

***Final Parcel 3 and 15th Street ROW
Site-Specific Cleanup Action Plan***

***Thea Foss Upland Properties
Consent Decree 94-10917 6***



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***Prepared for
City of Tacoma
Public Works Engineering***

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**FINAL PARCEL 3 AND 15TH STREET ROW
SITE-SPECIFIC CLEANUP ACTION PLAN
CITY OF TACOMA
THEA FOSS UPLAND PROPERTIES**

INTRODUCTION

At the turn of the century, the Thea Foss Waterway was the center of commerce and industry for the City of Tacoma. By the 1970s, many properties along the waterway stood vacant and blighted due to industrial decline and environmental degradation. Starting in the 1980s, the City began acquiring property along the waterway to spur environmental cleanup and redevelopment. Working closely with the Environmental Protection Agency (EPA) and Washington State Department of Ecology (Ecology), the City developed an area-wide plan for cleanup of both the waterway and adjacent uplands. For the past three years, cleanup of the uplands has been focused on properties along the westside of the waterway south of South 15th Street. Included in this area is the Parcel 3 site. This report presents the Site-Specific Cleanup Action Plan (SCAP) for Parcel 3 and the 15th Street ROW.

Area-Wide Cleanup

In 1994, the City voluntarily entered into an Administrative Order of Consent (AOC) with EPA for cleanup of the Thea Foss Waterway, and a Consent Decree (Decree) with Ecology for cleanup of the adjacent uplands. Cleanup work administered under the AOC and Decree are closely related, sharing a common boundary at mean higher high water (MHHW elevation 11.8 feet MLLW), although the upland property cleanup may extend to MLLW with EPA concurrence. This cleanup plan extends to MLLW throughout most of Parcel 3 where the shoreline is a "no action" area under the waterway cleanup. Ultimate compliance with provisions of both the AOC and Decree will result in a cleanup action extending from the mouth, to the head of the Thea Foss Waterway, and include adjacent City-owned uplands.

Upland cleanup under the Decree is currently focused on City-owned properties south of 15th Street along the west side of the waterway. Concurrent with work on Parcel 3 and 15th Street ROW, the following properties (as shown on Figure 1) are also being studied for identification of cleanup action needs.

- ▶ Parcel 4;
- ▶ Parcel 10, formerly the Harmon Cabinet property and the 21st Street ROW;
- ▶ Parcel 9, also known as the Albers Mill property;

- ▶ Parcel 7, formerly known as the Morris property; and
- ▶ Dock Street ROW.

Environmental cleanup of these properties will be closely related to their ultimate reuse and redevelopment. Based on current plans this may result in as many as twelve separate cleanup actions related to redevelopment activities. Redevelopment plans for Parcel 3 call for public esplanade along the waterfront with three private development sites along Dock Street. Based on the current concept for redevelopment, site-specific cleanup action plans for Parcel 3 include four cleanup action areas. These are referred to as the SCAP 9 area (Public Esplanade), and SCAP 10, 11, and 12 areas (Private Redevelopment). The 15th Street ROW is also included as its own SCAP in this report.

Concurrent with the uplands cleanup work the City is also working on plans for cleanup of the Thea Foss Waterway under the AOC with EPA. To the extent possible, the site-specific cleanup action plan for Parcel 3 and the 15th Street ROW presented in this report takes into consideration cleanup plans for the waterway and area-wide redevelopment plans.

Site-Specific Cleanup

The Site-Specific Cleanup Action Plans (SCAPs) presented in this report identify the cleanup actions required on Parcel 3 and the 15th Street ROW as defined by terms of the Thea Foss Redevelopment Cleanup Action Plan (CAP), Exhibit C to the Decree. The SCAPs follow a remedial investigation performed for the sites (Hart Crowser, 1998) which identified the contaminant issues on the sites and assessed the applicability of the Thea Foss Redevelopment Cleanup Action Plan to the sites. The Site-Specific Remedial Investigation (RI) includes an analysis of the historical sources of contamination, the nature and extent of contamination, and addresses the applicable cleanup alternatives for the sites given the identified environmental conditions and potential redevelopment scenarios.

The Draft Final RI and the SCAPs for Parcel 3 and the 15th Street ROW were made available for public comment in accordance with WAC 173-340-600. This Cleanup Plan is being finalized based on public comment and will be included as an amendment to the Consent Decree. The City of Tacoma will implement the final SCAPs, with submittal of appropriate remedial design, construction, and monitoring plans to Ecology for review. Final remedial action will be conducted in conjunction with site development.

SITE DESCRIPTION

Parcel 3 and the 15th Street ROW are located between Dock Street and the Thea Foss Waterway as shown on Figure 1. The Parcel 3 site includes Block 59, Lots 1 through 22. The 15th Street Right of Way (ROW) is located immediately adjacent to Parcel 3 on the north. Under the City's new boundary line adjustments Parcel 3 is redefined as Parcels A through C with Parcel A occurring along the waterfront (future public Esplanade site) and Parcels B and C lying along Dock Street (future redevelopment sites). The 18th Street ROW is located immediately south of Parcel 3.

Redevelopment plans for this parcel include public access and recreational uses along the waterfront property and 15th Street ROW. Private development sites are presently planned for the western portion of Parcel 3. To accommodate the redevelopment plans of Parcel 3, five separate Site-Specific Cleanup Action Plans (SCAPs) are addressed in this report. These include:

- ▶ **SCAP 9.** The waterfront between 15th Street and 18th Street planned for public recreational use (Public Esplanade) based on the City of Tacoma's Design Development Plans (Phase I) for the Thea Foss Waterway Public Esplanade and Dock Street (ARRJW, July 10, 1998);
- ▶ **SCAPs 10, 11, and 12.** The western portion of Parcel 3 adjacent to Dock Street planned as private redevelopment sites—identified as Development Sites 3 through 5 based on the City of Tacoma's Schematic Design, 15th Street to 21st Street, Thea Foss Waterway Public Esplanade (ARRW), 1997); and
- ▶ **15th Street ROW.** Future site of public access and park area based on the City of Tacoma's Schematic Design for the Thea Foss Waterway Public Esplanade (ARRJW, 1997).

SCAP 9 Area Conditions

SCAP 9 includes the area between 15th and 18th Streets along the waterfront. This area is currently planned for development of a public esplanade. Under the Consent Decree, the City may address the area between MHHW and Mean Lower Low Water (MLLW) with concurrence by EPA which has jurisdiction below MHHW under the AOC for the Thea Foss Waterway cleanup. The Thea Foss Waterway remedial design plans identify the Parcel 3 waterfront as a "No Action" area, except for the northernmost area (from about Lot 8 and north) where a thick cap is planned. SCAP 9 extends to the MLLW (elevation -6.33 TPWD datum) in this "No Action" area.

At present, SCAP 9 consists of exposed soil along the intertidal bank, with occasional concrete and timber docks. The intertidal beaches along SCAP 9 consist of a mix of artificial substrata and mixed gravel and cobble in a muddy matrix ("mixed fine"). At lower tidal elevations near MLLW, the substrate becomes increasingly muddy. Numerous wooden pilings, which currently or formerly supported overwater wharfs, are present in the intertidal and nearby offshore areas. An asphalt path surrounded by lawn at the top of the bank covers the remainder of the SCAP. A chain-link fence has been erected around a portion of the waterfront to prevent public access to certain areas, including the existing docks. The bank area is sloping to a variable degree of steepness, while the western portion of the SCAP is generally flat.

SCAP 10 Area Conditions

SCAP 10 is the southernmost development site (Development Site 3) located between Dock Street and the western boundary of the proposed esplanade. This area is inclusive of Lots 16 through 22 and a small portion of Lot 15. The south half of a proposed view corridor covering Lot 15 and parts of Lots 14 and 16 (ARRJW, 1997) is assumed to occur within this SCAP 10 area (See Figure 1).

The SCAP 10 area is generally flat, with site grades ranging in elevation from 9 feet (TPWD) in the south to about 12 feet in the north. Partially broken-up concrete slabs cover the majority of the area. Asphalt lots and walkways occur over most of the remaining SCAP 10 area, but some lawn and exposed soil areas are also present. These features will be demolished/removed during the cleanup of SCAP 10.

SCAP 11 Area Conditions

SCAP 11 is the central development site (Development Site 4) located between Dock Street and the western boundary of the proposed esplanade. This area is inclusive of Lots 8 through 14 and a portion of Lots 7 and 15. Half of a view corridor for public access to the Esplanade is assumed on both the northern and southern sides of the SCAP based on the present layout of the development sites/view corridors (ARRJW, 1997).

The SCAP 11 area is also relatively flat with existing site grades ranging in elevation between 11 and 12 feet (TPWD). The SCAP 11 area presently has a (partially) broken-up concrete slab over the southern half of the SCAP. Lawn area covers most the remaining area, however, an asphalt path traverses the eastern side of the SCAP. These features will be demolished/removed during the cleanup of SCAP 11.

SCAP 12 Area Conditions

SCAP 12 is the northernmost development site (Development Site 5) located between Dock Street and the western boundary of the proposed esplanade. This area is inclusive of Lots 1 through 6 and a portion of Lot 7. The north half of a view corridor for public access to the Esplanade is assumed to occur in the southern SCAP area based on the present layout of the development sites/view corridors. The view corridor covers Lot 7.

The SCAP 12 area existing grade is primarily at elevation 12 feet (TPWD). SCAP 12 is presently primarily lawn area; however, an asphalt parking lot surrounded by concrete sidewalk exists adjacent to Dock Street. In addition, the asphalt walkway traverses portions of the eastern extent of the SCAP, but is primarily within SCAP 9 at this location. These features will be demolished/removed during the cleanup of SCAP 11.

15th Street ROW Area Conditions

The 15th Street ROW is located immediately north of Parcel 3 and includes the band of property approximately 80 feet in width below the 15th Street ramp between MHHW and Dock Street. This area is planned as park and public access area for the waterfront. Site grades are consistent with the development sites to the south. The 15th Street ROW is presently primarily roadway and an asphalt-paved area for parking. Concrete sidewalks provide access to the site from Dock Street.

Historical Land Use

Railroad interests controlled Parcel 3 from its initial development to its purchase by the City in 1991. The following section briefly summarizes industrial activities, which have contributed to the soil quality issues characterized in the remedial investigation (Hart Crowser, 1998).

Lots 1 through 12

The north end of the parcel (Lots 1 through 4) was originally developed as a coal yard. Machine shop/metal treating plants (hot and cold galvanizing) were in operation on these lots from the early 1900s to about 1930. A wholesaler of windows, doors, roofing materials, and paints operated in this area from about 1930 until it burned to the ground in 1938. This was also the fate of the adjacent cement, lime, concrete, and building materials operation on Lots 5 through 7. This company had expanded from Lots 5 through 7 into the then-vacant land to

the south and extended operations through Lot 11. The building materials operation maintained trucks near Lot 7.

Lots 13 through 18

A major foundry/machine shop was located on Lots 13 through 18. The plant cast and machined parts (i.e., brass and iron parts) used in the ship repair industry. Coking ovens were used in the process. A dry dock was also located in the area, which may have released paint chips with copper/mercuric compounds until about 1905. Unfilled slip areas at the north and south end of these lots existed from the waterway to Dock Street up to about 1905. These slips received spoil materials from the adjacent industrial activities and subsequent to 1905 were completely filled. In 1922, a veneer plywood plant began production of fir and hardwood plywood. Oil and gas tanks were used, as well as a "wood treating oil sprayer" complex along the south property line.

Lots 19 through 22

A coal yard and storage area for cement, lime, sand and gravel, bricks, and tile first occupied this area (Lots 19 through 22) in the late 1880s. In 1915, ownership changed, but continued the building materials operations. A concrete batch plant was added, in addition to locating a roofing division on the property. A truck repair facility was in operation along Dock Street as well.

REMEDIAL INVESTIGATION FINDINGS

This section briefly summarizes the physical characteristics and environmental quality of site soil and groundwater for SCAPs 9 through 12 and the 15th Street ROW. A more detailed discussion of physical subsurface conditions and the nature and extent of contamination, including figures and cross sections, is provided in the Parcel 3 RI (Hart Crowser, 1998). The remedial investigation findings define areas for cleanup action. Figure 2 presents a map showing the principal areas of identified contamination.

Soil Characteristics and Quality

Parcel 3 and 15th Street ROW Soil Stratigraphy

Variable fill materials comprise the upper 10 to 15 feet of soils beneath Parcel 3, generally averaging about 12 feet. Below these fill materials, native tideflat soils occur. The fill materials are a complex mixture of silt, sand, and gravel, with wood, bricks, and other construction-related debris. The fill materials overlie native tideflat soils to an elevation of roughly 0 feet (TPWD).

The following units were classified based on materials that were encountered in explorations for Parcel 3, combined with interpretations that have been developed for other Thea Foss upland parcels. They are described below in sequence of occurrence from the former tideflat level up to the present ground surface:

- ▶ **Native Tideflat.** These soils are typically a dark brown to olive-brown, very silty, fine sand to sandy silt, with shells and organic material. The native tideflat soils are observed at depths of about 10 to 15 feet beneath Parcel 3, corresponding to an elevation at or slightly below 0 feet across most of the parcel.
- ▶ **Dredge Fill.** These soils are typically a gray to brown and black, fine sand, silty sand, and/or sandy silt. The initial filling on Parcel 3 occurred below Dock Street and the existing wharves during the initial (1889-1890) dredging of the waterway. Interpretation of remedial investigation data indicates that roughly 700 feet of the waterfront area (roughly Lots 6 to 21) does not include dredge fill in the filling sequence.
- ▶ **Upland Fill.** Fill materials from upland sources to the west are primarily silty sand and gravel mixtures with debris consisting of wood, brick fragments, and concrete pieces. This material was placed below Dock Street and intermixed with Mixed Fill that was likely placed during the 1905-1907 redevelopment of the area. The elevation of the site and most adjacent parcels were likely raised approximately 3 to 4 feet from the original wharf and street level.
- ▶ **Mixed Fill.** The Mixed Fill is commonly a brown to gray sand and gravel, with some silty zones. Debris is abundant in much of the fill and primarily includes brick, concrete, wood (some possibly treated), and coal. This variable fill material was placed in multiple episodes over the dredge fill, or tideflat if the dredge fill was not present (e.g., along the center of the proposed Esplanade, Lots 6 to 21). The fill material is variable in nature across Parcel 3 and was placed in different areas at different times. The filling is conceptualized as three different types of activities; material associated with the circa 1905 waterfront redevelopment, areas (such as slips) which received multiple episodes of filling before and after the 1905 activities and at least up until 1912, and filling and regrading associated with existing building demolition and property redevelopment.

- ▶ **Recent Fill.** This is primarily a silty sand and gravel material with debris similar to that of the Mixed Fill. This interpreted latest fill sequence on Parcel 3 is generally related to more recent development across the site.

Soil Quality Issues

The primary contaminants identified in Parcel 3 soils and within the 15th Street ROW are carcinogenic polycyclic hydrocarbons (cPAHs), total petroleum hydrocarbon (TPH) (oil-range), and lead. Specific areas of the site, primarily within the southcentral SCAP 11 area, have one or more contaminants at concentrations above soil contamination maximum concentrations (CAP maximums). Occasional exceedences of arsenic, and single exceedences of copper and pentachlorophenol were also identified on Parcel 3, but the relative magnitude and frequency of exceedence are much less than for cPAHs, TPH-oil, or lead.

The majority of the contaminants appear to be associated with burnt materials (wood and coal) disseminated within the Mixed Fill soils. The detected TPH is comprised of heavy-end hydrocarbons, which have low mobility and pose negligible risk to groundwater. Likewise, the data indicate that other constituents above cleanup levels have not impacted groundwater. Figure 2 presents a summary of the principal areas of contaminant occurrence identified by the Remedial Investigation (Hart Crowser, 1998). More detailed information on the soil quality is presented in the Remedial Investigation report.

SCAP 9 (Public Esplanade)

The soil quality issues along the waterfront portion of the property—SCAP 9—are predominantly associated with debris within the Mixed Fill soils. Specific soil quality issues by depth are summarized below.

- ▶ **0- to 3-Foot Depth.** cPAHs and TPH-oil (TPH-O) are the primary constituents detected above cleanup levels within the upper 3 feet of soils in SCAP 9. The cPAH concentrations range up to 18.5 mg/kg and the highest concentrations are most often associated with burned wood. TPH-O concentrations range up to 3,300 mg/kg, which is below the risk-based value of 5,700 mg/kg established based on sample analysis using Ecology's Interim TPH Policy (Hart Crowser, 1998).
- ▶ **3- to 7-Foot Depth.** Similar to the upper soils, cPAHs and TPH-O were the primary constituents detected within the 3- to 7-foot depth-range in the SCAP 9 area. In addition, an area of localized metal exceedences occurs in Lots 1 through 3. The metals contamination is interpreted to be slag-related

due to the historical foundry/machine shop operation in this area of the site. The cPAH concentrations are relatively low, ranging up to about 4.5 mg/kg. TPH-O was typically below the risk-based level of 5,700 mg/kg, with the exception of the central area adjacent SCAP 11. Here relatively high TPH concentrations (10,000 and 14,000 mg/kg) were indicated in the 4- to 6-foot-depth range. These higher TPH-O concentrations were associated with a layer of waste material containing burnt wood, bits of burnt coal-like material, and fragments of patent bottles dated to the 1880s/1900.

SCAP 10 (Development Site 3)

The soil quality issues in the southern portion of Parcel 3—SCAP 10—are interpreted to be primarily associated with waste materials from a series of machine shop and foundry operations. Two areas of foundry slag debris from former iron and/or brass foundries are inferred from explorations and soil quality data in the northern portion of this SCAP area (See Figure 2), typically within the 2- to 5-foot-depth range. The specific contaminant issues indicated by the chemistry data in this area are summarized below by depth range.

- ▶ **0- to 3-Foot Depth.** Contaminant issues in the upper 3 feet of SCAP 10 soils are primarily related to cPAHs and TPH-O. A single occurrence of arsenic at a concentration slightly above the cleanup level was also identified. The cPAH concentrations are generally low within the proposed building footprint of the development site, ranging up to 5.6 mg/kg. However, exceedences at concentrations of 15.9 and 33.0 mg/kg are indicated in the northern SCAP area within the proposed view corridor between SCAPs 10 and 11. Detected TPH-O is well below the risk-based level of 5,700 mg/kg, occurring up to concentrations of about 1,000 mg/kg.
- ▶ **3- to 7-Foot Depth.** Similar to the 0- to 3-foot-depth interval, the soil quality exceedences indicated within the 3- to 7-foot-depth interval are primarily cPAHs and TPH-O. The cPAHs are relatively low (up to 1.4 mg/kg) as are the TPH-O concentrations. TPH-O concentrations are well below the risk-based level of 5,700 mg/kg. A single occurrence of arsenic was detected in P3-TP18 (23.1 mg/kg) between 2.5 and 3.5 feet in depth. Lead was detected (2,700 mg/kg in P3-TP-16) above the CAP maximum concentrations. Both of these metal issues are likely related to the slag-like material present in this area.

SCAP 11 (Development Site 4)

The soil quality issues within the middle section of Parcel 3—SCAP 11—include the highest concentrations of TPH-O and lead identified on Parcel 3. The

- ▶ **3- to 7-Foot Depth.** Similar to the 0- to 3-foot-depth range, only low-level cPAH soil contamination was detected. Some slag or metal may be encountered due to the proximity of this SCAP area to the northeast corner of Parcel 3 (SCAP 9 area) where historical machine shop and galvanizing activities occurred.

15th Street ROW (Public Access Park)

Soil cleanup levels for cPAHs were exceeded in shallow soils within the 15th Street ROW with concentrations ranging up to 3 mg/kg. Nearest the waterway bank, elevated metal concentrations (lead, arsenic, and copper) were detected at depth on the adjacent Parcel 3, and could be expected in this area. Depth-specific issues identified are summarized below.

- ▶ **0- to 3-Foot Depth.** cPAHs exceed cleanup levels, but concentrations are relatively low (less than 2.9 mg/kg). Encountering soils within the ROW with metals, TPH-O, and cPAH contamination should be considered based on the data collected on the adjacent Parcel 3 area where past disposal likely occurred and may overlap the 15th Street ROW area.
- ▶ **3- to 7-Foot Depth.** Only low-level cPAH and metal soil contamination was detected in this area. Again, in the area along the waterway bank, some slag or metal may be encountered due to the proximity of this area to the Parcel 3 area of past disposal.

Groundwater Characteristics and Quality

Groundwater Occurrence

Depth to groundwater beneath most of Parcel 3 ranged from about 5 to 9 feet (about elevation 2 to 6 feet [TPWD]) during our exploration period. For the purpose of cleanup action/remedial design, a mean-high groundwater elevation of 5.5 feet is assumed, which is consistent with the Mean Higher High Water level (MHHW) of the Thea Foss Waterway and groundwater elevations observed on other upland parcels.

The shallow groundwater system beneath Parcel 3 is tidally influenced, with some areas along the waterway more responsive to tide levels than others. P3-MW01 is located about 85 feet from the waterway and indicated less than 0.1 foot of fluctuation during our measurements, whereas other areas along the waterway to the south (e.g., RD3-UMW-3 and R21-MW02) have exhibited as much as 3 to 5 feet of tidal fluctuation, respectively. Tidal response is a function of material type, quantity of debris, and distance from the waterway. In addition

to tidal fluctuations, seasonal fluctuations of several feet could also be observed based on data from surrounding parcels.

Groundwater in the vicinity of Parcel 3 is presumed to flow toward the Thea Foss Waterway during most of the tide cycle. During high tide, it is likely that groundwater flows inland from the waterway forming a temporary "saddle" in the groundwater surface. This periodic groundwater reversal results in mixing of fresh and salt water, which is confirmed by specific conductivity measurements made during the remedial investigation (Hart Crowser, 1998).

Groundwater and Surface Water Quality

Groundwater quality beneath Parcel 3 is similar to area background conditions, with no apparent groundwater quality impacts attributable to site soil quality issues. Groundwater quality data for Parcel 3 are available from downgradient well P3-MW01 and upgradient well P3-MW02. Monitoring well P3-MW01 is located immediately adjacent and downgradient of the area of the highest lead, TPH, and cPAH exceedences (See Figure 2). The lack of demonstrated impact to groundwater quality, after much of the fill materials have been in-place for several decades, indicates that the potential for exposure through groundwater or surface water pathways is low as discussed in the remedial investigation. Thus groundwater quality is not considered a cleanup issue for Parcel 3.

SITE CLEANUP STANDARDS

Soil Cleanup Standards

The cleanup standards for the site soils were developed according to Chapter 173-340 WAC and are defined in the Thea Foss Upland Redevelopment Consent Decree and Cleanup Action Plan (State of Washington, 1994). These standards are based on protection of groundwater and surface water, and on estimates of reasonable maximum exposure (RME) expected for protection of human health. The residential use scenario as defined in MTCA represents the reasonable maximum exposure scenario for direct contact in the development site areas because of the potential for residential uses. The residential cleanup levels are used for evaluation of data from Parcel 3 and the 15th Street ROW. Table 1 presents the cleanup standards planned for the Parcel 3 site.

Total Petroleum Hydrocarbons (TPH)

The Consent Decree states that the 200 mg/kg TPH soil cleanup level (MTCA Method A) is deliberately conservative and allows for reassessment of the TPH cleanup level to account for site-specific characteristics and current cleanup

policies. Results from the remedial investigation conducted on Parcel 3, as well as the other upland parcels, indicate that nearly all of the TPH detected is oil-range hydrocarbon. The data also indicate the TPH is typically associated with burnt materials (wood, treated wood, coal, coal ash, etc.) rather than petroleum. These heavy-end hydrocarbons are related to turn-of-the-century industrial land filling activities and do not contain readily leachable components. Lack of leachability is demonstrated by lack of hydrocarbons detected in groundwater in the area of the highest TPH occurrence on Parcel 3, as well as from data collected on other upland parcels.

Alternative cleanup levels for the non-carcinogenic TPH fractions, which are protective of human health and the environment, were calculated using Ecology's Interim TPH Policy as part of the Parcel 3 Remedial Investigations. A risk level (hazard quotient of 1) of 5,700 mg/kg was calculated for the non-carcinogenic components of the hydrocarbons detected in characteristic Parcel 3 fill materials. Based on these data, the TPH cleanup level for Parcel 3 is set at 5,700 mg/kg.

Relatively high concentrations of TPH detected in the southcentral portion of the site (SCAP 11 and border of SCAP 9) within the 4- to 6-foot-depth range exceed the TPH cleanup level of 5,700 mg/kg. In this same area the groundwater quality data indicate that the TPH has not impacted groundwater quality. Any excavated soil in this area will require remediation. Although the risk-based cleanup level is not exceeded in many of the soil samples in other areas, the TPH generally occurs with cPAHs. It is the cPAHs that pose potential risks and will require cleanup actions should soils be moved or excavated in other areas of the site.

Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)

Carcinogenic PAHs are the most common contaminant identified throughout the project area and appear to be primarily associated with non-petroleum sources such as burnt wood, coal-related materials, and ash. The cleanup level based on residential contact exposures for individual cPAH compounds is 0.137, or 1 mg/kg for the sum of the seven cPAH compounds. The remedial action goal will be to prevent direct contact with cPAHs in soil and sediment.

Lead

The lead soil cleanup level identified in the Consent Decree is the MTCA Method A cleanup standard of 250 mg/kg, which was based on preventing unacceptable blood lead levels. Although there is more recent evidence developed by the EPA's Science Advisory Board based on the IEUBK model that lead levels up to 400 mg/kg are protective of children under a residential use

scenario, Ecology has not yet accepted these data. The cleanup level for lead will remain at 250 mg/kg.

Lead exceedences occur within the SCAP 11 and view corridor of SCAP 10/11 areas at depths above the groundwater level. Also, the northeast corner of the Esplanade SCAP 9 indicated concentrations of lead in the metallic slag-like material encountered in this area. The soils in these areas will require remedial action if encountered in excavations.

Groundwater Cleanup Standards

Groundwater cleanup levels are based on the protection of marine surface water including protection of aquatic life (marine chronic criteria; Chapter 173-201A WAC) and the protection of human health from consumption of aquatic organisms (40 CFR 131). Protection of surface water is applicable for the site since groundwater in the fill material is not considered a current or future potable drinking water source. It is also unlikely that a contaminant in the shallow groundwater will be transported to an area where groundwater is a current or potential source of drinking water. Finally, there are no apparent impacts to the waterway from upland groundwater. Given the age of the fill soils, and the available groundwater quality data, the soil contaminants detected in Parcel 3 are not expected to impact groundwater quality in the future.

CLEANUP ACTION PLAN

The Model Toxics Control Act (MTCA) requires all cleanup actions to protect human health and the environment, comply with cleanup standards and other applicable state and federal laws, and provide for compliance monitoring. The Thea Foss Waterway Redevelopment Cleanup Action Plan defined in Exhibit C of the Consent Decree between Ecology and the City of Tacoma (1994) was developed in accordance with MTCA requirements. The Consent Decree calls for Site-Specific Cleanup Action Plans (SCAPs) to be developed to address cleanup on specific City-owned properties relative to the terms of the area-wide Cleanup Action Plan (CAP) of the Consent Decree, compliance with applicable ARARs, and property redevelopment plans.

Ecology has determined that the cleanup actions specified in the area-wide Consent Decree CAP apply to the Parcel 3 site based on the results of the Remedial Investigation (Hart Crowser, 1998). The cleanup actions identified in the Consent Decree that are potentially applicable to Parcel 3 include:

- ▶ If the property is proposed for use as commercial/retail, open space, or upper story residential uses, contaminated soil will be isolated below 3 feet of clean soil cover, a building, or a pavement cap. Remediation measures could include excavating and treating up to 3 feet of soil to MTCA Method B standards followed by backfilling using clean soil covers and/or caps.
- ▶ If the property is proposed for redevelopment with ground floor residential uses, contaminated soil will be remediated to the depth of the mean-high groundwater level to meet MTCA Method B cleanup standards.
- ▶ Small quantities of contaminated soil, which are defined and localized, can be readily accessed, are technically and economically treatable, and pose a significant threat to human health and the environment were the soil to remain, shall be remediated.
- ▶ Where utilities are installed, the trenches will be constructed in accordance with state and city standards with the additional requirement that 1 foot of overexcavation, or a geofabric lining, be used to provide a clean perimeter around the outside of the utility trench.
- ▶ In all cases where residual contamination remains following remediation, institutional controls will be implemented to control future excavations, provide for long-term maintenance of the surface cap, and potentially provide for routine environmental monitoring.

To facilitate environmental cleanup, one of the strategies adopted by Ecology and the City of Tacoma in the Consent Decree CAP was to accomplish cleanup in the context of the site redevelopment. This would ensure that the cleanup was accomplished in a timely and cost-effective manner. To assess appropriate cleanup actions for Parcel 3, the CAP requirements were evaluated with respect to the development plans for the SCAPs within Parcel 3 and the 15th Street ROW areas.

SCAP 9—Redevelopment as Public Use Area

The SCAP 9 area is planned for redevelopment as public open space with recreational uses. Design plans for the Thea Foss Public Esplanade (ARRJW, 1998) identify a development alternative that includes beaches with upper elevation benches of saltmarsh vegetation, pierheads with future boat launches, and walkways along the waterfront esplanade surrounded by lawn area with trees. The plan also calls for reshaping of the waterfront bank to include treatments consistent with aquatic habitat enhancement and integration of the

cleanup actions being completed under the Thea Foss Waterway in-waterway remedial design project.

SCAPs 10 through 12—Future Private Development

The SCAP 10 through 12 areas are proposed as private development sites. At this time, the nature of the developments is unknown, although they will be expected to comply with the terms of the Consent Decree and this SCAP. Even though the specific development plan for the SCAPs is unknown, it is expected that they will include a building over most of the area. The development plan could also include use of the subgrade area for parking or other use. For the purpose of cleanup actions under the Consent Decree, any subgrade area is defined as the depth below final grade to the mean-high groundwater level (approximately elevation 5.5 feet, TPWD).

Associated with the development sites are view corridors which will allow public access to the esplanade and waterfront. At this time, we have assumed the view corridor locations as depicted in the Schematic Design plans for the Esplanade (ARRJW, 1997); however, their locations may vary per Foss Development Plan guidelines. For the purpose of this report we have assumed that half of each view corridor is associated with the adjacent development site.

15th Street ROW—Redevelopment as Public Use Area

The 15th Street ROW area is planned as public open space. Schematic Design plans, Thea Foss Public Esplanade (ARRJW, 1997) identify an alternative that includes lawn areas, constructed wetlands, stream channels, and walkways through the park and along the waterfront esplanade (See Figure 6). Similar plans for reshaping the waterfront bank are likely to include treatments consistent with aquatic habitat enhancement and integration of the cleanup actions under the Thea Foss Waterway in-waterway project.

Cleanup Action Alternatives

The applicable cleanup alternatives identified for the Parcel 3 site, based on the Site-Specific Remedial Investigation include the following:

Alternative 1—No Action

The No Action Alternative is applicable on those portions of Parcel 3 where the existing soil cover provides a sufficient barrier from contact with deeper soils that contain contaminants, and where protection of groundwater from deeper soils is not of concern. No Action may be applicable to the 15th Street ROW as

the existing pavement provides a suitable cap preventing direct contact with subsurface soils. This alternative may apply to portions of Parcel 3 where contaminants are more than 3 feet below ground surface, however, because of the variable nature of the fill, there is potential for contaminants to occur in areas where no data were collected.

Alternative 2—Isolation by Cap or Cover

Isolation by cap or cover is applicable for the contaminated soils on Parcel 3 and the 15th Street ROW. Isolation may include pavement or building slabs, or soil cover placed to a thickness to provide a barrier to prevent direct contact exposure. Depending on the existing and proposed grades, isolation using 3 feet of soil cover could require overexcavation of contaminated material where shallow soil contamination occurs at the site. In areas where excavations to the groundwater surface are made exposing contaminated soil, a pavement or soil cover cap will be required above the subgrade soils.

Alternative 3—Excavation and Treatment

To meet the 3-foot soil cover criteria in areas that will not be paved, overexcavation may be needed in some areas as indicated above. In addition, excavation and treatment of soils is applicable for contaminated soils encountered under the following scenarios:

- ▶ During general site grading (i.e., within 3 feet of final grade);
- ▶ From utility trench excavations;
- ▶ From excavations to the mean high groundwater level with the private development sites; and
- ▶ Miscellaneous excavations required for development components (e.g., building foundation pilecaps).

The preferred treatment alternative for the excavated soil is permanent treatment. Much of the cPAH/TPH soil can be recycled using thermal desorption technology. In areas having metals concentrations in exceedence of MTCA Method A residential criteria, thermal desorption may be not feasible. In this case, landfill disposal would be an appropriate option. Given the nature of the fill, substantial screening may be required to separate out debris. Debris material would also be landfilled, unless suitable for recycling.

Determination of Treatment/Disposal Applicability for Excavated Soils

This section generally presents the manner in which excavated soils will be handled during site grading, utility excavations, and overexcavations for

miscellaneous development elements such as pile caps, etc. More specific treatment and disposal actions will be addressed in the remedial design and construction documents, which will follow the site-specific cleanup action plans.

Stockpiling and Chemical Testing of Excavated Soils

A combination of field screening and use of remedial investigation results are proposed for determination of the need for designation testing of soils for treatment/disposal applicability. The following conditions will require stockpiling and chemical characterization of soils encountered in excavations, as a minimum:

- ▶ All excavated soils from within one of the areas of the site shown on Figure 2, which presents the interpreted extent of specific contaminant issues. Supplemental field explorations with sampling and analysis may be needed to further define the extent of contamination and/or address gaps in data between explorations, especially where contaminants are expected. If supplementary sampling and analysis are conducted at the site, the need for stockpiling/testing soils must reflect any changes in the interpretations of contaminant extent;
- ▶ Soils having visual signs of contamination (including, but not limited to, oxidation or discoloration) or noticeable odor;
- ▶ Soils with tar, oily residue, or burned debris content;
- ▶ Soils that register "hits" or signs of potential contamination on field screening devices; and
- ▶ Soils within the Mixed Fill unit containing debris such as coal, slag, cinders, creosote-treated piling, asphalt, etc. This also includes concrete debris in soils having visible staining or signs of contamination.

Otherwise, soils within areas that have been demonstrated to be below cleanup levels can be used on site as fill without undergoing stockpiling and chemical testing. The applicability for the type of fill (i.e., general fill for grading versus structural fill) will need to be assessed by a geotechnical engineer based on the final design plans. Debris sorting will be required for soils containing substantial concrete debris prior to reuse (Note that all other debris would indicate the need for stockpiling and testing). Concrete debris without visible signs of contamination could be recycled on site for reuse in the fill, or alternatively, transported to a construction debris recycling operation or debris landfill.

Treatment and/or Disposal

If sampling and analysis results for soils that have been stockpiled according to the above criteria exceed cleanup levels, treatment or disposal of these soils will be required. The evaluation of the applicability of treatment and disposal option follows:

Thermal Desorption. Thermal treatment is applicable for cPAH- and TPH-contaminated soils with relatively low levels of metals. This is a preferred remediation method since contaminants are permanently destroyed in the process of treatment. Debris sorting will be required for this treatment technology. This can either be conducted on site or performed by the treatment facility.

Class D (Lined) Landfill. This disposal alternative is applicable for all waste materials below dangerous waste levels, such as creosote-treated timber piling, construction debris, and metal slag. For excavated material with soil quality above cleanup levels and sufficient debris (i.e., debris quantity and relative size is such that is not practical and/or cost-effective for debris sorting or recycling), this is the appropriate cleanup alternative.

Stabilization and Solidification. This will only be required if areas of slag are encountered that have leachable lead or other metals at or near the dangerous waste level based on TCLP testing. If material approaches the dangerous waste level, it will be stabilized by solidification, and then disposed of in a Class D landfill.

Reuse of Excavated Soils for Fill

In general, the reuse of excavated soils will be limited for soils at the Parcel 3 and 15th Street ROW sites. Soils must generally meet the provisions discussed below for reuse as fill (note that this is not an inclusive list). A geotechnical engineer must approve the soils for use as fill during construction, especially if used for support of structures. Generally speaking, soils would be reused as general fill for meeting site grades if soil meets the following criteria:

- ▶ Soil quality meets cleanup levels;
- ▶ Free of large-sized debris;
- ▶ Free of organic debris (e.g., wood); and
- ▶ Unsaturated (i.e., at a water content conducive to compaction).

Stockpiled soils that have undergone verification testing and are below cleanup levels may be reused as fill. In addition, soils that do not require stockpiling and

chemical testing (according to the requirements provided above in this section) can be reused as fill.

Remediation Levels

In some areas, local excavations of contaminated materials may be desired based on observations of potentially contaminated materials during site redevelopment activities. Under the Consent Decree provision for removal of small, readily accessible quantities of soil with significant risk, overexcavation of these materials may be undertaken. For this case, remediation levels are established to define the boundaries of the area to be excavated.

The remediation levels are established based on the assumptions of an exposure scenario of a utility and/or construction worker coming into contact with site soils 150 days per year for 20 years (using equations from WAC 173-340-745). These criteria are more stringent and conservative than is likely to occur given the short period of construction and the low frequency of utility repairs and upgrades. Additionally, as discussed above, these levels would only be used to determine boundaries of an overexcavation given that a suitably protective cleanup action (i.e., pavement cap and/or soil cover) is already being implemented. Soil remediation levels are proposed as follows:

- ▶ Total cPAHs concentrations shall not exceed the MTCA industrial cleanup level of 20 mg/kg; this criteria is more stringent and conservative than is likely to occur given the frequency and duration of exposure for a construction and/or utility worker;
- ▶ Lead concentrations shall not exceed the MTCA industrial cleanup level of 1,000 mg/kg; this criteria is more stringent and conservative than is likely to occur given the frequency and duration of exposure for a construction and/or utility worker;
- ▶ The TPH concentration shall not exceed 15,000 mg/kg based on a conservative estimate of the residual saturation levels for a fuel oil in granular site soils. Using a conservative assumption that all of the non-carcinogenic hydrocarbons present on the site are the more toxic aromatic compounds, the Method C industrial cleanup level for non-carcinogenic TPH would be 105,000 mg/kg. However, although this concentration may be protective of direct contact exposures, soils with this level of TPH likely contain free product. A TPH concentration of 15,000 mg/kg is not expected to exceed residual saturation based on granular site soils and the fuel oil nature of the TPH indicated by existing site chemistry as indicated in Table 2 below, and

the lack of free phase product observed in soil with TPH concentration of 12,000 mg/kg.

Table 2 - Ranges of Residual Liquid Hydrocarbon Concentrations in the Unsaturated Zone (API, 1993)

Medium	Gasolines in mg/kg	Middle Distillates in mg/kg	Fuel Oils in mg/kg
Coarse gravel	950	2,200	4,900
Coarse sand and gravels	1,500	3,500	7,800
Medium to coarse sand	2,800	6,500	15,000
Fine to medium sand	4,700	11,000	24,000
Silt to fine sand	7,600	17,000	39,000

Description of Selected Alternatives—Parcel 3 Public Esplanade (SCAP 9 Area)

The cleanup action selected for the SCAP 9 Public Use Area will include a combination of Alternatives 2 and 3. No action is generally not applicable for Parcel 3 given that site development will require excavation for grading, construction of development components, and utilities, and that the remedial investigation indicates that areas of contamination are likely to be encountered.

Isolation by soil cover or pavement cap will occur over most of the esplanade (SCAP 9) area. Based on proposed grades for the upland area and waterway bank improvements, some overexcavation will be required to provide a minimum 3-foot soil cover. As shown on Figures 3 and 5, overexcavation of 1 to 3 feet may be needed throughout SCAP 9 where the final grades are either at existing grade or within 1 to feet of existing grade. Overexcavation in these areas would occur prior to placing clean fill. The western portion of the SCAP is planned as paved area paralleling the waterfront for public access. In pavement areas (See Figure 4), overexcavation will not required because the pavement will act as the cap preventing any future contact with the subsurface soils.

Based on the soil quality results from the remedial investigation and our understanding of past disposal practices along the bank of the waterway, most excavated soils generated from grading and utility excavations will require treatment and/or disposal subsequent to stockpiling and chemical testing. A portion of these materials may be reusable as non-structural fill. For this to occur, soil quality must be in accordance with the cleanup levels, the soil must be geotechnically suitable, and the soil must be generally free of debris (refer to previous section on "Determination of Treatment/Disposal Applicability").

Specific elements of the cleanup action used to prepare cost estimates contained in Appendix A include:

- ▶ Site preparation, including demolition and removal of concrete and timber docks, portions of building slabs and foundations, and removal of existing asphalt pavement/walkways;
- ▶ Overexcavation of surface soils to allow for 3 feet of clean soil cover;
- ▶ Trench excavations for utilities;
- ▶ Placement of soil cover and grading of site; and
- ▶ Installation of pavement caps

The elements of the SCAP 9 site cleanup work are described in more detail below. Figure 5 presents a conceptual cross section of the cleanup plan through each of the SCAP areas.

Site Preparation

Site preparation for SCAP 9 grading and cap/cover placement will consist of the following:

- ▶ **Demolition of Existing Concrete/Timber Dock Structures.** Abandoned dock structures along the Parcel 3 waterfront will be demolished and removed to rehabilitate the waterway bank and allow for a minimum 3 feet of clean soil cover where no pavement is planned.
- ▶ **Removal of Piling.** Piling associated with abandoned dock structures along the waterfront and/or buried pilings would be removed at the excavation grade level and disposed of as appropriate.
- ▶ **Demolition of Existing Concrete Foundations and Slabs.** The southwestern portion of the esplanade appears to be the primary area where slabs may be encountered. In this area, the slab will underlie a planned paved area. Existing site grades in this area appear to be sufficiently below proposed grades to avoid demolition and removal of the slab, thus filling could occur on top of the slab. To prevent propagation cracks from developing in the new pavement, the outermost 10 feet of the underlying concrete slab should be broken up to provide a transition.

- ▶ **Maintenance of Monitoring Well P3-MW01.** This will require retrofitting and/or replacing the well following installation of the esplanade pavement for use in compliance monitoring.

Overexcavation and Treatment/Disposal of Contaminated Soils

Overexcavation will be required in many areas along the waterway bank to meet the 3-foot soil cover criteria. In addition, regrading, bank cuts, and the installations of utilities within the SCAP 9 area will generate soil requiring treatment and/or disposal consideration. Utility excavations will require either 1 foot of overexcavation in areas with contaminants above cleanup levels, or a geofabric lining placed around the trench perimeter as an “envelope” to provide a barrier between the existing soils and the clean soil backfill within the utility trench. The areas of expected excavation are shown on Figure 3 along with the estimated depth of excavation.

Treatment and/or disposal of excavated soils with contaminants in exceedence of cleanup levels will be accomplished. To facilitate evaluation of appropriate soil cleanup alternatives the excavated soils will be stockpiled in approximately 60 cubic yard piles. Stockpiled soils will be sampled and analyzed for TPH, cPAHs, and metals. If slag waste is encountered, the soils will also be analyzed for TCLP metals. The stockpiled soil would then be treated and/or disposed of as described under the previous section on “Determination of Treatment/ Disposal Applicability for Excavated Soils.”

Thermal desorption is a viable treatment alternative for most soils along the waterfront as soil quality exceedences are primarily associated with cPAH and TPH-O compounds amenable to this treatment. However, in areas where slag soils may be excavated (northeast corner of the site and southcentral area) thermal desorption will not be applicable due to excessive metals concentrations, and landfill disposal and/or solidification and landfill disposal will be used as previously described.

Placement of Soil Cover

Soil cover will be placed over the easternmost area of SCAP 9 to provide a cover to residual contamination. This will isolate the underlying fill materials with residual contamination from future contact. Figure 4 shows the SCAP 9 areas planned for soil cover. This cap is planned for a majority of the waterfront bank area primarily in the form of tidal marsh terraces, gravel beach, and quarry spalls.

Installation of Pavement Cap

Pavement cap is planned for the SCAP 9 area as sidewalk for public access to the waterfront areas. Pavement will act as a cap to any residual soil contaminants present in the subsurface. The SCAP 9 areas proposed for pavement cap are also shown on Figure 4.

Storm Water Runoff and Site Drainage

Collection and drainage of the storm water from pavement cap and soil cover areas will be an integral part of the cap design. Overland flow may be allowed from the esplanade walkway eastward toward the waterway, but storm water from paved areas will be collected and routed either to Dock Street storm lines (which discharge to the Thea Foss Waterway through either the 15th Street or 21st Street collector drains), or directly to the Thea Foss Waterway. All discharges to the waterway will be designed in accordance with the Department of Ecology's Stormwater Manual for the Puget Sound Basin including implementation of applicable Best Management Practices (BMPs).

During construction, erosion and sedimentation control measures would be implemented to prevent contaminated soils from leaving the site. This also aids in stabilizing exposed soils and preventing storm water discharge to the waterway. Applicable BMPs from the Stormwater Manual for the Puget Sound Basin will be used during construction.

Description of Selected Alternatives—Private Development Sites (SCAPs 10 through 12)

Selected cleanup actions for the private development parcels include a combination of isolation by soil cover or pavement cap, and excavation with treatment and/or disposal. To allow for flexibility in the future redevelopment of the private parcels, two options for cleanup are considered that span the likely scenarios of future development. Combinations of these options may be used depending on the final development plan, and considerations of this SCAP and Consent Decree requirements.

- ▶ The first option assumes filling the private development sites to provide a 3-foot clean soil cover to prevent future direct contact with the underlying soils. Site grades would be raised to 14 feet elevation to match the Dock Street and esplanade design elevations. In addition, pavement cap will ultimately be placed over much of the area for building slabs, concrete sidewalks, and asphalt/concrete pavement.

- ▶ The second option assumes that the development sites will use the subgrade space for additional parking or other use. Subgrade is assumed to be the area below grade to the mean-high groundwater level (5.5 feet elevation). Under this option, substantial excavation and treatment/disposal of contaminated soil will be required, with placement of a pavement cap (e.g., the building slab) over the excavated area. Figure 5 provides cross sections depicting the two options for the private development sites.

Under either option, view corridors are proposed adjacent the building sites. The view corridors are expected to include pavement caps and soil covers, with excavation and treatment of soils as necessary to install utilities and/or achieve the minimum 3 feet of clean soil cover.

The cleanup action elements specific to these options and common to each of the private development sites are described below. Any cleanup actions specific to individual development sites are identified as appropriate. The site-specific cleanup action plans for each private development parcel are depicted in plan view on Figures 3 and 4, and in cross section on Figure 5.

Site Preparation

Site work under either option is expected to include site preparation and grading activities. Because the existing concrete is broken, it does not provide a suitable cap. In most of the development site area it will need to be removed to obtain the minimum 3 feet of soil cover. Concrete debris would be recycled or disposed of in a permitted landfill facility.

Use of the development site subgrade area will also require demolition and removal of all concrete slabs and foundations as part of the site preparation. There will also be foundation elements encountered at depth as excavation proceeds. The location and quantity of those foundations are unknown. The debris will need to be removed and recycled or disposed of in a permitted landfill facility.

In the SCAP 11 area, existing sanitary and storm sewer lines below the existing parking lot will need to be abandoned, and the existing asphalt parking lot and sidewalk area adjacent Dock Street demolished and removed. In addition, monitoring well P3-MW01 will require retrofitting and/or replacing to maintain this well for future compliance monitoring. Well abandonment and replacement will be conducted in accordance to Chapter 173-160 WAC, Minimum Standards for Construction and Maintenance of Wells.

Excavation and Treatment of Contaminated Soils

Under the option of filling to grade for redevelopment, several areas of 1-foot overexcavation will be required to meet the minimum 3 feet of soil cover. These areas are shown on Figure 3. They include most of SCAP 12, and partial areas within SCAPs 10 and 11. The depth of overexcavation was based on the difference between the existing ground surface elevation and the proposed final elevation of 14 feet.

Excavation of the subgrade to the mean high groundwater level will require shoring walls and handling of a substantial amount of contaminated soil, particularly in the SCAP 10 and 11 areas. Construction activities around this area will require special care in the soil grading and handling to recognize the contaminated nature. All soils removed for foundations, drainage layers, and utilities may require treatment as previously described for soil handling.

The type of shoring system needed for the subgrade excavation will depend on the need for dewatering and other factors. As an example, construction such that the slab corresponds with mean-high groundwater may require some dewatering for pilecap excavations, etc. An unconventional subslab drainage system may also be needed to prevent the need for continuous removal and treatment/pretreatment of groundwater.

Excavations to mean-high groundwater will likely encounter considerable debris. Debris sorting will be required, or alternatively where debris is abundant, it may be most economical to send excavated material directly to a Class D landfill. Direct excavation and hauling to a landfill will only occur if the debris is inert construction debris based on the criteria described. There are likely to be areas of slag, coal waste, burnt material, or other potentially contaminated debris encountered during excavation in any of the SCAP areas, particularly in the northern SCAP 10 and southern SCAP 11 areas. Provisions for selective excavation, stockpiling, and sampling and analysis will be made for these areas.

Excavated soils will be stockpiled in approximately 60 cubic yard stockpiles. Stockpiled soils would be sampled and analyzed for TPH-O, cPAHs, and metals. Additional sampling for TCLP metals will be required for slag materials. The stockpiles would then be treated or disposed of as previously described in section on "Determination of Treatment/Disposal Applicability for Excavated Soils."

Trench Excavations for Utilities

Sanitary sewer, storm sewer, and electrical power for the private development sites will be provided from Dock Street. At this time it appears these are proposed as essentially short "tie-ins" from the Dock Street utilities to the western side of each development sites. In areas where excavation (versus placement in the new fill) is required for utility installation, the soils within areas of interpreted contamination would be stockpiled and tested for treatment or disposal.

Placement of Soil Cover

Under the option to fill to proposed grade for redevelopment, the development sites would receive clean or treated fill to provide a minimum 3-foot soil cover over the entire private development site and view corridors. Under the option to excavate to the mean high groundwater level, soil cover would only be placed in those areas where final design plans did not include pavement cap, such as in view corridors.

Installation of Pavement Cap

Pavement planned for sidewalks, parking areas, and building slabs will act as a cap to prevent contact with residual soil contamination in the subsurface. Subgrade development will use building slabs and footings as pavement cap. All footings and side walls will be backfilled with clean material.

Storm Water Runoff and Site Drainage

Collection and drainage of the storm water from pavement cap and soil cover areas will be an integral part of the cap design. Overland flow may be allowed from the esplanade walkway eastward toward the waterway, but storm water from paved areas will be collected and routed either to Dock Street storm lines (which discharge to the Thea Foss Waterway through either the 15th Street or 21st Street collector drains), or directly to the Thea Foss Waterway. All discharges to the waterway will be designed in accordance with Ecology's Stormwater Manual for the Puget Sound Basin including implementation of applicable BMPs.

During construction, erosion and sedimentation control measures would be implemented to prevent contaminated soils from leaving the site. This also aids in stabilizing exposed soils, and preventing storm water discharge to the waterway. Applicable BMPs from the Stormwater Manual for the Puget Sound Basin will be used during construction.

Description of Selected Alternatives—15th Street Public ROW (Park/View Corridor)

The cleanup action selected for the 15th Street ROW area is based on the future development plans for the area. Under the current condition, a no action alternative is feasible because of the integrity of the existing pavement over most of the ROW. However, under proposed redevelopment plans for a public park (ARRJW, 1997), which may include constructed wetlands, stream, and lawn areas, Alternatives 2 and 3 would be applicable.

Preliminary design work has considered the 15th Street ROW as public access and park as shown on Figure 6. This proposal includes use of the area below the 15th Street ramp as asphalt-paved parking area. In addition, a constructed wetland with small ponds and "viewpoint" paths would be developed under the ramp. For this redevelopment option, cleanup action would consist of a combination of excavation and treatment of contaminated soils, and isolation by soil cover and pavement cap. Figure 6 depicts the cleanup alternatives for this redevelopment option.

Three feet of overexcavation will be required to maintain a 3-foot soil cover cap thickness below the lowest adjacent grades for the "ponds" and stream area. Depth of overexcavation assumes that the wetlands areas and sidewalks, etc., are planned to coincide with existing grade (See Figure 7).

Soils that appear to be contaminated based on field screening, or soils that have been interpreted to be within the extent of contamination shown on Figure 2, will be stockpiled for testing. If soil quality does not exceed residential cleanup levels it can be reused as fill, if geotechnically suitable. Alternatively, soil will be thermally treated if cPAH and TPH-O are the primary contaminants. Landfilling and/or recycling would be used for debris disposal. If slag is encountered, the soils would be stockpiled separately and handled as discussed previously. Specific elements of the cleanup plan are outlined below.

Site Preparation

Site preparation will consist of removal of asphalt pavement and concrete sidewalk, and possibly removal of slag (if encountered near the waterfront) to accommodate overexcavation and placement the clean fill beneath areas forming the planned stream channels.

Overexcavation and Treatment/Disposal of Contaminated Soils

Overexcavation of surface soils to allow for the placement of 3 feet of clean soil cover cap beneath the lawn, pond, and stream areas would occur. The data to date indicate cPAHs as the primary soil constituent above the residential use cleanup levels. The cPAH-containing soils would be thermally treated. Although slag was not encountered in exploration R15-B01, it was encountered in an adjacent boring (P3-B01) on Parcel 3. In this area of the bank, the potential for encountering slag should be considered in the remedial design plans. Additionally, some debris sorting may be required. All debris and slag (if applicable), will be disposed of in a Class D (lined) landfill. Refer to previous section for discussion of treatment and disposal alternatives.

Placement of a Geosynthetic Liner and Additional Exploration

Placement of a geosynthetic liner beneath the "constructed wetland" area consisting of three small ponds interconnected with stream channels may be needed to prevent future mobilization of contaminants due to the added infiltration from these features and/or the groundwater mounding which may occur. Additional exploration and sampling with installation of monitoring wells may be needed in the specific area of the wetlands to evaluate the soil and groundwater quality, groundwater levels, and provide additional data for subgrade and liner design.

Trench Excavations for Utilities

Limited excavation for utilities is proposed for the 15th Street ROW according to present information; however, at this time it is uncertain whether the existing utilities will be maintained or replaced in this area. Soils would be excavated from utility trenches in accordance with the Consent Decree requirements and this Cleanup Action Plan as previously discussed.

Placement of Soil Cover

Soil cover will be used to isolate deeper contaminants in the lawn areas. In addition, soil cover will be placed beneath the constructed wetlands/streams features following the overexcavation.

Installation of Pavement Cap

Pavement will be used for public access to different areas of the park and to the Esplanade. These areas will provide a barrier to prevent direct contact with underlying contaminated soils. Pavement cap will consist of asphalt walkways or

concrete sidewalks that will either use existing pavement, use existing pavement with asphalt overlays, or include new pavement.

Storm Water Runoff and Site Drainage

Collection and drainage of the storm water from pavement cap and soil cover areas are an integral component of the cleanup action. Storm water will be collected and discharged to the drain lines in Dock Street, to existing lines beneath the 15th Street ROW, or into the constructed wetlands and stream features. All storm water collection and drainage will be designed consistent with the Ecology's Stormwater Management Manual for Puget Sound basin including implementation of applicable BMPs.

During construction, erosion and sedimentation control measures will be implemented to prevent contaminated soils from leaving the site. This also aids in stabilizing exposed soils, and preventing storm water discharge to the waterway. Applicable BMPs from the Stormwater Manual for the Puget Sound Basin will be used during construction.

Compliance Monitoring

Compliance monitoring will be performed to confirm that human health and the environment are protected during the construction, and operation and maintenance, of the cleanup action. Compliance monitoring will also confirm that the cleanup actions have attained the cleanup standards prescribed by the cleanup plan, and confirm the long-term effectiveness of the remedial action. Compliance monitoring will be performed according to the criteria specified in WAC 173-340-410 and -360(8), and the Consent Decree as follows:

- ▶ Protection Monitoring will be implemented during construction by ensuring that site workers are appropriately trained in health and safety and that a health and safety and contingency plans for encountering hazardous materials are available during construction. Soils that are obvious waste materials will be stockpiled and covered to prevent contact. Appropriate erosion and sedimentation control, and site drainage control measures will be used to ensure that no discharge occurs to the waterway during earthwork activities.
- ▶ Performance Monitoring will be performed during construction on all soils deemed suspect during the utility excavations. Suspect soils will be stockpiled separately and chemically analyzed for the constituents of concern identified in the RI report. Appropriate treatment and/or disposal

will be performed on excavated soils in accordance with applicable facility permits, the Consent Decree, and this cleanup action plan.

- ▶ Confirmation monitoring will be performed by collection of groundwater monitoring data during and after completion of the cleanup actions. The groundwater monitoring will ensure that the disturbance of the soil during construction and the various site work will not cause future leaching of contaminants to groundwater. A compliance monitoring plan will be submitted as part of the remedial design documents.

JUSTIFICATION OF CLEANUP ALTERNATIVE

MTCA requires that any alternative selected for site remediation must meet as minimum four threshold criteria: protect human health and the environment; comply with cleanup standards; comply with applicable state and federal laws; and provide for compliance monitoring. In addition, the cleanup action shall use permanent solutions to the maximum extent practicable and consider public concerns. The selected alternative meets these criteria as described below.

Protection of Human Health and the Environment

The cleanup action protects human health and the environment by eliminating the potential for direct contact with subsurface soils. The subsurface soils will be isolated from contact by pavement caps and building foundations in many areas, and by a minimum of 3 feet of soil cover in other areas. Contaminated soils that are excavated will be treated or landfilled, eliminating direct contact concerns for future site use and reducing on-site contaminant volumes. Use of thermal desorption where possible will permanently reduce contaminant volumes.

Groundwater quality at Parcel 3 has not been impacted beyond background levels and the data indicate that Parcel 3 soils are not acting as a source of contamination to groundwater. Confirmation monitoring will ensure that the groundwater continues to be protected. The cleanup action also eliminates the potential for impacts to the waterway by isolation of contaminated soils from surface water runoff.

Compliance with Cleanup Standards

The selected cleanup alternatives comply with the Consent Decree cleanup standards and the reasonable maximum exposure scenario expected with any future site uses.

Compliance with Applicable or Relevant and Appropriate Requirements

Applicable or Relevant and Appropriate Requirements (ARARs) associated with the following laws and regulations apply to the site:

Federal Laws and Regulations

- ▶ 33 USC 1251 *et. Seq.* (Clean Water Act) and 40 CFR 230;
- ▶ 40 CFR 131 Subpart D (Federally Promulgated Water Quality Standards);
- ▶ Subtitles C and D - 42 USC 6921-6949a and 40 CFR Part 268 (Resource Conservation and Recovery Act - RCRA);
- ▶ 20 CFR Subpart 1910.120 (Occupational Safety and Health Act); and
- ▶ Executive Order 11988 (40 CFR Part 6, Appendix A - Flood Plain Management).

State Laws and Regulations

- ▶ Chapter 70.105 RCW (Washington State Hazardous Waste Management Act) and Chapter 173-303 WAC (State Dangerous Waste Regulations);
- ▶ Chapter 90.48 RCW (State Water Pollution Control Act);
- ▶ Chapter 90.70 RCW (Puget Sound Water Quality Act);
- ▶ Chapter 173-201A WAC (Water Quality Standards for Surface Waters of the State of Washington);
- ▶ Chapter 173-14 WAC (Shoreline Management Act);
- ▶ Chapter 75-20 RCW (State Hydraulic Code) and Chapter 220-11 WAC (Hydraulic Code Rules);
- ▶ Chapter 75-20 RCW (Construction Projects in State Waters);
- ▶ Chapter 70.95 (Solid Waste Management - Reduction and Recycling);
- ▶ Chapter 70.94 RCW (Washington Clean Air Act);
- ▶ Chapter 173-160 WAC (Minimum Standards for Construction and Maintenance of Wells);
- ▶ Chapter 43.21C RCW (State Environmental Policy Act) and Chapter 197-11 WAC (State Environmental Policy Act Rules); and
- ▶ Washington Industrial Safety and Health Act (WISHA).

The selected cleanup plan complies with the ARARs from the laws and regulations listed above. These ARARs include compliance with the specific substantive requirements for project permits. Other administrative approvals and authorizations which are separate from substantive requirements will be complied with as part of the permitting process.

Compliance Monitoring

Compliance monitoring will be provided during and post-construction as described above. Protection monitoring will be implemented during construction, performance monitoring will include implementation of treatment or disposal of obvious waste material that is encountered, and groundwater monitoring will be performed to ensure that groundwater quality remains the same or improves. Establishment of saltmarsh vegetation on the intertidal benches will be monitored as specified in the Habitat Assessment and Mitigation Plan (HAMP; Pentec 1999).

Short-Term Effectiveness

The short-term effectiveness considers how the cleanup action impacts human health and the environment during the construction phase and prior to the attainment of cleanup standards. The primary risk during construction of Parcel 3 and 15th Street ROW development elements is workers coming in direct contact with contaminated soils during excavations and grading, and the potential for contaminant discharges to the waterway. Exposures to contaminated materials that may be encountered during construction can be addressed through a worker health and safety plan; by reducing dust generation during dry construction periods; and by constructing appropriate on-site drainage and erosion control measures.

Long-Term Effectiveness

The long-term effectiveness of the cleanup action is evaluated in terms of the magnitude of residual risk and the adequacy and reliability of the cleanup action. The residual risk will be dramatically reduced, or even eliminated, by removal and treatment of relevant cPAH/TPH-O-contaminated soils and capping or disposal of the lead-containing soils encountered during construction. Risk reduction will be further achieved by implementing treatment and/or disposal options for all excavated materials that are contaminated, including backfill of all utility trenches with clean soils. Where thermal desorption is used, the contaminants are permanently destroyed, eliminating all residual risk.

Permanent Reduction of Toxicity, Mobility, or Volume

This evaluation criterion addresses the preferential implementation of treatment technologies that permanently and significantly reduce toxicity, mobility, and volume of the hazardous substances present. Given the age and nature of the upland fill materials and their general lack of leachable constituents to the groundwater system, a capping alternative is appropriate. Any petroleum-

containing soils, or soils containing cPAHs at concentrations above the risk-based screening levels will be treated using a thermal desorption technology. Thermal desorption reduces the toxicity, mobility, and volume of contaminants in soil permanently. On-site volumes will also be reduced by the landfill disposal of all excavated material that may not be treatable (e.g., the lead-containing soils and debris).

Implementability/Technical Feasibility

The technologies chosen in the cleanup action have been implemented and used reliably elsewhere to remediate contaminated soil with similar characteristics.

State and Community Acceptance

State and community acceptance was evaluated by subjecting the Draft SCAP to public comment. The SCAP was modified based on the comments received.

Cost

Capping and soil cover is the most appropriate and cost-effective method of risk reduction for Parcel 3 and the 15th Street ROW. Appendix A presents the estimated cleanup costs for each of the SCAP areas and options.

SUBSTANTIVE REQUIREMENTS FOR PERMITS

Persons conducting cleanup under a MTCA Consent Decree are exempt from having to obtain certain state and local permits or approvals. Instead, the substantive requirements of those permit laws must be complied with as a part of the MTCA cleanup. The following are the substantive requirements, identified to date, that must be complied with.

Ecology, Chapter 90.48 RCW, Water Pollution Control

Construction design and implementation shall include measures to prevent any discharge into any waters of the state any organic or inorganic matter that shall cause or tend to cause pollution of such waters according to the determination of Ecology.

33 USC Sections 1341 and 1344 (CWA - Section 401 and Section 404) and 40 CFR Part 230

Discharges of material into navigable waters are regulated under Sections 401 and 404 of the CWA (33 USC Sections 1341 and 1344), 40 CFR Part 230 [Section 404(b)(1) guidelines], 33 CFR Parts 320 (general policies), 323 and 325 (permit requirements), and 328 (definition of waters of the United States). These requirements regulate the discharge of dredged or fill material to waters of the United States, implemented by the U.S. Army Corps of Engineers (Corps). Section 404(b)(1) guidelines, 40 CFR 230.10(b), specify criteria which prohibit discharges that violate various provisions of the CWA. These standards are legally applicable and affect planned sediment removal and fill placement activities (as well as related water quality issues).

The guidelines at 40 CFR 230.10(c) also provide that no discharge will be authorized which contributes to significant degradation of the waters of the United States. Where there is no practicable alternative to a discharge, 40 CFR 230.10(d) requires the use of appropriate mitigation measures to minimize potential adverse impacts of the discharge on the aquatic ecosystem.

The Endangered Species Act, 16 United State Code, Section 1531

The Endangered Species Act (ESA) of 1973, as amended (16 USC § 1531), provides "... a means whereby the ecosystems upon which endangered species depend may be conserved." On May 24, 1999, the National Marine Fisheries Service (NMFS) formalized the listing of Puget Sound chinook salmon (*Oncorhynchus tshawytscha*) as threatened under the Endangered Species Act (ESA). NMFS has designated the coho salmon (*O. kisutch*) as a candidate for listing. The U.S. Fish and Wildlife Service (USFWS) listed bull trout (*Salvelinus confluentus*) in Puget Sound as threatened, effective December 1, 1999. The presence of these species in the Thea Foss Waterway will require the U.S. Army Corps of Engineers (Corps) to engage in a consultation with NMFS and USFWS regarding the effects of their decision for issuing a Nationwide Permit (NWP 38) for the remedial action on chinook, coho, bull trout and their habitat under Section 7 of the ESA. The City of Tacoma is working with the Corps to facilitate the consultation process through preparation of a biological evaluation (BE) with succinct and focused assessment of the potential effects of the remedial action on listed (or proposed) species in the project area.

Memorandum of Agreement between EPA and U.S. Army Corps of Engineers [Mitigation under Clean Water Act Section 404(b)(1)]

The Agreement sets forth policy and procedures for developing mitigation for compliance under Section 404, but does not alter any of the requirements under this section. These guidelines for mitigation include, in order of importance, avoidance, minimization, and compensatory mitigation.

U.S. Fish and Wildlife Mitigation Policy (46FR 7644)

This policy establishes guidance for U.S. Fish and Wildlife personnel involved in making recommendations to protect or conserve fish and wildlife resources.

State of Washington Ecology, Chapter 70.105 RCW, Hazardous Waste Management

Remedial action shall not allow for disposal of dangerous wastes in any manner not in compliance with regulations under Chapter 173-303 WAC.

State Environmental Policy Act (SEPA - Chapter 43.21C RCW) and SEPA Rules (Chapter 197-11 WAC)

Rules on the integration of MTCA and SEPA provided in WAC 197-11-250 through 268 list applicable requirements for the project. Implementation of the site remediation action triggers SEPA environmental review (e.g., SEPA checklist), threshold determination, and public notice. Pursuant to WAC 197-11-060(5) and WAC 197-11-630 a review was done to ensure compliance of the remedial action with SEPA. A Mitigated Determination of Nonsignificance was issued for the site. A public comment period was conducted concurrent with that for the Site-Specific RI and SCAP.

Puget Sound Clean Air Agency, Regulation I of the Puget Sound Clean Air Agency

Remedial action shall be performed so as to not allow the emission of any air contaminants in violation of the visual standard established by Section 9.03 of the regulation. Remedial action shall be performed so as to not allow the emission of particulate matter in violation of Section 9.04 of the regulation.

Remedial action shall be performed so as to not allow the emission of air contaminants in violation of Section 9.11 of the regulation. Remedial action shall be performed so as to not allow the emission of fugitive dust in violation of Section 9.15 of the regulation. Equipment utilized on site for the remedial action

shall be maintained in such a manner as to not be in violation of Section 9.20(b) of the regulation.

Regulation III of the Puget Sound Clean Air Agency

The numerical standards for compliance with air emissions regulations that apply to remedial action on the site are those listed in Appendix A, Acceptable Source Impact Levels, of the regulation.

City of Tacoma, Storm Water Management Manual

Project activities will comply with provisions of the City of Tacoma Storm Water Management Manual and underlying regulations for storm water management in accordance with the National Clean Water Act, the Puget Sound Water Quality Management Plan, and the National Pollutant Discharge Elimination System Storm Water Permit. For environmental cleanup and redevelopment, activities comply with best management practices identified in Section A5 of manual "Construction and Demolition Activities" and Section A6 "Other Activities."

City of Tacoma, Chapter 13.10, Shoreline Regulations

Construction design shall include:

- ▶ Measures to minimize erosion during and after construction and for the replanting of the site after construction.
- ▶ Measures to minimize the problems of contamination of surface waters, depletion and contamination of groundwater, and the generation of increased surface water runoff.
- ▶ Provisions for facilities or appurtenances for disposal of sanitary waste and shall monitor the use of chemicals, fertilizers, and other pollutants in such a manner so as to not degrade existing levels of surface water and groundwater quality. Dust control measures, employing vegetative controls where feasible, shall be taken.
- ▶ Signs required for safety and security shall be allowed. All signs shall be of permanent materials.

City of Tacoma, Chapter 70, Uniform Building Code—Excavation and Grading

Grading and excavation requirements include:

- ▶ The slope cut surface shall be no steeper than safe for intended use, and shall be no steeper than two horizontal to one vertical. Detrimental amounts of organic material shall not be permitted in fills.
- ▶ No rock or similar irreducible material with a maximum dimension greater than 6 inches shall be buried or placed in fills.
- ▶ The top cut slopes shall not be made nearer to a site boundary line than one fifth of the vertical height of the cut with a minimum of 2 feet and a maximum of 10 feet. The setback may need to be increased for any required interceptor drains.
- ▶ Unless otherwise indicated on the approved grading plan, drainage facilities and terracing shall conform to the provisions of Section 7012 for cut or fill slopes steeper than three horizontal to one vertical.
- ▶ The faces of cut and fill slopes shall be prepared and maintained to control against erosion. This control may consist of effective planting. The protection for slopes shall be installed as soon as practicable and prior to calling final approval.

City of Tacoma, Chapter 12.08 City Code

Comply with provisions for acceptance of any water generated by remedial action discharged into the City sewer system.

Tacoma Pierce County Health Department, Waste Disposal Authorization

Comply with provisions for acceptance of any soils to be disposed of at the City of Tacoma Municipal Landfill according to criteria developed for the facility.

Mitigation Analysis

Cleanup of Parcel 3 will eliminate potential sources of contamination to the Thea Foss Waterway. Cleanup of the Parcel 3 shoreline will result in removal of existing derelict overwater structures and a large number of treated wood pilings.

Overall, the cleanup of Parcel 3 will result in minor gains and losses of intertidal habitat area at elevations below MHHW. There will be a negligible change in intertidal habitat area below MHHW (net change less than 25 square feet). The area of productive intertidal habitat will be extended up to the OHW level (about elevation 14.5 feet MLLW; 8.2 feet City of Tacoma datum) through the establishment of benches supporting saltmarsh vegetation along a portion of the SCAP 9 area. Approximately 0.25 acre of new habitat (775 feet by 14 feet) will be added in this fashion. Thus, the remediation of the shoreline in the SCAP 9 area will result in a net increase of approximately 0.25 acre of new habitat below OHW.

SCAP 9 cleanup will have the following additional positive impacts on the nature of marine habitat in the Thea Foss Waterway:

- ▶ Removal of several hundred pilings;
- ▶ Removal of approximately 0.42 acre of derelict overwater structures;
- ▶ Removal or capping of debris;
- ▶ Reduction in beach slopes (e.g., Figures 5b and 5c); and
- ▶ Provision of more natural substrata.

Collectively, these changes will improve the habitat quality of approximately 0.8 acre of shoreline habitat between MHHW and MLLW along this shoreline. The significant net positive effects on area and quality of marine habitat that will result from completion of the SCAP 9 remediation will offset net losses of low quality habitat in other SCAPs along the southwest shoreline of the Thea Foss Waterway. The net change in marine habitat resulting from shoreline remediation and upland remediation and development along the area between 15th Street and 22nd Street are dealt with in the HAMP (Pentec, 1999a).

SCHEDULE FOR IMPLEMENTATION

The cleanup action shall be completed within a reasonable time frame. Factors to be considered in establishing the cleanup time frame shall be in accordance with WAC 173-340-360(6) and the Consent Decree. Remedial design documents shall be submitted within one year of entry by court of amendment to Area-wide Consent Decree to include the SCAP for this site. The following tasks are planned for implementation of this cleanup action:

- TASK 1 Submit to Ecology a Draft Engineering Design Report, construction plans and specifications, maintenance plan, compliance monitoring plan, and financial assurance documents (hereafter "Remedial Design Documents").
Schedule: Within one year of entry by the court of the amendment to the Area-Wide Consent Decree to include the SCAP for this site.
- TASK 2 Submit final documents listed in Task 1 that incorporate Ecology's comments on the draft documents.
Schedule: Within 30 of receipt of Ecology's comments on the drafts.
- TASK 3 Begin implementation of Site-Specific Cleanup Action Plan.
Schedule: In accordance with the schedule approved in the Remedial Design documents.
- TASK 4 Submit as-built documentation of the cleanup and final financial assurance documents and procedures for periodic adjustment.
Schedule: In accordance with the schedule approved in the Remedial Design documents.
- TASK 5 Perform long-term monitoring, operation and maintenance.
Schedule: In accordance with the schedule approved in the Remedial Design documents.

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API, 1993. Guide for Assessing and Remediating Petroleum Hydrocarbons in Soils, API Publication 1629, American Petroleum Institute, Washington, D.C.

Architects Reed Reinald Johnson Willows (ARRJW), 1998. Thea Foss Waterway Public Esplanade and Dock Street Design Redevelopment Plans, Phase I, July 10, 1998.

Architects Reed Reinald Johnson Willows (ARRJW), 1997. Schematic Design, 15th Street to 21st Street, Thea Foss Waterway Public Esplanade, Tacoma, Washington, July 23, 1997.

Hart Crowser, 1998. Draft Final Parcel 3 and 15th Street ROW Site-Specific Remedial Investigation (RI report), Thea Foss Upland Properties. October 12, 1998.

Pentec Environmental, 1999a. Thea Foss Uplands Remediation Habitat Assessment and Mitigation Plan (HAMP), prepared for the City of Tacoma Public Works Department.

Pentec Environmental, 1999b. Thea Foss Upland Remediation Biological Assessment, Review Draft. Prepared for City of Tacoma, Public Works Department.

State of Washington Department of Ecology, 1994. Consent Decree 94-10917 6 between the State of Washington Department of Ecology and the City of Tacoma and Metropolitan Park District of Tacoma, filed October 7, 1994.

The Robinson Company, 1998. Revised Design Development Cost Estimate for the Thea Foss Waterway, a letter to Architects Reed Reinald Johnson Willows, August 21, 1998.

Table 1 - Cleanup Standards for Soil and Groundwater

Constituent	Soil Cleanup Level in mg/kg (Method B)	Groundwater Cleanup Level in ug/L
TPH ^(a)	5,700	1,000
Benzene	34.5	71.0
Toluene	16,000	200,000
Ethylbenzene	8,000	29,000
Xylenes	160,000	16,000
Carcinogenic PAH compounds	0.137	0.031
Antimony	32.0	4,300
Arsenic	1.43 (20 ^b)	0.14
Cadmium	80.0	8.0
Chromium (VI)	400	50.0
Copper	2,960	2.5
Lead	250 ^c	5.8
Mercury	24.0	0.025
Nickel	1,600	7.9
Zinc	24,000	76.6
PCB (Total)	0.13	0.030

Notes:

Table 1 is based on the Thea Foss Area-Wide Consent Decree (see Table 4-1 in the Cleanup Action Plan, 8-24-94). A few modifications are made to account for site-specific characteristics and contemporary cleanup policies.

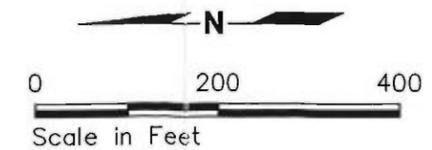
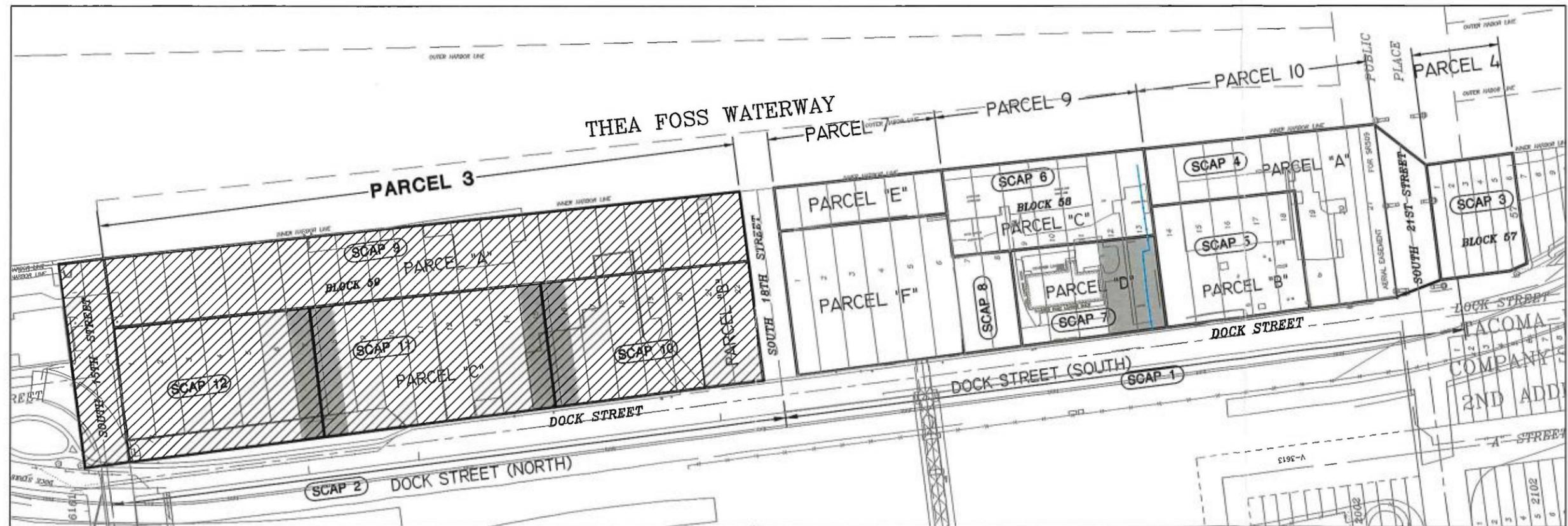
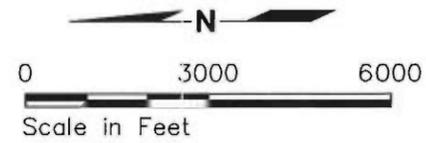
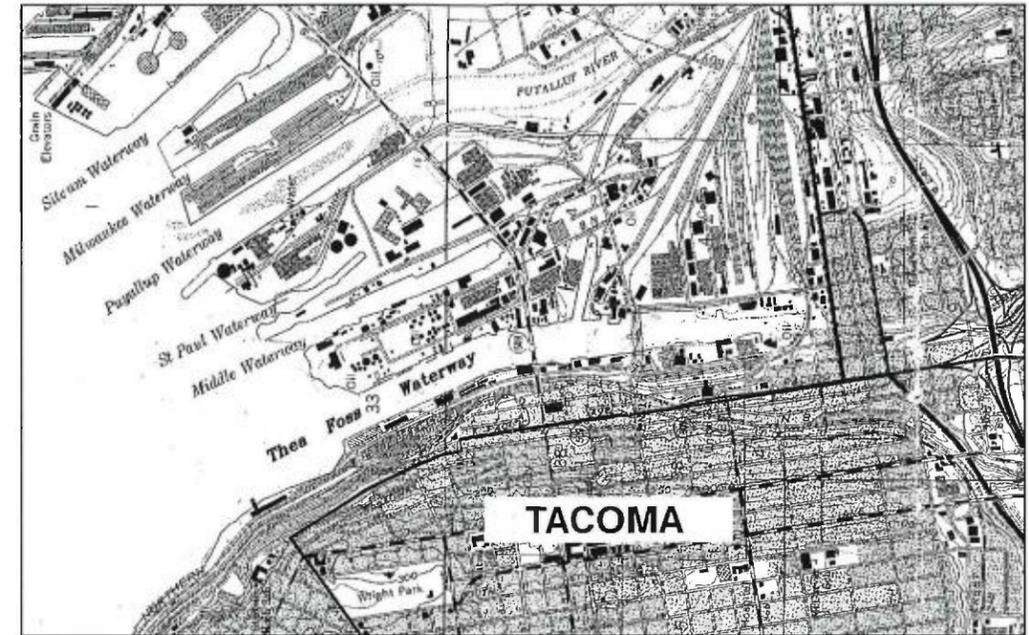
- ^a The TPH cleanup standard of 200 ppm as presented in the Consent Decree may be adjusted to allow for alternatives in setting the standard based on new risk assessment methods adopted by Ecology. In this case we are using 5,700 mg/kg as the residential direct contact cleanup level for TPH in soil based on Parcel 3 data and the current Ecology TPH policy.
- ^b Cleanup level based on the Method A cleanup criteria.
- ^c Soil cleanup levels for lead are not defined under Method B. Cleanup level is based on the MTCA Method A level.

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Project Area Map

Site-Specific Cleanup Action Plans

Vicinity Map



Summary of Potential Cleanup Action Areas

Parcel 3 and 15th Street ROW

(0- to 3-Foot Depth)

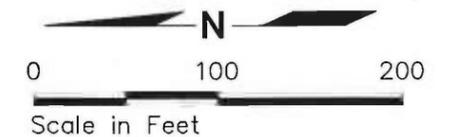


Exploration Location and Number (Source)

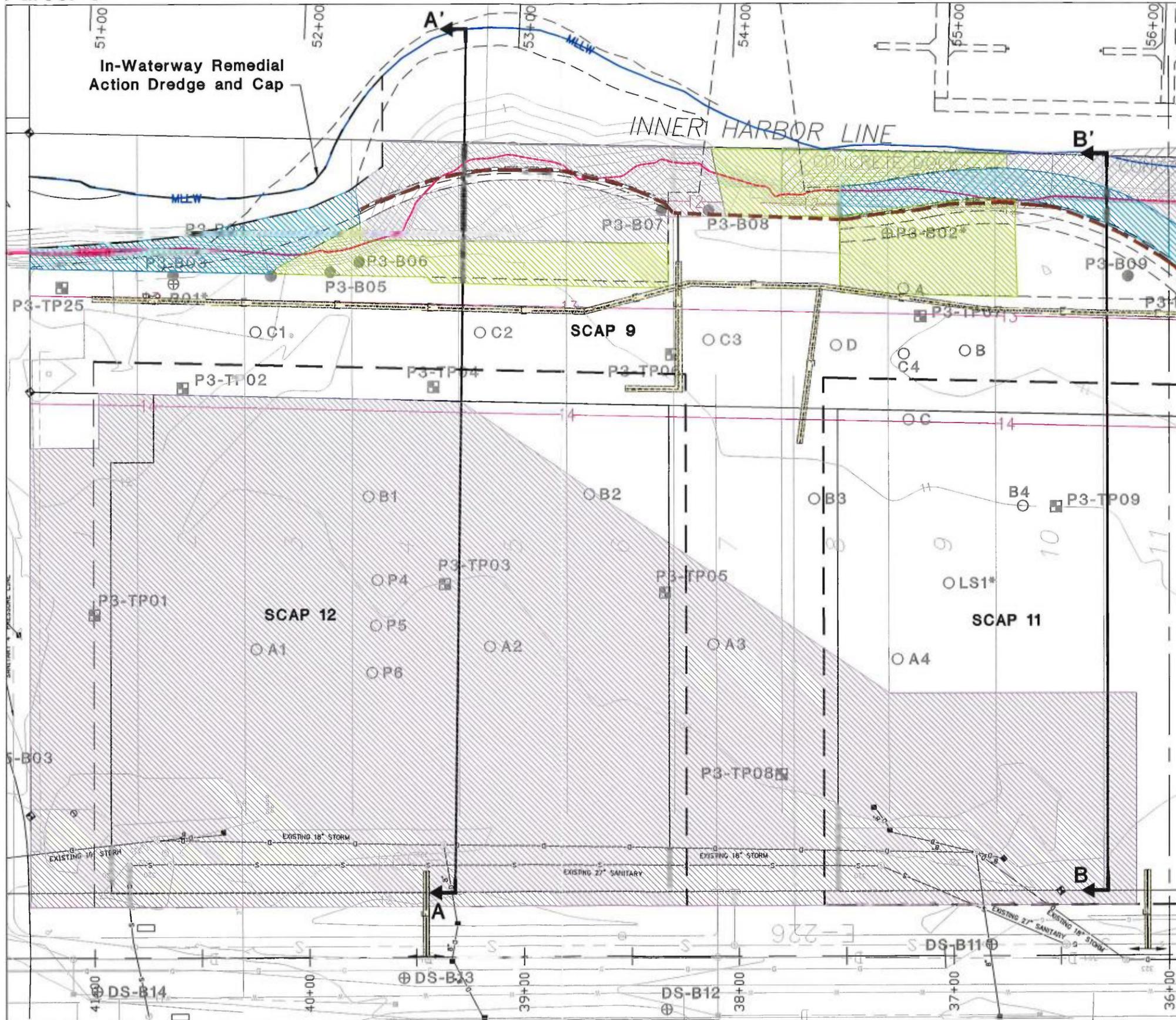
- | | | | |
|-------|--|-----------|------------------------------------|
| ⊕ A1 | Soil Boring (Bison, 1990, and E+E, 1990) | ■ P3-TP01 | Test Pit (Current Study) |
| ⊙ PA3 | Abandoned Monitoring Well (WSDOT) | ⊕ R15-B01 | Soil Boring (Current Study) |
| * | Indicates groundwater grab sample obtained | ● P3-B01 | Strataprobe Boring (Current Study) |
| | | ⊕ P3-MW1 | Monitoring Well (Current Study) |

Potential Cleanup Action Areas

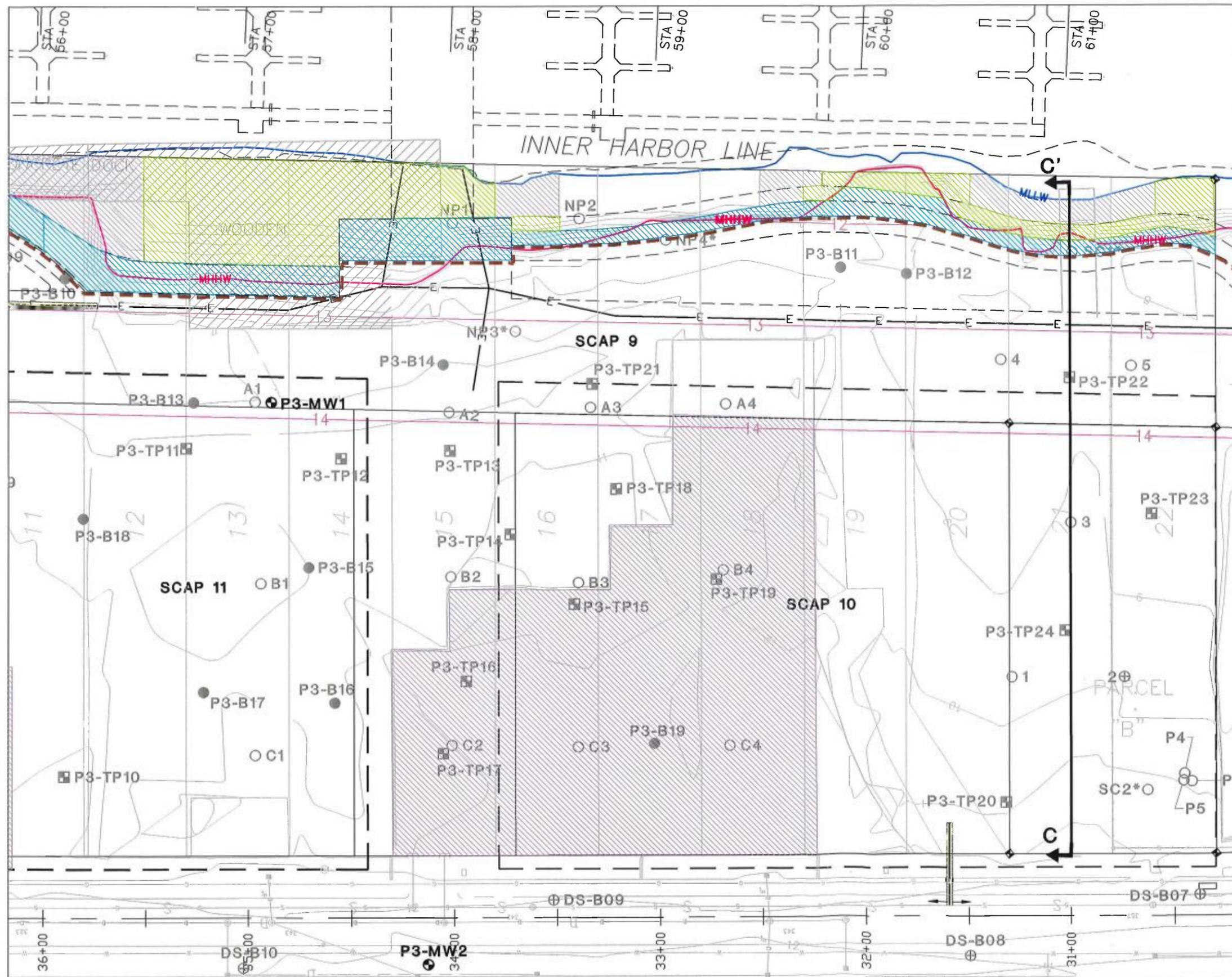
- | | |
|--|-------|
| | cPAHs |
| | Lead |



Proposed Cleanup Action - Areas of Excavation Parcel 3



HEC 5/25/99 1-50 cl-ocbas/COLOR34/cl-ocut/locant12.dwg 46763428
 46763428



Areas of Overexcavation Required for Adequate Isolation by Soil Cover

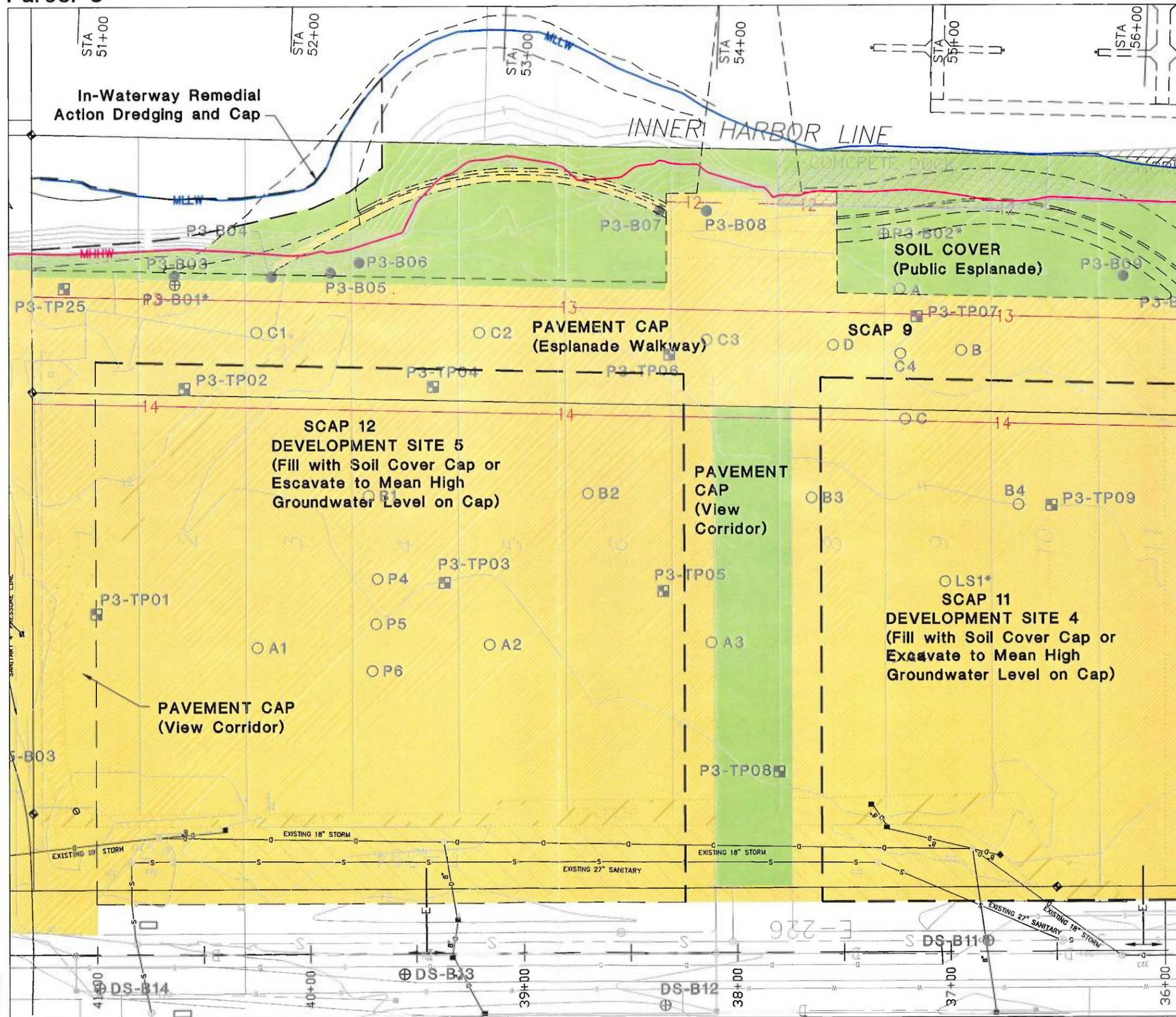
- 1-Foot Overexcavation
- 2-Foot Overexcavation
- 3-Foot Overexcavation
- Areas of Soil Excavation for Utility Construction
- Sheet Pile Wall
- Cross Section Location and Designation

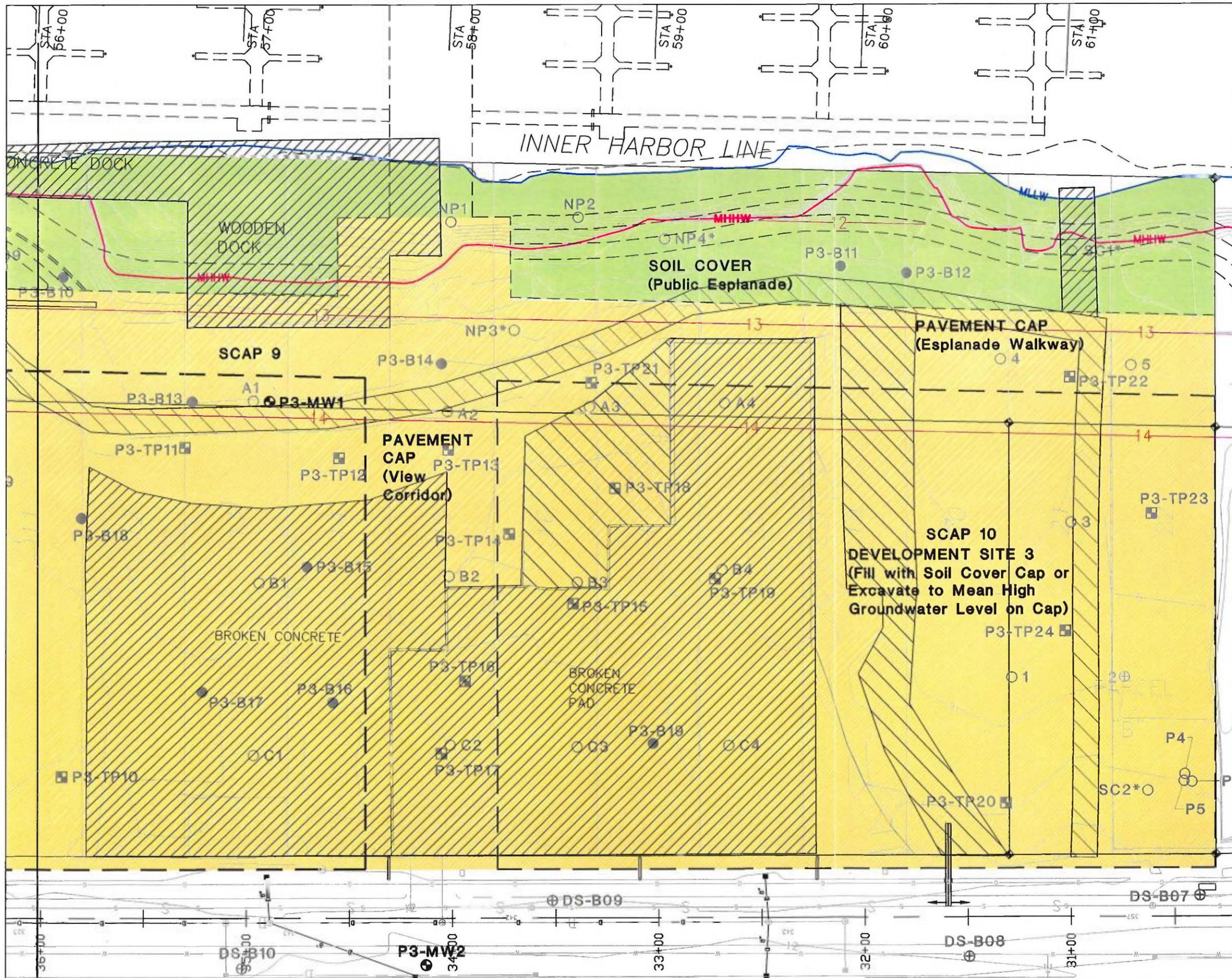
Note: Areas of overexcavation shown for the Esplanade Water Front from MLLW to the proposed sheet pile wall assume cuts to grade have occurred.



Proposed Cleanup Action - Areas of Pavement and Soil Cover with Demolition Areas Shown

Parcel 3





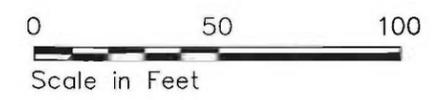
Areas of Pavement Cap or Soil Cover

- Concrete or Asphalt Cap
- Soil Cover

Areas of Demolition

- Concrete Demolition Required to Provide Cleanup Action
- Asphalt Demolition Required to Provide Cleanup Action

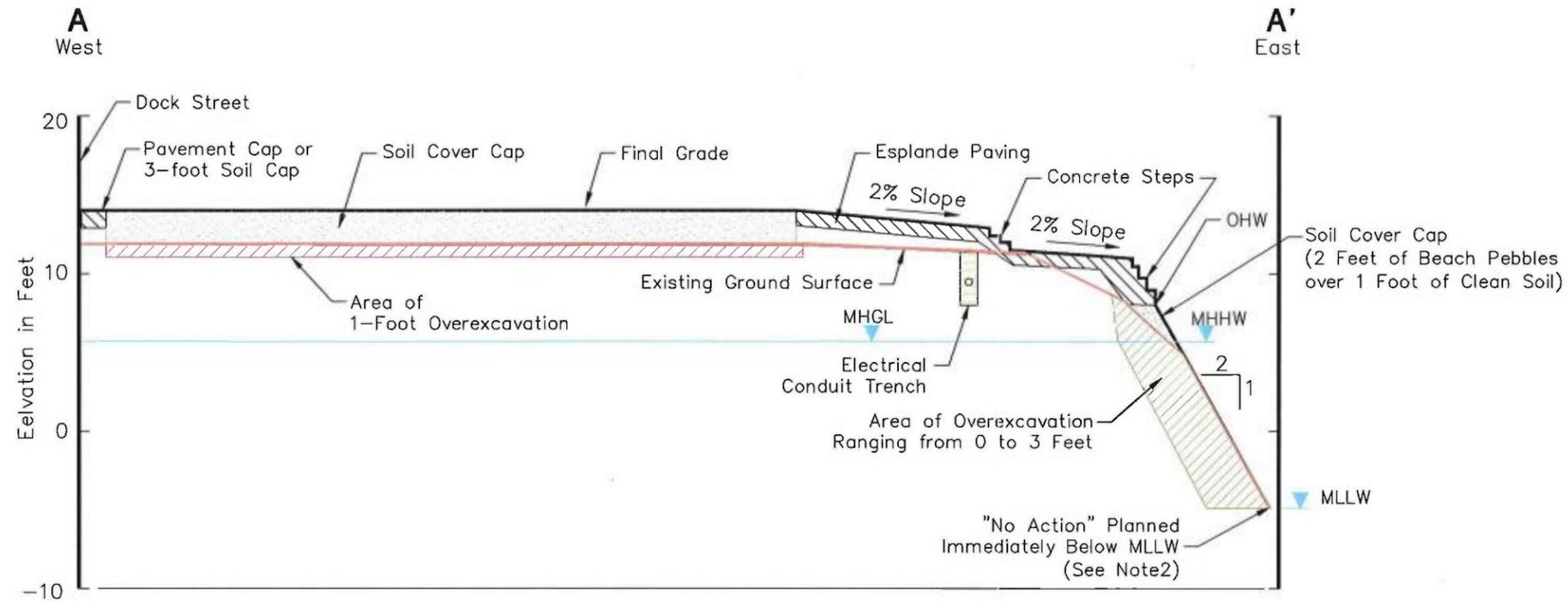
Note: Areas of overexcavation shown for the Esplanade Water Front from MLLW to the proposed sheet pile wall assume cuts to grade have occurred.



Typical Sections Showing Cleanup Actions

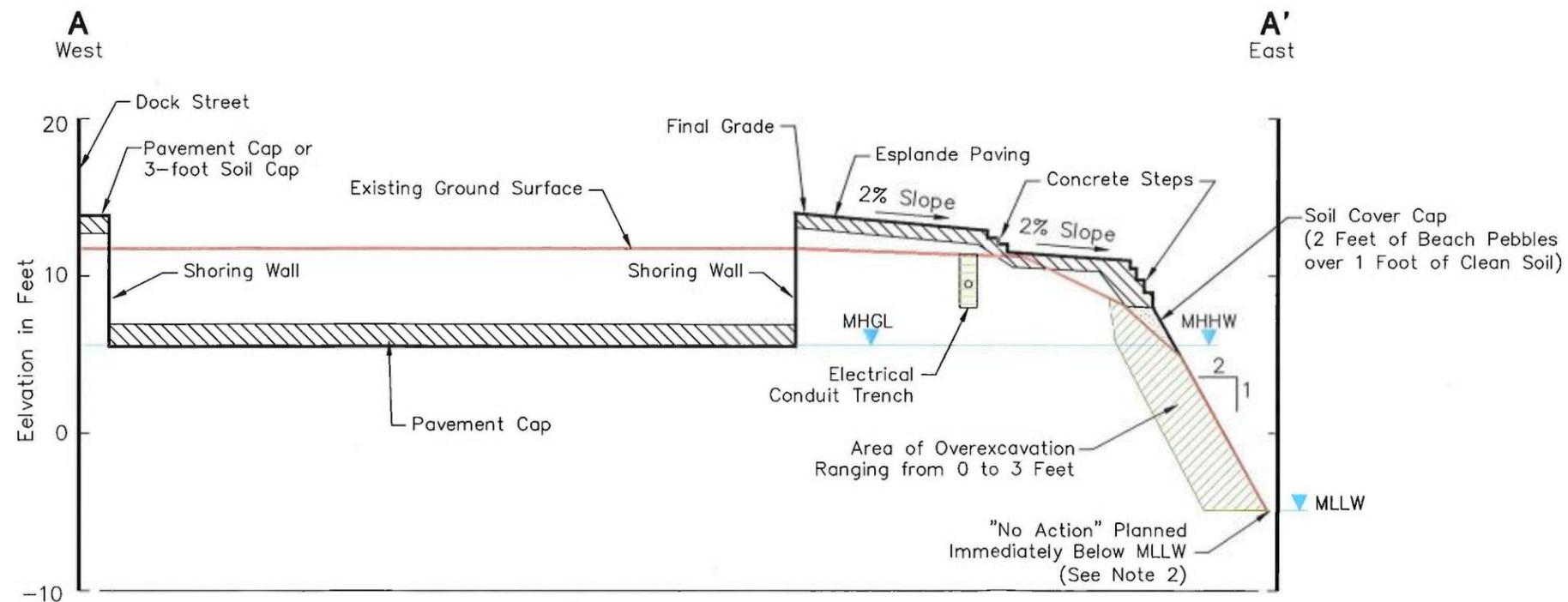
Parcel 3 - SCAP 12 Area Depicted (Station 39+25)

SCAP 12 - Option 1



— Existing Ground Surface
 MHGL Mean-High Groundwater Level (Assumed to be 5.5 Feet Elevation)

SCAP 12 - Option 2



Horizontal Scale in Feet
 0 50 100
 Vertical Scale in Feet
 0 10 20
 Vertical Exaggeration x 5

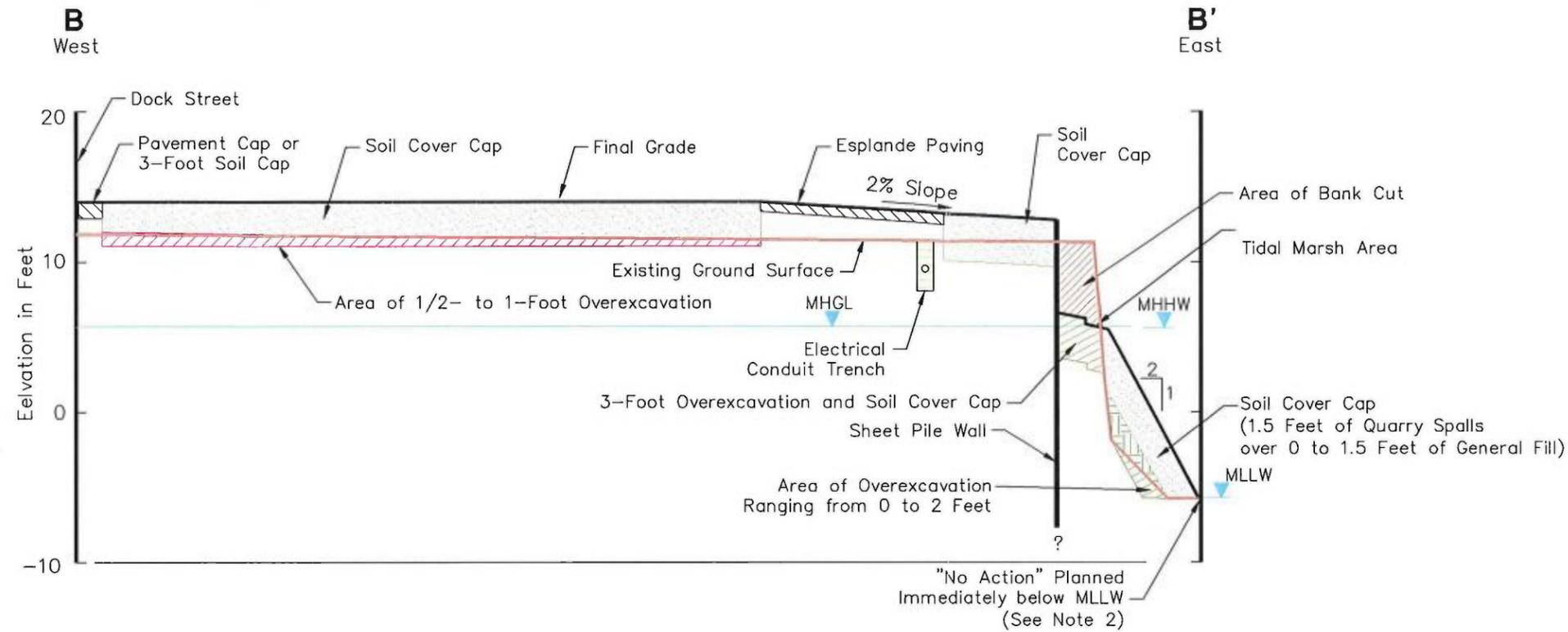
Notes: 1. Elevations are Tacoma Public Works Datum (TPWD) NGVD, 1929 datum.
 2. Refer to Thea Foss Waterway Alternative 5b.

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Typical Sections Showing Cleanup Actions

Parcel 3 - SCAP 11 Area Depicted (Station 36+25)

SCAP 11 - Option 1



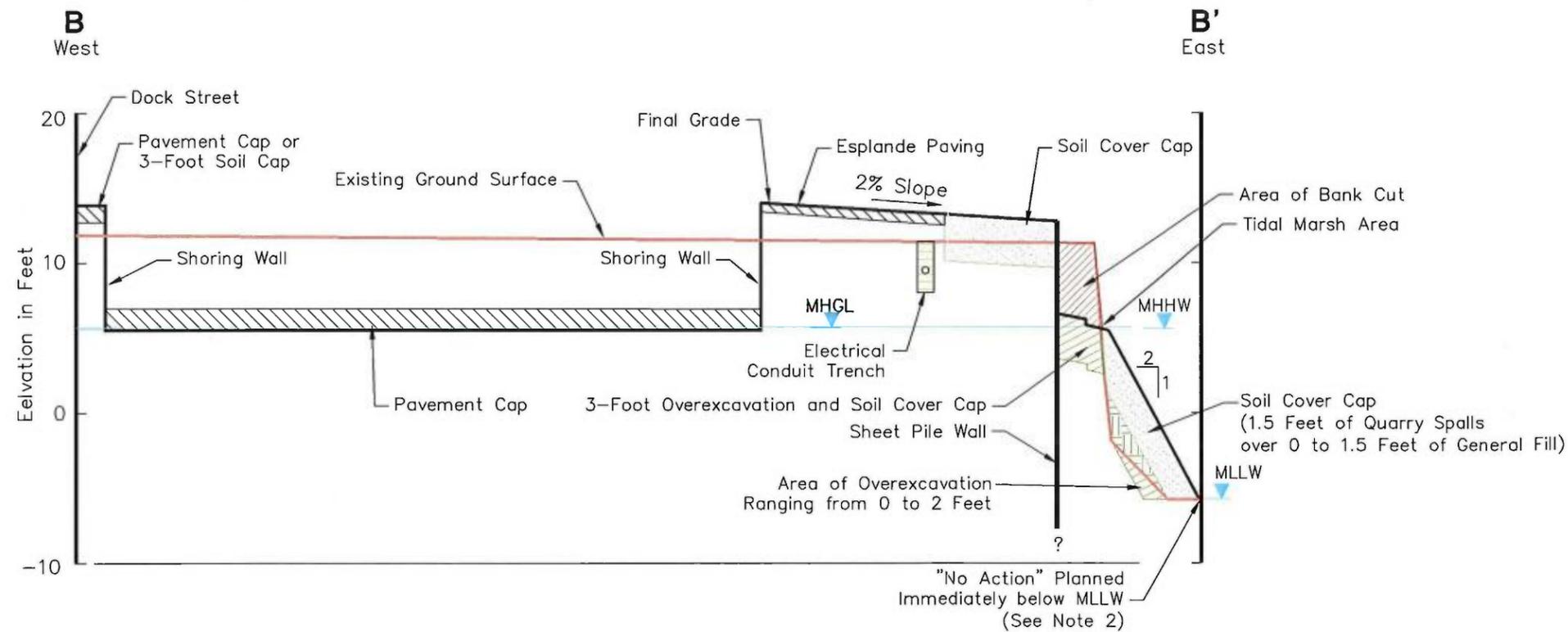
Existing Ground Surface

MHGL Mean-High Groundwater Level (Assumed to be 5.5 Feet Elevation)

Horizontal Scale in Feet
0 50 100

Vertical Scale in Feet
0 10 20
Vertical Exaggeration x 5

SCAP 11 - Option 2

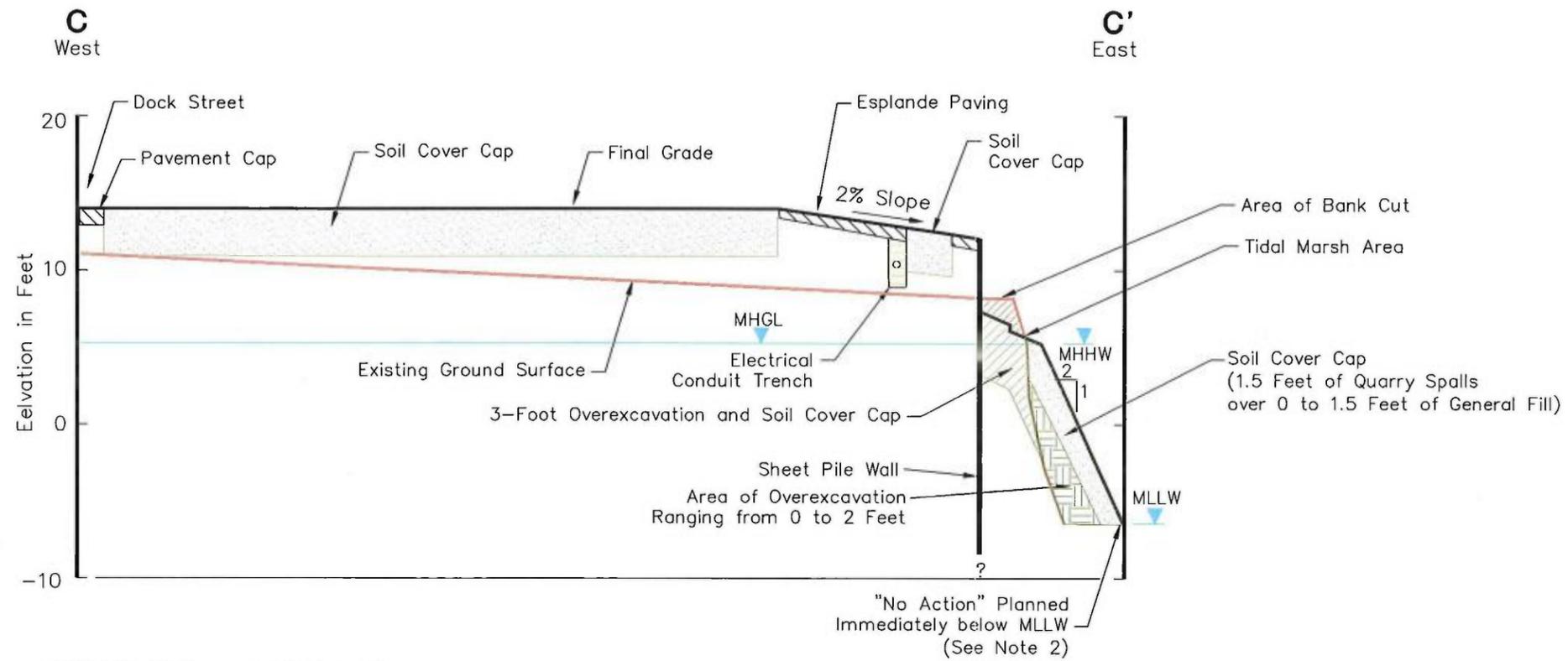


Notes: 1. Elevations are Tacoma Public Works Datum (TPWD) NGVD, 1929 datum.
2. Refer to Thea Foss Waterway Alternative 5b.

Typical Sections Showing Cleanup Actions

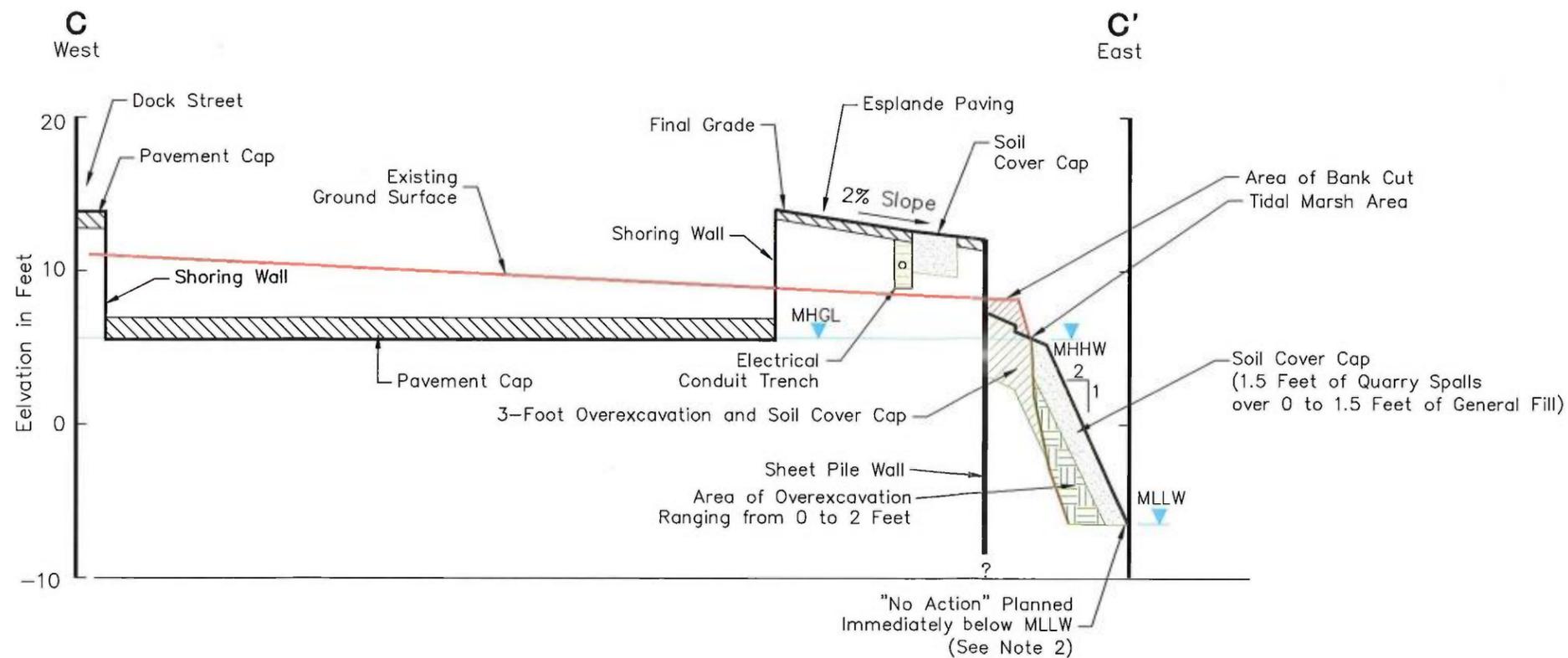
Parcel 3 - SCAP 10 Area Depicted (Station 31+00)

SCAP 10 - Option 1



— Existing Ground Surface
 MHGL Mean-High Groundwater Level (Assumed to be 5.5 Feet Elevation)

SCAP 10 - Option 2



Horizontal Scale in Feet
 0 50 100
 Vertical Scale in Feet
 0 10 20
 Vertical Exaggeration x 5

Notes: 1. Elevations are Tacoma Public Works Datum (TPWD) NGVD, 1929 datum.
 2. Refer to Thea Foss Waterway Alternative 5b.

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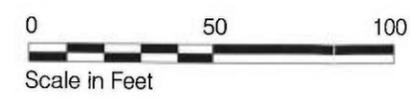
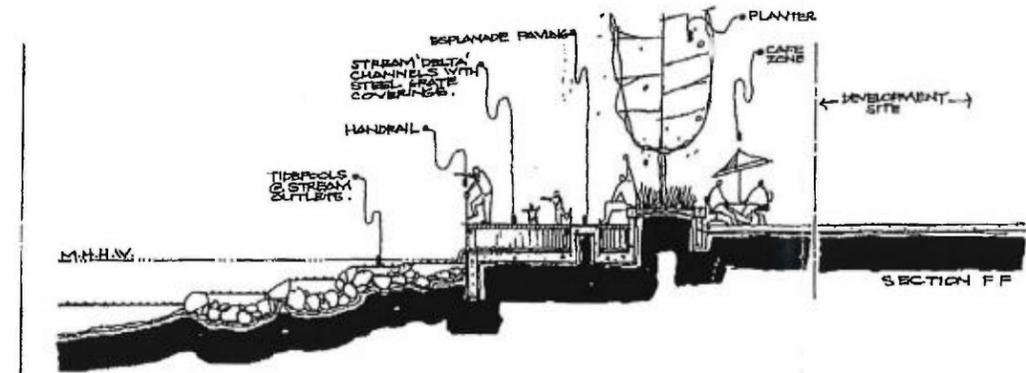
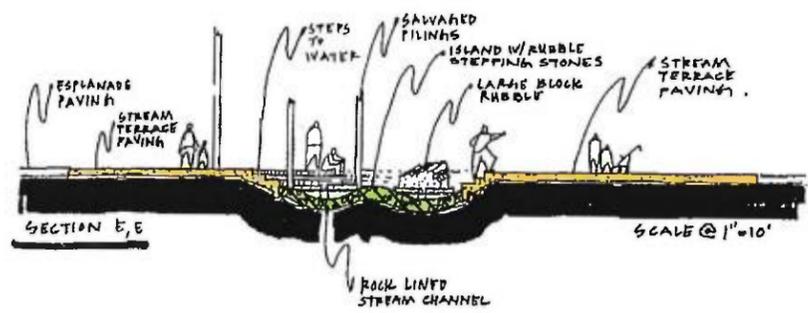
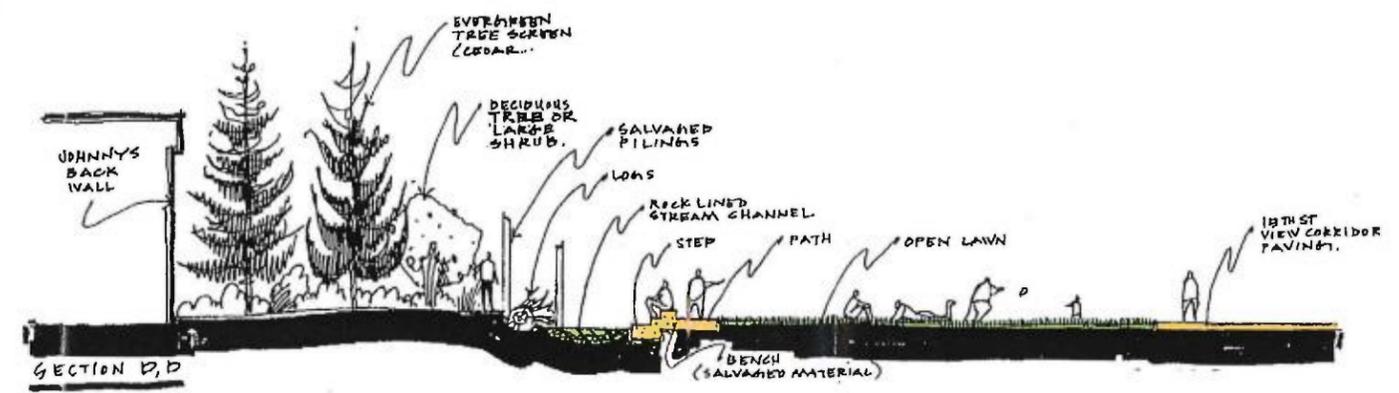
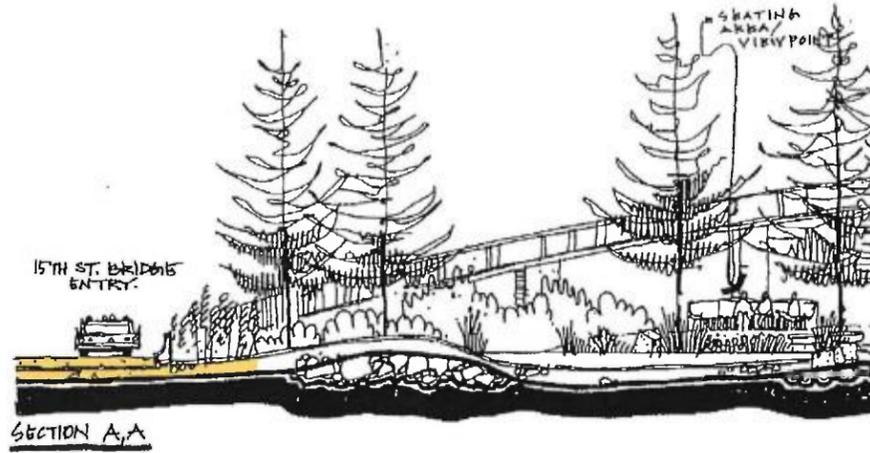
Proposed Cleanup Action

15th Street ROW



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Conceptual Cross Sections Showing Cleanup Action Elements 15th Street ROW



-  Pavement Cap
-  3 Foot Soil Cover Cap
-  Requires 3-Feet of Overexcavation Including below Stream Beds

Note: Based on figure by Architects Reed Reinvold Johnson Willows entitled "15th Street Corridor Landscape Cross Sections" dated July 1997.

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APPENDIX A
COST ESTIMATES AND ASSUMPTIONS

APPENDIX A CLEANUP ACTION COST ESTIMATE ASSUMPTIONS

This appendix presents cost estimates for the cleanup actions planned for each SCAP. The cost estimates are presented in Tables A-1 through A-8. Assumptions used to estimate the costs are described in detail below. Note that additional specific assumptions for unit cost and/or references are provided in each cost estimate.

SCAP 9 Area

Table A-1 presents the cost estimate for SCAP 9.

Site Preparation

The concrete building slab and foundations walls which occupy SCAP 9 will be demolished and disposed of to ensure that an adequate cover and/or cap is placed to prevent direct contact with subsurface soils. The following assumptions and estimates were used:

- ▶ Some cost items were taken from the Robinson Company (1998) and are labeled as such in the table.
- ▶ Asphalt demolition refers to portions of existing path within SCAP 9 requiring demolition and miscellaneous paved areas (see Figure 4). Assumes 895 lineal feet by 12 feet for the path in addition to 2,770 square feet of miscellaneous asphalt.
- ▶ Surface concrete demolition assumes the portion of the southernmost slab (i.e., primarily within SCAP 10, partially on SCAP 9) will be demolished and removed. Assumes a 6-inch-thick, reinforced slab with dimensions of 70 by 38 feet.
- ▶ Concrete demolition volume for disposal assumes ten truck and trailer loads of concrete debris will be generated from the dock demolition, 48 cy from the slab demolition, and 27 cy from the retaining wall demolition. Note for the dock demolition, volume assumes 20 cy per truck and trailer load (i.e., total of 200 cy) at 150 pcf (i.e., 2.03 ton/cy).
- ▶ Asphalt pulverization volume assumes 3-inch-thick asphalt at 145 pcf (i.e., 1.95 ton/cy).

- ▶ Assumes the following: a) timber dock area is 9,900 sf (see Figure 4); b) four timber piles per 200 sf; c) timber piles are nominally 12 inches in diameter and are cut off 7 feet from pile top (refer to design drawings ARRJW, July 1998); and assumes timber at 85 pcf (i.e., 1.15 ton/cy). Also, assumes piling and dock timbers are creosote-treated, requiring landfill disposal.

Note that this estimate neglects costs for encountering unknown structures during excavation unless they were identified in our explorations (e.g., neglects foundation elements such as pile caps from former structures).

Overexcavation and Treatment of Contaminated Soils

Several areas of SCAP 9 will require overexcavation of contaminated soils to obtain a minimum 3 feet of soil cover cap for the cleanup action. The estimated depths of the excavations are shown on Figure 3. In general, volumes assume cleanup occurs to the MLLW; except for the northernmost area where the in-waterway cleanup is addressing bank soils, and east of the Inner Harbor Line which may be subject to further assessment. Specific assumptions are as follows:

- ▶ The total volume of overexcavation/excavation is estimated as 8,753 cy.
- ▶ Volumes for overexcavation areas assume 4,884 cy (1-foot overexcavation), 1,369 cy (2-foot overexcavation), and 1,300 cy (3-foot overexcavation) (refer to Figure 3).
- ▶ Volume for bank cuts is based on cross sections through the Esplanade presented in ARRJW (1998). To calculate volume, bank cut areas shown on cross sections are assumed constant for half the distance to the adjacent cross section line on either side (i.e., total is 1,200 cy).
- ▶ Assume 98 percent of bank soils require stockpiling (i.e., 98% of 8,753 cy).
- ▶ Assumes 2 percent of total volume is relatively large debris and is immediately separated for disposal (i.e., 2% of 8,753 cy). Also assumes half of debris is creosote-treated piling. Note debris weight is assumed to be 1.95 ton/cy.
- ▶ Assumes 25 percent of stockpiled soil volume is below cleanup action levels and can be reused as fill. Of this, we have assumed that 50 percent is geotechnically suitable for reuse (i.e., 50% of 25% of 8,753 cy) and that 50 percent of this volume is geotechnically unsuitable for reuse but can be conditioning for reuse (i.e., amended with 4% cement by volume).

- ▶ Assumes 75 percent of stockpiled soil volume is above cleanup action levels and requires treatment/disposal. We then assumed that 60 percent of the stockpiled soils (60% of 8,578 cy at 1.6 ton/cy) are cPAH/TPH-O-contaminated and are applicable for thermal treatment, and that 40 percent of the stockpiled soils (40% of 8,578 cy at 1.6 ton/cy) have excessive debris, are too wet and fine-grained, or exceed MTCA cleanup levels for metals to receive thermal treatment and are therefore disposed of in a Class D landfill.

Electrical utilities were assumed to require trenches with dimensions of 4-foot width by 5-foot depth. This corresponds to an assumed utility line invert depth of 3.5 feet with an allowance of 6 inches for bedding material. Also assumes all excavation is within contaminated soil and thus requires a 1-foot overexcavation of soil as specified in the Consent Decree. Specific assumptions are as follows:

- ▶ The total volume of overexcavation/excavation is estimated as 399 cy.
- ▶ 225 feet of 4-foot-wide trench excavated 3 feet into existing soils (100 cy).
- ▶ 505 feet of 4-foot-wide trench excavated 4 feet into existing soils (299 cy).
- ▶ Assume 80 percent of bank soils require stockpiling (i.e., 80% of 399 cy).
- ▶ Assumes 20 percent of the excavated soil volume does not require stockpiling based on field screening, etc. (determination of appropriateness for stockpiling is discussed in the main text). These soils would therefore be below cleanup action levels and can be reused as fill. Assumes that 50 percent of this quantity is geotechnically suitable (i.e., 50% of 20% of 399 cy). Also assumes that 20 percent of the stockpiled soil is tested below cleanup action levels and can be reused as fill. Assumes that 50 percent of this quantity is geotechnically suitable (i.e., 50% of 20% of 319 cy).
- ▶ Similarly, assumes 50 percent of the excavated soil volume not requiring stockpiling requires geotechnical soil conditioning termed "cement-stabilization" for reuse (i.e., amended with 4% cement by volume) (i.e., 50% of 20% of 399cy). Also assumes that 50 percent of the fraction of stockpiled soils tested below cleanup action levels requires geotechnical soil conditioning for reuse (i.e., 50% of 20% of 319 cy).
- ▶ Assumes 80 percent of stockpiled soil volume is above cleanup action levels and requires treatment/disposal. Cost provided assumes 50 percent of stockpiled soils (50% of 319 cy at 1.6 ton/cy) are cPAH/TPH-O-contaminated and are applicable for thermal treatment.

- ▶ Assumes 80 percent of stockpiled soil volume is above cleanup action levels and requires treatment/disposal. Cost provided assumes 30 percent of stockpiled soils (30% of 319 cy at 1.6 ton/cy) have excessive debris, are too wet and fine-grained, or exceed MTCA cleanup levels for metals to receive thermal treatment and are therefore disposed of in a Class D landfill.

Placement of Soil Cover

Figure 3 shows the areas of soil cover required to provide a barrier from direct contact. Volumes of soil cover were estimated by comparing the existing site grade with future site grades of 13 to 14 feet over the site. Volumes were estimated as follows:

- ▶ Assumes the sum of "Capping material volume" from Robinson Company, (1998) added to overexcavation volume and utility trench volume that is not reused fill.

Installation of Pavement Caps

The total area of pavement cap was estimated using Figure 3.

SCAP 10 Area – Option 1

Table A-2 presents the cost estimate for SCAP 10, Option 1.

Site Preparation

The following estimates and assumptions were made for SCAP 10, Option 1:

- ▶ Surface concrete demolition assumes the slab will be demolished and removed. Assumes a 6-inch-thick, reinforced slab. Refer to Figure 4 for dimensions.
- ▶ Asphalt demolition refers to portions of existing path within SCAP 10 requiring demolition and miscellaneous paved areas. Refer to Figure 4 for dimensions.
- ▶ Concrete demolition volume assumes 6-inch-thick reinforced slab at 150 pcf (i.e., 2.03 ton/cy).
- ▶ Asphalt pulverization volume assumes 3-inch-thick asphalt at 145 pcf (i.e., 1.95 ton/cy).

Overexcavation and Treatment of Contaminated Soils

Following slab demolition and removal, some excavation will be required to obtain the minimum 3 feet of soil cover cap required for the cleanup action. The estimated depths of the excavations are shown on Figure 3. Specific assumptions are as follows:

- ▶ The total volume of overexcavation/excavation is estimated as 500 cy.
- ▶ Assume 75 percent of excavated soils require stockpiling (i.e., 75% of 500 cy).
- ▶ Assumes 25 percent of the excavated soil volume does not require stockpiling based on field screening, etc. (discussion of appropriateness for stockpiling is discussed in the main text). These soils would therefore be below cleanup action levels and can be reused as fill, if geotechnically suitable. Also assumes that 50 percent of the stockpiled soil is tested below cleanup action levels and can be reused as fill, if geotechnically suitable. Assumes that 70 percent of this total reusable quantity is geotechnically suitable (i.e., 70% of the sum of 25% x 500 cy and 50% x (500 cy - 125 cy)).
- ▶ Assumes the remaining 30 percent of reusable excavated soil requires geotechnical soil conditioning termed "cement-stabilization" for reuse (i.e., amended with 4% cement by volume).
- ▶ Assumes 50 percent of stockpiled soil volume is above cleanup action levels and requires treatment/disposal. Cost provided assumes 90 percent of stockpiled soils above cleanup action levels (90% of 50% of 375 cy at 1.6 ton/cy) are cPAH/TPH-O-contaminated and are applicable for thermal treatment.
- ▶ Assumes 50 percent of stockpiled soil volume is above cleanup action levels and requires treatment/disposal. Cost provided assumes 10 percent of stockpiled soils above cleanup action levels (10% of 50% of 375 cy at 1.6 ton/cy) have excessive debris, are too wet and fine-grained, or exceed MTCA cleanup levels for metals to receive thermal treatment and are therefore disposed of in a Class D landfill.

Placement of Soil Cover/Pavement Caps

Figure 4 shows the areas of soil cover/pavement caps. Volumes of soil cover were estimated by comparing an assumed future site grade of 14 feet over the site, with existing grade and the requirement that a minimum 3-foot-thick soil

cover cap be in place for the cleanup action. Figure 3 can be used to determine the dimensions for asphalt capping within the view corridor (Note that half of the view corridor is considered part of SCAP 10).

SCAP 10 Area – Option 2

Table A-3 presents the cost estimate for SCAP 10, Option 2.

Site Preparation

This will be the same as described above for SCAP 10, Option 1.

Overexcavation and Treatment of Contaminated Soils

Excavation to the groundwater surface result in a substantial volume of contaminated soil. The mass excavation for Option 2 is assumed to terminate at elevation 5.5 feet TPWD. Soldier/pile shoring walls that are either cantilever or with one row of tiebacks would be installed around the perimeter of the site for excavation retention and support. Excavation would then proceed to the indicated elevation. The following assumptions were made with respect to the excavation volumes and shoring:

- ▶ Assumes average site grade elevation 10 feet and shored excavation is 5.25 feet height (shoring height would likely vary from 4.5 to 6 feet). Refer to Figure 3 for dimensions of the perimeter of the site;
- ▶ For dewatering, assumes two ditches 2 x 2 x 9 feet and two 2-inch diaphragm pumps used 30 days;
- ▶ The total volume of excavation is estimated as 14,088 cy.
- ▶ Assume 68 percent of excavated soils require stockpiling (i.e., 68% of 14,088 cy).
- ▶ Assumes 2 percent of total volume is relatively large debris and is immediately separated for disposal (i.e., 2% of 14,088 cy). Also assumes half of debris is creosote-treated piling. Note debris weight is assumed to be 1.95 ton/cy.
- ▶ Assumes 30 percent of the excavated soil volume does not require stockpiling based on field screening, etc. (discussion of appropriateness for stockpiling is discussed in the main text). These soils would therefore be below cleanup action levels and can be reused as fill, if geotechnically

suitable. Also assumes that 25 percent of the stockpiled soil is tested below cleanup action levels and can be reused as fill, if geotechnically suitable. Assumes that 80 percent of this total reusable quantity is geotechnically suitable (i.e., 80% of the sum of 30% x 14,088 cy and 25% x (14,088 cy - 4,226 cy)).

- ▶ Assumes the remaining reusable excavated soil requires geotechnical soil conditioning for reuse.
- ▶ Assumes 75 percent of stockpiled soil volume is above cleanup action levels and requires treatment/disposal. Cost provided assumes 90 percent of stockpiled soils above cleanup action levels (90% of 75% of 9,862 cy at 1.6 ton/cy) are cPAH/TPH-O-contaminated and are applicable for thermal treatment.
- ▶ Assumes 75 percent of stockpiled soil volume is above cleanup action levels and requires treatment/disposal. Cost provided assumes 10 percent of stockpiled soils above cleanup action levels (10% of 75% of 9862 cy at 1.6 ton/cy) have excessive debris, are too wet and fine-grained, or exceed MTCA cleanup levels for metals to receive thermal treatment and are therefore disposed of in a Class D landfill.

Installation of Pavement Cap

The final pavement (e.g., building slab) will act as a cap to any residual soil contaminants present in the subsurface. The total area of pavement cap shown on Figure 4 was used in our estimate.

SCAP 11 Area – Option 1

Table A-4 presents the cost estimate for SCAP 11, Option 1.

Site Preparation

The following estimates and assumptions were made for SCAP 11, Option 1:

- ▶ Subsurface concrete demolition assumes the existing slab will be demolished and removed. Assumes a 6-inch-thick, reinforced slab that is broken up to some degree and partially covered with soil. Refer to Figure 4 for dimensions.

- ▶ Asphalt demolition refers to portions of existing path within SCAP 11 requiring demolition and miscellaneous paved areas. Refer to Figure 4 for dimensions.
- ▶ Concrete demolition volume assumes 6-inch-thick reinforced slab at 150 pcf (i.e., 2.03 ton/cy).
- ▶ Asphalt pulverization volume assumes 3-inch-thick asphalt at 145 pcf (i.e., 1.95 ton/cy).

Overexcavation and Treatment of Contaminated Soils

Following slab demolition and removal, some excavation will be required to obtain the minimum 3 feet of soil cover cap required by the cleanup action plan. The estimated depths of the excavations are shown on Figure 3. Specific assumptions are as follows:

- ▶ The total volume of overexcavation/excavation is estimated as 751 cy.
- ▶ Assume 100 percent of excavated soils require stockpiling (i.e., 100% of 751 cy). Note that this is primarily due to the relatively high concentrations of cPAHs within this SCAP. Most samples had total cPAH concentrations above cleanup action levels.
- ▶ Assumes that 20 percent of the stockpiled soil is tested below cleanup action levels and can be reused as fill, if geotechnically suitable. Assumes that 70 percent of this total reusable quantity is geotechnically suitable (i.e., 70% of 20% x 751 cy).
- ▶ Assumes the remaining 30 percent of reusable excavated soil requires geotechnical soil conditioning termed "cement-stabilization" for reuse (i.e., amended with 4% cement by volume).
- ▶ Assumes 80 percent of the stockpiled soil volume is above cleanup action levels and requires treatment/disposal. Cost provided assumes these soils (80% of 751 cy at 1.6 ton/cy) are cPAH/TPH-O-contaminated and are applicable for thermal treatment.

Placement of Soil Cover/Pavement Caps

Figure 4 shows the areas of soil cover/pavement caps. Volumes of soil cover were estimated by comparing an assumed future site grade of 14 feet over the site, with the existing grade and the need for a 3-foot-thick soil cover for the

cleanup action. Figure 3 can be used to determine the dimensions for pavement capping within the view corridor (Note that half of the southern view corridor and half of the northern view corridor are considered part of SCAP 11).

SCAP 11 Area – Option 2

Table A-5 presents the cost estimate for SCAP 11, Option 2.

Site Preparation

This will be the same as described above for SCAP 11, Option 1.

Overexcavation and Treatment of Contaminated Soils

Excavation to the groundwater surface results in a substantial volume of contaminated soil. The mass excavation for Option 2 is assumed to terminate at elevation 5.5 feet TPWD. Soldier/pile shoring walls that are either cantilever or with one row of tiebacks would be installed around the perimeter of the site for excavation retention and support. Excavation would then proceed to the indicated elevation. The following assumptions were made with respect to the excavation volumes and shoring:

- ▶ Assumes average site grade elevation 11 feet and shored excavation is 5.5 feet height (shoring height would likely vary from 4.5 to 6 feet). Refer to Figure 3 for dimensions of the perimeter of the site;
- ▶ For dewatering, assumes two ditches 2 x 2 x 9 feet and two 2-inch diaphragm pumps used 30 days;
- ▶ The total volume of excavation is estimated as 13,616 cy.
- ▶ Assume 95 percent of excavated soils require stockpiling (i.e., 95% of 13,616 cy).
- ▶ Assumes 5 percent of total volume is relatively large debris and is immediately separated for disposal (i.e., 5% of 13,616 cy). Also assumes half of debris is creosote-treated piling. Note debris weight is assumed to be 1.95 ton/cy.
- ▶ Utility demolition assumes existing sanitary and storm sewer lines are demolished and removed to accommodate excavation to the groundwater surface. Refer to Figure 4 for dimensions.

- ▶ Assumed abandonment for portions of utilities that would remain below Dock Street and the proposed view corridors consisting of filling the pipes with grout.
- ▶ Assumes that 20 percent of the stockpiled soil is tested below cleanup action levels and can be reused as fill, if geotechnically suitable. Assumes that 50 percent of this total reusable quantity is geotechnically suitable (i.e., 50% of 20% of 12,935 cy).
- ▶ Assumes the remaining reusable excavated soil requires geotechnical soil conditioning termed "cement-stabilization" for reuse (i.e., amended with 4% cement by volume).
- ▶ Assumes 80 percent of stockpiled soil volume is above cleanup action levels and requires treatment/disposal. Cost provided assumes 75 percent of stockpiled soils above cleanup action levels (80% of 75% of 12,935 cy at 1.6 ton/cy) are cPAH/TPH-O-contaminated and are applicable for thermal treatment.
- ▶ Assumes 80 percent of stockpiled soil volume is above cleanup action levels and requires treatment/disposal. Cost provided assumes 25 percent of stockpiled soils above cleanup action levels (80% of 25% of 12,935 cy at 1.6 ton/cy) have excessive debris, are too wet and fine-grained, or exceed MTCA cleanup levels for metals to receive thermal treatment and are therefore disposed of in a Class D landfill.
- ▶ For abandoned storm and sanitary sewer pipe, assume 2.03 ton/cy and disposal at a Class D landfill facility.

Installation of Soil Cover/Pavement Cap

The final pavement (e.g., building slab) will act as a cap to any residual soil contaminants present in the subsurface. The total area of pavement cap shown on Figure 4 was used in our estimate. Half of the northern view corridor is assumed to have a 3-foot-thick soil cover cap.

SCAP 12 Area – Option 1

Table A-6 presents the cost estimate for SCAP 12, Option 1.

Site Preparation

The following estimates and assumptions were made for SCAP 12, Option 1:

- ▶ Surface concrete demolition assumes the slab will be demolished and removed. Concrete sidewalks are assumed to be 4 inches thick. Refer to Figure 4 for dimensions.
- ▶ Asphalt demolition refers to portions of existing path within SCAP 12 requiring demolition and miscellaneous paved areas. Refer to Figure 4 for dimensions.
- ▶ Concrete demolition volume assumes 6-inch-thick reinforced slab at 150 pcf (i.e., 2.03 ton/cy).
- ▶ Asphalt pulverization volume assumes 3-inch-thick asphalt at 145 pcf (i.e., 1.95 ton/cy).

Overexcavation and Treatment of Contaminated Soils

Following slab demolition and removal, some excavation will be required in order to obtain the minimum 3 feet of soil cover cap required by the cleanup action. The estimated depths of the excavations are shown on Figure 3. Specific assumptions are as follows:

- ▶ The total volume of overexcavation/excavation is estimated as 2,080 cy.
- ▶ Assumes 40 percent of excavated soils require stockpiling (i.e., 40% of 2,080 cy).
- ▶ Assumes 60 percent of the excavated soil volume does not require stockpiling based on field screening, etc. (discussion of appropriateness for stockpiling is discussed in the main text). These soils would therefore be below cleanup action levels and can be reused as fill, if geotechnically suitable. Also assumes that none of the stockpiled soil is tested below cleanup action levels. Assumes that 75 percent of this total reusable quantity is geotechnically suitable (i.e., 75% of 60% of 2,080 cy).
- ▶ Assumes the remaining 25 percent of reusable excavated soil requires geotechnical soil conditioning termed "cement-stabilization" for reuse (i.e., amended with 4% cement by volume).
- ▶ Assumes 40 percent of stockpiled soil volume is above cleanup action levels and requires treatment/disposal. Cost provided assumes 80 percent of stockpiled soils above cleanup action levels (80% of 40% of 2,080 cy at 1.6

ton/cy) are cPAH/TPH-O-contaminated and are applicable for thermal treatment.

- ▶ Assumes 40 percent of stockpiled soil volume is above cleanup action levels and requires treatment/disposal. Cost provided assumes 20 percent of stockpiled soils above cleanup action levels (20% of 40% of 2,080 cy at 1.6 ton/cy) have excessive debris, are too wet and fine-grained, or exceed MTCA cleanup levels for metals to receive thermal treatment and are therefore disposed of in a Class D landfill.

Placement of Soil Cover/Pavement Caps

Figure 4 shows the areas of soil cover/pavement caps. Volumes of soil cover were estimated by comparing an assumed future site grade of 14 feet over the site, with the existing grade and the required minimum 3-foot-thick soil cover needed for the cleanup action. Figure 3 can be used to determine the dimensions for soil cover/asphalt capping within the view corridor (Note that half of the view corridor is considered part of SCAP 12).

SCAP 12 Area – Option 2

Table A-7 presents the cost estimate for SCAP 12, Option 2.

Site Preparation

This will be the same as described above for SCAP 12, Option 1.

Overexcavation and Treatment of Contaminated Soils

Excavation to the groundwater surface result in a substantial volume of contaminated soil. The mass excavation for Option 2 is assumed to terminate at elevation 5.5 feet TPWD. Soldier/pile shoring walls that are either cantilever or with one row of tiebacks would be installed around the perimeter of the site for excavation retention and support. Excavation would then proceed to the indicated elevation. The following assumptions were made with respect to the excavation volumes and shoring:

- ▶ Assumes average site grade elevation 12 feet and shored excavation is 6.5 feet height (shoring height would likely vary from 4.5 to 6 feet). Refer to Figure 3 for dimensions of the perimeter of the site;
- ▶ For dewatering, assumes two ditches 2 x 2 x 9 feet and two 2-inch diaphragm pumps used 30 days;

- ▶ The total volume of excavation is estimated as 14,400 cy.
- ▶ Assume 38 percent of excavated soils require stockpiling (i.e., 38% of 14,400 cy).
- ▶ Assumes 2 percent of total volume is relatively large debris and is immediately separated for disposal (i.e., 2% of 14,400 cy). Also assumes half of debris is creosote-treated piling. Note debris weight is assumed to be 1.95 ton/cy.
- ▶ Utility demolition assumes existing sanitary and storm sewer lines are demolished and removed to accommodate excavation to the groundwater surface. Refer to Figure 4 for dimensions.
- ▶ Assumed abandonment for portions of utilities that would remain below Dock Street and the proposed view corridors consisting of filling the pipes with grout.
- ▶ Assumes 60 percent of the excavated soil volume does not require stockpiling based on field screening, etc. (discussion of appropriateness for stockpiling is discussed in the main text). These soils would therefore be below cleanup action levels and can be reused as fill, if geotechnically suitable. Assumes that none of the stockpiled soil is tested below cleanup action levels. Assumes that 60 percent of this total reusable quantity is geotechnically suitable (i.e., 60% of 60% of 14,400 cy).
- ▶ Assumes the remaining reusable excavated soil requires geotechnical soil conditioning "cement-stabilization" for reuse (i.e., amended with 4% cement by volume).
- ▶ Assumes 38 percent of stockpiled soil volume is above cleanup action levels and requires treatment/disposal. Cost provided assumes 95 percent of stockpiled soils above cleanup action levels (95% of 38% of 14,112 cy at 1.6 ton/cy) are cPAH/TPH-O-contaminated and are applicable for thermal treatment.
- ▶ Assumes 38 percent of stockpiled soil volume is above cleanup action levels and requires treatment/disposal. Cost provided assumes 5 percent of stockpiled soils above cleanup action levels (5% of 38% of 14,112 cy at 1.6 ton/cy) have excessive debris, are too wet and fine-grained, or exceed MTCA cleanup levels for metals to receive thermal treatment and are therefore disposed of in a Class D landfill.

- ▶ Abandoned storm and sanitary sewer pipe assume 2.03 ton/cy and disposal at a Class D landfill facility.

Installation of Soil Cover/Pavement Cap

The final pavement (e.g., building slab) will act as a cap to any residual soil contaminants present in the subsurface. The total area of pavement cap shown on Figure 4 was used in our estimate along with the soil cover portion shown for the view corridor.

15th Street ROW – No Action Alternative

This alternative assumes the existing asphalt parking lot and sidewalks remain in-place to function as pavement caps to prevent direct contact with the underlying contaminated soils. The small area of exposed soil above MHHW along the 15th Street ROW bank would require sampling and analysis to confirm that No Action is applicable for this SCAP. If sampling indicates a 3-foot-thick layer is present below existing grade that has soil quality below cleanup action levels for the residential exposure scenario, a No Action alternative is applicable for this SCAP. This assumes that the final proposed grade along the bank is not designed below the existing grade, unless sampling has been conducted deep enough to confirm that relevant soils are below cleanup action levels.

No costs are estimated for this cleanup alternative although a small cost would be incurred to confirm the presence of the clean soil cover discussed above.

15th Street ROW – 15th Street Park Alternative

This alternative assumes the existing asphalt parking lot and sidewalks remain in-place to function as pavement caps to prevent direct contact with the underlying contaminated soils. In addition, we assume that the alternative for public park presented in the Schematic Design report (ARRJW, 1997) which includes constructed wetlands, a stream, and lawn areas is accomplished. The cost estimate for this alternative is presented in Table A-8 based on the following assumptions.

Site Preparation

The following estimates and assumptions were made for the 15th Street ROW SCAP:

- ▶ Surface concrete demolition assumes the parking lot is surfaced with asphaltic concrete/concrete and portions of these areas will be demolished and removed. Refer to Figure 6.
- ▶ Asphalt demolition refers to portions of existing path within the ROW. Refer to Figure 6.
- ▶ Concrete demolition volume assumes 4-inch-thick sidewalks and asphaltic concrete at 150 pcf (i.e., 2.03 ton/cy).

Overexcavation and Treatment of Contaminated Soils

Following slab demolition and removal, some excavation will be required to obtain the minimum 3 feet of soil cover required for the cleanup action. The estimated depths of the excavations are shown on Figure 3. Specific assumptions are as follows:

- ▶ The total volume of overexcavation/excavation is estimated as 1,210 cy.
- ▶ Assume 60 percent of excavated soils require stockpiling (i.e., 60% of 1,210 cy).
- ▶ Assumes 40 percent of the excavated soil volume does not require stockpiling based on field screening, etc. (discussion of appropriateness for stockpiling is discussed in the main text). These soils would therefore be below cleanup action levels and can be reused as fill, if geotechnically suitable. Also assumes that 10 percent of the stockpiled soil is tested below cleanup action levels and can be reused as fill, if geotechnically suitable. Assumes that 50 percent of this total reusable quantity is geotechnically suitable (i.e., 50% of the sum of 40% x 1,210 cy and 10% x (1,210 cy - 484 cy)).
- ▶ Assumes the remaining 50 percent of reusable excavated soil requires geotechnical soil conditioning for reuse.
- ▶ Assumes 90 percent of stockpiled soil volume is above cleanup action levels and requires treatment/disposal. Cost provided assumes 70 percent of stockpiled soils above cleanup action levels (70% of 90% of 726 cy at 1.6 ton/cy) are cPAH/TPH-O-contaminated and are applicable for thermal treatment.
- ▶ Assumes 90 percent of stockpiled soil volume is above cleanup action levels and requires treatment/disposal. Cost provided assumes 20 percent of

stockpiled soils above cleanup action levels (20% of 90% of 726 cy at 1.6 ton/cy) have excessive debris, are too wet and fine-grained, or exceed MTCA cleanup levels for metals to receive thermal treatment and are therefore disposed of in a Class D landfill.

- ▶ Abandoned storm and sanitary sewer pipe assume 2.03 ton/cy and disposal at a Class D landfill facility.

Placement of Soil Cover/Pavement Caps

Figure 6 shows the areas of soil cover/pavement caps. Volumes of soil cover were estimated using a minimum 3-foot-thick soil cover cap. Figure 3 can be used to determine the dimensions for soil cover/asphalt capping within the view corridor.

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Table A-1 - Cleanup Action Cost Estimate for SCAP 9

CLEANUP ACTION COMPONENT	QUANTITY	UNITS	UNIT COST	TOTAL COST	COMMENTS
Direct Cost					
Site Preparation					
Mobilization	1	ls	\$3,000	\$3,000	Contractor equipment and materials mob/demob and site setup.
Concrete Dock Demolition	351	sf	\$15	\$5,265	Cost and quantity from the Robinson Company, 1998.
Concrete/Timber Dock Demolition	3,778	sf	\$10	\$37,780	Cost and quantity from the Robinson Company, 1998.
Asphalt Demolition	13,510	sf	\$0.75	\$10,133	Unit cost from Robinson Company, 1998.
8-inch Retaining Wall Demolition	108	lf	\$25	\$2,700	Cost and quantity from the Robinson Company, 1998.
Fencing Demolition	1,563	lf	\$1.50	\$2,345	Cost and quantity from the Robinson Company, 1998.
Remove Ecology Blocks	1	ls	\$1,500	\$1,500	Cost and quantity from the Robinson Company, 1998.
Surface Concrete Demolition	49	cy	\$5.25	\$257	1999 Means 020-754-0440.
Concrete Demolition Debris Hauling/Disposal to Fife Sand and Gravel	558	ton	\$11.12	\$6,208	Assumes \$3/ton disposal and \$8.12/ton trucking. Assumes debris is too large-sized for City of Tacoma Landfill daily cover.
Mechanically Pulverize Asphalt to Reduce Debris Size	1,501	sy	\$2.64	\$3,963	Assumes debris size must be reduced for use at City of Tacoma Landfill (see below). 1999 Means 025-454-5000.
Asphalt Demolition Debris Use in Daily Cover at City of Tacoma Landfill	244	ton	\$3	\$732	Assumes asphalt would not be reused as general fill due to environmental concern.
Demolition Debris Hauling/Disposal to Class D Landfill (Dock Timbers/Cut Timber Piling)	46	ton	\$35	\$1,610	Refer to appendix text for specific assumptions of volume.
Subtotal				\$75,492	
Overexcavation of Contamination Zones					
Excavate/Stockpile Contaminated Soils	8,578	cy	\$15	\$128,670	Unit cost based on Robinson Company, 1998. Assumes some care is taken to segregate thermally treatable soils.
Separation and Disposal of Debris	341	ton	\$50	\$17,068	Unit cost includes handling required as well as Class D landfill disposal.
Reuse Geotechnically Suitable Soil (i.e., place/compact soil below cleanup action levels)	1,072	cy	\$10.28	\$11,023	1999 Means 022-200-0900 for placement/compaction plus \$4/ton for debris screening.
Recondition Geotechnically Unsuitable Soils for Reuse (i.e., cement amend soil for stabilization)	1,072	cy	\$18.63	\$19,976	1999 Means 022-412-1060 (stabilization) and 022-200-0900 (placement/compaction). Assumes \$8.35/cy for geotechnical cement stabilization, \$3.88/cy placement/compaction, and \$6.40/cy debris screening (\$4/ton x 1.6 ton/cy)
Haul and Treat cPAH/TPH-O Contaminated Soils by Thermal Desorption	6,176	ton	\$42	\$259,399	Assuming \$35/ton thermal desorption, \$3/ton for transport, and \$4/ton for debris screening.
Soil Disposal at Class D Landfill (Rabanco - Roosevelt Regional Landfill)	4,117	ton	\$35	\$144,110	Refer to appendix text for specific assumptions of volume.
Subtotal				\$580,246	
Excavation of Utility Trenches					
Excavate/Stockpile Soils	319	cy	\$15	\$4,788	Unit cost based on Robinson Company, 1998. Assumes some care is taken to segregate thermally treatable soils.
Reuse Geotechnically Suitable Soil (i.e., place/compact soil below cleanup action levels)	72	cy	\$10.28	\$738	1999 Means 022-200-0900 for placement/compaction plus \$4/ton for debris screening.
Recondition Geotechnically Unsuitable Soils for Reuse (i.e., cement amend soil for stabilization)	72	cy	\$18.63	\$1,338	1999 Means 022-412-1060 (stabilization) and 022-200-0900 (placement/compaction). Assumes \$8.35/cy for geotechnical cement stabilization, \$3.88/cy placement/compaction, and \$6.40/cy debris screening
Haul and Treat cPAH/TPH-O Contaminated Soils by Thermal Desorption	255	ton	\$42	\$10,725	Assuming \$35/ton thermal desorption, \$3/ton for transport, and \$4/ton for debris screening.
Soil Disposal at Class D Landfill (Rabanco - Roosevelt Regional Landfill)	153	ton	\$35	\$5,363	Refer to appendix text for specific assumptions of volume.
Subtotal				\$22,952	
Soil Cover and Pavement Cap					
Soil Cover Material	11,825	cy	\$25	\$295,630	Unit cost from Robinson Company, 1998. Cost includes material, hauling, placement, and compaction.
Concrete Capping	59,238	sf	\$4	\$236,952	Unit cost based on tooled joint slab-on-grade concrete from Robinson Company, 1998.
Subtotal				\$532,582	

467634/AppAmeanrnh.xls - Table A-1

Table A-1 - Cleanup Action Cost Estimate for SCAP 9

CLEANUP ACTION COMPONENT	QUANTITY	UNITS	UNIT COST	TOTAL COST	COMMENTS
Total Direct Costs				\$1,211,272	
<i>Indirect Cost</i>					
Remedial Design	1	ls	\$45,000	\$45,000	Review of plans and specs, design drawings, surveys, and construction documents completed by others. Cost provided includes a remediation engineering design report, cost estimate, scheduling, constr. QA plan, specs for H&S plan, constr. sampling and anal.
Construction Management	1	ls	(2)	(2)	
AE Design	1	ls	(2)	(2)	
Construction Observation	1	ls	\$60,564	\$60,564	Assume 5% of direct cost.
Profiling for Off-site Treatment and/or Disposal	148	ea	\$500	\$74,143	Assumed cost is based on testing every 60 cy of contaminated soil.
Closure Report	1	ls		\$20,000	Cost provided is a general assumption.
Total Indirect Costs				\$199,707	
Subtotal				\$1,410,979	
General Contingency (30%)				\$423,294	
TOTAL COST ESTIMATE (with contingency)				\$1,834,273	

Notes:

- (1) Volume estimate assumptions are presented in Appendix A.
- (2) Values not included in total cost estimate pending input from City and others.
- (3) Does not include cost for demolition and removal of existing foundation elements.

Table A-2 - Cleanup Action Cost Estimate - SCAP 10 Option 1 - Fill to Grade

CLEANUP ACTION COMPONENT	QUANTITY	UNITS	UNIT COST	TOTAL COST	COMMENTS
<i>Direct Cost</i>					
Site Preparation					
Mobilization	1	ls	\$3,000	\$3,000	Contractor equipment and materials mob/demob and site setup.
Surface Concrete Demolition	30,040	sf	\$5.25	\$157,710	1999 Means 020-754-0440.
Asphalt Demolition	13,360	sf	\$0.75	\$10,020	Unit cost based on Robinsion Company, 1998.
Mechanically Pulverize Asphalt to Reduce Debris Size	1,484	sy	\$2.64	\$3,919	Assumes debris size must be reduced for use at City of Tacoma Landfill (see below). 1999 Means 025-454-5000.
Concrete Demolition Debris Hauling/Disposal to Fife Sand and Gravel	1,129	ton	\$11.12	\$12,558	Assumes \$3/ton disposal and \$8.12/ton trucking. Assumes debris is too large-sized for City of Tacoma Landfill daily cover.
Asphalt Demolition Debris Use in Daily Cover at City of Tacoma Landfill	241	ton	\$3	\$724	Assumes asphalt would not be reused as general fill due to environmental concern.
Subtotal				\$187,930	
Overexcavation of Contamination Zones					
Excavate/Stockpile Contaminated Soils	375	cy	\$15	\$5,625	Unit cost based on Robinsion Company, 1998. Assumes some care is taken to segregate thermally treatable soils.
Reuse Geotechnically Suitable Soil (i.e., place and compact soil below cleanup action levels)	219	cy	\$10.28	\$2,251	1999 Means 022-200-0900 for placement/compaction plus \$4/ton for debris screening.
Recondition Geotechnically Unsuitable Soils for Reuse (i.e., cement amend soil for stabilization)	94	cy	\$18.63	\$1,751	1999 Means 022-412-1060 (stabilization) and 022-200-0900 (placement/compaction). Assumes \$8.35/cy for geotechnical cement-stabilization, \$3.88/cy placement/compaction, and \$6.40/cy debris screening (\$4/ton x 1.6 ton/cy)
Haul, Screen, and Treat cPAH/TPH Contaminated Soils by Thermal Desorption	271	ton	\$42	\$11,370	Assuming \$35/ton thermal desorption, \$3/ton for transport, and \$4/ton for screening out debris.
Soil Disposal at Class D Landfill (Rabanco - Roosevelt Regional Landfill)	30	ton	\$35	\$1,053	Refer to appendix text for specific assumptions of volume.
Subtotal				\$20,998	
Soil Cover and Pavement Caps:					
Soil Cover Material and Replace Excavated Volume Not Reused	8,517	cy	\$22.50	\$191,621	Unit cost from Robinsion Company, 1998. Cost includes material, hauling, placement, and compaction.
View Corridor Asphalt Capping	6,880	sf	\$3.50	\$24,080	Refer to Figure 3.
Subtotal				\$215,701	
Total Direct Costs				\$424,629	
<i>Indirect Cost</i>					
Remedial Design	1	ls	\$30,000	\$30,000	Review of plans and specs, design drawings, surveys, and construction documents completed by others. Cost provided includes a remediation engineering design report, cost estimate, scheduling, constr. QA plan, specs for H&S plan, constr. sampling and anal.
Construction Management	1	ls	(3)	(3)	
AE Design	1	ls	(3)	(3)	
Construction Observation	1	ls	\$42,822	\$21,231	Assume 5% of direct cost.
Closure Report	1	ls	\$20,000	\$20,000	Cost provided is a general assumption.
Total Indirect Costs				\$71,231	
Subtotal				\$495,861	
General Contingency (30%)				\$148,758	
TOTAL COST ESTIMATE (with contingency)				\$644,619	

Notes:

- (1) Volume estimate assumptions are presented in Appendix A.
- (2) Cost estimate accuracy expected within 30% of actual for elements included in this table.
- (3) Values not included in Total Cost Estimate pending input from City and others.

Table A-3 - Cleanup Action Cost Estimate - SCAP 10 Option 2 - Excavate to Water Table

CLEANUP ACTION COMPONENT	QUANTITY	UNITS	UNIT COST	TOTAL COST	COMMENTS
Direct Cost					
Site Preparation					
Mobilization	1	ls	\$3,000	\$3,000	Contractor equipment and materials mob/demob and site setup.
Surface Concrete Demolition	30,040	sf	\$5.25	\$157,710	1999 Means 020-754-0440.
Asphalt Path Demolition	13,360	sf	\$0.75	\$10,020	Unit cost based on Robinson Company, 1998.
Mechanically Pulverize Asphalt to Reduce Debris Size	1,484	sy	\$2.64	\$3,919	Assumes debris size must be reduced for use at City of Tacoma Landfill (see below). 1999 Means 025-454-5000.
Concrete Demolition Debris Hauling/Disposal to Fife Sand and Gravel	1,129	ton	\$11.12	\$12,558	Assumes \$3/ton disposal and \$8.12/ton trucking. Assumes debris is too large-sized for City of Tacoma Landfill daily cover.
Asphalt Demolition Debris Use in Daily Cover at City of Tacoma Landfill	241	ton	\$3	\$724	Assumes asphalt would not be reused as general fill due to environmental concern.
Subtotal				\$187,930	
Overexcavation of Contamination Zones					
Cantilever Soldier Pile/Single Support Shoring ⁽⁴⁾	5,775	sf	\$21	\$121,275	Including equipment, materials, and labor. 1998 Means 021-620-0200.
Dewatering by Ditching/Sump Pumps ⁽⁵⁾	1	ls	\$5,186	\$5,186	1999 Means 021-404-0010 to 0620.
Excavate/Stockpile Contaminated Soils	9,862	cy	\$15	\$147,930	Unit cost based on Robinson Company, 1998. Assumes some care is taken to segregate thermally treatable soils.
Separation and Disposal of Debris	549	ton	\$50	\$27,472	Unit cost includes handling required as well as Class D landfill disposal.
Reuse Geotechnically Suitable Soil (i.e., place and compact soil below cleanup action levels)	5,354	cy	\$10.28	\$55,039	1999 Means 022-200-0900 for placement/compaction plus \$4/ton for debris screening.
Recondition Geotechnically Unsuitable Soils for Reuse (i.e., cement amend soil for stabilization)	1,338	cy	\$18.63	\$24,927	1999 Means 022-412-1060 (stabilization) and 022-200-0900 (placement/compaction). Assumes \$8.35/cy for geotechnical cement-stabilization, \$3.88/cy placement/compaction, and
Haul, Screen, and Treat cPAH/TPH Contaminated Soils by Thermal Desorption	10,651	ton	\$42	\$447,340	Assuming \$35/ton thermal desorption, \$3/ton for transport, and \$4/ton for screening out debris.
Soil Disposal at Class D Landfill (Rabanco - Roosevelt Regional Landfill)	1,183	ton	\$35	\$41,420	Refer to appendix text for specific assumptions of volume.
Subtotal				\$870,589	
Pavement Cap					
Concrete Capping	72,450	sf	\$4	\$289,800	Cost per square foot of tooled joint slab on grade concrete, from The Robinson Company, 1998.
View Corridor Asphalt Capping	6,880	sf	\$3.50	\$24,080	Refer to Figure 3
Subtotal				\$313,880	
Total Direct Costs				\$1,372,400	
Indirect Cost					
Remedial Design	1	ls	\$30,000	\$30,000	Review of plans and specs, design drawings, surveys, and construction documents completed by others. Cost provided includes a remediation engineering design report, cost estimate, scheduling, constr. QA plan, specs for H&S plan, constr. sampling and anal.
Construction Management	1	ls	(3)	(3)	
AE Design	1	ls	(3)	(3)	
Construction Observation	1	ls	\$68,620	\$68,620	5% of direct cost
Profiling for Off-site Treatment and/or Disposal	164	ea	\$500	\$82,183	Assumed cost is based on testing every 60 cy of contaminated soil.
Closure Report	1	ls	\$20,000	\$20,000	Cost provided is a general assumption.
Total Indirect Costs				\$200,803	
Subtotal				\$1,573,203	
General Contingency (30%)				\$471,961	
TOTAL COST ESTIMATE (with contingency)				\$2,045,164	

Notes:

- (1) Volume estimate assumptions are presents in Appendix A.
- (2) Cost estimate accuracy expected within 30% of actual for elements included in this table.
- (3) Values not included in Total Cost Estimate pending input from City and others.
- (4) Shoring may not be necessary for this depth of excavation. Contractor may prefer to slope and/or bench soil at the excavation perimeter.
- (5) Dewatering needs depend upon a variety of factors - this system may not be adequate if the excavation extends even slightly below the groundwater surface. Wellpoints are sometimes used with soldierpile/lagging walls with some economy, but this is site-specific.

467634/AppAmeanmlw.xls - Table A-3

Table A-4 - Cleanup Action Cost Estimate - SCAP 11 Option 1 - Fill to Grade

CLEANUP ACTION COMPONENT	QUANTITY	UNITS	UNIT COST	TOTAL COST	COMMENTS
Direct Cost					
Site Preparation					
Mobilization	1	ls	\$3,000	\$3,000	Contractor equipment and materials mob/demob and site setup.
Subsurface Surface Concrete Demolition	23,625	sf	\$10.00	\$236,250	Cost is a general assumption considering surface concrete demolition from 1999 Means 020-754-0440 plus the added effort to remove soil, debris, etc. above the concrete.
Sidewalk Demolition	2,600	sf	\$1.15	\$2,990	Unit cost from Robinson Company, 1998.
Asphalt Demolition	4,715	sf	\$0.75	\$3,536	Unit cost from Robinson Company, 1998.
Mechanically Pulverize Asphalt to Reduce Debris Size	524	sy	\$2.64	\$1,383	Assumes debris size must be reduced for use at City of Tacoma Landfill (see below). 1999 Means 025-454-5000.
Concrete Demolition Debris Hauling/Disposal to Fife Sand and Gravel	953	ton	\$11.12	\$10,601	Assumes \$3/ton disposal and \$8.12/ton trucking. Assumes debris is too large-sized for City of Tacoma Landfill daily cover.
Asphalt Demolition Debris Use in Daily Cover at City of Tacoma Landfill	85	ton	\$3	\$255	Assumes asphalt would not be reused as general fill due to environmental concern.
Subtotal				\$258,015	
Overexcavation of Contamination Zones					
Excavate/Stockpile Contaminated Soils	751	cy	\$15	\$11,265.00	Unit cost based on Robinson Company, 1998. Assumes some care is taken to segregate thermally treatable soils.
Reuse Geotechnically Suitable Soil (i.e., place and compact soil below cleanup action)	105	cy	\$10.28	\$1,081	1999 Means 022-200-0900 for placement/compaction plus \$4/ton for debris screening.
Recondition Geotechnically Unsuitable Soils for Reuse (i.e., cement amend soil for stabilization)	45	cy	\$18.63	\$839	1999 Means 022-412-1060 (stabilization) and 022-200-0900 (placement/compaction). Assumes \$8.35/cy for geotechnical cement-stabilization, \$3.88/cy placement/compaction, and \$6.40/cy debris screening
Haul, Screen, and Treat cPAH/TPH Contaminated Soils by Thermal Desorption	961	ton	\$42	\$40,374	Assuming \$35/ton thermal desorption, \$3/ton for transport, and \$4/ton for screening out debris.
Subtotal				\$53,559	
Soil Cover and Pavement Caps:					
Soil Cover Cap Material and Replace Excavated Volume Not Reused	9,145	cy	\$22.50	\$205,763	Unit cost from Robinson Company, 1998. Cost includes material, hauling, placement, and compaction.
View Corridor Asphalt Capping	10,685	sf	\$3.50	\$37,398	Refer to Figure 3.
Subtotal				\$243,160	
Total Direct Costs				\$554,734	
Indirect Cost					
Remedial Design	1	ls	\$30,000	\$30,000	Review of plans and specs, design drawings, surveys, and construction documents completed by others. Cost provided includes a remediation engineering design report, cost estimate, scheduling, constr. QA plan, specs for. H&S plan, constr. sampling and anal.
Construction Management	1	ls	(3)	(3)	
AE Design	1	ls	(3)	(3)	
Construction Observation	1	ls	\$46,027	\$27,737	Assume 5% of direct cost
Closure Report	1	ls	\$20,000	\$20,000	Cost provided is a general assumption.
Total Indirect Costs				\$77,737	
Subtotal				\$632,471	
General Contingency (30%)				\$189,741	
TOTAL COST ESTIMATE (with contingency)				\$822,212	

Notes:

- (1) Volume estimate assumptions are presented in Appendix A.
- (2) Cost estimate accuracy expected within 30% of actual for elements included in this table.
- (3) Values not included in Total Cost Estimate pending input from City and others.

Table A-5 - Cleanup Action Cost Estimate - SCAP 11 Option 2 - Excavate to Water Table

Sheet 1 of 2

CLEANUP ACTION COMPONENT	QUANTITY	UNITS	UNIT COST	TOTAL COST	COMMENTS
Direct Cost					
Site Preparation					
Mobilization	1	ls	\$3,000	\$3,000	Contractor equipment and materials mob/demob and site setup.
Subsurface Surface Concrete Demolition	23,625	sf	\$10.00	\$236,250	Cost is a general assumption considering surface concrete demolition from 1999 Means 020-754-0440 plus the added effort to remove soil, debris, etc. above the concrete..
Sidewalk Demolition	2,600	sf	\$1.15	\$2,990	Unit cost based on Robinsion Company, 1998.
Asphalt Demolition	4,715	sf	\$0.75	\$3,536	Unit cost based on Robinsion Company, 1998.
Mechanically Pulverize Asphalt to Reduce Debris Size	524	sy	\$2.64	\$1,383	Assumes debris size must be reduced for use at City of Tacoma Landfill (see below). 1999 Means 025-454-5000.
Concrete Demolition Debris Hauling/Disposal to Fife Sand and Gravel	953	ton	\$11.12	\$10,601	Assumes 6-inch-thick reinforced concrete slab at 150 lb/cf (i.e., 2.03 ton/cy). Assumes \$3/ton disposal and \$8.12/ton trucking. Assumes debris is too large-sized for City of Tacoma Landfill daily cover.
Asphalt Demolition Debris Use in Daily Cover at City of Tacoma Landfill	85	ton	\$3	\$255	Assumes asphalt would not be reused as general fill due to environmental concern. Assumes 3-inch-thick asphalt at 145 lb/cf (i.e., 1.95 ton/cy)
	Subtotal			\$258,015	
Overexcavation of Contamination Zones					
Cantilever Soldier Pile/Single Support Shoring ⁽⁴⁾	5,830	sf	\$21.00	\$122,430	Including equipment, materials, and labor. 1998 Means 021-620-0200.
Dewatering by Ditching/Sump Pumps ⁽⁵⁾	1	ls	\$5,186	\$5,186	1999 Means 021-404-0010 to 0620.
Excavate/Stockpile Contaminated Soils	12,935	cy	\$15	\$194,028	Unit cost based on Robinsion Company, 1998. Assumes some care is taken to segregate thermally treatable soils.
Separation and Disposal of Debris	1,328	ton	\$50	\$66,378	Unit cost includes handling required as well as Class D landfill disposal.
Utility Demolition (18-inch-diameter storm sewer line and 27-inch-diameter sanitary sewer line)	225	lf	\$26.27	\$5,911	Based on 1999 Means 020-724-2000 to 2150
Abandonment of Existing Utilities Below Southern Half of the Northern View Corridor	4.5	cy	\$80	\$360	Assumes grouting is used to abandon the portion of existing utility lines considered to be below the SCAP 11 area that will be below the view corridor.
Reuse Geotechnically Suitable Soil (i.e., place and compact soil below cleanup action levels)	1,294	cy	\$10.28	\$13,297	1999 Means 022-200-0900 for placement/compaction plus \$4/ton for debris screening.
Recondition Geotechnically Unsuitable Soils for Reuse (i.e., cement amend soil for stabilization)	1,294	cy	\$18.63	\$24,098	1999 Means 022-412-1060 (stabilization) and 022-200-0900 (placement/compaction). Assumes \$8.35/cy for geotechnical cement-stabilization, \$3.88/cy placement/compaction, and
Haul, Screen, and Treat cPAH/TPH Contaminated Soils by Thermal Desorption	12,418	ton	\$42	\$521,539	Assuming \$35/ton thermal desorption, \$3/ton for transport, and \$4/ton for screening out debris.
Soil Disposal at Class D Landfill (Rabanco - Roosevelt Regional Landfill)	4,139	ton	\$35	\$144,872	Refer to appendix text for specific assumptions of volume.
Disposal of Demolished Sanitary/Storm Sewer Pipe at Roosevelt Regional Landfill (Class D)	9	ton	\$35	\$320	Assumes old concrete piping with no salvage value.
	Subtotal			\$1,098,419	
Pavement Cap					
Soil Cover Cap Material and Replace Excavated Volume Not Reused	901	cy	\$22.50	\$20,273	Unit cost from Robinsion Company, 1998. Cost includes material, hauling, placement, and compaction.
Concrete Capping	65,665	sf	\$4	\$262,660	Cost per square foot of tooled joint slab on grade concrete, from The Robinsion Company, 1998.
View Corridor Asphalt Capping	2,300	sf	\$3.50	\$8,050	Refer to Figure 3.
	Subtotal			\$290,983	
Total Direct Costs				\$1,647,417	

467634/AppAmeanmhw.xls - Table A-5

Table A-6 - Cleanup Action Cost Estimate - SCAP 12 Option 1 - Fill to Grade

CLEANUP ACTION COMPONENT	QUANTITY	UNITS	UNIT COST	TOTAL COST	COMMENTS
Direct Cost					
Site Preparation					
Mobilization	1	ls	\$3,000	\$3,000	Contractor equipment and materials mob/demob and site setup.
Sidewalk Demolition	2,515	sf	\$1.15	\$2,892	Unit cost from Robinson Company, 1998.
Asphalt Demolition	9,785	sf	\$0.75	\$7,339	Unit cost from Robinson Company, 1998.
Mechanically Pulverize Asphalt to Reduce Debris Size	1,087	sy	\$2.64	\$2,870	Assumes debris size must be reduced for use at City of Tacoma Landfill (see below). 1999 Means 025-454-5000.
Concrete Demolition Debris Hauling/Disposal to Fife Sand and Gravel	63	ton	\$11.12	\$701	Assumes \$3/ton disposal and \$8.12/ton trucking. Assumes debris is too large-sized for City of Tacoma Landfill daily cover.
Asphalt Demolition Debris Use in Daily Cover at City of Tacoma Landfill	177	ton	\$3	\$530	Assumes asphalt would not be reused as general fill due to environmental concern.
Subtotal				\$17,332	
Overexcavation of Contamination Zones					
Excavate/Stockpile Contaminated Soils	832	cy	\$15	\$12,480.00	Unit cost based on Robinson Company, 1998. Assumes some care is taken to segregate thermally treatable soils.
Reuse Geotechnically Suitable Soil (i.e., place and compact soil below cleanup action levels)	936	cy	\$10.28	\$9,622	1999 Means 022-200-0900 for placement/compaction plus \$4/ton for debris screening.
Recondition Geotechnically Unsuitable Soils for Reuse (i.e., cement amend soil for stabilization)	312	cy	\$18.63	\$5,813	1999 Means 022-412-1060 (stabilization) and 022-200-0900 (placement/compaction). Assumes \$8.35/cy for geotechnical cement-stabilization, \$3.88/cy placement/compaction, and \$6.40/cy debris screening
Haul, Screen, and Treat cPAH/TPH Contaminated Soils by Thermal Desorption	1,065	ton	\$42	\$44,728	Assuming \$35/ton thermal desorption, \$3/ton for transport, and \$4/ton for screening out debris.
Soil Disposal at Class D Landfill (Rabanco - Roosevelt Regional Landfill)	266	ton	\$35	\$9,318	Refer to appendix text for specific assumptions of volume.
Subtotal				\$72,643	
Soil Cover and Pavement Caps:					
Soil Cover Cap Material and Replace Excavated Volume Not Reused	9,259	cy	\$22.50	\$208,328	Unit cost from Robinson Company, 1998. Cost includes material, hauling, placement, and compaction.
View Corridor Asphalt Capping	14,150	sf	\$3.50	\$49,525	Refer to Figure 3.
Subtotal				\$257,853	
Total Direct Costs				\$347,828	
Indirect Cost					
Remedial Design	1	ls	\$30,000	\$30,000	Review of plans and specs, design drawings, surveys, and construction documents completed by others. Cost provided includes a remediation engineering design report, cost estimate, scheduling, constr. QA plan, specs for H&S plan, constr. sampling and anal.
Construction Management	1	ls	(3)	(3)	
AE Design	1	ls	(3)	(3)	
Construction Observation	1	ls	\$46,027	\$17,391	Assume 5% of direct cost
Closure Report	1	ls	\$20,000	\$20,000	Cost provided is a general assumption.
Total Indirect Costs				\$67,391	
Subtotal				\$415,219	
General Contingency (30%)				\$124,566	
TOTAL COST ESTIMATE (with contingency)				\$539,785	

Notes:

- (1) Volume estimate assumptions are presented in Appendix A.
- (2) Cost estimate accuracy expected within 30% of actual for elements included in this table.
- (3) Values not included in Total Cost Estimate pending input from City and others.

Table A-7 - Cleanup Action Cost Estimate - SCAP 12 Option 2 - Excavate to Water Table

CLEANUP ACTION COMPONENT	QUANTITY	UNITS	UNIT COST	TOTAL COST	COMMENTS
<i>Direct Cost</i>					
Site Preparation					
Mobilization	1	ls	\$3,000	\$3,000	Contractor equipment and materials mob/demob and site setup.
Sidewalk Demolition	2,515	sf	\$1.15	\$2,892	Unit cost based on Robinson Company, 1998.
Asphalt Path Demolition	9,785	sf	\$0.75	\$7,339	Unit cost based on Robinson Company, 1998.
Mechanically Pulverize Asphalt to Reduce Debris Size	1,087	sy	\$2.64	\$2,870	Assumes debris size must be reduced for use at City of Tacoma Landfill (see below). 1999 Means 025-454-5000.
Concrete Demolition Debris Hauling/Disposal to Fife Sand and Gravel	63	ton	\$11.12	\$701	Assumes \$3/ton disposal and \$8.12/ton trucking. Assumes debris is too large-sized for City of Tacoma Landfill daily cover.
Asphalt Demolition Debris Use in Daily Cover at City of Tacoma Landfill	177	ton	\$3	\$530	Assumes asphalt would not be reused as general fill due to environmental concern.
				\$17,332	
Overexcavation of Contamination Zones					
Cantilever Soldier Pile/Single Support Shoring ⁽⁴⁾	6,370	sf	\$21.00	\$133,770	Including equipment, materials, and labor. 1998 Means 021-620-0200.
Dewatering by Ditching/Sump Pumps ⁽⁵⁾	1	ls	\$5,186	\$5,186	1999 Means 021-404-0010 to 0620.
Excavate/Stockpile Contaminated Soils	5,472	cy	\$15	\$82,080	Unit cost based on Robinson Company, 1998. Assumes some care is taken to segregate thermally treatable soils.
Separation and Disposal of Debris	562	ton	\$50	\$28,080	Unit cost includes handling required as well as Class D landfill disposal.
Utility Demolition (18-inch-diameter storm sewer line and 27-inch-diameter sanitary sewer line)	1,024	lf	\$26.27	\$26,900	Based on 1999 Means 020-724-2000 to 2150
Abandonment of Existing Utilities Below Southern Half of the Northern View Corridor	6.5	cy	\$80	\$520	Assumes grouting is used to abandon the portion of existing utility lines considered to be below the SCAP 12 area that will be below the view corridor and lateral lines on the western side of the development site.
Reuse Geotechnically Suitable Soil (i.e., place and compact soil below cleanup action levels)	5,357	cy	\$10.28	\$55,068	1999 Means 022-200-0900 for placement/compaction plus \$4/ton for debris screening.
Recondition Geotechnically Unsuitable Soils for Reuse (i.e., cement amend soil for stabilization)	3,571	cy	\$18.63	\$66,531	1999 Means 022-412-1060 (stabilization) and 022-200-0900 (placement/compaction). Assumes \$8.35/cy for geotechnical cement-stabilization, \$3.88/cy placement/compaction, and
Haul, Screen, and Treat cPAH/TPH Contaminated Soils by Thermal Desorption	8,317	ton	\$42	\$349,332	Assuming \$35/ton thermal desorption, \$3/ton for transport, and \$4/ton for screening out debris.
Soil Disposal at Class D Landfill (Rabanco - Roosevelt Regional Landfill)	438	ton	\$35	\$15,322	Refer to appendix text for specific assumptions of volume.
Disposal of Demolished Sanitary/Storm Sewer Pipe at Roosevelt Regional Landfill (Class D)	13	ton	\$35	\$462	Assumes old concrete piping with no salvage value.
				\$763,252	
Pavement Cap					
Soil Cover Cap Material and Replace Excavated Volume Not Reused	2,614	sf	\$22.50	\$58,815	Unit cost from Robinson Company, 1998. Cost includes material, hauling, placement, and compaction.
Concrete Capping	59,800	sf	\$4	\$239,200	Cost per square foot of tooled joint slab on grade concrete, from The Robinson Company, 1998.
View Corridor Asphalt Capping	14,150	sf	\$3.50	\$49,525	Refer to Figure 3.
				\$347,540	
Total Direct Costs				\$1,128,124	

Table A-8 - Cleanup Action Cost Estimate - 15th Street ROW - Public Park Alternative

CLEANUP ACTION COMPONENT	QUANTITY	UNITS	UNIT COST	TOTAL COST	COMMENTS
Direct Cost					
Site Preparation					
Mobilization	1	ls	\$3,000	\$3,000	Contractor equipment and materials mob/demob and site setup.
Sidewalk Demolition	1,050	sf	\$1.15	\$1,208	Unit cost from Robinsion Company, 1998.
Surface Concrete Demolition (Asphalt/Asphaltic Concrete)	11,860	sf	\$5.25	\$62,265	Unit cost from Robinsion Company, 1998.
Concrete Demolition Debris Hauling/Disposal to Fife Sand and Gravel	317	ton	\$11.12	\$3,525	Assumes \$3/ton disposal and \$8.12/ton trucking. Assumes debris is too large-sized for City of Tacoma Landfill daily cover.
Subtotal				\$69,997	
Overexcavation of Contamination Zones					
Excavate/Stockpile Contaminated Soils	726	cy	\$10	\$7,260	Unit cost based on Robinsion Company, 1998. Assumes some care is taken to segregate thermally treatable soils.
Reuse Geotechnically Suitable Soil (i.e., place and compact soil below cleanup action levels)	279	cy	\$10.28	\$2,868	1999 Means 022-200-0900 for placement/compaction plus \$4/ton for debris screening.
Recondition Geotechnically Unsuitable Soils for Reuse (i.e., cement amend soil for stabilization)	279	cy	\$18.63	\$5,198	1999 Means 022-412-1060 (stabilization) and 022-200-0900 (placement/compaction). Assumes \$8.35/cy for geotechnical cement-stabilization, \$3.88/cy placement/compaction, and \$6.40/cy debris screening
Haul, Screen, and Treat cPAH/TPH Contaminated Soils by Thermal Desorption	732	ton	\$42	\$30,744	Assuming \$35/ton thermal desorption, \$3/ton for transport, and \$4/ton for screening out debris.
Soil Disposal at Class D Landfill (Rabanco - Roosevelt Regional Landfill)	209	ton	\$35	\$7,315	Refer to appendix text for specific assumptions of volume.
Utility Demolition (18-inch-diameter storm sewer line and 27-inch-diameter sanitary)	175	lf	\$26.27	\$4,597	Based on 1999 Means 020-724-2000 to 2150
Subtotal				\$57,982	
Soil Cover and Pavement Caps:					
Soil Cover Cap Material and Replace Excavated Volume Not Reused	1,210	cy	\$25.00	\$30,250	Unit cost from Robinsion Company, 1998. Cost includes material, hauling, placement, and compaction.
Pavement Cap	11,000	sf	\$4.00	\$44,000	Refer to Figure 6.
Subtotal				\$74,250	
Total Direct Costs				\$202,229	
Indirect Cost					
Remedial Design	1	ls	\$40,000	\$40,000	Review of plans and specs, design drawings, surveys, and construction documents completed by others. Cost provided includes a remediation engineering design report, cost estimate, scheduling, constr. QA plan, specs for H&S plan, constr. sampling and anal.
Additional Subsurface Exploration/Sampling and Analysis	1	ls	\$15,000	\$15,000	Assumes 1 day of test pits and two monitoring well installations. Cost does not include chemical analyses.
Construction Management	1	ls	(3)	(3)	
AE Design	1	ls	(3)	(3)	
Construction Observation	1	ls	\$10,111	\$10,111	5% of direct cost
Profiling for Off-site Treatment and/or Disposal	12	ea	\$500	\$6,050	Assumed cost is based on testing every 60 cy of contaminated soil.
Closure Report	1	ls	\$20,000	\$20,000	Cost provided is a general assumption.
Total Indirect Costs				\$91,161	
Subtotal				\$293,391	
General Contingency (30%)				\$88,017	
TOTAL COST ESTIMATE (with contingency)				\$381,408	

Notes:

- (1) Volume estimate assumptions are included in Appendix A.
- (2) Cost estimate accuracy expected within 30% of actual for elements included in this table.
- (3) Values not included in Total Cost Estimate pending input from City and others.