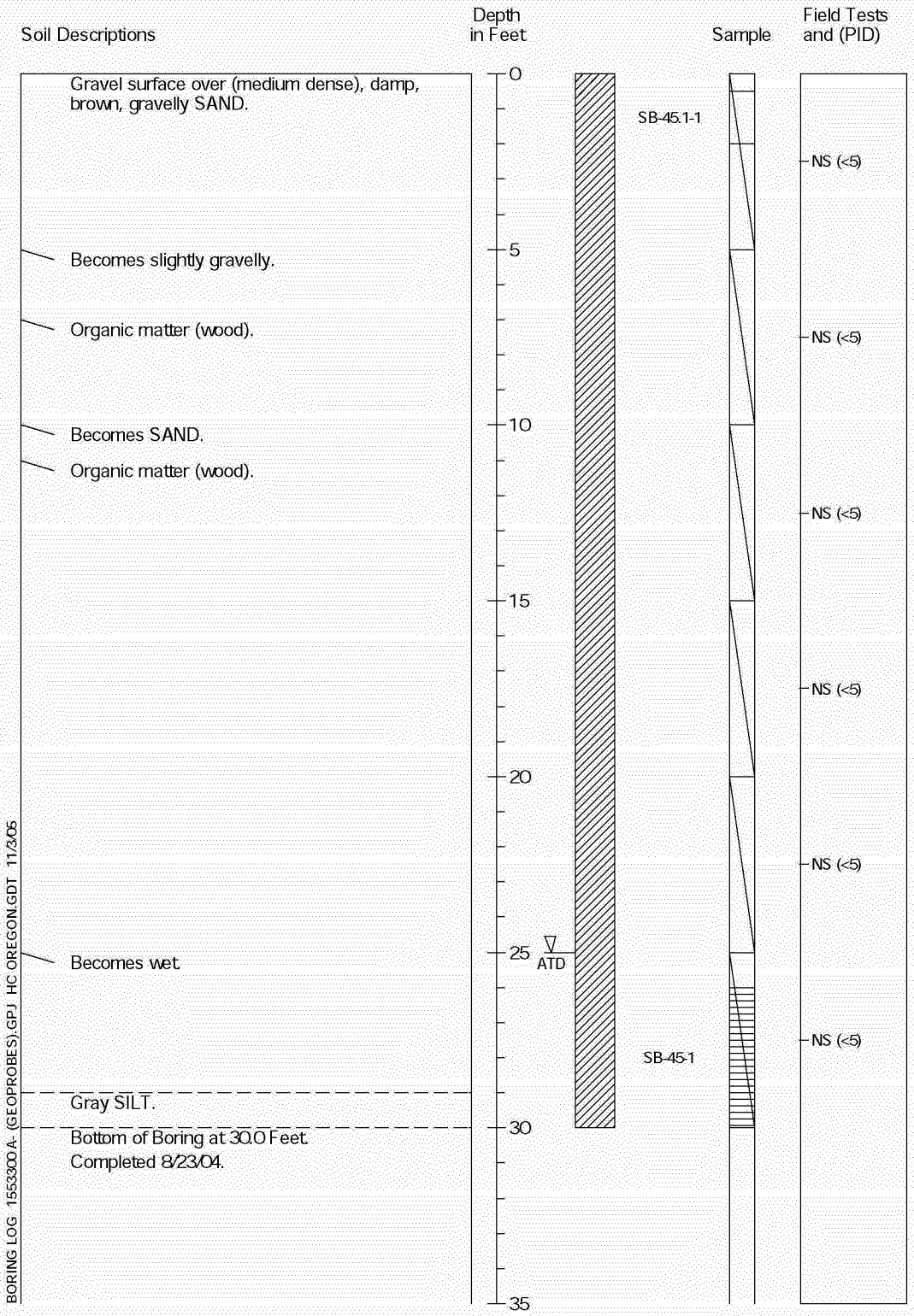
Figure A-36

Push Probe Exploration SB-45



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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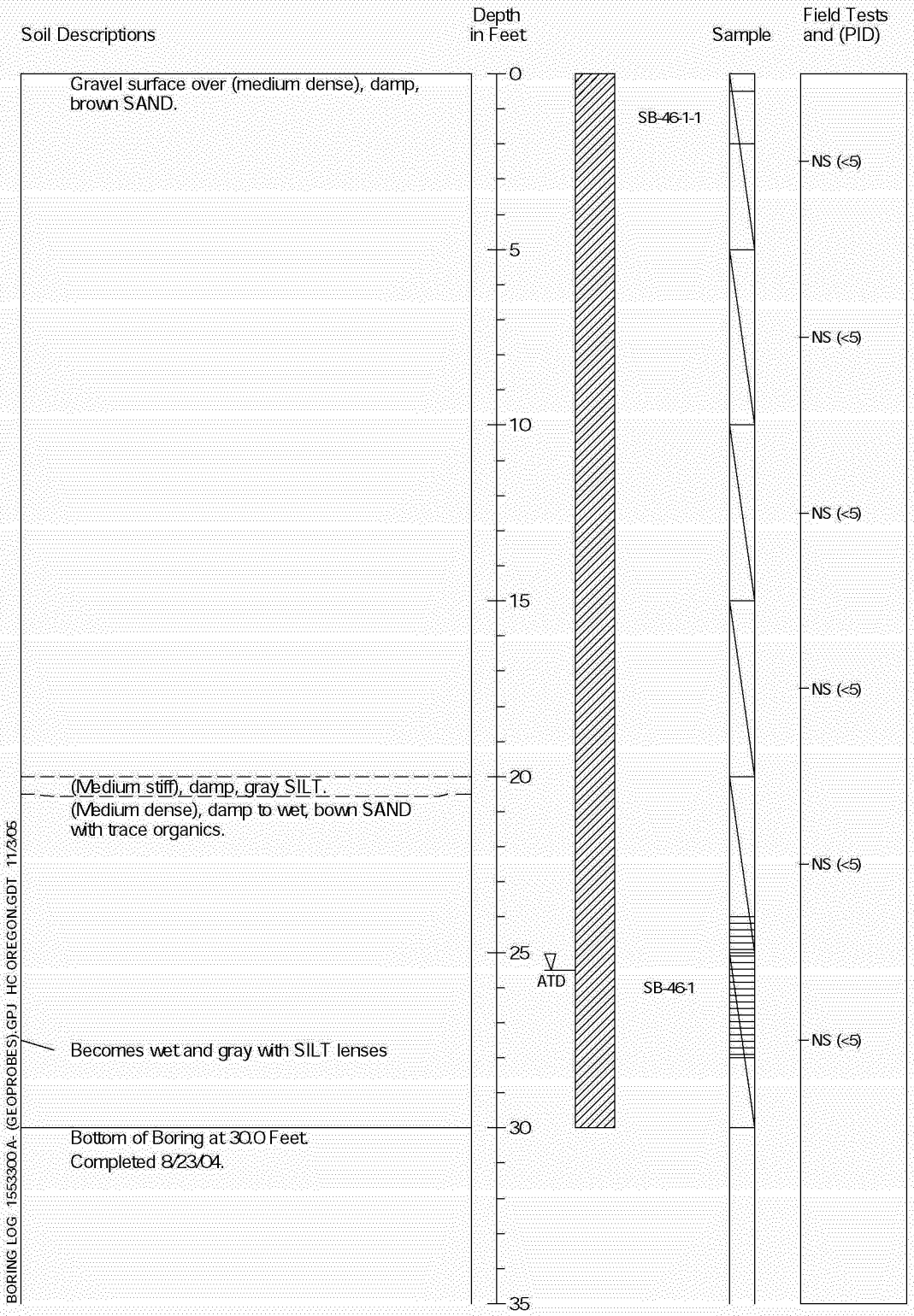
Figure A-37

Push Probe Exploration SB-46



BORING LOG 15533000.A- (GEOPROBES).GPJ HC OREGON.GDT 11/3/05

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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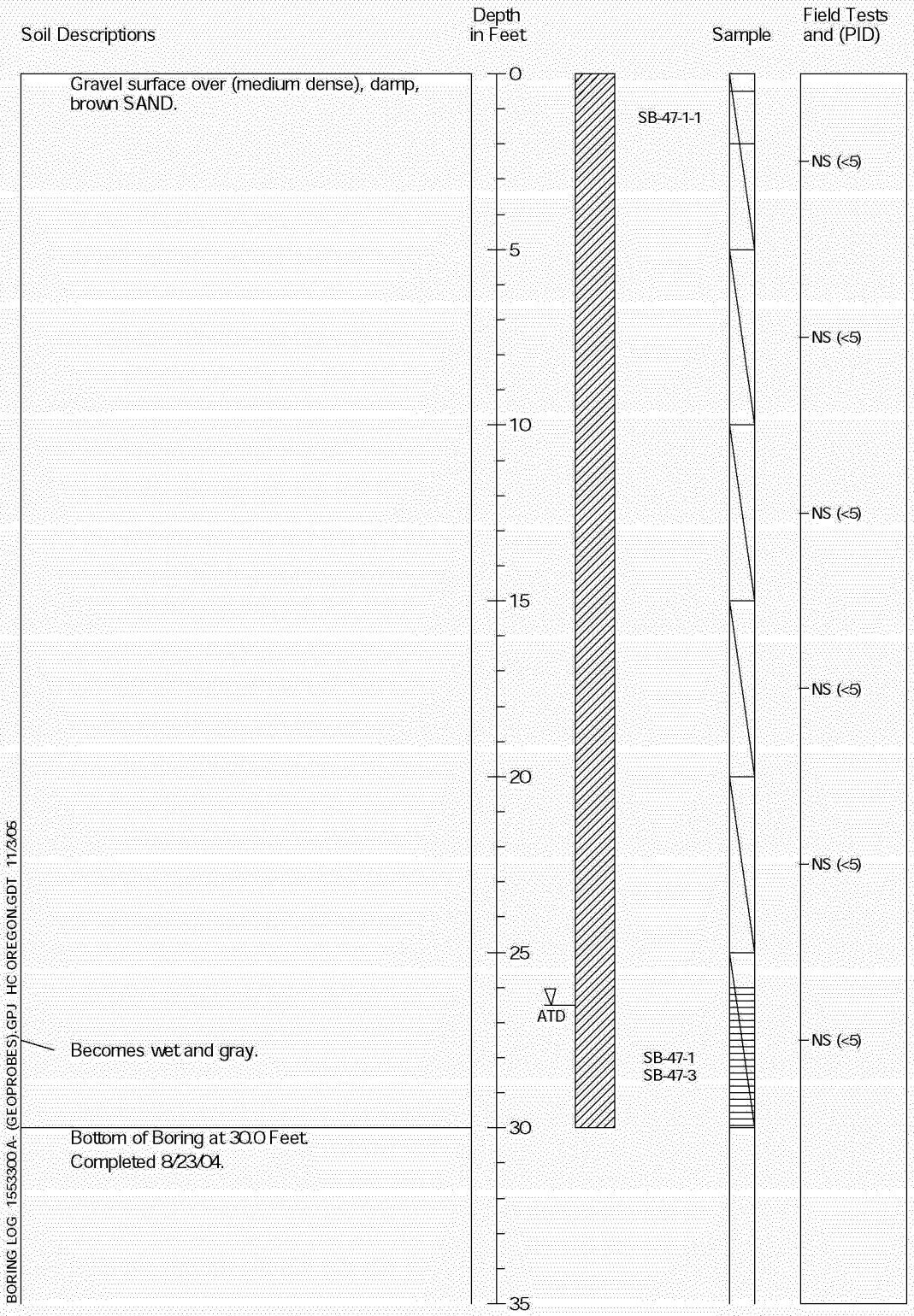
15533-00 *8/04*

Figure A-38

Push Probe Exploration SB-47



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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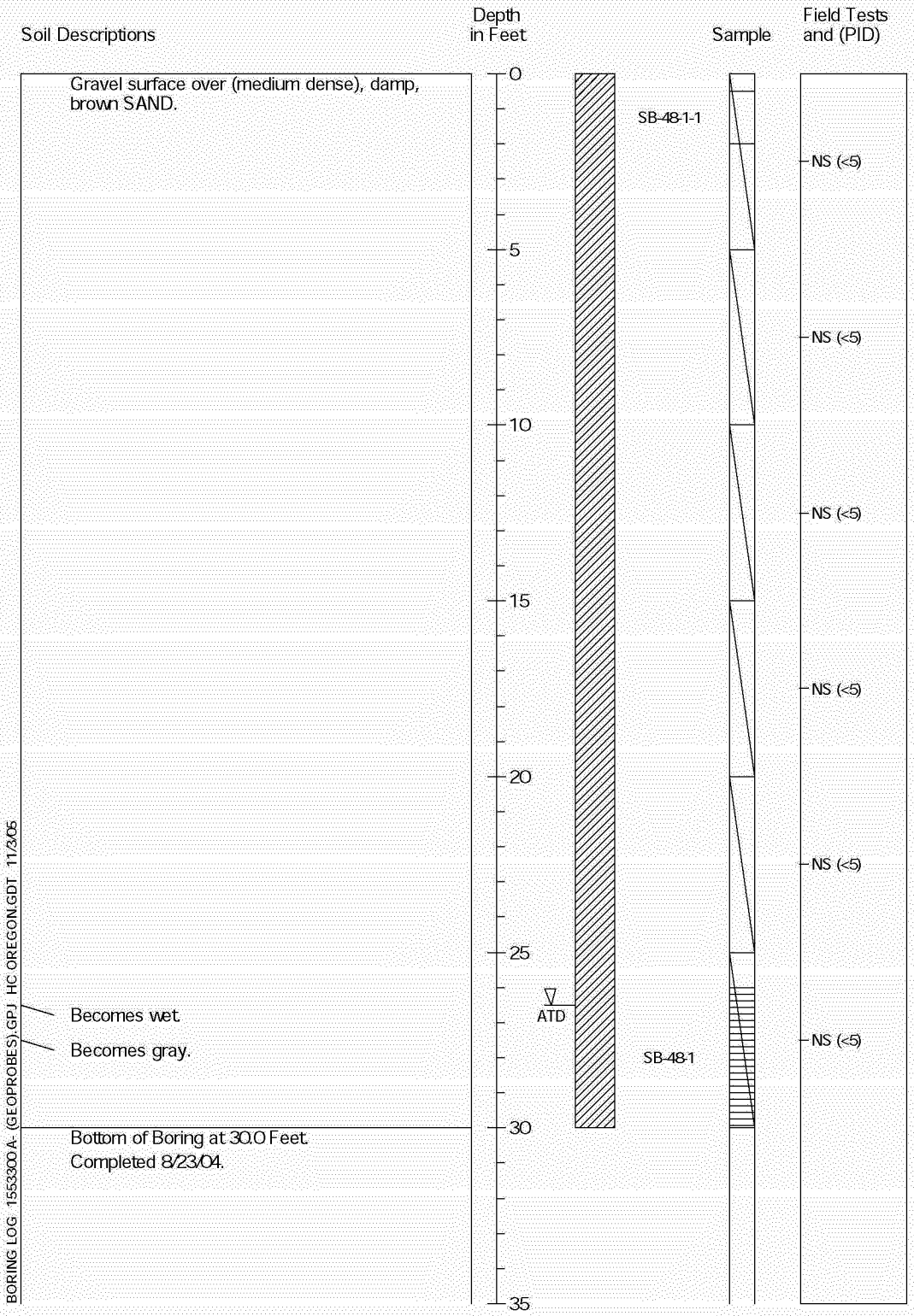
Figure A-39

Push Probe Exploration SB-48



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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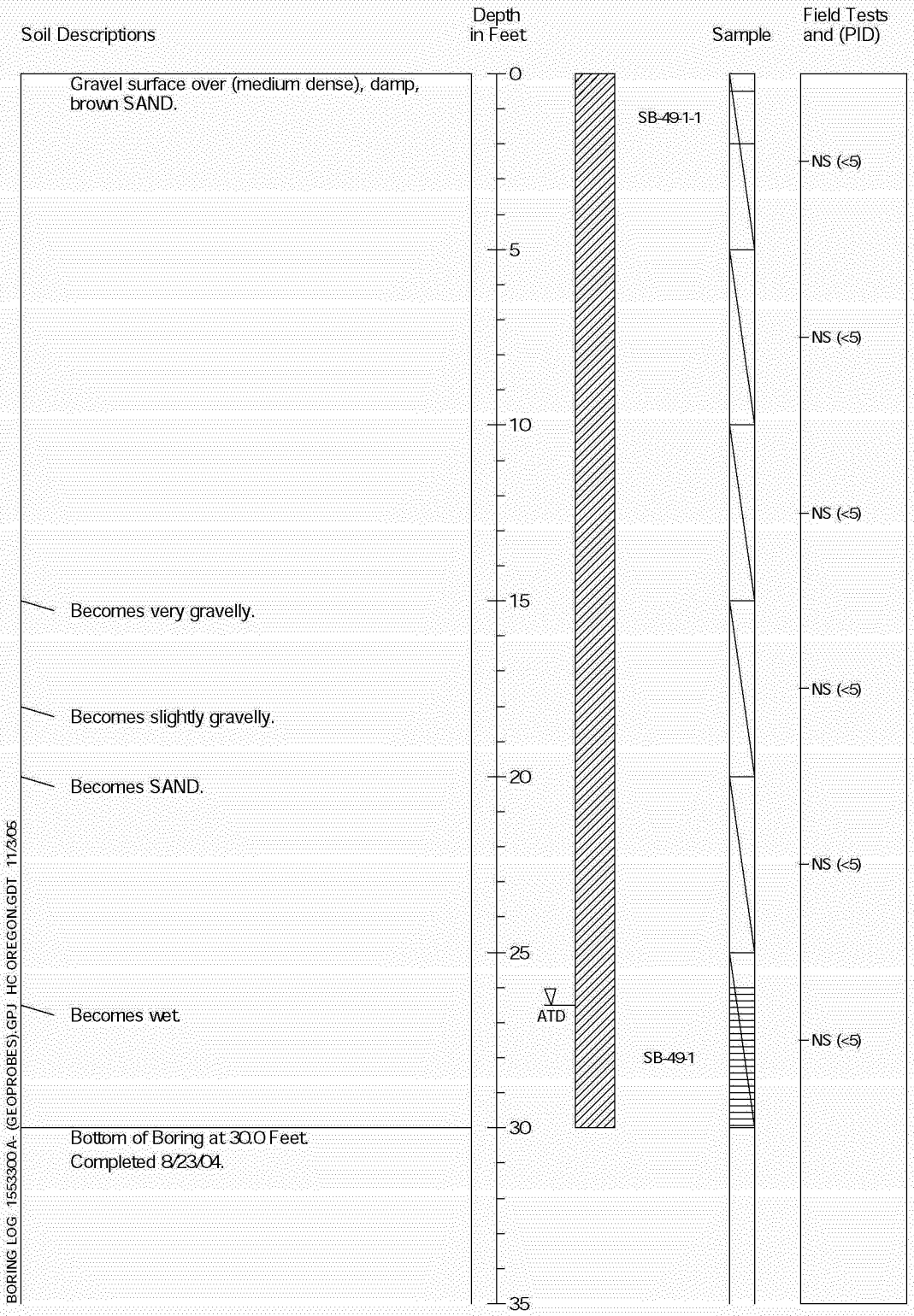
15533-00 *8/04*

Figure A-40

Push Probe Exploration SB-49



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

HARTCROWSER

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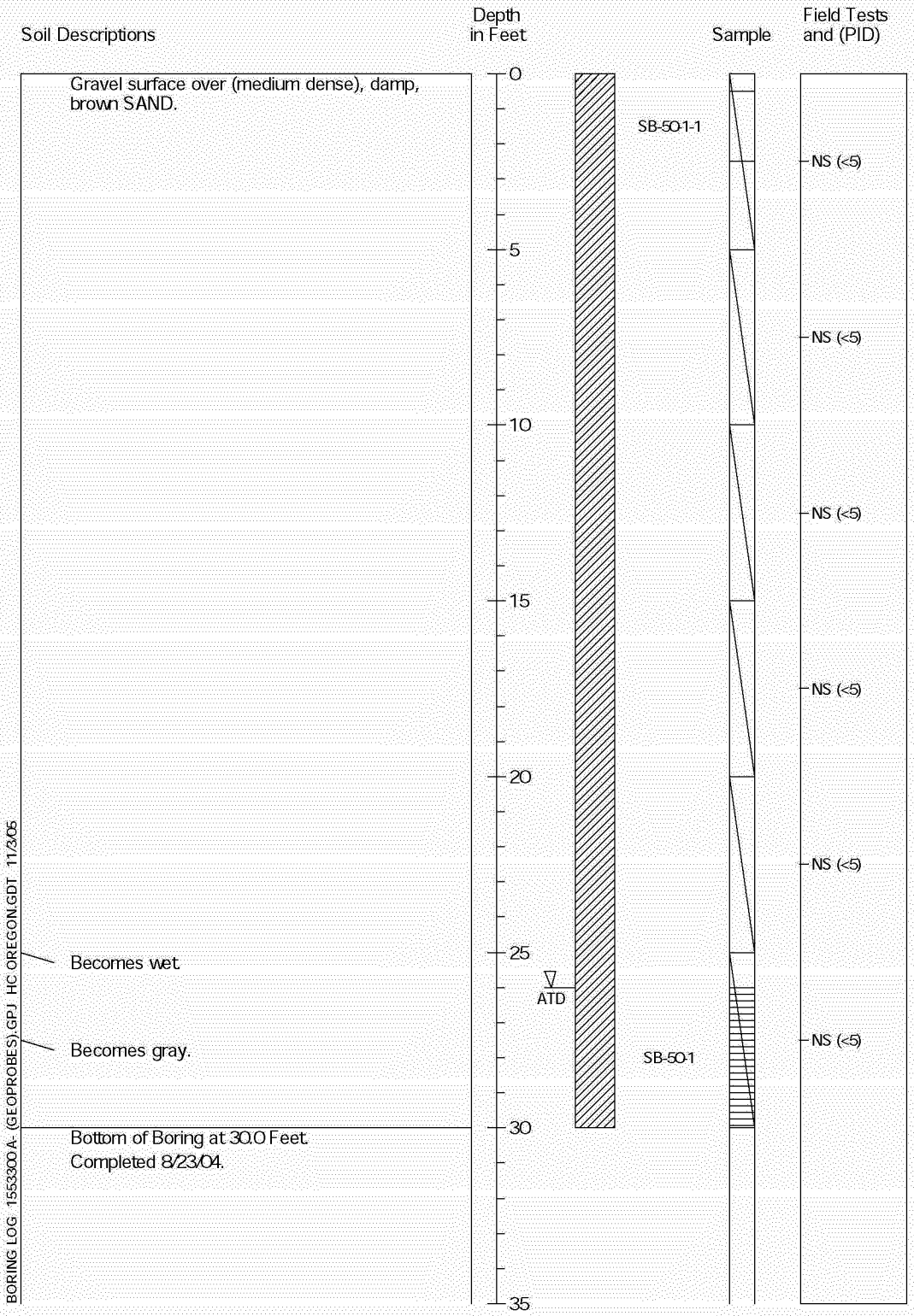
Figure A-41

Push Probe Exploration SB-50



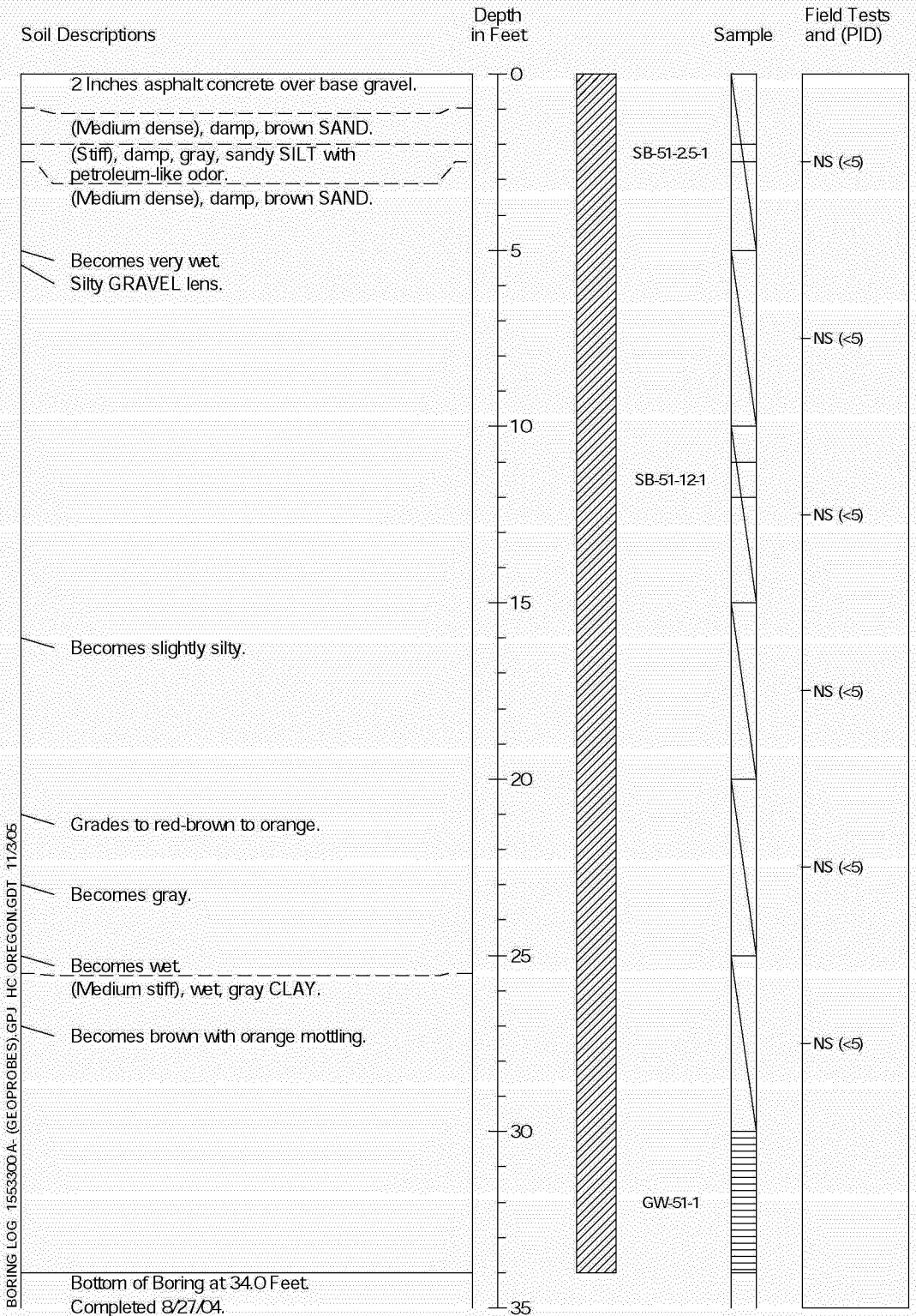
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

HARTCROWSER

15533-00 *8/04*

Figure A-42

Push Probe Exploration SB-51



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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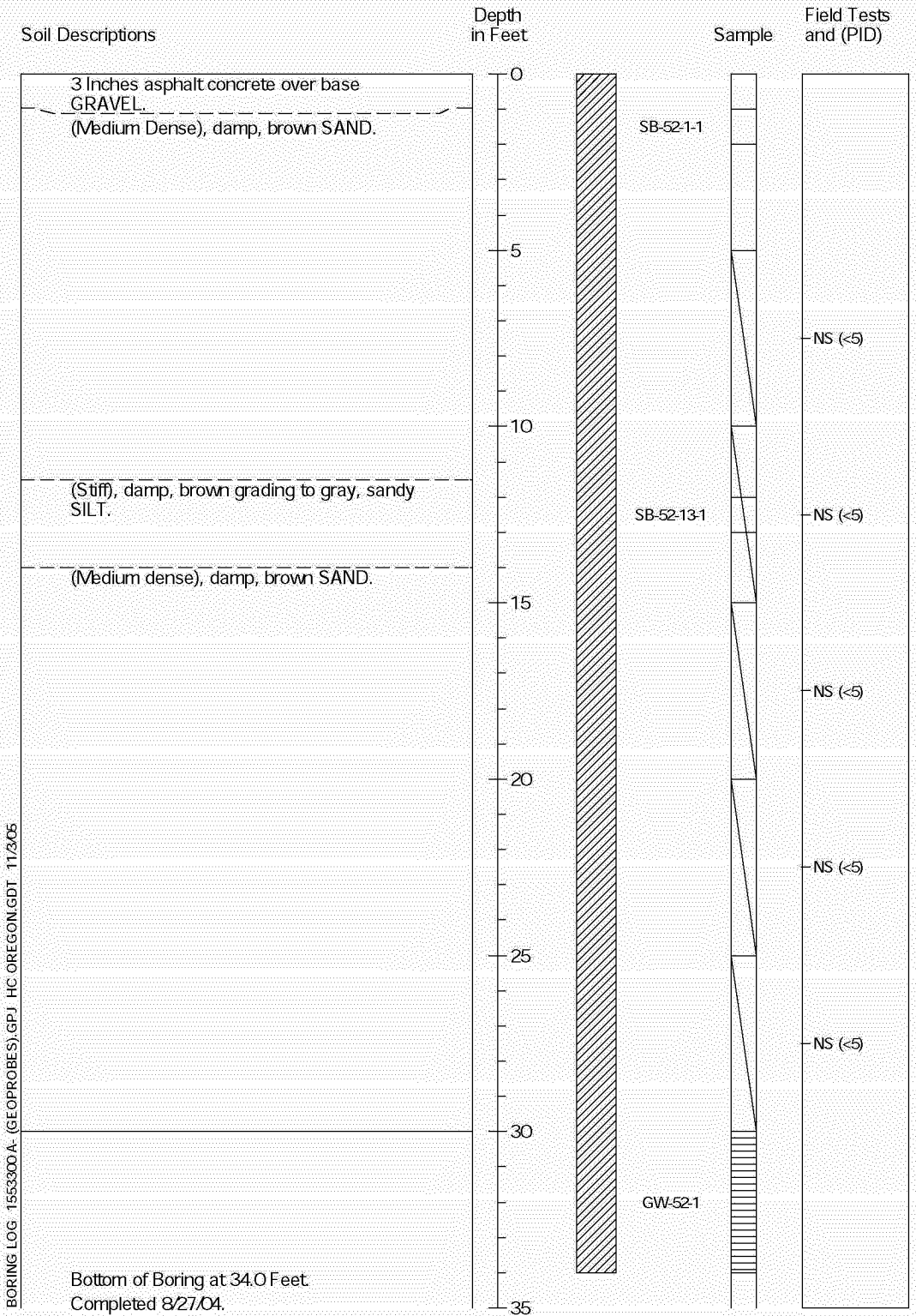
15533-00 *8/04*

Figure A-43

Push Probe Exploration SB-52



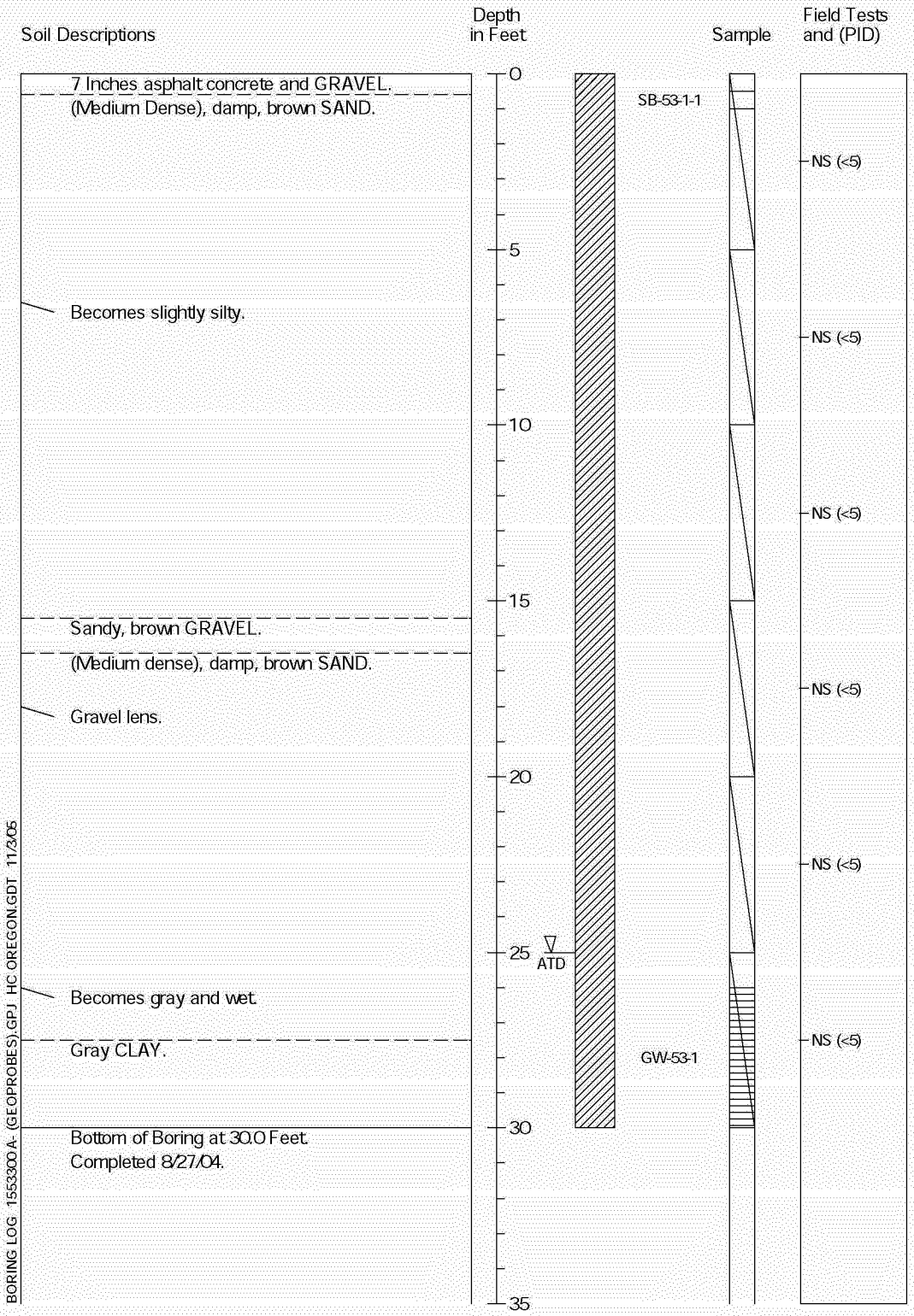
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

HARTCROWSER

15533-00 *8/04*

Figure A-44

Push Probe Exploration SB-53



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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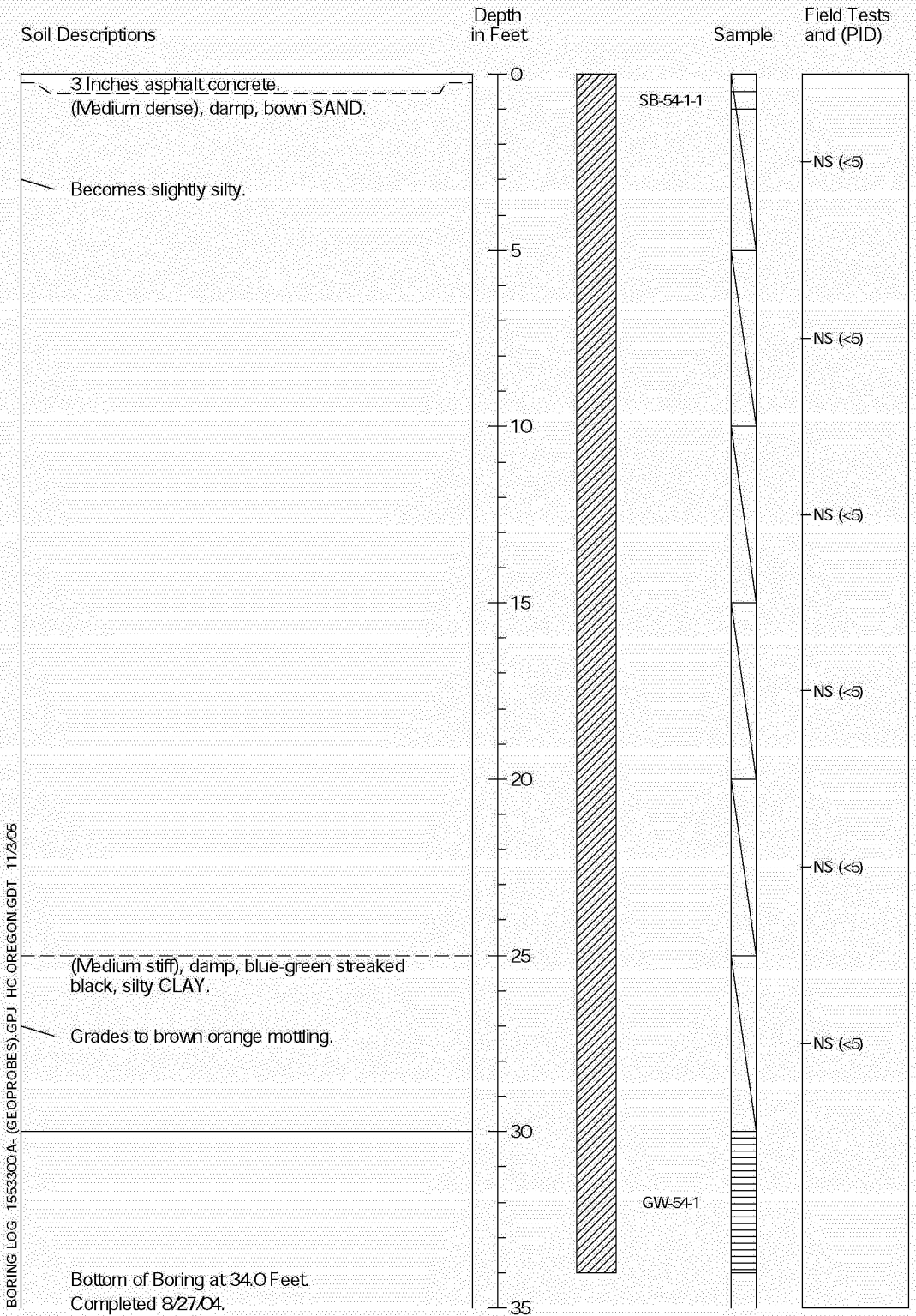
15533-00 *8/04*

Figure A-45

Push Probe Exploration SB-54



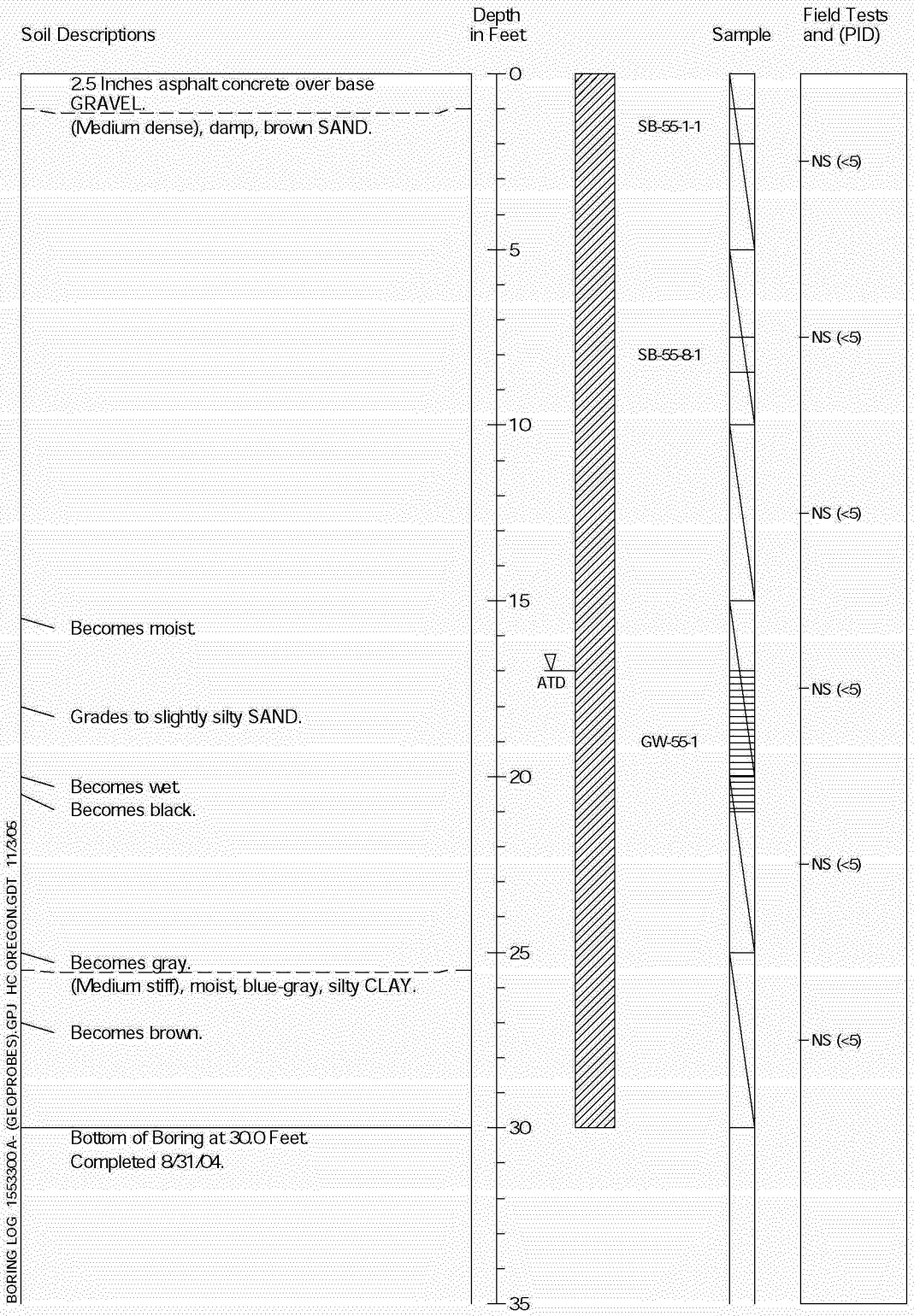
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

HARTCROWSER

15533-00 *8/04*

Figure A-46

Push Probe Exploration SB-55



BORING LOG 15533000 A- (GEOPROBES).GPJ HC OREGON.GDT 11/3/05

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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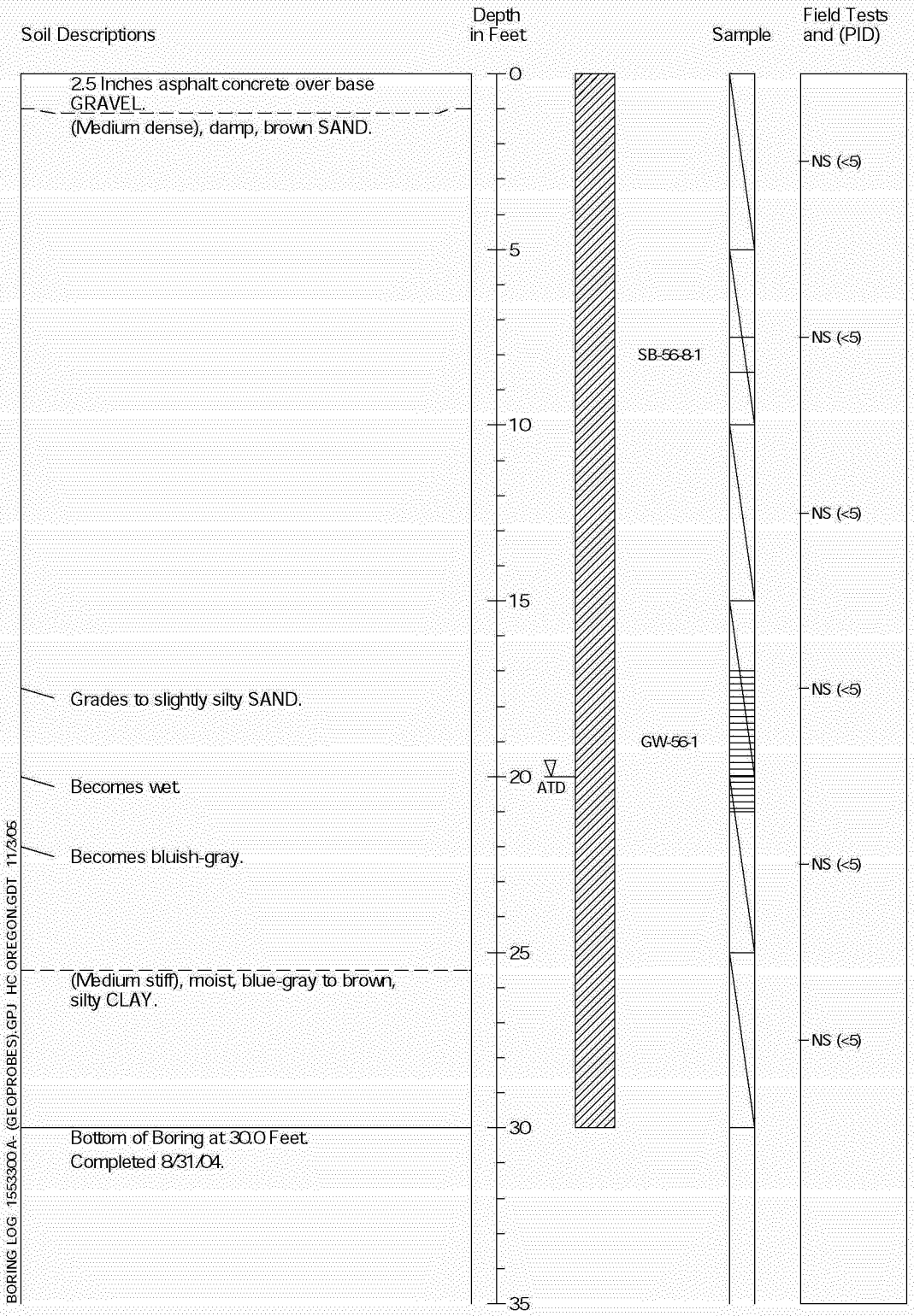
15533-00 *8/04*

Figure A-47

Push Probe Exploration SB-56



BORING LOG 1553300 A- (GEOPROBES).GPJ HC OREGON.GDT 11/3/05

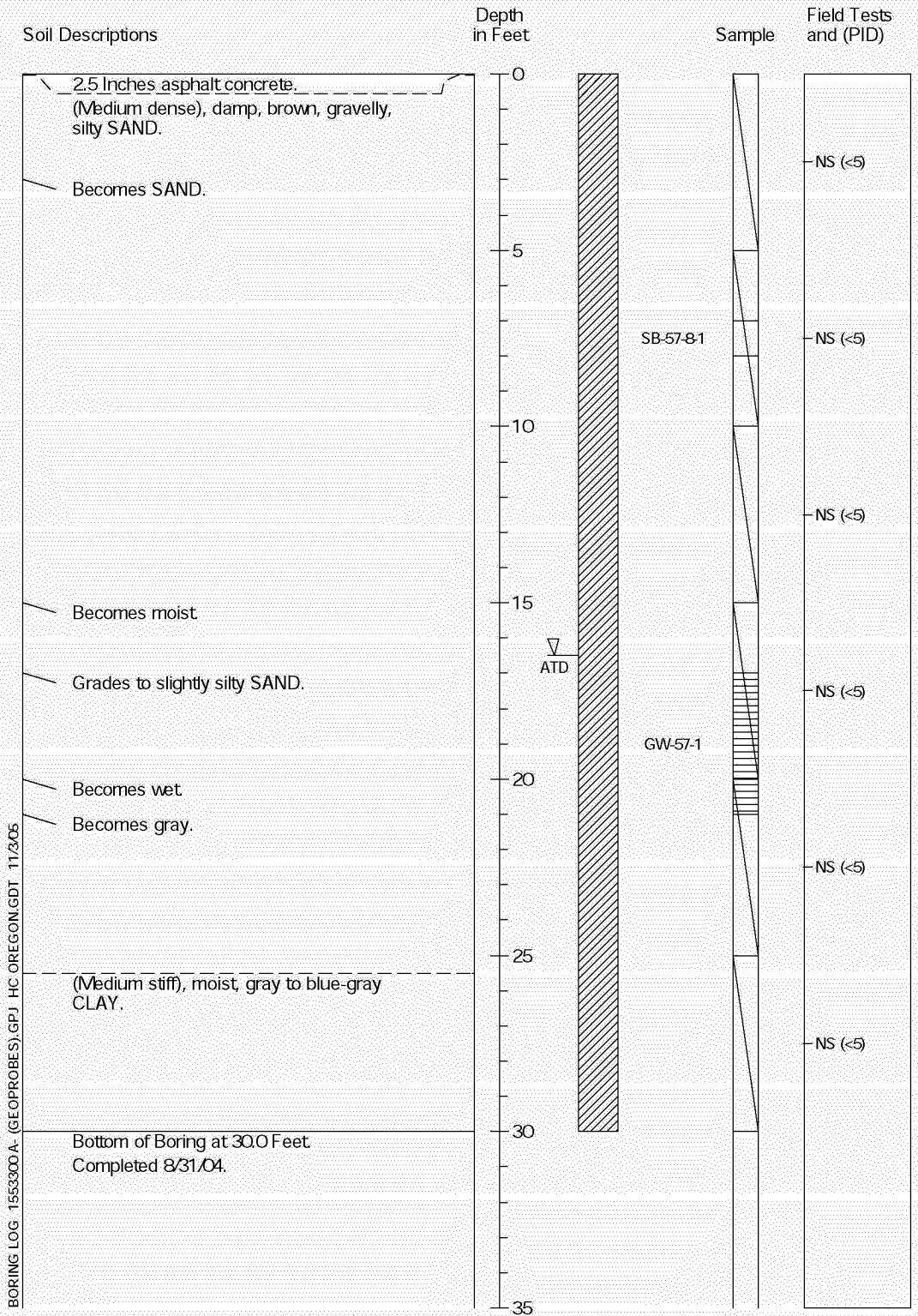
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

HARTCROWSER

15533-00 *8/04*

Figure A-48

Push Probe Exploration SB-57



BORING LOG 1553300A (GEOPROBES).GPJ HC OREGON.GDT 11/3/05

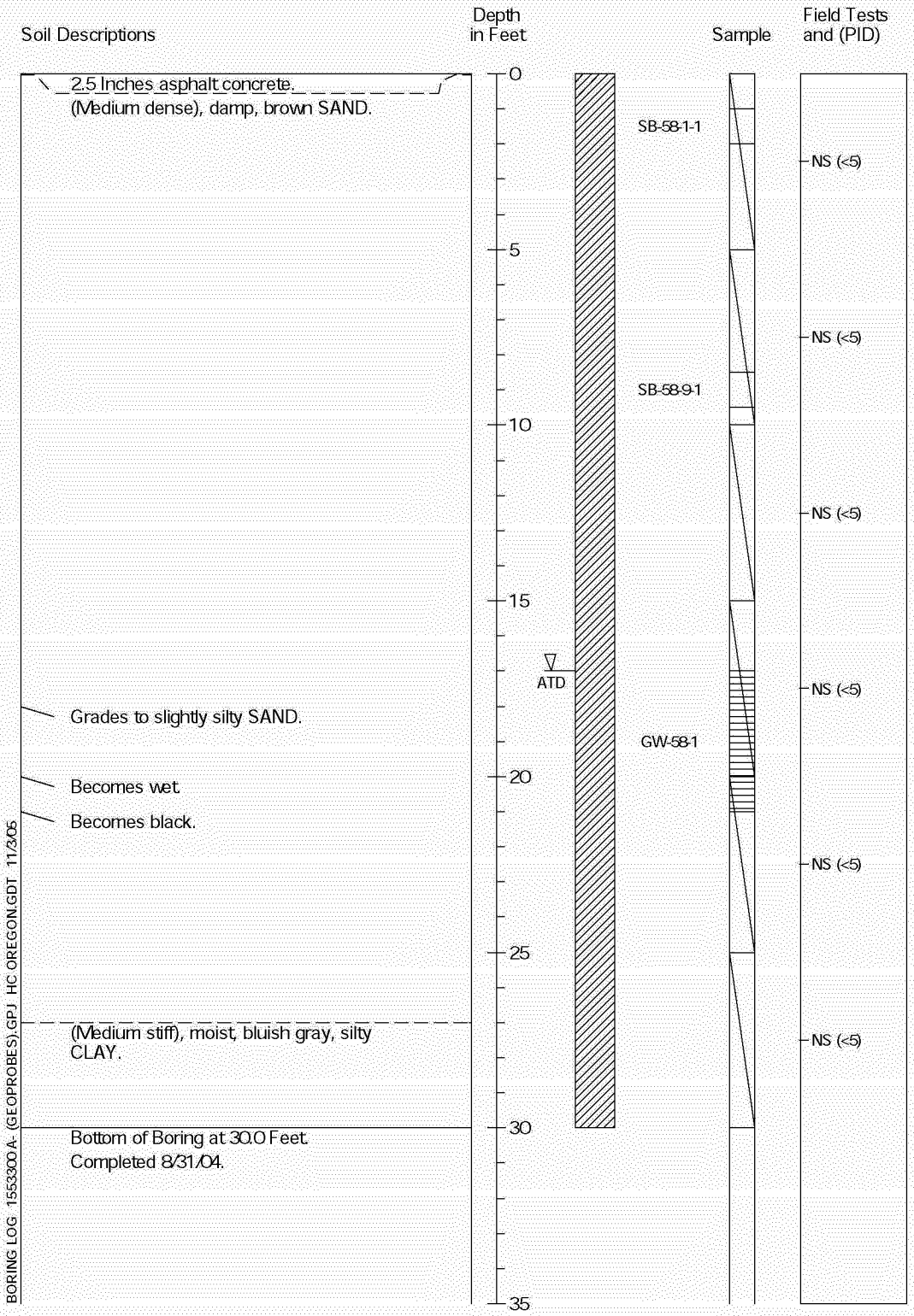
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

HARTCROWSER

15533-00 *8/04*

Figure A-49

Push Probe Exploration SB-58



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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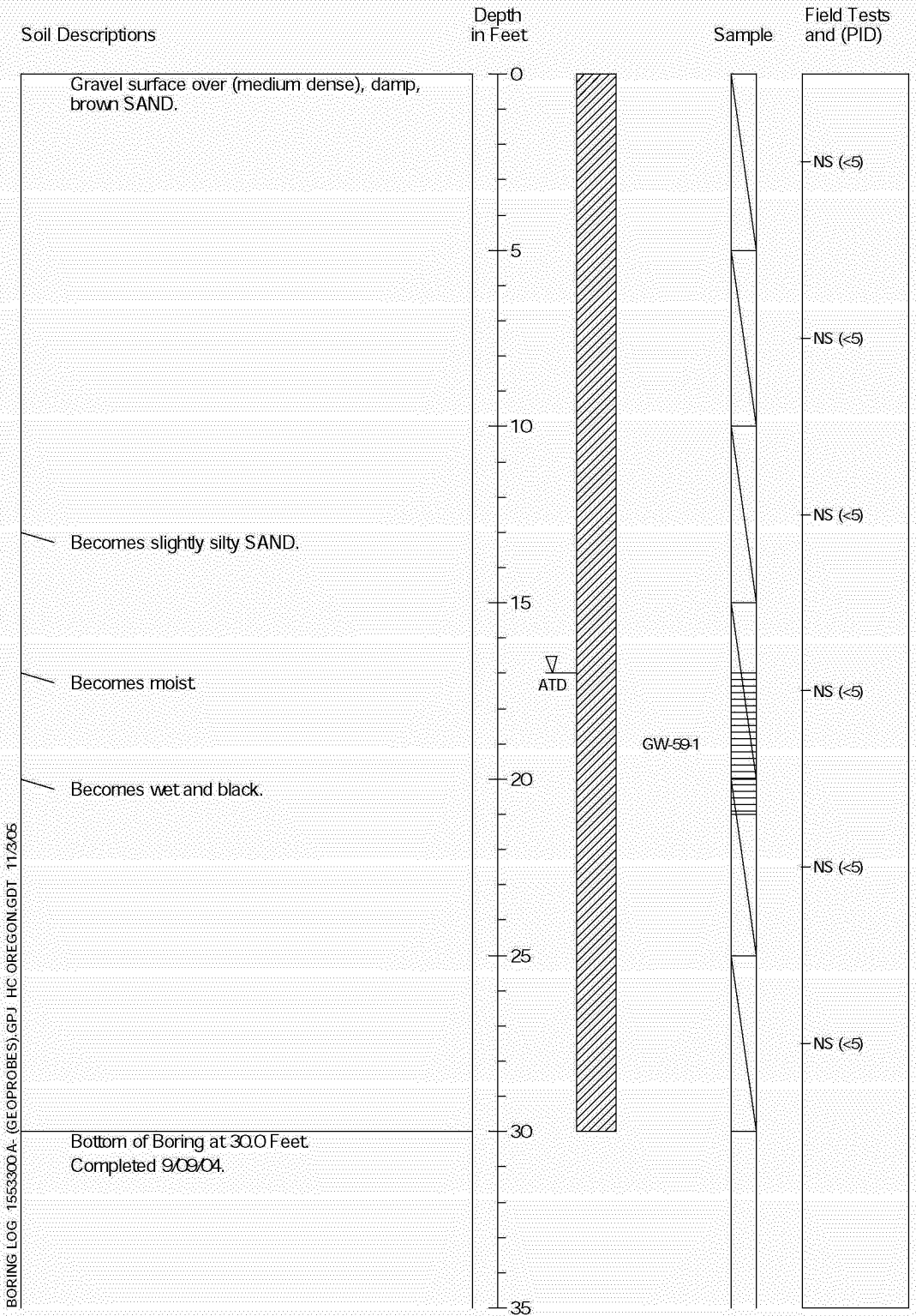
15533-00 *8/04*

Figure A-50

Push Probe Exploration SB-59



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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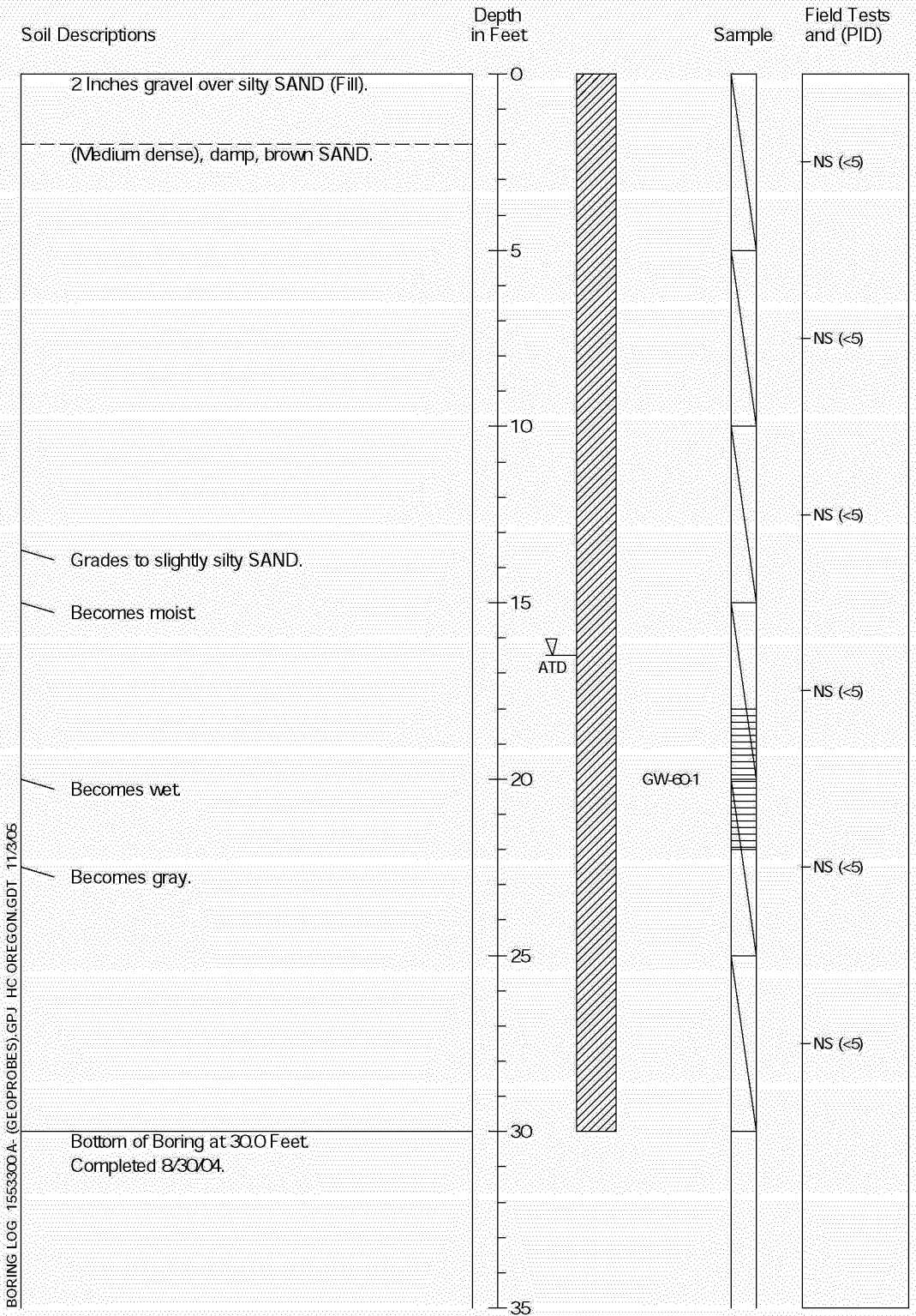
Figure A-51

Push Probe Exploration SB-60



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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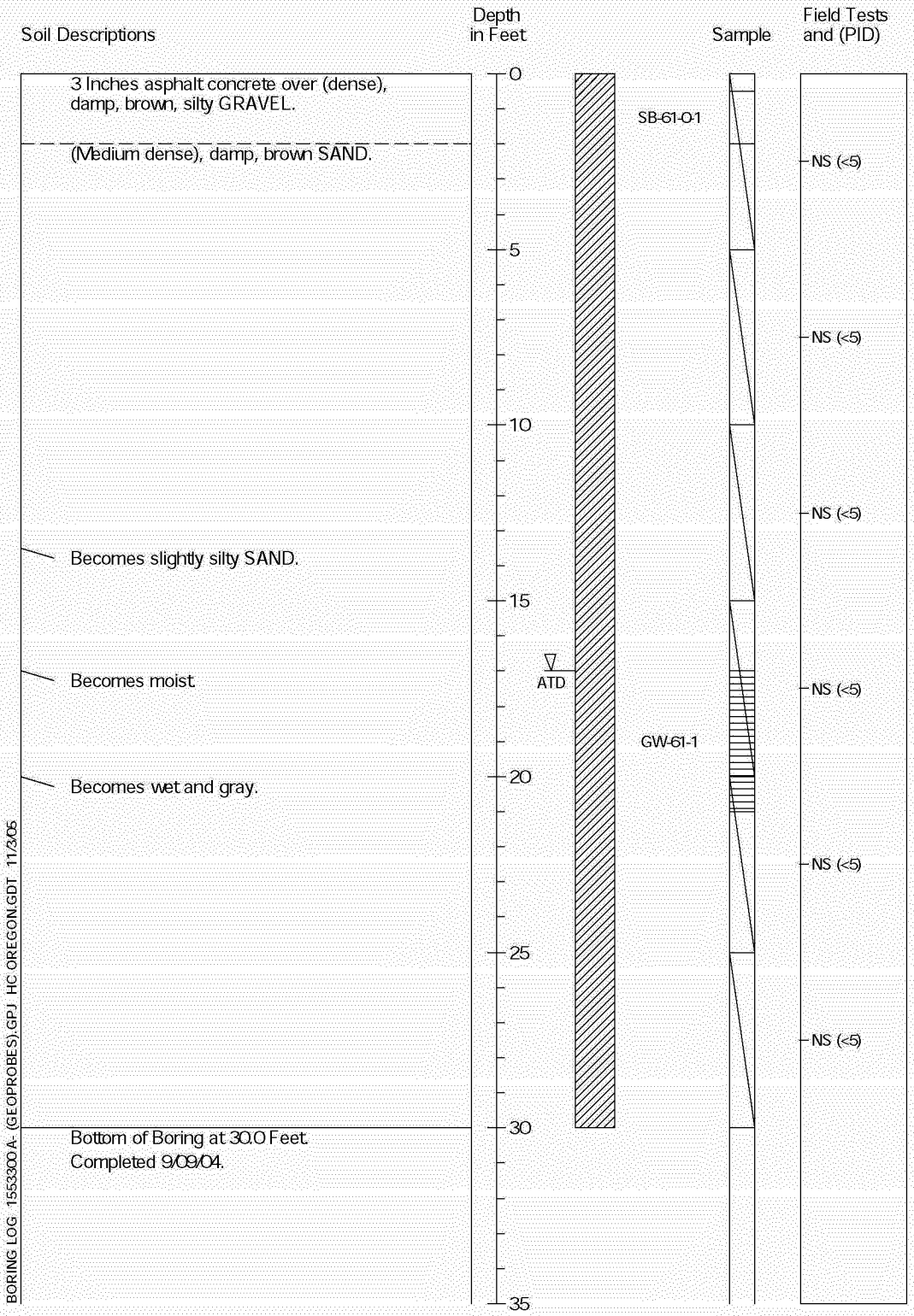
15533-00 *8/04*

Figure A-52

Push Probe Exploration SB-61



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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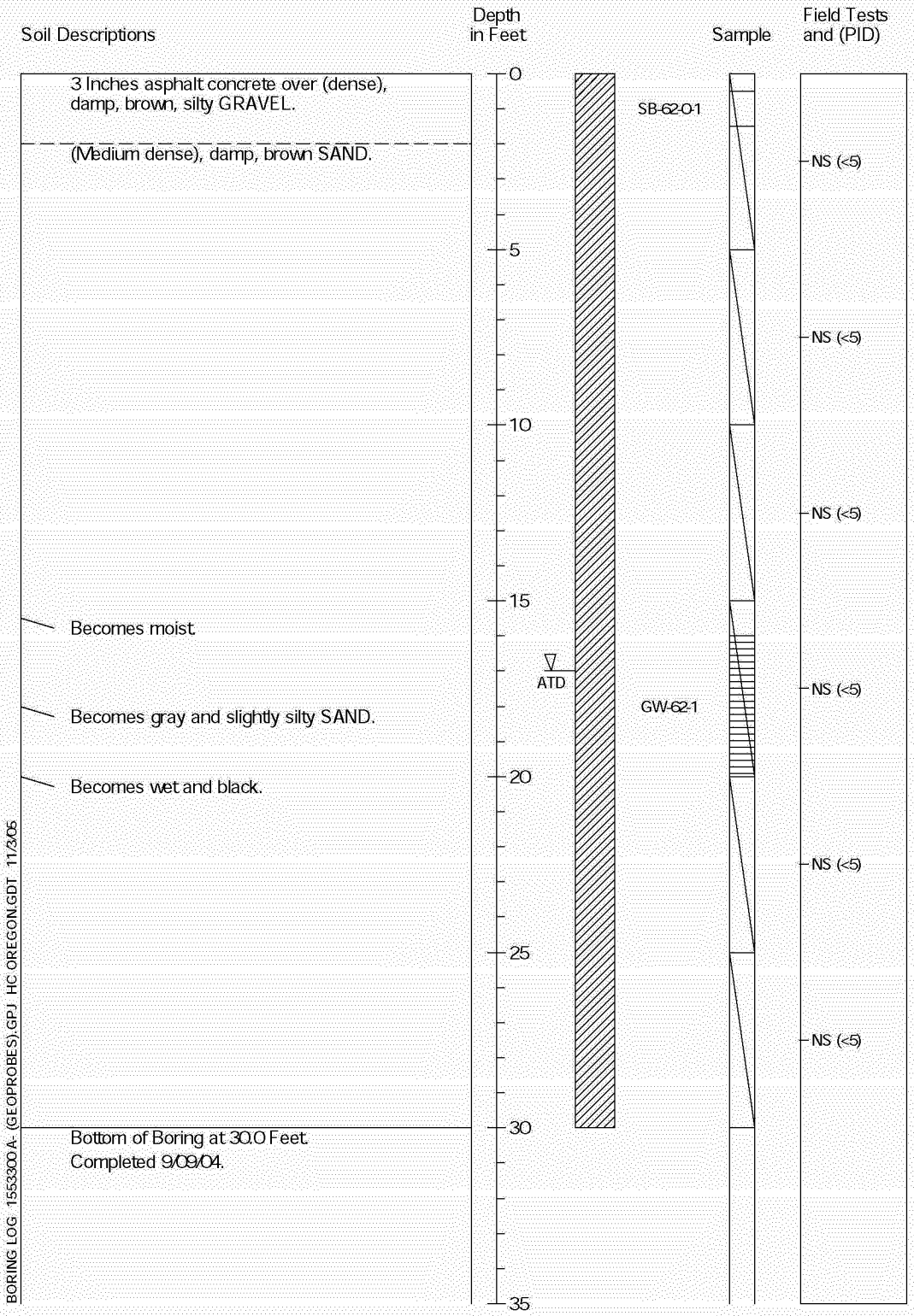
15533-00 *9/04*

Figure A-53

Push Probe Exploration SB-62



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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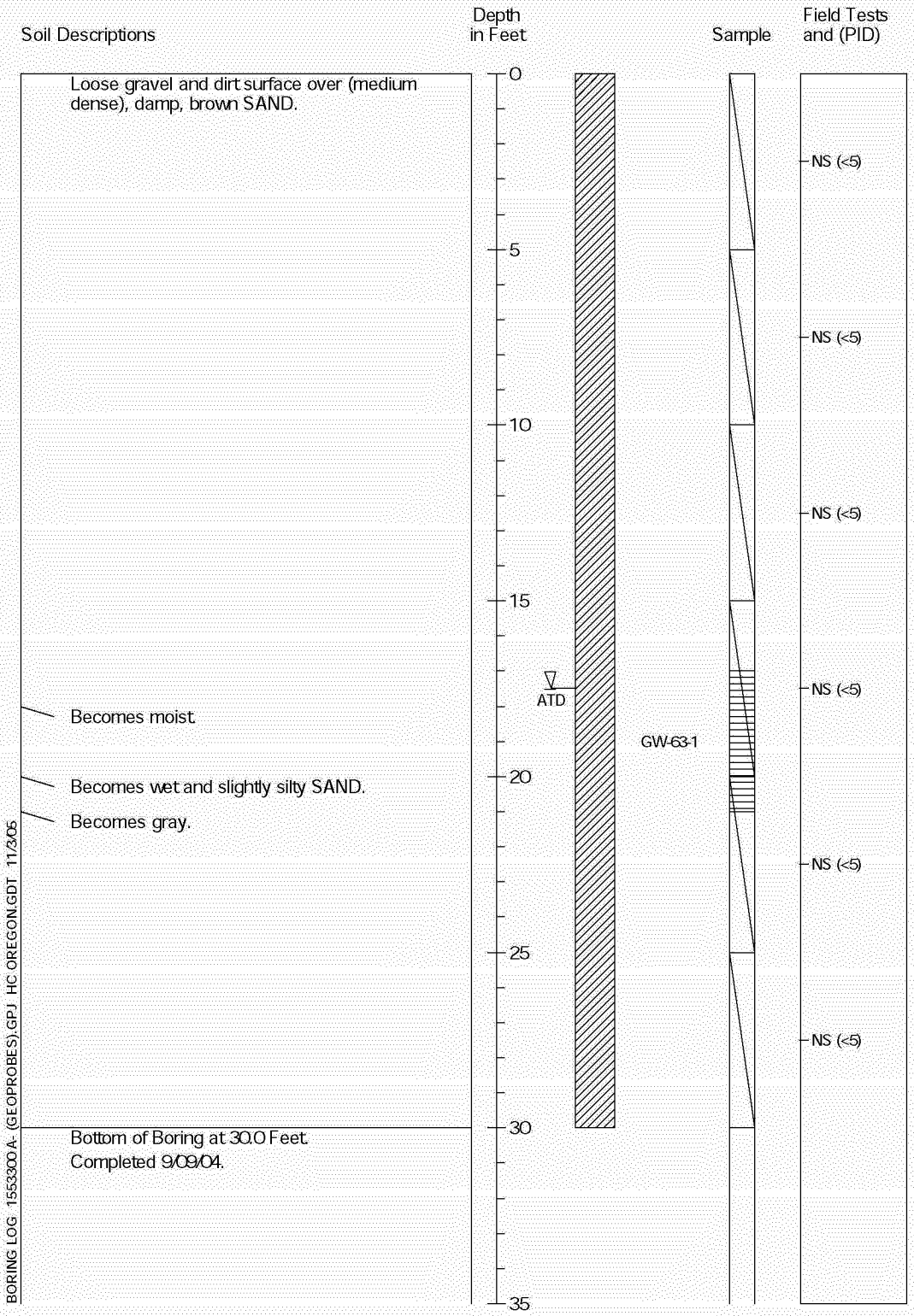
15533-00 *9/04*

Figure A-54

Push Probe Exploration SB-63



BORING LOG 1553300 A- (GEOPROBES).GPJ HC OREGON.GDT 11/3/05

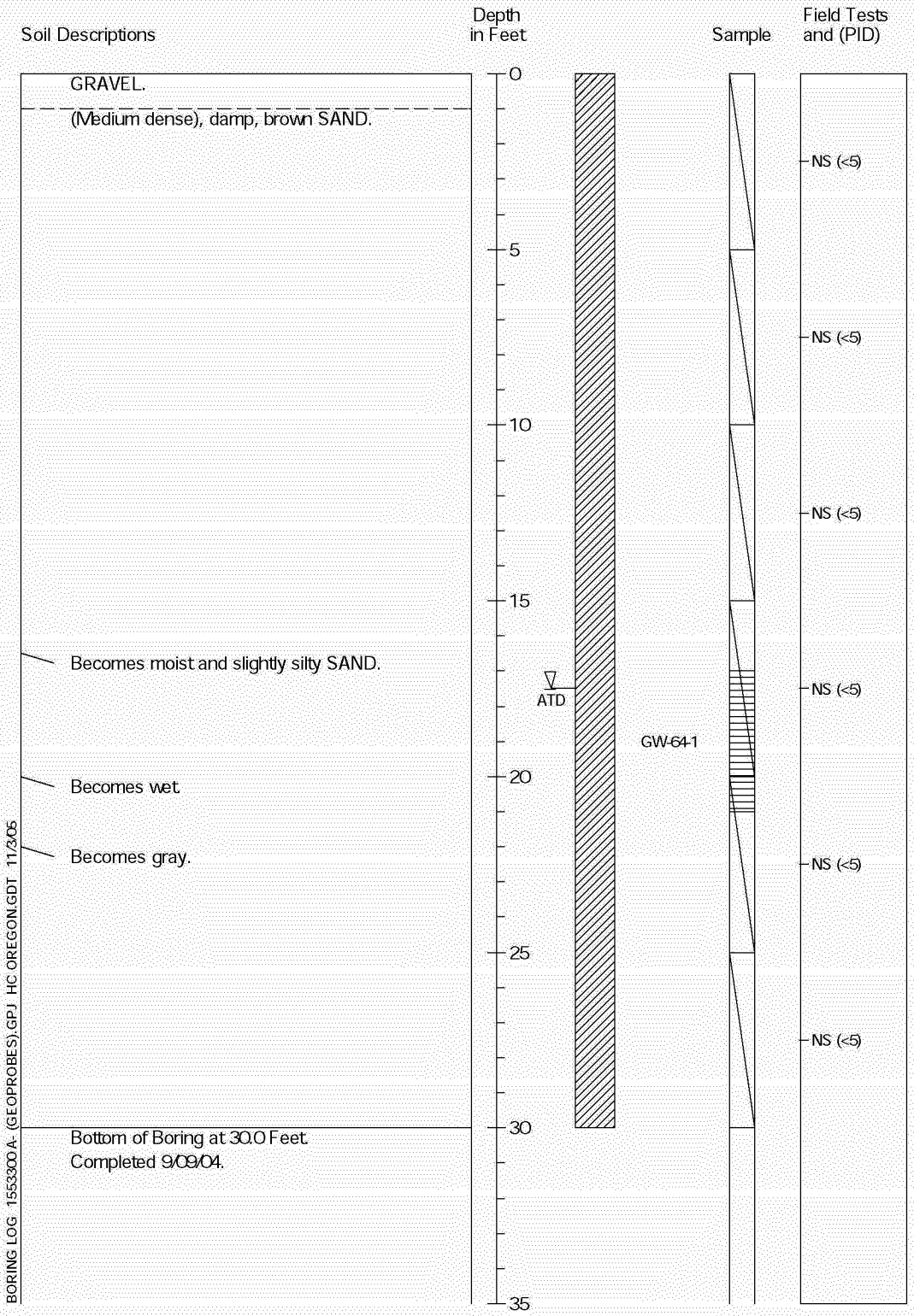
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

HARTCROWSER

15533-00 *9/04*

Figure A-55

Push Probe Exploration SB-64



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

HARTCROWSER

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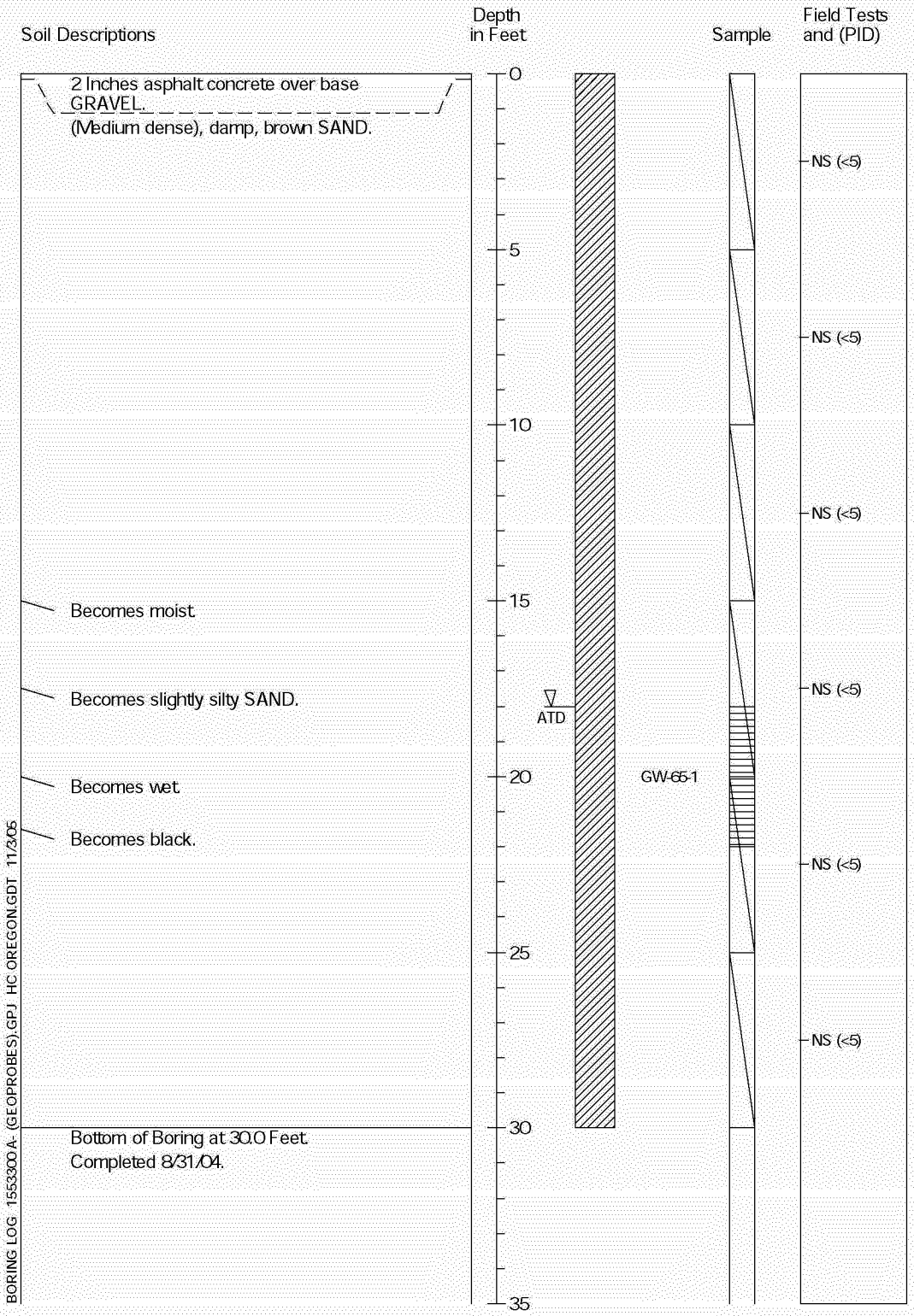
Figure A-56

Push Probe Exploration SB-65



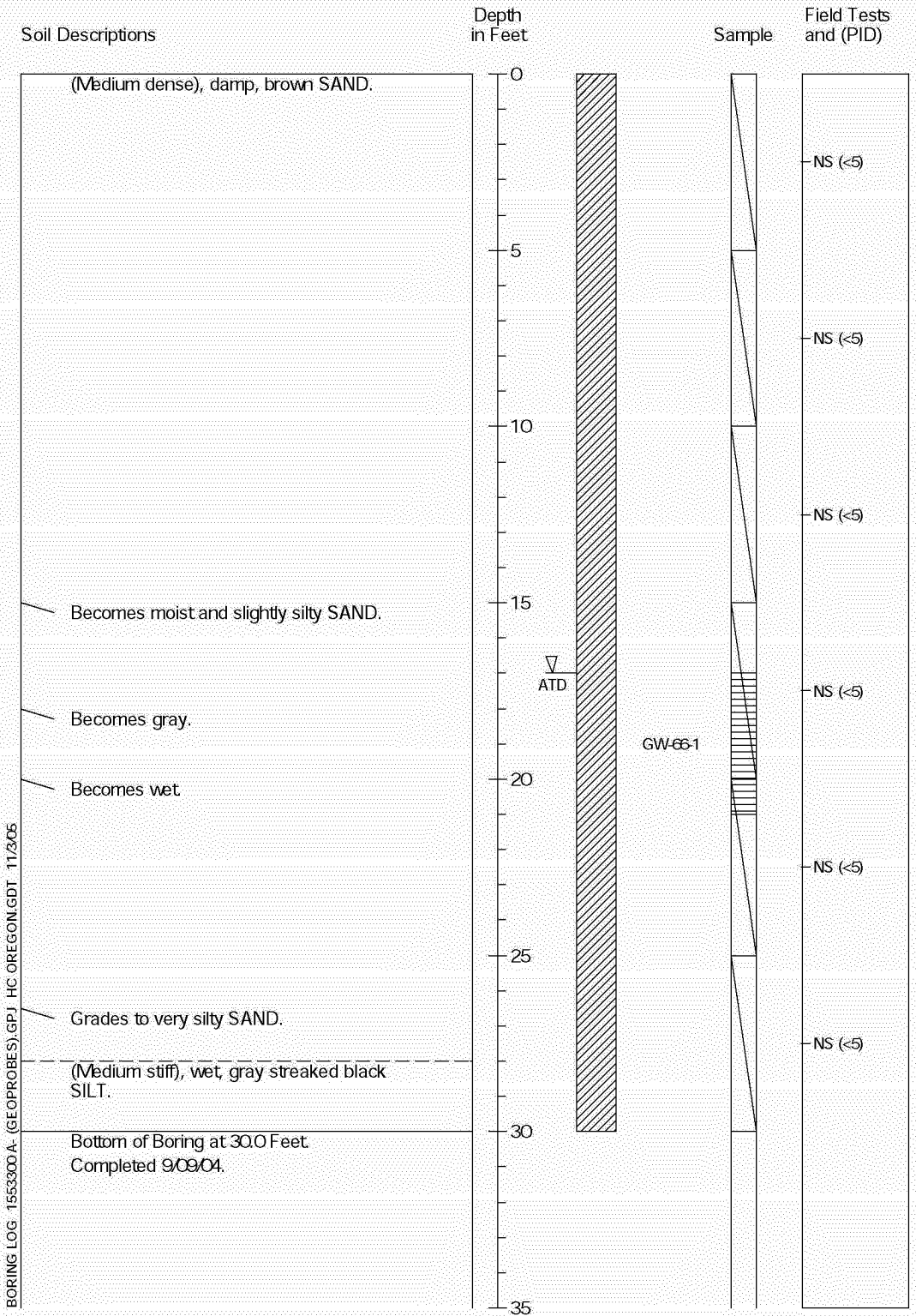
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

HARTCROWSER

15533-00 *8/04*

Figure A-57

Push Probe Exploration SB-66



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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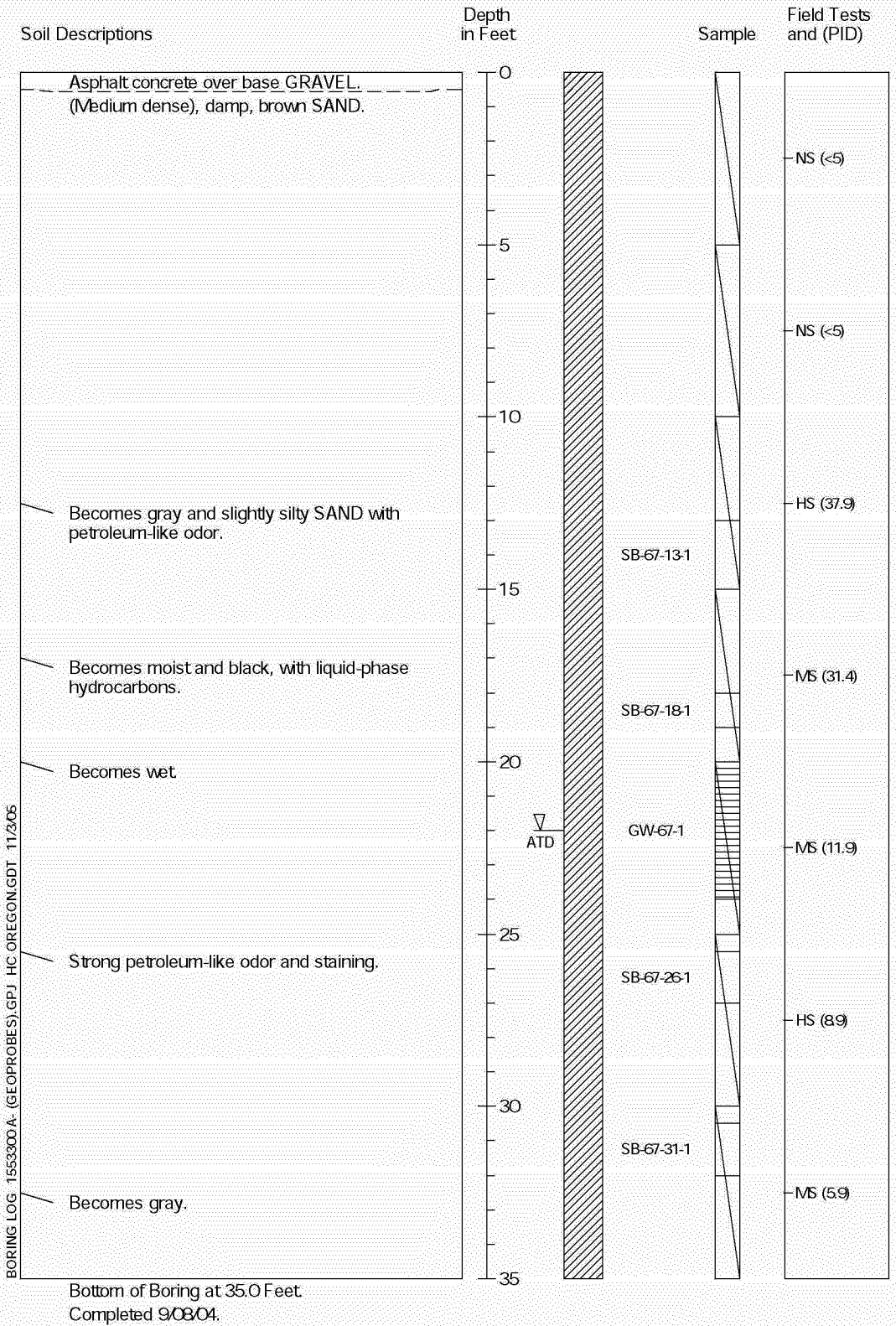
Figure A-58

Push Probe Exploration SB-67



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

HARTCROWSER

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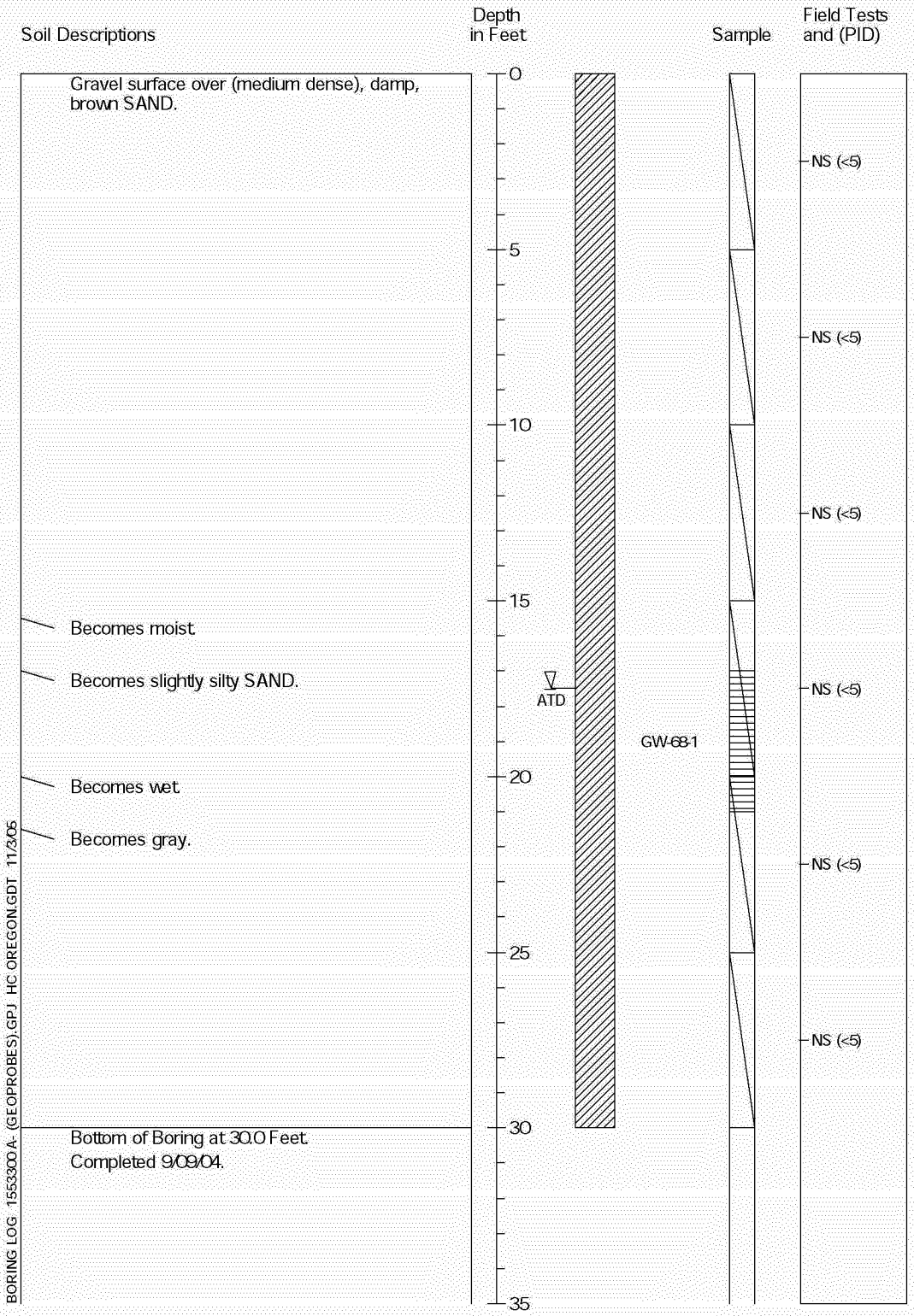
Figure A-59

Push Probe Exploration SB-68



BORING LOG 15533000 A- (GEOPROBES).GPJ HC OREGON.GDT 11/3/05

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

HARTCROWSER

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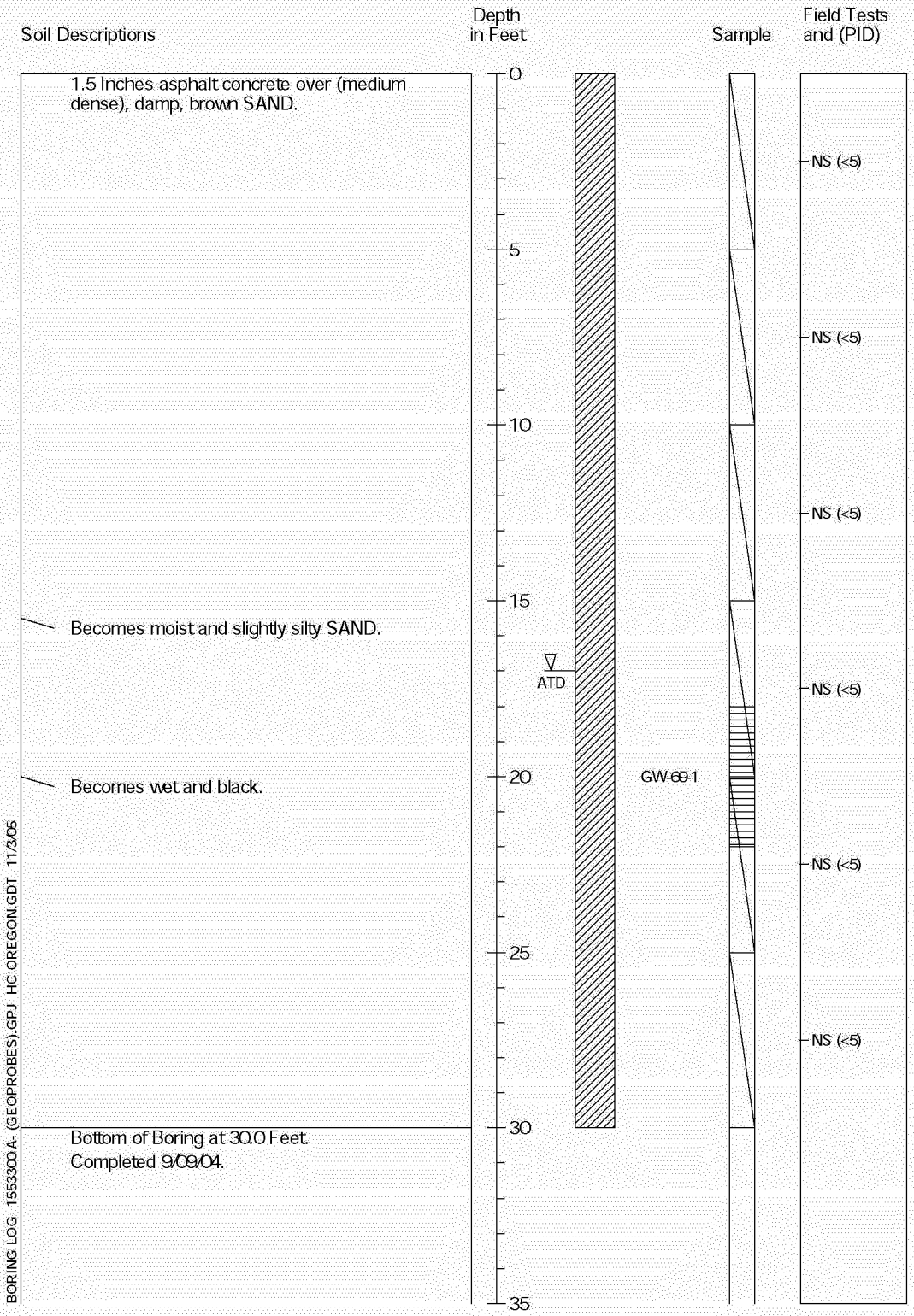
Figure A-60

Push Probe Exploration SB-69



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

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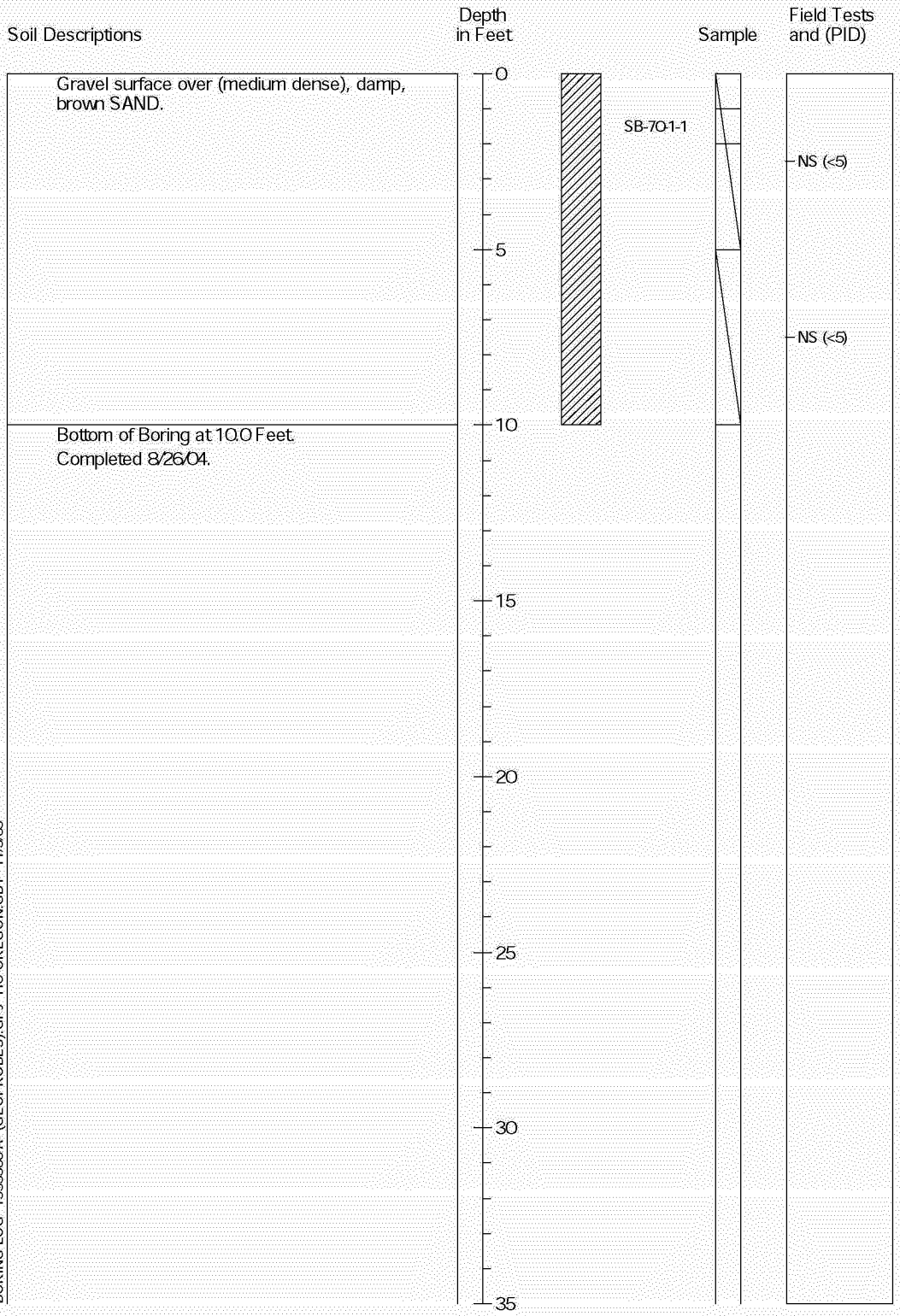
Figure A-61

Push Probe Exploration SB-70



BORING LOG 1553300 A- (GEOPROBES).GPJ HC OREGON.GDT 11/3/05

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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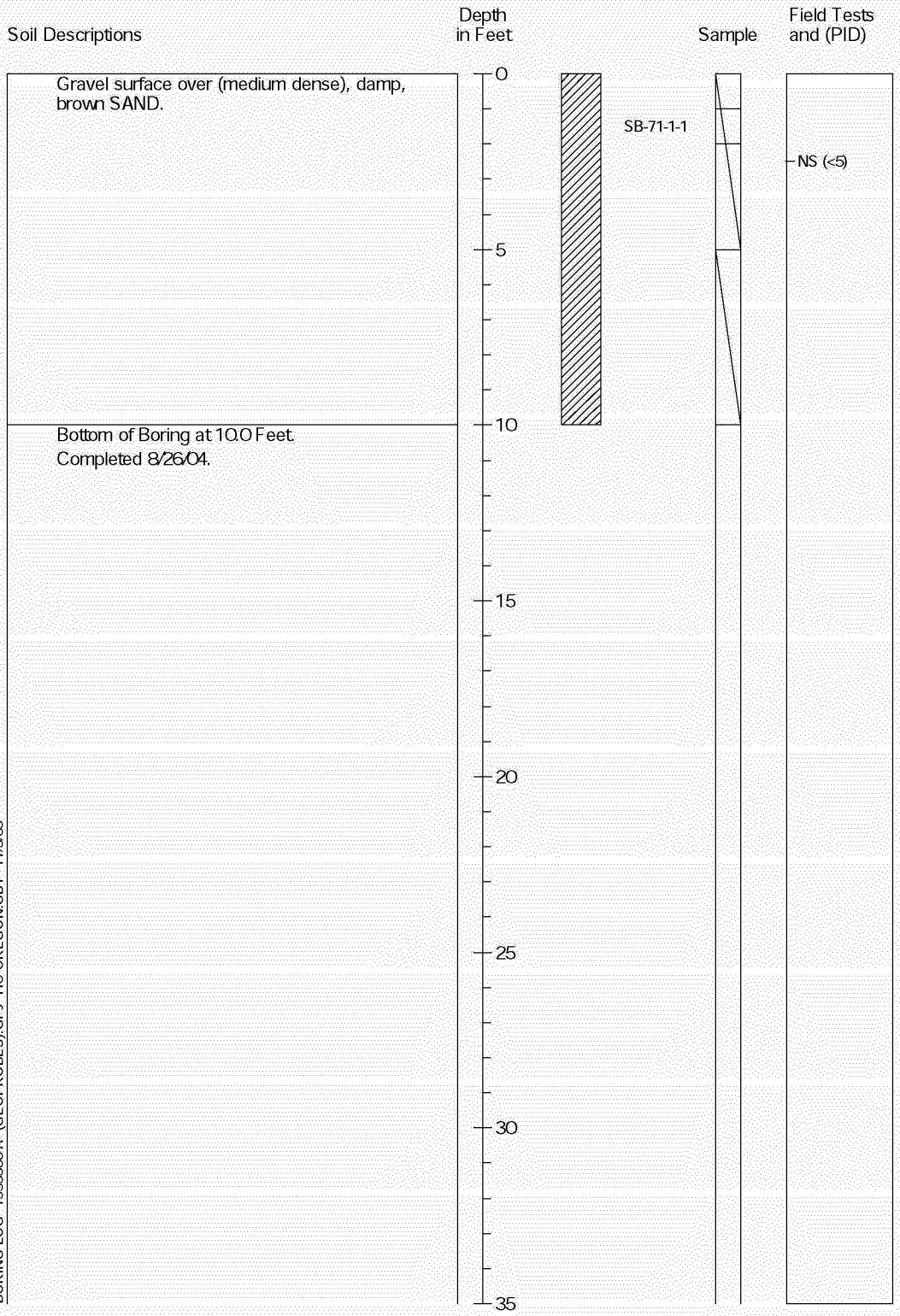
15533-00 *8/04*

Figure A-62

Push Probe Exploration SB-71



BORING LOG 1553300 A- (GEOPROBES).GPJ HC OREGON.GDT 11/3/05

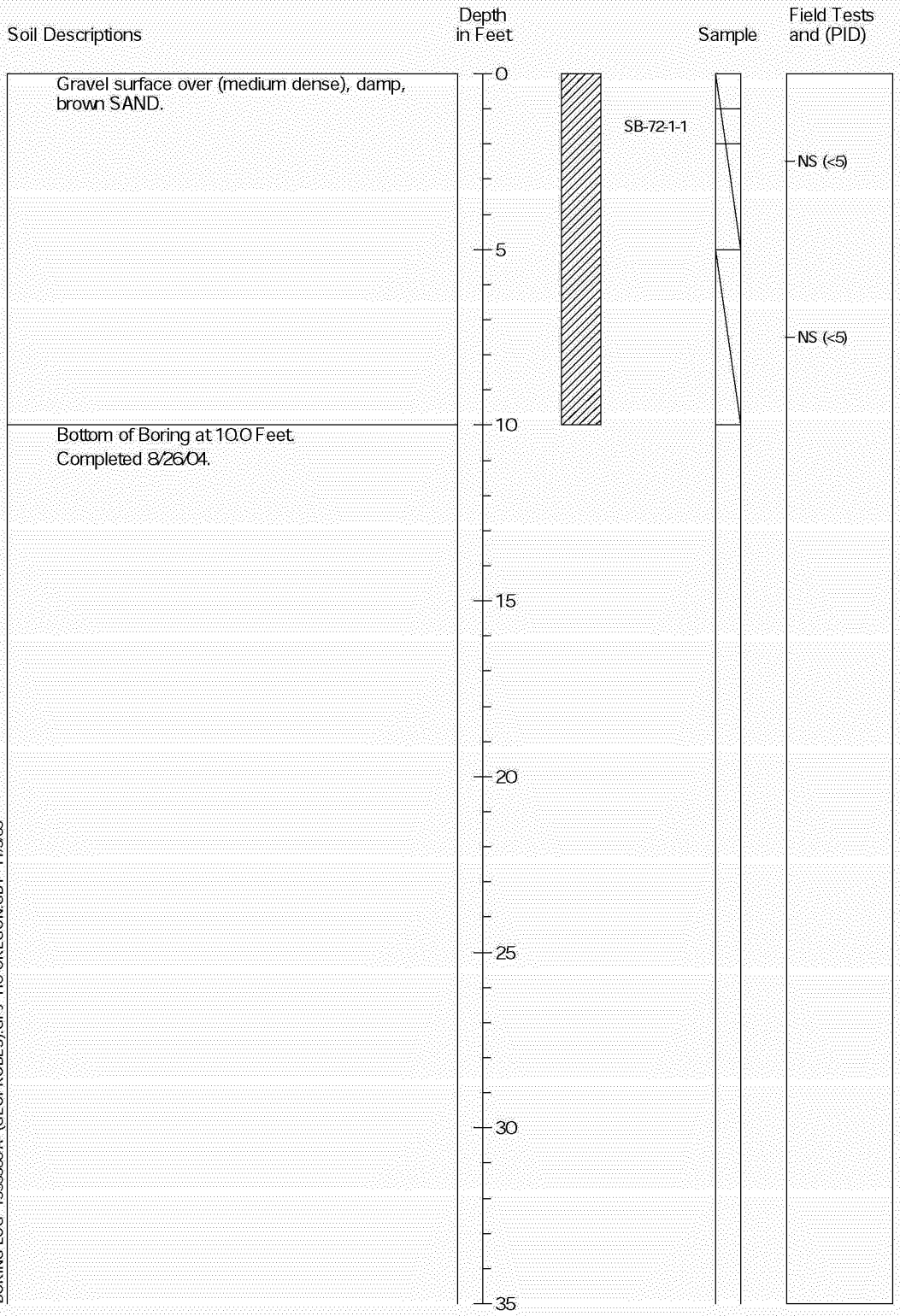
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

15533-00 *8/04*

Figure A-63

Push Probe Exploration SB-72



BORING LOG 1553300A- (GEOPROBES).GPJ HC OREGON.GDT 11/3/05

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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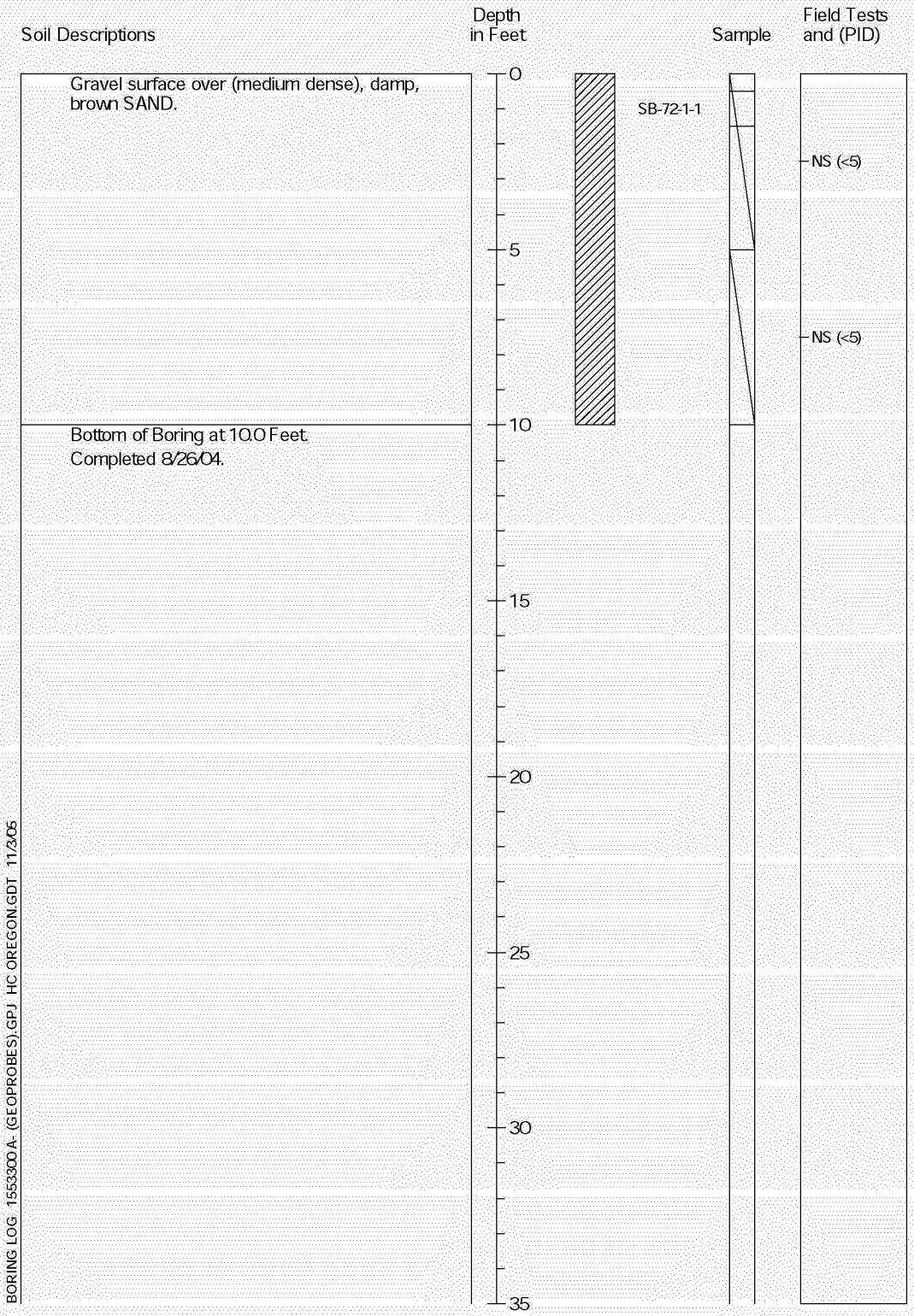
15533-00 *8/04*

Figure A-64

Push Probe Exploration SB-73



BORING LOG 1553300 A- (GEOPROBES).GPJ HC OREGON.GDT 11/3/05

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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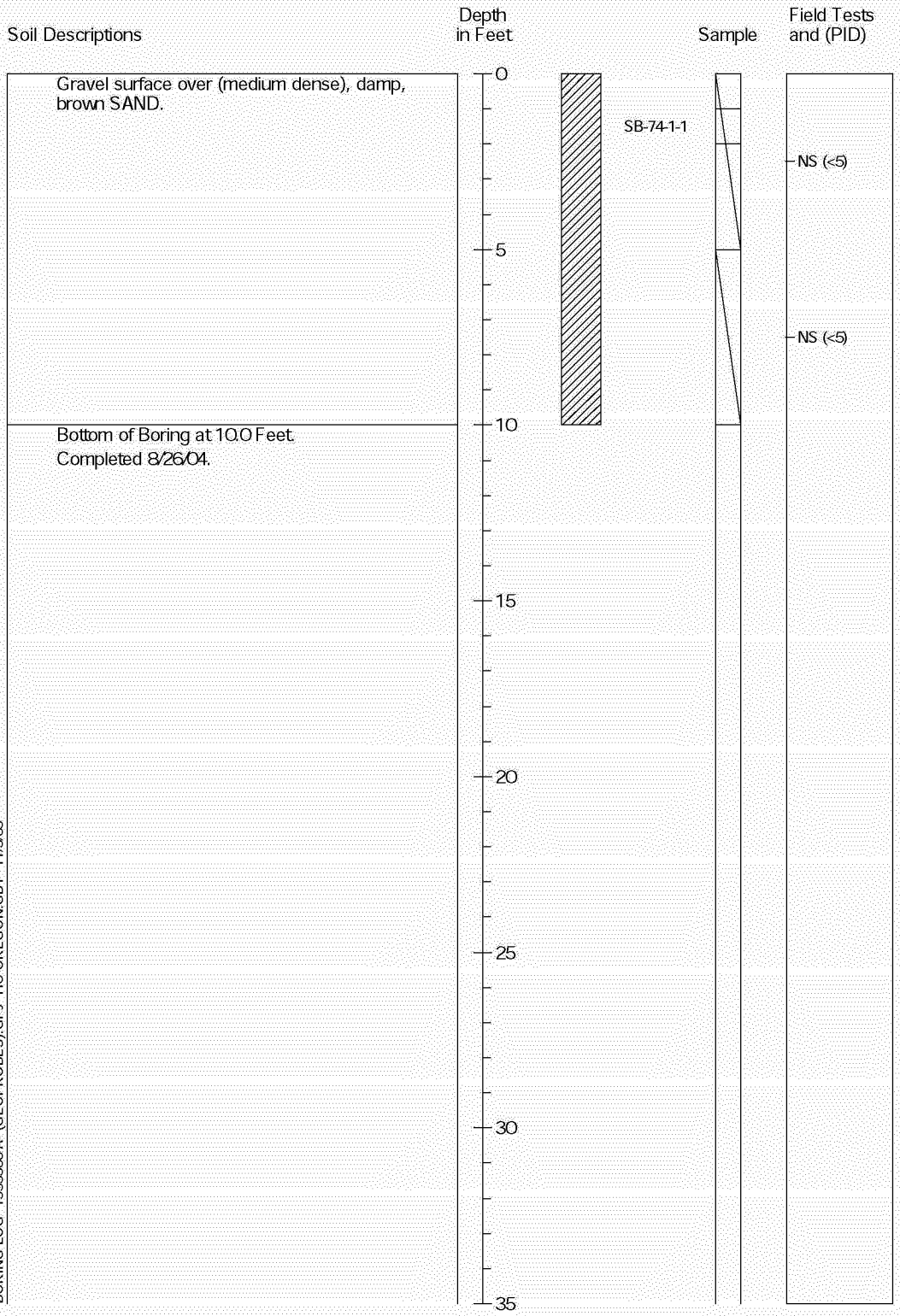
15533-00 *8/04*

Figure A-65

Push Probe Exploration SB-74



BORING LOG 15533000 A- (GEOPROBES).GPJ HC OREGON.GDT 11/3/05

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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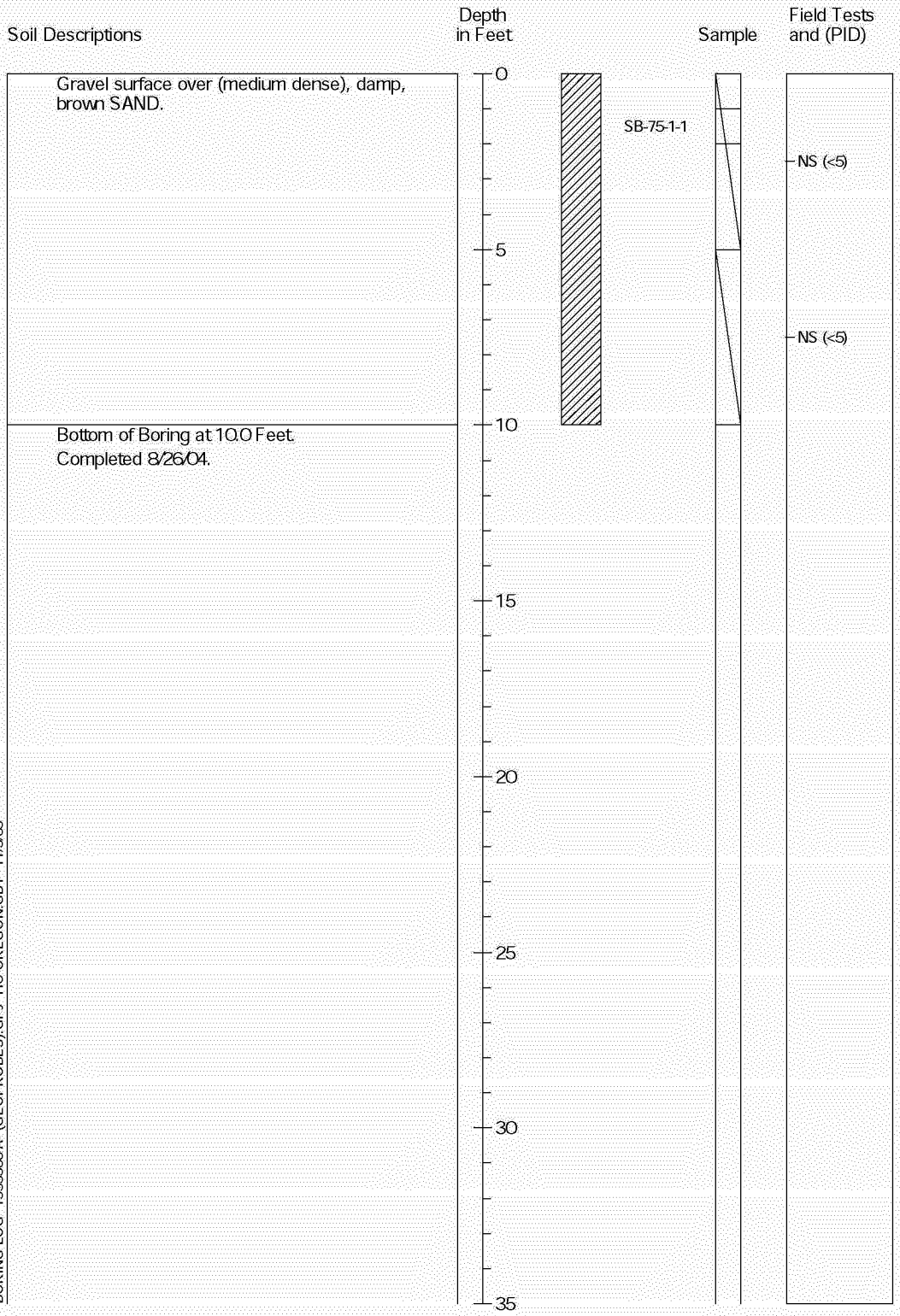
15533-00 *8/04*

Figure A-66

Push Probe Exploration SB-75



BORING LOG 1553300 A- (GEOPROBES).GPJ HC OREGON.GDT 11/3/05

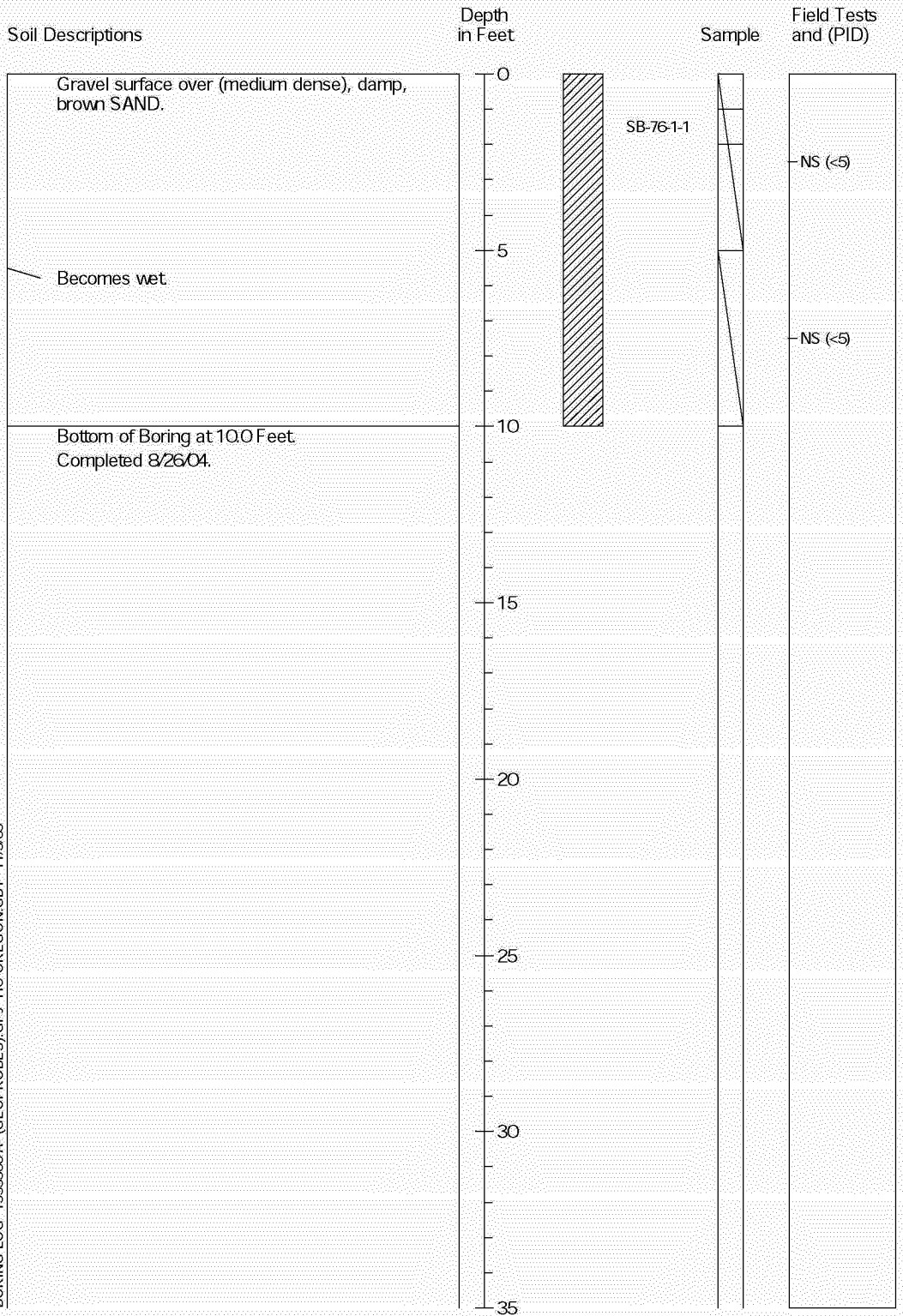
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

15533-00 *8/04*

Figure A-67

Push Probe Exploration SB-76



BORING LOG 1553300 A- (GEOPROBES).GPJ HC OREGON.GDT 11/3/05

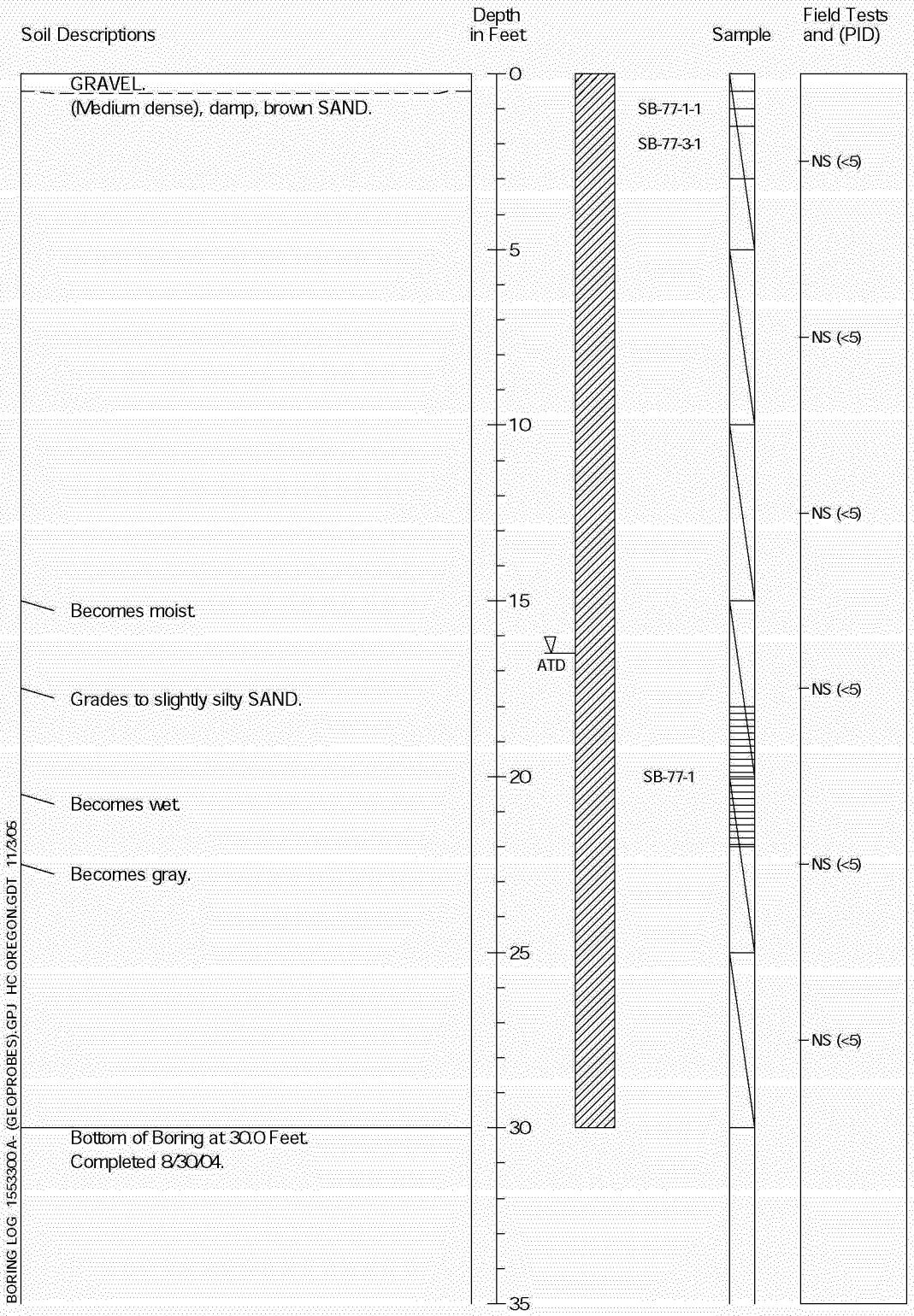
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

15533-00 *8/04*

Figure A-68

Push Probe Exploration SB-77



BORING LOG 15533000 A- (GEOPROBES).GPJ HC OREGON.GDT 11/3/05

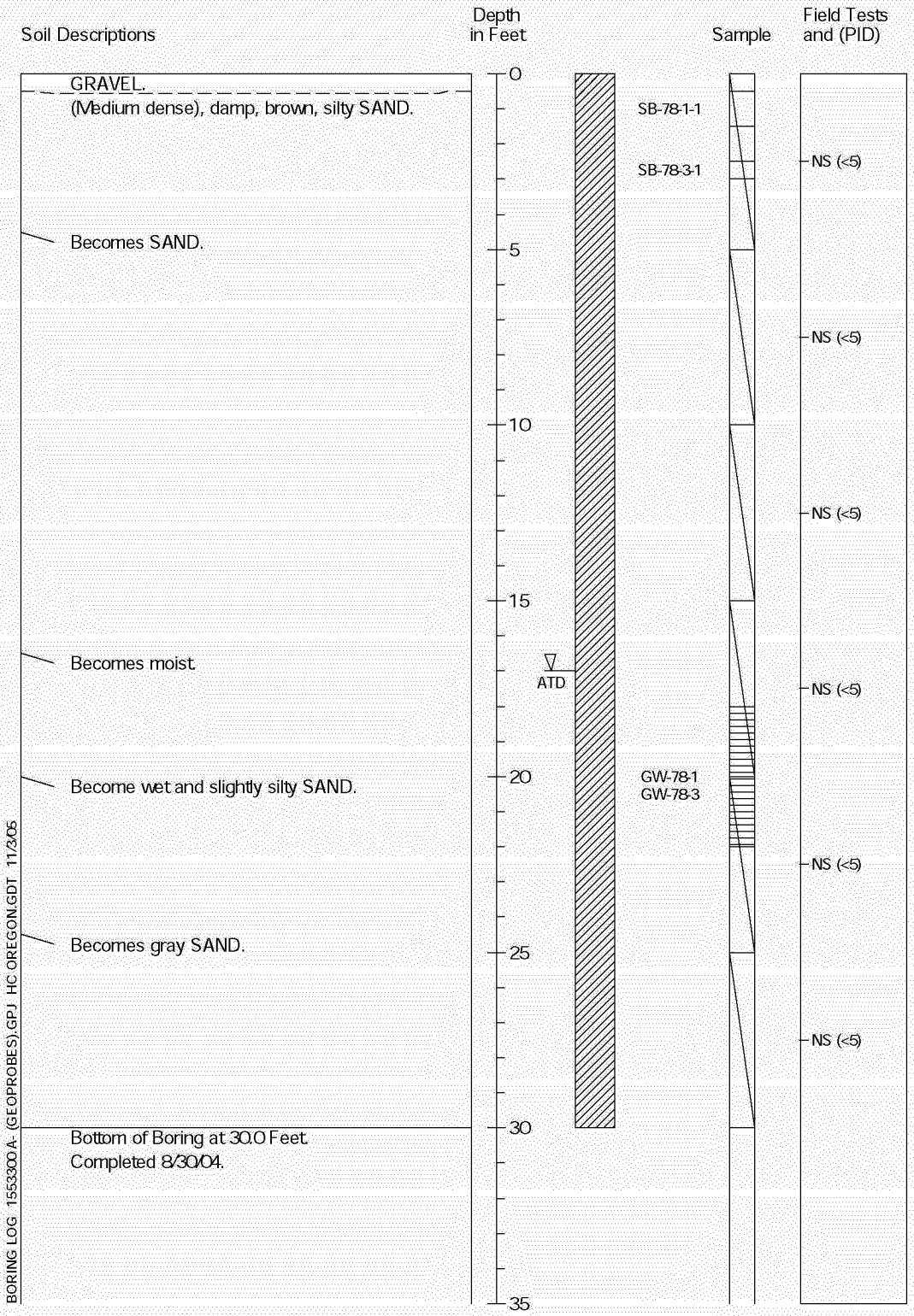
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

15533-00 *8/04*

Figure A-69

Push Probe Exploration SB-78



BORING LOG 15533000 A- (GEOPROBES).GPJ HC OREGON.GDT 11/3/05

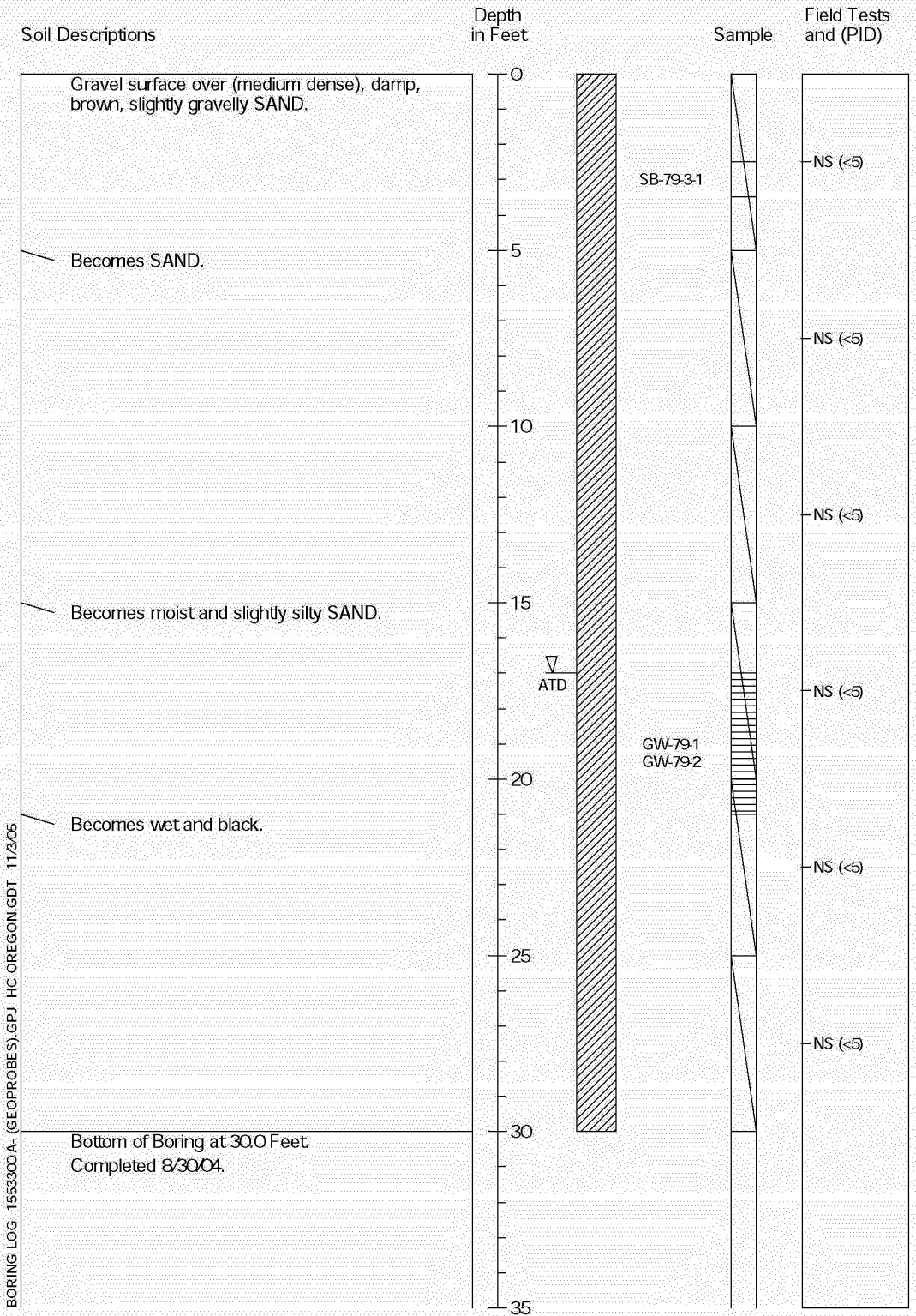
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

HARTCROWSER

15533-00 *8/04*

Figure A-70

Push Probe Exploration SB-79



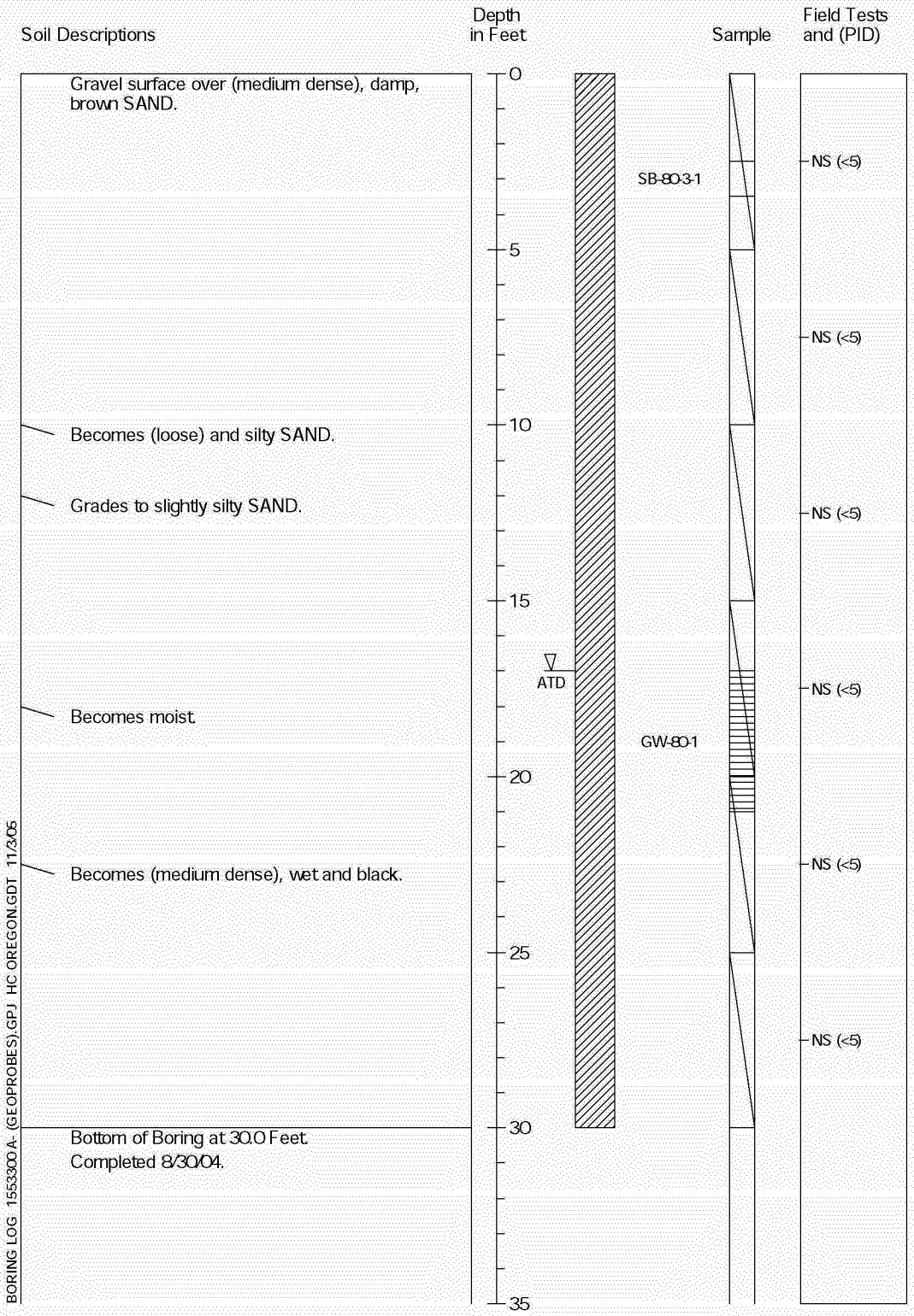
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

HARTCROWSER

15533-00 *8/04*

Figure A-71

Push Probe Exploration SB-80



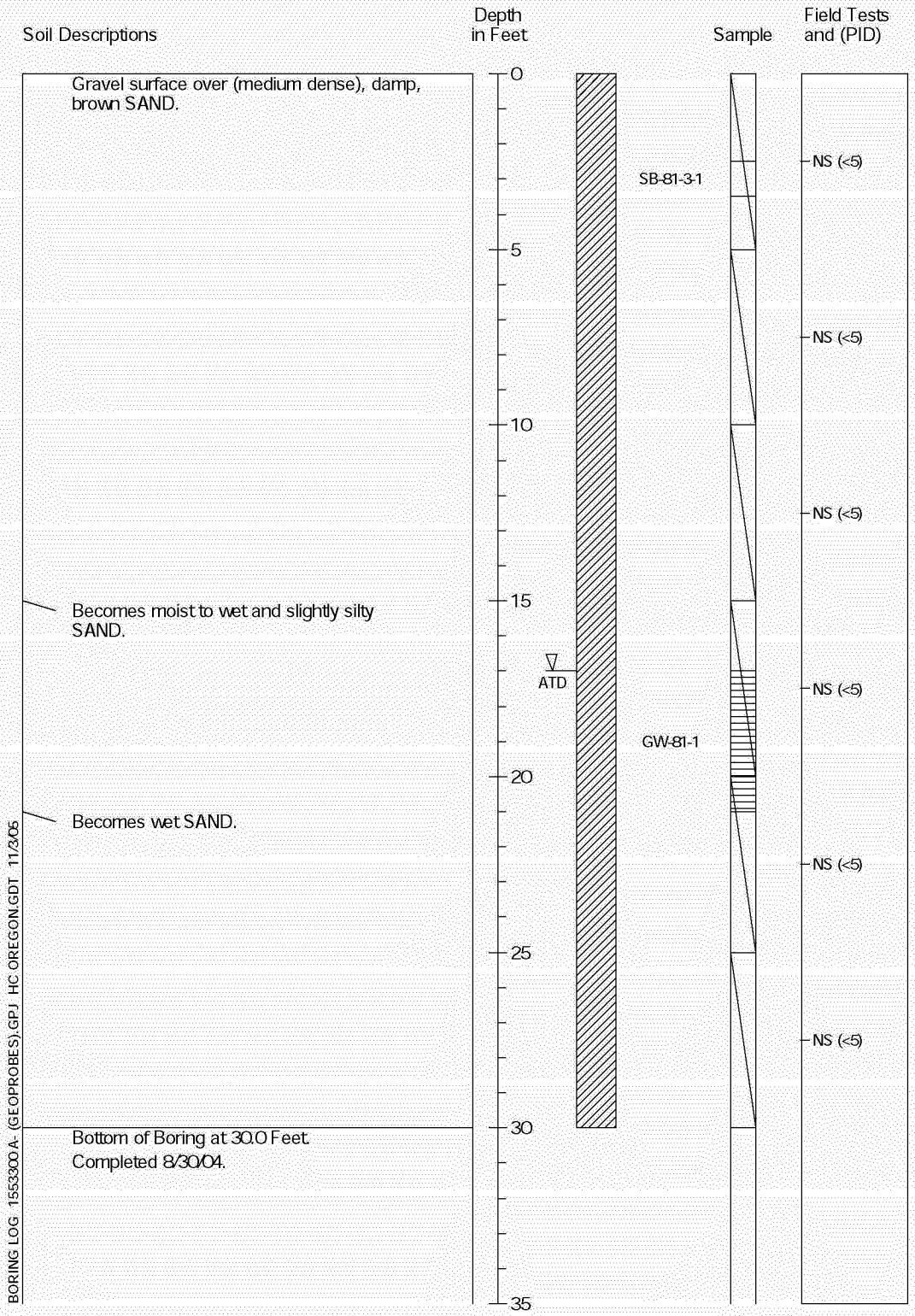
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

HARTCROWSER

15533-00 *8/04*

Figure A-72

Push Probe Exploration SB-81



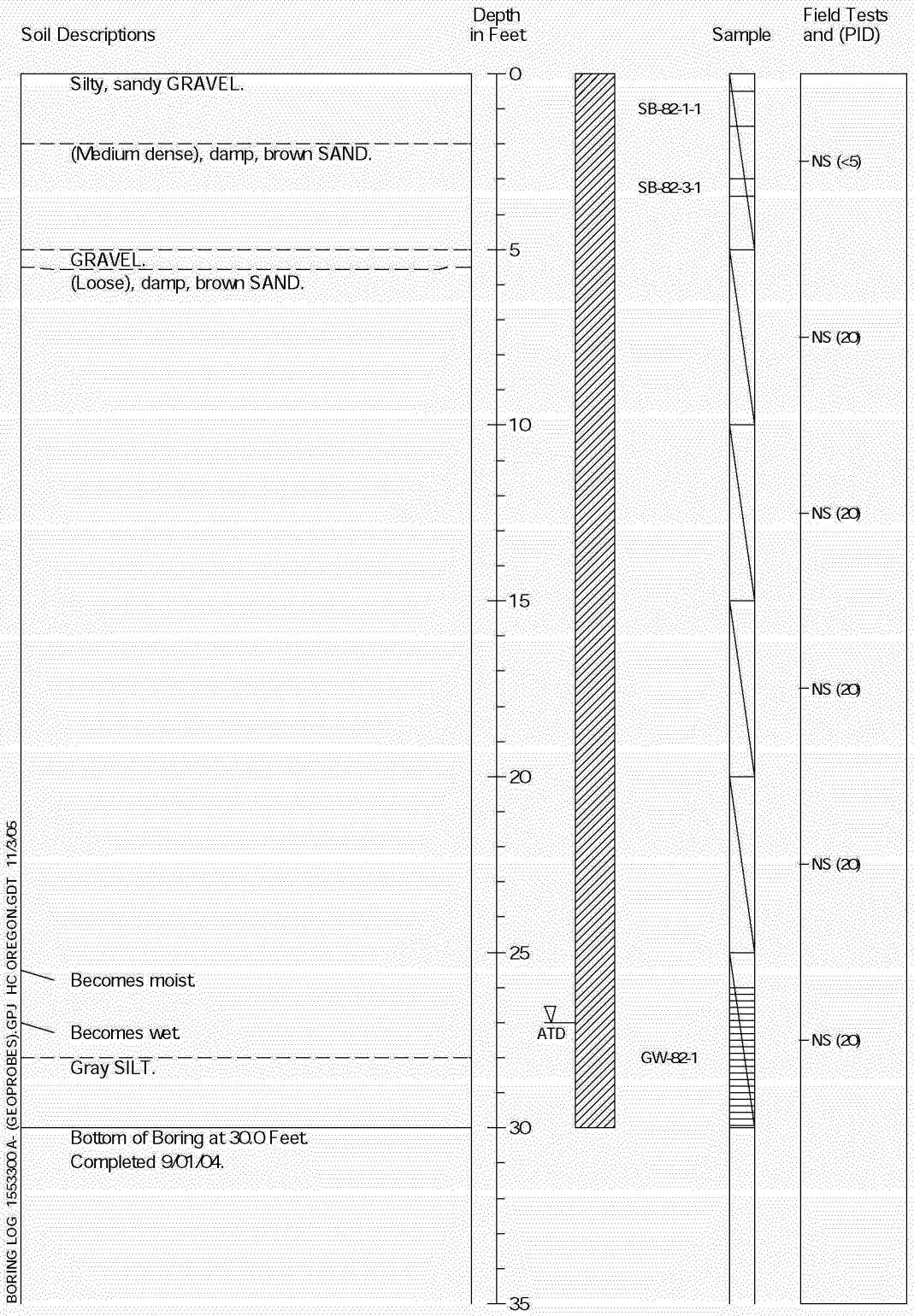
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

HARTCROWSER

15533-00 *8/04*

Figure A-73

Push Probe Exploration SB-82



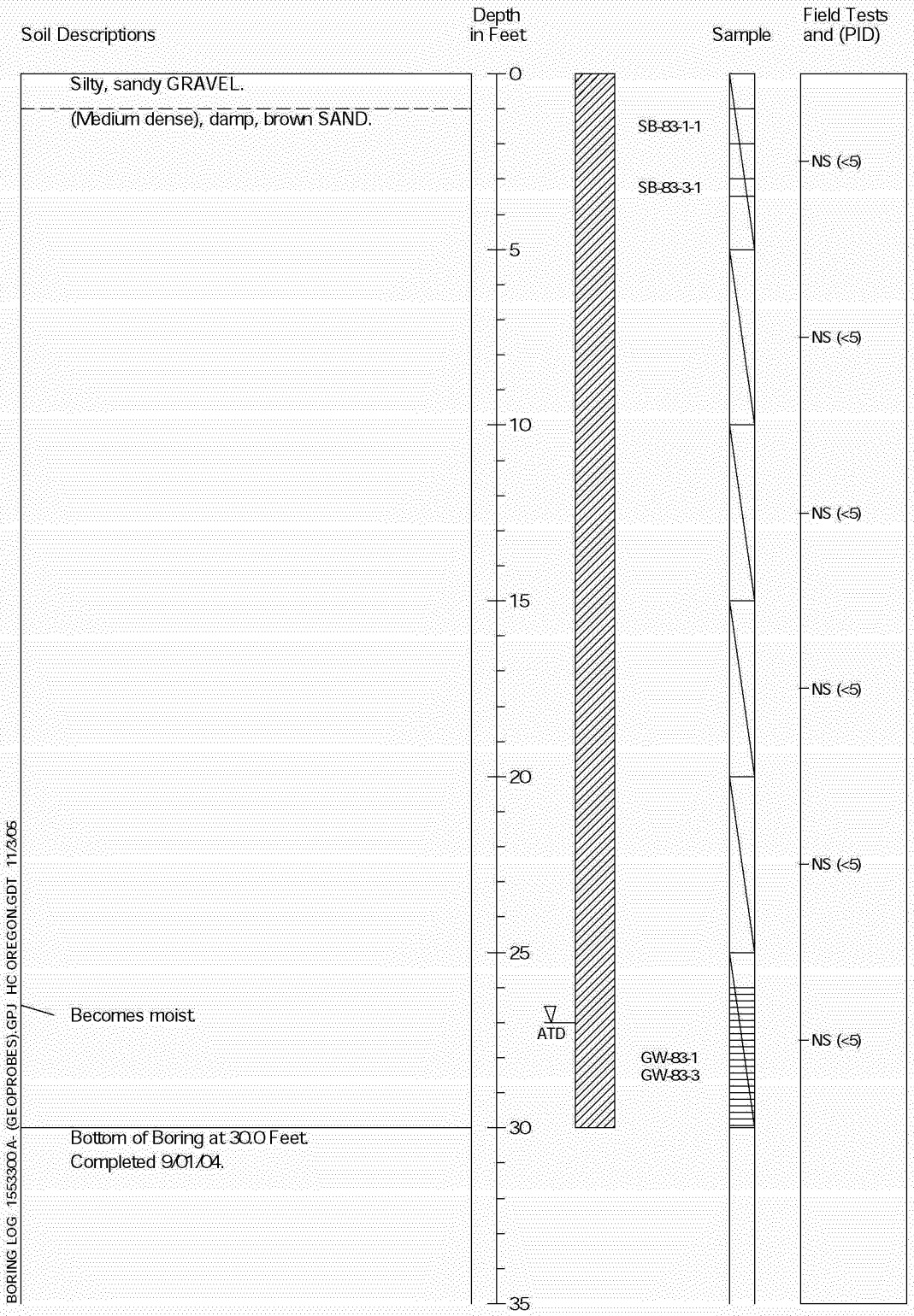
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

HARTCROWSER

15533-00 *9/04*

Figure A-74

Push Probe Exploration SB-83



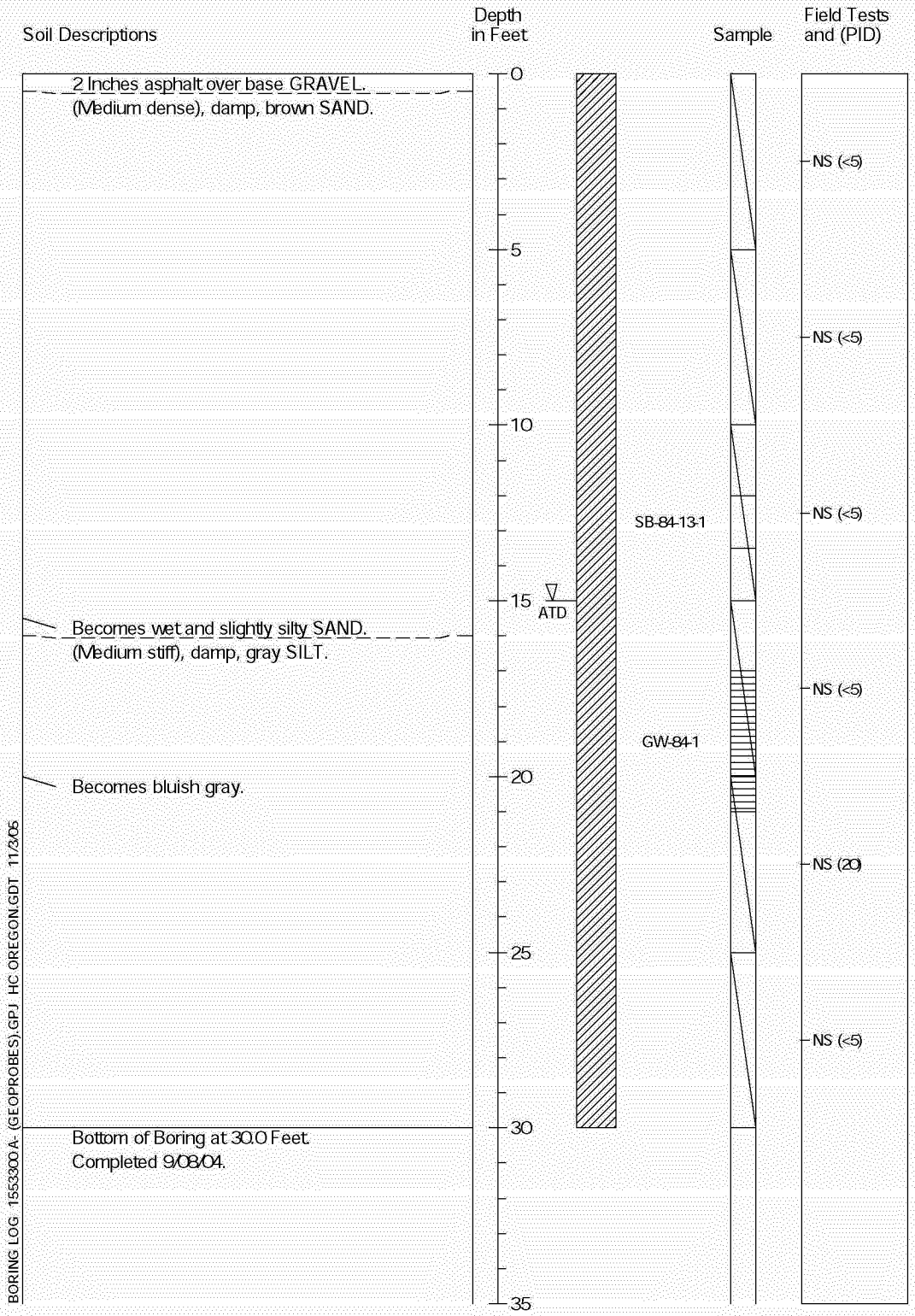
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

HARTCROWSER

15533-00 *9/04*

Figure A-75

Push Probe Exploration SB-84



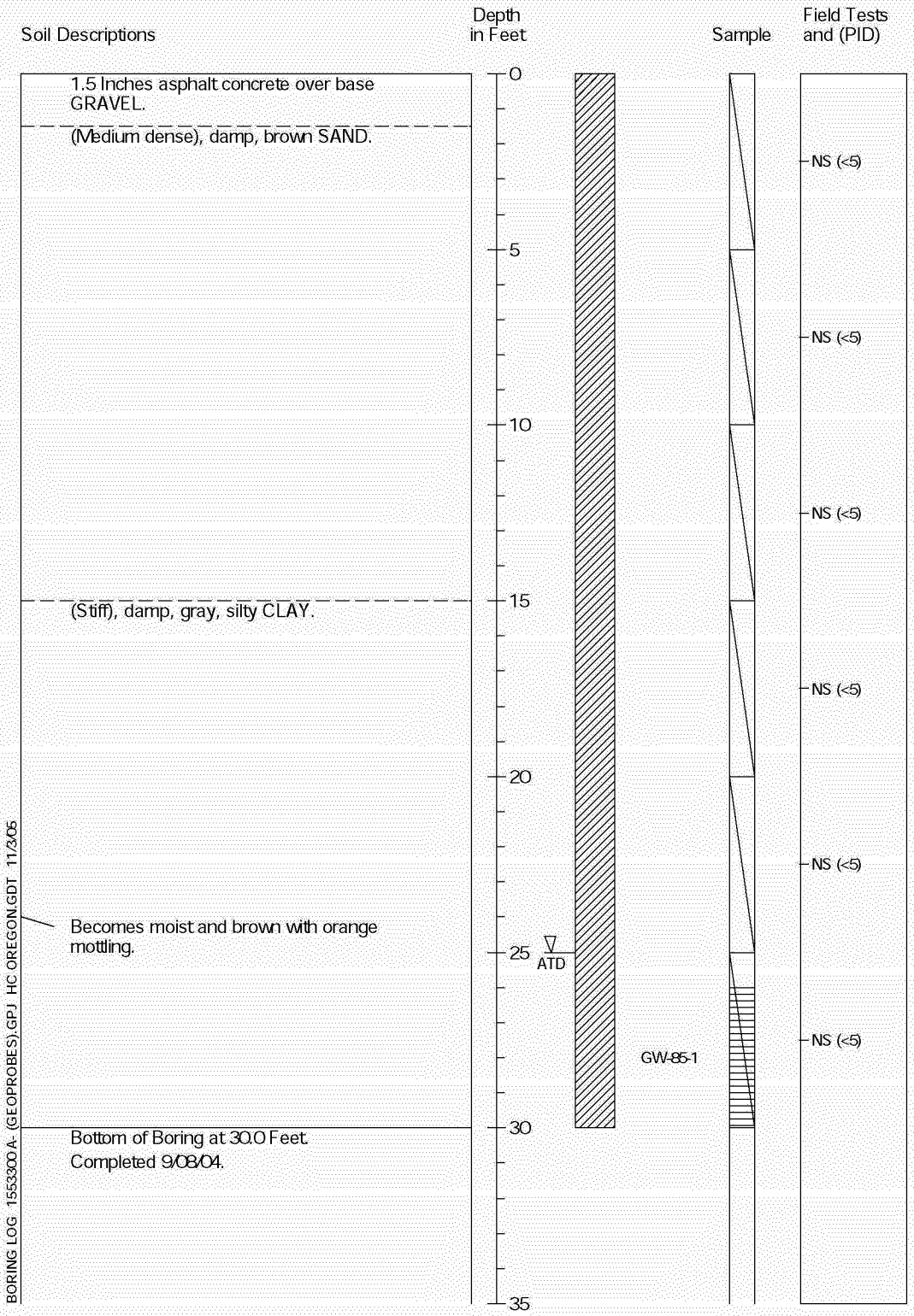
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

HARTCROWSER

15533-00 *9/04*

Figure A-76

Push Probe Exploration SB-85



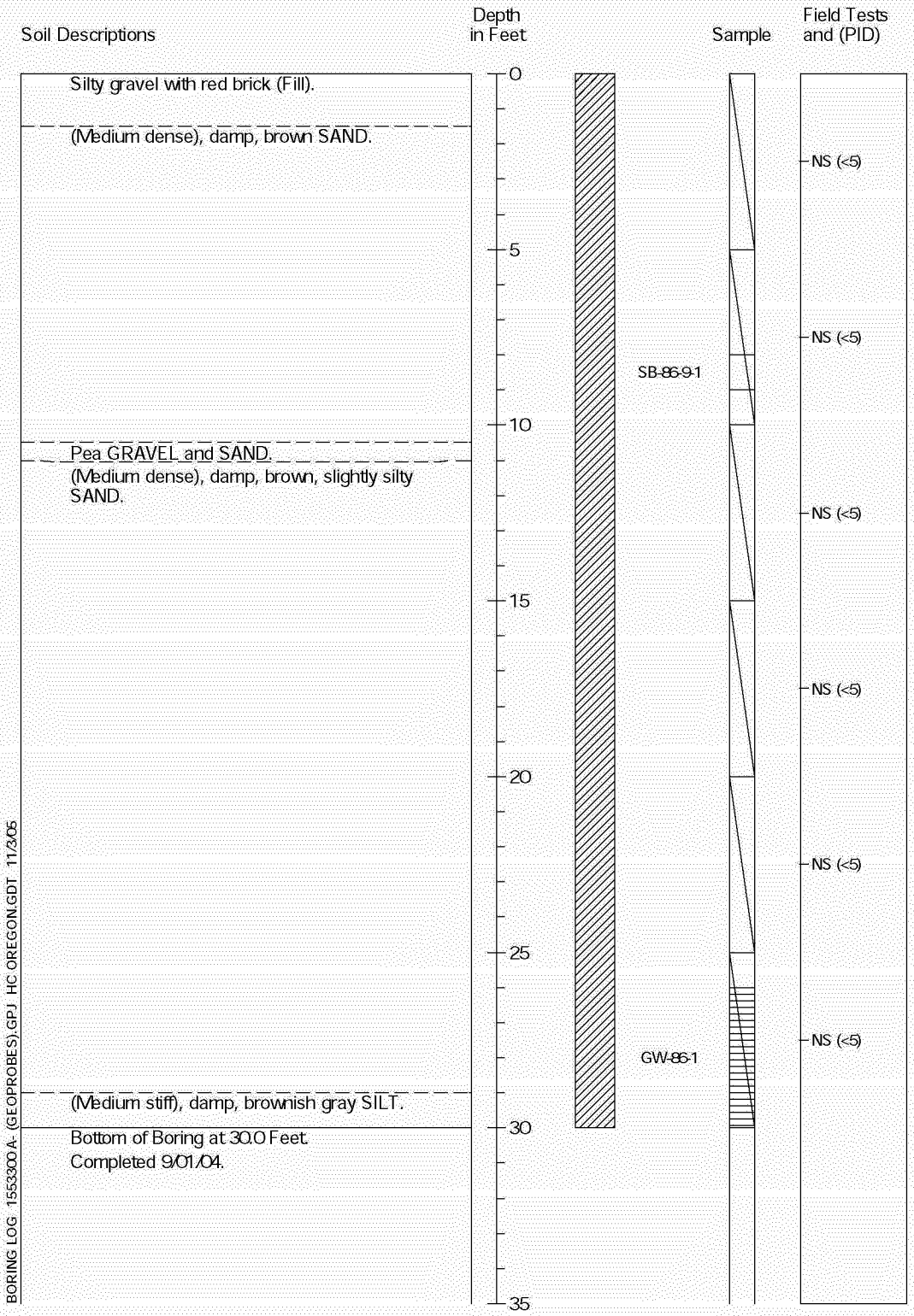
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

HARTCROWSER

15533-00 *9/04*

Figure A-77

Push Probe Exploration SB-86



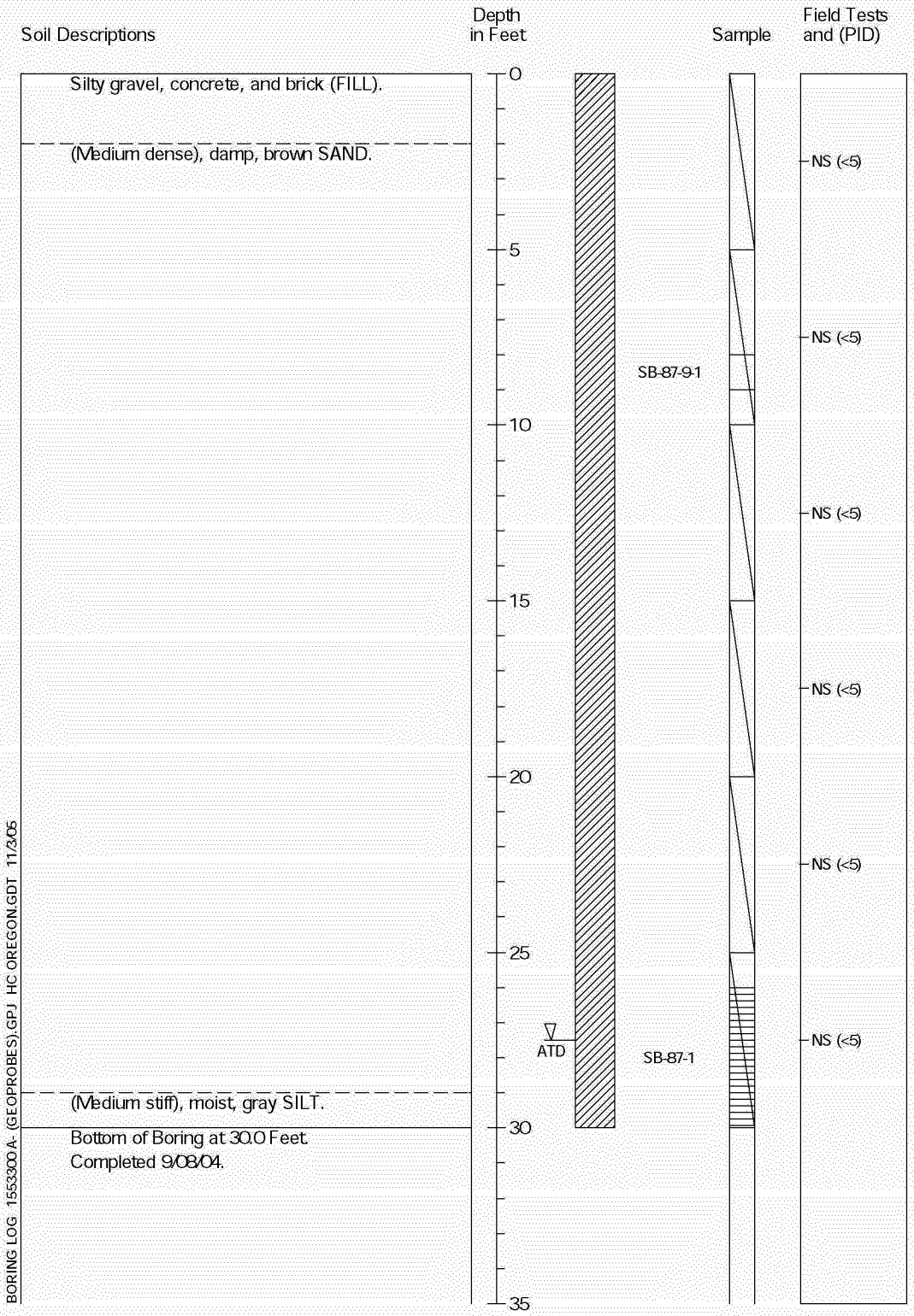
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

HARTCROWSER

15533-00 *9/04*

Figure A-78

Push Probe Exploration SB-87



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Water sample was collected from a temporarily screened interval as shown.

HARTCROWSER

15533-00 *9/04*

Figure A-79

Ash Creek Associates, Inc.
Environmental and Geotechnical Consultants

Terminal 4 Slip 1
Remedial Investigation
Phase III

Project Number 1065-00
1066-00

Boring Number S-12

Boring Location: North Side of Slip 1
Surface Elevation: Not Measured
Contractor: BBL
Date Completed: 9/6/05
Equipment: Hand-Dug Hole with SS Bowl
Logged By: JRS of BBL

Depth, feet	Sample ID	Sample	Sheen	PID	Material Description
	S-12-0.5		No	<5	3" Gravel surface over coarse GRAVEL with sand and silt and a some organics.
	S-12-2		No	<5	(Loose), damp, brown, well sorted, medium SAND.
					Bottom of Boring at 2.5 Feet.
5					
10					

Boring Number S-13

Boring Location: North Side of Slip 1
Surface Elevation: Not Measured
Excavation: BBL
Date Completed: 9/6/05
Equipment: Hand-Dug Hole with SS Bowl
Logged By: JRS of BBL

Depth, feet	Sample ID	Sample	Sheen	VOC	Material Description
	S-13-0.5		No	0.0	3" Gravel surface over (loose), damp, brown, fine SAND and some coarse and fine gravel.
	S-13-2		No	0.0	(Loose), damp, brown, well sorted, medium SAND.
					Bottom of Boring at 2.5 Feet.
5					
10					

Note: Boring number prefix "T4S1" removed for clarity.

Ash Creek Associates, Inc.
Environmental and Geotechnical Consultants

Terminal 4 Slip 1
Remedial Investigation
Phase III

Project Number 1065-00
1066-00

Boring Number SB-77

Boring Location: East Side of Slip 1 | Surface Elevation: Not Measured
Contractor: BBL | Date Completed: 9/8/05
Equipment: Hand-Dug Hole with SS Bowl | Logged By: JRS of BBL

Depth, feet	Sample ID	Sample	Sheen	VOC	Material Description
	SB-77-0.5-1		No	0.0	3" Gravel surface over (loose), damp, brown, fine SAND with some fine to medium gravel.
	SB-77-2-1		No	0.0	(Loose), moist, brown, fine SAND with trace coarse sand and fine gravel.
					Bottom of Boring at 2.5 Feet.
5					
10					

Boring Number SB-88

Boring Location: North Side of Slip 1 | Surface Elevation: Not Measured
Excavation: Geotech | Date Completed: 9/7/05
Equipment: Geoprobe 6600 | Logged By: JRS of BBL

Depth, feet	Sample ID	Sample	Sheen	VOC	Material Description
					Asphalt and coarse base gravel.
	SB-88-2-1		No	0.0	(Loose), damp, brown, fine SAND with some medium sand.
	SB-88-2.5-1		No	0.0	Gravelly lens.
5					
	SB-88-5-1		No	0.0	
					Gravelly layer with some fine to medium sand.
	SB-88-7.5-1		No	0.0	(Loose), damp, brown, fine SAND with some medium sand.
10					
					Bottom of Boring at 15.0 Feet.

Note: Boring number prefix "T4S1" removed for clarity.

Ash Creek Associates, Inc.
Environmental and Geotechnical Consultants

Terminal 4 Slip 1
Remedial Investigation
Phase III

Project Number 1065-00
1066-00

Boring Number SB-89

Boring Location:
Contractor: Geotech
Equipment: Geoprobe 6600

Surface Elevation: Not Measured
Date Completed: 9/7/05
Logged By: JRS of BBL

Depth, feet	Sample ID	Sample	Sheen	VOC	Material Description
	SB-89-0-1		No	0.0	4" Asphalt surface over 3" base gravel over (loose), moist, brown, fine to medium SAND with trace coarse gravel.
					Bottom of Boring at 2.5 Feet.
5					
10					

Boring Number SB-90

Boring Location: East of Large Concrete Tank Farm
Excavation: Geotech
Equipment: Geoprobe 6600

Surface Elevation: Not Measured
Date Completed: 9/7/05
Logged By: JRS of BBL

Depth, feet	Sample ID	Sample	Sheen	VOC	Material Description
	SB-90-0-1		No	0.0	4" Asphalt surface over 2" gravel over fine to medium SAND with trace coarse sand.
					Bottom of Boring at 2.5 Feet.
5					
10					

Note: Boring number prefix "T4S1" removed for clarity.

Ash Creek Associates, Inc.
Environmental and Geotechnical Consultants

Terminal 4 Slip 1
Remedial Investigation
Phase III

Project Number 1065-00
1066-00

Boring Number SB-91

Boring Location: Between Large Concrete Tank, NE of Slip 1
Surface Elevation: Not Measured
Contractor: Geotech
Date Completed: 9/7/05
Equipment: Geoprobe 6600
Logged By: JRS of BBL

Depth, feet	Sample ID	Sample	Sheen	VOC	Material Description
	SB-91-0-1		No	0.0	Gravel surface over (loose), dry, brown, rounded. coarse GRAVEL and COBBLES with some very fine sand, silt, and trace organics.
					Bottom of Boring at 2.5 Feet.
5					
10					

Boring Number SB-92

Boring Location: Northeast of Slip 1
Surface Elevation: Not Measured
Excavation: Geotech
Date Completed: 9/7/05
Equipment: Geoprobe 6600
Logged By: JRS of BBL

Depth, feet	Sample ID	Sample	Sheen	VOC	Material Description
	SB-92-0-1		No	0.0	Gravel surface over fine sand and trace fine gravel.
					Bottom of Boring at 2.5 Feet.
5					
10					

Note: Boring number prefix "T4S1" removed for clarity.

Ash Creek Associates, Inc.
Environmental and Geotechnical Consultants

Terminal 4 Slip 1
Remedial Investigation
Phase III

Project Number 1065-00
1066-00

Boring Number SB-93

Boring Location: Northeast of Slip 1
Contractor: Geotech
Equipment: Geoprobe 6600

Surface Elevation: Not Measured
Date Completed: 9/7/05
Logged By: JRS of BBL

Depth, feet	Sample ID	Sample	Sheen	VOC	Material Description
	SB-93-0-1		No	0.0	12" CLAY with some fine sand and fine gravel.
					(Loose), damp, brown, fine SAND with trace fine gravel.
					Bottom of Boring at 2.5 Feet.
5					
10					

Boring Number SB-94

Boring Location: Northeast of Slip 1
Excavation: Geotech
Equipment: Geoprobe 6600

Surface Elevation: Not Measured
Date Completed: 9/7/05
Logged By: JRS of BBL

Depth, feet	Sample ID	Sample	Sheen	VOC	Material Description
	SB-94-0-1		No	0.0	Coarse gravel surface over (loose), moist, brown, fine SAND with some medium sand, trace gravel and clay.
					Bottom of Boring at 2.5 Feet.
5					
10					

Note: Boring number prefix "T4S1" removed for clarity.

Ash Creek Associates, Inc.
Environmental and Geotechnical Consultants

Terminal 4 Slip 1
Remedial Investigation
Phase III

Project Number 1065-00
1066-00

Boring Number SB-95

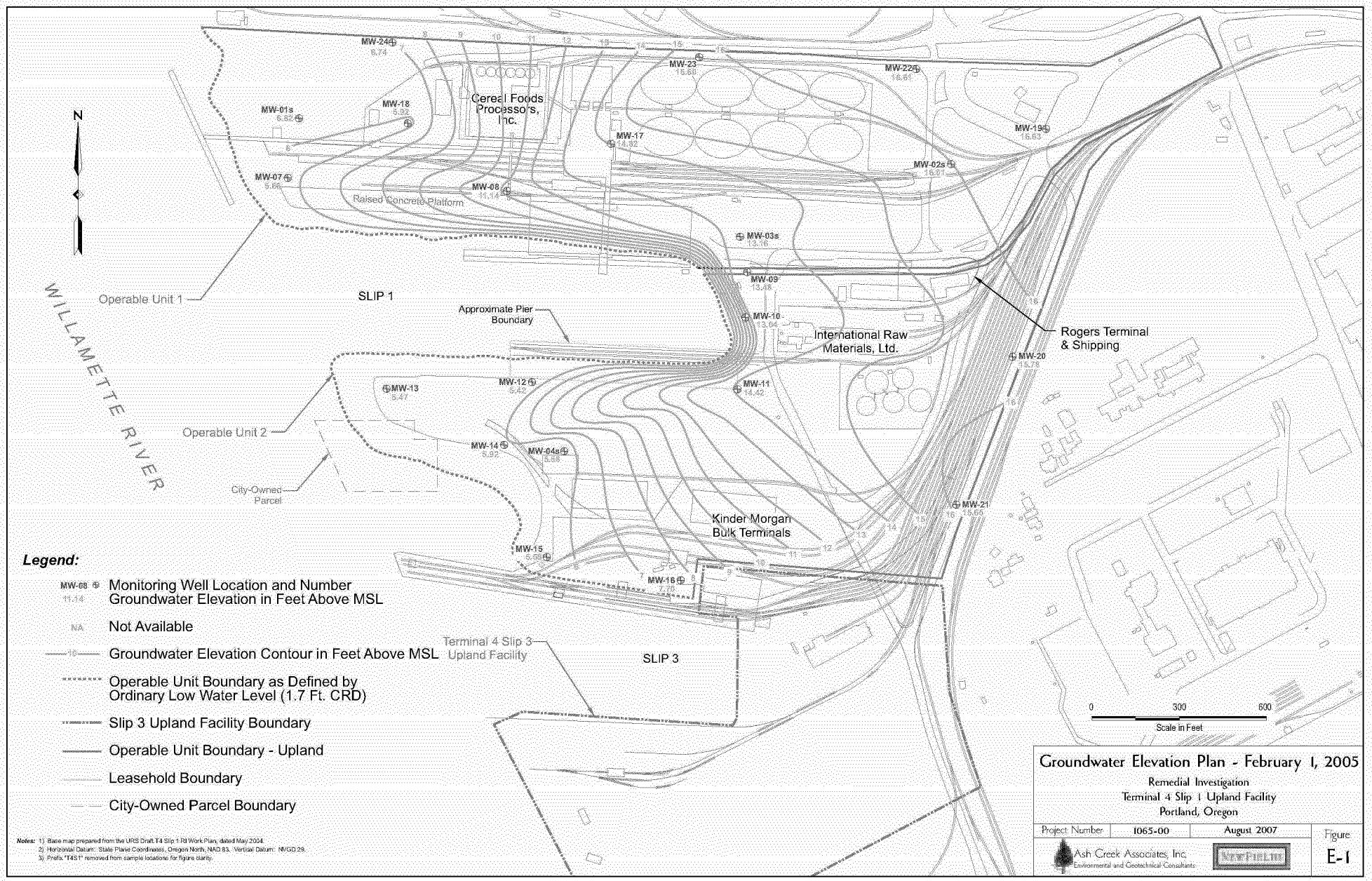
Boring Location: Northeast of Slip 1
Surface Elevation: Not Measured
Contractor: Geotech
Date Completed: 9/7/05
Equipment: Geoprobe 6600
Logged By: JRS of BBL

Depth, feet	Sample ID	Sample	Sheen	VOC	Material Description
	SB-95-0-1		No	0.0	Coarse gravel surface over (loose), moist, brown, fine to medium SAND with trace fine to coarse gravel.
					Bottom of Boring at 2.5 Feet.
5					
10					

Note: Boring number prefix "T4S1" removed for clarity.

Appendix E

Groundwater Elevation Maps



Legend:

- MW-08 / 11.14 — Monitoring Well Location and Number / Groundwater Elevation in Feet Above MSL
- NA — Not Available
- 15 — Groundwater Elevation Contour in Feet Above MSL
- Operable Unit Boundary as Defined by Ordinary Low Water Level (1.7 Ft. CRD)
- Slip 3 Upland Facility Boundary
- Operable Unit Boundary - Upland
- Leasehold Boundary
- City-Owned Parcel Boundary

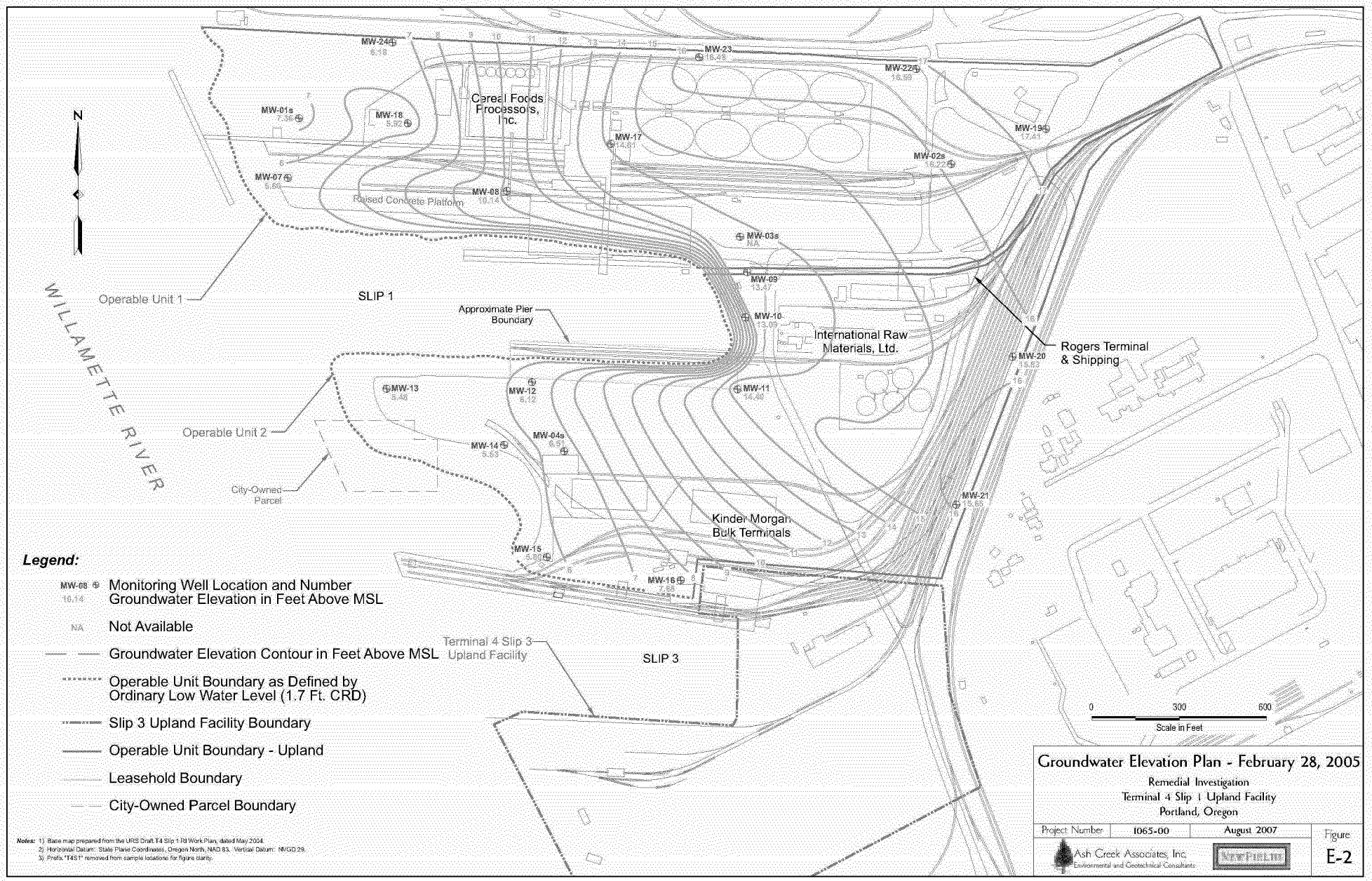
Notes: 1) Base map prepared from the URS Draft T4 Slip 1 RI Work Plan, dated May 2004.
2) Horizontal Datum: State Plane Coordinates, Oregon North, NAD 83. Vertical Datum: NVGD 29.
3) Prefix "T4S1" removed from sample locations for figure clarity.

Groundwater Elevation Plan - February 1, 2005

Remedial Investigation
Terminal 4 Slip 1 Upland Facility
Portland, Oregon

Project Number	1065-00	August 2007	Figure
Ash Creek Associates, Inc. Environmental and Geotechnical Consultants	NewFields		E-1

KMB00008711



Legend:

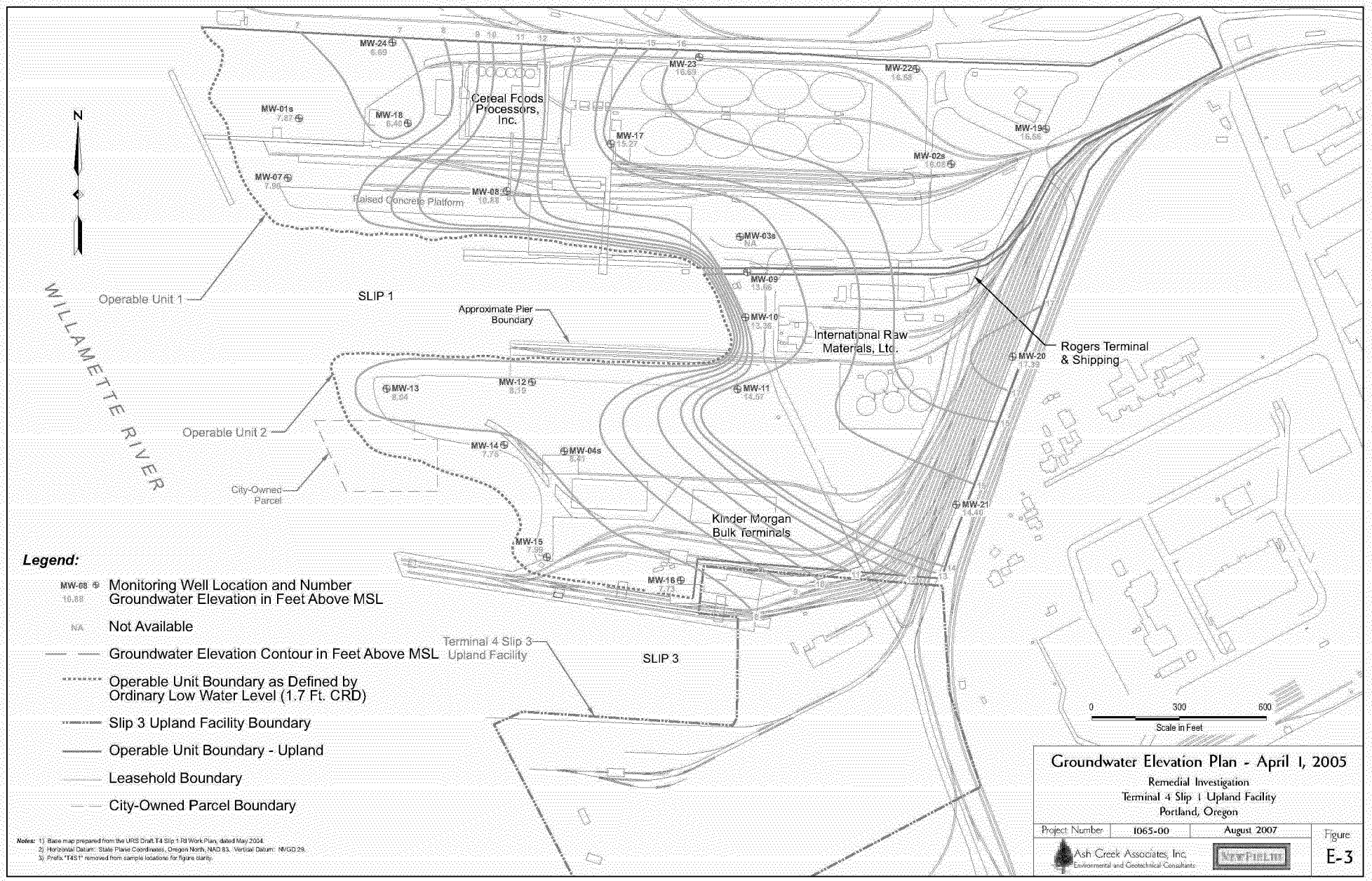
- MW-08 / 10.14 — Monitoring Well Location and Number, Groundwater Elevation in Feet Above MSL
- NA — Not Available
- Groundwater Elevation Contour in Feet Above MSL
- Operable Unit Boundary as Defined by Ordinary Low Water Level (1.7 Ft. CRD)
- Slip 3 Upland Facility Boundary
- Operable Unit Boundary - Upland
- Leasehold Boundary
- City-Owned Parcel Boundary

Notes: 1) Base map prepared from the URS Draft T4 Slip 1 RI Work Plan, dated May 2004.
2) Horizontal Datum: State Plane Coordinates, Oregon North, NAD 83. Vertical Datum: NVGD 29.
3) Prefix "T4S1" removed from sample locations for figure clarity.

Groundwater Elevation Plan - February 28, 2005

Remedial Investigation
Terminal 4 Slip 1 Upland Facility
Portland, Oregon

Project Number	1065-00	August 2007	Figure
Ash Creek Associates, Inc. Environmental and Geotechnical Consultants	NewFields		E-2



Legend:

- MW-08 / 10.88 — Monitoring Well Location and Number / Groundwater Elevation in Feet Above MSL
- NA — Not Available
- Groundwater Elevation Contour in Feet Above MSL
- Operable Unit Boundary as Defined by Ordinary Low Water Level (1.7 Ft. CRD)
- Slip 3 Upland Facility Boundary
- Operable Unit Boundary - Upland
- Leasehold Boundary
- City-Owned Parcel Boundary

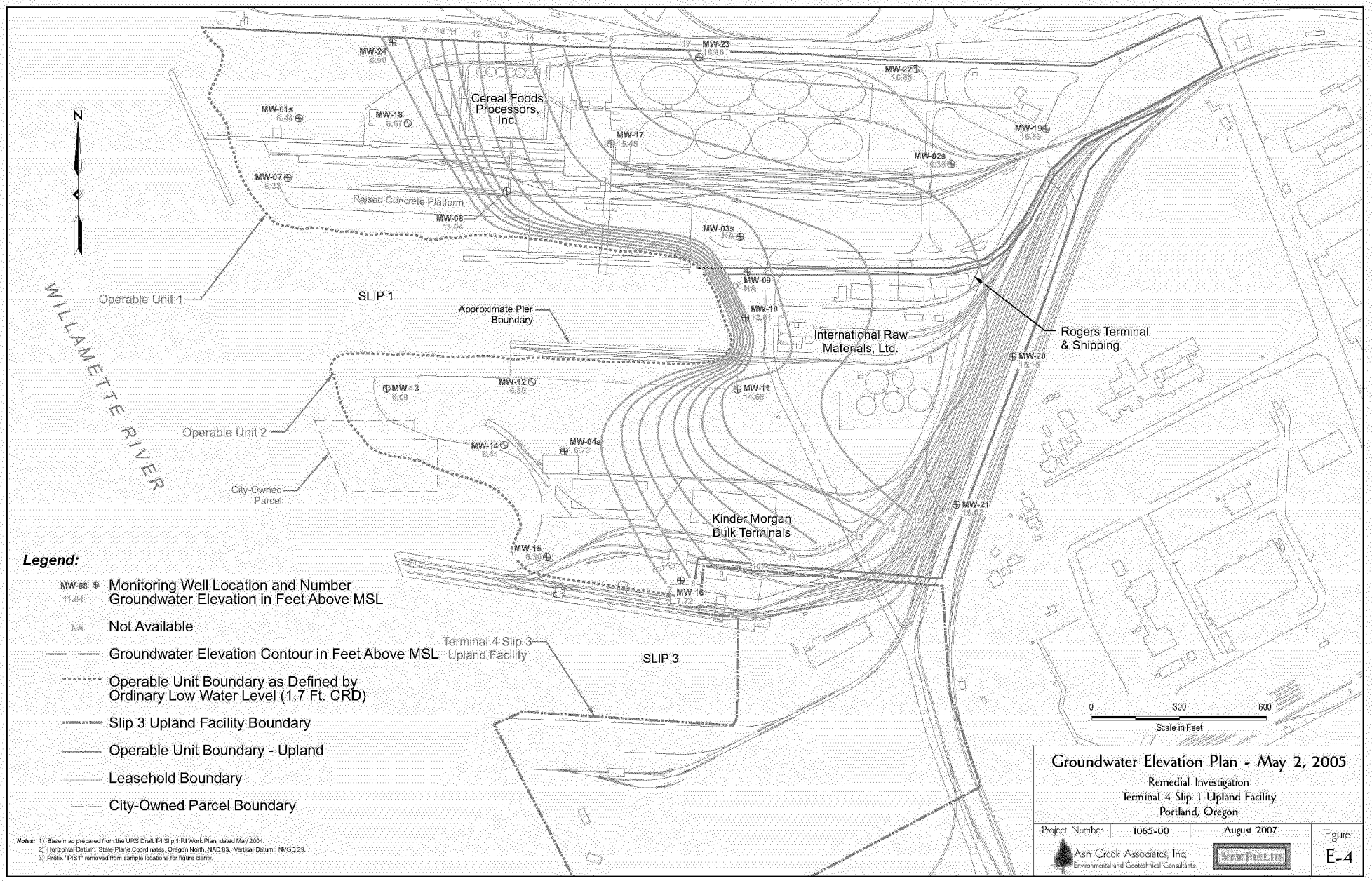
Notes: 1) Base map prepared from the URS Draft T4 Slip 1 RI Work Plan, dated May 2004.
2) Horizontal Datum: State Plane Coordinates, Oregon North, NAD 83. Vertical Datum: NVGD 29.
3) Prefix "T4S1" removed from sample locations for figure clarity.

Groundwater Elevation Plan - April 1, 2005

Remedial Investigation
Terminal 4 Slip 1 Upland Facility
Portland, Oregon

Project Number	1065-00	August 2007	Figure
Ash Creek Associates, Inc. Environmental and Geotechnical Consultants	NEWFIELDS		E-3

KMB00008713



Legend:

- MW-08 ⊕ 11.04 — Monitoring Well Location and Number, Groundwater Elevation in Feet Above MSL
- NA — Not Available
- Groundwater Elevation Contour in Feet Above MSL
- Operable Unit Boundary as Defined by Ordinary Low Water Level (1.7 Ft. CRD)
- Slip 3 Upland Facility Boundary
- Operable Unit Boundary - Upland
- Leasehold Boundary
- City-Owned Parcel Boundary

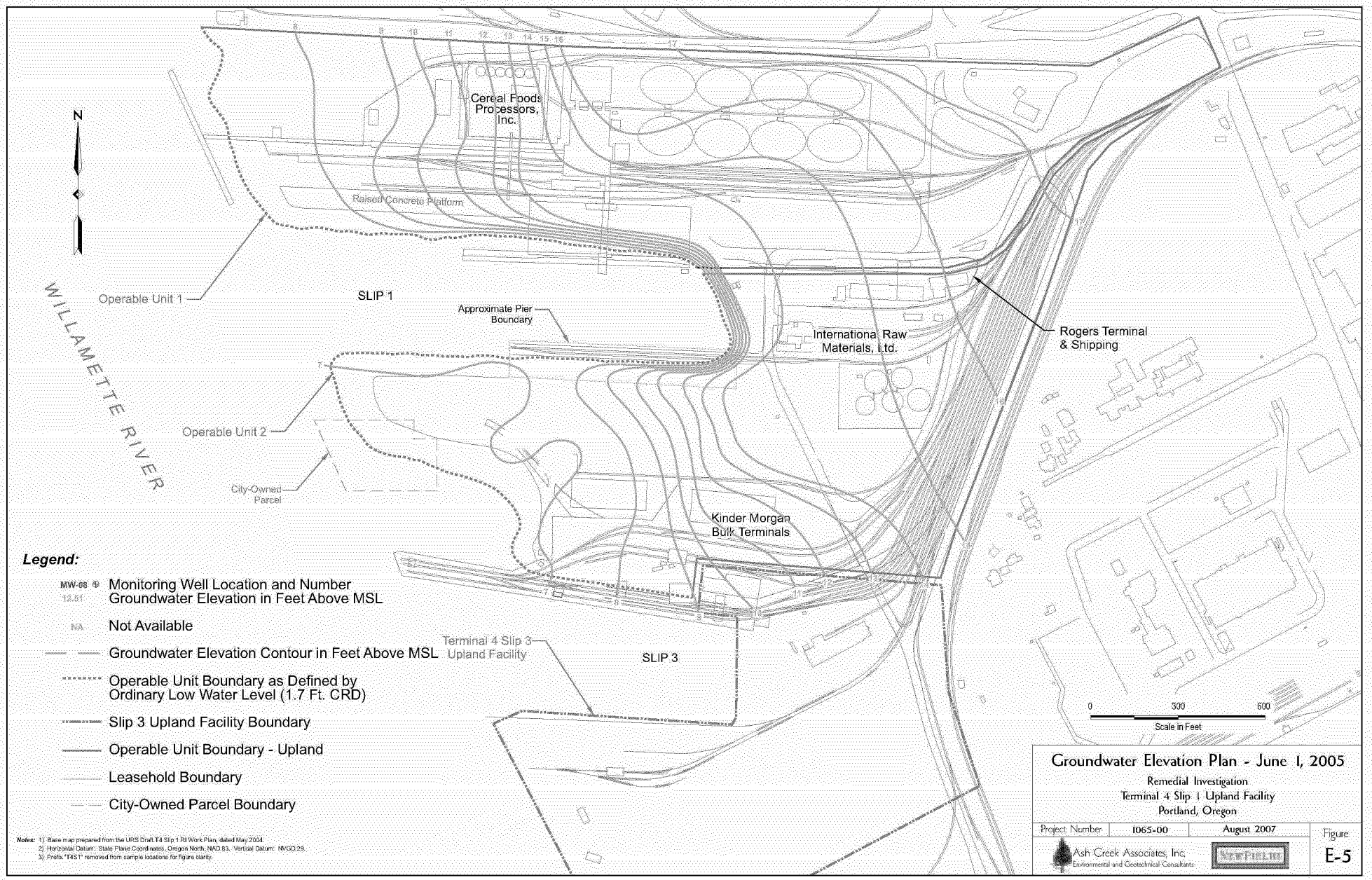
Notes: 1) Base map prepared from the URS Draft T4 Slip 1 RI Work Plan, dated May 2004.
2) Horizontal Datum: State Plane Coordinates, Oregon North, NAD 83. Vertical Datum: NVGD 29.
3) Prefix "T4S1" removed from sample locations for figure clarity.

Groundwater Elevation Plan - May 2, 2005

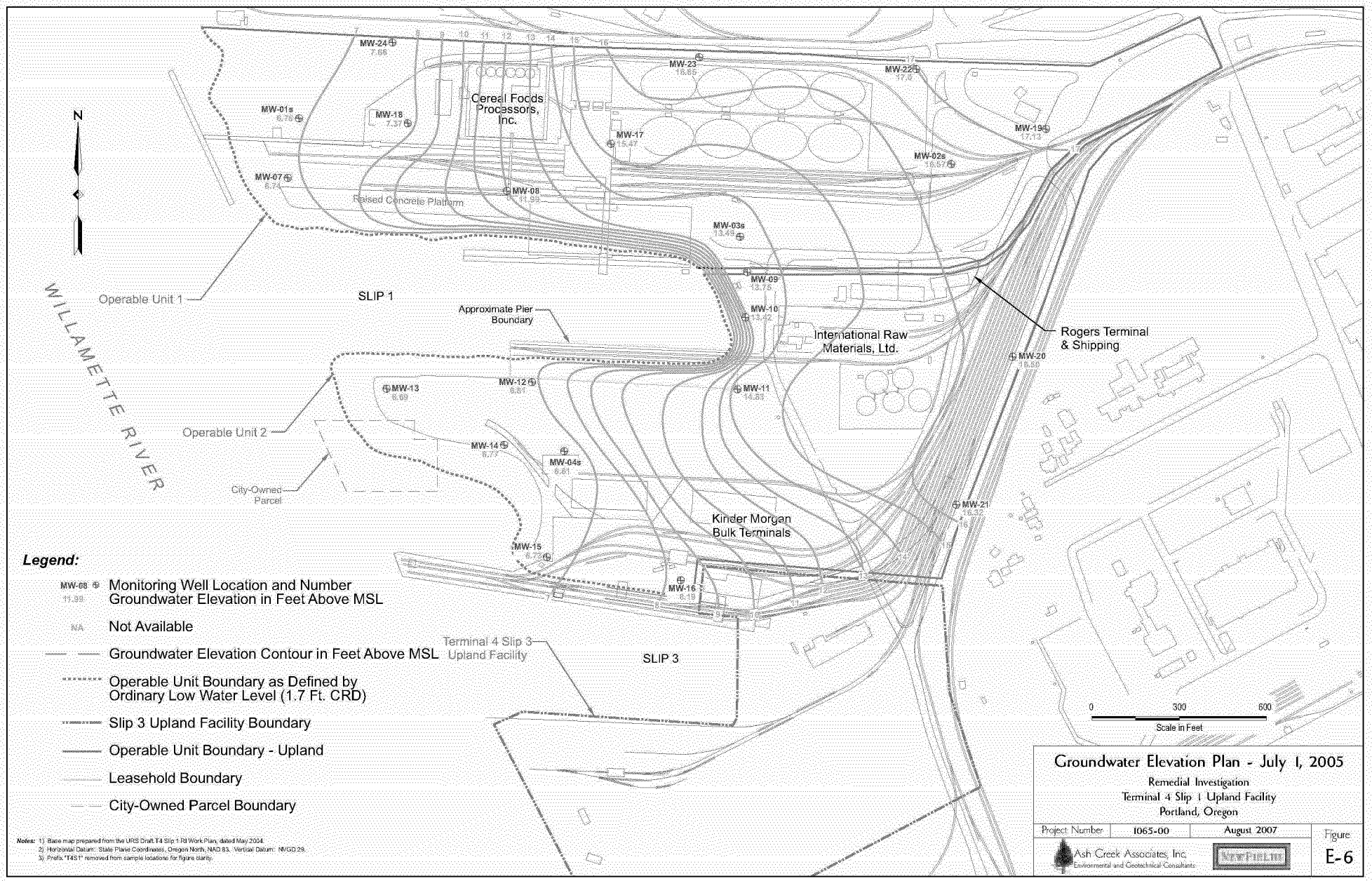
Remedial Investigation
Terminal 4 Slip 1 Upland Facility
Portland, Oregon

Project Number	1065-00	August 2007	Figure
Ash Creek Associates, Inc. Environmental and Geotechnical Consultants	NewFields		E-4

KMB00008714



KMB00008715



Legend:

- MW-08 ⊕ 11.99 — Monitoring Well Location and Number Groundwater Elevation in Feet Above MSL
- NA — Not Available
- Groundwater Elevation Contour in Feet Above MSL
- Operable Unit Boundary as Defined by Ordinary Low Water Level (1.7 Ft. CRD)
- Slip 3 Upland Facility Boundary
- Operable Unit Boundary - Upland
- Leasehold Boundary
- City-Owned Parcel Boundary

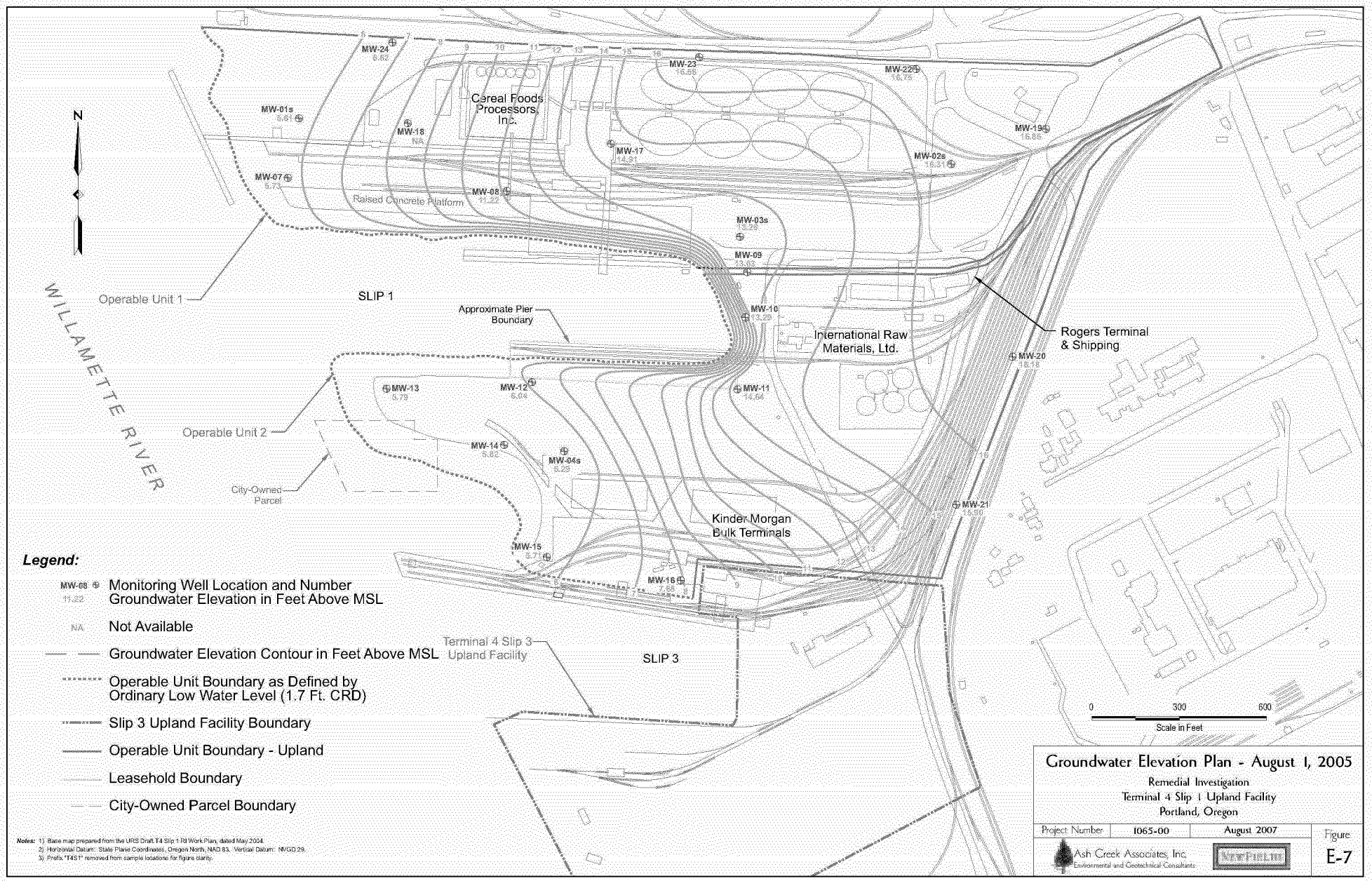
Notes: 1) Base map prepared from the URS Draft T4 Slip 1 RI Work Plan, dated May 2004.
2) Horizontal Datum: State Plane Coordinates, Oregon North, NAD 83. Vertical Datum: NVGD 29.
3) Prefix "T4S1" removed from sample locations for figure clarity.

Groundwater Elevation Plan - July 1, 2005

Remedial Investigation
Terminal 4 Slip 1 Upland Facility
Portland, Oregon

Project Number	1065-00	August 2007	Figure
Ash Creek Associates, Inc. Environmental and Geotechnical Consultants	NewFields		E-6

KMB00008716



Legend:

- MW-08 / 11.22 — Monitoring Well Location and Number / Groundwater Elevation in Feet Above MSL
- NA — Not Available
- Groundwater Elevation Contour in Feet Above MSL
- Operable Unit Boundary as Defined by Ordinary Low Water Level (1.7 Ft. CRD)
- Slip 3 Upland Facility Boundary
- Operable Unit Boundary - Upland
- Leasehold Boundary
- City-Owned Parcel Boundary

Notes: 1) Base map prepared from the URS Draft T4 Slip 1 RI Work Plan, dated May 2004.
2) Horizontal Datum: State Plane Coordinates, Oregon North, NAD 83. Vertical Datum: NVGD 29.
3) Prefix "T4S1" removed from sample locations for figure clarity.

Groundwater Elevation Plan - August 1, 2005

Remedial Investigation
Terminal 4 Slip 1 Upland Facility
Portland, Oregon

Project Number	1065-00	August 2007	Figure
Ash Creek Associates, Inc. Environmental and Geotechnical Consultants	NewFields		E-7

KMB00008717

Appendix F

Appendix D of Engineering Evaluation and Cost Analysis (EE/CA) for Terminal 4 Removal Action Area (Conceptual Hydrogeologic Model)

KMB00008718

Appendix D

Summary of Hydrogeologic Characteristics

BBL®
BLASLAND, BOUCK & LEE, INC.
engineers, scientists, economists

Appendix D – Summary of Hydrogeologic Characteristics

In this section, hydrogeologic information in support of the Terminal 4 hydrogeologic conceptual model (HCM) is presented and discussed. The HCM is based primarily on information provided from hydrogeologic cross sections developed from monitoring well boring logs and on groundwater elevation, river stage, and precipitation data. The HCM will be used in support of the engineering evaluation/cost analysis (EE/CA) to evaluate contaminant transport aspects of certain Removal Action alternatives, for example, sediment capping or placement in an onsite confined disposal facility (CDF).

D.1 Hydrogeologic Cross Sections

Three hydrogeologic cross sections were developed using information obtained from monitoring well boring logs. Locations of the hydrogeologic cross sections are shown on Figure D-1. Hydrogeologic cross-sections A-A', B-B', and C-C' (Figures D-2 through D-4) show the relative locations of the upland fill material, Unconsolidated Alluvial Deposits, and Troutdale Gravel geologic units. The upland fill material is composed of medium brown fine sands. Based on monitoring well boring logs (BBL, 2004) and from information provided in a previous upland investigation at Terminal 4 (Hart Crowser, 2000), the fine sands range in thickness from about 40 feet near the river to 5 feet in some upland portions of Terminal 4. The upland fill material was placed directly on top of the sediments that comprise the Unconsolidated Alluvial Deposits.

Near the river (monitoring well clusters T4-MW01, T4-MW04, and T4-MW06), the Unconsolidated Alluvial Deposits consist of dark grey to black, fine to medium sand that is about 160 feet in thickness. In the upland portions of Terminal 4 (monitoring well clusters T4-MW02, T4-MW03, and T4-MW05), the Unconsolidated Alluvial Deposits are primarily composed of interbedded layers of fine sand, silt, clayey silt, and silty clay. Sediments in the Unconsolidated Alluvial Deposits in the vicinity of Gatton's Slough (monitoring well clusters T4-MW02 and T4-MW03) are finer grained than are sediments in the Unconsolidated Alluvial Deposits in the vicinity of monitoring well cluster T4-MW05. The sediments of the Unconsolidated Alluvial Deposits are 120 to 150 feet in thickness in the upland portion of Terminal 4.

Gravel from the Troutdale formation was encountered at depths ranging from 142 to 200 feet below ground surface and at elevations ranging from -114 feet to -168 feet Columbia River Datum (CRD) at monitoring well T4-MW02D and monitoring well T4-MW06D, respectively (Figures D-2 through D-4). Gravel encountered in boring samples from monitoring well T4-MW05I likely is not associated with Troutdale Gravel given the higher elevation (-22.2 feet CRD) at which the monitoring well T4-MW05I gravels were encountered.

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D.2 Groundwater Data

D.2.1 Groundwater Elevation Data

Depth to groundwater measurements were conducted approximately weekly from April 29, 2004 through June 3, 2004 and depth to groundwater values were converted to groundwater elevations (BBL, 2004). Weekly groundwater elevation data are presented on Figures 5-9 through 5-14 in BBL (2004) for monitoring well clusters T4-MW01 through T4-MW06, respectively.

During the study period, fluctuations in groundwater elevations greater than 4.0 feet were observed for shallow, intermediate, and deep groundwater at near-river monitoring well clusters T4-MW01, T4-MW04, and T4-MW06 and for deep groundwater at upland monitoring well clusters T4-MW02 and T4-MW03. The magnitude and direction of groundwater elevation fluctuations were similar for these wells (Figures 5-9 through 5-14 in BBL, 2004). The similarities in the magnitude and direction of groundwater elevation fluctuations indicate that a hydraulic connection exists between these depths and locations. As described in more detail in Section D.2.2, these groundwater elevation fluctuations appear to be correlated with river stage. Shallow and intermediate groundwater elevation fluctuations at upland monitoring well clusters T4-MW02, T4-MW03, and T4-MW05 were small (<1.0 foot) relative to the variations in groundwater elevations observed at the near-river monitoring well clusters. Hydraulic connectivity between shallow and intermediate groundwater at these locations may be impeded by layers of fine-grained materials within the Unconsolidated Alluvial Deposits and Gatton's Slough in the upland portion of Terminal 4.

Based on the weekly groundwater elevation data, downward vertical hydraulic gradients were observed between shallow and intermediate groundwater at monitoring well clusters T4-MW03, T4-MW04, and T4-MW05 and between intermediate and deep groundwater at monitoring well cluster T4-MW02 (Table 5-1 in BBL, 2004). Upward vertical hydraulic gradients were observed between shallow and intermediate groundwater at monitoring well cluster T4-MW02. Vertical hydraulic gradient reversals were observed between shallow and intermediate groundwater and between intermediate and deep groundwater at near-river monitoring well clusters T4-MW01 and T4-MW06 (Table 5-1 in BBL, 2004). These apparent reversals in vertical hydraulic gradient may be an artifact of the method in which depth to groundwater was measured. Time lapses of up to four hours but generally less than one hour, occurred between depth to groundwater measurements for individual monitoring wells at a monitoring well cluster. As described in Section D.2.2, tidally-induced changes in river stage cause rapid changes in groundwater elevations in near-shore monitoring wells. These changes could result in apparent gradient reversals between weekly measurement periods if the depth to groundwater measurements were not collected within a short time duration. Additional monitoring of groundwater elevations using pressure transducers deployed at monitoring well clusters T4-MW01 and T4-MW02 is currently underway. These additional data will be used to evaluate vertical hydraulic gradients in greater detail. The magnitude of the vertical hydraulic gradient was small to moderate (from less than 0.01 to 0.1 ft/ft) at near-river monitoring well clusters T4-MW01, T4-MW04, and T4-MW06 and was moderate to large (from 0.01 to greater than 0.1 ft/ft) at upland monitoring well clusters T4-MW02, T4-MW03, and T4-MW04.

These data indicate that vertical groundwater flow at Terminal 4 is dynamic and may be influenced by different factors, such as river stage or resistance to flow by fine-grained materials, at different locations. For example,

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variation in river stage may cause gradient reversals between hydrostratigraphic units at the near-river locations; however, at monitoring well cluster T4-MW02, horizontal groundwater flow in the Unconsolidated Alluvial Deposits may be hindered due to the confining nature of fine-grained materials located in downgradient Gatton's Slough.

Pressure transducers were used to "continuously" monitor groundwater pressure at 1-minute intervals at monitoring wells T4-MW06I and T4-MW06D. These pressure data were converted to groundwater elevations. In addition, a pressure transducer was used to continuously monitor Willamette River stage in Slip 3 at 10-minute intervals. Concurrent continuous groundwater elevation data and continuous stage data were available for a one-month period from April 17 to May 17, 2004 as shown on Figure 5-15 in BBL (2004). For illustrative purposes, weekly and continuous groundwater elevation data for monitoring well cluster T4-MW06 were compared with Willamette River stage and daily precipitation for a two-week period as shown on Figure D-5.

The Willamette River stage was tidally affected, and tidal stage fluctuations ranged from about 0.8 foot to 2.8 feet. Groundwater elevation also appeared to be tidally affected; daily groundwater elevation fluctuations ranged from about 0.7 foot to 2.2 feet and were less than river stage fluctuations. A strong relation between river stage and the elevation of intermediate ($R^2 = 0.987$, $p = 0$) and deep ($R^2 = 0.983$, $p = 0$) groundwater at monitoring wells T4-MW06I and T4-MW06D was observed during the monitoring period. When river stage changed, groundwater elevation at both monitoring wells changed in a similar manner (Figure D-5). This effect was observed for both tidally influenced changes in river stage as well as precipitation-induced changes in river stage. There was a time lag of about zero to 15 minutes between changes in the river stage and changes in the groundwater elevations at both monitoring wells, i.e., groundwater elevation changes lagged behind river stage changes by less than about 1/4 hour at this location.

Given the strong interaction between river stage and groundwater elevations at monitoring wells T4-MW06I and T4-MW06D demonstrated by the pressure transducer data, weekly groundwater elevation data can also be used to demonstrate tidal influence on groundwater elevation at other T4 monitoring wells. Based on weekly groundwater elevation data, the influence of change in river stage was also observed in shallow groundwater at monitoring wells T4-MW01S, T4-MW04S, and T4-MW06S in intermediate groundwater at monitoring wells T4-MW01D and T4-MW04I, and in deep groundwater at T4-MW01D, T4-MW02D, and T4-MW03I/D (Figures 5-9 through 5-14 in BBL, 2004). These observations indicated that in the upland fill material, Unconsolidated Alluvial Deposits, and Troutdale Gravel at nearshore locations (i.e., monitoring well clusters T4-MW01, T4-MW04, and T4-MW06), shallow, intermediate, and deep groundwater was hydraulically connected to and groundwater elevations were influenced by variations in stage in the Willamette River.

Tidal influences were not observed in shallow and intermediate groundwater at upland monitoring well clusters T4-MW02, T4-MW03, and T4-MW05. Finer-grained materials that are present in the upland portions of the Unconsolidated Alluvial Deposits (including Gatton's Slough) likely dampened the tidal pressure effect so that the tidal signal was no longer observed in shallow and intermediate groundwater at the upland monitoring well clusters. The elevation of the contact between the upland fill material and Unconsolidated Alluvial Deposits was greater than river stage at upland monitoring well clusters for the period of record (Figures 5-6 through 5-8 in BBL, 2004). Therefore, tidal fluctuation in river stage likely was not propagated through fine-grained Unconsolidated Alluvial Deposits to shallow groundwater at these upland locations. Tidal effects may be observed farther upland in shallow and intermediate groundwater during periods of higher river stage.

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The magnitude and timing of variations in groundwater elevations at upland monitoring wells T4-MW02D and T4-MW03I/D were similar to the magnitude and timing of variations in groundwater elevations at near-river monitoring wells T4-MW01D and T4-MW06D (Figures 5-9, 5-10, 5-11, and 5-14 in BBL, 2004). Therefore, it is likely that fluctuations in river stage affected deep groundwater elevations as far upland as monitoring well cluster T4-MW02, indicating that river stage influences groundwater elevations farther upland within the Troutdale Gravel as compared with the upland fill material and Unconsolidated Alluvial Deposits. This tidal influence on deep groundwater at monitoring well clusters T4-MW02 and T4-MW03 suggests that the Troutdale Gravel is under semi-confined conditions due to the presence of fine-grained materials in the Unconsolidated Alluvial Deposits above the Troutdale Gravel in this portion of Terminal 4 (Fetter, 1994).

Tidal efficiency (TE) relates the amplitude of groundwater elevation fluctuations in an aquifer to the amplitude of fluctuation at the tidal boundary, which at Terminal 4 is the Willamette River. Tidal efficiency at monitoring well cluster T4-MW06 was estimated by dividing the change in groundwater elevation over a single tidal cycle by the change in river stage for the same tidal cycle. Tidal efficiency in intermediate and deep groundwater at monitoring well cluster T4-MW06 ranged from about 0.7 to 0.8 for the monitoring period. Because only weekly depth to groundwater measurements were performed at other monitoring well clusters, TEs were not calculated for other locations at Terminal 4. Tidal efficiency will be evaluated for groundwater at monitoring well clusters T4-MW01 and T4-MW02 once additional depth to groundwater data collection activities have been completed.

Relatively short-duration (i.e., 1-hour) hydraulic gradient reversals were observed between river stage and groundwater elevations at T4-MW06I during the monitoring period (BBL, 2004). However, since average groundwater elevation at T4-MW06I from April 27 through May 17, 2004 (5.13 feet CRD) was 0.1 feet greater than average river stage for this same period (5.03 feet CRD), there was a net discharge of groundwater from the Unconsolidated Alluvial Deposits to the river at this location for this time period. Average groundwater elevation at T4-MW06D (5.02 feet CRD) was 0.11 feet lower than average groundwater elevation at T4-MW06I (5.13 feet CRD) for the April 27 through May 17, 2004 time period. This difference of 0.11 feet indicates that there was a net potential for flow of water from the Unconsolidated Alluvial Deposits to the Troutdale Gravel at this location. The Troutdale Gravel aquifer is not directly connected with the Willamette River at T4.

D.2.2 Groundwater Elevation Contours

Groundwater elevation contour maps were developed for shallow, intermediate, and deep groundwater (Figures D-6 through D-8) based on river stage and depth to groundwater measurements performed on April 29, 2004. Since river stage is tidally affected and can vary by about 2 feet between low tide and high tide, the range of stage values for the time period during which groundwater elevation measurements were made was used for comparison with the groundwater elevations. For April 29, 2004, river stage ranged from 5.44 to 6.16 feet CRD during the 11:00 to 15:00 time period.

Shallow groundwater elevations ranged from 3.55 feet CRD at monitoring well T4-MW06S to 16.02 feet CRD at monitoring well T4-MW05S on April 29, 2004 (Figure D-6). As shown, the horizontal hydraulic gradient direction for shallow groundwater was toward the Willamette River. Horizontal hydraulic gradient in shallow groundwater ranged from approximately 0.0002 to 0.02 ft/ft depending upon location at Terminal 4. The average horizontal hydraulic conductivity was approximately 0.01 ft/ft. Based on groundwater elevation data

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presented in Hart Crowser (2000) and on groundwater elevation data from BBL (2004), groundwater horizontal hydraulic gradients were steepest at the eastern ends of Slip 1 and Slip 3.

Intermediate groundwater elevations ranged from 2.93 feet CRD at monitoring well T4-MW04I to 16.47 feet CRD at monitoring well T4-MW02I on April 29, 2004 (Figure D-7). As shown, the horizontal hydraulic gradient direction for intermediate groundwater was toward the Willamette River. Horizontal hydraulic gradient ranged from approximately 0.005 to 0.02 ft/ft depending upon location at Terminal 4. The average horizontal hydraulic gradient in intermediate groundwater was approximately 0.01 ft/ft.

Deep groundwater elevations ranged from 3.35 feet CRD at monitoring well T4-MW06D to 4.17 feet CRD at monitoring well T4-MW02D on April 29, 2004 (Figure D-8). As shown, the horizontal hydraulic gradient direction for deep groundwater was toward the Willamette River on April 29, 2004. The average horizontal hydraulic gradient in deep groundwater was approximately 0.0005 ft/ft on April 29, 2004.

D2.3 Groundwater Flow Parameters

Results of a pumping test conducted in 1994 suggested a horizontal hydraulic conductivity, K, of about 0.023 centimeters per second (cm/sec) (65 feet/day) for the upland fill material and upper Unconsolidated Alluvial Deposits near the head of Slip 3 (Hart Crowser, 2000). This K value falls within the expected range of hydraulic conductivity values of 10^{-3} to 10^{-1} cm/sec (2.8 to 280 feet/day) for clean sands (Freeze and Cherry, 1979). Given the similar grain sizes of the upland fill material and Unconsolidated Alluvial Deposits in the near-river portion of Terminal 4 at monitoring well clusters T4-MW01, T4-MW04, and T4-MW06 (Figures D-2 through D-4), the horizontal hydraulic conductivity value of 0.023 cm/sec likely is representative for the upland fill material and sandy layers of the Unconsolidated Alluvial Deposits.

Pumping tests have not been conducted at Terminal 4 monitoring wells completed in Troutdale Gravel or in finer-grained layers of the Unconsolidated Alluvial Deposits. Based on descriptions of soils from monitoring well boring logs (BBL, 2004), the expected range of horizontal hydraulic conductivities for finer-grained layers of the Unconsolidated Alluvial Deposits is 10^{-6} to 10^{-4} cm/sec for silt (0.0028 to 0.028 feet/day) (Freeze and Cherry, 1979). The expected range of horizontal hydraulic conductivities is 10^{-1} to 10 cm/sec for gravel (280 to 28,000 feet/day) (Freeze and Cherry, 1979,)

Groundwater flow velocity is estimated from the following equation:

$$v = Ki/\eta_e$$

where v is velocity, K is horizontal hydraulic conductivity, i is the horizontal hydraulic gradient, and η is the effective soil porosity.

The effective soil porosity, η_e, was not measured. For unconsolidated sediments, total porosity typically is 0.25 to 0.40 for gravel, 0.25 to 0.50 for sand, and 0.35 to 0.50 for silt (Freeze and Cheery, 1979). Effective soil porosity typically is less than total porosity. Assuming (1) the horizontal gradients discussed above in Section D1.3, (2) typical values for effective porosity for poorly sorted gravel (0.30), well-sorted sand (0.30), and silt (0.40), and (3) typical hydraulic conductivities for gravel (2,800 feet/day) and silt (0.0028 feet/day), horizontal

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groundwater velocities within the different geologic materials encountered in monitoring well borings at Terminal 4 may be approximately as follows:

Deposit	Horizontal Hydraulic Conductivity (feet/day)	Average Horizontal Hydraulic Gradient (ft/ft)	Effective Soil Porosity	Horizontal Groundwater Velocity (feet/day)
Gravel	2,800	0.0005	0.30	5
Sand	65	0.01	0.30	2
Silt	0.0028	0.01	0.40	10^{-4}

D.3 Hydrogeologic Conceptual Model

The hydrogeologic regime at Terminal 4 is complex due to the heterogeneous grain size and differences in lateral extent in the upland fill and alluvial deposits. In addition, there is a distinctly strong hydraulic connection to Willamette River stage variations within an area generally defined as west of the former shoreline and within the Troutdale Gravel. This hydraulic connection is dampened by the presence of interbedded fine-grained silt and clay layers within the natural deposits that are generally east of the former shoreline within the Unconsolidated Alluvial Deposits. Therefore, a generalized interpretation of the hydrogeologic conceptual model relative to groundwater flow and gradient behavior is made by defining two primary areas at Terminal 4 separated by the general location of the former shoreline, which is shown on Figure D-1. Upland fill material consisted primarily of well-sorted fine to medium sand; Unconsolidated Alluvial Deposits consisted of fine sand at near-river monitoring well cluster locations (T4-MW01, T4-MW04, and T4-MW06) and of interbedded layers of well sorted fine sand, silt, and clay at upland monitoring well cluster locations (T4-MW02, T4-MW03, and T4-MW05); and Troutdale Gravel consisted primarily of poorly sorted fine to medium gravel (Figures D-2 through D-4).

For the western portion of Terminal 4 (west of the former shoreline), the two geologic units of upland fill and Unconsolidated Alluvial Deposits combine as essentially one hydrostratigraphic unit that is above the underlying hydrostratigraphic unit of the Troutdale Gravel. The separation of the upland fill and Unconsolidated Alluvial Deposits from the Troutdale Gravel hydrostratigraphic unit in the nearshore portion of Terminal 4 is due to considerable differences in gradation and the resulting likelihood of order-of-magnitude differences in hydraulic conductivities between the upper sands and the Troutdale Gravel, but the hydraulic connection is evident based on groundwater level monitoring data. The similarity of grain size characteristics between the upland fill and underlying Unconsolidated Alluvial Deposits, which are both composed of fine to medium sand with less than 15% fines content and which are differentiated primarily by color, is a reasonable indicator that their similar transmissivity characteristics will cause the two units to function as a single hydrostratigraphic unit west of the historic shoreline.

For the eastern portion of Terminal 4 (east of the former shoreline), there are three hydrostratigraphic units, which include the sands of the upland fill material; the finer-grained sands, silts, and clays of the Unconsolidated Alluvial Deposits; and the gravels of the Troutdale Gravel. As described in Section D.2.1, the

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finer-grained materials of the Unconsolidated Alluvial Deposits act as a semi-confining unit above the Troutdale Gravel in this portion of Terminal 4.

Groundwater elevations varied across Terminal 4 and were higher in the upland portions of Terminal 4 (i.e., at monitoring well clusters T4-MW02, T4-MW03, and T4-MW05) than at near-river portions of Terminal 4 (i.e., at monitoring well clusters T4-MW01, T4-MW04, and T4-MW06). The net horizontal hydraulic gradient was toward the river for groundwater in upland fill material, Unconsolidated Alluvial Deposits, and Troutdale Gravel. However, short-duration (i.e., 1-hour) gradient reversals were recorded for the Unconsolidated Alluvial Deposits and Troutdale Gravel and were associated with tidal changes in the river.

Tidal fluctuations caused changes in groundwater elevations in the intermediate depth groundwater at monitoring well T4-MW06I. However, based on average river stage (5.036 feet CRD) and monitoring well T4-MW06I groundwater elevation (5.132 feet CRD) for the April 27 through May 17 time period, there was a net potential for discharge of groundwater to the river. Based on the similarity between shallow and intermediate groundwater elevations at monitoring well clusters T4-MW01, T4-MW04, and T4-MW06, shallow groundwater is expected to respond similarly to tidal variations in river stage, but net discharge will be to the river. At monitoring well T4-MW06D, average groundwater elevation (5.02 feet CRD) was about 0.1 feet less than average groundwater elevation at monitoring well T4-MW06I. There is a net downward vertical gradient between the Unconsolidated Alluvial Deposits and the Troutdale Gravel at this location. There is no direct connection between the Troutdale Gravel and the Willamette River at T4.

Vertical hydraulic gradients were primarily upward at some locations (e.g., intermediate to shallow groundwater at monitoring well cluster T4-MW02) and primarily downward at some locations (e.g., shallow to intermediate groundwater at monitoring well cluster T4-MW05 and intermediate to deep groundwater at monitoring well cluster T4-MW02), while vertical hydraulic gradient reversals were observed between shallow and intermediate groundwater and between intermediate and deep groundwater at monitoring well clusters T4-MW01 and T4-MW06. Variations in river stage may cause gradient reversals between hydrostratigraphic units at the near-river locations. At monitoring well cluster T4-MW02, horizontal groundwater flow in the Unconsolidated Alluvial Deposits may be hindered due to the confining nature of fine-grained materials located in downgradient Gatton's Slough, resulting in the observed upward vertical gradients from the Unconsolidated Alluvial Deposits to the upland fill material and downward vertical gradients from the Unconsolidated Alluvial Deposits to the Troutdale Gravel during the monitoring period.

As demonstrated by the correlation between Willamette River stage and intermediate and deep groundwater elevations at monitoring well cluster T4-MW06, tidal and precipitation-induced changes in the Willamette River stage caused changes in groundwater elevation that were similar in magnitude and direction for groundwater in the Unconsolidated Alluvial Deposits and Troutdale Gravel at this location. The TE for intermediate and deep groundwater at monitoring well cluster T4-MW06 was on the order of 0.7 to 0.8. Based on the magnitude of change in weekly groundwater elevations observed at monitoring well clusters T4-MW01 and T4-MW04 and at monitoring wells T4-MW02D and T4-MW03D, the TE is expected to be similar in magnitude to but slightly less than the TE at monitoring well cluster T4-MW06.

Based on weekly groundwater elevation data, river stage-induced groundwater elevation changes were also observed for shallow, intermediate, and deep groundwater at monitoring well cluster T4-MW01, for shallow and intermediate groundwater at monitoring well cluster T4-MW04, and for deep groundwater at monitoring well

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clusters T4-MW02 and T4-MW03. The observed tidal effects in deep groundwater at the upland well locations (monitoring well clusters T4-MW02 and T4-MW03) likely indicate that the Troutdale Aquifer is under semi-confining conditions due to the presence of finer-grained materials within the Unconsolidated Alluvial Deposits in the upland portion of Terminal 4.

D.4 References

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Freeze, R.A., and J.A. Cherry. 1979. Groundwater. Prentice-Hall, Inc., Englewood Cliffs, New Jersey.

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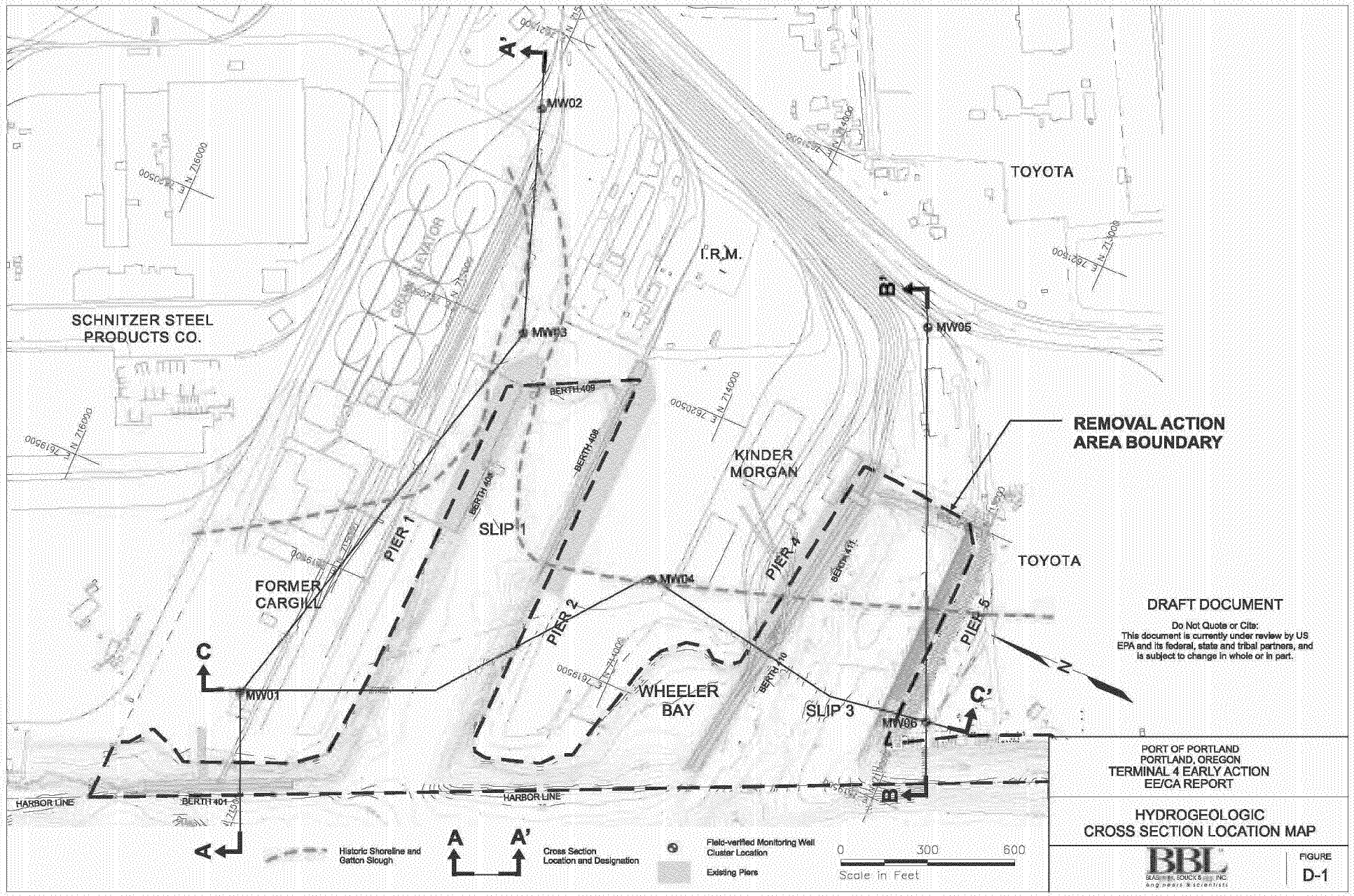

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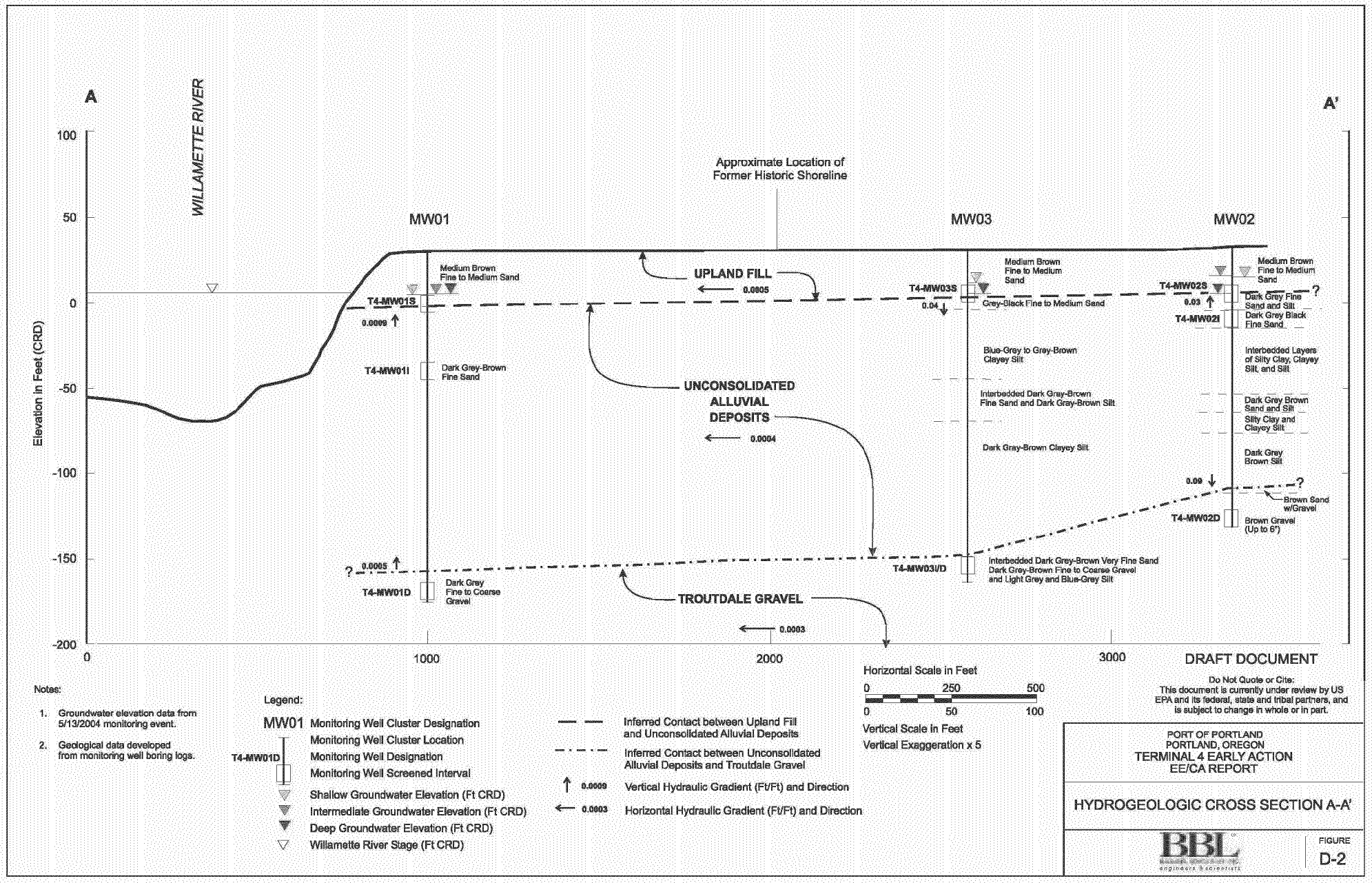

Notes:

1. Groundwater elevation data from 5/13/2004 monitoring event.
2. Geological data developed from monitoring well boring logs.

Legend:

- MW01 — Monitoring Well Cluster Designation
- Monitoring Well Cluster Location
- T4-MW01D — Monitoring Well Designation
- Monitoring Well Screened Interval
- Shallow Groundwater Elevation (Ft CRD)
- Intermediate Groundwater Elevation (Ft CRD)
- Deep Groundwater Elevation (Ft CRD)
- Willamette River Stage (Ft CRD)
- Inferred Contact between Upland Fill and Unconsolidated Alluvial Deposits
- Inferred Contact between Unconsolidated Alluvial Deposits and Troutdale Gravel
- ↑ 0.0009 — Vertical Hydraulic Gradient (Ft/Ft) and Direction
- ← 0.0003 — Horizontal Hydraulic Gradient (Ft/Ft) and Direction

Horizontal Scale in Feet
0 250 500
0 50 100
Vertical Scale in Feet
Vertical Exaggeration x 5

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HYDROGEOLOGIC CROSS SECTION A-A'

BBL engineers & scientists

FIGURE
D-2

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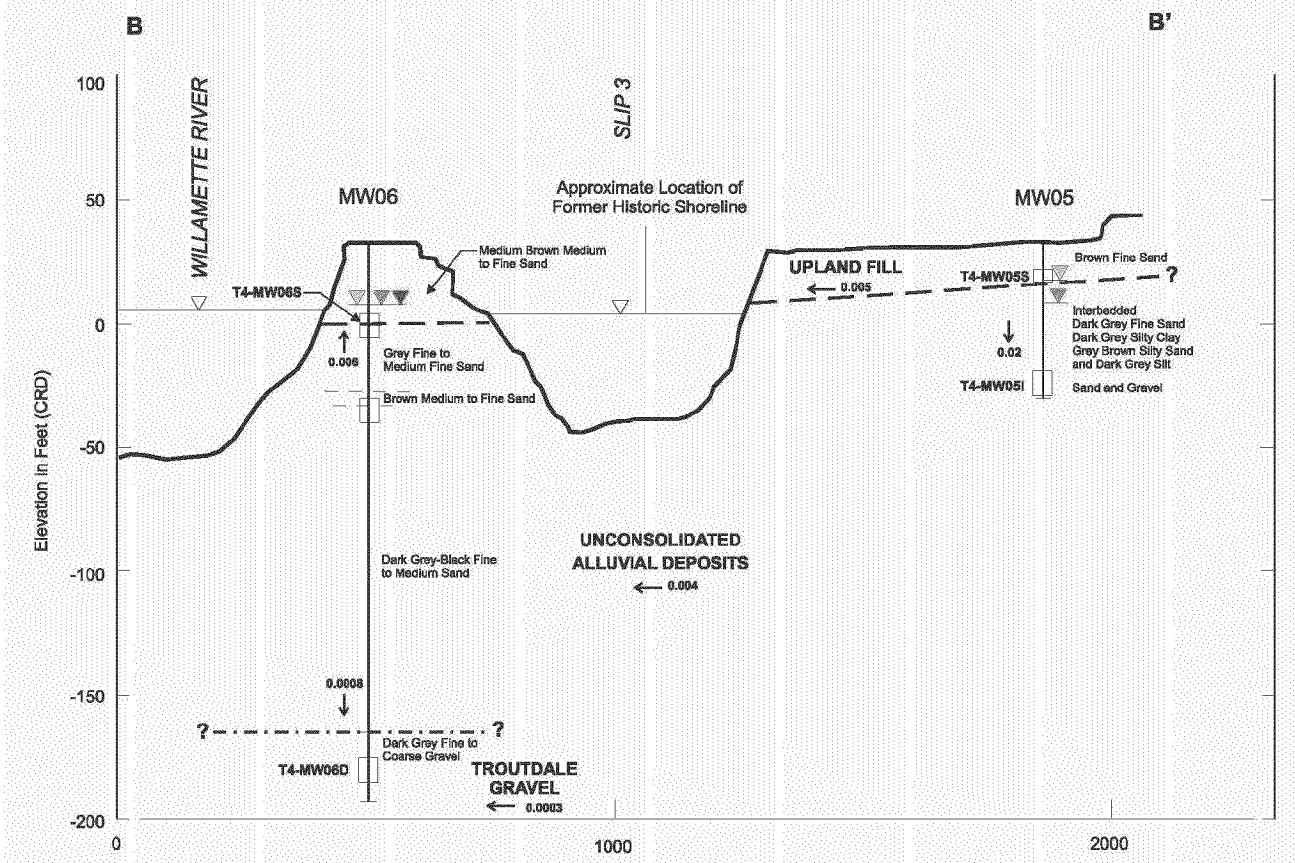

Legend:

- MW05 — Monitoring Well Cluster Designation
- Monitoring Well Cluster Location
- T4-MW05S — Monitoring Well Designation
- Monitoring Well Screened Interval
- Shallow Groundwater Elevation (Ft CRD)
- Intermediate Groundwater Elevation (Ft CRD)
- Deep Groundwater Elevation (Ft CRD)
- Willamette River Stage (Ft CRD)
- Inferred Contact between Upland Fill and Unconsolidated Alluvial Deposits
- Inferred Contact between Unconsolidated Alluvial Deposits and Troutdale Gravel
- 0.0008 — Vertical Hydraulic Gradient (Ft/Ft) and Direction
- 0.0003 — Horizontal Hydraulic Gradient (Ft/Ft) and Direction

Notes:

1. Groundwater elevation data from 5/13/2004 monitoring event.
2. Geological data developed from monitoring well boring logs.

Horizontal Scale in Feet
0 250 500
0 50 100
Vertical Scale in Feet
Vertical Exaggeration x 5

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HYDROGEOLOGIC CROSS SECTION B-B'

BBL engineers & scientists

FIGURE
D-3

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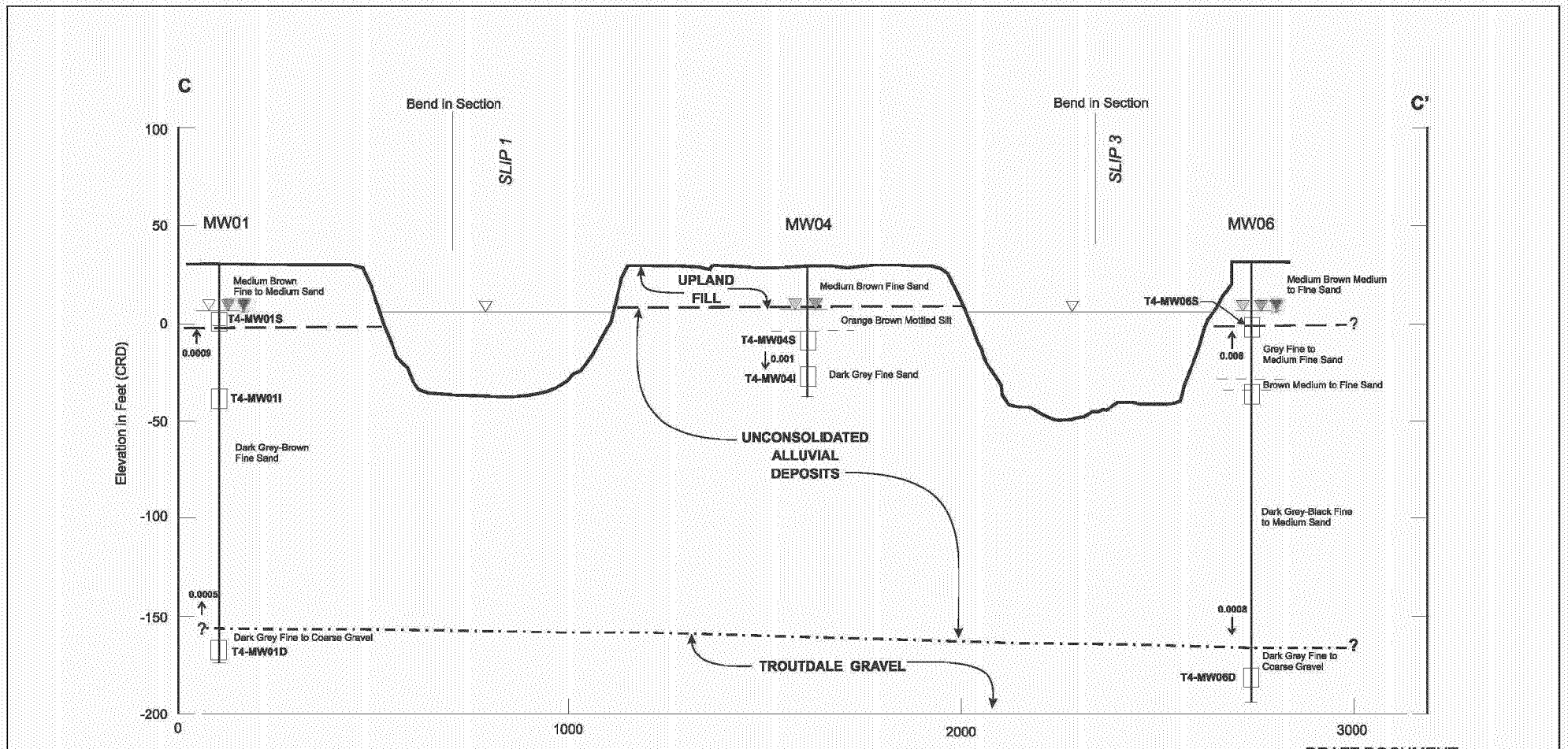

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Notes:

1. Groundwater elevation data from 5/13/2004 monitoring event.
2. Geological data developed from monitoring well boring logs.

Legend:

- MW01 — Monitoring Well Cluster Designation
- Monitoring Well Cluster Location
- T4-MW01D — Monitoring Well Designation
- Monitoring Well Screened Interval
- Shallow Groundwater Elevation (Ft CRD)
- Intermediate Groundwater Elevation (Ft CRD)
- Deep Groundwater Elevation (Ft CRD)
- Willamette River Stage (Ft CRD)
- Inferred Contact between Upland Fill and Unconsolidated Alluvial Deposits
- Inferred Contact between Unconsolidated Alluvial Deposits and Troutdale Gravel
- 0.0009 — Vertical Hydraulic Gradient (Ft/Ft) and Direction
- 0.0003 — Horizontal Hydraulic Gradient (Ft/Ft) and Direction

Horizontal Scale in Feet
0 250 500
0 50 100
Vertical Scale in Feet
Vertical Exaggeration x 5

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HYDROGEOLOGIC CROSS SECTION C-C'

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FIGURE
D-4

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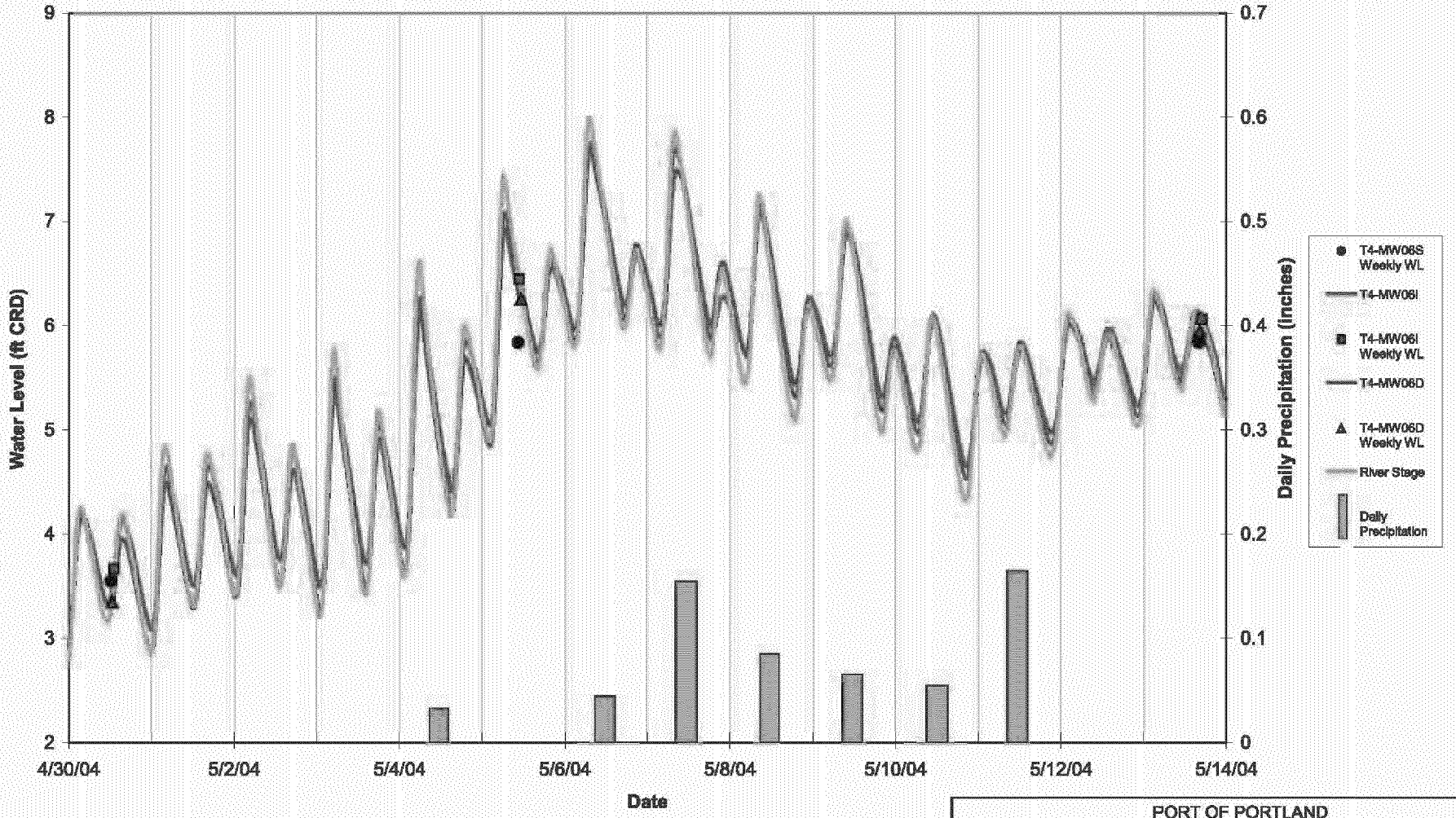

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PORT OF PORTLAND
PORTLAND, OREGON

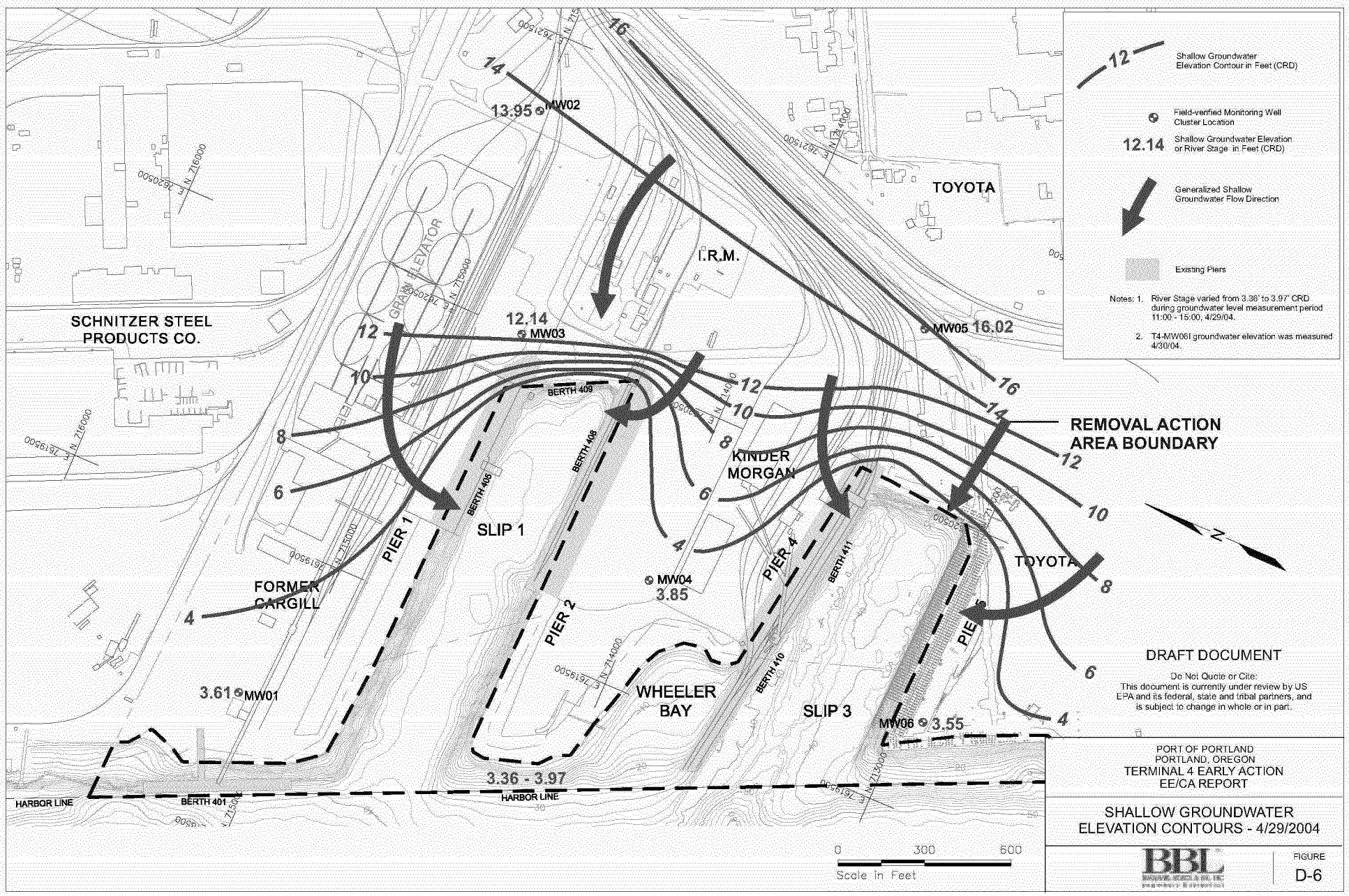
TERMINAL 4 EARLY ACTION
EE/CA REPORT

WILLAMETTE RIVER STAGE, PRECIPITATION, AND T4-MWO6 GROUNDWATER ELEVATIONS - 4/30/2004-5/13/2004

BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE
D-5

KMB000008732



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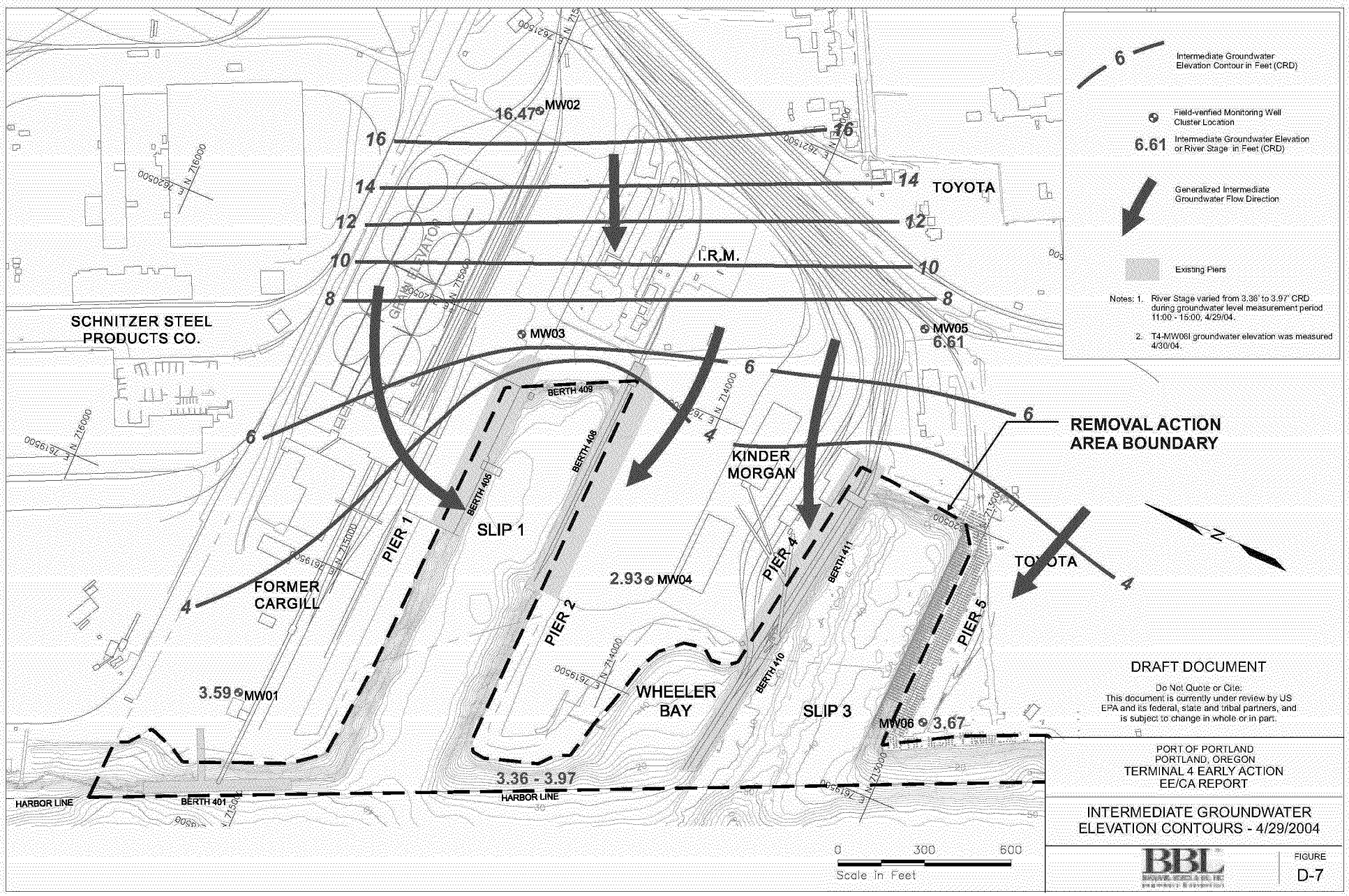

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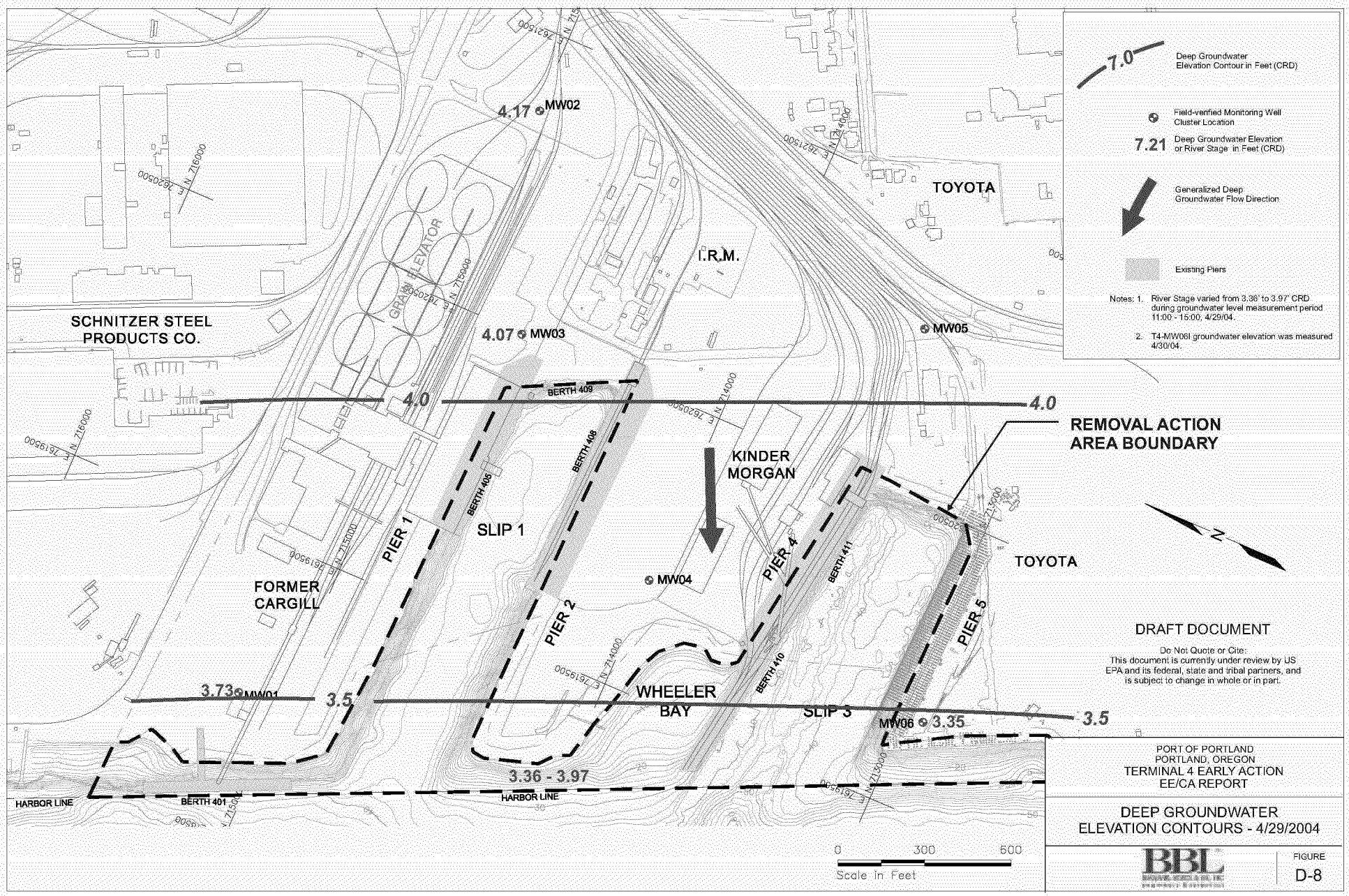
TERMINAL 4 EARLY ACTION
EE/CA REPORT

INTERMEDIATE GROUNDWATER ELEVATION CONTOURS - 4/29/2004

BBL

FIGURE
D-7

KMB00008734



PORT OF PORTLAND
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TERMINAL 4 EARLY ACTION
EE/CA REPORT

DEEP GROUNDWATER ELEVATION CONTOURS - 4/29/2004

BBL

FIGURE
D-8

Appendix G

Data Quality Review and Analytical Data Sheets (contained on CD)

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Appendix H

AOC Results Summary

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Summary of Environmental Conditions at OU1 AOCs

1. AOC RESULTS SUMMARY

This appendix presents a discussion of analytical results by Area of Concern (AOC) to document that each area has been adequately characterized for purposes of the RI and the risk assessment. Further evaluation of the data is not provided herein: the risk assessment (included in Appendix A of the RI Report) evaluates whether any of the detected constituents of interest (COIs) would pose an unacceptable risk to human or ecological receptors. AOCs are shown on Figure 5 of the main report and explorations are shown on Figure 6. The main report also includes a list of abbreviations.

No significant field evidence of impacted soil was observed during the field activities, with the exception of location SB-67. Boring SB-67 (AOC 67) exhibited a petroleum sheen and separate phase hydrocarbons (SPH) on soil at about 12 feet to 18 feet below ground surface (bgs).

A total of 133 surface/shallow soil samples (0 to 3 feet bgs), 49 subsurface soil samples, and 77 grab groundwater samples were collected to investigate the 48 AOCs identified as requiring further assessment during the RI. In addition, 24 monitoring wells were installed and monitored for one year to assess groundwater conditions at the Facility. Tables 3 through 5 detail the chemical analyses performed on the soil, grab, and groundwater samples collected, respectively. A data quality review of the RI is presented in Appendix E with the laboratory data.

The analytical results for the RI are listed in tables included in the main body of the report. These tables are:

- Tables 6 through 12 tabulate the analytical results for soil samples for total petroleum hydrocarbons (TPH), polynuclear aromatic hydrocarbons (PAHs), semi-volatile organic compounds (SVOCs), volatile organic compounds (VOCs), polychlorinated biphenyl (PCBs), pesticides (organochlorine and organophosphorous), and metals, respectively;

- Tables 13 through 19 tabulate the analytical results for groundwater samples collected from the monitoring wells during the one-year quarterly monitoring program for TPH, PAHs, SVOCs, VOCs, PCBs, pesticides, and metals, respectively; and

- Tables 20 through 26 tabulate the analytical results for grab groundwater samples for TPH, PAHs, SVOCs, VOCs, PCBs, pesticides, and metals, respectively.

Each table has been split into "A" and "B" (e.g., Table 6A tabulates TPH soil data from Operable Unit 1 [OU1] and Table 6B tabulates TPH soil data in Operable Unit 2 [OU2]) and tabulate data from OU1 and OU2, respectively. Consistent with the methods proposed in the RI Work Plan to assist in evaluating whether further investigation was needed to adequately characterize each AOC, detected concentrations were compared to the preliminary screening levels identified in the RI Work Plan. These screening levels are listed in Tables 6 through 26.

Summary of Environmental Conditions at OU1 AOCs

1.1 Operable Unit 1

AOC1 – Cargill T-45	T-45 was a 675-gallon, steel, diesel aboveground storage tank (AST) used for locomotive and other small equipment fueling. The tank was removed in September 2003. During the October and December 2003 site reconnaissance by URS Corporation (URS), some spill clean-up material (i.e. granular adsorbent material) was found in the vicinity of the former tank indicating that some contents of the tank may have spilled prior to or during removal. Potential COIs for AOC 1 include TPH, VOCs, and PAHs.
Explorations and Analyses:	A surface soil sample collected at boring SB-09 from 0 to 1 foot bgs was analyzed for TPH and PAHs. A grab groundwater sample was collected and analyzed for TPH, PAHs, and VOCs.
Results:	TPH was not detected above the method reporting limit (MRL) in the soil sample from SB-09. Low concentrations of PAHs were detected but did not exceed preliminary screening levels. TPH, PAHs, and VOCs were not detected above the MRL in grab groundwater from SB-09 with the exception of naphthalene which was detected slightly above the MRL but below the preliminary screening levels. The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.
AOC 5 – Cargill T-22	This 500-gallon, heating oil underground storage tank (UST) was reportedly removed; however, the removal date is not known. The former tank was located inside the grain storage building. This building has a multi-level basement with limited access. During an October 2003 reconnaissance of the basement, no evidence of a UST was observed. The tank was assigned DEQ Registration File Number 401. Potential COIs for AOC 5 include TPH, VOCs, and PAHs. Because the location of this UST was unknown and the area of its reported location is generally inaccessible to subsurface investigation, this AOC was assessed by completing explorations downgradient of the building.
Explorations and Analyses:	Grab groundwater from downgradient borings SB-17 and SB-26 were analyzed for TPH, VOC, and PAHs.
Results:	TPH and VOCs were not detected above the MRLs in grab groundwater. No PAHs were detected above preliminary screening levels in the grab groundwater samples. The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.

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Summary of Environmental Conditions at OU1 AOCs

AOC 6 – Cargill T-23	This 1,000-gallon, diesel UST was reportedly removed in 1989. The tank was assigned DEQ Registration File Number 401. Potential COIs for AOC 6 include TPH, VOCs, and PAHs
Explorations:	Borings: SB-02, SB-10, and SB-11.
Analyses:	Soil samples were collected from approximately 1 foot and 8 feet bgs in each boring and analyzed for TPH. Grab groundwater samples from all three borings were analyzed for TPH, PAHs, and VOCs.
Results:	TPH was not detected above the MRL in the soil or grab groundwater samples. VOCs were not detected above the MRL in the grab groundwater samples. Six PAHs were detected in grab groundwater from boring SB-11 at concentrations that slightly exceeded the preliminary screening levels. However, their presence is likely associated with sediments entrained in the sample. No PAHs were detected in grab groundwater above the MRLs in downgradient boring SB-02. The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.

Summary of Environmental Conditions at OU1 AOCs

AOC 7 – Cargill T-85	The UST appears to be a former heating oil UST that was converted for use as a used oil tank. This UST may be the same as T-22 (AOC 5). The tank was reportedly decommissioned in 1993, and was assigned DEQ Registration File Number 401. Potential COIs for AOC 7 include TPH, VOCs, PAHs, PCBs, and metals.
Explorations and Analyses:	Soil samples were collected at adjacent boring SB-12 at depths of 1 foot and 9 feet and were analyzed for TPH. Monitoring well MW-17 was sampled for one year (4 events) and analyzed for TPH, PAH, VOCs, PCBs, pesticides, metals, and SVOCs. Grab groundwater samples were collected from adjacent boring SB-12 and from 15 downgradient borings: SB-03, SB-09 through SB-12, SB-17, SB-18, SB-24 through SB-26, SB-28, and SB-36 through SB-39 and were analyzed for TPH.
Results:	TPH was not detected in the soil samples from SB-12. TPH was not detected above MRLs in any of the 15 grab groundwater samples collected directly adjacent to or downgradient of the former UST. TPH, PAHs and VOCs were not detected above the MRLs in the groundwater samples collected from monitoring well MW-17 (with the exception of toluene detected just above the MRL in the sample from February 1, 2005); metals and pesticides were not detected above MRLs with the exception of low concentrations of metals (chromium, lead, nickel, selenium, and zinc), and endrin ketone. The metals concentrations are consistent with concentrations observed at other waterfront sites and appear to be within regional background. No compounds were detected above preliminary screening levels. The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.

Summary of Environmental Conditions at OU1 AOCs

AOC 9 – Rail Road Track Staining Area	Significant petroleum staining on the east-west track on the western portion of OU1 was observed by URS and ATC during the site reconnaissance. The staining was identified as a recognized environmental condition (REC) in ATC's environmental site assessment (ESA) report. The track has historically been used by steam engines for moving and transferring rail cars for transportation of grain and flour (ATC, 2003). Potential COIs for AOC 9 include TPH, SVOCs, PAHs, and VOCs.
Explorations:	Borings: SB-01, SB02, and SB-14 through SB-16. Monitoring Wells: MW-07
Analyses:	Surface soil samples (1 to 2 feet bgs) were collected from borings SB-14 through SB-16 along the railroad tracks in this area and analyzed for the presence of TPH, PAHs, and SVOCs. Soil samples from borings SB-14 through SB-16 from depths of 3 to 5 feet bgs were collected for VOC analysis. Grab groundwater samples were collected from borings SB-01 and SB-02 were analyzed for TPH, PAHs, and VOCs. Grab groundwater samples from SB-14 through SB-16 were analyzed for TPH, PAH, SVOCs, and VOCs. Samples from well MW-07 were analyzed for TPH, PAHs, SVOCs, and VOCs.
Results:	TPH and VOCs were not detected above MRLs in soil with the exception of residual range hydrocarbons in SB-14 (1 to 2 feet bgs; 780 mg/kg). PAH concentrations, where detected in soil, were low and below the preliminary screening levels, with the exception of benzo(a)pyrene (SB-14 [1 to 2 feet bgs; 320 µg/kg]), which slightly exceeded the EPA Region 9 preliminary remediation goals (PRGs) for industrial soils and dibenzofuran that exceeded the Oregon Department of Environmental Quality (DEQ) Ecological Screening Level Values (SLVs) for terrestrial receptors (SB-14 [1 to 2 feet bgs; 7.5 µg/kg]). SVOCs were not detected above the MRL. TPH and VOCs were not detected above MRLs in groundwater with the exception of 1,3-dichlorobenzene detected slightly above the MRL in samples SB-01 and SB-02. PAH concentrations in groundwater were low and, with the exception of a few constituents in the samples from SB-14 and SB-15, were below the preliminary screening levels. The exceedances of the preliminary screening levels at SB-14 and SB-15 are likely due to soil entrained in the grab samples because PAH concentrations were below the preliminary screening levels in grab groundwater samples collected directly adjacent or downgradient of these borings (e.g., SB-01 and SB-02) and in monitoring well MW-7 (with the exception of the February 2005 sampling event due to sediment entrained in the sample), located downgradient of the area. The results demonstrate that this AOC has been adequately characterized for the purposes of the RI

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	and risk assessment.
AOC 10 – Cargill Hydraulic Pump Area Staining	An area adjacent to the South Truck Tipper in OU1 contained hydraulic equipment for the operation of the Tipper. The URS reconnaissance in October 2003 and the ATC ESA noted soil staining in the vicinity of this equipment (ATC, 2003). Potential COIs for AOC 10 include TPH, VOCs, PAHs, and PCBs.
Explorations:	Borings: SB-03, SB-17, and SB-18.
Analyses:	Soil samples were collected at borings SB-17 and SB-18 at approximately 1 foot bgs and were analyzed for TPH, PAH, VOCs, and PCBs. Grab groundwater samples from each of the three borings in this AOC were analyzed for TPH, PAHs, and VOCs. In addition additional analysis was performed on the grab groundwater samples from borings SB-03 (pesticides) and SB-17 and SB-18 (PCBs).
Results:	TPH, VOCs, and PCBs were not detected above the MRL in soil. Low concentrations of PAHs were detected and dibenzofuran slightly exceeded the terrestrial SLV in soil from boring SB-18. TPH, PCBs, and pesticides were not detected above the MRL in the grab groundwater samples. No PAHs or VOCs were detected above the preliminary screening levels in the grab groundwater samples. The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.

Summary of Environmental Conditions at OU1 AOCs

AOC11 – Cargill Former Deep Well	A former deep well was identified by ATC on the Cargill leasehold in OU1 and was also shown in a 1953 drawing (ATC, 2003). The drawing indicated that the well supplied water to the Dust House. The well was 220 feet deep and 14 inches in diameter and was located west of the grain storage silos. According to an Oregon Water Well Report dated April 27, 1992, the well was decommissioned by filling with cement. Field notes indicated that approximately 7 feet of oil were observed on top of water in the well at a depth of approximately 27 feet bgs. This oil may have been caused by the presence of a turbine pump within the well. Spencer Environmental pumped 302 gallons of "product" from the well in April 1992, and a PCB analysis of the product did not detect PCBs (ATC, 2003). The Port reported the former presence of the deep well and oil within the well to the Oregon DEQ in a letter dated December 12, 2003. Potential COIs for AOC 11 include TPH, VOCs, and PAHs.
Explorations and Analyses:	Soil samples were collected at adjacent boring SB-12 at depths of 1 foot and 9 feet and were analyzed for TPH. A monitoring well, MW-17, was installed directly adjacent to the former deep well and quarterly monitoring of the well was conducted for one year (4 events); groundwater samples from the well were analyzed for TPH, PAH, VOCs, PCBs, pesticides, metals, and SVOCs. Grab groundwater samples were collected from adjacent boring SB-12 and from 15 downgradient borings: SB-03, SB-09 through SB-12, SB-17, SB-18, SB-24 through SB-26, SB-28, and SB-36 through SB-39 and were analyzed for TPH.
Results:	Petroleum hydrocarbons were not observed during the installation of the borings located directly adjacent to the former deep well. TPH was not detected in the soil samples from SB-12. TPH was not detected above MRLs in any of the 15 grab groundwater samples collected directly adjacent to or downgradient of the former deep well. TPH, PAHs and VOCs were not detected above the MRLs in the groundwater samples collected from monitoring well MW-17 (with the exception of toluene detected just above the MRL in the sample from February 1, 2005); metals and pesticides were not detected above MRLs with the exception of low concentrations of a few metals (chromium, lead, nickel, selenium, and zinc), and endrin ketone. The metals concentrations are consistent with concentrations observed at other waterfront sites and appear to be within regional background. No compounds were detected above the preliminary screening levels. The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.

Summary of Environmental Conditions at OU1 AOCs

AOC 12 – General Pesticide Usage	The nature of the industrial activities on the OU1 property (grain and flour handling) required rodent and insect control, which may have included rodenticides and insecticides. The quantities, types, storage areas, and application areas of these pesticides are not known. Potential COIs for AOC 12 include pesticides. Specific pesticide use locations are not known at this time; however, several surface soil sample locations were collected across OU1 to assess for the presence of pesticides in surface soils of the Cargill leasehold.
Explorations:	Surface soil locations: S-1 through S-4. Borings: SB-12, SB-19, SB-20, and SB-32.
Analyses:	Surface soil samples from the near surface (about 0.5 feet bgs) were analyzed for pesticides at the above locations. In addition, locations (S-1 through S-4) were analyzed for PCBs.
Results:	Pesticides were not detected above the MRL in the majority of the samples analyzed. DDT was detected above the MRL in samples from SB-12 and SB-20 at low concentrations which were below the preliminary screening levels. The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.
AOC13 – Former Transformer House	According to aerial photographs and Facility drawings from 1919 through 1976, the transformer house was located on the OU1 property to the east of the grain storage building (ATC, 2003). The building was reportedly demolished in 1977. The area is now covered with asphalt, with no surface indication of the former building. Port drawings indicate that transformers were stored in the basement of the building. There is no information with respect to the type of transformers contained in the building, but the period of use for the transformers indicates PCB-containing equipment may have been present at one time. Potential COIs for AOC 13 include TPH, PAHs, and PCBs.
Explorations and Analyses:	Soil samples were collected at borings SB-19 and SB-20 at approximately 8 feet bgs and were analyzed for TPH and PCBs. Grab groundwater samples from each of these borings were analyzed for TPH, PAHs, and PCBs. A groundwater sample from downgradient well MW-26 was analyzed for PAHs, pesticides, and metals in September 2005.
Results:	TPH and PCBs were not detected above the MRL in soil or grab groundwater. Six PAHs were detected at concentrations that exceeded the preliminary screening levels in grab groundwater from SB-19. PAHs were not detected above the MRLs in grab groundwater from SB-20 with the exception of naphthalene which was detected just above the MRL and below the preliminary screening levels.

	PAHs were not detected above applicable screening criteria in downgradient well MW-26. The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.
AOC 14 – Cargill Basement Level Sumps	Basement level sumps have been identified at OU1 at the Truck Tipper Scale and South Rail Car Tipper. The sump at the bottom of the South Rail Car Tipper was observed during the URS site reconnaissance in October 2003, and by HAI in June 2003 (Hart Crowser, 2004). Both parties observed dark, odorous fluid in the sump at the time of the reconnaissance. The integrity of this sump with respect to the underlying soils is not known, though an inspection of the sump bottom suggested it was concrete-lined. A float switch and sump pump was observed in the sump suggesting that material collected in the sump was periodically pumped out. A report prepared by ATC indicated 475 gallons of used oil were pumped from the truck sump in January 1989 by Spencer Environmental (Hart Crowser, 2004). Between 1990 and 1999, Spencer Environmental pumped and disposed of approximately 2,045 gallons of oil for recycling and 32, 1-gallon garbage cans of hydraulic oil-soaked wheat and absorbent pads. Potential COIs for AOC 14 include TPH, VOCs, PAHs, and PCBs.
South Rail Car Tipper Explorations and Analyses:	Borings SB-03 and SB-18 were installed directly adjacent to and monitoring well MW-08 was installed down-gradient of the South Rail Car Tipper sump. A 1-foot depth soil sample was collected from SB-18 and analyzed for TPH, PAHs, VOCs, and PCBs. Groundwater samples collected from borings SB-03 and SB-18 and monitoring well MW-8 (up to 5 events) were analyzed for TPH, PAHs, VOCs, pesticides (MW-08 and SB-03 only), and PCBs (SB-18 only). Groundwater samples from well MW-8 were also analyzed for metals during two monitoring events.
Truck Tipper Explorations and Analyses:	Boring SB-84 was installed adjacent to the Truck Tipper Sump. Borings SB-85 and SB-88 and monitoring well MW-26 were installed down-gradient of the Truck Tipper Sump. A 12-foot soil sample was collected from boring SB-84 and analyzed for TPH, VOCs, PAHs, and pesticides. A 7.5-foot depth soil sample was collected from SB-88 and analyzed for PAHs. Grab groundwater samples were collected from SB-84 and SB-85 and analyzed for TPH, PAHs, VOCs, pesticides (SB-84 only) and PCBs. Groundwater samples collected from well MW-26 were analyzed for PAHs, pesticides, and metals.

Summary of Environmental Conditions at OU1 AOCs

Results-South Rail Car Tipper Sump:	The soil sample from SB-18 did not contain TPH, VOCs, or PCBs above the MRLs, and PAHs were below the preliminary screening levels with the exception of dibenzofuran which slightly exceeded the terrestrial SLV. TPH and PCBs were not detected above MRLs in groundwater samples collected adjacent to and downgradient of this area; PAH and VOC compounds detected in the groundwater samples below applicable aquatic screening criteria. The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.

AOC 14 – Cargill Basement Level Sumps (cont.)

Results-Truck Tipper Sump: Soil samples collected adjacent to the Truck Tipper sump area did not contain TPH, VOCs, or pesticides above MRLs and PAH concentrations were below industrial PRGs. TPH, PCBs, VOCs (with the exception of acetone), and pesticides were below MRLs in groundwater samples collected at or downgradient of this area. Acetone concentrations were below applicable screening criteria. One or more PAHs, pesticides, or metals exceeded the screening criteria in the grab groundwater samples from borings SB-84 and/or SB-85 but were not detected above applicable screening criteria in downgradient well MW-26 (with the exception of arsenic, which was detected at concentrations typical of regional background). The presence of PAHs and metals in the grab groundwater samples appears to be due to turbidity in the sample.

The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.

AOC 15 – Abandoned Cesspools

Historical Port maps indicate the presence of six wood-lined, below-ground cesspools in several locations around the grain Facility in OU1 (Hart Crowser, 2004). The earliest map depicting the cesspools was dated 1948, and a 1954 map indicated the cesspools were to be abandoned, though no method was indicated. The drawing also shows the cesspools to be lined with creosote-coated wood and constructed in 10-foot by10-foot squares, 10 feet deep. The drawings also show lines from the adjacent grain storage buildings leading to the cesspools; however, the sources of the lines are not noted. While the cesspools were most likely used for sewage disposal, this exclusive use has not been confirmed. URS was not able to locate the cesspools during the site reconnaissance and documentation with respect to the contents of the cesspools or the method for decommissioning has not been identified. Potential COIs for AOC 15 include TPH, VOCs, PAHs, PCBs, pesticides, and metals.

Explorations: Borings SB-21, SB-22, SB-23, SB-24, SB-25, and SB-84 were installed directly within or adjacent to the footprints of the former cesspools.

Monitoring wells MW-08, MW-17, and MW-26 were installed downgradient of one or more of the cesspools.

Analyses: Seven soil samples (one or more from each boring) collected between depths of 9 and 18 feet were analyzed for one or more of the following analytical suites: TPH, PAHs, VOCs, PCB, pesticides, and metals. Grab groundwater samples were collected from SB-21, SB-22, SB-23, SB-24, SB-25, and SB-84 and analyzed for one or more of the following analytical suites: TPH, PAHs, VOCs, PCBs, and pesticides. Groundwater samples from the wells MW-08, MW-17 and MW-26 were analyzed for

PAHs, metals, and pesticides, and MW-08 and MW-17 for TPH, VOCs and PCBs.

AOC 15 – Abandoned Cesspools (cont.)

Results: Residual-range TPH was detected in borings SB-22 and SB-23 ranging from 2,800 mg/kg in the 13-foot sample from SB-23 to 16,000 mg/kg in the 17-foot sample from SB-22. A 13-foot sample from SB-22 did not contain TPH above the MRLs.

The concentrations of five of PAHs exceeded industrial PRGs in the 17-foot sample from SB-22. Subsurface soil samples collected in adjacent borings or at shallower depths contained significantly lower PAH concentrations and only benzo(a)pyrene exceeded the industrial PRG in one of the adjacent samples (SB-23 at 13 feet bgs). PAH concentrations were below the PRGs in the other nearby soil samples and demonstrate that the PAH-impacted soil in the vicinity of the cesspools is limited in extent and below a depth of about 13 feet.

Up to three VOCs were detected in soil from SB-21 through SB-23 above the MRLs but below the preliminary screening levels. One Aroclor was detected in soil from SB-23 above the MRL but below the preliminary screening levels. One pesticide was detected in soil from SB-22 and SB-23 above the MRL but below the preliminary screening levels. Arsenic was detected slightly above the regional background and the industrial PRG in SB-22.

TPH, PAH, VOC, PCB, and pesticide concentrations in soil and groundwater samples collected at or downgradient of the cesspools located near borings SB-24/SB-25 and SB-84 were either below MRLs or were low and below applicable screening criteria. TPH, PAH, VOC, PCB, and pesticides were not detected above applicable screening criteria in downgradient wells MW-08, MW-17, and MW-26.

The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.

Summary of Environmental Conditions at OU1 AOCs

AOC 16 – Cargill Malathion Mixing Area	This area, in the approximate location of the former Millwright Shop in OU1, was observed during the URS reconnaissance. CLD Pacific Grain confirmed that malathion spraying activities occurred in the area (ATC, 2003). Both URS and ATC noted a chemical odor in and around the mixing area during a site reconnaissance. The mixing area consisted of a room used for bulk Malathion storage in drums and mixing of malathion with grain prior to shipment. Malathion use was terminated in 1997.
Explorations:	Borings: SB-25, SB-26, SB-27, and SB-28. Monitoring Well: MW-08.
Analyses:	Soil samples collected from about 1 foot bgs were analyzed for pesticides. Grab groundwater samples from SB-25, SB-26, and SB-28 were analyzed for pesticides.
Results:	A few pesticides were detected in soil just above the MRLs but significantly below the preliminary screening levels. DDT was detected above the preliminary screening levels in grab groundwater from SB-26 at an estimated concentration below the MRLs but above the MDLs (referred to herein as "trace" concentrations). Trace concentrations of three compounds (heptachlor, heptachlor epoxide, and 4-4'-DDE) exceeded the fish consumption SLV in the sample from downgradient well MW-08 from the April 2004 monitoring event. None of these compounds exceeded the screening criteria in the subsequent three sampling events. The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.

Summary of Environmental Conditions at OU1 AOCs

AOC 17 – Cargill Former Millwright Shop and Compressor House	Port maps from 1958 and 1961 depict a Millwright Shop and Compressor House west of the Grain Storage Operating House in OU1, which corresponds with the location of the Former Malathion Mixing Area (AOC 16). A UST was apparently associated with an oil-fired heating unit in the building, but the tank size indicated on the drawing (500-gallon) does not match the tank description of the two USTs documented by Century West (Century West, 1995) immediately adjacent to this AOC (see AOCs 21 and 22). The Millwright Shop drawing also shows the location of a former sump vault that drained to a sewer line. The map noted the sump was to be covered with a steel plate prior to the construction of the Millwright Shop. A wood-covered underground structure was observed by URS immediately west of this AOC during the site reconnaissance. It is not known whether this structure is the sump, but this structure was further evaluated during the RI. There is no documentation of the specific activities that occurred in the Millwright Shop or the Compressor House. Potential COIs for AOC 17 include TPH, VOCs, and PAHs.
Explorations:	Borings: SB-25, SB-26, SB-27, and SB-28.
Analyses:	Soil samples were analyzed for TPH from about 8.5 feet bgs (SB-25, SB-26, and SB-28) or 5 feet bgs (SB-27). Grab groundwater samples from SB-25, SB-26, and SB-28 were analyzed for TPH, PAHs, and VOCs.
Results:	TPH was not detected above the MRL in the soil or grab groundwater samples. VOCs and PAHs were not detected above the MRL in the grab groundwater samples with the exception of naphthalene which was low and below the preliminary screening levels. The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.

Summary of Environmental Conditions at OU1 AOCs

AOC 18 – Cargill Hydraulic Oil Releases	In the western portion of OU1, two soil removal and sampling activities were conducted by Foss Environmental through a contract with CLD Pacific Grain. The removal activities were conducted to evaluate the presence of hydraulic oil contamination of soil in the vicinity of the hydraulic lift station, identified as Building C-11. The November 2003 soil removal revealed an additional area of visible petroleum hydrocarbon soil contamination, approximately 10 feet west of the hydraulic lift station and 8 feet bgs. The appearance and odor of the soil was apparently different than the hydraulic oil contamination found adjacent to Building C-11 during the previous investigation. The visually impacted soil was not completely removed due to access limitations, and confirmation sample analytical results indicated that petroleum contamination remained at this location. Potential COIs for AOC 18 include TPH.
Explorations and Analyses:	Soil samples from SB-29 and SB-30 (8 feet bgs) were analyzed for TPH.
Results:	TPH was not detected above the MRLs in soil. The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.
AOC 19 – Former Blacksmith Shop	The former Blacksmith Shop was previously located just east of the former Transformer Building at OU1 and was noted on a 1924 Sanborn Fire Insurance map. According to the map, the shop was used for general storage, carpentry, tractor storage, and a blacksmith shop. The shop does not appear on a 1935 aerial photograph, and is not noted in any previous reports. The area is now vacant, although there is a concrete slab that may be the former foundation of the shop. The slab is surrounded by asphalt. The former blacksmith shop may have used fuel for a furnace or other equipment. Potential COIs for AOC 19 include TPH, VOCs, PAHs, and metals.
Explorations:	Borings: SB-31, SB-32, and SB-33.
Analyses:	A surface soil sample (approximately 1-foot depth), 3-foot soil sample and a grab groundwater sample were collected from each boring. Surface soil samples were analyzed for TPH, PAHs, and metals. The deeper (approximately 3-foot) soil samples were analyzed for VOCs and the grab groundwater samples were analyzed for TPH, PAHs, VOCs, and metals (SB-31 and SB-32 only).

AOC 19 – Former Blacksmith Shop (cont.)

Results: Metals and PAH concentrations were below industrial PRGs and VOCs were not detected above MRLs in the soil samples. TPH were not detected above MRLs, with the exception of the 1-foot sample collected from SB-31, which reported oil-range hydrocarbons at 1,200 mg/kg. Gasoline range hydrocarbons were reported at 6.7 mg/kg in the 1-foot sample from SB-32; however, the result was flagged by the laboratory and noted as not resembling a petroleum product.

With the exception of 3.5 µg/L chloroform at location SB-32, VOCs were not detected above MRLs in the grab groundwater samples. Several PAHs, TPH (gasoline), copper, and lead were detected at low to trace concentrations in the grab groundwater samples. However, downgradient monitoring well MW-26 did not contain these constituents above MRLs (with the exception of arsenic, which was detected at concentrations typical of regional background), supporting the assumption that the presence of these concentrations in the grab groundwater was due to sediments entrained in the sample.

The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.

AOC 20 – Cereal Foods T-19

This 10,000-gallon UST reportedly contained Fuel Oil #5. The removal date is not known, and documentation of its removal has not yet been identified. The UST was assigned DEQ Registration File Number 447. This file does not contain any additional information relevant to the removal of the UST. Potential COIs for AOC 20 include TPH, VOCs, and PAHs.

Explorations and Analyses: Soil samples from borings SB-34 and SB-35 (12.5 feet bgs) were analyzed for TPH. Grab groundwater samples from each boring were analyzed for TPH, PAHs, and VOCs.

Results: TPH was not detected above the MRL in the soil or grab groundwater samples. VOCs and PAHs were not detected above the MRL in the grab groundwater samples with the exception of naphthalene and 2-Methylnaphthalene which were low and below the preliminary screening levels.

The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.

Summary of Environmental Conditions at OU1 AOCs

AOC 21 – Cereal Foods T-20

This 1,000-gallon, diesel UST was apparently removed in 1989; however, documentation of its removal has not yet been identified. The UST was assigned DEQ Registration File Number 447. This file does not contain any additional information relevant to the removal of the UST. Potential COIs for AOC 21 include TPH, VOCs, and PAHs.

Explorations and Analyses: Soil samples from borings SB-36 and SB-37 (7.5 feet bgs) were analyzed for TPH. Grab groundwater samples from each boring were analyzed for TPH, PAHs, and VOCs.

Results: TPH was not detected above the MRL in the soil or grab groundwater samples. VOCs and PAHs were not detected above the MRL in the grab groundwater samples with the exception of naphthalene and 2-methylnaphthalene which were low and below the preliminary screening levels. Chrysene was detected in grab groundwater at a low concentration that slightly exceeded the fish consumption SLV in SB-37 but no in downgradient monitoring well MW-08.

These results support that the former UST did not significantly impact soil or groundwater and the AOC has been sufficiently characterized.

AOC 22 – Cereal Foods T-21

This 1,000-gallon UST reportedly contained Fuel Oil #2. The removal date is not known, and documentation of its removal has not yet been identified. The UST was assigned DEQ Registration File Number #447. This file does not contain any additional information relevant to the removal of the UST. Potential COIs for AOC 22 include TPH, VOCs, and PAHs.

Explorations: Borings: SB-38 and SB-39.

Analyses: One soil sample each from borings SB-38 and SB-39 were collected at a depth of approximately 9-feet and analyzed for TPH. Grab groundwater from each boring was analyzed for TPH, PAHs, and VOCs.

Results: TPH was not detected in soil or grab groundwater above the MRL. No PAHs were detected above the preliminary screening levels. VOCs were not detected above the MRLs.

The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.

Summary of Environmental Conditions at OU1 AOCs

AOC 24 – Cafeteria Oil-Storage UST

A 1965 drawing obtained from the Port shows an oil-storage UST adjacent to the former cafeteria at OU1. No additional documentation is available. Potential COIs for AOC 24 include TPH, VOCs, and PAHs.

Explorations: Borings: SB-40 and SB-41.

Analyses: Soil samples from approximately 13 feet were collected from each boring and analyzed for TPH. Grab groundwater from each boring was analyzed for TPH, PAHs, and VOCs.

Results: TPH was not detected in soil or grab groundwater above the MRL. Anthracene was detected above the MRL in both grab groundwater samples at concentrations below the preliminary screening levels.

The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.

AOC 25 – Waste Pile

A waste pile was identified at OU1 during the URS site reconnaissance in October 2003. The pile contained used vehicle tires, scrap metal, and railroad ties. The waste pile was subsequently removed, but the period of use and historical disposal practices with respect to this waste pile were not identified. Potential COIs for AOC 25 include TPH, VOCs, SVOCs, PAHs, PCBs, and metals.

Explorations and Analyses: Surface soil (0.5 to 1.5 feet bgs) from boring SB-42 was analyzed for TPH, SVOCs, PCBs, and metals. Soil from 5 to 6 feet bgs was analyzed for VOCs. Grab groundwater was analyzed for TPH, PAHs, SVOCs, VOCs, and PCBs.

Results: TPH, SVOCs, PCBs, and VOCs were not detected in soil above the MRL. Metals were detected in soil at low concentrations consistent with regional background values and below the preliminary screening levels. PAHs were detected in the surface soil sample and the grab groundwater sample at low concentrations that did not exceed the preliminary screening levels. TPH, SVOCs, VOCs, and PCBs were not detected above the MRL in the grab groundwater sample.

The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.

Summary of Environmental Conditions at OU1 AOCs

AOC 26 – Former Gas Fueling Station	A 1966 map and historical information indicate the presence of a gas fueling station along the southern side of Carroll Road, which is located northeast of the Gearlocker building. The gas station was apparently used during the U.S. Army Transport Service (ATS) tenancy at the site, between the period of 1942 and 1947. Existing information does not reference a gasoline storage tank associated with this AOC. Potential COIs for AOC 26 include TPH, VOCs, PAHs, and metals.
Explorations and Analyses:	Grab groundwater from borings SB-43 and SB-44 were analyzed for TPH, PAHs, VOCs, and metals.
Results:	TPH and VOCs were not detected above the MRL in the grab groundwater samples. Metals were detected at concentration consistent with regional background and below the preliminary screening levels. Four PAHs in SB-43 were detected at low concentrations that exceeded a screening level. Downgradient grab groundwater and monitoring well samples did not contain PAHs above the preliminary screening levels supporting the assumption that the presence of these concentrations in the grab groundwater was due to sediments entrained in the sample. The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.
AOC 27 – Former Transformer Handling Area	Interviews with Port employees indicate this area was used for staging and loading PCB-containing materials in and out of the former Warehouse No. 5 and to stage transformers and capacitors with PCB oil prior to removal and disposal. The former transformer handling area was located at the western edge of OU1. Soil staining was observed at the base of the loading ramp during the time of PCB-material handling. Potential COIs for AOC 27 include TPH, PAHs, and PCBs.
Explorations:	Surface soil location: S-31. Borings: SB-45, SB-46, and SB-47. Monitoring Well: MW-01s.
Analyses:	Shallow soil samples (0.5 to 2 feet bgs) were collected at each location and were analyzed for TPH and PCBs. The shallow soil samples from borings SB-45 through SB-47 were also analyzed for PAHs. Grab groundwater samples were collected at each location (with the exception of S-31) and were analyzed for TPH, PAHs, and PCBs (with the exception of SB-45). Groundwater from well MW-01s was analyzed for TPH, PAHs, VOCs, and PCBs.

AOC 27 – Former Transformer Handling Area (cont.)

Results: PCBs were below the MRLs in SB-45. Benzo(a)pyrene and dibenzofuran slightly exceeded the screening criteria in SB-45 (250 and 9.8 µg/kg, respectively). TPH was below MRLs in the soil samples with the exception of the residual range, which was detected in one sample at low concentration (T4S1SB-45; 120 µg/kg). TPH and PCBs were not detected above MRLs in the grab groundwater samples or groundwater from well MW-01s. Low concentrations of a few PAHs were detected above the screening criteria in the grab groundwater samples; however, their presence is likely associated with sediments entrained in the sample. No PAHs or VOCs were detected in well MW-01s above the preliminary screening levels.

The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.

AOC 28 – Possible Drum Burial Area

Interviews with Port employees indicate drums may have been buried in the western portion of OU1. Previous geophysical testing of the area revealed anomalies (Geopotential, 1993). Potential COIs for AOC 28 include TPH, VOCs, PAHs, PCBs, pesticides, and metals.

Explorations: Soil samples (0.5 to 2 feet bgs) from borings SB-48, SB-49, and SB-50 were analyzed for PAHs, pesticides and metals. Grab groundwater from each boring was analyzed for TPH, PAHs, VOCs, PCBs, and pesticides.

Results: PAHs and pesticides were not detected above the MRL in the soil samples. The detected concentrations of metals in soil were consistent with the regional background values and below the preliminary screening levels. TPH, VOCs, PCBs, and pesticides were not detected above the MRLs in grab groundwater. Two PAHs were detected in grab groundwater from SB-48 at low concentrations below the preliminary screening levels.

The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.

Summary of Environmental Conditions at OU1 AOCs

AOC 29 – Schnitzer Auto Fluff Area

Activities occurring on the Schnitzer Steel property, immediately north of OU1, include automobile demolition and metal recycling. These activities result in generation of dust, particulate matter, and projectiles that accumulate on the ground surface at OU1 along the northern border with the Schnitzer property. Potential environmental impacts at OU1 resulting from the adjacent automobile demolition and metal recycling are not known. Potential COIs for AOC 29 include TPH, SVOCs, PAHs, PCBs, and metals.

Explorations: Surface soil locations: S-5, S-6, and S-7.
Monitoring Well: MW-24

Analyses: The surface soil samples were analyzed for TPH, PAHs, PCBs, and metals. Groundwater from well MW-24 were analyzed for TPH, PAHs, SVOCs, VOCs, PCBs, and metals for three quarters.

Results: TPH was not detected in surface soil with the exception of S-7 with 100 and 960 mg/kg in the diesel and residual range, respectively. The laboratory notes indicate that chromatogram did not resemble the petroleum standard. Five PAHs in sample S-7 slightly exceeded the industrial PRG. PCBs were detected at low concentrations below the preliminary screening levels. The concentrations of up to six metals exceeded the regional background and the preliminary screening levels values in soil samples S-5 and S-7. TPH, SVOCs, and PCBs were not detected above the MRLs for groundwater from well MW-24. Several PAH concentrations slightly exceeded the preliminary screening levels from well MW-24 during the February 2005 sampling event. These exceedances were not observed in the other quarters of monitoring and are likely related to soil entrained in the samples. Toluene was detected in groundwater from the February 2005 sampling event at a low concentration below the preliminary screening levels. Metals were detected at low concentrations that were below the preliminary screening levels.

The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.

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Summary of Environmental Conditions at OU1 AOCs

AOC 69 – Former PCB-Containing Transformer Locations

The former locations of transformers at OU1, as they could be identified, are noted on Figure 7. Potential COIs for AOC 69 include TPH, PAHs, and PCBs. Due to the limited information available, RI field activities were conducted at those transformer locations for which reliable location information was obtained.

Explorations: Surface Soil Sample Locations: S-11 through S-19.

Analyses: Two surface soil samples (0 to 6 inches) were collected from location S-12 and S-13 and were analyzed for TPH, PAHs, and PCBs. Additional soil samples were collected at S-12 and S-13 from 6 to 12 inches bgs and 2-feet, and at five locations (S-15 through S-19) around S-12 and S-13 to define the lateral and vertical extent of PAHs in this area.

Results: TPH was not detected above the MRL and PCB concentrations were below the preliminary screening levels. Several PAHs from S-12 and S-13 exceeded the preliminary screening levels. Follow-up samples from S-15 through S-19 indicate that the area of elevated PAH concentrations is limited both laterally and vertically. The PAH concentrations dropped dramatically between the 0 to 6-inch samples and the 6- to 12-inch samples at both S-12 and S-13, supporting that the elevated PAH concentrations in the 0 to 6-inch samples is likely due to the presence of asphalt in surface soil (and not releases from the former transformers). The PAH results for the surrounding samples (S-15 through S-19) collected from 0.5 to 1 foot bgs support the conclusion that the elevated PAH concentrations in samples S-12 and S-13 (e.g., where several to numerous PAH compounds exceed PRGs) are limited to the upper foot of soil in limited areas around S-12 and S-13. The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.

Summary of Environmental Conditions at OU1 AOCs

AOC 76 – Cargill Former Machinery Shop	A 1958 map identified a machinery shop west of the Cargill Office Building and north of the former Warehouse No. 8 at OU1. The specific activities associated with this shop are not known, but may have included fuel-powered equipment or the use of industrial chemicals. Potential COIs for AOC 76 include TPH, VOCs, PAHs, and PCBs.
Explorations:	Borings: SB-82 and SB-83.
Analyses:	Surface soil samples (about 1 foot bgs) were collected from borings SB-82 through SB-83 were analyzed for TPH and PAHs. Soil samples from depths of 3 to 3.5 feet bgs were collected for VOC analysis. Grab groundwater samples were analyzed for TPH, PAHs, VOCs, and PCBs.
Results:	TPH and VOCs were not detected above the MRLs in soil or grab groundwater. PCBs were not detected in grab groundwater. The detected concentrations of PAHs in soil were low and below the preliminary screening levels. The concentrations of up to four PAHs in grab groundwater slightly exceeded. PAHs did not exceed the preliminary screening levels in monitoring well MW-01s supporting that the PAHs in the grab groundwater samples are likely due to sediment entrained in the samples. The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.
AOC 77 – Former Cold Storage Plant UST	A 1977 Port drawing shows a 2,500-gallon oil UST along the east side of the former cold storage plant, and adjacent to a boiler room. The drawing is a demolition plan for the removal of the cold storage plant and includes instructions to "dig out and remove 2,500 gallon oil tank." Therefore, the UST appears to have been removed, but there is no record of its removal. Potential COIs for AOC 77 include TPH, VOCs, and PAHs.
Explorations and Analyses:	Soil samples from about 8 feet bgs from borings SB-86 and SB-87 were analyzed for TPH. Grab groundwater samples were analyzed for TPH and VOCs.
Results:	TPH was not detected above the MRL in soil or groundwater. VOCs were not detected above the MRLs with the exception of acetone which was low and below the preliminary screening levels. The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.

Summary of Environmental Conditions at OU1 AOCs

AOC 78 and 80 – Storm Drain Catch Basins.	Two storm drain catch basins (one to the west and one to the east of the north row of the large grain storage tanks) were identified by longshoremen who previously worked at the Facility as having received waste/excess pesticides during Cargill's operations at the Facility.
Explorations:	Borings SB-89 and SB-90 were located adjacent to these catch basins to assess whether residual constituents were present.
Analyses:	Samples were collected between 1 and 3 feet at each location and analyzed for TPH, PAHs, pesticides, and metals.
Results:	No field evidence of petroleum sheens or other constituents were observed during the installation of the borings. Diesel-range petroleum hydrocarbons were not detected at either location. Residual-range hydrocarbons were below the MRL at both locations; however, A trace concentration of 55 mg/kg was reported above the method detection limit (MDL) in the sample from SB-89. PAHs were in general not detected above the MRL; detected concentrations were low and below industrial PRGs. Pesticides were not detected above the MRLs; several pesticides (gamma chlordane, alpha chlordane,4,4-DDE, 4,4-DDE, 4,4-DDT, dieldrin, and endrin ketone) were reported as trace values above the MDL. These trace values and the MRLs were below industrial PRGs. The concentrations of chromium and zinc slightly exceeded the regional background value and the terrestrial SLV in the sample from boring SB-89. The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.
AOC 79 – Pump at Cargill with Hydraulic Oil Leak.	A pump formerly located in the center of the large grain storage tank area in the former Cargill operating area was identified by longshoremen who previously worked at the Facility as historically leaking hydraulic oil.
Explorations:	Boring: SB-91.
Analyses:	A sample was collected from 0.5 to 2.5 feet and analyzed for diesel-range and residual-range petroleum hydrocarbons.
Results:	No field evidence of petroleum sheens or other constituents were observed during the installation of the boring. Diesel-range hydrocarbons were not detected above the MRL of 26.3 mg/kg. Residual-range hydrocarbons were detected at 74.3 mg/kg. The results support that releases, if any, from the

former pump have not significantly impacted soil at the Facility.

The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.

AOC 81 and AOC 82, Waste Areas (Creosote). According to information provided to the DEQ by former longshoremen at the Cargill Facility, creosoted waste was dumped in two areas.

Explorations: Two borings were located in each area (SB-92 and SB-93; SB-94 and SB-95).

Analyses: One shallow (approximately 1-foot depth) soil sample was collected from each location and analyzed for TPH, PAHs, pesticides, and metals.

Results: No field evidence of petroleum sheens or other constituents were observed during the installation of the borings. Diesel-range hydrocarbons were not detected above MRLs in the samples. Residual-range hydrocarbons were not detected above MRLs in the samples from AOC 81; residual-range hydrocarbons were detected slightly above the MRL in both samples from AOC 82 (e.g., at concentrations between 55 and 79 mg/kg. PAH concentrations, where detected, were below industrial PRGs, with the exception of benzo(a) pyrene at locations T4S1SB-92 and T4S1SB-95. DDE was detected above the MRL in soil from SB-95 but below the preliminary screening levels. The detected concentration of lead in soil slightly exceeded the regional background value and terrestrial SLV from borings SB-92, SB-93, and SB-95. Zinc slightly exceeded the regional background value and terrestrial SLV in soil from SB-95.

These results showed only intermittent detections of a few constituents and indicate that the presence of the former waste areas has been adequately characterized for the purposes of the remedial investigation and risk assessment.

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Summary of Environmental Conditions at OU2 AOCs

1.2 Operable Unit 2

AOC 54 – Hall-Buck T-24	This tank is described as a 10,000-gallon UST of unknown contents that was reportedly removed. The removal date is not known, and documentation of its removal has not yet been identified. Assuming the tank was used for petroleum product storage, potential COIs for AOC 54 include TPH, VOCs, PAHs, PCBs, and metals.
Explorations:	Borings: SB-51 and SB-52.
Analyses:	Soil samples from SB-51 (2 and 11 feet bgs) and SB-52 (12 feet bgs) were analyzed for TPH. The 2-foot sample from SB-51 was also analyzed for VOCs. Grab groundwater samples from each boring were analyzed for TPH, PAHs, VOCs, PCBs, and metals.
Results:	Low concentrations of TPH in the diesel (88 mg/kg) and residual range (190 mg/kg) were detected in the 2-foot soil sample from SB-51 although the analytical laboratory notes indicate the chromatographic fingerprint does not resemble a petroleum product. TPH was not detected above MRLs in the 11 and 12 foot samples from SB-51 and SB-52, respectively. VOCs were not detected in soil above the MRL with the exception of acetone which was low and below the screening criteria. TPH, PCBs, and VOCs were not detected in grab groundwater above the MRLs with the exception of toluene detected in SB-51 at a low concentration below the preliminary screening levels. Up to seven PAHs were detected in grab groundwater at low concentrations that slightly exceeded the preliminary screening levels. With the exceptions of one sampling event (May 2005) at downgradient well MW-16, PAHs were not detected above the preliminary screening levels during the quarterly sampling. The concentration of several metals in grab groundwater (total and dissolved) exceeded the aquatic SLVs. None of these compounds exceeded the preliminary screening levels for groundwater from well MW-16. The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.

Summary of Environmental Conditions at OU2 AOCs

AOC 57 – Kinder Morgan Former Railcar Wash Area	Interviews with Port employees and photographs from 1988 indicate the presence of a railcar wash shed in the southern portion of OU2, which is northwest of the Kinder Morgan buildings. The photographs do not show the drainage system of the wash area, but the location of the building and the activities in the photos indicate the shed may have been used to rinse ore and other bulk material dust from railcars prior to traveling off site. Potential COIs for AOC 57 include TPH, VOCs, PAHs, and metals.
Explorations:	Borings: SB-53 and SB-54. Monitoring Well: MW-16.
Analyses:	Surface soil (0.5 to 1 foot bgs) from boring SB-53 was analyzed for TPH, VOCs, and metals and from SB-54 for PCBs. Surface soil from MW-16 was analyzed for PCBs, pesticides, and metals. Grab groundwater from both borings was analyzed for TPH, PAHs, VOCs, and metals. Groundwater from well MW-16 was analyzed for TPH, PAHs, VOCs, PCBs, and metals.
Results:	TPH and VOCs were not detected above the MRL in surface soil. The concentrations of metals detected in soil from SB-53 were low but exceeded the terrestrial SLV for lead and zinc. DDT was detected just above the detection limit and below the preliminary screening levels in surface soil from MW-16. PCBs were not detected above the MRLs with the exception of Aroclor 1260 in soil from MW-16. TPH was not detected in grab groundwater above the MRLs. Low concentrations of one or more VOCs and PAHs were detected below the preliminary screening levels. The detected concentrations of copper (total only) and zinc (total and dissolved) exceeded the aquatic SLVs. The total copper concentration slightly exceeded the aquatic SLV in MW-16 in August 2004 but the dissolved copper concentrations were consistently below the screening criteria. TPH and PCBs were not detected in groundwater from well MW-16. With the exception of one sampling event (May 2005) at well MW-16, PAHs were not detected above the preliminary screening levels during the quarterly sampling. These exceedances were not repeated in the other quarters of monitoring and are likely related to soil entrained in the samples. One detected VOC (carbon disulfide) slightly exceeded the aquatic SLV in well MW-16 in February 2005. No other exceedances were identified. Chloroform was detected in well MW16 for three sampling rounds but the screening criteria were not exceeded. The results demonstrate that this AOC has been adequately characterized for the purposes of the RI

	and risk assessment.
AOC 58 – T-26	This tank is reported as a gasoline UST of unknown size or construction, and was formerly located along the west side of former building 334. An asphalt patch observed next to the building foundation indicates this tank may have been removed; however, records documenting its removal were not identified. This tank may be the same as T-44 (AOC 60). Potential COIs for AOC 58 include TPH, VOCs, PAHs, and metals.
Explorations and Analyses:	Soil from approximately 7.5 feet bgs was analyzed for TPH in borings SB-55 and SB-56. Grab groundwater from both borings was analyzed for TPH, PAHs, VOCs, and metals. Groundwater from MW-11 was analyzed for TPH, PAHs, VOCs, pesticides, and metals.
Results:	TPH was not detected above the MRL in soil. TPH and VOCs were not detected in grab groundwater above the MRLs. Metals were not detected above the preliminary screening levels in the grab groundwater samples from the borings and in groundwater from well MW-11. Three PAHs were detected in grab groundwater above the preliminary screening levels in each boring but not in the groundwater sample from well MW-11. The trace concentration of 4,4'-DDT exceeded the screening criteria in groundwater from MW-11 in September 2004. The concentrations of 4,4'-DDT were below the screening criteria in the other sampling events. The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.

Summary of Environmental Conditions at OU2 AOCs

AOC 60 – City CPD T-44	This tank is reported as a diesel UST of unknown size or construction, and was formerly located along the west side of former building 334. This tank may be the same as T-26 (AOC 58). Potential COIs for AOC 60 include TPH, VOCs, PAHs, and metals.
Explorations and Analyses:	Soil from approximately 8 feet bgs was analyzed for TPH in borings SB-57 and SB-58. Surface soil (1 to 2 feet bgs) from SB-58 was analyzed for TPH, VOCs, and metals. Grab groundwater from both borings was analyzed for TPH, PAHs, VOCs, and metals. Groundwater from MW-11 was analyzed for TPH, PAHs, VOCs, pesticides, and metals.
Results:	TPH was not detected above the MRL in soil. TPH and VOCs were not detected in grab groundwater above the MRLs. Metals were not detected above the preliminary screening levels in the grab groundwater samples from the borings and in groundwater from well MW-11. Up to six PAHs were detected in grab groundwater above the preliminary screening levels in each boring but not in the groundwater sample from well MW-11. The trace concentration of 4,4'-DDT exceeded the screening criteria in groundwater from MW-11 in September 2004. The concentrations of 4,4'-DDT were below the screening criteria in the other sampling events. The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.

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Summary of Environmental Conditions at OU2 AOCs

AOC 61 – Groundwater Seeps	Three groundwater seeps, labeled North, Middle, and South Seeps, were observed at the base of the Ro-Ro Dock at the head of Slip 1 by DEQ during an April 30, 2001 site visit. Seeps were also observed on November 4, 2002 by HAI, whose subsequent grab sampling of the three seeps showed diesel- and oil-range petroleum hydrocarbons at 180 and 1,200 parts per billion (ppb) at the South Seep (HAI, 2003a). Hydrocarbons were not detected at the North or Middle Seeps. PAHs were detected in all of the samples collected, but only the concentrations of benzo(a)anthracene and/or benzo(a)pyrene in South and Middle Seeps exceeded DEQ screening level values for aquatic receptors in fresh surface water. VOCs were not detected in any of the samples collected. Only two of the seeps were observed by URS during the October 2003 reconnaissance. Potential COIs for AOC 61 include TPH, VOCs, PAHs, and pesticides.
Explorations:	Borings: SB-05 and SB-06. Monitoring Wells: MW-03s, MW-09, and MW-10.
Analyses:	Grab groundwater from each boring was analyzed for TPH, PAHs, VOCs, and pesticides. Groundwater samples from monitoring wells MW-09 and MW-10 were analyzed for TPH, PAHs, VOCs, PCBs, pesticides, and metals. Groundwater samples from MW-03s were analyzed for TPH, PAHs, SVOCs, and pesticides.
Results:	TPH and PAHs were not detected above the MRLs grab groundwater. Up to two VOCs were detected at low concentrations below the preliminary screening levels in grab groundwater. No VOCs were detected above the MRLs in the wells MW-09 and MW-10. Several VOCs were detected at low concentrations in well MW-03s with only one exceedance of the fish consumption SLV for PCE in January 2005. No SVOCs were detected in groundwater from well MW-03s. PAHs were generally not detected above the MRL in samples from monitoring wells MW-03s, MW-09, and MW-10. Metals were not detected above the preliminary screening levels in wells MW-09 and MW-10. PCBs and SVOCs were not detected above the MRLs in groundwater. The trace concentration of 4,4'-DDT exceeded the screening criteria in MW-09 in February 2005. The concentrations of 4,4'-DDT were below the screening criteria in the other sampling events. The trace concentration of dieldrin exceeded the screening criteria in well MW-10 in April 2004 but not in the other sampling events. The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.

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Summary of Environmental Conditions at OU2 AOCs

AOC 62 – Sloped Truck Scale with Sump	Historical Port maps note the location of a sloped truck scale with a sump northwest of the former PM-Ag tank farm on OU2. The truck scale area is currently in use by IRM, and contains a concrete sump and pump that discharges to a surface infiltration area immediately east of the truck scale. Potential COIs for AOC 62 include TPH, PAHs, VOCs, and metals.
Explorations:	Borings: SB-05, SB-59 and SB-60. Monitoring Wells: MW-09, and MW-10
Analyses:	Grab groundwater samples from each boring were analyzed for TPH, PAHs, VOCs, and metals (with the exception of SB-05). Groundwater samples from monitoring wells MW-09 and MW-10 were analyzed for TPH, PAHs, VOCs, PCBs, pesticides, and metals.
Results:	TPH was not detected above the MRLs in grab groundwater or groundwater from the monitoring wells. VOCs were not detected above the MRLs in grab groundwater with the exception of 1,3-Dichlorobenzene in SB-05 (which was significantly below the preliminary screening levels). No VOCs were detected above the MRLs in the wells MW-09 and MW-10. Low concentrations of up to seven PAHs were detected in grab groundwater and exceeded the preliminary screening levels. However, PAHs were generally not detected above the MRL in samples from monitoring wells MW-09 and MW-10. The metals concentrations in groundwater from the borings and wells were below the preliminary screening levels and consistent with the expected background concentrations. PCBs were not detected above the MRLs in groundwater. The trace concentration of 4,4'-DDT exceeded the screening criteria in MW-09 in February 2005. The concentrations of 4,4'-DDT were below the screening criteria in the other sampling events. The trace concentration of dieldrin exceeded the screening criteria in well MW-10 in April 2004 but not in the other sampling events. The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.

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Summary of Environmental Conditions at OU2 AOCs

AOC 63 – Former Ore/Product Handling and Storage Locations	Ore and other bulk raw products were handled at Pier 2 with gantry and container cranes beginning in 1921 until 1996 at OU2, at which point the warehouses, cranes and docking areas were decommissioned. Pier 4 is currently used for off-loading bulk materials, but this does not include ore or raw product. Pencil pitch was handled from 1978 to 1998 at Pier 4 (see AOC 73). Soda ash is the only product stored and transported at Pier 4 since 1998 (Donovan and Associates, 1998; AINW, 2003; BBL, 2004). Potential COIs for AOC 63 include metals.
Explorations:	Borings: SB-07 and SB-08. Monitoring Wells: MW-12 through MW-16.
Analyses:	Soil from about 2 feet bgs in each boring was analyzed for metals. Grab groundwater from the borings was analyzed for TPH, PAHs, VOCs, and metals. Groundwater from monitoring wells MW-13 through MW-16 was analyzed for TPH, PAHs, VOCs, and metals (except MW-14). In addition, groundwater from wells MW-15 and MW-16 were analyzed for PCBs and groundwater from MW-12 for metals.
Results:	Metals in soil were detected at concentrations below the regional background and screening level values. TPH was not detected in grab groundwater above the MRLs. Up to three VOCs were detected at concentrations below the preliminary screening levels. Up to seven PAHs exceeded the preliminary screening levels in SB-08. With the exception of one sampling event (May 2005) at well MW-16, PAHs were not detected above the preliminary screening levels during the quarterly sampling. Several PAHs slightly exceeded the preliminary screening levels from well MW-16 during the February 2005 sampling event. These exceedances were not observed in the other quarters of monitoring and are likely related to soil entrained in the samples. The metals concentrations in groundwater from the borings and wells were below the preliminary screening levels and consistent with the expected background concentrations. Low concentrations of some metals were detected in samples from the groundwater monitoring wells; however, with a few exceptions, the concentrations were consistently below aquatic the preliminary screening levels. Exceptions included the following:

AOC 63 – Former Ore/Product Handling and Storage Locations (cont.)

Results cont.	• Total chromium slightly exceeded the aquatic SLV for hexavalent chromium in wells MW-12 and MW-15 in one event (May 2005); the total chromium concentration was below the SLVs in the subsequent event and dissolved chromium concentrations in this well are below SLVs; • Total copper concentrations slightly exceeded the aquatic SLV in wells MW-15 (May 2005) and MW-16 (August 2004); total copper did not exceed the SLVs in samples from these wells during other events and the dissolved copper concentrations have been consistently below SLVs in both wells; and • Total lead concentration exceeded the aquatic SLV in well MW-15 in May 2005 but did not exceed during any of the preceding sampling events nor have the dissolved lead concentrations in samples from this well exceeded the SLVs. The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.
AOC 64 – Former Leckenby Fumigation Plant	A Fumigation Plant was constructed in 1923 south of the PM-Ag office buildings in OU2 and was operated until 1955, when it was demolished. Under the operations of H.N. Leckenby, the building was used to fumigate Asian cotton, peanuts, rice, beans, and other foods. Prior to the 1940s, pesticides were based on inorganic compounds, including arsenic, mercury, copper, or lead. DDT was invented in 1939, and became widely used after the 1940s. Fumigants used in the 1930s and 1940s include VOCs such as methyl bromide, ethylene dibromide (EDB), 1,3-dichloropropene, and 1,2-dibromo-3-chloropropene (DBCP). Potential COIs for AOC 64 include pesticides, metals, and VOCs.
Explorations:	Borings: SB-06, SB-61, and SB-62. Monitoring Wells: MW-10 and MW-11.
Analyses:	Grab groundwater from borings SB-61 and SB-62 were analyzed for VOCs, pesticides, and metals. Grab groundwater from boring SB-06 was analyzed for TPH, PAHs, VOCs, and pesticides. Groundwater samples from monitoring wells MW-10 and MW-11 were analyzed for TPH, PAHs, VOCs, PCBs (MW-10 only), pesticides, and metals.

AOC 64 – Former Leckenby Fumigation Plant (cont.)

Results:	TPH and PAHs were not detected above the MRLs grab groundwater. Up to two VOCs were detected at low concentrations below the preliminary screening levels in grab groundwater. No VOCs were detected above the MRLs in the wells MW-10 and MW-11. The trace concentrations of up to two pesticides were detected at low concentrations that exceeded the preliminary screening levels in grab groundwater from SB-61 (4,4'-DDT and heptachlor epoxide) and SB-62 (4,4'-DDT). The trace concentration of aldrin and 4,4'-DDT exceeded the screening criteria in well MW11 in September 2004 but none of the other sampling events. The trace concentration of 4,4'-DDD exceeded the screening criteria in well MW-11 in March 2004 but none of the other sampling events. The trace concentration of dieldrin exceeded the screening criteria in well MW-10 in April 2004 but none of the other sampling events. PAHs were generally not detected above the MRL in samples from monitoring wells MW-10 and MW-11. The concentrations of metals in grab groundwater and samples from wells MW-10 and MW-11 were low and below the preliminary screening levels. PCBs were not detected above the MRLs in groundwater from MW-10. The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.
AOC 65 – Former ATS Disinfestation Plant	During the Army Transport Services (ATS) tenancy of Terminal 4, a building was constructed in 1943 for disinfestation of military personnel, prisoners of war (POWs), and their belongings. The location of this building was described as "east of House No. 1" and in the "Water Division Repair Shop", which may correspond to the former Fumigation Plant (AOC 64). An Army directive from 1944 instructed military installations to use methyl bromide (Donovan and Associates, 1998; BBL, 2004). Potential COIs for AOC 65 are the same as AOC 64 and include pesticides, metals, and VOCs.
Explorations:	Borings: SB-06, SB-61, and SB-62. Monitoring Wells: MW-10 and MW-11.
Analyses:	Grab groundwater from borings SB-61 and SB-62 were analyzed for VOCs, pesticides, and metals. Grab groundwater from boring SB-06 was analyzed for TPH, PAHs, VOCs, and pesticides. Groundwater samples from monitoring wells MW-10 and MW-11 were analyzed for TPH, PAHs, VOCs, PCBs (MW-10 only), pesticides, and metals.

AOC 65 – Former ATS Disinfestation Plant (cont.)

Results:	TPH and PAHs were not detected above the MRLs grab groundwater. Up to two VOCs were detected at low concentrations below the preliminary screening levels in grab groundwater. No VOCs were detected above the MRLs in the wells MW-10 and MW-11. The trace concentrations of up to two pesticides were detected at low concentrations that exceeded the preliminary screening levels in grab groundwater from SB-61 (4,4'-DDT and heptachlor epoxide) and SB-62 (4,4'-DDT). The trace concentration of aldrin and 4,4'-DDT exceeded the screening criteria in well MW11 in September 2004 but none of the other sampling events. The trace concentration of 4,4'-DDD exceeded the screening criteria in well MW-11 in March 2004 but none of the other sampling events. The trace concentration of dieldrin exceeded the screening criteria in well MW-10 in April 2004 but none of the other sampling events. PAHs were generally not detected above the MRL in samples from monitoring wells MW-10 and MW-11. The concentrations of metals in grab groundwater and samples from wells MW-10 and MW-11 were low and below the preliminary screening levels. PCBs were not detected above the MRLs in groundwater from MW-10. The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.
AOC 67 – Gearlocker and Maintenance Building	The Gearlocker building was built at OU2 in 1932 and housed a blacksmith, paint, carpenter, and auto shop, electrical room, and an area labeled "oil room" along with other maintenance and office facilities. Historical information shows that this building was also used for painting activities during the ATS tenancy (Donovan and Associates, 1998). The URS reconnaissance of the building identified no existing operations in the building, although Port personnel reported an area of soil staining outside the auto shop. Historical waste management and chemical storage practices in and around the building are not known. Potential COIs for AOC 67 include TPH, VOCs, PAHs, PCBs, and metals.
Explorations:	Borings: SB-05, SB-63 through SB-67. Monitoring Wells: MW-09, MW-10, and MW-25.

AOC 67 – Gearlocker and Maintenance Building (cont.)

Analyses:	Grab groundwater samples from borings SB-05 and SB-63 through SB-67 were analyzed for TPH, PAHs, PCBs (with the exception of SB-05), pesticides (SB-05 only), and VOCs. Groundwater samples from downgradient monitoring wells MW-09 and MW-10 were analyzed for TPH, PAHs, VOCs, PCBs, pesticides, and metals. A soil sample collected at a depth of 18 feet bgs in boring SB-67 exhibited visual evidence of SPH (i.e., hydrocarbons were observed on soil). The sample was analyzed for TPH, VOCs, PCBs, and metals. Monitoring well MW-25 was installed adjacent (within 5 feet) to and downgradient of SB-67. A hydrocarbon odor was observed starting at about 17.5 feet bgs during the installation this well. Three soil samples were collected from the MW-25 at depths of 7.5, 17.5, and 18.5 feet below grade and were analyzed for TPH and PAHs. Well MW-25 was monitored for the presence of SPH on water for three months; SPH was not observed. A groundwater sample was then collected for PAH analysis.
Results:	TPH, PCBs, and pesticides were not detected above the MRL in the grab groundwater samples. PAHs were detected slightly above the preliminary screening levels for up to six compounds in the grab groundwater samples but were generally not detected above the MRL in samples from the downgradient monitoring wells (MW-09 and MW-10). One VOC (1,3-dichlorobenzene) was detected above the MRL but below the preliminary screening levels in SB-05. No VOCs were detected above the MRLs in the wells MW-09 and MW-10. Copper and lead were detected slightly above the aquatic SLVs in groundwater from SB-66 and SB-67 but not in wells MW-09 and MW-10. The analytical results for soil from SB-67 show the sample contained TPH in the gasoline, diesel, and oil hydrocarbon range at concentrations of 1,400 mg/kg, 21,000 mg/kg, and 14,000 mg/kg, respectively. TPH concentrations were not detected above the MRL in the grab groundwater sample from this location (groundwater measured at 22 feet bgs at time of drilling). Two PAHs were detected (0.054 µg/L benzo(a)anthracene and 0.11 µg/L chrysene) in the grab groundwater sample at concentrations slightly above human health (fish consumption) or aquatic SLVs. TPH was not detected in the soil samples from MW-25. Five PAHs were detected in the 7.5 foot sample above the MRLs but below the industrial PRGs. No PAHs were detected above the MRLs in the samples collected at 17.5 and 18.5 feet bgs. PAHs were not detected above MRLs in groundwater from MW-25. These results support that the residual hydrocarbons detected in boring

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	SB-67 are not mobile, are very limited in extent, and have not impacted groundwater quality. The AOC has been adequately defined for the purposes of the RI and risk assessment.
AOC 68 – Boiler House	The boiler house was built in 1919 at OU2, and at that time employed an oil-fired boiler. A 12,000-gallon, boiler fuel UST was located adjacent to the building, but this UST was removed and received an NFA from DEQ. Associated equipment apparently included a below-ground gas line and fueling station (Donovan and Associates, 1998; BBL, 2004). A 1965 Port map shows the buried gas fuel line to the building, indicating the boiler may have been natural gas fired at one time. According to Port personnel, there is a concrete vault beneath the floor of the boiler house that contains a sump. Standing water with an oily sheen was noted in the sump. The boiler house is still standing, but is not in operation. Potential COIs for AOC 68 include TPH, VOCs, and PAHs.
Explorations and Analyses:	Grab groundwater samples from borings SB-68 and SB-69 were analyzed for TPH, PAHs, and VOCs. Groundwater from well MW-09 was analyzed for TPH, PAHs, VOCs, PCBs, pesticides, and metals.
Results:	TPH and VOCs were not detected above the MRLs in grab groundwater. Up to six PAHs were detected at low concentrations that exceeded the preliminary screening levels in grab groundwater from boring SB-68. PAHs were generally not detected above the MRL in samples from the downgradient monitoring well (MW-09) and support that the PAHs were likely due to sediment entrained in the grab groundwater sample. No VOCs were detected above the MRLs in the wells MW-09. The metals concentrations in groundwater from well MW-09 was below the preliminary screening levels and consistent with the expected background concentrations. PCBs were not detected above the MRLs in groundwater from the monitoring wells. The trace concentration of 4,4'-DDT exceeded the screening criteria in MW-09 in February 2005. The concentrations of 4,4'-DDT were below the screening criteria in the other sampling events. The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.

Summary of Environmental Conditions at OU2 AOCs

AOC 69 – Former PCB-Containing Transformer Locations	The former location of a transformer was approximated because the source documents appeared to estimate the locations (ATC, 2003). Potential COIs for AOC 69 include TPH, PAHs, and PCBs.
Explorations:	Soil Sample Locations: S-14 and S-14B.
Analyses:	Sample S-14, collected between 0 and 0.5 feet bgs, was analyzed for TPH, PAHs, and PCBs. A follow-up sample was collected from S-14B between 0.5 and 1-foot bgs and analyzed for PAHs.
Results:	Up to five PAHs were detected above the preliminary screening levels in the surface sample from S-14 located within AOC 69. PCBs concentrations were slightly above the MRL (detected concentrations of 0.11 mg/kg and 0.12 mg/kg for Aroclor 1254 and Aroclor 1260, respectively; the MRL was 0.10 mg/kg). TPH were detected at 200 mg/kg (diesel range) and 600 mg/kg (residual range); however the chromatograph indicated that the pattern was not consistent with a fuel product. Field notes indicate the sample was collected from the ground surface just a few inches from a creosote-treated utility pole. An additional surface sample (S-14B) was collected about 5 feet from the utility pole at a depth of approximately 6 inches to evaluate whether the original sample is representative of surface soil conditions in the sampling area. Although PAHs were detected in the sample collected at S-14B, the concentrations were almost two orders of magnitude lower than at S-14 and all were below industrial PRGs, with the exception of benzo (a) pyrene. The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.

Summary of Environmental Conditions at OU2 AOCs

AOC 72 – Railroad Alignments	The earliest tracks in the railroad alignment on the western border of OU2 were constructed in 1906 to provide transport of goods in and out of Terminal 4. Additional rail lines were added, improved and modified up until 1996. Periodic maintenance in the area has included replacement of tracks and ties, addition of new lines or repair for accommodation of new import/export products (BBL, 2004). There was a potential for spills and dust dispersion during ore and raw material transport and liquid spills and dripping from oil transport starting with the initial import and export of oil by rail car in 1912. In April 2001 URS conducted an evaluation of soil along railroad track 401 (URS, 2001). The evaluation included the collection of soil samples from five locations along the track. At each location samples were collect from depths of 0 to 6 inches, 6 to 12 inches, and 12 to 16 inches bgs and analyzed for total metals and metals by TCLP. The analytical results indicated a maximum leachable lead concentration (by TCLP) in the shallow soil of 194 mg/L. At the intermediate and deep samples, TCLP maximum lead concentrations were 2.42 mg/L and 0.13 mg/L respectively, suggesting minimal leaching potential of lead from the surface soil. Potential COIs for AOC 72 include TPH, VOCs, SVOCs, PAHs, and metals.
Explorations:	Surface Soil Locations: AOC72-S1 through AOC72-S3. Borings: SB-70 through SB-76.
Analyses:	Surface soil samples collected from AOC72-S1 through AOC72-S3 from 0.5 and 1.5 feet bgs were analyzed for TPH, PAHs, and metals. In addition, the 1.5 foot samples from AOC72-S1 and AOC72-S3 were analyzed for VOCs. Soil samples from borings SB-70 through SB-76 from approximately 1-foot bgs were analyzed for TPH, VOCs, and metals. Grab groundwater from boring SB-70 was analyzed for metals.
Results:	TPH was not detected above the MRL in soil. VOCs in soil were generally not detected above the MRL with the exception of methylene chloride which was below the preliminary screening levels in SB-70 and SB-71. A few PAHs were detected above the MRL in soil from AOC72-S1 at low concentrations that were all below the preliminary screening levels. The concentrations of up to three metals in soil from SB-72, SB-75, and SB-76 exceeded the preliminary screening levels. The concentrations of metals in grab groundwater were low and consistent with the expected background values. The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.

Summary of Environmental Conditions at OU2 AOCs

AOC 73 – Berth 411 Pencil Pitch Handling	Pencil pitch was handled at Berth 411 in Slip 3 in OU2 from 1978 to 1998. Longshoremen removed the pencil pitch from the ships' holds by means of the clamshell-equipped Dravo unloading tower on Pier 4 and loaded it directly onto truck trailers or rail cars adjacent to the pier. Sediment sampling conducted in Slip 3 by Battelle Marine Sciences in December 1988 showed elevated concentrations of PAHs, which were attributed to pencil pitch spills. The sediments in Slip 3 were dredged in December 1994 and January 1995, and confirmatory sediment sampling verified that pencil pitch concentrations were below the maximum allowable concentration of 0.5 percent. Hall-Buck Marine notified the Port in June 1997 of an additional pencil pitch spill in Berth 411, and suction dredging was used in July 1997 to remove the pencil pitch from the submerged riprap area at the southern face of Berth 411. Confirmatory sampling showed that the dredging technique was inefficient in cleaning the area outside the riprap, and bucket dredging was utilized in 1998 to complete the cleanup. The upland areas around Berth 411 have not been characterized with respect to pencil pitch contamination, and these areas may present a potential source of contamination to the sediments in Slip 3 (DEQ, 1998b). Potential COIs for AOC 73 include PAHs. PCBs were added following soil detections in soil during installation of well MW-16.
Explorations:	Soil Sample Locations: S-8, S-9, and S-10. Monitoring Well: MW-16.
Analyses:	The surface soil samples (0 to 0.5 feet bgs) from S-8 through S-10 and MW-16 were analyzed for PAHs and PCBs. Groundwater from well MW-16 was analyzed for PAHs.
Results:	Low concentrations of PAHs were detected in the surface soil samples. The concentration of benzo(a)pyrene (270 ug/kg) in S-10 slightly exceeded the industrial PRG (210 ug/kg). With the exception of one sampling event (May 2005) at well MW-16, PAHs were not detected above the preliminary screening levels during the quarterly sampling. These exceedances were not observed in the other quarters of monitoring and are likely related to soil entrained in the samples. PCBs were not detected above the MRLs with the exception of Aroclor 1260 in soil from MW-16. PCBs were not detected above the MRL in groundwater from well MW-16. The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.

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Summary of Environmental Conditions at OU2 AOCs

AOC 74 – Utility Storage Building	Interviews with Port employees indicate a small building west of the IRM offices in OU2 was formerly a hazardous materials storage shed, where paint supplies and industrial cleaning agents were stored. The building is approximately 10 feet by 10 feet in dimension and has a concrete floor. The area around the building is asphalt. Potential COIs for AOC 74 include TPH, VOCs, SVOCs, PAHs, and metals.
Explorations:	Borings: SB-77 and SB-78. Surface sample locations: S-20 through S-22.
Analyses:	Soil from 1-foot bgs from borings SB-77 and SB-78 were analyzed for TPH, PAHs, and metals. Soil from 2-feet bgs from borings SB-77 and SB-78 was analyzed for VOCs. Follow-up soil samples collected from SB-77 at depths of 0.5 and 2-feet bgs were analyzed for lead. Surface soil samples collected at 0.5 feet from S-20 through S-22 were analyzed for lead.
Results:	Lead was detected at 1,000 mg/kg (exceeding the industrial PRG) in the 1-foot soil sample from boring SB-77. Four surface soil (0.5-foot depth) samples were collected around SB-77 to define the extent of elevated lead in the surface soil. The 1-foot depth sample was resampled and a deeper (2- to 2.5-foot) sample was collected at SB-77 to define the vertical depth. Lead is limited in extent both vertically and laterally. To resample the SB-77 location, a second boring was installed within 2 feet of the first boring location. The results indicated 189 mg/kg in the 0.5 to 1 foot sample (collected slightly above the original sample) and 37.5 mg/kg in the 2 to 2.5 foot sample. The 1-foot samples collected from the borings located 25 feet south and west of SB-77 contained 65.4 mg/kg or less lead. SB-78, located 50 feet northeast of SB-77, contained 43 mg/kg lead. These results indicate that the presence of the lead impacted soil is limited in horizontal and vertical extent, and has been adequately characterized for the purpose of the RI and risk assessment.

Summary of Environmental Conditions at OU2 AOCs

AOC 75 – Former Car Cleaning Pit and Drain	Historical Port maps note the location of a car wash pit and drain northwest of the former PM-Ag tank farm in OU2. URS was not able to verify these locations during the site reconnaissance, and it is likely these areas were filled at approximately the same time as the decommissioning of liquid bulk storage tanks in the PM-Ag tank farm (1992-1995). The areas are now level and covered with gravel surface. Potential COIs for AOC 75 include TPH, VOCs, PAHs, and metals.
Explorations:	Borings: SB-05, SB-79, SB-80, and SB-81. Monitoring Wells: MW-09 and MW-10.
Analyses:	Soil samples collected between 2.5 and 3.5 feet bgs from borings SB-79, SB-80, and SB-81 were analyzed for TPH, PAHs, VOCs, and metals. Grab groundwater samples from each boring were analyzed for TPH, PAHs, and metals (with the exception of SB-05). Groundwater samples from downgradient monitoring wells MW-09 and MW-10 were analyzed for TPH, PAHs, VOCs, PCBs, pesticides, and metals.
Results:	TPH and VOCs were not detected above the MRL in soil. The detected concentrations of PAHs and metals in soil were low and below the screening criteria. TPH was not detected above the MRL in grab groundwater. The concentrations of up to seven PAHs exceeded the preliminary screening levels in SB-80 and SB-81 but were generally not detected above the MRL in samples from the downgradient monitoring wells (MW-09 and MW-10). One VOC (1,3-dichlorobenzene) was detected above the MRL but below the preliminary screening levels in SB-05. No VOCs were detected above the MRLs in the wells MW-09 and MW-10. The results demonstrate that this AOC has been adequately characterized for the purposes of the RI and risk assessment.

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Summary of Environmental Conditions at OU2 AOCs

AOC 83 – Erodable Bank Areas	The U.S. Environmental Protection Agency (EPA) and DEQ have identified erodable riverbank soil as a potential pathway for constituent transport to surface water at the Facility (EPA, 2005). On April 13, 2005, the banks of the Facility were observed for exposed surface soil that has the potential to be eroded and transported to the river. The areas along Wheeler Bay and the west end of the south side of Slip 1 were identified as having the potential for surface erosion. These areas are collectively referred to as AOC 83 (Figure 4). Composite sampling of surface soils will be conducted in this area. Potential COIs for AOC 83 include TPH, PAHs, PCBs, pesticides, metals, and phthalates.
Explorations:	Surface soil was collected from a depth of 0 to 1 foot at the four discrete sub-sample locations within each of the eight composite sample areas (S-23 through S-30). Stabilized bank areas were observed in locations S-29A , S-29B, S-29C, and S-30B and therefore samples were not collected from these locations. The discrete samples were maintained in sample jars, individually labeled (e.g., S-23A, S-23B, S-23C, S-23D, for the sub-samples collected from composite soil area S-23, etc.) and retained for potential future analysis.
Analyses:	The composite samples were analyzed for TPH, PAHs, PCBs, pesticides, metals, and phthalates. Discrete samples were analyzed for PAHs (S-26 through S-28 and S-30), pesticides (S-23 through S-30), and metals (S-26).
Results:	TPH in the residual range was detected above the MRL at three composite sample locations (S-28 through S-30) at low concentrations. PCBs were not detected above the MRLs. PAHs were detected in the composite samples at concentrations that exceeded the preliminary screening levels. The discrete soil samples from this area were analyzed for PAHs to better assess the extent. The results of the discrete analysis indicated that one or more PAHs exceeded the preliminary screening levels at each location. The composite samples contained pesticides at concentrations above 1/4 of the preliminary screening levels; therefore, the discrete samples from the area were analyzed for the presence of pesticides to assess whether localized areas of pesticides were present. None of the pesticide concentrations exceeded industrial PRGs. With the exception of 4,4-DDT at two discrete locations, no pesticides exceeded terrestrial SLVs in the discrete riverbank samples.

AOC 83 – Erodable Bank Areas

Results (cont.):	The composite samples detected metals above regional background concentrations and the preliminary screening levels. The concentrations of several metals (arsenic, cadmium, copper, lead, zinc) in one of the composite riverbank soil samples from the Wheeler Bay area (S-26) were relatively higher compared to the regional background and the preliminary screening levels; the discrete samples from this area were analyzed for metals. The results of the discrete sample analyses suggested that the elevated metals are limited to a localized area of the riverbank soils (S-26D). Bis(2-ethylhexyl)Phthalate was detected above the MRL in soil from composite sample S-25 but was below the preliminary screening levels. For riverbank soils in OU2, there is currently sufficient evidence to indicate that some potentially erodable areas have relatively higher concentrations of some COIs and localized actions to attenuate higher concentrations will reduce potential transport to the river. No further characterization is needed and a source control measures evaluation is recommended to select the most effective source control remedy.

Appendix I

Appendix A of EE/CA for Terminal 4 Removal Action Area (Summary of Area History and Current Uses)

Appendix A

Summary of Area History and Current Uses

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Appendix A – Summary of Area History and Current Uses

This appendix summarizes the history and current uses of the Terminal 4 Removal Action Area. The information presented is excerpted from the detailed account that was provided in the work plan (BBL, 2004) and incorporates any new information discovered since that time.

A.1 Removal Action Area and Terminal 4 Boundaries

The Port of Portland's Terminal 4 facility, located at 11040 North Lombard Street, Portland, Oregon, is within or adjacent to the Portland Harbor Superfund Site. The Terminal 4 Removal Action Area is bordered to the north by Schnitzer Steel Industries and Northwest Pipe and Casing; to the north/northeast by the Burgard Industrial Park; to the south by the Terminal 4 Auto Storage Area, which is occupied by Toyota; to the east by Union Pacific rail tracks; to the southeast by a Toyota lot; and to the west by the Willamette River.

The Removal Action Area is that portion of the Portland Harbor Superfund Site adjacent to and within Terminal 4 that extends west from the ordinary high water line on the northeast bank of the lower Willamette River to the edge of the navigation channel and south from the downstream end of Berth 414 to the downstream end of Berth 401, including Slip 1, Slip 3, and Wheeler Bay.

A.2 Cultural Resources

Information presented in this section is summarized from A Cultural Resources Reconnaissance Survey of the Port of Portland's Terminal 4, Portland, Oregon (Final Draft) (AINW, 2003), which was prepared by Archaeological Investigations Northwest. The complete report has not yet been approved for public release.

Copies of the draft cultural resources report for Terminal 4 were provided to all six Tribes on August 11, 2003, and a meeting was held with Tribal representatives to discuss the Terminal 4 cultural resources report on October 7, 2003. No comments or concerns regarding the report or cultural resources at Terminal 4 were expressed at the October 7 meeting. Letters requesting Tribal concurrence with the report and its findings were sent to the Tribes on February 10, 2004, and responses were received. The Port will revise the cultural resources report as appropriate, and prepare an Archeological Monitoring Protocol after USEPA selects the remedy.

A.2.1 Native American Cultural Resources

Terminal 4 lies within the traditional homeland of the Chinookan peoples who occupied most of the lower Columbia River valley at the time of Euroamerican contact. The present Portland area was historically occupied by groups speaking two Upper Chinookan dialects, Multnomah and Clackamas. The confluence of the Willamette and Columbia rivers and the Lower Willamette River were major resource locations and regularly drew native peoples from throughout the Columbia River drainage for seasonal fishing and trading expeditions (French and French, 1998; Silverstein, 1990).

DRAFT DOCUMENT: Do Not Quote or Cite.
This document is currently under review by US EPA and
its federal, state and tribal partners, and is subject to change in whole or in part.

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William Clark of the Lewis and Clark Expedition made a brief exploration up the Lower Willamette River in April 1806. He and his men camped near a small Chinookan village on the east bank of the Willamette. Clark's description and maps of the location indicate this village may have been in the vicinity of Terminal 4. The village, designated "Ne-mal-quin-ner's," had an estimated population of 200. The residents of the village were absent at the time of Clark's visit and he was told by his Indian guide that the Ne-mal-quin-ner's people usually lived at Willamette Falls, moving to the lower river settlement "when they Come down to the Valley to gather Wappato" (Moulton, 1990, 1991).

There are no written references to the Ne-mal-quin-ner village or any settlement at that location after the time of the Lewis and Clark Expedition; a well-known archaeological site at the mouth of Gatton's Slough (the lower course of the slough was buried by construction of Terminal 4) is likely to be the remains of Ne-mal-quin-ner's village. Prior to construction of Slip 1, Gatton's Slough was formerly a natural surface drainage feature discharging to the Willamette River. John Wacheno, a Clackamas Indian, told an anthropologist in 1934 of a village in the St. Johns area known as wÜxsûn, the residents of which fished for sturgeon at the mouth of the Willamette River (Drucker, 1934). Treaties in 1855 led to the relocation of many Chinookans, and other native peoples who had traditionally used the Lower Willamette River, onto reservations. Accounts of early settlers in the St. Johns area indicate, however, that some Indians remained along the river through the 1850s and into the 1860s (Dickson, 1976; Singleterry, 1976). Other Indians are known to have left the reservations seasonally to visit traditional resource locations.

Other than the archaeological site at the mouth of Gatton's Slough, the only reported archaeological resources at Terminal 4 are a few artifacts apparently collected in the 1960s and 1970s by a former worker at the terminal. One of these artifacts was a net weight collected from under Pier 5 in Slip 3 (Schenkenberger, 1981).

An archaeological reconnaissance survey of Terminal 4 conducted in January 2003 included an examination of the accessible banks and beaches. The bank exposures indicated that they are composed of dredged sands and silts. No evidence of any archaeological resources associated with American Indian use or occupation was observed (AINW, 2003). However, the alignment of the historical-period Willamette River bank and the banks of the former Gatton's Slough have been identified as high-probability areas for archaeological resources associated with American Indian use and occupation of the Terminal 4 area (AINW, 2003).

A.2.2 Early Euroamerican Activity

Few non-Native uses of the location prior to 1917, when construction of Terminal 4 began, have been documented. A Donation Land Claim encompassing the future Terminal 4 location was settled in 1846 by James Loomis and his family, who built a cabin along the bank of the Willamette River (although this occupation was probably short-lived). By the 1890s, however, the only use of the Terminal 4 location appears to have been for grazing cattle and possibly growing hay. The future Terminal 4 location was purchased in 1897 by the Ogden family, but the new owner did not develop the area, opting instead to build a home on higher ground to the northeast.

More intensive development occurred in the years before World War I. A dock where ships transferred oil to the Union Pacific Railroad and an associated pipeline were built in approximately 1906-07 along the south side and to the east of the future location of Slip 3 and in approximately 1907-08, the railroad was constructed along

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the eastern edge of the floodplain. These are the only known uses of the Terminal 4 location prior to construction of Terminal 4, which began in 1917.

A.3 Physical History of the Terminal 4 Area

The landscape and physical features of the Terminal 4 area have changed significantly in the past century. The rural landscape began changing in the first decade of the 1900s, when what was once Willamette River floodplain was modified by grading, dredging, and filling as early as 1906 to 1907.

Prior to development, the banks of the terminal location were lined with trees, and Gatton's Slough (which discharged to the Willamette River) traversed the northern portion of the property (U.S. Coast and Geodetic Survey, 1895). A small stand of trees was located on the floodplain immediately south of the slough, beyond which were several small swales and ponds. The remainder of the area was occupied by grasslands, which were probably wet prairies. A U.S. Coast and Geodetic Survey (USC&GS) map from 1895 depicts a building (possibly a farmhouse) located at the eastern edge of the floodplain (southeast of the location of the now-removed Warehouse 6) along with a series of trees suggestive of a small orchard.

In 1897, the Ogden family purchased the land around lower Gatton's Slough. They built a house on the higher ground overlooking the floodplain, probably close to the modern entrance to Terminal 4 on North Lombard Street. In addition to farming, the Ogden family reportedly drilled for oil near the mouth of the slough, without success (Minkler, 1976).

The rural landscape portrayed in the 1895 map began changing in the first decade of the 1900s. The first developments at Terminal 4 occurred between 1906 and 1908, when the Oregon-Washington Railroad and Navigation Company (OWR&N, a Union Pacific Railroad affiliate and part of the Union Pacific system, hereafter referred to as Union Pacific) constructed the railroad along the eastern edge of the floodplain (the railroad alignment now serves as the eastern boundary of Terminal 4) and a pipeline and oil dock along the south side of the modern Slip 3. By 1912, Union Pacific had completed its oil-supply facility for fueling locomotives, to include the St. Johns Tank Farm, which was adjacent to Terminal 4 on the east slope above the rail tracks. Photographs from 1917 indicate that an oil pipeline extended east from the river across the floodplain to the tank farm. The oil pipeline later became an underground structure, and was presumably buried when the area of Slip 3 was filled and graded for development, however, the date of burial has not been confirmed. The pipeline alignment was along the south side of where Slip 3 would later be constructed and the oil was pumped uphill from the oil-supply dock to the tank farm.

In 1917, site preparation for the development of Terminal 4 began. Trees and other vegetation were removed over most of the floodplain in the northern Terminal 4 area, and dredged fill material was deposited across the low-lying ground and then leveled by horse teams. Most of lower Gatton's Slough was filled at this time as well. Beginning about the same time, fill was also placed into the offshore shallows to extend the riverbank out into the channel. The 1895 U.S. Coast and Geodetic Survey map labeled the offshore area as "Linton Shoal," with water less than a meter deep in places. Filling this area was relatively easy and provided the new Terminal 4 with a larger land base. As described in more detail below, the northern Terminal 4 facilities were Piers 1 and 2 at Slip 1 and Pier 5 at Slip 3. A Slip 2 was planned and partially excavated but never completed. The remnant Slip 2 is known today as "Wheeler Bay." Photographs taken in 1917 trace the rapid transformation of this landscape (Port of Portland, 1917).

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Pre- and post-construction maps and plans for Terminal 4 indicate substantial changes occurred in the landscape from 1917 to approximately 1921 (AINW, 2003). First, construction of the terminal involved placement of fill that extended 650 to 975 feet from the original riverbank. Second, the construction of Slips 1, 2, and 3 also required excavations into the original shoreline. Slip 1 was located at the entrance to Gatton's Slough, and the head of the slip extended up to 650 feet inland from the original riverbank. These excavations probably removed much of the upriver portion of the mouth of the slough; the downriver portion of the slough entrance was covered by Houses 1 and 2 at Pier 1 and portions of the grain complex. The inland excavations for Slips 2 and 3 extended from 440 to 565 feet back from the original shoreline. (Slip 2 was never completed, and the remnant of Slip 2 is known today as Wheeler Bay.) The northern portion of Terminal 4 was thus developed through a combination of fill outward from the original riverbank and excavations into the original floodplain. All traces of lower Gatton's Slough were lost either through burial under fill or removal for the creation of Slip 1.

According to Port records, Slip 2 was filled in two stages by the City of Portland Commission of Public Docks (City CPD). The first stage occurred in July 1948. At that time, the City CPD requested the Port conduct dredging operations south of Pier 5 in connection with the construction of an oil dock for Richfield Oil Company. The City CPD made available the head of Slip 2 for the disposal of dredged material. Also in July 1948, the City CPD contracted with General Construction for dredging Slip 3; however, the disposal location for dredged material generated from that event has not been verified.

The second stage of filling Slip 2 occurred in 1957-58 in conjunction with the widening of Slip 3. The widening of Slip 3 was part of the overall plan for the construction of Pier 4, which was sited on the north side of Slip 3. The City CPD contracted with a private entity, General Construction Company, for the widening of Slip 3, which included dredging and construction of a hydraulic fill. City CPD drawings indicate the hydraulic fill was placed at the head of Slip 2, which thus created the upland as it is configured today.

A.4 Chronology of Ownership and Operations

A.4.1 Property Acquisition and Development History at Terminal 4

Originally called the St. Johns Municipal Terminal, Terminal 4 was developed by the City CPD as a result of the push by the City to become a world-class shipping port and to capitalize on growth in the shipping industry following the opening of the Panama Canal in 1914 (Donovan and Associates, 1997). Following the physical preparation of the land, the City CPD initiated construction for development of the property as a marine terminal.

The main building construction and other physical developments at Terminal 4 are summarized in Table A-1. Note that warehouses at Pier 1 were called "houses," while those at Pier 2 were called "warehouses."

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Table A-1
Chronology of Development at Terminal 4

Year	Entity and Event
1906-07	St. Johns Tank Farm (with storage tanks and a pipeline to a terminal dock) constructed by Union Pacific at the future location of Slip 3; the facility handled Bunker C fuel oil for fueling steam locomotives south of modern Slip 3.
1917	$3,000,000 bond levy approved on June 17, 1917, for land purchase and development. City CPD purchases 117.55 acres of upland and purportedly 36 acres of submerged land centered on Gatton's Slough.
1917-20	Slips 1 and 3 dredged and Pier 1 (Berths 403-405), grain elevator, operating house, storage bins, track shed, and Warehouses 1-5 constructed. Spur tracks from existing Union Pacific lines constructed.
1919	Liquid bulk storage facility constructed at the head of Slip 1; House 4 constructed.
1919-20	Pier 2 and Berths 406-408 constructed. Vegetable oil weighing house constructed east of Slip 1.
1920	4.94-acre parcel acquired from Union Pacific adjacent to Slip 3; however, parcel developments (pipeline, oil supply tanks, and fuel oil dock) remained under ownership of Union Pacific. Flour mill, adjoining concrete warehouse for grain and flour, and Berth 409 constructed. Houses 1 and 2 constructed on the upstream side of Slip 1. Boiler house and service buildings (including an administration building, cafeteria/restaurant, and welfare building) constructed east of Slip 1.
1920-21	Substructure for Piers 3, 4, and 5 constructed (although Pier 3 was never completed). Quay dock, bulk handling facility, and Berths 412 and 413 completed on the upstream side of Slip 3. Union Pacific pipeline extended to service Berth 412 at Pier 5, Slip 3.
1920-24	Filling platform for liquid bulk storage facility constructed east of Slip 1.
1921	Storage bunkers constructed east of Slip 3.
1921-22	Warehouses 6 and 7 constructed on Pier 2, Slip 1 serviced by Berths 406 and 407.
1922	House 5 constructed perpendicular to House 4 along the river.
1923	Houses 6, 7, and 8 were constructed perpendicular to House 5 as a cold storage plant and ventilated warehouse. 150,000-gallon elevated water tank constructed. H.R. Leckenby fumigation plant constructed.
1930	Grain storage annex constructed north of the grain elevator.
1931	Tanks added to liquid bulk storage facility.
1932	Gearlocker building constructed north of the liquid bulk storage facility.
1940-41	Berth 401 and Airveyor system for unloading bulk grain from barges constructed on the harbor side of Houses 4 and 5 at Pier 1 for grain unloading.

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Year	Entity and Event
1942	At the onset of WWII, the U.S. Army Transport Service (USATS) leased Terminal 4 from City CPD for Portland's Sub-Port of Embarkation. USATS added a second story to the gearlocker building. The USATS rehabilitated the loading apron at Pier 1, replaced decking and rehabilitated railroad track at Pier 2, and rehabilitated the slip side of Pier 5.
1944	Auxiliary pipeline constructed by the USATS at Slip 3 Pier 5.
1946-47	The USATS relinquished Terminal 4 to City CPD. Bulk loading facility constructed at Berth 412 on the slip side of Pier 5.
1948	20-acre parcel south of Pier 5 acquired from Union Pacific. Head of Slip 2 partially filled following dredging for construction of Union Pacific oil dock located along the Willamette River south of Pier 5. Slip 3 dredged.
1951	A railcar dumper and a hydraulic truck unloading hoist and dust collection system added to the grain facility at Pier 1.
1953	Oil packaging plant constructed and eight aboveground storage tanks (ASTs) and an underground transfer pipeline installed at the head of Slip 3 by Quaker State for oil storage.
1954	Eight steel ASTs for grain storage constructed east of the grain storage buildings at Slip 1. Electric elevator system at grain elevator modernized.
1955	Pier 2 rehabilitated and two gantry cranes added. Fumigation plant removed.
1957	Berth 401 renovated.
1957-58	19.64-acre parcel upstream of Pier 5 acquired from Multnomah County. Slip 3 widened for the construction of Pier 4 and filling of head of Slip 2 completed.
1958	Second gallery for grain loading added at Pier 1.
1959-60	Pier 4 (Berths 410 and 411) constructed on the downstream side of Slip 3.
1962	Pier 5 harbor-side wharf and Berth 409 at the head of Slip 1 removed. Dravo bulk unloader installed at Pier 4.
1963	Head of Slip 1 developed as small boat landing.
1966	Five tanks constructed by Pacific Molasses added to liquid bulk storage facility.
1968	Warehouse 4 constructed at Pier 2. Matson Navigation Co. installed 33-ton-capacity container crane on Pier 2. Three 36-ton revolver cranes purchased and installed at Pier 4.
1968-69	Berths 404 and 405 reconstructed (Berth 405 to handle offloading of barges for grain). Coal bunkers removed at Pier 5.
1971	Grain elevator remodeled; Union Pacific abandoned existing pipeline to St. Johns Tank Farm and installed a replacement pipeline; Port and City CPD consolidated; except for City's fire boat station, CPD properties and functions transferred to Port.

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Year	Entity and Event
1973	Land purchased from Broadway Holding Company. House 8 demolished at Pier 1. Berth 417 constructed southwest and upstream of Slip 3.
1975	Berth 401 reconstructed to handle ships, adding grain loading equipment and conveyor system.
1978	Cold storage plant and ventilated warehouse (Houses 6 and 7) at Pier 1 removed.
1983	Union Pacific's operation of the St. Johns Tank Farm tanks and replacement pipeline ceased.
1984	Boat landing at the head of Slip 1 removed and ro-ro dock, called Berth 409, constructed in its place. Service buildings removed, including an administration building, cafeteria/restaurant, and welfare building. Whirley cranes removed from Berths 410 and 411.
1985	Quaker State ASTs and underground pipeline removed.
1986	City of Portland began construction of Outfall 52C and the associated storm sewer system serving Lombard Street properties.
1987	Bulk outloading facility constructed at Pier 4 by Hall-Buck Marine. Construction of City drainage system and Outfall 52C at the head of Slip 1. Tanks removed from Union Pacific's St. Johns Tank Farm.
1988	Diesel and gasoline underground storage tanks (USTs) and fueling station installed by Oregon Terminal Company.
1989	Second railcar dumper added to grain facility. Two pipes added at Pier 1 for liquid bulk storage facility.
1990	House 4 condemned.
1991	Guard station constructed.
1992	Four of the steel ASTs for grain storage (east of the storage bins to the north of Slip 1) modified.
1992-93	Downstream row of tanks at original liquid bulk storage facility removed.
1994-95	All but five of the tanks remaining at liquid bulk storage facility removed.
1995	Soda ash storage building constructed at Pier 4.
1996	House 6, House 7, Berth 406, and Berth 407 at Pier 2 dismantled.
1996	Oregon Terminal Company's diesel and gasoline USTs removed.
1997	Pipeline for liquid bulk storage facility rebuilt under Berth 408.
1997-98	Portions of Union Pacific's decommissioned/abandoned St. Johns Tank Farm pipeline removed from under Berth 412 and elsewhere.

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Year	Entity and Event
1999	Houses 3, 4, and 5 and Berths 403 and 404 demolished. Mechanical/electrical building and bridge to Berth 401 constructed.

A.4.2 Historical Terminal Operations

Tenant operations at Terminal 4 are discussed here by operating areas, further subdivided by the piers and berths the tenants used.

Union Pacific Railroad

As discussed above, Union Pacific and its predecessor, OWR&N Co., built, maintained and operated a fuel oil dock, 10-inch steel pipeline, and the St. Johns Tank Farm and tank car loading facility near Pier 5 on the south (upstream) side of Slip 3 beginning in at least 1906 to 1907. The tank farm and loading facility included two 55,000-barrel aboveground storage tanks (ASTs) for oil and associated pumping and heating facilities. The tanks and the pumping and heating facilities were adjacent to the terminal on the bluff beyond the rail trackage east of Pier 5. The pipeline was used to transfer diesel fuel and, prior to 1955, Bunker C oil from marine vessels to the storage tanks, which delivered fuel oil via a loading rack on the main rail line above the terminal to locomotive steam engines and to rail tank cars for distribution to other facilities elsewhere in Union Pacific's system. Track scales were built to avoid having to transport cars to the railroad yard, which was some distance away. The track scales were operated under the supervision of the Weighing and Inspection Department of the Transcontinental Freight Bureau.

The City CPD purchased two parcels of land from Union Pacific that contained the pipeline and dock at Terminal 4, Pier 5 but not the tank farm: approximately 5 acres in 1920 and approximately 20 acres in 1948. The 1920 and 1948 deeds retained an easement for the existing pipeline that served the St. Johns Tank Farm on Union Pacific's property east of the terminal. The easement granted the railroad and its successors the right to operate and maintain the pipeline and associated dock.

From 1922 to 1939, General Petroleum Corporation leased the St. Johns Tank Farm from Union Pacific and operated a facility near Slip 3 for delivery of bunker fuel and unloading of fuel oil from vessels. Included in their operation was an approximately 30-ft AST used for fuel oil and two associated buildings, one of which was a designated pump house. All three structures were located along the area of the pipeline to the south of Slip 3 (Sanborn Fire Insurance Map, 1924). Neither the date of construction nor the date of demolition of these structures could be verified.

In 1952, Union Pacific requested an area for cleaning railcars and was offered the use of Track 10½ by the City CPD.

In 1969, Union Pacific leased the St. Johns Tank Farm and associated pipeline to Standard Oil Company of California (now known as Chevron). The arrangement provided that Standard Oil would supply Union Pacific with oil for its tank cars.

In 1971, Union Pacific abandoned the pipeline because of leaks. A new pipeline was then constructed parallel to the old one, but farther to the south across the adjoining 19.5-acre parcel. Standard Oil continued to operate

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the tank farm and replacement pipeline until 1983, when fuel transfer operations ceased altogether. The tanks were removed in 1987. In 1997, during removal of the dock at Berth 412, the under-dock portions of the pipeline were drained, cleaned, and removed. In 1998, other portions of the pipeline were drained and removed.

Cargill Grain Facility

The grain elevator and its operating house were completed in 1920 and were operated by the City CPD. The facility contained a conveyor belt system that carried sacked grain to the elevator for cleaning and storage. Northwest sacked wheat was susceptible to a wheat fungus known as smut. An initial lime scouring method for cleaning was later replaced when Wolf-Dawson wheat washers were installed. Dust collecting and sweeping systems controlled airborne particulates. A two-belt shipping gallery could load two vessels with bulk grain simultaneously. Track facilities were provided in the front and rear of the pier; the rear tracks had placement for 105 cars. The pier had cargo masts along its entire face, electric elevators, and electrically operated ramps for handling freight to and from river steamers and barges. The grain elevator had capacity to handle 1,053,800 bushels in eight hours. After the construction of the grain elevator annex in 1930, its grain-storing capacity of 2,000,000 bushels exceeded that of any other grain elevator on the Lower Columbia (Merchants Exchange Journals, 1932).

Barge delivery of bulk wheat to the grain elevator began to supplant sack delivery in 1939. The following year, the City CPD installed a Fuller Airveyor vacuum system for unloading grain barges in Slip 1. Another, higher-capacity vacuum system was added in 1957. Eight grain storage silos are located east of the grain terminal. When these were built and put into operation in 1954, the grain storage capacity at Terminal 4 increased to 7,400,000 bushels. To more readily accommodate grain delivery at the enhanced storage facility, a new box car unloader was added.

In 1942, Terminal 4 and operation of the grain facility were turned over to the U.S. Army Transport Service (USATS). In 1947, the facility was returned to the City CPD, which entered into a lease agreement with Kerr-Gifford. Kerr-Gifford operated the grain elevator at Pier 1 from 1947 until 1954. In 1953, Cargill agreed to purchase all of the stock of Kerr-Gifford, and in November 1954, Kerr-Gifford was merged into Cargill as the Kerr Gifford Division. It was at that time that Kerr-Gifford's lease of the grain terminal was assigned to Cargill. Table A-2 summarizes the facilities Cargill used in connection with their operation of the grain facility.

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Table A-2
Cargill Operating Areas at the Grain Facility at Terminal 4

Year Constructed	Cargill Facility	Location(s)	Use/Former Use	Status
1917	Transformer House	Southeast of Pellet Mill between the Operating House and Storage Silos	Transformer storage	Razed in 1977
1920	Operating House (grain elevator)	South of Storage Annex	Transfer of grain	Present
Prior to 1940	Conveyor to Berth 405	Extends south of the Operating House to Berth 405	Grain transport	Present
Prior to 1953	Track Shed	South of Operating House	Cover for rail trackage	Present
Prior to 1953	Truck Dumper	East of Track Shed	Unloading trucks	Present
Circa 1954	Grain Storage Silos (8)	East of Operating House	Grain storage	
Circa 1954	Railcar Tipper	South of Track Shed	Unloading grain from railcars	Present
1955	Deep Water Well	Southeast of Storage Annex (northeast of Operating House)	Turbine pump	Abandoned and filled in 1992
1958	Millwright Shop	West of Operating House	Not confirmed	Removed
1970s	Conveyor Building (Building C-10)	West of Office Building	Conveyor equipment	Present
1970s	Maintenance Shop	East of Operating House	Equipment maintenance	Present
1975	Office Building (Building 168)	West of Flour Mill	Administrative offices	Present
1975	Conveyor to Berth 401	Extends west from the Operating House to Berth 401	Grain transport	Present
1976	Truck Shed (Building 178)	North of Building C-10	Covered way for trucks	Present
1980s	Longshoremen's Lunchroom	Adjacent to Berth 401	Longshoremen's facility	Present
1994	Pellet Mill	East of Storage Annex	Processing beet pellets	Present
1999	UIC Dry Well	Near Berth 401	Stormwater Discharge	Present
Various Dates	Electrical Transformers	Various locations	Energy conversion	PCB-containing transformers replaced in 1988
Various Dates	Rail trackage	Throughout the leasehold	Transport of railcars and materials	Present

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Year Constructed	Cargill Facility	Location(s)	Use/Former Use	Status
Not confirmed	Gearlocker	South of Railcar Tipper north of Berth 405	Storage of equipment	Present
Not confirmed	Blacksmith Shop	South of Grain Storage Silos	Not confirmed	Removed
Not confirmed	Oil Shack	North of Maintenance Shop	Not confirmed	Not available
Not confirmed	Bull Pen	Not confirmed	Not confirmed	Unknown
Not confirmed	Electrical Distribution Center	Adjacent to Berth 405	Transformer storage	Removed
Not confirmed	Work Pit	Beneath Railcar Tipper	Not confirmed	Present
Not confirmed	Fueling Facility	Between Buildings 152 and 160	Fueling equipment	Removed
Not confirmed	Diesel UST (1,000-gallon) (T4-20)	West of Operating House	Diesel storage	Removed 1989
Not confirmed	Fuel oil UST (1,000-gallon) (T4-21)	West of Operating House	Fuel oil storage	Removed 1989
Not confirmed	Fuel oil UST (500-gallon) (T4-22)	Beneath the Operating House	Fuel oil storage	Removed 1993
Not confirmed	Used oil UST (T4-85)	North of Compressor House	Used oil storage	Removed 1993
Not confirmed	Diesel AST (500-gallon) (T4-45)	West of Car Shed	Diesel storage	Removed September 2003
Not confirmed	Diesel AST (675-gallon) (T4-47)	Southwest of Operating House	Fueling locomotives and equipment	Removed September 2003
Not confirmed	Used oil AST (250-gallon) (T4-48)	North of Maintenance Shop	Used oil storage	Removed September 2003
Not confirmed	Sumps	Railcar Tipper, Building 141, Truck Dump, Building Basements	Discharge	Present
Not confirmed	Hydraulic equipment	Building C-10, near Track Shed, and west of Railcar Tipper	Various uses	Present

Cargill maintained preferential berthing rights throughout their occupancy at Berths 401 and 405. Cargill transported materials to and from Berth 401 via railcars that moved along trackage located between Berth 401 and the track shed. Materials were transported to and from Berth 405 utilizing the conveyor system. Cargill leased the grain facility until 2004.

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Cold Storage Plant

The cold storage plant and ventilated storage warehouse, constructed at Pier 1 in 1923, provided refrigeration space for transit shipments of apples received for export. The facility, immediately north of the Pier 1 warehouses, was a concrete and brick structure divided into three compartments (Houses 6, 7, and 8).

The 1923 addition of the cold storage plant in the eastern third of the apple storage warehouse led to a five-year storage contract with the Apple Growers Association of Hood River (City CPD, 1923). The cold storage plant was 100 ft by 200 ft and had a capacity of 105,000 boxes. The ventilated apple storage warehouse adjoined the cold storage plant and had a capacity of 350,000 boxes. The Port of Portland led the ports of the Pacific in the shipment of apples; during an average year in the mid-1920s, approximately 1 million boxes were shipped.

H.N. Leckenby

In 1923, H.N. Leckenby constructed a fumigation plant near the head of Slip 1 (just in front of the modern International Raw Materials [IRM] tank location). In 1924, Mr. Leckenby began fumigating Oriental cotton received at the Port and other commodities (e.g., peanuts, rice, beans, and other foodstuffs). The plant reportedly had a capacity of 250 tons per day. City CPD minutes from the 1930s indicate that the plant operated under the name of NW Pesticide Company. During World War II, the Army may have used the fumigation plant in connection with its operations (further discussed below). According to City CPD minutes (City CPD, 1949), after the military had vacated the terminal, arrangements were made in 1946 for Mr. Leckenby to enter into a lease with the City CPD and continue operating the plant. The plant continued in operation until sometime in the mid-1950s.

Liquid Bulk Storage

In 1919, a liquid bulk storage facility was constructed at the head of Slip 1. By 1931, additional bulk storage tanks were added and the facility included a City CPD-operated warehouse, tank car cleaning facility, and an edible-oil cleaning pit. In 1947, the facility was leased to Pacific Molasses (which later became PM-Ag). Products handled included liquid fertilizer, molasses, molasses products, tallow, urea, caustic soda, and fats. By 1966, the liquid bulk storage facility had been upgraded to include 14 steel tanks on a concrete foundation. Liquid bulk materials were pumped directly from vessels to the tanks via one of two 8-inch pipelines at Pier 1 and Pier 2. The liquid bulks could then be weighed on a 60-ton-capacity scale and pumped into railcars at the filling platform. Up to 10 tank cars could be filled at one time. Pacific Molasses also made use of a car cleaning pit and a steam cleaning area northwest of its tanks to clean food products out of the railcars prior to their filling.

PM-Ag formerly utilized an approximately 8,000-gallon underground storage tank (UST) for storing diesel. The UST was decommissioned by removal in 1991.

Between 1992 and 1995, all of the original public tanks were removed; five private tanks remain in use at present. In 1995, the lease for the liquid bulk storage facility was assigned to IRM, which continues to operate the facility.

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The Port removed an approximately 3,000-gallon diesel UST from the IRM leasehold in 1995. Based on confirmatory sampling, the DEQ subsequently issued a No Further Action determination for the UST.

Flour Mill

A 1919 agreement between the City CPD and the Eagle Flour Mills Company for the construction of a flour mill north of Slip 1 was transferred to Terminal Flour Mills Company in 1923. A flour production and storage facility was completed and in operation at Terminal Flour by 1925. Terminal Flour operated the facility until 1992, at which time Terminal Flour's lease was assigned to Cereal Food Processors, which continues to operate the facility.

The mill originally consisted of a concrete building and an adjoining concrete grain and flour warehouse (Donovan and Associates, 1997). An annex was added at a later date (circa 1924 to 1950). A system of conveyors, which originally provided the mill with grain from the neighboring grain storage facility, was abandoned in 1966, and a track pit was added to the facility to accommodate hopper bottom railcars. In addition, two rail spurs running between the eight grain storage tanks served to accommodate delivery of bulk flour from the mill. Sacked flour was loaded directly onto vessels docked at Pier 1 using a conveyor belt system. In 1925, the flour mill had a capacity of 1,500 barrels a day. The output was nearly all for export. The export of flour ceased following World War II when Terminal Flour modified its operation and began milling flour for U.S. consumption. Grain was brought into the silos by rail, milled, and sold either in bulk or in sacks. At present, Cereal Food Processors mills flour for Portland-area customers and sells its product in bulk, exporting the flour from the facility via truck or rail.

Terminal Flour Mills formerly utilized an approximately 10,000-gallon fuel oil UST located north of the flour mill, an approximately 1,000-gallon diesel UST located south of the flour mill, and an approximately 1,000-gallon fuel oil UST located south of the flour mill. All three USTs were reportedly decommissioned by removal by Terminal Flour Mills. However, based on currently available information, neither the date of installation nor the date of removal of the USTs has been confirmed.

Oregon Sulphur Company

Oregon Sulphur Company operated on the east side of Slip 3 at Pier 5, importing bulk sulfur beginning in at least 1920. In photographs from 1920, there appears to be an open storage area, and sulfur was unloaded via clamshell bucket using a locomotive crane. The material was placed on the pier adjacent to the bunkers, where it likely remained until being loaded into railcars.

Matson Lines

Warehouses 6 and 7 at Pier 2, called the "Old Matson Warehouse," were constructed in 1922 and were used in Matson Navigation Company's Hawaiian trade (City CPD, 1947). Matson operated a freight dock at Slip 1 from 1955 to 1985. Matson initiated containerized cargo operations in 1964 at Berth 408, which was formerly used for the loading of scrap iron. This location fits within space designated as Berths 406 to 408. Pacific Northwest products, such as refrigerated meat, fresh fruit, potatoes, other vegetables, and canned goods, were shipped in containers to Matson's Hawaiian terminals on a biweekly basis. Return containers delivered commodities such as sugar, pineapple (fresh and canned), and tuna. Molasses shipped in vessel holds was used

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for ballast. Matson Navigation's agreement with the City CPD gave it preferential berthing at Pier 2 and provided for exclusive use of a paved portion of the yard south of the pier for Matson's container operations. Matson used space at Terminal 4 until expiration of the agreement in March 1982, at which time it transferred its container operations to Terminal 6 and discontinued the shipment of liquid molasses.

Quaker State

In 1953, Quaker State constructed an oil packaging (motor oil bottling) facility at the head (to the east) of Slip 3. The facility included an underground transfer pipeline, three 220,000-gallon tanks, one 42,000-gallon tank, four 10,000-gallon tanks, a main blending and bottling building, and a storage building. Bulk oil was brought in via railcars on the north side of the facility or via ships berthed at Pier 5, Berth 412. The oil was pumped directly to the tanks from the railcars or directly from vessels into the transfer pipeline that traversed from Pier 5 to the eight ASTs. The tanks, which were located west of the packaging plant building, were connected to the packaging plant via pipeline. Quaker State bottled motor oil in 1-quart containers; some of the oil was blended at the facility with detergent and with motor oils of different weights. Once the oil was packaged, it was loaded onto trucks or railcars via a spur track on the north side of the packaging plant.

Port drawings indicate that Quaker State also utilized a waste oil UST and a used oil AST located southeast of their main blending and bottling building. The UST was decommissioned in 1991. The date of removal of the AST has not been confirmed.

Quaker State continued its operations through 1985, when the ASTs and the abandoned underground pipeline were removed. The building was converted in 1985 to a new gearlocker building and electrical shop for Oregon Terminal Company. Port drawings indicate that a rail-covered shop work pit was constructed west of the gearlocker building and two USTs were installed east of the gearlocker building at that time.

Rail Development at Terminal 4

Terminal 4 had approximately 10 miles (of a projected 17 miles) of railroad line when operations began there in 1920. After the addition of the cold storage facility in 1922, approximately 15 miles of rail trackage served the terminal. City CPD annual reports (City CPD, 1927, 1931) subsequent to 1926 described the rail network as having a working capacity of 425 cars (130 at ship side) with the ability to accommodate up to 800 cars.

The USATS made additions to the terminal's rail network during its tenure between 1943 and 1947, constructing or repairing approximately 22 miles of rail trackage. The high-capacity movement of defense materiel through the Portland Sub-Port of Embarkation created railcar holding backlogs on the main lines. The War Department responded to this by leasing land adjacent to Terminal 4 and building a railcar storage yard to accommodate cargoes awaiting transshipment.

Following the facility's return to the City CPD, improvements were made in 1947 when additional trackage was installed for the new bulk outloader built by the City CPD at Pier 5, Berth 412 for handling expected coal and phosphate cargo. Rail improvements continued at Terminal 4 in the 1950s, including a spur track constructed in 1953 to serve the Quaker State oil packaging plant at the head of Slip 3, rail modifications to accommodate the addition of the Cargill grain storage tanks in 1954, the 1959 addition of rail lines for Pier 4 when it was

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developed, and improvements in 1964 at the time of Matson's container terminal operation. More recently, in 1996 Hall-Buck Marine required modification of the rail network to accommodate its soda ash export facility.

In 1964, when Matson Navigation began container terminal operations at Pier 2, the rail infrastructure was assessed for container operations. In 1985, the north throat and grain leads into Terminal 4 were reconstructed. In 1987 and 1996, Hall-Buck Marine's lease operations required modification of the rail network near Slip 3.

Exported freight is the railroad company's responsibility until facility operators take delivery with their locomotive, as is the case with Kinder Morgan Bulk Terminals (KMBT). Responsibility remains with KMBT and the longshoremen while product is transferred to a ship's hold. When the ship's hatches are closed, responsibility for the cargo is transferred to the vessel owners and operators. The same process applies to imported cargo. While the product is in the ship's hold, it is the vessel owner/operator's responsibility. During transfer, the responsibility shifts to the terminal operator (tenant) and its agents (longshoremen). This status is in effect while the railcar is shifted to another siding and an empty car takes its place. Union Pacific, or another railroad company, assumes responsibility when the completed load is hooked up and pulled out of the terminal.

Army Transport Service Sub-Port of Embarkation

In January 1942, the USATS leased all of Terminal 4 for use as the Portland Sub-Port of Embarkation, and municipal shipping activities were shifted to City CPD Terminal 1 and old Terminal 2. The facility was used to embark troops for overseas, as well as to store equipment and materials, house Army personnel, refuel ships, and load ships for transport overseas. The War Department in turn leased property and buildings to subtenants (e.g., Northwestern Ice and Cold Storage Company), providing services at the Portland Sub-Port of Embarkation. During its tenure at Terminal 4, the USATS operated the facilities described below.

Disinfestation/Fumigation Plant. Between May and September 1943, the USATS constructed a disinfestation (fumigation) plant to the east of Warehouse 1 for delousing soldiers and prisoners of war prior to their embarkation or debarkation. (Maps and drawings from the war years refer to a House 1 on both Piers 1 and 2. A report from February 1944 notes that the disinfestation plant was located in the former Water Division repair shop, but that location has yet to be verified.) The disinfestation plant was designed to delouse 150 men and their clothing and belongings per hour. The prisoners of war were reportedly held at Warehouse 1 (including a "delousing area") prior to being transferred elsewhere. The materials used in the disinfestation process have not been confirmed. An Army directive of August 19, 1944 instructed military installations to use methyl bromide for disinfestation and fumigation.

Salvage Yard. The USATS established a small salvage yard at Terminal 4 for scrap metal (including scrap iron and ferrous metal) and rubber. A report from March 1943 noted the sale of more than 38,000 pounds of scrap iron and steel from salvage operations. The total tonnage of materials scrapped at the terminal during the USATS's tenure was close to 350 tons, with most of that sold in 1944. Some of the materials were sold to the Zidell Manufacturing & Supply Company, Alaska Junk Company, and California Bag & Metal Company. Aerial photographs indicate that the USATS filled the salvage yard area sometime around 1945.

Auxiliary Oil Pipeline. In February 1944, the USATS completed construction of an auxiliary pipeline at Pier 5, Slip 3. The pipeline extended 340 ft to the slip side of the pier. The Army also constructed two standpipes

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adjacent to the slip to accommodate the auxiliary pipeline. The new line was built to permit tankers to transfer oil to upland facilities while other ships took on coal from the adjacent bunkers.

Other USATS Facilities. Two other facilities are of potential interest: a gasoline station and a sulfur plant. The gas station was located along the south side of Carroll Road (the entrance road to the terminal) slightly northeast of the vegetable oil storage tanks east of Slip 1. The gas station utilized an approximately 2,000-gallon gasoline storage tank and pump in connection with the processing of military vehicles. It is not known whether the storage tank was above or below ground. The sulfur plant was located east of the bulk storage bunkers on Pier 5 (corresponding with the former location of the Oregon Sulphur Company).

Terminal 4 was returned to the City CPD in February 1946. In 1947, the War Assets Administration purchased the northern portion of the City CPD terminal occupied by Oregon Shipbuilding Corporation in exchange for property on the west bank of the river that the City CPD later developed as Terminal 2.

Ore and Concentrate Handling

Pre-1950. From its inception, Terminal 4 was designed to handle imports and exports of bulk cargo. Rail transport by OWR&N Co. and its successor, Union Pacific, was the chief means of conveyance for import and export cargo. Ores and concentrates were an important element of this traffic beginning in 1921 with the completion of Pier 5 on the southern edge of Slip 3. A large area for open storage, to the east and south of Pier 5, lay adjacent to eight covered concrete bunkers with sloping interiors, which were serviced by a series of belt conveyors. This was the mineral bulk-handling facility at Terminal 4, details of which are provided in Table A-3 based on information known to date.

Table A-3
Chronology of Pre-1950 Mineral Bulk Handling at Terminal 4

Ore	Status	Transfer Method	Storage	Period
Phosphate rock	Export	Railcar from siding unloaded to either track hopper or cradle unloader to bunkers or cars; contents were discharged to open area storage. Material traveled by conveyor belt from bunkers to loading towers on the harbor face (Berth 414) of Pier 5, where it was loaded directly into ships' holds.	Open storage or covered bunker	1921-1950
Sulfur	Import	Ships unloaded by Terminal 4 locomotive crane onto Slip 3 side of Pier 5 (Berths 412 and 413).	Open storage	1921-1945
Manganese ore	Export	Same method as used for phosphate rock.	Open storage or covered bunker	1924-1925
Zinc	Export	Same method as used for	Open storage	1925-1928

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Ore	Status	Transfer Method	Storage	Period
concentrate		phosphate rock.	or covered bunker	
Coal	Ship fuel	Same method as used for phosphate rock.	Open storage or covered bunker	1923-1931, 1935-1936, 1940-1950
Chrome ore	Import	Same method as used for phosphate rock. Unloaded at Pier 5 in 1925 and at Pier 2 (Berths 406-408) in 1937-1941.	Open storage or covered bunker	1925, 1937, 1940-1941

Post-1950. At the end of World War II, the City CPD regained use of Pier 5 and constructed a new bulk outloader on the Slip 3 side of the pier (Berth 412) for handling expected cargoes of coal and phosphate. Starting in 1955, lead and zinc concentrates were directly transferred from ships in Slip 1 to open Union Pacific gondola railcars by two gantry cranes at Pier 2 equipped with clamshell buckets. The transfer of lead and zinc concentrates at Terminal 4 was relocated to Slip 3 (Berths 410 and 411) in 1961 with the completion of Pier 4 and the Dravo bulk unloading tower. The Dravo unloading tower remained in service until 1998, when it was decommissioned. Soda ash, initially exported from Pier 5, Berth 412, became a major export in 1988, when loading was transferred to Pier 4, Berths 410 and 411, where a new bulk outloader was constructed by Hall-Buck. Based on currently available information, details of these operations are summarized in Table A-4.

Table A-4
Chronology of Post-1950 Mineral Bulk Handling at Terminal 4

Ore	Status	Transfer Method	Storage	Period
Lead concentrate	Import	Gantry crane clamshell removed ore concentrate from ship hold to open railcar on Pier 2 (Berths 406-408) until 1961; Dravo unloading tower removed ore concentrates from ship hold to open railcar on Pier 4 (Berths 410 and 411) from 1961-1971. Railcars were spotted on Tracks 4-10, 4-11, 4-12, and 4-15. Cars were then pulled west to Tracks 4-2 and 4-3 for pushing under the Dravo loader. Loaded cars exited to the ladder tracks at the east of the pier for switching.	No storage	1955-1971
Coal	Export	Berth 412 bulk unloader; gantry cranes at Pier 2 also unloaded coal from barges.	Pier 5 storage bunkers	1952-1958
Zinc concentrate	Import	Same method as used for lead, same time frame.	No storage	1955-1971
Soda ash	Export	Bulk outloader; Pier 5-loaded railcars dumped soda ash into Berth 412 outloader, direct transfer to vessel. Pier	30,000-ton A-frame storage building at	1988-Present

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Ore	Status	Transfer Method	Storage	Period
		4-loaded railcars traveled along face of dock, in strings of six cars, through one of two dumper buildings. Soda ash was either transported directly to ship via conveyor or taken to storage building for later shipment. Ships could be simultaneously loaded from storage and rail.	Pier 4 since 1993; no storage at Pier 5 (direct transfer from rail to ship only)	
Sulfur	Export	Transfer from railcars to barges by bulk unloader at Berth 412. After 1961, transferred by Pier 4 Dravo tower.	No storage	1955-1967
Alumina/Bauxite	Import	Gantry cranes at Pier 2 (Berths 406-408) removed ore from ship hold to Union Pacific railcars. After 1961, ships were unloaded at Pier 4 (Berths 410 and 411) by the Dravo unloading tower.	No storage	1955-1956, 1963
Ammonium sulfate	Import	Transferred from ship hold by Dravo tower into dump trucks.	Storage building south of Pier 5	1970
Bentonite clay	Export	Direct transfer from railcar to ship via Pier 5, Berth 412 bulk outloader via conveyor belt from railcars until new outloader constructed at Pier 4.	No storage	1967
Sodium sulfate	Export	Direct transfer from railcar to ship via bulk outloader at Pier 5 until new outloader built at Pier 4.	No storage	Not available
Soybean meal	Export	Direct transfer from railcar to ship via bulk outloader at Pier 5 until new outloader built at Pier 4.	No storage	Not available
Chromite	Import	Gantry cranes at Pier 2 removed ore from ship holds to Union Pacific railcars.	No storage	1956-1957
Ferro-phosphorous iron ore	Export	Transferred by Pier 2 gantry cranes from railcars (originating in Idaho) to SS *Jotunfjell* for shipment to Rotterdam, Holland.	No storage	1955-1957
Limestone	Import	Transfer from barge hold to railcar.	No storage	1966-1967
Manganese	Import	Gantry cranes at Pier 2 removed ore from ships to railcars.	No storage	1958
Potash	Export	Transferred from railcars to ships at Berth 412.	Storage bunkers	1959

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Ore	Status	Transfer Method	Storage	Period
Rutile ore sand (titanium oxide)	Import	Transferred from ship holds by Berth 412 bulk loader.	Storage bunkers	1970
Talc	Export	Transferred from Burlington Northern railcars to ship holds by Berth 412 bulk outloader (Berth 401).	Storage bunkers	1966
Tricaphos (tri-calcium phosphate)	Import	Discharged by a marine leg and conveyor belts at Pier 1.	Storage bunkers at Pier 1	1961

The Bunker Hill Company and Hecla Mining Company's Sullivan Electrolytic Zinc Plant were the major consignees for lead and zinc ore concentrates during the 1955 to 1971 period. Anaconda Mining Co. (a former ARCO subsidiary) and American Smelting & Refining Co. (known as ASARCO) also imported ores through Terminal 4. The American National Soda Ash Consortium (known as ANSAC) has supplied Wyoming soda ash to the KMBT (formerly Hall-Buck Marine) facility at Terminal 4 from 1988 to the present day.

Pencil Pitch Handling

Pencil pitch is a coal tar distillate used as anode material at aluminum refineries throughout the Pacific Northwest. It is manufactured by extruding finger-width coal tar pitch "pencils." Available Port records indicate that pencil pitch was handled at Terminal 4 from 1978 to 1998. The pencil pitch was manufactured in Germany and China and purchased from Koppers Industries, Inc. Ships carrying the pencil pitch were moored at Berth 411 in Slip 3. Longshoremen removed the pencil pitch from the ships' holds by means of the clamshell-equipped Dravo unloading tower on Pier 4 and loaded it directly onto truck trailers or railcars adjacent to the pier.

In 1978, 13,161 short tons of pencil pitch arrived at the Port in several ships and were transferred to rail and truck carriers at Pier 4. In 1979, Jones Oregon Stevedoring Co. signed an agreement to handle bulk pencil pitch cargo at Terminal 4. That agreement was renewed in September 1982. In 1987, the Port leased the bulk cargo handling operations to Hall-Buck Marine, Inc. At that time, the Port was using the Dravo unloading tower to transfer an estimated 25,000 to 35,000 tons of pencil pitch annually. Hall-Buck Marine modified the Dravo mechanism in 1988 and the rear section of the loading hopper enclosure in 1992 to improve operations. Statistics indicate that 182,748 short tons of pencil pitch were unloaded from at least 28 ships between 1978 and 1989. Port records register 11 ships calling between January 1997 and June 1998. Ten of those vessels were affiliated with General Steamship Corporation, Ltd. In 1998, Hall-Buck Marine ended bulk import of pencil pitch at Terminal 4. The Dravo unloading tower was decommissioned that same year.

General Cargoes

Terminal 4 was chiefly designed to handle bulk (as opposed to break-bulk) cargo. The grain elevator, vegetable oil and molasses tanks, and the bulk mineral facility at Pier 5 have been prominent elements of the bulk cargo handling at Terminal 4. Other bulk cargoes imported or exported through Slip 1 and its adjacent piers and warehouses were wool, cotton, and natural rubber. The entities handling these cargoes and the time frames

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involved are not presently known. Some break-bulk cargoes were processed through Terminal 4, including automobiles exported to the Far East beginning in 1925.

Prior to and during the terminal's use as a container station by Matson Navigation Company, the terminal was used to process whole log bundles for export to Japan.

In addition to the bulk storage plant for handling coal, phosphate rock, and other bulk products, the rear of the quay dock at Pier 5 had a 3.5-acre storage space available for lumber, logs, sulfur, and steel. The equipment used for loading and unloading these materials included two traveling towers, hoppers, tripper, chutes, bins, and automatic scales. The quay dock was removed from Pier 5 in 1962, and the bulk handling facility was demolished between 1968 and 1969. The bulk outloader on the slip side of Pier 5 was decommissioned and removed between 1990 and 1992.

City of Portland

The City of Portland owns a parcel of land adjacent to Wheeler Bay commonly known as the fire boat station parcel. When the Port and the City CPD were consolidated in 1971, the CPD's properties and functions were transferred to the Port. However, the fire boat station parcel was specifically exempted from the transfer of property. The exemption was recorded correctly, but the parcel was erroneously located on Multnomah County tax maps at Slip 1 instead of in Wheeler Bay. That error was corrected in 2002.

The City of Portland operated a fire boat station at Terminal 4 from a pier into Wheeler Bay from approximately 1960 through approximately 1986. At one point, the fire boat station was located on the upstream end of Wheeler Bay, attached to Berth 410. In approximately 1980, the Multnomah County Sheriff's Department moved a boat house and houseboat just inside the area closer to the head of the slip from the fire boat station. The City of Portland formerly utilized an approximately 1,000-gallon UST for the storage of gasoline. The former UST was decommissioned in 1995 and, following sampling of soil and groundwater, DEQ issued a No Further Action determination. The City of Portland relocated its fire boat moorage to the Port's Terminal 1 facility in 1995, at which time Carr Marine leased the ramp and floating dock to tie up barges. That lease ended in 1999. The fire boat parcel has been vacant since that time.

In 1986, the City of Portland constructed a municipal stormwater sewer conveyance system that drains properties located along North Lombard Street and North Roberts Avenue. The stormwater piping traverses the northern portion of the Slip 1 Upland Facility and ultimately discharges to Slip 1. The City of Portland refers to the outfall discharging to Slip 1 as Outfall 52C. According to City of Portland records, Outfall 52C is a 36-inch municipal storm drain with a catchment area of approximately 24 acres located above the railroad tracks east of the terminal.

Oregon Terminal Company

In 1988, the Port ceded control of overall operations at Pier 2 under a management agreement with Oregon Terminal Company (OTC) for operation of all break-bulk berths. OTC handled Berth 408, the ro-ro dock, and associated warehouses. In addition, OTC operated the old Quaker State building as a gearlocker. A rail-covered work pit was constructed west of the gearlocker building at that time. In addition, one 4,000-gallon UST for diesel and one 4,000-gallon UST for gasoline were installed with a fueling station on the south side of the

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gearlocker building. An equipment wash station was installed on the slip side of the building; the wash station drained to the sanitary sewer. Both the USTs and the wash station were removed when the management agreement ended in 1996.

Other Facilities

A gearlocker building that was constructed in 1932, housed shops for carpentry, painting, blacksmithing, and repairs. In 1942, during the USATS's tenure, an internal, second-story loft was added to the one-story building.

A.6 Dredging and Filling History at Terminal 4

Dredging activity at Terminal 4 began with the work that provided fill for the general terminal space and created Slips 1 and 3 between 1917 and 1921. In the process, the former Gatton's Slough and adjacent Willamette River shoreline were reconfigured. Port of Portland dredges provided the dredged material for the City CPD's facility. Maintenance dredging of the slips and improvements to the terminal's harbor face occurred periodically in ensuing years. Table A-5 provides a chronology of dredging and filling events at Terminal 4.

Table A-5
Chronology of Dredging and Filling Events at Terminal 4

Month* / Year	Specific Area Dredged	Specific Area Filled	Estimated Volume (cubic yards)*	Description
1917	St. Johns Elevator and Terminal (Terminal 4)	Terminal 4 Upland		Slip excavation performed by Dredge Portland and "special channel" work performed by Dredge Willamette.
1918	St. Johns Terminal (Terminal 4)	Terminal 4 Upland		Slip excavation performed by Dredge Portland and channel work performed by Dredges Columbia, Willamette, and Tualatin.
Jan 1919	Terminal 4, Willamette River Channel	Terminal 4 Upland	21,950	Terminal development.
Jan 1919	Slip 1	Terminal 4 Upland	26,600	Terminal development.
Jan 1919	Slip 1	Terminal 4 Upland	30,400	Terminal development.
Jan 1919	Terminal 4, Willamette River Channel	Terminal 4 Upland	45,480	Terminal development.
Feb 1919	Slip 1	Terminal 4 Upland	34,400	Terminal development.
Feb-May 1919	Willamette River, Channel - Linnton	Terminal 4 Upland	631,060	Terminal development.
Apr-May 1919	Slip 1	Terminal 4 Upland	132,000	Terminal development.
May-June 1919	Slip 2	Terminal 4 Upland	69,200	Terminal development. Excavation of 1500-ft length and 200-foot width slip.

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Month* / Year	Specific Area Dredged	Specific Area Filled	Estimated Volume (cubic yards)*	Description
May-July 1919	Terminal 4, Willamette River Channel	Terminal 4 Upland	294,240	Terminal development.
Aug-Dec 1919	Slip 2	Not verified	318,200	Terminal development. Excavation of 1500-ft length and 200-foot width slip.
Jan 1920	Terminal 4 Slips	Terminal 4 Upland	586,661	Terminal development.
Feb-Apr 1920	Terminal 4, Willamette River Channel	Terminal 4 Upland	683,200	Terminal development.
July 1920	Terminal 4 Slips	Terminal 4 Upland	39,360	Terminal development.
Sept-Dec 1920	Terminal 4 Slips	Terminal 4 Upland	271,584	Terminal development.
Dec 1920	Terminal 4 Slips	Terminal 4 Upland	11,445	Terminal development.
1921	Slip 2	Not verified.		Terminal development.
1921	Slip 3	Slip 2		Terminal development.
1921	Slip 2	Not verified.		Terminal development.
1921	Slip 3	Not verified.		Terminal development.
1921	Pier 2	Pier 3		Terminal development.
1921	Slip 3	Pier 4		Terminal development.
Oct 1923	Willamette River Channel below Terminal 4	Terminal 4 Beach	80,545	Dredging.
Oct-Nov 1923	Willamette River Channel below Terminal 4	Terminal 4 Beach	469,435	Job No. 1087: Dredging
Dec 1923	Willamette River Channel below Terminal 4	Terminal 4	218,230	Dredging.
1923-1924	Willamette River above Terminal 4	Weyerhauser Tract		Dredging.
1924	Piers 3 & 4	Not verified.		Dredging for construction of bulkheads and fills.
Aug-Sept 1924	Willamette River Channel above Terminal 4	Terminal 4 above	146,890	Dredging.
Sept-Oct 1924	Pier 5	Bank upstream from Terminal 4	107,010	Job No. 1100: Dredging.
Oct 1924	Shoal above Terminal 4	Terminal 4 above	187,300	Dredging.
1924-1925	Terminal 4 above	Land above Terminal 4	402,710	Dredging
1925	Willamette River	Land above		Dredging.

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Month* / Year	Specific Area Dredged	Specific Area Filled	Estimated Volume (cubic yards)*	Description
	Channel	Terminal 4		
Nov-Dec 1935	Terminal 4	Not verified.	228,085	Dredging.
1935-1936	Willamette River Channel near Terminal 4	Lowlands above Terminal 4		Dredging.
1936	Terminal 4, Willamette River Channel	Not verified.		Dredging.
July-Aug 1936	Terminal 4	Not verified.	495,045	Dredging.
July-Aug 1936	Willamette River Channel, Terminal 4	Not verified.		Corps maintenance dredging (Job #1241).
1937	Terminal 4	Not verified.	187,651	Dredging.
Dec 1938	Associated Oil Company	Terminal 4, ashore below	190,960	Filling.
1941	Willamette River Channel below Terminal 4	Weyerhauser Tract		Dredging.
Feb-Apr 1941	Terminal 4	Not verified.		Dredging (CPD Project 1257).
Feb-Apr 1941	Terminal 4	Swan Island	823,640	Dredging.
Apr-June 1941	Slip below Terminal 4 above	Not verified.		Dredging. Contract 1260.
1942	Slip 1	Not verified.		U.S. Army Transport Service maintenance dredging.
July 1948	Willamette River Channel south of Pier 5	Head of Slip 2		Dredging for construction of oil dock south of Pier 5 (Job #1286). Initial filling of head of Slip 2
Aug 1948	Slip 3	Not verified.		Maintenance dredging.
1957-1958	Slip 3	Slip 2		Widening of Slip 3, dredging and final filling of head of Slip 2.
1962	Slip 1	Not verified.		Dredging.
1963	Terminal 4, Willamette River Channel	Oregon Shipbuilding Way-Ends		Dredging.
1968	Slip 1	Not verified.		Dredging.
1968	Willamette River Channel adjacent to Terminal 4	Rivergate		Dredging.
1969	Slip 3	Not verified.		Emergency dredging by Western Pacific Dredging to accommodate iron ore vessels.
June 1971	Willamette River Channel	Terminal 4	79,400	Locations and purpose not specified.

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Month* / Year	Specific Area Dredged	Specific Area Filled	Estimated Volume (cubic yards)*	Description
1972	Willamette River Channel	Terminal 4 Auto Storage Area Bankline	700,000	Terminal development.
1972	Terminal 4	Rivergate		Dredging.
1973	Slip 2	Not verified.		Fireboat basin dredging.
Feb 1973	Willamette River Channel	Terminal 4	355,466	Locations and purpose not specified.
Nov-Dec 1974	Willamette River Channel at Terminal 4	Rivergate (Area 14)	908,836	Channel maintenance.
Jan-Mar 1975	Willamette River Channel at Terminal 4	Rivergate (Area 14)	1,938,550	Channel maintenance.
1975	Slip 1	Not verified.		Dredging of Berths 403-405.
1975	Slips 1, 2, 3 and Harbor Piers	Not verified.		Maintenance dredging.
1976	Terminal 4	Swan Island Lagoon	3,000	Maintenance dredging.
1977	Slips 1 and 3	Not verified.		Dredging of Berths 407-408 (Slip 1) and Berth 410 (Slip 3)
1980	Slip 2	Not verified	100	Material removed for future river patrol boathouse as part of maintenance dredging.
1983	Slips 1, 2, 3 and Harbor Piers	Not verified.		Maintenance dredging.
1984	Slip 3	Swan Island Lagoon	5,000	Maintenance dredging of Berths 410 and 411.
1987	Terminal 4	Ross Island	2,000	Maintenance dredging of Berth 401.
1987	Terminal 4 Auto Storage Area	Morgan Bar	1,800	Maintenance dredging of Berth 416.
1988	Slip 1	Not verified.		Maintenance dredging of Berths 403-408.
1988	Terminal 4	Morgan Bar	28,900	Maintenance dredging of Berths 401, 403-408, and 414-416
1994	Slip 3	Ross Island	35,000	Remedial dredging associated under Consent Decree.
1994	Terminal 4	Ross Island	2,300	Maintenance dredging of Berth 408.
1996-1997	Slip 3	Ross Island		Maintenance dredging of Berths 410 & 411.
1997	Slip 3	Not verified.	5,454	Maintenance dredging of Berths 410 & 411.
2002	Slip 3	Not verified.	2,250	Maintenance dredging of Berths 410 & 411.
2003	Slip 3	Not verified.		Maintenance dredging of Berths 410 & 411.

** where reported or available*

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A.6 Current Uses at Terminal 4

Throughout the 1980s and 1990s, some of the buildings, equipment, and docks at Terminal 4 became obsolete and were removed. Slip 1 is not presently deep enough to accommodate deeper-draft modern vessels and current Port plans do not call for such deepening in the foreseeable future. In the late 1980s and early 1990s, Warehouse 4 was condemned and removed, and the original tanks at the bulk liquid storage facility near the head of Slip 1 were removed. In 1996, Berths 406 and 407 and their associated docks and warehouses were dismantled. The demolition of Berths 403 and 404 and associated Houses 3 and 4 followed in 1999. Bulk operations at Berth 412 (Pier 5) were terminated in 1989, and the wharf at Berth 412 was removed in 1997.

A.6.1 Tenant Operations

Current lessees within the Removal Action Area at Terminal 4 and their status are listed below.

Cereal Food Processors

Cereal Food Processors, Inc. (formerly known as Terminal Flour Mills) is currently in the last two years of a lease for approximately 1.6 acres at the flour mill facility at Terminal 4.

International Raw Materials

IRM is currently in year four of a 10-year lease (with two five-year option periods) for approximately 6.3 acres at the liquid bulk storage facility, excluding a Port building. The previous lease for the facility was assigned from PM-Ag to IRM in 1995.

Rogers Terminal

Rogers Terminal & Shipping (a division of Cargill Marine) is currently in "hold over" status with a lease of improved space east of Slip 1. The lease is for less than 1 acre and encompasses an 11,712-square-ft warehouse with 406 square ft of office space and a 15,451-square-ft yard. Rogers, a terminal service company, originally leased the space for stevedoring services supplied to Cargill's operation. Since Cargill is in the process of exiting its lease and is no longer operating at Terminal 4, Rogers is currently utilizing the leasehold for storage purposes. Rogers' initial lease agreement with the Port dates from 1983.

Rogers formerly utilized an aboveground used oil tank in connection with its operations. In addition, the Port removed an approximately 10,000-gallon gasoline UST from the Rogers leasehold in 1990. Sampling during decommissioning of the UST confirmed that there were no releases associated with the UST.

Kinder Morgan Bulk Terminals

In 1998, Hall-Buck was acquired by Kinder Morgan and renamed KMBT. KMBT continues to export soda ash through Slip 3. KMBT currently leases 6.56 acres adjacent to Berths 410 and 411 for ship loading of soda ash and/or unloading of bulk cargo from rail. The lease area includes rails, associated buildings, a storage dome, and utilities.

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Additional agreements affecting Kinder Morgan's lease area include:

- Portland General Electric easement for underground line;
- Pipeline Crossing Agreement, Union Pacific (licensor) to Hall-Buck (licensee), allowing Hall-Buck to construct, maintain, and operate a pipeline; and
- Revenue Sharing Agreement with Union Pacific.

KMBT currently utilizes an approximately 5,000-gallon diesel UST located north of the Rail Dump building, an approximately 675-gallon AST located in the eastern portion of the facility, and an approximately 2,000-gallon sulfuric acid AST located within Building 432. In addition, KMBT utilizes an approximately 43,000-gallon open settling tank for soda ash wash-down water.

Schnitzer

The Port has a moorage agreement with Schnitzer Investment Corporation for a portion of the mooring dolphin that extends onto submerged lands adjacent to property owned by Schnitzer at the Berth 401 grain elevator.

A.6.2 Rail Trackage

Rail Usage

The rail trackage within the confines of Terminal 4 is owned by the Port. The Port leases portions of the rail trackage to individual tenants as part of their facility leases. The Terminal 4 rail system is designated as capacity that the Port will afford a tenant under terms of the lease. Older, renewable leases, such as the one currently in effect with KMBT, subsume the particulars of car movement and loading under the general term of "operations." Newer facility leases deal with all aspects of terminal transfer operations in detail.

Although not specifically addressed in older lease language, there are recognized responsibilities regarding rail activities at Terminal 4. Union Pacific, or any other railroad company involved in car transit and delivery, is responsible for the line haul of consigned product from origin to destination. This includes delivery of the cars to the terminal.

A.6.3 Adjacent Property Ownership and Operations

The Terminal 4 Removal Action Area is bordered to the north by Schnitzer Steel Industries and Northwest Pipe and Casing; to the north/northeast by the Burgard Industrial Park; to the south by the Terminal 4 Auto Storage Area, which is occupied by Toyota; to the east by Union Pacific rail tracks, beyond which is the Toyota processing yard and Toyota processing center; to the southeast by the Toyota upper lot; and to the west by the Willamette River.

The Schnitzer Steel Industries, Northwest Pipe and Casing, and Burgard Industrial Park properties and the Toyota Auto Storage Area, all of which border the Terminal 4 Removal Action Area, are discussed below.

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Schnitzer Steel Industries

Schnitzer Steel Industries (Schnitzer), located at 12005 North Burgard Street, borders Terminal 4 on the north. Schnitzer processes, stores, and exports scrap metal (e.g., automobiles, appliances, and ferrous metal products) from its facility. Schnitzer also operates a deep marine terminal for bulk commodities. The property was the site of Oregon Shipbuilding Corporation's shipyard from approximately 1943 through 1945; between the late 1960s and 1972, Schnitzer reportedly conducted ship scrapping activities at the property. Schnitzer Steel Industries is listed as Oregon Department of Environmental Quality (DEQ) Environmental Cleanup Site Information (ECSI) #2355 and is currently under a Voluntary Cleanup Program (VCP) Agreement for remedial investigation of the site, which is ongoing.

Northwest Pipe and Casing

Northwest Pipe and Casing, located at 12005 North Burgard Street, borders Terminal 4 on the north. Northwest Pipe and Casing operates a welded steel pipe and coating manufacturing facility. Historically, the Oregon Shipbuilding Corporation shipyard, which operated from 1943 through 1945, extended onto the Northwest Pipe and Casing property. Beall Pipe operated a pipe manufacturing facility on the property from 1945 to 1983. Northwest Pipe and Casing, purchased the property in 1983. Northwest Pipe and Casing is listed as DEQ ECSI #138 and is currently under a VCP Agreement for remedial investigation of the site, which is ongoing.

Burgard Industrial Park

The portion of the Burgard Industrial Park that is adjacent to the north/northeast of Terminal 4 includes Boydstun Metal Works and Western Machine Works.

Boydstun Metal Works, located at 9002 North Sever Court in the Burgard Industrial Park, borders Terminal 4 on the north/northeast. Boydstun Metals Works fabricates and paints automobile transport trailers. Specific manufacturing activities include cutting steel and aluminum sheets and tubes, welding parts as part of trailer assembly, sandblasting, painting, and installing hydraulics and electrical control systems. Historically, the Oregon Shipbuilding Corporation shipyard, which operated from 1943 to 1945, extended onto the Boydstun property; between the late 1960s and 1972, Schnitzer reportedly conducted ship scrapping activities at the property. Boydstun is separately listed as DEQ ECSI #2362; however, the site has been incorporated into the Schnitzer Steel Industries investigation (ECSI #2355 described above), which is ongoing.

Western Machine Works, located at 12005 North Burgard Street in the Burgard Industrial Park, also borders Terminal 4 on the north/northeast. Western Machine Works fabricates and remanufactures components for the paper and pulp industry. Historically, the Oregon Shipbuilding Corporation shipyard, which operated from 1943 to 1945, extended onto the Boydstun property; between the late 1960s and 1972, Schnitzer reportedly conducted ship scrapping activities at the property. Western Machine Works is not listed in the DEQ's ECSI database; however, the site is included in the Schnitzer Steel Industries investigation (described above), which is ongoing.

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Toyota - Auto Storage Area

Toyota Motor Sales, which occupies properties to the east, south, and southeast of the Terminal 4 Removal Action Area, holds a long-term lease agreement with the Port dating to 1976 for the storage and processing of automobiles. Historically, Toyota's facilities have been at Terminal 4 and above Terminal 4 on Lombard Street; the facilities are known as the upper and lower lots.

The Toyota area south of the terminal was first developed in 1969 and paved as a large-scale automobile import facility. A floating dock (Berth 417) was constructed in 1969, and a second floating auto dock (Berth 416) was constructed in 1972. In addition, Berths 414 and 415 were completed in 1974 for the handling of steel cargo.

In 1976, Toyota leased the import facility at Berth 416, and the processing plant was expanded in 1979. Berth 417 was relocated to the Port's Terminal 6 and a general cargo auto terminal was constructed there.

In 1986, the Port purchased the St. Johns Auto Wrecking Yard on Lombard Street above Terminal 4. Toyota entered into an agreement with the Port for approximately 69.2 acres of property, buildings, improvements, and dock rights located to the east and south of the Removal Action Area. Toyota exercised an option under the terms of the 1986 lease on October 30, 1989 for an additional 12-acre parcel farther upstream. On April 3, 1990, Toyota exercised another option under the lease for an additional 8.8-acre parcel located on the corner of North Lombard and North Roberts. A recent amendment extending the term of the lease also provided for closure of the "upper property" (east of the terminal) on North Lombard, including removal of the underground fuel tanks.

In 2002, Toyota Motor Sales, U.S.A., Inc. (also known as Toyota; TLS, Logistics) entered into a separate lease agreement for approximately 82 acres south of the Terminal 4 Removal Action Area, which includes a vacated portion of North Bradford Street.

Toyota's current operations include unloading automobiles from ships that dock at Berths 414 and 415, driving the cars to designated yard areas, and storing the vehicles awaiting processing, which includes fueling and washing vehicles, installing accessories, and making minor repairs to damage caused during shipping.

A.7 Planned Future Uses at Terminal 4

The Port is currently involved in master planning to guide development and redevelopment to the year 2020. Terminal 4 will remain one of the Port's primary marine terminals for the foreseeable future. Options under consideration for Terminal 4 generally involve retaining the existing terminal purposes of handling grain, autos, and dry bulk and liquid bulk cargoes. Most of the alternatives under consideration emphasize the continued use of Slip 3 and deemphasize the use of Slip 1.

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Appendix J

Cultural Resources Report

KMB00008816

Archaeological Investigations Northwest, Inc.

2632 S.E. 162nd Ave. • Portland, Oregon 97236
Phone (503) 761-6605 • Fax (503) 761-6620

Vancouver Phone (360) 696-7473
E-mail: ainw@ainw.com
Web: www.ainw.com

December 28, 2005

Michael J. Pickering, R.G.
Project Hydrogeologist
Ash Creek Associates, Inc.
9615 S.W. Allen Boulevard, Suite 106
Portland, Oregon 97005

Re: Archaeological Monitoring of Soil Sampling and Drilling of Monitoring Wells for the Port of Portland Terminal 4 Slip 1 Upland Facility Removal Action Project
AINW Report No. 1587

Dear Michael:

Per the agreement between Blasland, Bouck and Lee, Inc. (BBL) and Archaeological Investigations Northwest, Inc. (AINW), we have monitored the drilling of soil borings and monitoring wells and inspected soil samples obtained from the soil borings and monitoring wells for the Port of Portland's Terminal 4 Slip 1 Upland Facility located at 11040 North Lombard Street along the northeastern bank of the lower Willamette River in Portland, Oregon (Figure 1). The agreement also includes preparing this report, which addresses the archaeological monitoring conducted in September 2005 directly under contract with BBL and monitoring undertaken in 2004 under previous contracts with URS and Hart Crowser, Inc.

The Port's Terminal 4 property is located on the Willamette River floodplain, approximately between River Miles 4.4 and 5.7. The historical floodplain was covered with dredged sand and silt from the Willamette River beginning in about 1917 and continuing through the early 1920s. The 2003 cultural resource survey of the Port of Portland's Terminal 4 property concluded that there was a potential for archaeological deposits in the alluvial silt buried beneath the dredged deposits (Ellis and O'Brien 2003). That report identified locations at Terminal 4 considered to have a high potential for archaeological resources in native soils underlying the dredged soils.

A historical tributary of the Willamette River known as "Gatton's Slough" was considered to constitute an area of especially high archaeological sensitivity. Gatton's Slough originally flowed across the area now occupied by the northernmost portion of Terminal 4 and emptied into the Willamette at the modern Slip 1 location. A major prehistoric archaeological site was reported at the mouth of the slough in the decades prior to construction of Terminal 4. Other locations at Terminal 4 considered likely to have buried archaeological resources were along the historical Willamette River bank and on the shorelines of historical floodplain lakes, ponds, and marshes. All of these natural features are now buried under 3.0 to 6.1 meters (m) (10 to 20 feet [ft]) of dredged fill.

Given the potential for archaeological deposits in the buried floodplain at these locations, the 2003 cultural resource report recommended archaeological monitoring of any ground-disturbing activity in these areas. This recommendation was subsequently implemented for elements of the soil sampling at Terminal 4 in 2004 (Baker and Ellis 2004) and bank excavations/remedial actions at Slip 3 at Terminal 4 in 2004 (Smits et al. 2005). No evidence of archaeological deposits or materials was observed in the monitoring of these activities. It is considered nonetheless important to continue to implement the 2003 report recommendations.

The archaeological monitoring of these projects was undertaken within the framework of archaeological monitoring protocols developed by AINW for the Port of Portland: *Port of Portland Terminal 4 Field Sampling Archaeological Monitoring Protocol* (Ellis 2004a) and *Archaeological Protocol, Terminal 4, Portland, Oregon* (Ellis 2004b). These protocols define the role and responsibilities of the archaeological monitor and procedures to be followed in the event of the discovery of human remains or archaeological materials. These protocols were implemented for the monitoring that is the subject of this report.

The decision regarding which soil samples and monitoring wells should be monitored was made by AINW Senior Archaeologist David V. Ellis. Proposed soil sample and monitoring well locations at Terminal 4 were submitted in advance by the respective consultants (URS, Hart Crowser, and Ash Creek [on behalf of BBL]) to Mr. Ellis. He then reviewed these plans and had overlays prepared that allowed him to compare the distribution of the planned excavations with the archaeological sensitivity areas. Proposed sampling and wells within or in the immediate vicinity of the sensitivity areas were selected for monitoring.

In total, AINW monitored excavation of 7 monitoring wells and 28 soil borings for soil samples. URS conducted drilling and sampling of 4 of these wells and 2 soil borings; Hart Crowser was responsible for 3 wells and 22 soil borings; and BBL/Ash Creek excavated 1 monitoring well and 4 soil borings. The locations of these excavations are shown in Figure 2, which also indicates the historical riverbank and Gatton's Slough channel. Most of the monitored excavations were in or along the buried Gatton's Slough channel or on the historical riverbank. The remaining monitored excavations were located in and around former beds of floodplain lakes or ponds.

Field Investigations and Results

AINW archaeologist R. Todd Baker, M.A., monitored the drilling of soil borings and monitoring wells and inspected soil samples obtained from the drilling at the Terminal 4 Slip 1 Upland Facility on April 5, 7, and 8, August 25 to 27, and September 1 and 10, 2004. AINW archaeologist Todd Ogle, M.A., monitored drilling activity on September 7, 2005. The standard workday was 7:00 a.m. to 6:00 p.m., Monday through Friday. The monitoring was conducted within a designated exclusion zone. Mr. Baker and Mr. Ogle had completed the 40-hour Hazardous Waste Operations and Emergency Response course and the 8-hour refresher course per OSHA 1910.120. Mr. Baker and Mr. Ogle also attended all of the daily site safety meetings conducted prior to commencement of the drilling.

Modified Level D personal protective equipment (PPE) was utilized during the field activities. A full-face respirator, with appropriate filters and cartridges, was carried in case contaminant levels exceeded the acceptable parts per million.

For safety reasons field glasses and nitrile gloves were used to examine dirt as it was being removed from the sampling tubes. If possible artifacts or other archaeological deposits were observed, the archaeological monitor was to request that the sample material be deposited where it could be safely examined. Mr. Baker and Mr. Ogle completed daily monitoring logs designed specifically for the Terminal 4 field sampling that summarized the results of each day's activities.

Archaeological monitoring of soil sampling and drilling began on April 5, 2004. The soil borings and monitoring wells were completed using drill rigs employing the direct push drilling method (Photo 1). Direct push drilling is a method of drilling where the sampling tube is "pushed" or driven into the ground using a hydraulic probe hammer mounted on the back of a truck or on a remote control vehicle that can access locations a truck cannot reach (Photo 2). No rotation is involved so all of the samples are uncontaminated and there is no drilling debris on the surface. Direct push drilling allows the driller to take a sample sealed inside a plastic tube so that no handling of the sample takes place. The plastic tubes are approximately 1.5 meters (m) (5 feet [ft]) in length, which allows for sampling in 1.5 m (5 ft) intervals. After the sample is taken the plastic tube is removed from the drilling sheath and the tube is cut open and the contents are sampled (Photo 3).

Monitoring of drilling activities included the monitoring of soil borings T4S1 SB-3 and 4, T4S1 SB-24 to 28, T4S1 SB-36 to 41 (Photo 4), T4S1 SB-51 to 54, T4S1 SB-70 to 76, T4S1 SB-92 to 95, and monitoring wells MW-02s, MW-08 and 09, MW-17, 19, 20, and 26. MW-19 had to be re-drilled due to a metal sheath from the drill rig breaking off in the original monitoring well hole. The soil borings were drilled to a depth of between 0.8 m (2.5 ft) and 9 m (30 ft) below the surface, depending on the purpose and location of the soil boring. The monitoring wells were drilled to a depth of between 8 m (25 ft) and 12 m (40 ft), depending on the location of the well and the depth water was encountered.

Soils observed during the drilling in most locations consisted of a brown sand or grayish black sand, overlying a gray or grayish brown mottled silt loam or silty clay loam. Some locations had intermixed layers of sand and silt. The silt loam layer is considered to be the native soil in the project area.

No prehistoric or historic-period cultural material was discovered during monitoring of the drilling of soil borings and monitoring wells and inspection of the soil samples obtained from the drilling for the Terminal 4 Slip 1 Upland Facility removal action project. At no time during the excavations did Mr. Baker or Mr. Ogle observe any evidence of artifacts or other possible archaeological deposits, and at no time therefore did they request that soil samples be deposited where they could examine them

Summary and Recommendations

AINW monitored the drilling of soil borings and monitoring wells and inspected the soil samples obtained from the drilling at the Terminal 4 Slip 1 Upland Facility site from April 5, 7, and 8, August 25 to 27, and September 1 and 10, 2004, and September 7, 2005. No prehistoric or historic-period cultural material was discovered during monitoring of the drilling or inspection of the soil samples. Based on the results of the field investigations, it is AINW's professional opinion that the drilling and sample collection did not affect any significant archaeological resources. AINW therefore recommends no additional studies at this time.

We appreciate the opportunity to participate in the monitoring project. Please contact our office if you have any questions about the results of the monitoring work or this report.

Sincerely,

R. Todd Baker, M.A.
Supervising Archaeologist

David V. Ellis, M.P.A.
Senior Archaeologist

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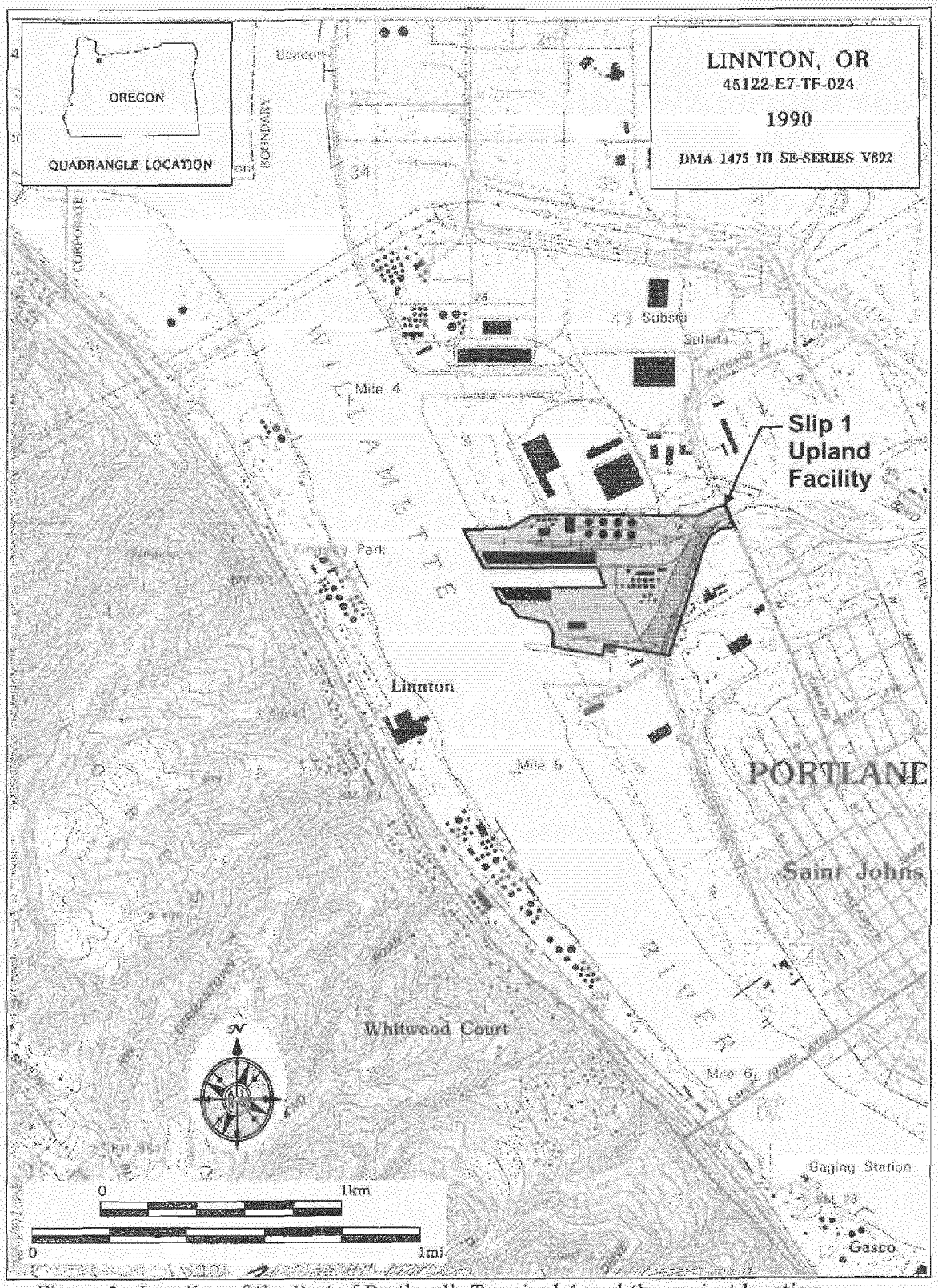

Figure 1. Location of the Port of Portland's Terminal 4 and the project location.

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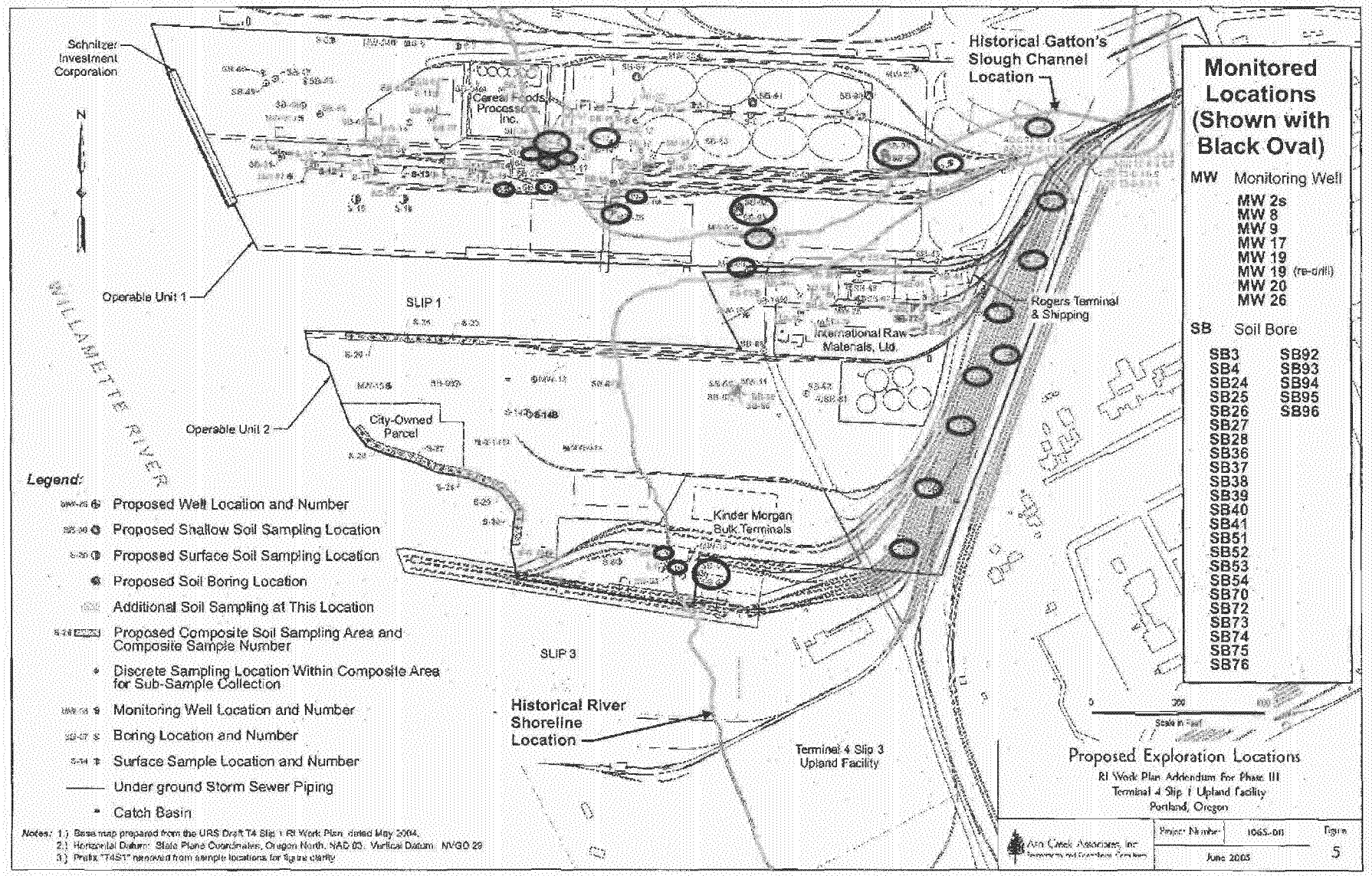

Figure 2. T4 monitored locations (shown with black ovals).

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Photo 1. Drilling of Soil Boring #51 in progress using the direct push drilling method. The view is to the northwest.

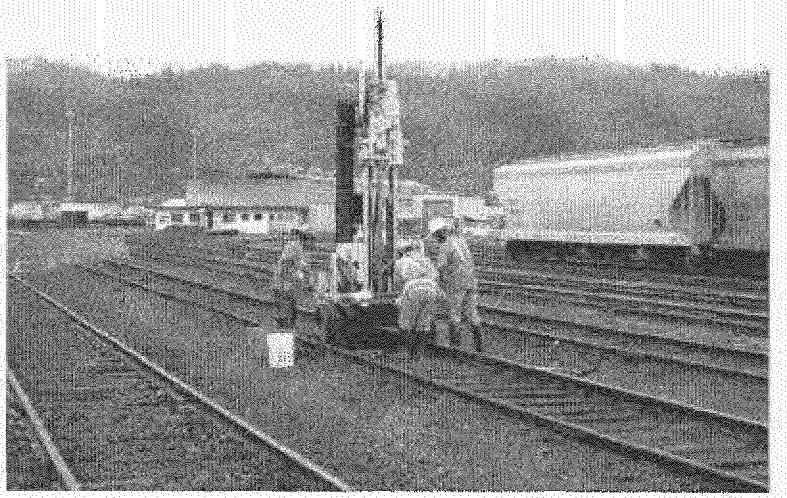

Photo 2. Drilling of Soil Boring #76 in progress using remote controlled vehicle in an area not accessible by truck. The view is to the northwest.

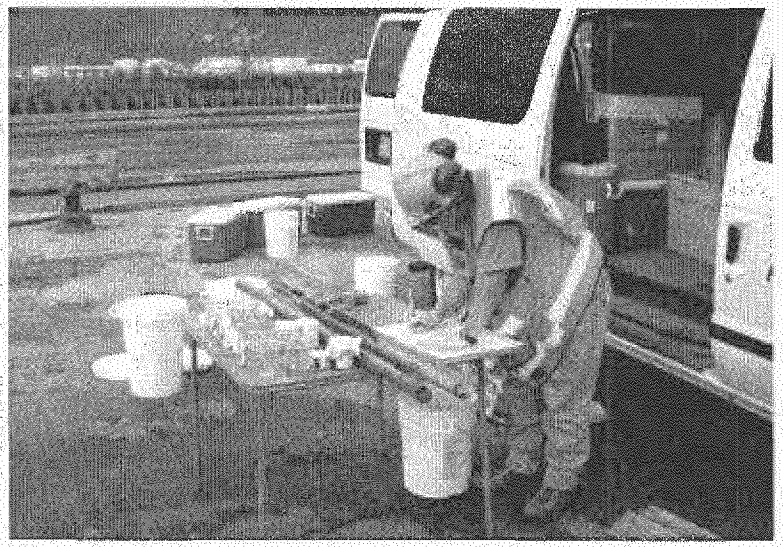

Photo 3. Sediment sampling from Soil Boring #52 showing plastic sampling tube cut open and samples being labeled and placed in jars. The view is to the southwest.

Photo 4. Soil Boring #40 in progress. The view is to the north.

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Appendix K

Screening Tables Supporting Source Control Evaluation

KMB00008825

TABLE K-1
SOIL SUMMARY (<3FT) FOR RIVERBANK SOILS AND RISK SCREENING

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Terminal 4 Slip 1 Operable Unit 2 - Joint Source Control Screening Levels (Ecological Receptors)

Constituents of Interest (COI)				Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	COI Conc. (max)	Potential Portland Harbor Bioaccumulative COI?*1	Joint Source Control Screening Level Value - Toxicity*2	COI Concentration Exceeds Toxicity Screening Value?	Joint Source Control Screening Level Value - Bioaccumulation*3	COI Concentration Exceeds Bioaccumulation Screening Value?
				Minimum	Maximum	Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max				Value (mg/kg)		Value (mg/kg)	
CASNo	Analyte	Analyte Group	Units																
7440-36-0	Antimony and compounds	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	12	8%	1.48	1.74	0.0728	0.0728	S-26	0.0728	Yes	64	No	10	No
7440-38-2	Arsenic	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			2.23	15.7	S-26D	15.7	Yes	33	No	NA	NA
7440-41-7	Beryllium and compounds	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			0.186	0.352	S-30	0.352	No	NA	NA	NA	NA
7440-43-9	*Cadmium and compounds*	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			0.11	25.3	S-26D	25.3	Yes	4.98	*Yes*	0.003	*Yes*
75-15-0	Carbon disulfide	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	1.06	1.06				ND	No	NA	NA	NA	NA
7440-50-8	*Copper and compounds*	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			12	219	S-26D	219	Yes	149	*Yes*	10	*Yes*
7439-92-1	*lead*	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			4.59	868	S-26D	868	Yes	128	*Yes*	128	*Yes*
7439-97-6	Mercury and compounds	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	6	54%	0.0638	0.131	0.0092	0.325	S-26D	0.325	Yes	1.06	No	NA	NA
7440-02-0	Nickel	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			16.2	20.5	S-30	20.5	Yes	48.6	No	316	No
7782-49-2	*Selenium*	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			0.159	0.479	S-24	0.479	Yes	5	No	0.1	*Yes*
7440-22-4	Silver and compounds	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	8	38%	0.495	0.529	0.0967	2.1	S-26D	2.1	Yes	5	No	NA	NA
7440-28-0	Thallium	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	11	15%	0.495	0.529	0.0624	0.122	S-26D	0.122	No	NA	NA	NA	NA
7440-47-3	Total Chromium	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			12.3	23.8	S-29	23.8	Yes	111	No	4200	No
7440-66-6	*Zinc*	Metals/Inorganics	mg/kg	9/12/2005	9/13/2005	13	0	100%			49.6	3320	S-26D	3320	Yes	459	*Yes*	3	*Yes*
83-32-9	*Acenaphthene*	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	13	46%	0.0136	0.0773	0.00959	1.18	S-30D	1.18	Yes	0.3	*Yes*	NA	NA
208-96-8	Acenaphthylene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	16	33%	0.0136	0.347	0.00474	0.176	S-29	0.176	Yes	0.2	No	NA	NA
120-12-7	Anthracene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	7	71%	0.0138	0.52	0.0034	0.717	S-28A	0.717	Yes	0.845	No	NA	NA
56-55-3	*Benzo[a]anthracene*	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0151	6.58	S-28A	6.58	Yes	1.05	*Yes*	NA	NA
50-32-8	*Benzo[a]pyrene*	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.00808	7.79	S-28A	7.79	Yes	1.45	*Yes*	NA	NA
205-99-2	Benzo[b]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.00749	8.01	S-28A	8.01	Yes	NA	NA	NA	NA
191-24-2	*Benzo[g,h,i]perylene*	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	1	96%	0.0139	0.0139	0.0175	4.77	S-28A	4.77	Yes	0.3	*Yes*	NA	NA
207-08-9	Benzo[k]fluoranthene	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.00534	7.26	S-28A	7.26	Yes	13	No	NA	NA
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	SVOC, Phthalate Esters	mg/kg	9/12/2005	9/13/2005	9	8	11%	0.0142	0.0548	0.0176	0.0176	S-25	0.0176	Yes	0.8	No	0.33	No
218-01-9	*Chrysene*	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0179	8.19	S-28A	8.19	Yes	1.29	*Yes*	NA	NA
99-87-6	Cymene	VOC	mg/kg	9/12/2005	9/12/2005	1	0	100%			0.0212	0.0212	S-23D	0.0212	No	NA	NA	NA	NA
53-70-3	*Dibenz[a,h]anthracene*	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	1	96%	0.0139	0.0139	0.00479	1.53	S-28A	1.53	Yes	1.3	*Yes*	NA	NA
84-74-2	Di-n-butyl phthalate	SVOC, Phthalate Esters	mg/kg	9/12/2005	9/13/2005	9	9	0%	0.0142	0.0548				ND	Yes	0.1	No	NA	NA
206-44-0	*fluoranthene*	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0265	11.3	S-28A	11.3	Yes	2.23	*Yes*	NA	NA
86-73-7	*fluorene*	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	13	46%	0.0136	0.0773	0.00751	1.24	S-30D	1.24	Yes	0.536	*Yes*	NA	NA
193-39-5	*Indeno(1,2,3-cd)pyrene*	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	1	96%	0.0139	0.0139	0.0154	4.46	S-28A	4.46	Yes	0.1	*Yes*	NA	NA
91-20-3	*Naphthalene*	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	25	14	44%	0.0136	0.344	0.00555	6.48	S-30D	6.48	Yes	0.561	*Yes*	NA	NA
85-01-8	*Phenanthrene*	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.00965	6.3	S-28A	6.3	Yes	1.17	*Yes*	NA	NA
129-00-0	*Pyrene*	SVOC, Polycyclic Aromatic Hydrocarbons	mg/kg	9/12/2005	9/13/2005	24	0	100%			0.0195	8.28	S-28A	8.28	Yes	1.52	*Yes*	NA	NA
11097-69-1	***Aroclor 1254***	PCBs Aroclors	mg/kg	9/12/2005	9/13/2005	9	9	0%	0.0335	0.0845				ND	Yes	0.3	No	0.01	***ND>SLV***
11096-82-5	Aroclor 1260	PCBs Aroclors	mg/kg	9/12/2005	9/13/2005	9	9	0%	0.0335	0.0394				ND	Yes	0.2	No	NA	NA
309-00-2	Aldrin	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.00101	0.0077				ND	Yes	0.04	No	NA	NA
5103-71-9	alpha-Chlordane	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.00101	0.077				ND	No	0.0176	***ND>SLV***	NA	NA
12789-03-6	Chlordane (technical)	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.00101	0.0077				ND	No	0.0176	No	NA	NA
72-54-8	*DDD*	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	31	14%	0.00135	0.0077	0.00014	0.00279	S-29	0.00279	Yes	0.028	No	0.0003	*Yes*
72-55-9	*DDE*	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	31	14%	0.00135	0.077	0.00161	0.00784	S-29	0.00784	Yes	0.0313	No	0.0003	*Yes*
50-29-3	*DDT*	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	18	50%	0.00135	0.0678	0.0004	0.0968	S-26D	0.0968	Yes	0.0629	*Yes*	0.0003	*Yes*
319-86-8	delta-BHC	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.00101	0.0077				ND	No	NA	NA	NA	NA
60-57-1	Dieldrin	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	30	17%	0.00135	0.077	0.00027	0.0009	S-30A	0.000896	Yes	0.0618	No	NA	NA
959-98-8	Endosulfan I	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	35	3%	0.00101	0.0077	0.00033	0.00033	S-23	0.000329	Yes	NA	NA	NA	NA
72-20-8	Endrin	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.00135	0.0678				ND	Yes	0.207	No	NA	NA
7421-93-4	Endrin Aldehyde	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.00135	0.077				ND	Yes	0.207	No	NA	NA
53494-70-5	Endrin Ketone	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.00135	0.077				ND	Yes	0.207	No	NA	NA
76-44-8	Heptachlor	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.00101	0.0077				ND	Yes	0.01	No	NA	NA
72-43-5	Methoxychlor	Organochlorine Pesticides	mg/kg	9/12/2005	9/13/2005	36	36	0%	0.00135	0.077				ND	Yes	NA	NA	NA	NA
87-61-6	1,2,3-Trichlorobenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	0	100%			0.0836	0.0836	S-23D	0.0836	No	NA	NA	NA	NA
95-63-6	1,2,4-Trimethylbenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				ND	No	NA	NA	NA	NA
108-67-8	1,3,5-Trimethylbenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				ND	No	NA	NA	NA	NA
106-46-7	1,4-Dichlorobenzene	SVOC, Halogenated	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				ND	No	0.3	No	NA	NA
78-93-3	2-Butanone	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	1.06	1.06				ND	No	NA	NA	NA	NA
67-64-1	Acetone	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	2.65	2.65				ND	No	NA	NA	NA	NA
71-43-2	Benzene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				ND	No	NA	NA	NA	NA
56-23-5	Carbon tetrachloride	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				ND	No	NA	NA	NA	NA
108-90-7	Chlorobenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				ND	No	NA	NA	NA	NA
67-66-3	Chloroform	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				ND	No	NA	NA	NA	NA
98-82-8	Cumene (isopropylbenzene)	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.212	0.212				ND	Yes	NA	NA	NA	NA
DRO	Diesel Range	Petroleum Hydrocarbons	mg/kg	9/12/2005	9/13/2005	9	6	33%	25.4	29.5	14.9	36.2	S-29	36.2	No	NA	NA	NA	NA
100-41-4	Ethylbenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				ND	No	NA	NA	NA	NA
87-68-3	Hexachlorobutadiene	SVOC, Halogenated	mg/kg	9/12/2005	9/12/2005	1	0	100%			0.226	0.226	S-23D	0.226	Yes	0.6	No	NA	NA

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TABLE K-1
SOIL SUMMARY (<3FT) FOR RIVERBANK SOILS AND RISK SCREENING

REMEDIAL INVESTIGATION
PORT OF PORTLAND - TERMINAL 4 SLIP 1

Terminal 4 Slip 1 Operable Unit 2 - Joint Source Control Screening Levels (Ecological Receptors)

Constituents of Interest (COI)				Period of Record		Samples			Non-detected Concentrations		Detected Concentrations		Maximum Detection Location	COI Conc. (max)	Potential Portland Harbor Bioaccumulative COI?[*1]	Joint Source Control Screening Level Value - Toxicity[*2]	COI Concentration Exceeds Toxicity Screening Value?	Joint Source Control Screening Level Value - Bioaccumulation[*3]	COI Concentration Exceeds Bioaccumulation Screening Value?
CASNo	Analyte	Analyte Group	Units	Minimum	Maximum	Number of Samples	Number of ND	Detection Frequency	Min	Max	Min	Max				Value (mg/kg)		Value (mg/kg)	
75-09-2	Methylene chloride	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.529	0.529				ND	No	NA	NA	NA	NA
104-51-8	n-Butylbenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	0	100%			0.0434	0.0434	S-23D	0.0434	No	NA	NA	NA	NA
103-65-1	n-Propylbenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				ND	No	NA	NA	NA	NA
95-47-6	o-Xylene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				ND	No	NA	NA	NA	NA
RRO	Residual Range	Petroleum Hydrocarbons	mg/kg	9/12/2005	9/13/2005	9	4	56%	53.1	59	34	138	S-29	138	No	NA	NA	NA	NA
135-9-88	sec-Butylbenzene	VOC	mg/kg	9/12/2005	9/12/2005	1	0	100%			0.0222	0.0222	S-23D	0.0222	No	NA	NA	NA	NA
127-18-4	Tetrachloroethylene (PCE)	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				ND	No	0.5	No	NA	NA
108-88-3	Toluene	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				ND	No	NA	NA	NA	NA
79-01-6	Trichloroethylene (TCE)	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.106	0.106				ND	No	2.1	No	NA	NA
1330-20-7	Xylene (mixed)	VOC	mg/kg	9/12/2005	9/12/2005	1	1	0%	0.212	0.212				ND	No	NA	NA	NA	NA

Notes:
1 - COI detected in Portland Harbor Round 1a fish tissue or has a log Kow of ≥ 3.5
2 - MacDonald PECs and other SQVs
3 - DEQ 2001 Bioaccumulative Sediment SLVs
[*] All JSCS criteria from Table 3-1, Final Portland Harbor Joint Source Control Strategy, December 21, 2005, http://www.deq.state.or.us/nwr/Portland Harbor/jscs (downloaded January 3, 2006)

COI - constituent of interest
ND - non-detect
mg/kg - milligram per kilogram
min - minimum
max - maximum
NA - not available
SLV - screening level value
VOC - volatile organic compound
SVOC - semi-volatile organic compound

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