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August 16, 2017

Port of Olympia
C/o Ms. Rachael Jamison
Director of Env. Programs
606 Columbia St. NW
Olympia, WA 98501

City of Olympia
c/o Mr. Jay Burney
Assistant City Manager – Special Projects
P.O. Box 1967
Olympia, WA 98507-1967

LOTT Clean Water Alliance
C/o Ms. Wendy Steffensen
Environmental Project Manager
500 Adams Street NE
Olympia, WA 98501

Re: Ecology Comments on the *Engineering Design Report for Cleanup Implementation,* Prepared by PIONEER Technologies Corporation, dated June 2017, Construction Plans and Specifications, Prepared by the Port of Olympia dated June 15, 2017, and the Unanticipated Discoveries Plan, Prepared by PIONEER Technologies Corporation, dated August 14, 2017, East Bay Redevelopment Site, Olympia, Washington, Agreed Order DE14072, Ecology Facility/Site No. 5785176, Cleanup Site ID No. 407.

Dear Ms. Jamison, Mr. Burney, and Ms. Steffensen:

Thank you for submitting the above-referenced documents for our review. Ecology has no further comments at this time. Therefore, please consider these documents as approved.

If you have any questions, please contact me at (360) 407-6247 or steve.teel@ecy.wa.gov.

Sincerely,

SS Teel

Steve Teel, LHG
Cleanup Project Manager/Hydrogeologist
Toxics Cleanup Program
Southwest Regional Office

By certified mail [91 7199 9991 7037 7496 0081]

Cc: Mr. Chris Waldron, PIONEER Technologies Corporation
Mr. Mark Barber – City Attorney, City of Olympia
Mr. Chris Cleveland, Brown and Caldwell
Ivy Anderson – Office of the Attorney General
Nick Acklam – Department of Ecology
Stacy Galleher – Department of Ecology

Engineering Design Report for Cleanup Implementation

East Bay Redevelopment Site
Olympia, Washington

Agreed Order No. DE14072
Facility/Site No. 5785176

Prepared for:

Port of Olympia
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Olympia, WA 98501

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June 2017

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Executive Summary

The purpose of this Engineering Design Report (EDR) is to present the design for performing cleanup activities at the Port of Olympia's (Port's) East Bay Redevelopment Site (Site) per the Cleanup Action Plan (CAP) for the Site (PIONEER Technologies Corporation [PIONEER] 2016a; PIONEER 2016b). This EDR was prepared in accordance with Washington Administrative Code (WAC) 173-340-400(4)(a). Previously completed interim actions (IAs) at the Site include soil removal and installation of a soil cover. This EDR will be incorporated by reference into the Port's forthcoming plans and specifications. Washington State Department of Ecology (Ecology) will be given an opportunity to review the Port's forthcoming plans and specifications.

The cleanup activities presented in this report include the removal of soil with constituent of concern (COC) concentrations that exceed remediation levels (RLs), and the installation of a soil cover. The RL exceedances in soil are due to concentrations of arsenic, total petroleum hydrocarbons in the gasoline range (TPH-G), total naphthalenes, and total chlorinated dibenzo-p-dioxins and chlorinated dibenzofurans (dioxins/furans). Once soil with RL exceedances is excavated, a soil cover will be installed in order to minimize potential exposures to contamination. Any future development at a parcel which may disturb the soil cover will require Ecology approval prior to development.

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Certification

This document was prepared under my direction. The information submitted is, to the best of my knowledge and belief, true, accurate, and complete.

Christopher S. Waldron, P.E.
PIONEER Technologies Corporation
Washington P.E. Registration No. 52744

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List of Acronyms

Acronym	Explanation
bgs	Below Ground Surface
CAP	Cleanup Action Plan
City	City of Olympia
CL	Cleanup Level
COC	Constituent of Concern
cPAHs	Carcinogenic Polycyclic Aromatic Hydrocarbons
Dioxins/Furans	Chlorinated Dibenzo-p-Dioxins and Chlorinated Dibenzofurans
Ecology	Washington State Department of Ecology
ECs	Engineering Controls
EDR	Engineering Design Report
FS	Feasibility Study
GPS	Global Positioning System
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
IA	Interim Action
ICs	Institutional Controls
LOTT	Lacey, Olympia, Tumwater, and Thurston County Clean Water Alliance
MTCA	Model Toxics Control Act
MW	Monitoring Well
NPDES	National Pollutant Discharge Elimination System
OSHA	Occupational Safety and Health Act
PIONEER	PIONEER Technologies Corporation
POC	Point of Compliance
Port	Port of Olympia
QAPP	Quality Assurance Project Plan
RCW	Revised Code of Washington
RI	Remedial Investigation
RL	Remediation Level
SAP	Sampling and Analysis Plan
SEPA	State Environmental Policy Act
Site	East Bay Redevelopment Site
SPCC	Spill Prevention Control and Countermeasures
SWPPP	Stormwater Pollution Prevention Plan
TESC	Temporary Erosion and Sediment Control
TCP	Toxics Cleanup Program

Acronym	Explanation
TPH-D	Total Petroleum Hydrocarbons in the Diesel Range
TPH-G	Total Petroleum Hydrocarbons in the Gasoline Range
TPH-HO	Total Petroleum Hydrocarbons in the Heavy Oil Range
UECA	Uniform Environmental Covenants Act
WAC	Washington Administrative Code
WISHA	Washington Industrial Safety and Health Act
WSDOT	Washington State Department of Transportation

SECTION 1: INTRODUCTION

The purpose of this Engineering Design Report (EDR) is to present the design for performing cleanup activities at the Port of Olympia's (Port) East Bay Redevelopment Site (Site) per the Cleanup Action Plan (CAP) for the Site (PIONEER Technologies Corporation [PIONEER] 2016a; PIONEER 2016b). This EDR was prepared in accordance with Washington Administrative Code (WAC) 173-340-400(4)(a). The Remedial Investigation (RI)/Feasibility Study (FS) Report and the CAP for the Site were prepared pursuant to Agreed Order DE7830 and the cleanup implementation is being conducted pursuant to Agreed Order DE14072. The Port, City of Olympia (City), and Lacey, Olympia, Tumwater, and Thurston County Clean Water Alliance (LOTT) are potentially liable parties in Agreed Order DE7830 and Agreed Order DE14072. The design aspects in this report are intended to manage soil disturbances and infrastructure construction-excavation activities for the protection of human health and the environment under Model Toxics Control Act (MTCA) regulations. This EDR will be incorporated by reference into the Port's forthcoming plans and specifications. Ecology will be given an opportunity to review the Port's forthcoming plans and specifications.

The Site is located in Olympia, Washington, on the southwest corner of the East Bay of Budd Inlet (see Figure 1). Specifically, the Site is west of East Bay Drive and Marine Drive, east of Franklin Street, and North of State Avenue. The East Bay Redevelopment Project consists of seven parcels and a small area north of the seven parcels (Lot 1; see Figure 2). The Port currently owns five of the seven parcels (Parcels 2, 3, 6, 7, and 9) within the East Bay Redevelopment Project boundary. LOTT and the City purchased Parcel 4 and Parcel 5, respectively, from the Port in June 2010. Ecology concurs that the wetland features on Parcels 2 and 3 are the result of Ecology required stormwater management on Site and will not be regulated as wetlands (Habel 2016). Approval of this assessment will ultimately be determined by the United States Army Corps of Engineers (Habel 2016).

This report is organized as follows:

- Section 2: Site background, cleanup standards, and selected remedy for the Site are presented in this section.
- Section 3: CAP implementation activities are presented in this section.
- Section 4: References are presented in this section.

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SECTION 2: SELECTED REMEDY OVERVIEW

The purpose of this section is to (1) briefly describe the Site background, (2) present the cleanup standards established in the CAP, and (3) summarize the remedy selected for addressing impacts at the Site in accordance with the RI/FS and CAP (PIONEER 2016a; PIONEER 2016b).

2.1 Site Background

Constituents were released at this 14.8-acre MTCA Site via spills, buried refuse, and treated wood pilings during historical operations. The primary historical operations at the Site were lumber milling activities and related operations (lumber sawing, lumber milling, veneer manufacturing, and plywood manufacturing), which occurred from the late 1800s to 1972. Most of the Site is situated on land that was reclaimed using fill material that consists of sediment that was dredged from Budd Inlet as part of civic improvement projects beginning in the late 1800s. The last fill event, which created the current shoreline, occurred along the eastern boundary of the Site in 1982. The 1982 fill was imported from an upland rock quarry and was placed after historical operations. Site contamination is not present in 1982 fill, but is present in pre-1982 fill material as a result of historical Site operations.

Two interim actions (IAs) have been completed at the Site. The principal components of the IAs were (1) excavation and off-Site disposal of soil with constituent concentrations that exceeded soil remediation levels (RLs), (2) installation of a soil cap/cover, and (3) implementation of engineering controls (ECs) during cleanup and construction activities.

2.2 Soil Cleanup Standards

Soil cleanup standards for the Site were presented in the RI/FS and CAP (PIONEER 2016a; PIONEER 2016b).[1] The COCs, cleanup levels (CLs), RLs, and point of compliance (POC) depths presented in the RI/FS and CAP are summarized in the following table. The POC depth refers to the depth where COCs in soil must comply with CLs and RLs.

Soil Constituent of Concern	Soil Cleanup Level	Soil Remediation Level	Point of Compliance Depth (ft)
Arsenic	20 mg/kg	20 mg/kg	15
Lead	250 mg/kg	1,000 mg/kg	15
Total Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)	0.095 mg/kg	3.4 mg/kg	15
Dioxins/Furans	11 ng/kg	590 ng/kg	15
Total Petroleum Hydrocarbons in the Diesel and Heavy Oil Range (TPH-D and TPH-HO Combined)	4,700 mg/kg	24,000 mg/kg	15
Total Petroleum Hydrocarbons in the Gasoline Range (TPH-G)	100 mg/kg	100 mg/kg	4.5
Total Naphthalenes	5 mg/kg	5 mg/kg	4.5

[1]Soil is the only medium of concern at the Site.

2.3 Selected Remedy

The selected remedy for the Site includes targeted soil removal, soil cover, and controls (PIONEER 2016a; PIONEER 2016b). This remedy protects human health and the environment, employs reliable and proven technologies, and can be completed quickly (PIONEER 2016a; PIONEER 2016b). A conceptual schematic for the excavation, off-Site disposal, on-Site reuse, backfill, and soil cover cleanup action implementation is presented in Figure 3. The selected remedy for the Site includes the following remedial components:

- Soil sample locations DP04, MW24S, and DP06/SVP-2SO (where concentrations exceeded the RLs) will be excavated and disposed of at an off-Site facility permitted to receive such waste (e.g., Weyerhaeuser Regional Landfill in Castle Rock, Washington; see Figure 4). The DP04, MW24S, and DP06/SVP-2SO excavations will be backfilled using clean soil from an Ecology-approved off-Site, upland borrow source.
- A soil cover will be installed in the portions of the Site not covered by 1982 fill. The soil cover will consist of a permeable geotextile fabric and at least 12 inches of clean soil from an off-Site upland borrow source. During the IAs, a cap or soil cover was installed over the entire IA areas. Remaining areas that do not have a cap or soil cover will receive a soil cover as shown on Figure 5.[2] Any future development at a parcel which may disturb the soil cover will require Washington State Department of Ecology approval prior to development.
- Soil that is excavated to install the soil cover, and is geotechnically suitable for possible on-Site reuse, will be stockpiled on-Site on an impervious surface (e.g., concrete, asphalt, or polyethylene liner with a thickness of at least 10 mil). When a stockpile is left overnight or not in use, it will be covered with a polyethylene liner (at least 10 mil thick), which will be secured with ropes and sandbags.
- Soil excavated to install the soil cover will be sampled to determine the final disposition of the excavated soil. If any COC concentration in the stockpile characterization sample exceeds its RL, then that stockpile will be disposed of off-Site.[3] If all COC concentrations in the stockpile characterization samples are less than or equal to RLs, the stockpile can be reused on-Site beneath a soil cover.
- Institutional controls (ICs) and ECs will be implemented to minimize exposures for potential receptors (i.e., on-Site workers and trespassers). During construction activities, the Port will require Site developers and construction contractors to implement ECs (e.g., Site control measures, dust control measures, implementation of a Health and Safety Plan [HASP], and use of appropriately-trained workers). The ECs are presented in Section 3.7. In order to minimize exposures following construction activities, the Port, City, and LOTT will also implement and maintain ICs for perpetuity using an environmental covenant prepared in accordance with WAC 173-340-440 and Ecology's Toxics Cleanup Program (TCP) Procedure 440A, which will:
    - Prevent unplanned and unmitigated excavation of soil within the Site boundary.

[2]Note that a suitable cap or soil cover already exists in Parcel 4, Parcel 5, the infrastructure corridor, and the existing landscaped area located between the Marine Drive sidewalk and Marine Drive (east of Parcels 4 through 7).
[3]Soil that is geotechnically and chemically suitable for on-Site reuse, but for which there is no remaining reuse capacity, will also be disposed of off-Site.

- Require intrusive sub-surface soil work within the Site boundary to be implemented by appropriately-trained workers in accordance with a HASP.
- Prohibit installation of a well for water supply purposes within the Site boundary.
- Restrict extraction of groundwater within the Site boundary for any purpose other than temporary construction dewatering, investigation, monitoring, or remediation.
- Require that any groundwater extracted for any purpose within the Site boundary be considered potentially contaminated and any discharge of this water be done in accordance with state and federal law.
- Restrict construction of stormwater infiltration facilities or ponds within the contaminant delineation areas where the depth of these exceedances are shallower than the historical lowest measured groundwater depths for that location.[4]
- Require that all stormwater catch basins, conveyance systems, and other appurtenances be of water-tight construction within the contaminant delineation areas where the depth of these exceedances are shallower than the historical lowest measured groundwater depths for that location.[5]

- Compliance monitoring will include dust monitoring and qualitative EC assessments during remediation activities, excavation sidewall and bottom sampling, and long-term inspections of the cap, soil cover, and ICs.

[4]Unless the soil associated with the exceedance is removed as part of the cleanup.
[5]Unless the soil associated with the exceedance is removed as part of the cleanup.

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SECTION 3: IMPLEMENTATION OF THE CLEANUP ACTION

The purpose of this section is to provide a detailed description of the engineering design, which will be implemented during the cleanup action. Design plans and specifications will be produced by the Port.

3.1 Roles and Responsibilities

The cleanup action implementation team includes representatives from the Port, Ecology, PIONEER, and other to-be-determined organizations, contractors, and service providers. Table 1 presents anticipated cleanup implementation roles and responsibilities. This information will be updated as the project progresses.

3.2 Site Preparation

To prepare the Site for cleanup activities, several tasks need to be completed prior to the excavation of soil with RL exceedances and installation of the soil cover, including:

- Eighteen of the 28 Site-related monitoring wells (MWs) will be decommissioned as part of the cleanup action (see Figure 6). Ten of the 28 MWs were decommissioned during previous IAs (see Figure 6; PIONEER 2016a).
- Existing asphalt pads on the Site will be removed to prepare the Site for redevelopment (see Figure 6). Due to the TPH-G and total naphthalene RL exceedances at the location DP06/SVP-2SO, the asphalt pad at this location must be removed prior to soil excavation. The remaining asphalt pads will be removed prior to the installation of the soil cover.
- The 1982 fill boundary will be determined and staked using a Trimble GeoXH Global Positioning System (GPS) unit or equivalent. The location of Lot 1 will also be marked using a GPS unit. These boundary determinations will be performed by a professional survey crew before construction work begins at the site.
- The existing fill thickness along the 1982 fill boundary (the segments adjacent to the designated soil cover areas) will be confirmed by digging 1.5-foot deep holes centered at 50-foot intervals along the boundary (see Figure 7). The soil profile in these holes will be inspected and measurements taken to verify there is at least one foot (12 inches) of the visually distinct 1982 fill material intact at each test location. For any locations where there is not at least one foot of 1982 fill in place, an additional hole will be dug five feet away from the original hole, further (laterally) into the 1982 fill area. This process will continue, checking five feet further from the boundary each time, until a 1-foot 1982 fill depth is confirmed. The extent of the geotextile and gravel cover boundary would then be increased to ensure all locations will have at least one foot of fill or geotextile and gravel cover. This information will be documented in field notes and will be presented in the Cleanup Action Completion Report.
- A pre-construction topographical survey will be completed (as well as a later, post-construction topographical survey) to ensure the proper soil cover thickness will exist at the 1982 fill boundary. The new soil cover will extend one to two feet past the 1982 fill boundary and be tapered to meet the existing 1982 fill grade.
- The Site will be cleared and grubbed as necessary to prepare for the soil cover installation.

3.3 Soil RL Exceedance Excavation

To address the four remaining soil RL exceedances, three soil RL exceedance locations at the Site will be excavated during the cleanup action in accordance with this EDR and the SAP/QAPP, which is presented in Appendix A (see Figure 4):

RL Exceedance Location	Exceedance Depth (feet below ground surface [bgs])	Constituent(s)	Concentration	RL
DP04	4 – 6	Arsenic	52 mg/kg	20 mg/kg
MW24S	6.5 – 8	Total Dioxins/Furans	979 ng/kg	590 ng/kg
DP06	3 – 5	TPH-G	290 mg/kg	100 mg/kg
		Total Naphthalenes	142 mg/kg	5.0 mg/kg
SVP-2SO	4 – 6	TPH-G	1,100 mg/kg	100 mg/kg
		Total Naphthalenes	150 mg/kg	5.0 mg/kg

The soil surrounding each RL exceedance location will be excavated in an iterative manner, as necessary. The surface area dimensions of each initial excavation will be approximately 10 feet by 10 feet, centered on the location of the RL exceedance. A Trimble GeoXH GPS unit or equivalent will be used to determine the boundary of each initial excavation. The depths of the initial DP04, MW24S, and DP06/SVP-2SO excavations will be to 7 feet bgs, 9 feet bgs, and 4.5 feet bgs, respectively.[6] The total estimated quantity of soil from the initial excavations to be disposed of off-Site will be approximately 45 cubic yards.

3.3.1 Confirmation Sampling

Once each initial excavation is complete, confirmation samples will be collected in accordance with the SAP/QAPP (see Appendix A). One bottom and four sidewall soil samples (at the same depth as the RL exceedance) will be collected from the DP04 and MW24S excavations and four sidewall samples (at the same depth as the RL exceedance) will be collected from the DP06/SVP-2SO excavation (see Table A-1).[7] If excavation sidewalls need to be extended beyond 30 feet in length, then multiple sidewall samples will be collected. If the sidewall and bottom sampling results indicate that an excavation is not in compliance with RLs, the excavation will be expanded as necessary based on the confirmation sample results. Confirmation samples will be collected in order to confirm that the excavation is in compliance with RLs. If sampling results indicate that the excavation is still not in compliance with RLs, the excavation will continue to be expanded using the same process until compliance with RLs is achieved (based on additional sidewall/bottom soil sampling). Any excavation and soil sampling beyond the initial excavations will be conducted in consultation with the Ecology Site Manager. A Trimble GeoXH GPS unit

[6]The depth of the initial DP04 excavation of 7 feet bgs will be one foot beneath the bottom depth of the arsenic RL exceedance. The depth of the initial DP06/SVP-2SO excavation of 4.5 feet bgs will be the estimated depth of groundwater and the POC depth for this location. The depth of the initial MW24S excavation of 9 feet bgs is defined by the total dioxins/furans concentration in the soil samples collected from 9-10 feet bgs (0.000079 mg/kg), which was significantly less than the total dioxins/furans RL of 0.00059 mg/kg (PIONEER 2016a).

[7]A bottom sample will not be collected for DP06/SVP-2SO because the initial excavation depth will be the POC depth of 4.5 feet bgs.

or equivalent will be used to determine the final excavation boundaries and all sidewall/bottom sample locations.

3.3.2 Excavation Width

To the extent practicable, the DP04, DP06/SVP-2SO, and MW24S excavations will be cut vertically to minimize the overall size of the excavation. Due to the depth, the excavations may need additional preventative measures (e.g., sloping) per Occupational Safety and Health Act (OSHA) regulations (see HASP for details). Personnel and equipment will maintain a three-foot offset from the edge of each excavation for worker protection. However, if additional measures are necessary to stabilize excavation sidewalls for worker protection, the excavation sidewalls will be sloped or benched as appropriate to protect workers. If an excavation is sloped or benched, the smallest portion of the initial excavation surface area will be no smaller than approximately 10 feet by 10 feet.

3.3.3 Soil Segregation and Temporary Storage

Overburden soil[8] will be segregated, stockpiled, and reused on-Site in accordance with the SAP/QAPP (see Appendix A). Overburden stockpiled soil will be kept separate per excavation location. Overburden stockpiled soil will be managed using the procedures presented in the Stockpile Management and Procedures Plan, which is presented in Appendix B. The overburden soil for the initial DP04, DP06/SVP-2SO, and MW24S excavations will be the soil from 0-3 feet bgs, 0-2 feet bgs, and 0-4.5 feet bgs, respectively.[9]

Any temporary stockpiles generated during this process will be placed on an impervious surface (e.g., concrete, asphalt, or polyethylene liner with a thickness of at least 10 mil), and if left overnight, will be covered with a polyethylene liner (at least 10 mil thick), which will be secured with ropes and sandbags.

3.3.4 Groundwater Dewatering

Given the initial excavation depths and the typical depths to groundwater at the Site, it is expected that some groundwater will need to be removed from the excavation(s) using a pump in order to complete excavation activities. Any groundwater that is removed from these excavations will be temporarily stored in a large portable tank, pre-treated for suspended solids, and discharged to LOTT. If the wastewater cannot be disposed of at LOTT, it will be disposed of at an off-Site facility permitted to receive such waste.

[8]For the purposes of this cleanup implementation, overburden soil is defined as soil with concentrations below RLs located above RL exceedance locations.

[9]The arsenic concentration in a soil sample collected from 1-3 feet bgs at DP04 was 3.8 mg/kg, which was significantly less than the arsenic RL of 20 mg/kg (PIONEER 2016a). The soil from 0-2 feet bgs at DP06/SVP-2SO appeared to contain no contamination; this soil will be tested prior to possible on-Site reuse. The total dioxins/furans concentrations in soil samples collected from 1-2.5 feet bgs and 3-4.5 feet bgs at MW24S were 0.0000012 mg/kg and 0.0000061 mg/kg, respectively, which were significantly less than the total dioxins/furans RL of 0.000590 mg/kg.

3.3.5 *Reuse/Disposal*

Once an excavation is in compliance with RLs, it will be backfilled with the overburden soil generated and stockpiled from that excavation (as long as stockpile sampling results confirm that COC concentrations do not exceed the RL) and with clean soil from an off-Site upland borrow source approved by Ecology. The backfill will be compacted as necessary. For more details regarding sampling requirements for reuse of the overburden excavated soil, see Appendix A.

Excavated soil with concentrations exceeding RLs will be disposed of at an off-Site facility permitted to receive such waste (e.g., Weyerhaeuser Regional Landfill in Castle Rock, Washington).

3.4 Soil Cover

To limit potential soil exposure at the Site, a soil cover will be installed for the portions of Parcels 2, 3, 6, 7, and 9, and Lot 1 not covered with clean 1982 fill. The purpose of the soil cover is to minimize potential exposures in the portions of the Site with uncovered pre-1982 fill. A Trimble GeoXH GPS unit or equivalent and field measurements will be used to determine and mark the boundary of the clean 1982 fill in order to install the soil cover. The approximate locations where the soil cover will be installed are shown in Figure 5. The estimated surface area of the soil cover is approximately five acres. The soil cover being installed pursuant to the CAP will not include stormwater collection or treatment; therefore the soil cover cannot be used for permanent parking. However, the area with the soil cover may be used for periodic, overflow event parking. Three temporary catch basins are proposed in key areas of Parcels 2 and 3 where stormwater has historically run off due to extremely shallow groundwater and/or low permeability soil (some stormwater runoff is acceptable during extreme rain events). These catch basins will be connected to existing catch basins in the street. All stormwater catch basins, conveyance systems, and other appurtenances will be of water-tight construction. Once the soil cover is installed, stormwater run-off may leave the Site.

The soil cover will consist of a permeable geotextile fabric overlaid by a washed gravel. The geotextile will (1) serve as an indicator of the extent of clean soil during any potential future intrusive activities, (2) act as a supplemental exposure barrier to complement the soil cover, and (3) prevent mixing of the soil cover with existing soil. The clean gravel will provide a suitable exposure barrier for the soil. In accordance with the soil cover options presented in Figure 3, the soil cover may be constructed below existing grade or above existing grade. Soil immediately adjacent to sidewalks will be removed prior to the installation of the soil cover to keep soil cover grade flush with the sidewalks. Due to the relatively flat topography of the Site, the impact of the soil cover on slopes and drainage will be minimal. However, prior to the installation of the soil cover, soil will be removed from any areas on the Site that will be too high with the addition of the soil cover.

Additional requirements for the soil cover include:

- The thickness of the soil cover installed on above the geotextile will be a minimum of 12 inches.
- A Layfield LP200 geotextile fabric or approved equivalent geotextile fabric will be used (see Appendix C).

- The geotextile seams will overlap by at least one foot, and pins, staples, or other anchors will be used to secure the geotextile to the ground surface.
- The gravel soil cover will consist of clean aggregate material conforming to Washington State Department of Transportation (WSDOT) Specification 9-03.9(2) Permeable Ballast. The gravel will be obtained from an off-Site borrow source.
- The soil cover will consist of gravel with a 30% void ratio in order to provide enough storage capacity for peak rain events, but still be drivable for use as periodic overflow parking. This cover will also allow for the infiltration of stormwater.

Soil that is removed to install the soil cover, not associated with exceedance excavation, and has concentrations below RLs will be segregated, stockpiled, and sampled to confirm appropriateness for on-Site reuse in accordance with the SAP/QAPP (see Appendix A). If the soil stockpiles meet the criteria for clean soil as presented in the SAP/QAPP, the stockpiles will be reused on-Site, if needed. Ideally, most of the excavated soil will be reused on-Site in low-lying areas and open excavations. Stockpiled soil will be managed using the procedures presented in the Stockpile Management and Procedures Plan, which is presented in Appendix B. For more detail on how stockpiles will be managed, see the Stockpile Management and Procedures plan in Appendix B.

3.5 Engineering Controls during Construction

The Remediation Contractor will be required to implement ECs during cleanup activities (e.g., Site control measures, dust control measures, stormwater control measures, and HASP implementation). The following ECs will be implemented, as necessary, in conjunction with the ECs described in Sections 3.2 through 3.5.

3.5.6 Site Control

To limit public access to the Site, the perimeter fencing placed around Parcels 2, 3, 6, 7, and 9, and Lot 1 will be maintained and will remain in place until the soil cover is installed. The Port and/or Port contractors will control fencing access points during construction. In addition, traffic and pedestrian control measures will be implemented as necessary for public right-of-ways during construction. Once the soil cover has been installed, the temporary fencing will be removed from the Site and signage and barricades will be added to prevent parking at the Site.

3.5.7 Dust Control

To suppress dust during construction activities and eliminate visible dust, best management practices for dust control (e.g., misting/watering of dry soil) will be implemented as necessary in accordance with Ecology's Best Management Practices Standards and Specifications for Dust Control (Ecology 2012). However, misting/watering will not be conducted for stockpiles of potentially-contaminated material to minimize contaminant transport to stormwater (see also stockpile covering requirements in Appendix B). To prevent contaminated dirt from leaving the Site, designated construction entrances and wheel washes will be required.

Dust monitoring will also be conducted during the first week of soil excavation activities and the first week of the soil cover installation (see Appendix A). However, all respirable dust concentrations measured during the approximately two months of daily dust monitoring for the Infrastructure IA were more than an order of magnitude less than the Airborne Dust Action Level of 5 mg/m^3 (PIONEER 2010).

3.5.8 Stormwater Control

Generation of groundwater and stormwater during installation of the soil cover is not expected (Section 3.5). Even so, all groundwater or stormwater generated during cleanup activities will be handled in the same manner as the groundwater removed from the RL excavations (see Section 3.4).

To prevent untreated stormwater from leaving the Site before excavation activities and the installation of the soil cover are complete, best management practices for construction stormwater will be implemented as necessary.

3.5.9 Spill Control

To prevent equipment oil/fuel spills, all contractors using heavy equipment will have a spill kit available on-Site and take necessary measures during construction activities. Any release to the environment will be completely remedied to the Port's and Ecology's satisfaction by the contractor responsible for the spill.

3.6 Required Permits

Potentially applicable or potentially relevant and appropriate requirements associated with non-MTCA environmental laws and regulations to be considered for remedy implementation include:

- State Environmental Policy Act (SEPA) as authorized by the RCW 43.21C and WAC 197-11.
- Occupational Safety and Health Act and Washington Industrial Safety and Health Act regulations (29 Code of Federal Regulations 1910.120; WAC 296-843).
- Washington Industrial Safety and Health Act, Chapter 49.17 RCW, Safety Standards for Construction Work (WAC 296-155).
- Underground Utilities, RCW 19.122.010, General Protection Requirements (WAC 296-155-655).
- Coverage under the general construction stormwater National Pollution Discharge Elimination System (NPDES) permit. The Remediation Contractor will prepare a Temporary Erosion and Sediment Control (TESC) plan, SWPPP, and Spill Prevention Control and Countermeasures (SPCC) plan as necessary in accordance with the NPDES permit.
- City permit requirements (e.g., grading permit).[10]
- LOTT discharge authorization permit to dispose of wastewater generated during the cleanup action (e.g., from dewatering).
- Chapter 173-160 WAC requirements to decommission all remaining Site MWs prior to any remediation construction activities. A licensed driller will submit a notice of intent to Ecology's Water Resources Program prior to decommissioning the MWs. Resource Conservation and

[10]City permits will likely be required to construct permanent structures on Parcels 2 and 3. It is beyond the scope of this EDR to discuss the City permitting requirements associated with construction of those structures.

Recovery Act regulations for waste generation, hauling, and disposal (WAC 173-303; WAC 173-350).

- Solid Waste Management Chapter 43.21 RCW, Minimum Functional Standards for Solid Waste Handling (WAC 173-304).

3.7 Pre-Mobilization Coordination

Pre-mobilization coordination activities will include, but are not limited to, the following:

- Addressing any overlapping health and safety issues with the Project Team.
- Communicating the project schedule with the Project Team.
- Notifying Ecology about the anticipated field schedule at least five working days prior to the scheduled start of the cleanup activities.
- Performing a utility locate prior to each excavation activity.
- Communicating with the laboratory about the laboratory requirements included in the SAP/QAPP (see Appendix A).
- Communicating with the off-Site waste disposal facility regarding the acceptance of Site solid waste.
- Coordinating with the appropriate wastewater facility (e.g., LOTT) regarding the acceptance of any stormwater and groundwater discharged to that facility.

3.8 Schedule

The schedule is presented in the Agreed Order.

3.9 Compliance Monitoring

The compliance monitoring plan for the Site was developed in accordance with the requirements of WAC 173-340-410. Three types of compliance monitoring are defined in WAC 173-340-410: (1) protection monitoring, (2) performance monitoring, and (3) confirmational monitoring. The application of each type of compliance monitoring during cleanup activities is described below. Compliance monitoring includes qualitative EC assessments during remediation construction activities, excavation sidewall and bottom sampling, dust monitoring, stockpile sampling, and long-term inspections of the soil cover and ICs. The Port and PIONEER will implement the compliance monitoring plan. The applicable sampling, analyses, and quality assurance/quality control details associated with the compliance monitoring plan are presented in the SAP/QAPP (see Appendix A).

3.9.1 Protection Monitoring

The purpose of protection monitoring per WAC 173-340-410(1)(a) is to "confirm that human health and the environment are adequately protected" during cleanup activities. Even though dust monitoring data collected at the Site during the Infrastructure IA indicated it was likely that dust levels produced during future construction activities would be at acceptable levels, airborne dust monitoring with a particulate-matter field monitor will be conducted during cleanup activities as described in the SAP/QAPP (see Appendix A; PIONEER 2010).

3.9.2 Performance Monitoring

The purpose of performance monitoring per WAC 173-340-410(1)(b) is to "confirm that the interim action or cleanup action has attained cleanup standards and, if appropriate, remediation levels or other performance standards." The following performance monitoring will be conducted during cleanup activities per the SAP/QAPP (see Appendix A):

- Sidewall and bottom soil samples will be collected from the DP04 and MW24S RL soil excavations as discussed in Section 3.4.
- Sidewall samples will be collected from the DP06/SVP-2SO RL soil excavation as discussed in Section 3.4.
- Soil samples will be collected from stockpiles of overburden soil generated during the DP04, DP06/SVP-2SO, and MW24S RL soil excavations as discussed in Section 3.4.
- Soil samples will be collected from soil stockpiles generated during soil cover installation and designated for possible reuse as discussed in Section 3.5.

3.9.3 Confirmational Monitoring

The purpose of confirmational monitoring per WAC 173-340-410(1)(c) is to "confirm the long-term effectiveness of the interim action or cleanup action once cleanup standards and, if appropriate, remediation levels or other performance standards have been attained." Long-term monitoring will confirm that the soil cap/covers are continuing to provide a suitable exposure barrier prior to redevelopment activities. The details of the monitoring will be included in the Long-term Monitoring Plan. The Port or PIONEER will document each annual monitoring event and provide a copy of the documentation to Ecology. Qualitative EC assessments during redevelopment construction activities and long-term inspections of the soil cover and ICs are considered part of long-term compliance monitoring and will be included in the forthcoming Operations and Maintenance Plan.

3.10 Health and Safety Plan

PIONEER will lead the MW decommissioning and RL exceedances soil removals. PIONEER will also provide a supporting role during the installation of the soil cover. The HASP for PIONEER's and its subcontractors' cleanup activities is presented in Appendix D.

Because the Site is regulated under MTCA and construction activities related to soil excavation, soil cover installation, and redevelopment are being conducted, hazardous waste operation regulations promulgated under the OSHA and Washington Industrial Safety and Health Act (WISHA) are applicable (see WAC 173-340-810 and WAC 246-843-100). As a result, the Remediation Contractor, who will perform excavation and construction work and install the soil cover, will need to prepare and implement their own HASPs specific to the activities they will be conducting. In addition, Hazardous Waste Operations and Emergency Response (HAZWOPER) trained construction workers will perform soil-related work in accordance with WAC 296-843-200. Once a soil cover is installed, the Site will be protective of human health and the environment and HAZWOPER training will not be required of workers on the Site who will not come into contact with soil deeper than one foot bgs (e.g., landscapers,

office workers, residents). HAZWOPER training will be required for any workers who are performing subsurface work (e.g., utility workers).

3.11 Cleanup Action Completion Report

Once excavation activities and the soil cover installation are completed, a Cleanup Action Completion report will be produced in order to document these cleanup implementation activities.

3.12 Institutional Controls

The ICs are a critical component of the cleanup activities. The Port, City, and LOTT will implement and maintain the ICs using an environmental covenant developed in accordance with WAC 173-340-440 and Ecology's TCP Procedure 440A. Specifically, the environmental covenant will:

- Prevent unplanned and unmitigated excavation of soil within the Site boundary.
- Require intrusive sub-surface soil work within the Site boundary to be implemented by HAZWOPER-trained workers in accordance with a HASP.
- Prohibit installation of a well for water supply purposes within the Site boundary.
- Restrict extraction of groundwater within the Site boundary for any purpose other than temporary construction dewatering, investigation, monitoring or remediation.
- Require that any groundwater extracted for any purpose within the Site boundary be considered potentially contaminated and any discharge of this water be done in accordance with state and federal law.
- Restrict construction of stormwater infiltration facilities or ponds within the contaminant delineation areas where the depth of these exceedances are shallower than the historical lowest measured groundwater depths for that location.[11]
- Require that all stormwater catch basins, conveyance systems, and other appurtenances be of water-tight construction within the contaminant delineation areas where the depth of these exceedances are shallower than the historical lowest measured groundwater depths for that location.[12]

The ICs will be implemented using an environmental covenant in accordance with WAC 173-340-440. Specifically, per WAC 173-340-440(8)(a), the ICs "shall be described in a restrictive covenant on the property. The covenant shall be executed by the property owner and recorded with the register of deeds for the county in which the site is located. This restrictive covenant shall run with the land, and be binding on the owner's successors and assigns." The environmental covenant will be based on Ecology's template for environmental covenants. Once signed, the environmental covenant will be recorded in Thurston County in accordance with Uniform Environmental Covenants Act (UECA) requirements in the Revised Code of Washington (RCW) Chapter 64.70.080(1). A copy of the recorded environmental covenant will also be distributed to each person signing the covenant, each person holding a recorded interest in the real property subject to the covenant, each person in possession of

[11]Unless the soil associated with the exceedance is removed as part of the cleanup.
[12]Unless the soil associated with the exceedance is removed as part of the cleanup.

the real property subject to the covenant at the time the covenant is executed, the City, and Ecology per UECA requirements in RCW Chapter 64.70.070(1).

An Operations and Maintenance Plan (e.g., roles and responsibilities, a land use inspection form), which will be used for long-term monitoring of the ICs and soil cover, will be prepared once the soil RL exceedances are removed and the soil cover is installed.

SECTION 4: REFERENCES

Ecology 2012. "BMP C140: Dust Control" in Stormwater Management Manual for Western Washington: Volume II Construction Stormwater Pollution Prevention, August.

Habel, D 2016. "Re: Wetland Assessment for Port of Olympia Property." Message to Troy Bussey. August 19.

PIONEER 2010. Infrastructure Interim Action Report for East Bay Redevelopment Site, June.

PIONEER 2016a. Remedial Investigation/Feasibility Study Report, East Bay Redevelopment Site, December.

PIONEER 2016b. Cleanup Action Plan, East Bay Redevelopment Site, December.

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Figures

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Legend

Site Boundary

0 500 1,000 1,500 Feet

PIONEER TECHNOLOGIES CORPORATION

Vicinity Map
Engineering Design Report for Cleanup Implementation
East Bay Redevelopment Site

Figure 1

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Legend

- Site Boundary
- Parcel Boundaries
- Sidewalk
- Soil Removal
- Completed Soil Cap
- Completed Soil Cover

0 100 200 300 Feet

PIONEER TECHNOLOGIES CORPORATION

Completed Interim Actions
Engineering Design Report for Cleanup Implementation
East Bay Redevelopment Site

Figure 2

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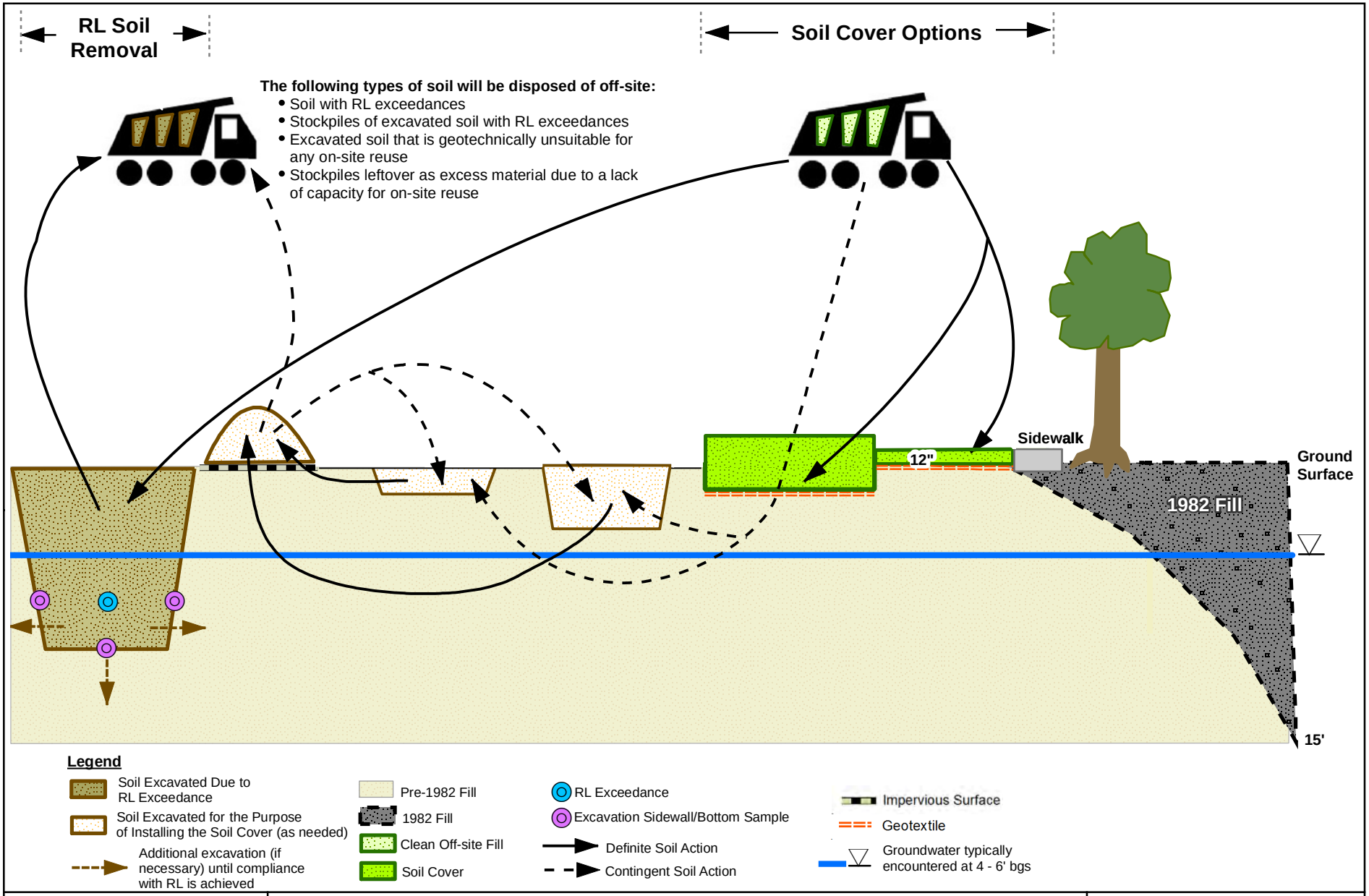

PIONEER TECHNOLOGIES CORPORATION

Conceptual Schematic for Targeted Soil Removal and Soil Cover
Engineering Design Report for Cleanup Implementation
East Bay Redevelopment Site

Figure 3

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Legend

- Soil Removal
- Temporary Gravel Ramp
- Site Boundary

0 50 100 200 300
Feet

PIONEER TECHNOLOGIES CORPORATION

Soil Excavation Locations
Engineering Design Report for Cleanup Implementation
East Bay Redevelopment Site

Figure 4

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Legend

- Completed Interim Actions
- 1982 Fill
- Sidewalk
- Parcel Boundaries
- Site Boundary
- Soil Cover

0 100 200 300 Feet

PIONEER TECHNOLOGIES CORPORATION

Soil Cover Locations
Engineering Design Report for Cleanup Implementation
East Bay Redevelopment Site

Figure 5

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Legend

- Already Decommissioned
- To Be Decommissioned
- Asphalt Pads(1)
- Site Boundary

Notes:
(1) Asphalt pads will be removed prior to the installation of the soil cover.

0 50 100 200 300
Feet

PIONEER TECHNOLOGIES CORPORATION

Site Preparation Activities
Engineering Design Report for Cleanup Implementation
East Bay Redevelopment Site

Figure 6

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Completed Interim Actions

1982 Fill

Sidewalk

Parcel Boundaries

Site Boundary

Soil Cover

Approximate Hole Locations (50-ft Center Intervals, Typ.)

1982 Fill Boundary (Adjacent to Soil Cover)

0 100 200 300 Feet

PIONEER TECHNOLOGIES CORPORATION

Investigative Hole Locations Along 1982 Fill Boundary
Engineering Design Report for Cleanup Implementation
East Bay Redevelopment Site

Figure 7

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Tables

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Table 1: Project Roles and Responsibilities

Project Role	Contact Name, Phone Number, and Email	Project Responsibilities
Port Engineering Director	Bill Helbig, P.E. (360) 528-8022 BillH@portolympia.com	Communication and coordination with Port Executive Director and Port engineering staff.
Port Environmental Program Manager	Rachael Jamison (360) 528-8020 Rachaelj@portolympia.com	Overall environmental management of project. Communication and coordination with Ecology and Port Executive Director.
Ecology Site Manager	Steve Teel, L.H.G. (360) 407-6247 stee461@ecy.wa.gov	Regulatory review and approval of EDR. Complete public notification requirements.
PIONEER Project Manager	Chris Waldron, P.E. (360) 570-1700 waldronc@uspioneer.com	Prepare EDR. Provide cleanup implementation oversight support in accordance with existing contract. Support primary organization(s) conducting oversight for environmental soil issues related to implementation of this EDR. Implement CMP, SAP, and QAPP.
Remediation Contractor	To be determined	
Analytical Laboratory	Anatek Labs, Inc. and Pace Analytical Services	Analyze soil samples and conduct laboratory QC.
Solid Waste Disposal Facility	Off-Site Facility Permitted to Receive Solid Waste (e.g., Weyerhaeuser Regional Landfill in Castle Rock, WA)	Permitted facility for disposal of off-Site solid waste.
Material Supplier	To be determined	
Wastewater Disposal Facility	Off-Site Facility Permitted to Receive Wastewater (e.g., LOTT)	Permitted facility for disposal of off-Site wastewater.

Notes:

CMP: Compliance Monitoring Plan

RCRA: Resource Conservation and Recovery Act

QC: Quality Control

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Appendix A: Sampling and Analysis Plan/Quality Assurance Project Plan

East Bay Redevelopment Site
Olympia, Washington

Facility/Site No. 5785176

Prepared for:

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Olympia, WA 98501

City of Olympia
P.O. Box 1967
Olympia, WA 98507-1967

LOTT Clean Water Alliance
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June 2017

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Figures

Tables

Attachments

Attachment A-1: PIONEER Field Forms

List of Acronyms

Acronym	Explanation
bgs	Below Ground Surface
CFR	Code of Federal Regulations
CL	Cleanup Level
COC	Constituent of Concern
cPAHs	Carcinogenic Polycyclic Aromatic Hydrocarbons
Dioxins/Furans	Total Chlorinated Dibenzo-p-dioxins and Chlorinated Dibenzofurans
Ecology	Washington State Department of Ecology
EDR	Engineering Design Report
PIONEER	PIONEER Technologies Corporation
POC	Point of Compliance
PPE	Personal Protective Equipment
PQL	Practical Quantitation Limit
QAPP	Quality Assurance Project Plan
QC	Quality Control
RL	Remediation Level
SAP	Sampling and Analysis Plan
Site	East Bay Redevelopment Site
TPH-D	Total Petroleum Hydrocarbons in the Diesel Range
TPH-G	Total Petroleum Hydrocarbons in the Gasoline Range
TPH-HO	Total Petroleum Hydrocarbons in the Heavy Oil Range
WAC	Washington Administrative Code
USEPA	United States Environmental Protection Agency

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SECTION 1: SAMPLING AND ANALYSIS PLAN

1.1 Purpose

The purpose of this Sampling and Analysis Plan (SAP) is to present the methodology for collecting and analyzing samples associated with soil excavation and soil cover installation activities at the East Bay Redevelopment Site (Site) pursuant to this Engineering Design Report (EDR). The work addressed in this SAP is being conducted in accordance with Washington Administrative Code (WAC) 173-340-820 and the Washington State Department of Ecology (Ecology) guidance (Ecology 1995).

PIONEER Technologies Corporation (PIONEER) has developed and will implement this SAP on behalf of the Port of Olympia (Port). A soil SAP summary is presented in Table A-1, and the soil RL exceedance locations are displayed on Figure A-1.

1.2 Roles and Responsibilities

The cleanup action implementation team includes representatives from the Port, Ecology, PIONEER, and other to-be-determined organizations, contractors, and service providers. Table A-2 shows anticipated EDR implementation roles and responsibilities. This information will be updated as the project progresses.

1.3 Excavation Sidewall and Bottom Soil Sampling

Soil excavation and removal will be conducted at three soil RL exceedance locations: DP04, DP06/SVP-2SO, and MW24S. Each initial excavation will be approximately 10 feet in width and 10 feet in length, centered on the location of each RL exceedance. The initial depths for each excavation location are discussed below in Sections 1.3.1, 1.3.2, and 1.3.3. Once an excavation has been completed, confirmation sampling will be performed in order to ensure that RL exceedances in soil have been removed. Sidewall samples will be collected from three soil RL exceedance locations to confirm that the RL exceedances have been removed, along with bottom samples from two of the three locations (DP04 and MW24S). No bottom sample will be collected from DP06/SVP-2SO because the contaminant excavation will extend to the point of compliance (POC) depth (Ecology 2013). Samples will be collected as non-sieved, grab samples from the excavator bucket. If confirmation sidewall sampling results show that RL exceedances still exist at an excavation location, the excavation will be expanded by at least 5 feet in width and 5 feet in length. If confirmation bottom sampling results show that RL exceedances still exist at an excavation location, the excavation will be expanded by 2-5 feet in depth. Confirmation sampling will again be performed to confirm that RL exceedances have been removed. The number of additional sidewall and bottom samples associated with the expansion of an excavation location will be determined in consultation with the Ecology Site Manager. This sampling and excavation process will be continued until all RL exceedances are removed from each excavation location. The samples that will be collected at each excavation are described in the following sections.

1.3.1 RL Exceedance at Sample Location DP04

To address arsenic RL exceedances at sample location DP04, soil will be excavated as described in the EDR, and then four sidewall soil samples and one bottom soil sample will be collected from 4-6 feet below ground surface (bgs) and 7 feet bgs, respectively (see Figure A-2). These sidewall and bottom samples will be analyzed for arsenic by United States Environmental Protection Agency (USEPA) Method SW846-6010 or 6020.

1.3.2 RL Exceedance at Sample Location DP06/SVP-2SO

To address total petroleum hydrocarbons (TPH) in the gasoline range (TPH-G) and total naphthalene RL exceedances at sample location DP06/SVP-2SO, soil will be excavated as described in the EDR, and then four sidewall soil samples will be collected from 3 feet bgs to 4.5 bgs (see Figure A-3). These sidewall samples will be analyzed for TPH-G by Ecology Method NWTPH-Gx and for total naphthalenes by USEPA Method SW846-8270D.

1.3.3 RL Exceedance at Sample Location MW24S

To address total chlorinated dibenzo-p-dioxins and chlorinated dibenzofurans (dioxins/furans) RL exceedances at sample location MW24S, soil will be excavated as described in the EDR, and then four sidewall soil samples and one bottom soil sample will be collected from 6.5-8 feet bgs will be collected at 9 feet bgs, respectively (see Figure A-4). These samples will be analyzed for dioxins/furans by USEPA Method SW846-8290.

1.4 Soil Sampling for Overburden Stockpiles from RL Excavations

Soil samples will be collected from overburden stockpiles generated during the excavation activities. The number of samples that will be collected from the overburden stockpiles will be based on stockpile size (see Table A-3). One overburden stockpile will be generated for each of the excavations (i.e., one overburden stockpile will be generated from the DP04 excavation, one overburden stockpile will be generated from the MW24S excavation, and one overburden stockpile will be generated from the DP-06/SVP-2SO excavation). Samples will be collected using stainless steel hand tools (e.g., hand trowel). The overburden stockpile sample(s) for the DP04 excavation will be analyzed for arsenic by USEPA Method SW846-6010 or 6020. The overburden stockpile sample(s) for the DP-06/SVP-2SO excavation will be analyzed for both TPH-G and total naphthalenes by Ecology Method NWTPH-Gx and USEPA Method SW846-8270D, respectively. The overburden stockpile sample(s) for the MW24S excavation will be analyzed for dioxins/furans by USEPA Method SW846-8290.

1.5 Soil Sampling for Stockpiles Generated During Soil Cover Installation

Soil samples will be collected from the soil stockpiles generated during excavation activities pursuant to the soil cover installation.[1] These samples will be collected at the sampling frequencies shown in Table

[1]The gravel of the temporary ramp in Parcel 7 does not need to be sampled prior to reuse because it is clean gravel.

A-3 to determine if this soil can be reused on-Site. Each stockpile sample will be collected using stainless steel hand tools (e.g., hand trowel) and will be analyzed for:

- Arsenic by USEPA Method SW846-6010 or 6020
- Carcinogenic polycyclic aromatic hydrocarbons (cPAHs) by USEPA Method SW846-8270D
- Dioxins/furans by USEPA Method SW846-8290
- Lead by USEPA Method SW846-6010 or 6020
- Total petroleum hydrocarbons (TPH) in the diesel range (TPH-D) and the heavy oil range (TPH-HO) by Ecology Method NWTPH-Dx
- TPH-G by Ecology Method NWTPH-Gx
- Total naphthalenes by USEPA Method SW846-8270D

1.6 Sample Containers, Preservation, and Holding Times

New, clean sample containers will be provided by the analytical laboratory for all analyses. Table A-4 presents the appropriate sample containers, preservation, and holding times for the analyses included in this SAP. Sample containers will be filled until almost full in order to provide the laboratory with a sufficient sample volume for analysis.

1.7 Sample Labeling, Handling, and Shipment

All samples will be identified by a unique sample designation that includes the sample media, sample location name, sample date, and sample depth. The sample designation nomenclature will be in the form of: {sample media}-{sample location name}-{sample date}-{sample depth top}-{sample depth bottom}-{type code, if necessary}.

The sample media is a two character code that uniquely identifies each medium (e.g., SO for soil, EB for equipment rinsate blank). The sample location name uniquely identifies each sampling location and has two parts separated by a dash: the first part contains both the Site ID and a two-letter location type (e.g., SP for stockpile sample, SW for excavation sidewall sample, BO for excavation bottom sample) followed by a unique, sequential two-digit number. Sample date is in the format of month, day, and year (i.e., MMDDYY). Sample depth top is the top of the sample interval in feet below stockpile or ground surface (e.g., 0.5). Sample depth bottom is the bottom of the sample interval in feet below stockpile or ground surface (e.g., 1). A type code of (01) is used for field duplicates. The following table presents examples of complete sample designations:

Sample Number	Explanation of Sample Schema
SO-DP04SW-09-062217-4-6	Soil sidewall sample #9 collected from the DP04 soil excavation on June 22, 2017 from a depth of 4 to 6 feet below ground surface.
SO-MW24SBO-06-062217-9	Soil bottom sample #6 collected from the MW24S soil excavation on June 22, 2017 from a depth of 9 feet below ground surface.
SO-DP06SP-05-062217-0.5-1	Soil stockpile sample #5 collected from a stockpile associated with the DP06/SVP-2SO soil excavation on June 22, 2017 from a depth of 0.5 to 1 foot below the stockpile surface.
SO-DP06SP-05-062217-0.5-1-(01)	Duplicate of above soil sample from the stockpile associated with the DP06/SVP-2SO

soil excavation.

Sample packaging and shipping procedures are based on USEPA specifications and United States Department of Transportation regulations as specified in 49 Code of Federal Regulations (CFR) 173.6 and 49 CFR 173.24. All samples will be shipped as environmental samples, not as hazardous materials. Samples will be shipped via express delivery to the laboratory as soon as reasonably possible after samples have been collected using PIONEER standard operating procedures for packing and shipping.

1.8 Chain-of-Custody Documentation

Chain-of-custody procedures will be employed to document sample possession. A sample is considered under a person's custody if it is in that person's physical possession, within visual sight of that person after taking physical possession, secured by that person so that the sample cannot be tampered with, or secured by that person in an area that is restricted to unauthorized personnel.

The originator (the sampler) will fill in all requested information on the custody record and will sign and date the record in the first "relinquished by" box. Original signed custody records listing the samples in the cooler will accompany all shipments of samples (note: it is possible that more than one custody form will be needed per cooler to list all the samples contained in the cooler). The originator of the custody record will keep the bottom copy.

1.9 Equipment Decontamination Procedures

Non-dedicated sampling equipment (including the excavator bucket) to be reused at multiple sample locations will be decontaminated in accordance with the following procedures:

- All non-dedicated equipment will be cleaned before use.
- A hand brush and a hand sprayer containing potable water with diluted detergent (e.g., Liquinox) will be used to clean the affected portions of non-dedicated equipment following use at each monitoring location.
- The affected portions of non-dedicated equipment will be sufficiently rinsed with potable water after cleaning.
- Gloves will be changed before working at each sampling location.

1.10 Investigation-Derived Waste

All decontamination water generated during sampling will be contained for off-site disposal, pre-treated for suspended solids, and discharged to LOTT wastewater treatment plant, pending approval. Disposable PPE (e.g., nitrile gloves) and other general garbage will be disposed of as part of the normal solid waste stream.

1.11 Airborne Dust Monitoring

Airborne dust monitoring will be conducted during soil excavation activities and soil cover installation activities. Real-time monitoring will be conducted each work day for the duration of the work day at one reasonable maximum exposure sample location (e.g., next to heavy equipment operators). Each work day may have a different monitoring location depending on the nature of work being conducted that day. A calibrated MIE personal DataRAM model pDR-1000 dust monitor or equivalent field meter

will be used to measure the amount of respirable dust (i.e., particles less than 10 microns in diameter) in the air. The respirable dust measurements will be logged throughout the day. The field meter will be configured to collect measurements approximately every minute and to emit an alarm if a concentration exceeds the Site's Airborne Dust Action Level of 5 mg/m^3 (PIONEER 2009; PIONEER 2010). The Airborne Dust Action Level is the more stringent of (1) the permissible exposure limit for the respirable fraction of nuisance dust of 5 mg/m^3 per WAC 296-841-20025 (PIONEER 2010) and (2) the dust concentration (18 mg/m^3) that is protective of human health based on Site soil concentrations (PIONEER 2009).

Airborne dust monitoring will be conducted during all soil excavation activities and the first week of the soil cover installation. If the time-weighted averages of all daily dust measurements do not exceed the Airborne Dust Action Level during this period, then airborne dust monitoring will be discontinued for the remainder of the construction of the soil cover. If the time-weighted average of the daily dust measurements for any day exceeds the Airborne Dust Action Level, then airborne dust monitoring will be continued for the construction of the soil cover.

1.12 Field Recordkeeping

PIONEER will utilize the following forms to document this investigation: Field Checklist and Daily Field Report. The Field Checklist is designed to assist with planning and coordinating field activities prior to a field event. The Daily Field Report is used to document field activities on a daily basis. A copy of each form is included in Attachment A-1.

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SECTION 2: QUALITY ASSURANCE PROJECT PLAN

2.1 Purpose

The purpose of this Quality Assurance Project Plan (QAPP) is to provide methodology for evaluating whether or not sampling and analysis procedures will produce data of acceptable quality. This QAPP was prepared in accordance with WAC 173-340-820 and Ecology guidance (Ecology 2004). Some contents of a typical standalone QAPP are not included in this QAPP if they were included in the SAP or EDR.

2.2 Field Quality Control Samples

Field quality control (QC) samples will include field duplicates and an equipment rinsate blank (see Table A-1). Field duplicate samples will be collected at a frequency of approximately one duplicate per 20 primary soil samples. Field duplicate samples will be collected at random locations selected by the field sampling team. One equipment rinsate blank will be collected for the project. The equipment rinsate blank will be collected by pouring deionized water on non-dedicated soil sampling equipment following its decontamination.

2.3 Laboratory Quality Control

The analytical laboratory for this project will be responsible for conducting laboratory QC procedures and reporting laboratory QC results in accordance with laboratory standard operating procedures. It is expected that, at a minimum, the laboratory will perform and report a method blank, blank spike, matrix spike, and matrix spike duplicate once per batch of analyses. Laboratory control limits for acceptable spike recoveries and the relative percent differences on spike duplicates are shown in Table A-5. Also, it is expected that the laboratory will perform and report surrogate recovery results for all analytes except metals. Control limits for acceptable surrogate percent recoveries are also shown in Table A-5.

2.4 Practical Quantitation Limit

Table A-6 presents a comparison of Cleanup Levels (CLs) and RLs with target practical quantitation limits (PQLs) for each COC. The target PQLs are less than CLs and RLs. Thus, it is expected that the project will be able to achieve soil PQLs of appropriate sensitivity.

2.5 Data Quality Review

The overall data quality will be reviewed by PIONEER to determine the appropriateness of the project-related data. Project data and quality assurance/QC data (i.e., field QC results, lab QC results, actual PQLs, and holding times) will be evaluated in terms of precision, accuracy, representativeness, comparability, completeness, and sensitivity. Results of this evaluation will be summarized in the Cleanup Action Completion Report. Corrective action for field or laboratory procedures will be conducted as necessary in consultation with Ecology.

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SECTION 3: REFERENCES

Ecology. 1995. Guidance on Sampling and Data Analysis Methods, January.

Ecology. 2004. Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies, July.

Ecology. 2013. Letter from Steve Teel to Alexandra Smith, Jay Burney, and Eric Hielema with title of "Ecology Comments on the Response to Comments on (1) Interim Action Work Plan for the Remaining Portions of the East Bay Redevelopment Site, and (2) Evaluation of the Potential Soil-to-Indoor Air Pathway for TPH-G, East Bay Redevelopment Site," December 16.

PIONEER 2009. Port of Olympia East Bay Site: Interim Action Work Plan, May.

PIONEER 2010. Infrastructure Interim Action Report for East Bay Redevelopment Site, June.

PIONEER 2016. Remedial Investigation/Feasibility Study Report for East Bay Redevelopment Site, December.

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Figures

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Legend

- Parcel Boundaries
- Site Boundary
- Soil Removal

0 100 200 300 Feet

PIONEER TECHNOLOGIES CORPORATION

Initial Soil Excavation Locations
Engineering Design Report for Cleanup Implementation
East Bay Redevelopment Site

Figure A-1

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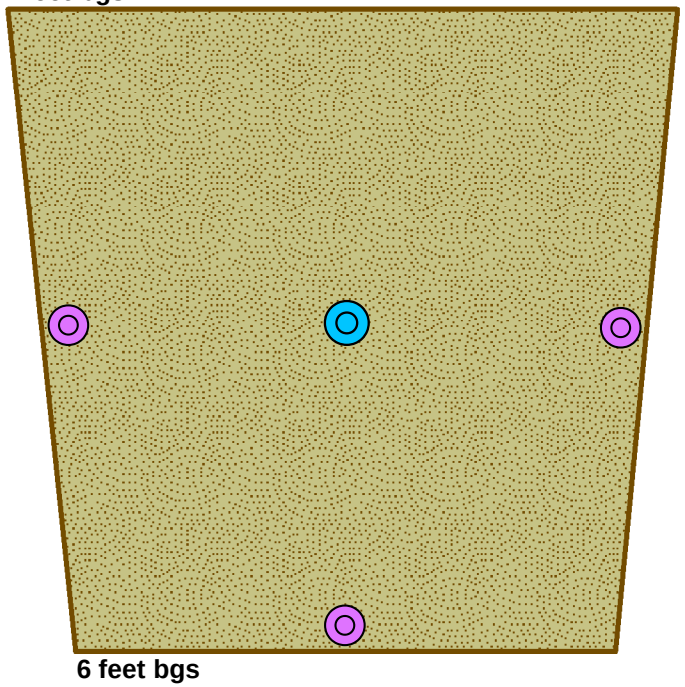
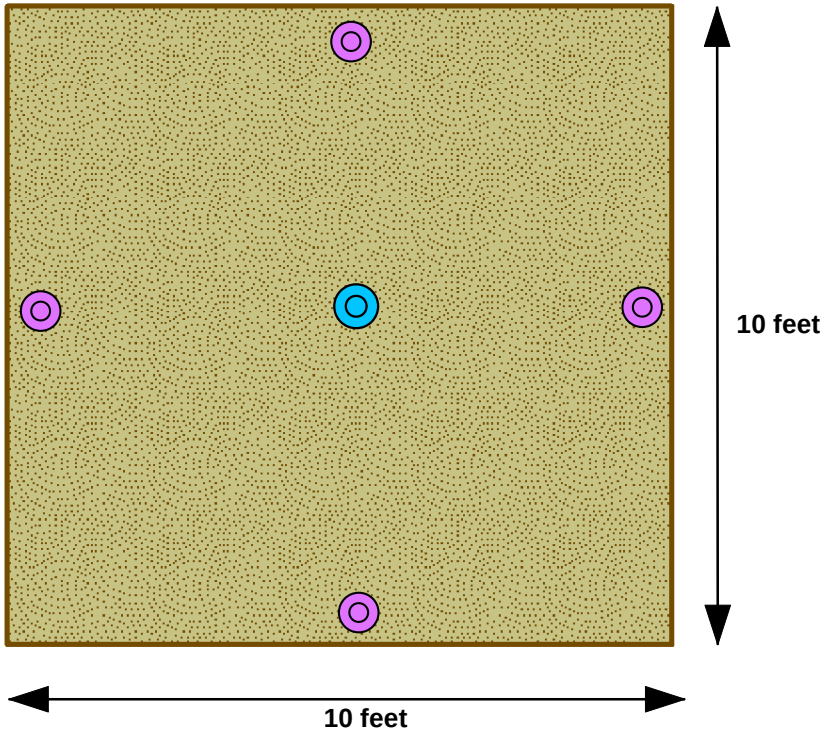
Side View of Sample Locations



Top View of Sample Locations



Legend

- Soil Excavated Due to RL Exceedance
- RL Exceedance
- Post-Excavation Sidewall/Bottom Sample

Notes:
-This conceptual diagram is not to scale.

PIONEER TECHNOLOGIES CORPORATION

Soil Excavation and Confirmation Sampling Locations at DP04
Engineering Design Report for Cleanup Implementation
East Bay Redevelopment Site

Figure A-2

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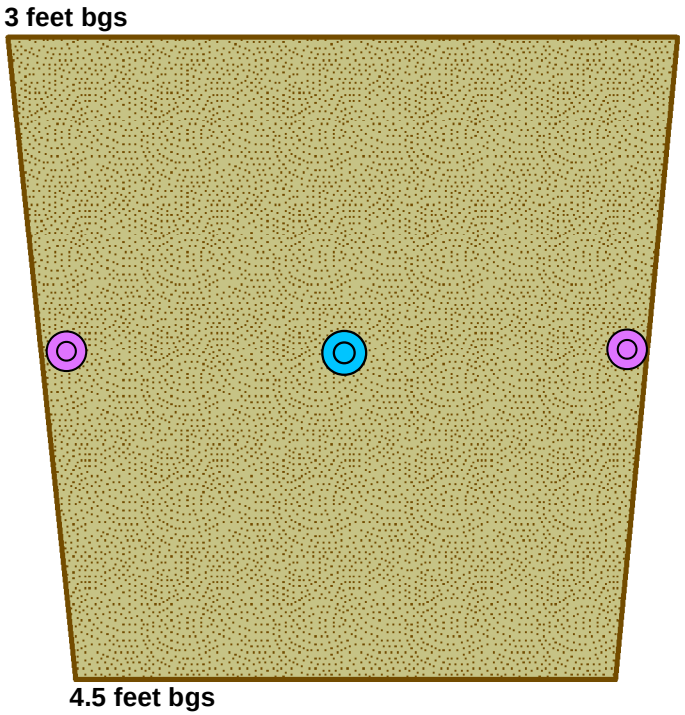
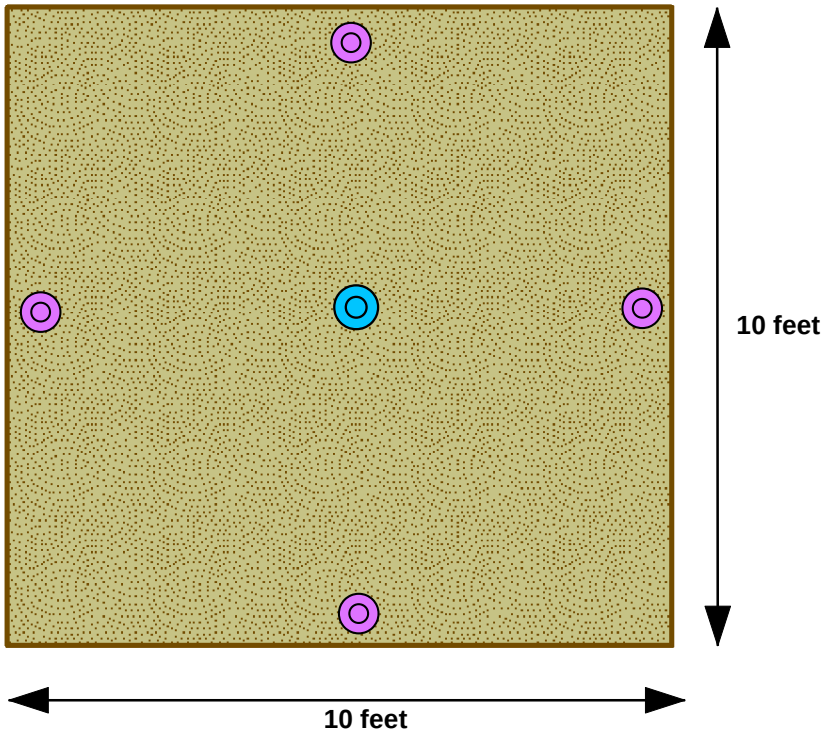
Side View of Sample Locations



Top View of Sample Locations



Legend

- Soil Excavated Due to RL Exceedance
- RL Exceedance
- Post-Excavation Sidewall/Bottom Sample

Notes:
-This conceptual diagram is not to scale.

PIONEER TECHNOLOGIES CORPORATION

Soil Excavation and Confirmation Sampling Locations at DP06/SVP-2SO
Engineering Design Report for Cleanup Implementation
East Bay Redevelopment Site

Figure A-3

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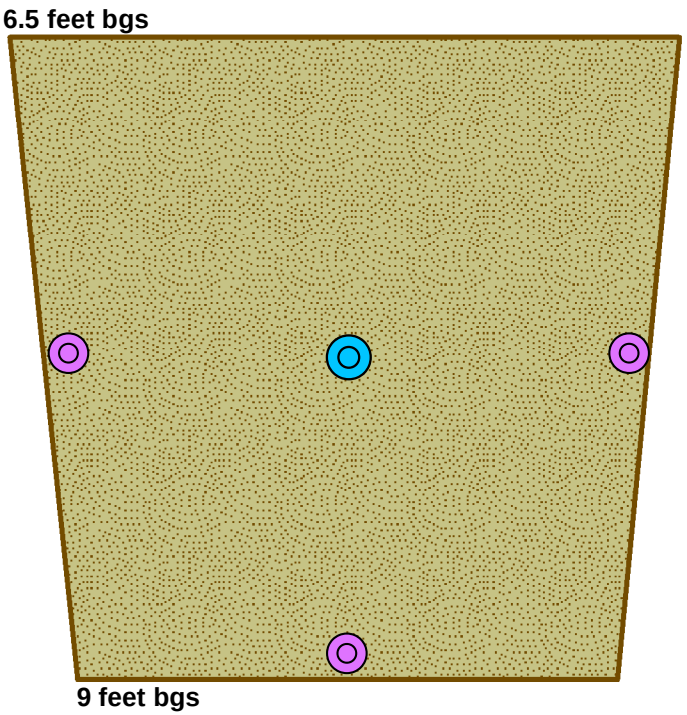
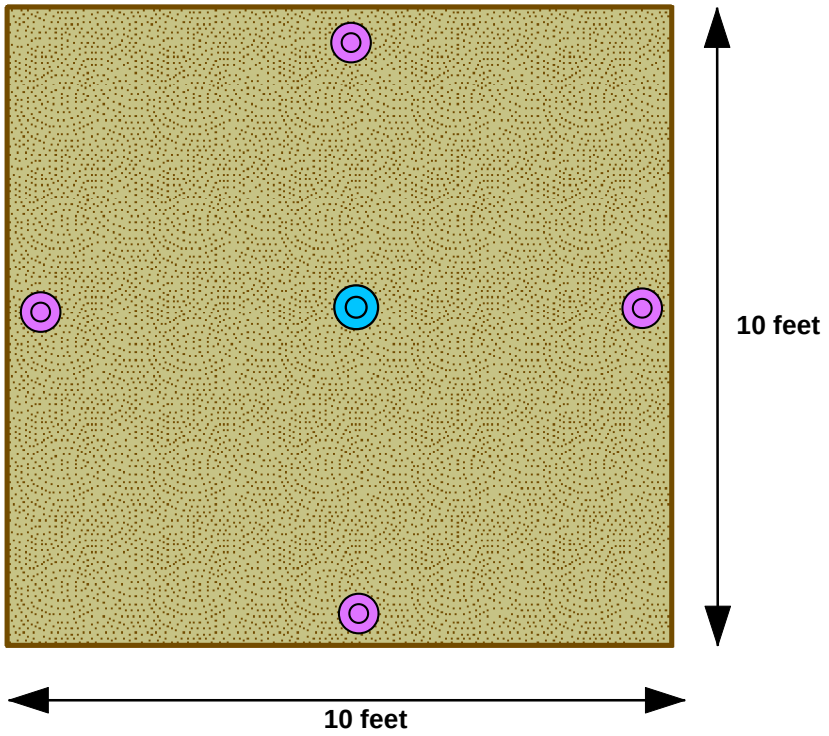
Side View of Sample Locations



Top View of Sample Locations



Legend

- Soil Excavated Due to RL Exceedance
- RL Exceedance
- Post-Excavation Sidewall/Bottom Sample

Notes:
-This conceptual diagram is not to scale.

PIONEER TECHNOLOGIES CORPORATION

Soil Excavation and Confirmation Sampling Locations at MW24S
Engineering Design Report for Cleanup Implementation
East Bay Redevelopment Site

Figure A-4

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Tables

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Table A-1: Confirmation Soil Sampling and Analysis Plan Summary

Category	Sample Type	Arsenic by USEPA Method SW846-6010 or 6020	Lead by USEPA Method SW846-6010 or 6020	cPAHs by USEPA Method SW846-8270D	Dioxins/Furans by USEPA Method SW846-8290	TPH-D and TPH-HO by Ecology Method NWTPH-Dx	TPH-G by Ecology Method NWTPH-Gx	Total Naphthalenes by USEPA Method SW846-8270D
DP04 Excavation	Initial excavation of DP04 RL exceedance	4 Sidewall samples at 4-6 feet bgs, 1 Bottom sample at 7 feet bgs	Not analyzed	Not analyzed	Not analyzed	Not analyzed	Not analyzed	Not analyzed
	Additional excavation of DP04 RL exceedance (if necessary)	To be determined in consultation with Ecology Site Manager	Not analyzed	Not analyzed	Not analyzed	Not analyzed	Not analyzed	Not analyzed
DP06/SVP-2SO Excavation	Initial excavation of DP06/SVP-2SO RL exceedance	Not analyzed	Not analyzed	Not analyzed	Not analyzed	Not analyzed	4 Sidewall samples at 3-4.5 bgs	4 Sidewall samples at 3-4.5 bgs
	Additional excavation of DP06/SVP-2SO RL exceedance (if necessary)	Not analyzed	Not analyzed	Not analyzed	Not analyzed	Not analyzed	To be determined in consultation with Ecology Site Manager	To be determined in consultation with Ecology Site Manager
MW24S Excavation	Initial excavation of MW24S RL exceedance	Not analyzed	Not analyzed	Not analyzed	4 Sidewall samples at 6.5-8 feet bgs, 1 Bottom sample at 9 feet bgs	Not analyzed	Not analyzed	Not analyzed
	Additional excavation of MW24S RL exceedance (if necessary)	Not analyzed	Not analyzed	Not analyzed	To be determined in consultation with Ecology Site Manager	Not analyzed	Not analyzed	Not analyzed
Overburden Stockpiles	Soil stockpiles generated during excavation activities and designated for possible reuse	Sample size per Table A-2	Sample size per Table A-2	Sample size per Table A-2	Sample size per Table A-2	Sample size per Table A-2	Sample size per Table A-2	Sample size per Table A-2
Field QC Samples	Field duplicates	1 Field duplicate sample per 20 primary soil samples (same analyses as the primary sample)						
	Equipment rinsate blank	1 Equipment rinsate blank for the project (same analyses as the associated primary samples)						

Notes:
CY: Cubic yards
GW: Groundwater

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Table A-2: Project Roles and Responsibilities

Project Role	Contact Name, Phone Number, and Email	Project Responsibilities
Port Engineering Director	Bill Helbig, P.E. (360) 528-8022 BillH@portolympia.com	Communication and coordination with Port Executive Director, Port Commissioners, and Port engineering staff.
Port Environmental Program Manager	Rachael Jamison (360) 528-8020 Rachaelj@portolympia.com	Overall environmental management of project. Communication and coordination with Ecology. Reports to Port Engineering Director.
PIONEER Project Manager	Chris Waldron, P.E. (360) 570-1700 waldronc@uspioneer.com	Prepare EDR. Provide oversight support in accordance with existing contract.
Ecology Site Manager	Steve Teel, L.H.G. (360) 407-6247 stee461@ecy.wa.gov	Regulatory review and approval of EDR. Complete public notification requirements.
Oversight Support for Environmental Soil Issues	PIONEER (TBD) (360) 570-1700	Support primary organization(s) conducting oversight for environmental soil issues related to implementation of this EDR. Implement CMP, SAP, and QAPP.
Analytical Laboratory	Anatek Labs, Inc.	Analyze soil samples and conduct laboratory QC.
Disposal Facility	To be determined	Facility for disposal of off-Site waste. Assist with waste characterization and transportation to facility as necessary.

Notes:

CMP: Compliance Monitoring Plan
EDR: Engineering Design Report
RCRA: Resource Conservation and Recovery Act
SAP: Sampling and Analysis Plan
QAPP: Quality Assurance Project Plan
QC: Quality Control

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Table A-3: Sampling Quantity by Stockpile Size

Stockpile Size (CY)	Sample Quantity
0 - 100	3
101 - 500	5
501 - 1000	7
1001 - 2000	10
2000	10 + 1 for each additional 500 CY of soil

Notes:
cy: cubic yards

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Table A-4: Soil Sample Containers, Preservation, and Holding Times

Analytical Method	Container Type	Preservation	Extraction Holding Time (days)	Analyses Holding Time (days)
USEPA Method SW846-6010/6020	One 4-oz glass jar	Cool to 4°C +/- 2°C	Not applicable	180
USEPA Method SW846-8270D	One 4-oz glass jar	Cool to 4°C +/- 2°C	7	40
USEPA Method SW846-8290	One 4-oz glass jar	Cool to 4°C +/- 2°C	30	40
Ecology Method NWTPH-Dx	One 4-oz glass jar	Cool to 4°C +/- 2°C	14	40
Ecology Method NWTPH-Gx	Pre-tared VOA vials	Cool to 4°C +/- 2°C; Methanol preservative.	Not applicable	14

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Table A-5: Laboratory Control Limits

Analytical Method	Range of Acceptable Blank Spike Recoveries (%)	Range of Acceptable Matrix Spike/Matrix Spike Duplicate Recoveries (%)	Acceptable Spike Duplicate Relative Percent Difference (%)	Acceptable Range of Surrogate Percent Recovery (%)
USEPA Method SW846-6010/6020	80 - 120	75 - 125	< 20	Not applicable
USEPA Method SW846-8270D	30 - 140	30 - 140	< 50	18 - 137
USEPA Method SW846-8290	63 - 170	30 - 150	< 30	25 - 175
Ecology Method NWTPH-Dx	50 - 150	50 - 150	< 50	50 - 150
Ecology Method NWTPH-Gx	70 - 130	70 - 130	< 25	70 - 130

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Table A-6: Comparison of Cleanup Levels and Remediation Levels with Target Practical Quantitation Limits

Analytical Method	Constituent of Concern	Cleanup Level (mg/kg)	Remediation Level (mg/kg)	Target PQL[1] (mg/kg)
USEPA Method SW846-6010/6020	Arsenic	20	20	0.5
	Lead	250	1,000	0.5
USEPA Method SW846-8270D	Total cPAHs	0.095	3.4	0.015[2]
	Total naphthalenes	5.0	5.0	0.015
USEPA Method SW846-8290	Total dioxins/furans	0.000011	0.00059	0.000005[2]
Ecology Method NWTPH-Dx	TPH-D and TPH-HO	4,700	24,000	25,100[3]
Ecology Method NWTPH-Gx	TPH-G	100	100	2.5

Notes:

[1] It may not be possible to achieve these quantitation limits for some samples (e.g., samples that require dilution before analysis).

[2] The total PQL was calculated using toxicity equivalency factors in WAC 173-340-708(8).

[3] PIONEER will be combining the TPH-D and TPH-HO results once the laboratory has tested for both of these COCs separately, therefore, the Target PQL values are listed individually.

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PIONEER TECHNOLOGIES CORPORATION (PIONEER)
FIELD CHECKLIST

Project/Task Name: _____ Site Location: _____

Requested By / Date: _____ Work Deadline: _____

SERVICES REQUESTED	COMPLETED
_____	☐ YES ☐ NO
_____	☐ YES ☐ NO
_____	☐ YES ☐ NO
_____	☐ YES ☐ NO
_____	☐ YES ☐ NO
_____	☐ YES ☐ NO
_____	☐ YES ☐ NO
_____	☐ YES ☐ NO
_____	☐ YES ☐ NO
_____	☐ YES ☐ NO
_____	☐ YES ☐ NO
_____	☐ YES ☐ NO

ADDITIONAL STANDARD INSTRUCTIONS	COMPLETED		COMPLETED
☐ Review Docs: _____	☐ YES ☐ NO	☐ Health & Safety Meeting	☐ YES ☐ NO
☐ Agency NOI / Utility Locate / Concrete Coring	☐ YES ☐ NO	☐ Call PM from Site	☐ YES ☐ NO
☐ Coordinate Access: _____	☐ YES ☐ NO	☐ Draw Site Map _____	☐ YES ☐ NO
☐ Coordinate Sub / Equip: _____	☐ YES ☐ NO	☐ Cuttings / Purge Water Characterization & Disposal	
☐ Purchase / Rent Equip: _____	☐ YES ☐ NO	☐ Potential HW _____	☐ YES ☐ NO
☐ Client/Agency Coordination: _____	☐ YES ☐ NO	☐ Non-Haz _____	☐ YES ☐ NO
☐ Calibrate Equipment: _____	☐ YES ☐ NO	☐ Background _____	☐ YES ☐ NO

_____

_____

SAMPLING REQUIREMENTS

☐ Field Testing: _____

☐ Lab Testing: _____ Laboratory: _____

☐ Lab Testing: _____ Laboratory: _____

☐ Lab Testing: _____ Laboratory: _____

FIELD SUPPLIES NEEDED

☐ Site Map ☐ Camera ☐ Survey Equip / GPS ☐ Vehicle

☐ Std Field Equip (keys, forms, SAP, HASP, PPE, decon, tools)

☐ Drilling Equip (PID, references, knife, baggies, tape)

☐ Soil Equip (SS bowls, spoon/shovel, hand auger, pick, sieves)

☐ GWM (pump, tubing, gen., compres., bailers, rope/string, PDB)

☐ Pump / Slug Test Equip (GWM Equip, slug, stopwatch)

☐ Water Level Indicator / Interface Probe

☐ Water Quality Meter _____ ☐ Field Test Kits _____

☐ Sample Kit / Cooler / COC / Ice _____

☐ IDW: ☐ Drums _____ ☐ 5-gal buckets _____

☐ Other: _____

☐ Other: _____

PIONEER
DAILY FIELD REPORT

Date:_____ Site Location: _____ Site Arrival Time: _____ Site Departure Time :_____

WEATHER
TEMPERATURE
WIND

Clear Sun	Overcast	Drizzle	Rain	Snow
To 32	32-50	50-70	70-85	85 Up
Calm	Med.	Strong	Severe	

PEOPLE PRESENT ON-SITE

NAME	ASSOCIATION	TIME ON-SITE AND OFF-SITE

NOTES ON WORK COMPLETED

SIGNATURE:_____ DATE:_____

Appendix B

Stockpile Management and Procedures

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Memo

PIONEER TECHNOLOGIES CORPORATION
5205 Corporate Ctr. Ct. SE, Ste. A
Olympia, WA 98503-5901
Phone: 360.570.1700
Fax: 360.570.1777
www.uspioneer.com

To: Chris Waldron, P.E.

From: Shella Swain, M.S.

Cc: Rachael Jamison, Director of Environmental Programs, Port of Olympia

Date: December 29, 2016

Subject: East Bay Engineering Design Report
Appendix B: Stockpile Management and Procedures

The purpose of this appendix is to explain how stockpiles of overburden soil created by soil excavations will be managed by the Port of Olympia (Port) and PIONEER Technologies Corporation (PIONEER) at the East Bay Redevelopment Site (Site). The following types of excavated soil will exist at the Site during cleanup implementation: contaminated soil to be disposed of, clean overburden soil from soil removal excavation, and soil excavated for the purposes of installing the soil covers.

Soil Stockpile Management and Procedures

- Soil Reuse: The Remediation Contractor will reuse excavated soil for soil cover installation to the maximum extent practicable. Unless otherwise allowed, soil designated for reuse will be reused on-Site to fill excavated locations, level the existing grade as appropriate, et cetera.
- Stockpile Placement Locations: The Remediation Contractor will consolidate potentially geotechnically suitable soil into stockpiles rather than windrowing soil adjacent to an excavation. The Remediation Contractor will place all stockpiles on an impervious surface such as concrete, asphalt, or polyethylene liner with a thickness of at least 10-mils.
- Covering Stockpiles: The Remediation Contractor will cover stockpiles with a polyethylene liner with a thickness of at least 10-mils and secure the cover with ropes and sandbags. All stockpiles will be covered and secured when not in use. The Remediation Contractor will only uncover the working face of a stockpile when adding soil to, removing soil from, or sampling a stockpile. Active stockpiles will be recovered and secured at the end of each work day.
- Stockpile Throughput: To the extent practicable, it is expected that the Remediation Contractor will maximize the generation of stockpiled soil at the beginning of the project in order to ensure that soil is available for reuse when needed later in the project. Due to the need to collect soil samples and perform chemical analyses for each stockpile (see Appendix A), there will be a delay between when the Remediation Contractor is done generating a stockpile and when a determination is made as to whether the stockpile can be reused on-Site or needs to be disposed of off-Site.
- Stockpile Sign Management System: PIONEER will establish and maintain a stockpile sign management system to designate and track each stockpile generated by the Contractor. PIONEER will place color-coded stockpile signs (approximately 18 inches by 24 inches) on each stockpile to communicate the current status of each stockpile. Attachment B-1 presents the text and color for the three types of signs that will be used to communicate stockpile status. The attached signs are defined as follows:

- Class A Soil is designated with a green sign that means the soil can only be reused under the soil cover
- Class B Soil is designated with an red sign that means the soil cannot be reused and must be disposed of
- Unclassified Soil is designated with a white sign that means the soil has not been tested yet

- Once notified by the Remediation Contractor that new stockpile(s) are ready for chemical testing, PIONEER will (1) estimate the size of each stockpile, (2) collect representative soil sample(s) from each stockpile (the number of which will depend on the stockpile size), and (3) place a white sign on the stockpile. The Remediation Contractor will not move a stockpile while it is designated with a white sign. Once analytical results are received and evaluated, PIONEER will replace the white sign with a green or red sign, depending on the analytical results. The Remediation Contractor may then move soil to the final location in accordance with the stockpile classification color.
- Sign Protection: The Contractor is responsible for ensuring the signs are not damaged or removed once placed on a stockpile.

Enclosures

Attachment B-1 Soil Stockpile Sign Designs

Attachment B-1

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Class A Soil

Reuse Under Soil Cover ONLY

For more information, contact:

Port of Olympia
360-528-8020

PIONEER Technologies
360-570-1700

Sample No:

Stockpile ID:

Date Sampled:

Date Released for Use:

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Class B Soil

NO USE

Disposal ONLY

For more information, contact:

Port of Olympia
360-528-8020

PIONEER Technologies
360-570-1700

Sample No:

Stockpile ID:

Date Sampled:

Date Released for Use:

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Appendix C

Layfield LP200 Specifications Sheet

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1. Product Description

Standard woven slit-film polypropylene geotextiles, usually called "wovens" are an economical range of geotextiles that combine high strength with low cost. These materials are made by weaving pre-stressed polypropylene tapes in a simple weave pattern. The resulting fabric has a high strength to weight ratio. Slit-film wovens are primarily used in roadbuilding and embankment construction but can be used in most applications requiring the separation of one type of soil from another. Slit-film wovens help to speed construction with short term reinforcement of the base. Slit film wovens can also be used in sediment control products such as floating silt curtains and silt fence.

2. Technical Data

Materials information is on page 2.

3. Installation

General Installation: Place the roll of woven geotextile at the top of the slope/grade and roll down grade, over lap successive and adjacent rolls by 450mm minimum. Do not allow vehicles to drive directly on the geotextile. Geotextile should be stored such that it is protected from rain and direct sunlight. Geotexile Separation: Ensure subgrade is rolled flat and compacted to engineer's specifications with no sharp objects or protrusions. Install geotextile as per General Installation above.

4. Availability and Cost

Available from Layfield or distributors. Call
425-254-1075 Pacific time
780-453-6731 Mountain time, or
905-761-9123 Eastern time

5. Manufactured For

Layfield USA Corp.
Layfield Canada Ltd.

6. Warranty

Products sold will meet Layfield's published specifications at time of sale. Full warranty details are available from Layfield.

7. Maintenance

Once geotextiles and geogrids are installed and carefully backfilled they do not require ongoing maintenance.

8. Filing Systems

https://www.layfieldgroup.com/Geosynthetics/Geotextile-Products/Woven-Geotextiles.aspx

9.

26 May 2015	Woven Geotextiles - US Values[1]			
	ASTM	LP 200	LP 250	LP 315
Grab Tensile (lbs)	D4632	200	250	315
Elongation (%)	D4632	15	15	15
Trapezoid Tear (lbs)	D4533	75	90	120
CBR Puncture Strength (lbs)	D6241	700	900	1000
AOS (sieve size)	D4751	50	40	40
Permittivity (sec^{-1})	D4491	0.05	0.05	0.05
Weight (oz/yd^2) (Typical)	D5261	4.0	5.0	6.3
UV Resistance (500 hrs)	D4355	70	70	70
Wide Width Seam Strength (lbs/in)	D4884	66	77	91
Roll Size (ft) Typical)		17.5 x 309	17.5 x 309	17.5 x 258
Roll Weight (lbs) (Typical)		205	215	220
Note[1] - The physical properties presented in the table above are Minimum Average Roll Values or otherwise indicated.				

10.

26 May 2015	Woven Geotextiles - Metric Values[1]			
	ASTM	LP 200	LP 250	LP 315
Grab Tensile (N)	D4632	889	1110	1400
Elongation (%)	D4632	15	15	15
Trapezoid Tear (N)	D4533	333	400	533
CBR Puncture Strength (N)	D6241	3115	4005	4450
AOS (Microns)	D4751	300	425	425
Permittivity (sec^{-1})	D4491	0.05	0.05	0.05
Weight (g/m^2) (Typical)	D5261	136	170	214
UV Resistance (500 hrs)	D4355	70	70	70
Wide Width Seam Strength (kN/m)	D4884	11.5	13.5	16.0
Roll Size (m) (Typical)		5.3 x 94	5.3 x 94	5.3 x 79
Roll Weight (kg) (Typical)		92	97.5	100
Note[1] - The physical properties provided in the table above are Minimum Average Roll Values or otherwise indicated.				

Appendix D: PIONEER Health and Safety Plan

East Bay Redevelopment Site
Olympia, Washington

Prepared for:

Port of Olympia
606 Columbia St NW, Suite 300
Olympia, WA 98501

City of Olympia
P.O. Box 1967
Olympia, WA 98507-1967

LOTT Clean Water Alliance
500 Adams Street NE
Olympia, WA 98501

Prepared by:

5205 Corporate Center Ct. SE, Suite A
Olympia, Washington 98503
Phone: 360.570.1700
Fax: 360.570.1777
www.uspioneer.com

December 2016

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Table of Contents

Tables

Attachments

List of Acronyms

Acronym	Explanation
ACGIH	American Conference of Governmental Industrial Hygienists
COC	Constituent of Concern
CPR	Cardiopulmonary Resuscitation
EDR	Engineering Design Report
H&S	Health and Safety
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
LOTT	Lacey, Olympia, Tumwater, and Thurston County Clean Water Alliance
NIOSH	National Institute of Occupational Safety and Health
PIONEER	PIONEER Technologies Corporation
Port	Port of Olympia
PPE	Personal Protective Equipment
RL	Remediation Level
Site	East Bay Redevelopment Site
SSO	Site Safety Officer
TLV	Threshold Limit Value
WAC	Washington Administrative Code

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SECTION 1: PIONEER HEALTH AND SAFETY PLAN

1.1 Purpose

The purpose of this health and safety plan (HASP) is to establish personnel protection standards, specify safe operating procedures, and provide for contingencies that may arise during on-site cleanup action activities conducted by PIONEER Technologies Corporation (PIONEER) at the Port of Olympia (Port) East Bay Redevelopment Site (Site) pursuant to the Engineering Design Report (EDR). This HASP covers PIONEER personnel and any of its subcontractors. Any other on-site contractors or organizations are not covered by this HASP. This HASP was developed in accordance with 29 Code of Federal Regulations 1910.120, Chapter 296-843 of the Washington Administrative Code (WAC) and WAC 173-340-810. This HASP will be updated as necessary when conditions change. PIONEER employees will keep a copy of this HASP with them when they are conducting work on Site.

1.2 Compliance Agreement

Each field worker must complete and sign the HASP Compliance Agreement form in Attachment D-1 prior to conducting any fieldwork in order to:

1. Document that they have reviewed the HASP;
2. Ensure that they have the required training;
3. Communicate any physical conditions (e.g., allergies) they may have; and
4. Provide emergency contact information in case of an emergency.

1.3 Scope of Work

PIONEER employees' fieldwork for this EDR includes:

- Overseeing the decommissioning of monitoring wells
- Overseeing remediation level (RL) soil exceedance removal activities, including excavation, dewatering, and material hauling tasks
- Overseeing installation of the soil cover
- Collecting soil samples
- Performing airborne dust monitoring
- Using a global positioning system unit

PIONEER subcontractors' fieldwork for this EDR may include:

- Decommissioning monitoring wells
- Completing RL soil exceedance removal activities, including excavation, dewatering, and material-hauling tasks

1.4 HASP Roles and Responsibilities

Key PIONEER health and safety (H&S) roles and responsibilities are as follows:

- The Project Manager is responsible for ensuring the HASP is implemented throughout the duration of the project. The Project Manager is also responsible for ensuring that the project is audited as necessary to verify compliance with the HASP (see Attachment D-2).
- The Site Safety Office (SSO), under the direction of the Project Manager, is responsible for (1) implementing and enforcing this HASP daily, (2) overseeing the safety of daily operations and coordination of H&S issues with PIONEER subcontractors, (3) conducting daily tailgate H&S meetings (see Attachment D-3), and (4) documenting the completion of H&S tasks (e.g., ensuring completion of all applicable forms in Attachments D-1 through D-5).
- All field personnel (e.g., PIONEER employees and PIONEER subcontractors), under the direction of the SSO, are responsible for (1) reviewing this HASP, (2) taking all reasonable precautions to prevent injury to themselves and other workers, (3) conducting only those tasks that they believe they can do safely, (4) reporting all injuries, accidents, and unexpected occurrences to the SSO (forms are included in Attachment D-4), and (5) exercising stop-work authority in the event of an unsafe condition or imminent danger to any personnel.

If PIONEER employees and subcontractors are going to work in an area where other Site construction activities will be occurring, they will check in with the Construction Superintendent or other responsible person to communicate that they are going to work in the area and to obtain any needed safety instructions. PIONEER employees involved in field activities will attend the Construction Contractor's safety tailgate meetings, as appropriate, in order to facilitate clear communication between all individuals working at the Site.

1.5 Hazard Analysis

In addition to possible chemical, physical, and biological hazards, other hazards may be identified as field work progresses. The unexpected occurrence reporting forms in Attachment D-4 will be completed by the SSO in the event of a near miss, incident or accident, spill or environmental release, as well as any unplanned event which could be indicative of a trend or potential hazard.

1.5.1 Chemical Hazards

Overexposure from site chemicals is not anticipated based on the concentrations in Site soil and the limited nature of PIONEER's cleanup action activities. Nonetheless, the following procedures will be used to minimize potential chemical hazards:

- Safe work practices will be employed (e.g., allowing only essential personnel in the area and standing in upwind locations to the extent practicable).
- Personal protective equipment (PPE) will be worn (see Section 1.7).
- Personnel and equipment decontamination procedures will be followed (see Section 1.9).
- Good hygiene practices will be enforced (e.g., all field personnel will be required to wash hands and face prior to any hand-to-face activities).

The maximum detected constituent of concern (COC) concentration in Site soil and the associated permissible exposure limits and symptoms of overexposure are presented on Table D-2. The Site's Airborne Dust Action Level of 5 mg/m^3 is conservatively protective of potential inhalation exposures associated with COCs in airborne dust (PIONEER 2009, 2010).

1.5.2 Physical Hazards

Potential physical hazards and the procedures to monitor/reduce these hazards will include the following:

- Concrete/Pavement Cutting: Implement effective dust control during concrete/pavement cutting. Eye protection and hearing protection are required for concrete/pavement cutting. Operators need to designate cutting paths with effective means of delineating work areas and use barrier tape or barricades as necessary.
- Cutting Hazards: Fixed, open-blade hand-tools are never permitted for use. Identify all hand safety hazards as part of the job planning process BEFORE starting work. Remember that gloves are a secondary level of defense when it comes to hand safety; the primary way to avoid hand injuries is by proper hand placement and using the right tool for the job. When using any cutting tool, set up your work so that you cut away from your body or anyone else working nearby and pay attention to the location of your free hand when cutting. Workers will use tube cutters when cutting tubing. No glove can eliminate the potential for cuts or punctures. Wear cut resistant (e.g., Kevlar®) gloves to reduce the hazard when handling sharp cutting tools or when exposed to sharp objects.
- Excavation Safety: No personnel will enter an excavation greater than four feet deep at any time for any reason unless appropriate excavation safety measures (e.g., sloping, shoring) are utilized. For this work, samples will be collected from the excavator bucket. Personnel will maintain a three-foot offset from the edge of an excavation deeper than four feet. Barricades (e.g., caution tape, cones) will be placed around excavations anytime the work area is left unattended.
- Getting Hit by Heavy Equipment: Wear appropriate PPE (including a high-visibility safety vest) and maintain visibility with equipment operators. Do not approach equipment while in operation. When working in an area where mechanical equipment is being used, communicate directly with operators so that they are aware that you are there and the types of activities you are performing. Do not assume that they know that you are there and what you are going to do.
- Heat/Cold Exposure: Stay apprised of the anticipated weather conditions and be aware of the heat and cold exposure information included in Attachment D-5. During cold weather, wear layered clothing and gloves/hats, as necessary. During wet weather, use rain gear and have a change of clothing available. During hot weather, try to schedule work during the cooler times of the day, keep water and fluids available at all times, and drink water/fluids regularly (i.e., at least 1 quart per hour) to prevent dehydration. To prevent sunburn, apply sunscreen of SPF 30 or greater, and keep skin covered as much as possible. Use the buddy system to let other workers know if they are getting burned or showing any signs of heat or cold exposure. As necessary, the SSO will periodically monitor for physiological signs and symptoms of heat and cold exposure during each work day using the guidance in Attachment D-5 and behavioral changes (e.g., worker disorientation and confusion, workers who exhibit unusual level of irritability). Based on the weather conditions and the results of heat and cold exposure monitoring, the SSO will implement corrective action as necessary in accordance with Attachment D-5.
- Lone Worker: Implement the use of the buddy system or have a means of communication (e.g., cell phone) available to maintain contact with other personnel and communicate emergencies.

If working alone is necessary, the lone worker will make contact with another employee capable of providing assistance at regularly scheduled intervals.

- Noise: Wear ear protection, as necessary, when proximate to noisy equipment. Personnel must wear approved hearing protection when working around equipment that produces sound levels in excess of 85 decibels (e.g., whenever voices must be raised to be heard at a distance of three feet or less) or if signs indicate that hearing protection is required.
- Overhead Obstructions/Lines: Before the start of work, all work areas and mobilization pathways will be evaluated to identify overhead obstructions.
- Pinch Points: Pinch points include vehicle doors and tailgates, drill rig components, and hand tools. Always be aware of limb or body positions proximate to moving equipment to reduce pinch point hazards. Wear appropriate hand protection.
- Portable Electric Equipment: Portable electrical tools and equipment shall only be plugged into electrical circuits protected by a properly-functioning ground fault circuit interrupter. Tools with damaged or defective cords will not be used. All electrical cords and extension cords must be inspected prior to use. Do not overload plugs.
- Slip/Trip/Fall: Keep work area free and clear of obstacles. Check work area for potential slip/trip/fall hazards and remove or mark prior to starting work. Wear sturdy shoes/boots with adequate tread, and rubber boots/boot covers for wet or slippery conditions. Maintain work site and equipment to minimize hazards. Good housekeeping practices will be employed to prevent slip/trip/fall hazards. Place tools out of the way when not in use. Use caution when walking to prevent slip/trip/fall hazards caused by terrain. Use hand rails when walking down steps and three points of contact when entering/exiting equipment. Do not use a cell phone while walking.
- Tools and Equipment: Inspect all hand tools before use to determine if they are the proper size, free of oil or grease, and in good condition. Use tools for the purposes for which they are designed (i.e., use the correct tool for the job).
- Underground Utilities: Underground utility locates must be completed prior to all intrusive activities.
- Vehicle Traffic: Use caution when working, operating equipment, and/or driving a vehicle(s). Abide by traffic-control measures implemented by the Remediation Contractor, including parking in designated areas, maximizing the distance away from areas where others are working, and assuming that other vehicles have the right-of-way. Pay particular attention to uneven terrain, and the width of roads and slope(s). Appropriate measures will be taken to avoid equipment and/or vehicles from becoming stuck. In the event equipment and/or vehicles do become stuck, appropriate measures to safely remove equipment and/or vehicles will be discussed with the SSO prior to removal. City traffic control permits will be necessary to decommission monitoring wells.
- Weather: Weather hazards include torrential rain, lightning, flooding, excessive cold, snow, blizzards, and high winds. The SSO is responsible for being up-to-date on anticipated weather conditions and preparing the crew. Discontinue all work for 30 minutes after lightning is seen or thunder is heard.

1.5.3 Biological Hazards

Biological hazards that could be encountered while performing work at the Site are stinging insects and blood-borne pathogens, which may be a concern if there is an injury to a co-worker.

- Stinging insects: Prior to digging in any areas, observe the site for several minutes to identify potential nests. Look not only at the proposed excavation area but in the area where you will be standing as well. If stung by a bee, carefully remove the stinger by gently scraping with a fingernail (do not squeeze). Wash the area with soapy water and apply a cold compress (ice) to decrease absorption and spreading of the venom. If excessive swelling or redness appears, seek immediate medical attention. (Note: Allergic reactions to bee stings can be life threatening; therefore, identify susceptible persons prior to project start up.)
- Blood-borne Pathogens: Use latex gloves, cardiopulmonary resuscitation shield, and universal precautions whenever the potential exists for contact with bodily fluids; current First Aid and Cardiopulmonary resuscitation (CPR) training is required if providing assistance.

1.6 Site Control

Due to the nature and scope of the fieldwork being conducted by PIONEER, establishment of a formal PIONEER-specific Site control plan is not warranted. PIONEER will employ the buddy system to the extent practicable to assist in the event of an emergency. Any visitors will be escorted 100% of the time and will not be allowed in the work areas. If visitors or bystanders refuse to cooperate with these provisions, stop work and call the Port to deal with visitors/bystanders.

1.7 Personal Protective Equipment

The level of PPE for PIONEER employees and subcontractors was selected by evaluating the performance characteristics of the PPE against the requirements and limitations of the Site and task-specific conditions. Based on the nature of potential Site hazards and the nature of PIONEER's cleanup action activities, Level D PPE is recommended for all PIONEER employees and subcontractors while on Site. Level D PPE includes:

- Leather steel-toed boots
- Hard hat
- Safety glasses with side shields
- High-visibility safety vest
- Nitrile (surgical-type) gloves, as necessary
- Hearing protection, as necessary

Provisions for upgrade to Level C PPE have not been made because the potential for overexposure to chemical hazards by PIONEER employees and subcontractors is low given the nature of potential Site hazards and the nature of PIONEER's cleanup action activities.

1.8 Exposure Monitoring

Provisions for exposure monitoring of PIONEER employees and subcontractors have not been made at this time for monitoring well decommissioning and removal of RL soil exceedances because the potential for overexposure to chemical hazards is low given the nature of these activities. Airborne dust monitoring will be conducted during the installation of the soil cover as described in Appendix A of the EDR.

1.9 Personnel Decontamination

Due to the nature and scope of fieldwork being conducted by PIONEER employees, a formal personnel decontamination infrastructure is not warranted. In the event that non-disposable PPE or clothing becomes contaminated during Site activities, the PPE or clothing must either be appropriately cleaned before put back into service, or replaced. If skin comes into contact with contaminated media, the affected skin should be washed immediately, as appropriate.

1.10 Drum/Container Issues

Sampling, managing, or handling of drums is not in the scope of the fieldwork being conducted by PIONEER. Any groundwater that is removed from the soil excavations will be temporarily stored in a large portable tank, pre-treated for suspended solids, and discharged to Lacey, Olympia, Tumwater, and Thurston County Clean Water Alliance (LOTT). If the wastewater cannot be disposed of at LOTT, it will be disposed of at an off-Site facility permitted to receive such waste.

1.11 Confined Spaces

The scope of PIONEER's cleanup action activities does not include confined space entry. Under no circumstances should a PIONEER employee or subcontractor enter a confined space during the cleanup action.

1.12 Personnel Training

All on-site PIONEER employees and subcontractors will be appropriately trained in accordance with WAC 296-843-200. For cleanup action work to be conducted by PIONEER, this entails 40-hour initial Hazardous Waste Operations and Emergency Response (HAZWOPER) training, three days of supervised fieldwork, and eight-hour annual HAZWOPER refreshers. In addition, the SSO will have completed an additional eight hours of HAZWOPER supervisor training.

PIONEER employees and subcontractors will review this HASP prior to initiating field activities. Additional training and information briefings will be conducted as necessary.

1.13 Medical Surveillance

If any on-site worker meets the medical surveillance requirements in WAC 296-843-21005[1], a medical surveillance program (e.g., medical examinations and consultations supervised by an occupational medicine physician) will be implemented for the employee in accordance with WAC 296-843-21005. If a medical surveillance program becomes necessary for project workers, each individual contractor will take responsibility for implementing the necessary medical surveillance program for their employees and will provide a medical clearance letter as requested.

[1]An employee who is exposed to hazardous substances at concentrations exceeding a permissible exposure limit for 30 or more days a year, who wears a respirator during any part of a day for 30 or more days a year, who is injured, becomes ill, or develops signs or symptoms from likely overexposure to hazardous substances, or who is a member of a hazardous materials response team.

1.14 Sanitation

Due to the nature and scope of fieldwork being conducted by PIONEER, PIONEER-specific sanitation facilities are not warranted. PIONEER employees and subcontractors should use potable water and toilet facilities provided by the Remediation Contractor and/or the Port. Per standard procedures, PIONEER employees and subcontractors should wash hands and face before eating, drinking, smoking, or other hand to mouth contact.

1.15 Lighting

Work will be performed during daylight hours only. Due to the nature and scope of anticipated fieldwork, provisions for lighting are not necessary.

1.16 Emergency Contingency Plan

1.16.1 Emergency Phone Numbers

Contact	Name	Number
Police/Security	Police Department	911
Fire and Ambulance	Fire Department	911
Hospital	Providence St. Peter's Hospital 413 Lily Road NE Olympia, WA 98506-5166	(360) 491-9480
PIONEER Project Manager	Chris Waldron	(360) 570-1700
PIONEER Site Safety Officer	To be determined	(360) 570-1700
PIONEER Principal	Chris Waldron or Brad Grimsted	(360) 570-1700
Site/Client Contact	Rachael Jamison	(360) 528-8020
Environmental Release Contact	Washington State Department of Ecology 24-hour Emergency Response	1-800-258-5990
Regulatory Agency	Washington State Department of Ecology	(360) 407-6000

1.16.2 Directions and Map to Nearest Hospital

	1. Head west from State Ave. NE - go 73 ft
Directions to:	2. Turn left at Franklin St. SE - go 0.1 mi
Providence St. Peter's Hospital	3. Turn left at 4th Ave. NE - go 1.5 mi
413 Lilly Rd. NE	4. Continue on Martin Way E - go 1.0 mi
Olympia, WA 98506-5166	5. Turn left at Lilly Rd. NE - go 0.4 mi
	Total Distance is 3.1 miles.

Map to:

Providence St. Peter's Hospital

413 Lilly Rd. NE

Olympia, WA 98506-5166

1.16.3 *Emergency Response Procedures*

In the event of a personnel injury, fire, explosion, or spill:

- Ensure that all equipment has been shut off.
- Assess the nature of the situation.
- If appropriate, conduct corrective action if it can be done safely (e.g., bandage a minor injury, stop and contain a minor spill).
- If necessary, sound emergency alarm or phone 911 for emergency assistance.
- If appropriate, secure the area until emergency assistance arrives.
- Issue site-wide stop-work.
- If necessary, rally at designated location and take head count.
- Meet with and advise emergency crew of location and nature of situation.
- Contact the PIONEER Project Manager and/or a PIONEER Principal.
- Begin investigation of situation.

1.16.4 *Emergency Equipment*

A first-aid kit and fire extinguisher will be present in the field at all times.

1.17 References

PIONEER. 2009. Port of Olympia East Bay Site: Interim Action Work Plan, May.

PIONEER. 2010. Infrastructure Interim Action Report for East Bay Redevelopment Site, June.

Tables

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Table D-1: Project Roles and Responsibilities

Project Role	Contact Name, Phone Number, and Email	Project Responsibilities
Port Engineering Director	Bill Helbig, P.E. (360) 528-8022 BillH@portolympia.com	Communication and coordination with Port Executive Director, Port Commissioners, and Port engineering staff.
Port Environmental Program Manager	Rachael Jamison (360) 528-8020 Rachaelj@portolympia.com	Overall environmental management of project. Communication and coordination with Ecology. Reports to Port Engineering Director.
PIONEER Project Manager	Chris Waldron, P.E. (360) 570-1700 waldronc@uspioneer.com	Prepare EDR. Provide oversight support in accordance with existing contract.
Ecology Site Manager	Steve Teel, L.H.G. (360) 407-6247 stee461@ecy.wa.gov	Regulatory review and approval of EDR. Complete public notification requirements.
Oversight Support for Environmental Soil Issues	PIONEER (TBD) (360) 570-1700	Support primary organization(s) conducting oversight for environmental soil issues related to implementation of this EDR. Implement CMP, SAP, and QAPP.
Analytical Laboratory	Anatek Labs, Inc.	Analyze soil samples and conduct laboratory QC.
Disposal Facility	To be determined	Facility for disposal of off-Site waste. Assist with waste characterization and transportation to facility as necessary.

Notes:

CMP: Compliance Monitoring Plan
EDR: Engineering Design Report
RCRA: Resource Conservation and Recovery Act
SAP: Sampling and Analysis Plan
QAPP: Quality Assurance Project Plan
QC: Quality Control

Table D-2: Chemical Hazard Analysis

Constituent of Concern	Maximum Soil Concentration (mg/kg)	Permissible Exposure Limit, Time-Weighted Average [1] (mg/m^3)	Symptoms of Overexposure [2]
Arsenic	52	0.010	Respiratory system irritation
Lead	170	0.050	Weakness, exhaustion
Total cPAHs	1.1	0.20	Respiratory system irritation
Total Dioxins/Furans	0.00098	No Value	Suspected carcinogen. Acute effects of overexposure have not been reported.
Total Naphthalenes	0.32	50	Irritated eyes, headaches, malaise, confusion, profuse sweating, nausea, vomiting, abdominal pain, dermatitis.
TPH-D	7,300	100 [3]	Irritated eyes and mucous membranes. CNS effects including dizziness, headaches, blurred vision, and slurred speech.
TPH-HO	21,000	100 [4]	Symptoms are dependent on constituents (may contain cPAHs and metals). Some symptoms can include fatigue, headache, nausea, drowsiness, difficulty breathing, irritation to skin, eyes, throat and stomach, and numbness.
TPH-G	31	900[5]	Irritated eyes and mucous membranes. CNS effects including dizziness, headaches, blurred vision, and slurred speech.

Notes:

CNS: Central nervous system

(1) From Chapter 296-841 WAC and/or September 2005 National Institute for Occupational Safety and Health Pocket Guide to Chemical Hazards.

(2) Exposure is assumed through the inhalation route. PPE, work practices, and hygiene will minimize incidental ingestion of and dermal contact with soil.

(3) A Threshold Limit Value from American Conference of Government Industrial Hygienists, based on total hydrocarbons.

(4) Assumed based on total petroleum hydrocarbons in the diesel range value.

Attachments

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D-1: HASP Compliance Agreement Form

HEALTH AND SAFETY PLAN COMPLIANCE AGREEMENT

Instructions: Circle the appropriate answer (Yes, No, or N/A) for each question, then sign and date at the bottom of the form.

HASP Review	1. Worker has read the Health and Safety Plan (HASP) as well as any applicable project safety analysis or job hazard analysis attachments?	**Yes**	**No**	**N/A**
	2. Worker understands the health and safety protocols presented in the HASP as well as any applicable project safety analysis or job hazard analysis attachments?	**Yes**	**No**	**N/A**
Training/Certifications	3. Worker has completed appropriate initial HAZWOPER training? Chose the appropriate answer from the following:			
	• 40-hour initial HAZWOPER training	**Yes**	**No**	**N/A**
	• 24-hour initial HAZWOPER training	**Yes**	**No**	**N/A**
	4. Worker has completed appropriate HAZWOPER supervised field experience? Chose the appropriate answer from the following:			
	• If 40-hour trained, 3 days of supervised field experience	**Yes**	**No**	**N/A**
	• If 24-hour trained, 1 day of supervised field experience	**Yes**	**No**	**N/A**
	• Worker is obtaining the supervised field experience as part of this project	**Yes**	**No**	**N/A**
	5. Worker has completed 8-hour annual HAZWOPER refresher in past year?	**Yes**	**No**	**N/A**
	6. Worker is medically cleared for respirator use?	**Yes**	**No**	**N/A**
	7. Worker has completed a respirator fit test?	**Yes**	**No**	**N/A**
Emergency Information	8. Emergency contact name(s):			
	8. Emergency contact number(s):			
	10. Any medical conditions that could be affected by the work (e.g., hypoglycemia, sensitivity to heat/sunlight, bee allergies, food allergies)? If yes, please describe:			
	11. Any other special considerations that might comprise the health and safety of the worker or fellow workers? If yes, please describe:			

The information presented on this form is complete, accurate, and true to the best of my understanding. I understand that providing incorrect information on this form or noncompliance with the HASP may result in dismissal from the site.

Project Name: _____

Employee Name:_____ Employer Name:_____

Signature: _____ Date: _____

D-2: IIPP/APP Form 5 - Safety Audit Form

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IIPP/APP Form 5 - Safety Audit Form

Date:	
Site:	
Audit Team:	
Activities Audited:	
Site Contact:	
Audit Focus:	
PSA Completed?	YES NO
HASP Completed	YES NO
Project Field Team	

Audit Process:

The procedure for conducting the audit is as follows:

1. Decide on a focus (e.g., high hazard activity, recent incident or near-miss associated task).
2. Observe the work scene, looking for the selected focus.
3. Look for positive safety actions and indications of safety attitudes.
4. Make at least 10 total observations with a minimum of 5 behavioral based observations.
5. Discuss observations with the people observed.
6. Mention the positive behaviors and actions of the people observed.
7. Involve the people observed in a safety discussion, highlighting the observations.
8. Ensure that previous findings (if applicable) have been corrected.
9. Exit the audit, thanking the observed people for their time and ideas for improvement.
10. Report the audit findings to the field project team at the next daily safety briefing.
11. Document the audit by completing the attached audit form.

1 Positive Observations within Focus:

Observation Number:	List of Observations:
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

2 Improvement Observations within Focus:

Observation Number:	List of Observations:
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

3 Positive Observations OUTSIDE Focus:

Observation Number:	List of Observations:
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

4 Improvement Observations OUTSIDE Focus:

Observation Number:	List of Observations:
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

5 Hand Safety Observations:

Observation Number:	List of Observations:
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

6 Environmental Focus:

Observation Number:	List of Observations:
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

7 Unsafe Acts:

Observation Number:	List of Observations:
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

8 Unsafe Conditions:

Observation Number:	List of Observations:
1	
2	
3	
4	
5	
6	
7	
8	
9	
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D-3: Tailgate Meeting Form

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TAILGATE MEETING FORM

Date and Time of Meeting_____ **Prepared By:**_____

CHECK TOPIC(S) DISCUSSED. SOME TOPICS MAY NOT APPLY TO THIS PROJECT.

Intro / General _ Health and safety philosophy _ Roles and responsibilities _ HASP (and PSA/JHA as necessary) _ HASP Compliance Agreements _ Stop work authority _ Reporting injuries, accidents, unexpected occurrences _ Health and safety audits _ Other _____	**Health and Safety Provisions** _ PPE _ Exposure monitoring _ Site control _ Personnel decontamination _ Equipment decontamination _ Other _____ _ Other _____ _ Other _____
Potential Project Hazards _ Physical _ Chemical _ Biological _ Other _____	**Sanitation, Hygiene, and Housekeeping** _ Drinking water _ Restrooms/Portable toilets _ Personal Hygiene _ Site Housekeeping _ Other _____
Hazards Associated with Certain Equipment / Tools _ Drill rig _ Heavy equipment _ Cutting tools _ Pressure washer _ Equipment / tool inspections _ Other _____	**Emergency Procedures** _ Equipment shut-off _ Rally / headcount area _ First aid supplies _ Fire extinguishers _ Route to hospital _ Other _____
Common Hazard Topics _ Anticipated weather and heat/cold exposure _ Buddy system / lone worker provisions _ Confined space _ Cutting hazards _ Excavation safety _ Fire / explosion hazards _ Material / drum / waste handling _ Overhead / underground obstructions _ Slip / trip / fall _ Traffic control	**Miscellaneous / Other Topics** _ Communications _ Lighting _ No smoking _ Visitors _ Other _____ _ Other _____ _ Other _____ _ Other _____ _ Other _____

ATTENDEES

Name (Printed)	**Signature**

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D-4: IIPP/APP Forms for Injury/Illness, Accident, and Unexpected Occurrence Reporting

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IIPP/APP Form 2 - Employee Injury or Illness Report

Instructions: It is our policy that all work related injuries, illnesses, and near-miss incidents be reported – *no matter how minor*. This helps to identify and correct hazards before they cause serious injuries. Complete this form and submit to the supervisor as soon as possible after job injury or illness. In the event of a near-miss incident, complete IIPP/APP Form 4 – Unexpected Occurrence or Near-Miss Report.

Please Print

I am reporting a work related: ❑ Injury ❑ Illness	
Your Name:	
Job title:	
Supervisor:	
Have you told your supervisor about this incident? ❑ Yes ❑ No	
Date of incident:	Time of incident:
Name of witnesses (if any)?	
Where, exactly, did it happen?	
What were you doing at the time?	
Describe the steps that led to the accident/injury:	
What could have been done to prevent this accident/injury?	
What parts of your body were injured? How could you have been hurt?	
Did you see a doctor about this injury/illness?	❑ Yes ❑ No
If yes, print name of doctor:	Phone number of doctor:
Date:	Time:
Has this part of your body been injured before? ❑ Yes ❑ No	
If yes, when?	Employer:
Your signature (optional):	Date:
Report received by:	Date:

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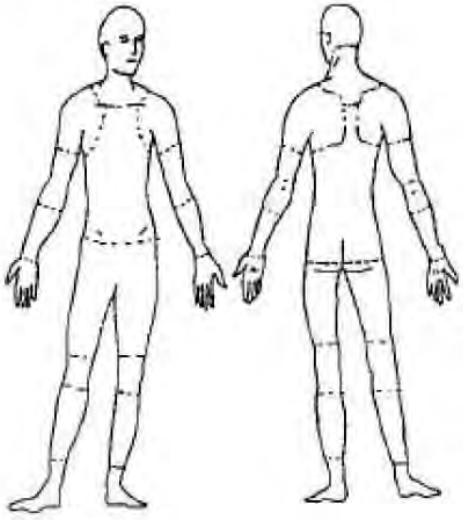
IIPP/APP Form 3 - Accident Investigation Report

Employee(s) name:	
Date & Time of Incident:	
Employee Job Title:	
Supervisor/Lead Person	
Witnesses:	
Brief Description of the Incident:	
Site:	
Site Contact:	
PSA Completed?	YES NO
HASP Completed	YES NO
Project Field Team	

Indicate body part affected:



Did the injured employee(s) see a doctor?	YES NO
If yes, did you file an employer's portion of a worker's compensation form?	YES NO
Did the injured employee(s) go home during their work shift?	YES NO
If yes, list the date and time injured employee(s) left job(s):	
Supervisor's Comments:	

What could have been done to prevent this accident/incident?	
Have the unsafe conditions been corrected?	( ) Yes ( ) NO
If yes, what has been done?	
If not, what needs to be done?	
Employer or Supervisor's signature:	
Date:	
Additional Comments/Notes:	

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IIPP/APP Form 4 - Unexpected Occurrence or Near-Miss Report

Instructions: It is our policy that all work related injuries, illnesses and near-miss events is reported – *no matter how minor*. This helps identify and correct hazards before serious injuries occur. In the event of a near-miss, complete this form and submit to the supervisor. Note: if near-miss occurred at a site, use CRG Unexpected Occurrence Report form.

Please Print

I am reporting a work related: ❑ Near miss	
Employee Name:	
Job title:	
Supervisor:	
Have you told your supervisor about this near-miss? ❑ Yes ❑ No	
Date of near-miss:	Time of near-miss:
Name of witnesses (if any)?	
Where, exactly, did it happen?	
What were you doing at the time?	
Describe step by step what led up to the near-miss:	
What could have been done to prevent this near-miss?	
What parts of your body could have been injured?	
Root Cause:	
Key Learning Objectives:	

Recommendations/Responsibility: (*What should be done to prevent a recurrence? What are other relevant assignments to the individual, or the team, to create a safe work environment? What is the completion date for these tasks? Be specific and concise.)*	
Unexpected Occurrence Investigation Team:	
Date:	

D-5: Heat and Cold Exposure Information

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HEAT EXPOSURE

Heat stress may pose a threat to the health and safety of site personnel based on the season of the year. Depending on the relative humidity, temperatures may create heat stress conditions, particularly when working in chemical-protective equipment. This section discusses heat-related health hazards and details WCD's heat stress program, which has been used successfully.

Heat Stress

Heat stress is a major hazard, especially for workers wearing protective clothing. Depending on the ambient conditions and the work being performed, heat stress can occur very rapidly within as little as 15 minutes. The key to preventing excessive heat stress is to educate personnel on the hazards associated with working in heat and the benefits of implementing proper controls and work practices.

Heat Rash

Heat rash (prickly heat) may result from continuous exposure to heat or humid air where the skin remains wet due to lack of evaporation, sweat ducts become clogged, and a skin rash appears. This uncomfortable rash can be prevented by resting in a cool place during breaks and by practicing good daily personal hygiene.

Heat Cramps

Heat cramps are muscular spasms that usually occur in the abdomen or limbs due to a loss of salt from profuse sweating. Drinking large quantities of water tends to dilute the body's fluids, while the body continues to lose salt.

- First Aid

  Apply warm, moist heat and pressure to reduce pain.

  Give electrolyte drinks by mouth (e.g., *Gatorade*®).

Heat Exhaustion

Caution: Persons with heart problems or on a low-sodium diet who work in hot environments should consult a physician about what to do under these conditions.

Heat exhaustion is a result of overexertion in hot or warm weather. It is highly possible for an on-site worker to experience heat exhaustion due to the use of protective coveralls, boots, gloves, and respiratory protection, even if ambient temperatures are mild.

- *Symptoms*

  Pale, clammy skin

  Profuse perspiration

  Weakness

  Headache

  Nausea

- *First Aid*

  Get victim into the shade or to a cooler place.

  Immediately remove any protective clothing.

  Encourage victim to drink plenty of fluids.

  Make victim lie down with feet raised.

  Fan and cool victim with wet compress.

  Transport victim to the hospital if vomiting occurs.

  Instruct victim to rest for a few days.

- *Prevention*

  If possible, schedule work for early morning or evening during warm weather.

  Have cool liquids at the Exclusion Zone border for down-range personnel to continuously replace body fluids.

  The SSO or alternate should continually monitor personnel for signs of heat stress.

Heat Stroke

The body's temperature control system, which causes sweating, stops functioning correctly in the case of heat stroke. Brain damage and death may occur if the body core temperature is extremely elevated and is not reduced.

- *Symptoms*

  Flushed, hot, dry skin

  High body core temperature (greater than 105 F)

  Dizziness

  Nausea

  Headache

  Rapid pulse

  Unconsciousness

- *First Aid*

  Immediately take precautions to cool the body core temperature by removing clothing and sponging the body with alcohol or cool water, or by placing the victim in a tub of cold water until his or her body temperature is reduced sufficiently (102 F). Stop cooling and observe the victim for 10 minutes. Once the temperature is controlled at a low enough level, dry the person off. Use fans or air conditioning, if available. Do not give the victim stimulants. Transfer to a medical facility.

Heat Stress Program

The heat stress program includes work and rest regimens employed as necessary so that personnel do not suffer adverse effects from heat stress. The SSO is responsible for monitoring heat stress throughout the day. Based on heat stress severity, the SSO will determine to what extent the elements of the heat stress program will be implemented.

Special clothing and an appropriate diet and fluid intake will be recommended to all site personnel to reduce the chance of heat-related hazards. The work and rest regimens followed by WCD were developed based on the current American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) guidelines and on National Institute of Occupational Safety and Health (NIOSH) recommendations.

Work Load

The following table will be used as a guide for establishing initial work and rest regimens. It takes into account TLV wet-bulb globe temperature (WBGT) correction factors for clothing.
The work-load category will be established by ranking each job in light, medium, or heavy load categories based on the type of operation, as follows:

- *Light Work*
  Sitting or standing to operate machinery, performing light hand or arm work.
- *Moderate*
  Walking about with moderate amounts of lifting or pushing.
- *Heavy*
  Heavy physical labor (e.g., pick and shovel work).

APPROACH FOR SETTING WORK/REST SCHEDULES FOR WORKERS WEARING NORMAL WORK CLOTHING

Adjusted Temperature* (calculated)	Light Work	Moderate Work	Heavy Work
90	Normal	Normal	Normal
91	Normal	Normal	Normal
92	Normal	Normal	Normal
93	Normal	Normal	Normal
94	Normal	Normal	Normal
95	Normal	Normal	45/15
96	Normal	Normal	45/15
97	Normal	Normal	40/20
98	Normal	Normal	35/25
99	Normal	Normal	35/25
100	Normal	45/15	30/30
101	Normal	40/20	30/30
102	Normal	35/25	25/35
103	Normal	30/30	20/40
104	Normal	30/30	20/40
105	Normal	25/35	15/45
106	45/15	20/40	Caution
107	40/20	15/45	Caution
108	35/25	Caution	Caution
109	30/30	Caution	Caution
110	15/45	Caution	Caution
111	Caution	Caution	Caution
112	Caution	Caution	Caution

Note: Adjust the temperature reading as follows before using the temperature column in the table.

Weather	Adjustment
Full Sun (no clouds)	add 13°
Partly Cloudy/Overcast	add 7°
No shadows visible/work is in the shade	No adjustment
For Relative Humidity of:	
10%	subtract 8°
20%	subtract 4°
30%	No adjustment
40%	add 3°
50%	add 6°
60%	add 9°

For example, if the temperature is 91°, it is dusk, the relative humidity is 40%, and heavy work is to be performed, such as moving heavy materials with a wheelbarrow:

Start with 91° and add 3° because the humidity is 40%: 91°+3°=94°. Go to 94° in the table; under these conditions, it would be reasonable to follow a normal work schedule.

Notes:

1. This table is based on American Conference of Governmental Industrial Hygienists for heat-acclimatized adults in effect at the time the document was published (1993). Assumptions include physically fit, well-rested, and fully hydrated workers under the age of 40; adequate water intake; 30% relative humidity; natural ventilation; and temperature readings in Fahrenheit, taken in the shade, no sunshine or shadows visible.
2. 45/15 minutes = 45 minutes work and 15 minutes rest during each hour.
3. "Caution" indicates very high levels of heat stress. Consider rescheduling activities for a time when the risk of heat illness is lower.

SOURCE: Adapted from: U.S. EPA/OSHA. 1993. A guide to heat stress in agriculture. EPA-750-b-92-001

APPROACH FOR SETTING WORK/REST SCHEDULES FOR WORKERS WEARING CHEMICAL-RESISTANT SUITS

Air Temperature	Work/Rest Schedules								
	Light Work			Moderate Work			Heavy Work		
	Full Sun	Partly Cloudy	No Sun	Full Sun	Partly Cloudy	No Sun	Full Sun	Partly Cloudy	No Sun
75° F	Normal	Normal	Normal	Normal	Normal	Normal	35/25	Normal	Normal
80° F	30/30	Normal	Normal	20/40	Normal	Normal	10/50	40/20	Normal
85° F	15/45	40/20	Normal	10/50	25/35	Normal	Caution	15/45	40/20
90° F	Caution	15/45	40/20	Caution	Caution	25/35	Stop Work	Caution	15/45
95° F	Stop Work	Stop Work	15/45	Stop Work	Stop Work	Stop Work	Stop Work	Stop Work	Stop Work

Notes:

1. This table is based on values for heat-acclimatized adult workers under the age of 40 who are physically fit, well-rested, and fully hydrated with the assumptions of Tyvek coveralls, gloves, in the shade. Cooling vests may enable workers to work for longer periods. Adjustments must be made when additional protective gear is worn.
2. No sun refers to no shadows are visible or work is in the shade or at night.
3. 35/25 = 35 minutes of work and 25 minutes of rest each hour.
4. “Caution” indicates very high levels of heat stress. Consider rescheduling activities for a time when the risk of heat illness is lower.

SOURCE: Adapted from: U.S. EPA/OSHA. 1993. A guide to heat stress in agriculture. EPA-750-b-92-001

COLD EXPOSURE

Cold Stress

Cold injury such as frostbite and hypothermia may occur during field operations. The extent of injury caused by exposure to the cold will depend on such factors as wind velocity, temperature, and humidity. To guard against such injuries, personnel must wear appropriate clothing, have immediate access to warm shelter, carefully schedule work and rest periods, monitor workers' physical conditions, and learn to recognize warning symptoms, such as reduced coordination, drowsiness, impaired judgment, fatigue, and numbing of toes and fingers.

Frostbite

Frostbite is a localized injury that results from the freezing of tissue. It is most common to the fingers and toes (due to reduced circulation in the extremities), and on the face and ear (most commonly exposed to the weather).

For frostbite to occur, there must be subfreezing temperatures. It is most prevalent in very cold temperatures (20 F or less) or when cold temperatures are exacerbated by the wind (wind chill).

- *Symptoms*

  Prefrostbite
  The affected area feels painfully cold, but is usually flushed (rosy-red in color)

  First-Degree Frostbite (Frost Nip)
  Crystallization occurs in superficial tissues. The affected area no longer feels cold, is completely numb, and shows as a small white or grayish-yellow waxy patch. Immediate treatment will completely reverse the condition with no ill effects.

  Second-Degree Frostbite (Deep)
  A deep freezing of the fluids in the underlying soft tissues. Symptoms and treatment are the same as for first-degree frostbite. It usually results in the death of tissue (e.g., blistering black skin or a loss of toes) with possible complications from gangrene.

Memo

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From: Heather McPherson, EIT and Troy Bussey Jr., PE, LG, LHG

Cc: Tyson Carpenter, PE (Port of Olympia [Port]), Rachael Jamison (Port), Chris Waldron, PE (PIONEER Technologies Corporation [PIONEER])

Date: August 14, 2017

Subject: Unanticipated Discoveries Plan
Addendum to the Engineering Design Report for the East Bay Redevelopment Site

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The purpose of this memorandum is to present the Unanticipated Discoveries Plan (Plan) for cleanup implementation at the East Bay Redevelopment Site (Site; Agreed Order No. DE14072, Facility/Site No. 5785176). This memorandum is an addendum to the June 2017 Engineering Design Report for Cleanup Implementation (EDR; PIONEER 2017).

Introduction

Three relatively small soil excavations and Site-wide grading activities will take place during the Site cleanup implementation, as presented in the EDR. Based on the limited cleanup implementation activities to be performed, and the extent of fill material across the majority of the Site, it is unlikely that work will disturb soil containing items of cultural/archaeological significance (cultural/archaeological resources) or of human remains (PIONEER 2016). However, in the event that any cultural/archaeological resources or human remains are inadvertently found, this Plan outlines the procedures to be followed at the Site. All Site personnel will be notified of the procedures during a pre-construction meeting and with reminders during tailgate meetings prior to excavation work. This Plan was developed in accordance with: Chapters 27.44 (Indian Graves and Records), 27.53 (Archaeological Sites and Resources), 68.50 (Human Remains), and 68.60.050 (Protection of Historic Graves) of the Revised Code of Washington (RCW), and Chapter 25-48 (Archaeological Excavation and Removal Permit) of the Washington Administrative Code (WAC).

Discovery of Cultural/Archaeological Resources

Description of Cultural/Archaeological Resources

A cultural/archaeological resource discovery could be prehistoric or historic (e.g., older than 50 years) in age. Some examples of cultural/archaeological resources include:

- Groups of shells, charred rocks, or other materials related to food preparation
- Soil with burned material (charcoal or very dark staining) that could contain artifacts
- Stone tools, points, or stone flakes
- Historic tin cans or glass bottles
- Buried logging or agricultural equipment (e.g., hand saw)

If in doubt, assume the material found could be a cultural/archaeological resource.

Procedure

1. Stop work in the vicinity of the discovery, ensuring no change or damage to the discovery, and immediately contact the Port Primary Contact (see Table 1).
2. Secure the location and prevent foot and vehicle access. The Port Primary Contact will arrange for security at the Site, as necessary.
3. The Port Primary Contact will contact a professional archaeologist to examine the finding and determine whether or not the discovery is a cultural/archaeological resource.
    a. If the discovery is determined to be non-cultural/non-archaeological, work may resume at that location.
    b. If the discovery is a cultural/archaeological resource, the Port Primary Contact must notify the Washington State Department of Ecology (Ecology), Washington State Department of Archaeology and Historic Preservation (DAHP) and the Squaxin Island Tribe (see Table 1 for contact information). All parties will be invited to attend an on-site inspection with a professional archaeologist. The discovery will be investigated and documented appropriately as mandated by state and federal law. Field personnel will not resume work in the vicinity of the discovery until official notice to resume work has been given by the applicable authorities.
    c. If the discovery is determined to be human remains, follow the procedures in the Discovery of Human Remains section below.

Discovery of Human Remains

Procedure

1. Stop work in the vicinity of the apparent remains, ensuring no change or damage to the remains, and immediately contact the Port Primary Contact (see Table 1).
2. Site personnel will be respectful. A cover (such as a tarp) will be put over the remains to prevent disturbance or photographs.
3. The Port Primary Contact will immediately contact Ecology, the City of Olympia Police Department and the Thurston County Coroner's Office (see Table 1).
4. The Port Primary Contact will arrange for security at the Site to prevent foot and vehicle access.
5. The City of Olympia Police Department and Thurston County Coroner will determine whether the remains are human and whether a crime scene investigation is needed.
6. The Port Primary Contact will contact Ecology, DAHP and the Squaxin Tribe with the findings from the City of Olympia Police Department and the Thurston County Coroner's Office (see Table 1).
7. Field personnel will not resume work in the vicinity of the discovery until the consultation and documentation process is complete and official notice to resume work has been given by the applicable authorities.

Contact Information

Table 1: Contact Information

Role/Organization	Name/Title	Contact Information
Port Primary Contact	Tyson Carpenter, Project Engineer	(360) 528-8006 tysonc@portolympia.com
Port Alternate Contact	Rachael Jamison, Director of Environmental Programs	(360) 528-8020 rachaelj@portolympia.com
Washington State Department of Ecology Contact	Steve Teel, Cleanup Project Manager	(360) 407-6247 steve.teel@ecy.wa.gov
City of Olympia Police Department	(General Non-Emergency Number)	(360) 704-2740
Thurston County Coroner's Office	Gary Warnock, Coroner	(360) 867-2140
DAHP	Allyson Brooks, State Historic Preservation Officer/Director	(360) 586-3066 allyson.brooks@dahp.wa.gov
Squaxin Island Tribe	Rhonda Foster, Tribal Historic Preservation Officer	(360) 432-3850 rfoster@squaxin.us

References

PIONEER 2016. Remedial Investigation/Feasibility Study Report, East Bay Redevelopment Site, December.

PIONEER 2017. Engineering Design Report for Cleanup Implementation, East Bay Redevelopment Site, June.

- *First Aid*

  Cover and protect the affected area.

  Provide extra clothes.

  Bring the victim indoors as soon as possible.

  Give the victim warm drink

  Rewarm frozen tissue quickly by immersing it in warm water (if thawed and refrozen, warm at room temperature).

  Do not rub; rubbing causes death of tissue.

  Do not apply heat.

  Do not break blisters.

  Do not allow victim to walk after feet thaw.

  Discontinue warming as soon as the frostbitten body part becomes flushed.

  Exercise the thawed body part.

  Separate fingers and toes with sterile gauze.

  Elevate frostbitten parts.

  Seek medical attention because of chance of infection or gangrene.

Hypothermia

Hypothermia is a systemic lowering of the body temperature. Extreme cases (core temperature below 90 F) result in death. Hypothermia is the most common cause of death for persons involved in outdoor/wilderness activities. It does not require freezing temperatures and can occur in ambient air temperatures as high as 70 F. Wind and wetness greatly accentuate hypothermia by causing increased cooling. An example of a hypothermic condition is a rainy, windy day with 50 F air temperatures.

- *Symptoms*

  First Stage: "goose bumps," shivering, feeling chilly

  Second Stage: violent shivering, blue lips, pale complexion, feeling extremely cold

  Third Stage: no longer feeling cold, lack of coordination, mild unresponsiveness, drowsiness, stumbling

  Fourth Stage: failing eyesight, almost total lack of responsiveness, inability to speak, inability to walk

  Fifth Stage: coma or rapid death

- *Treatment*

For all levels, remove wet, frozen, or restrictive clothing. Dry and rewarm the victim using an external heat source that completely envelops the victim (e.g., placing the victim in a warm vehicle, a warm room, a tub of warm water, or a sleeping bag with another person). Do not use a source of radiant heat that will warm only one side of the victim. Be prepared to administer cardiopulmonary resuscitation (CPR). Do not give the victim alcohol.

First Stage

Put additional clothing on the victim such as a hat, shirt, or windbreaker; give food and drink; exercise tense muscles.

Second Stage

Follow the same steps listed for the first stage, only more so; give warm drinks and provide means of rewarming if possible.

Third Stage

Rewarm the victim; give warm food and drink. **Note: In hypothermia beyond the second stage, the victim can no longer warm himself and must have an external heat source.**

Fourth Stage

Remove wet or cold clothing and gradually rewarm the victim so that blood trapped in extremities is rewarmed before it is circulated back into the inner body, in order to prevent *afterdrop*. Afterdrop is a further lowering of the body core temperature that results from recirculation of cold blood. Avoid hot, radiant heat sources that will warm surface blood before the inner blood has been warmed. Do not give warm drinks that can fool the body internally into feeling it is warm. Fourth stage hypothermia victims are best treated by supervised, experienced medical help because complications can cause death. Place the victim in a warm vehicle and evacuate immediately to a medical facility.

Fifth Stage

Gradually rewarm the victim. Requires sophisticated medical help to prevent death from *aftershock* (a recirculation of chilled blood causing heart fibrillation).