Marine Area Cleanup Action Plan Weyerhaeuser Mill A Former

Everett, Washington
Ecology Agreed Order No. DE 8979

By

Washington State Department of Ecology
Lacey, Washington

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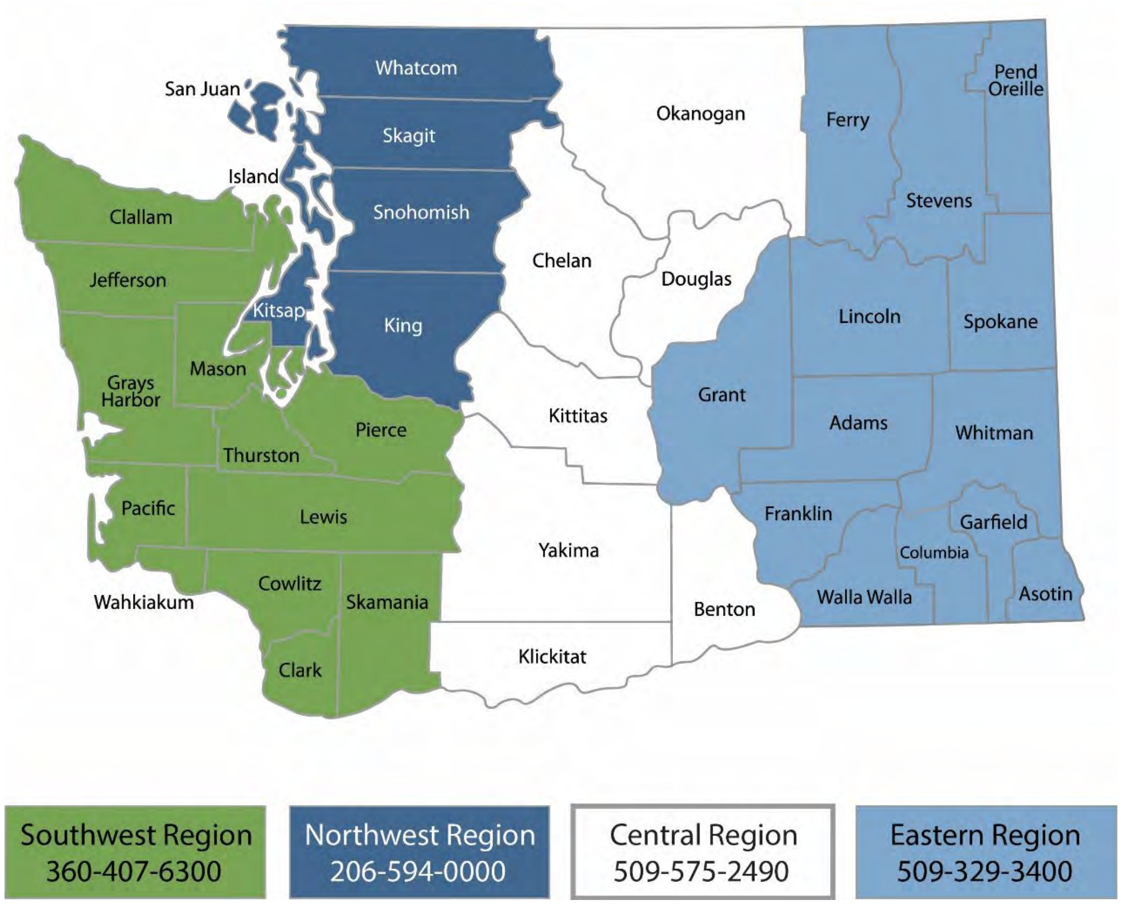

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DEPARTMENT OF
ECOLOGY
State of Washington

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Executive Summary

This Cleanup Action Plan (CAP) describes the cleanup action selected by the Washington State Department of Ecology (Ecology) for the Marine Area portion of the Weyerhaeuser Mill A Former (Mill A) Site (Site) in Everett, Washington. The selected cleanup action addresses contamination in the Marine Area resulting from historical activities at the Site. Cleanup activities are being completed pursuant to Ecology Agreed Order No. DE8979 (AO).

The Site is comprised of two sub-areas: the Marine Area and the Upland Area. The boundary between the Marine and the Upland Areas is the ordinary high-water mark (OHWM) elevation along the shoreline. Ecology has determined that separate Remedial Investigation/Feasibility Study (RI/FS) and CAP documents be prepared for the Marine and Upland Areas of the Site. The Marine Area is comprised of land owned by the Port of Everett and Washington State-owned aquatic lands and is generally situated between Port Gardner Bay and the East Waterway as described in Section 2.0. The Port has a Port Management Agreement (PMA) with the Washington State Department of Natural Resources (DNR) for State-owned aquatic lands that are situated between the Port's property line and the outer-harbor line.

Historical industrial activities at the Site have included pulp manufacturing, saw milling, ship building, shingle milling, log storage and log handling since the early 1900s. From 1926 through 1980, the Weyerhaeuser Company (Weyerhaeuser) operated lumber and pulp mills at the Site. In 1983, the Mill A property was purchased by the Port, and between 1983 and the mid-2000s, was used by Port (or their lessees) for log handling and storage. From the mid-2000s to the present, the Site has been used by the Port as a seaport facility for break bulk, container cargo storage and other shipping operations. Additional details on the use and history of the Site are presented in the Marine Area Remedial Investigation/Feasibility Study (RI/FS) Report and the AO.

The Port currently operates three vessel berths within the Marine Area including the South Terminal Wharf, Pacific Terminal Wharf and Pier 1. The shoreline in and between the terminal areas is characterized by bulkheads and/or armored slopes extending to the approximate base of the navigation area. A public open space with access to the adjacent beach area is located at the southern end of the Site.

The future uses of the terminal areas will require the Port to provide deeper navigational depths and longer berths in order to maintain the viability of their marine terminals. At the South Terminal, the future navigation needs of the berth require deepening up to -52 feet mean lower low water (MLLW) and at the Pacific Terminal and Pier 1 berths a navigation depth of -44 feet MLLW will be required.

As part of Marine RI, multiple studies were completed including bathymetric survey, geochronology investigation, vessel propeller wash scour analysis, and sediment sampling and analysis. Bathymetric surveys were performed to characterize the current mudline elevations in the Marine Area. A geochronology investigation was completed to evaluate net sedimentation rates in the deeper parts of the Marine Area. The results of the geochronology study identified an average sedimentation rate of 1.27 centimeter (cm) per year in the deeper areas that are not subject to vessel scour. The scour study was completed to evaluate the potential scour impacts of vessel navigation in the Marine Area on the sediment bed. The scour study was considered in the evaluation of the cleanup point of compliance and evaluation of remedial alternatives. In general, the scour study identified the potential of vessel scour in the Marine Area from mudline to an elevation of -55 feet MLLW.

Sediment sampling and analysis was completed as part of the RI to evaluate sediment stratigraphy and to define the nature and extent of contamination. Sediment stratigraphy in the Marine Area is generally comprised of recently deposited (non-native) sediment overlying native sediment. Recently deposited sediment is generally comprised of silts, sands and wood debris that have accumulated on the native sediments since the beginning of the industrial development of the Site. Up to 20 feet thick deposits of wood debris are present in the Marine Area located generally between the South and Pacific Terminals.

Native sediments at the Site are generally comprised of alluvial sediment deposits (sand, silty sand, sandy silt to moderately soft silts) from the Snohomish River Basin that pre-date the industrial development at the Site. The results of RI identified sediment and wood debris as the contaminated media in the Marine Area. The contaminants of concern (COCs) in the Marine Area sediment and within the wood debris deposits include metals, polycyclic aromatic hydrocarbons (PAHs), chlorinated hydrocarbons, phthalates, phenols, miscellaneous extractables, polychlorinated biphenyls (PCBs), dioxin-like PCBs, and dioxin/furans. In addition to these COCs, wood debris is identified as a substance of concern (SOC) for the Marine Area because decomposition of wood may generate by-products such as sulfides, ammonia, phenols and other hazardous substances, and degrades habitat.

The horizontal extent of contaminated media in the Marine Area is estimated to be approximately 70 acres where the existing mudline elevations range from +18 feet to -215 feet MLLW. Contaminated media at the Site is estimated to extend to 24 feet below the mudline and the thickest deposits of contamination are in the general vicinity of the historical pier structure that was located between South and Pacific Terminals.

To perform the feasibility study (FS), the extent of contamination in the Marine Area was divided into seven sediment management areas (SMAs) identified as SMA-1 through SMA-7. SMA-1 is approximately 40.2 acres and is located waterward of the maximum scour elevation (-55 feet MLLW). SMA-2 is approximately 7.4 acres and is located between the future navigational elevations (i.e., -52 feet MLLW in front of South Terminal and 44 feet MLLW in front of Pacific Terminal) and the maximum scour elevation. SMA-3 is approximately 2 acres and is the location of the current and future vessel berth and navigational area at the Pacific Terminal. SMA-4 is approximately 1.2 acres and is the location of Pacific Terminal interim action where contaminated media was removed in 2016. SMA-5 is approximately 6 acres and is located between the South and Pacific Terminals with future use identified as cargo handling. SMA-6 is approximately 9.7 acres and is the location of the current and future vessel berth and navigational area at the South Terminal. SMA 7 is approximately 2.9 acres and is located adjacent to the armored shoreline in the southern area of the Site, offshore of the public open space and beach.

A remedial technology screening process was used in the RI/FS to ensure that the cleanup alternatives are based on technologies that are effective and implementable for the various conditions present in the Marine Area. Several remediation technologies were evaluated based on their effectiveness, implementability, and relative cost. Based on the screening process, the technologies retained for the Marine Area include monitored natural recovery (MNR), enhanced natural recovery (ENR; placement of clean imported sand mass equivalent of a 6-inch layer), dynamic sand capping (placement of clean imported sand mass equivalent of a 3-foot layer), in-place containment, establishing confined disposal facility (CDF) on Site, removal through excavation or dredging, disposal of dredged material into the on-site CDF and upland landfill, and institutional controls.

In the RI/FS, ten remedial alternatives (Alternatives 1 through 10) were developed using the retained remediation technologies to provide for a reasonable range of environmental benefits and cost. Each alternative was assigned a score for each of the benefit criteria defined in Washington Administrative Code (WAC) 173-340-360(3)(f) and WAC 173-204-570(4) including protectiveness, permanence, long-term effectiveness, management of short-term risks, technical and administrative implementability and consideration for public concerns on a scale from 1 (low benefit) to 10 (high benefit). The scores for each alternative were then adjusted using the weighting factors, as outlined in Ecology’s Sediment Cleanup User’s Manual (SCUM). The total weighted relative benefit score for the alternatives ranged from 7.1 to 8.5. For each of the alternatives, a concept-level cost estimate was calculated and included costs for construction, professional services, long-term monitoring, and contingency. The costs estimate for the ten alternatives ranged from approximately 201 million to 258 million dollars.

In the RI/FS, each of the remedial alternatives was identified as meeting the Sediment Management Standards (SMS) minimum requirements specified in WAC 173 204-570[3]. In accordance with Model Toxics Control Act (MTCA) and SMS, the disproportionate cost analysis (DCA) tool was used to compare benefits and costs of alternatives. The purpose of the DCA is to determine which alternative uses permanent solutions to the maximum extent practicable. For the purposes of the DCA, relative benefit to cost ratios were calculated for alternatives which ranged from 6.16 to 7.6. Alternative 8 achieves the highest relative benefit to cost ratio of 7.6 and as a result is selected as the cleanup action for the Marine Area.

The Ecology-selected cleanup action for the Marine Area (i.e., Alternative 8) is estimated to cost a total of approximately $209.8 million.

The key elements of the selected cleanup action include:

- Demolition of existing pile-supported roll-on/roll-off berthing pier and associated dolphins.
- Implementing MNR in SMA-1a and ENR in SMA-1b, -1c and -7.
- Installing a containment and CDF wall to contain the contaminated media located within SMA-5 and provide confined space for on-Site disposal of contaminated dredged material generated from the other SMAs.
- Installing a toe wall at the South Terminal to facilitate full removal of contaminated media in SMA-6 and protect the adjacent South Terminal wharf structure and underlying armored slopes from dredging activities.
- Performing dredging activities to fully remove contaminated media from SMA-2 (2a and 2b), -3 (3a through 3c), and 6.
- Performing partial removal of contaminated sediment and installing dynamic sand cap in SMA-1d.
- Disposing contaminated dredged material into the on-Site CDF.
- Disposing contaminated dredged material that cannot be accommodated into the CDF at a permitted upland landfill facility.
- Covering the CDF area with a cap (a layer of clean imported fill material overlain by an asphalt surface with a stormwater management system) to isolate the contaminated dredge material and prevent stormwater infiltration and exposure.
- Performing mitigation activities for the loss of aquatic habitat.
- Implementing institutional controls.

Compliance and long-term monitoring activities will be completed following the completion of the cleanup action.

At the completion of the construction of the selected cleanup action, cleanup standards, which are inclusive of cleanup levels and points of compliance, will be met in SMAs where full removal, containment/CDF and capping are implemented (SMA-1d, -2, -3, -4, -5 and -6). Cleanup standards are expected to be met throughout the Marine Area within a 10 year restoration timeframe, as MNR and ENR progress in SMA-1a, -1b, -1c and -7. The Marine Area cleanup action objective (CAO)is to eliminate, reduce, or otherwise control to the extent feasible and practicable, unacceptable risks to human health and the environment posed by Site-related hazardous substances in marine sediment. The selected cleanup action meets the Marine Area CAO.

This Executive Summary should be used only in the context of the full report for which it is intended

1.0 Introduction

This Cleanup Action Plan (DCAP) describes the cleanup action selected by the Washington State Department of Ecology (Ecology) to address contamination at the Marine Area portion of the Weyerhaeuser Mill A Former (Mill A) Site (Site) located in Everett, Washington (Figure 1). The preparation of a CAP is a requirement of Agreed Order DE 8979 (2012 AO; Ecology 2012) issued by Washington State Department of Ecology (Ecology) for the Site. The Marine Area is also referred to as In-Water Area in the 2012 AO.

As required by the 2012 AO, the CAP has been prepared to meet the requirements of the Model Toxics Control Cleanup Act (MTCA), chapter 70A.305 Revised Code of Washington (RCW) which is administered by Ecology under the MTCA Cleanup Regulation, chapter 173-340 of the WAC and Sediment Management Standards (SMS), chapter 173-240 of the WAC. The Site is currently listed in Ecology’s database of confirmed and suspected contaminated sites under Facility/Site Number No. 1884322 and Cleanup Site ID No. 2146. The selected cleanup action addresses contamination in the Marine Area resulting from historical activities, which primarily included lumber/saw milling, pulp manufacturing and log handling/storage, at the Site.

The CAP is based on the final Marine Area Remedial Investigation and Feasibility Study (Marine Area RI/FS; GeoEngineers 2024). The Marine Area RI was developed using the results of several characterization studies completed between 2007 through 2023. The Marine Area FS developed and evaluated several remedial alternatives to address Marine Area contamination and identified a preferred alternative in accordance with the requirements of MTCA and SMS.

The CAP summarizes the results of the RI/FS and describes the selected cleanup action for the Marine Area.

1.1 Purpose and Scope

MTCA is the Washington State law that governs the cleanup of contamination releases of hazardous substances to the environment. When contaminated sediment is involved, the cleanup levels and other procedures are also regulated by the Sediment Management Standards (SMS), chapter 173-204 WAC. MTCA regulations specify criteria for evaluating and conducting a state cleanup action. SMS regulations dictate the standards for the cleanup of contaminated sediments. Under both regulations, a cleanup must protect human health and the environment, comply with cleanup standards, comply with applicable state and federal laws, and provide for monitoring to confirm compliance with cleanup standards.

The Marine Area RI/FS identified and screened the applicability of potential cleanup technologies for the conditions at the Marine Area and evaluated a range of remedial alternatives. WAC 173-204-570(3)(d) includes a requirement that the remedial alternatives use permanent solutions to the maximum extent practicable. To assess the permanence of the cleanup action alternatives, a disproportionate cost analysis (DCA) is used, along with criteria in WAC 173-340-360(3) and WAC 173-204-570(4). The DCA is conducted to determine which alternative, that otherwise meets the minimum requirements, is permanent to the maximum extent practicable. This analysis compares the relative benefits and costs of cleanup alternatives in selecting the alternative where the incremental costs are not disproportionate to the incremental benefits. The remedial alternative that is permanent to the maximum extent practicable is identified as the preferred cleanup action alternative in the Marine Area RI/FS (GeoEngineers 2024). The preferred cleanup action alternative identified in the Marine Area RI/FS is Ecology's selected cleanup action for the Marine Area.

The purpose of this CAP is to identify and describe the selected cleanup action for the Marine Area of the Site and to provide an explanatory document for public review. In general accordance with the provisions for development of a CAP (WAC 173-340-380), this document provides the following information:

- Summary of general site information including site description, historical operations and uses, and current and future land use (Section 2.0).
- Summary of environmental conditions including nature and extent of contamination, potential receptors and exposure pathways (Section 3.0).
- Cleanup requirements applicable to the Marine Area, including cleanup standards and other federal, state, and local laws applicable to the cleanup action (Section 4.0).

- Summary of contaminated media and contamination in the Marine Area (Section 5.0).
- Summary of the cleanup action alternatives evaluated in the Marine Area RI/FS (Section 6.0).
- Rationale for selection of the cleanup action (Section 7.0).
- Description of the selected cleanup action (Section 8.0).
- References used in the preparation of this plan (Section 9.0).

1.2 Regulatory Framework

Ecology entered into the 2012 AO with the Port of Everett (Port), the Weyerhaeuser Company (Weyerhaeuser), and the Washington State Department of Natural Resources (collectively "the Potentially Liable Person/Party" [the PLPs]), on August 9, 2012. The 2012 AO required the PLPs to conduct an RI and FS, per WAC 173-340-350 and WAC 173-204-560 and develop a draft CAP per WAC 173-340-350 through 173-340-380 and WAC 173-204-560 through WAC 173-204-580, addressing contamination at the Site. Subsequent to issuance of the AO, Ecology determined that the PLPs could prepare separate RI/FSs and draft CAPs for contamination in the Upland Area and Marine Area. Work was broken into two phases to allow completion of the RI/FS and draft CAP for the Marine Area while additional data is being collected from the Upland Area.

In April 2016, Ecology entered into Agreed Order DE 13119 (2016 AO) with the Port and Weyerhaeuser, which required the performance of an interim action. The scope of the interim action included the dredging/removal of contaminated sediment at the Site to a depth of -42 feet mean lower low water (MLLW) adjacent to the Pacific Terminal.

The cleanup actions are being performed under a MTCA agreed order or consent decree. Therefore, the cleanup action meets the permit exemption provisions of MTCA (WAC 173-340-710[9]), removing the need to follow the procedural requirements of most state and local permits. However, the substantive requirements of applicable state and local permits must be met. The MTCA exemptions do not apply to federal permits and therefore, the cleanup action must meet the substantive as well as the procedural requirements of applicable federal permits. Section 4.3 discusses additional regulatory requirements considered during the development of the CAP. Section 8.5 presents a list of permits and regulatory requirements applicable to the selected cleanup action.

2.0 General Site Information

2.1 Site Location and Legal Description

The Site is located at the southern end of the City of Everett waterfront. Its address is 3500 Terminal Avenue, Everett, Snohomish County, Washington. As previously noted, the Site is comprised of both upland and marine areas. Coordinates for the centroid of the Site are Latitude N47.97515º and Longitude W122.22536º. The Site lies within the following Townships and Ranges:

- Northwest quarter of Section 30, Township 29 North, Range 5 East.
- Northeast quarter of Section 25, Township 29 North, Range 4 East.

Figure 2 shows the general vicinity of the Site relative to the established parcel boundaries, inner and outer harbor lines, and parts of the Washington State-owned aquatic lands located within the Marine Area that are managed by the Port under Port Management Agreement (PMA) No. 20-080027.

2.2 Site Description

The Site is comprised of two areas: the Marine Area and the Upland Area. The 2012 AO and 2016 AO referred to Marine Area as the "In-Water Area." The boundary between the Marine and the Upland Areas is generally defined as the ordinary high-water mark (OHWM)[3] along the shoreline. An overview of the Site and surrounding area is shown on Figure 3. The current Site layout, features and facilities are shown on Figure 4. The sub-sections below describe the existing conditions at the Site, developmental/dredging history, and current uses at the Site. Historical industrial operations and Site uses are summarized in Section 2.3. Future Site use is described in Section 2.4.

2.2.1 Marine Area Description

The Marine Area is the portion of the Site situated offshore of the Upland Area below OHWM as shown on Figure 4. The Marine Area is comprised of land that is owned by the Port and Washington State and is generally situated between Port Gardner Bay and the East Waterway. The Washington State-owned aquatic lands located between the Inner and Outer Harbor Lines (Figure 4) in the Marine Area are managed by the Port under PMA No. 20-080027.

[3] As per WAC 173-22-030, the OHWM is coincident with the line of vegetation. Where there is no vegetative cover for less than one hundred feet parallel to the shoreline, the OHWM is the average tidal elevation of the adjacent lines of vegetation. Where the OHWM cannot be found, it is the elevation of mean higher high tide.

2.2.1.1 Pacific Terminal

The Pacific Terminal is comprised of a 650-foot-long pile-supported wharf and adjacent navigation areas that accommodate breakbulk and container cargo for the aerospace, construction, manufacturing, energy and agriculture industries. The Pacific Terminal has two container cranes. A majority of the shoreline is comprised of bulkheads and/or armored slopes extending to the base of the navigation area which is maintained to an approximate elevation of -42 feet MLLW to facilitate navigation and moorage.

Construction of Pacific Terminal was completed in the mid-1990s and included cleanup of contaminated sediments and confinement of the contaminated material in a nearshore confined disposal (NCD) facility at the Site under the oversight of Ecology. What is now the uplands associated with the Pacific Terminal was historically a log pond associated with Weyerhaeuser's lumber and pulp mill operations that was used for log rafting and handling.

The cleanup included dredging the log pond to -25 feet MLLW, constructing a containment berm across its opening to form the NCD and placing contaminated dredged material removed from areas offshore of the log pond (northeast and southwest of existing Pier 1) in the NCD. Dredging the log pond and adjacent parts of the Marine Area removed contaminated sediment and wood debris from historical operations (mill operations and log rafting and handling associated with historical milling and later Port tenant log storage activities).

The NCD containment berm was constructed of sand and gravel. The waterward face was armored using 36-inch-diameter rip rap. Following construction of the containment berm, approximately 130,000 cubic yards (CY) of contaminated dredged material was placed into the NCD and capped with approximately seven feet of clean dredged material. The approximate locations of NCD and areas dredged in late-1990s adjacent to Pacific Terminal and Pier 1 are shown on Figure 4. Dredged material that was determined to be suitable for open-water disposal was transported to and placed at the Port Gardner open-water disposal site.

Because the NCD facility is located within the historical Mill A facility footprint, Ecology determined that this area is part of the Site. In 2008, after 10-years of post-construction monitoring were completed for the NCD facility, Ecology issued a No Further Action (NFA) Letter to the Port confirming the completeness of the remedial actions (Ecology 2008a).

2.2.1.2 Pacific Terminal Interim Action

Under the 2016 AO, an interim action was completed within the Marine Area southwest end of Pacific Terminal (Figure 4) between August 2016 and February 2017.

The interim action was completed to expedite part of the environmental cleanup at the Site and facilitate increased navigational access for larger vessels. Dredging was completed to remove approximately 23,000 CY of contaminated material to depths ranging from -32 feet MLLW to -42 feet MLLW and to construct a 2-foot horizontal to 1-foot vertical (2H:1V) slope to transition from the base depth to the existing adjacent mudline elevations along the southwest and southeast limits of the dredge prism. Approximately 3 feet of bedding and armor rock was placed on the transition slope to protect the slope and to isolate the contaminated material exposed by the dredging. The contaminated dredged material was offloaded at the adjacent South Terminal and transported to Republic Service's Roosevelt Regional Solid Waste Landfill.

Following the removal of contaminated material by the interim action, the area was then dredged to -42 feet MLLW to meet the navigation requirements of the Pacific Terminal. The clean material removal following the interim action was managed separate from the cleanup construction. Approximately 14,000 CY of clean material was dredged and disposed at the Port Gardner open-water disposal site.

2.2.1.3 South Terminal

The South Terminal is comprised of a 700-foot-long pile-supported wharf and adjacent navigation areas that accommodate heavy lifts, roll-on/roll-off, breakbulk and container cargo including aerospace, military, agricultural, cars, trucks, mining, energy, and construction equipment. The Port recently completed upgrades of the South Terminal Wharf to accommodate larger and heavier cargo as required by current customers and added two Post-Panamax-size container cranes. The shoreline is generally comprised of bulkheads and/or armored slopes extending to the base of the navigation area which is maintained to an elevation of -42 feet MLLW.

The South Terminal wharf was originally constructed in the 1970s by Weyerhaeuser. The wharf is supported by concrete piling and dredged fill material retained behind a containment berm (Figure 4). The as-built drawings of the South Terminal wharf indicate that the berth area was dredged in 1970s to elevations ranging between -40 and -42 feet MLLW and a berm was constructed, behind which fill was placed to form the terminal. Based on the as-built drawings, the berm generally consists of medium dense fine to coarse gravel with sand. The face of the berm from the top of the berm to Elevation -20 MLLW is armored with heavy rip rap (i.e., a minimum 24-inch-diameter rock) and horizontally oriented concrete pile pieces. The face of the berm below Elevation -20 MLLW is armored with light rip rap (i.e., a minimum 18-inch-diameter rock). As part of the construction of the South Terminal Wharf, the waterward face of the bulkhead northeast of the South Terminal Wharf was armored with heavy rip rap.

2.2.1.4 Public Beach Area

South of the South Terminal, a freshwater creek (Pigeon Creek) discharges to Port Gardner Bay and has formed deltaic deposits that created a shallow and relatively flat intertidal area. Located between the mouth of Pigeon Creek and the South Terminal is a public beach (Public

Beach). The Public Beach is comprised of gravel from approximately +16 feet mean lower low water (MLLW) to approximately +8 feet MLLW, mixed cobble and sand from approximately +8 MLLW to +7 MLLW, and fine sand and silt with occasional gravel is generally located waterward from the +7 MLLW line. To the north and south of the Public Beach, the shoreline slope is armored with heavy stone from approximately +16 feet MLLW to the base of the slope. Additional discussion on the developmental history of the Public Beach and adjacent upland areas is presented in the description of the Upland Area below.

2.2.2 Upland Area

The Upland Area is the portion of the Site that is above OHWM and landward of the Marine Area. The Upland Area is bounded to the southeast by the BNSF Railway (BNSF) rail lines, to the northwest by Port Gardner Bay (and the Marine Area), and to the northeast by a line extending landward on the southwestern side of Pier 1. The Upland Area contains the South and Pacific Terminals which are zoned M-2 (Heavy Manufacturing).

The Upland Area is relatively flat with a ground surface elevation ranging between approximately +17 and +22 feet MLLW. Most of the Upland Area is paved with asphalt or concrete and is used by the Port for terminal operations. A portion of the southern extent of the Upland Area is not paved and has a crushed gravel working surface for equipment laydown and storage (Equipment Storage Area).

The southwestern most end of the Upland Area is zoned O-S (Open Space) and is accessible to the public via a 0.6-mile paved pathway situated between the southeastern boundary of the Pacific and South Terminals and the BNSF rail lines. Chain link fences are on either side of the pathway to prevent entry onto the marine terminal and the BNSF rail lines. A gate at the northeast end of the path restricts access to the pathway and beach. The gate (and Public Open Space with access to the Public Beach) is generally open between dawn and dusk (i.e., approximately 12 hours a day).

Prior to 2003, public access to the area that now comprises the Public Open Space and Public Beach was restricted, and the area was part of the Port’s Equipment Storage Area. Between 2003 and 2004, Kimberly-Clark and the City of Everett (City) installed a new outfall (Outfall 001) and deep-water diffuser and imported fill sand to restore the beach area. In conjunction with this project, agreements between the Port and City of Everett resulted in the establishment of the Public Open Space (and adjacent Public Beach). Currently, the Public Open Space includes asphalt pavement where the public access path enters this area, native grasses, shrubs, and trees are located between the asphalt and top of the shoreline slope. Maintenance of the Public Open Space is currently the responsibility of the City.

Southeast of the Upland Area and the BNSF railroad tracks, a steep and wooded bluff extends from the local ground surface to over 200 feet MLLW. From the wooded bluff, freshwater from Pigeon Creek and two unnamed creeks (Unnamed Creek No. 1 and 2; Figure 4) discharges to Port Gardner Bay at the southwest end of the Site. Freshwater from Pigeon Creek enters Port Gardner Bay from a culvert that extends beneath BNSF railroad tracks. Freshwater from Unnamed Creek 1 enters Port Gardner Bay from a culvert that extends beneath BNSF railroad tracks and the Equipment Storage Area. Freshwater from Unnamed Creek No. 2 discharges to Port Gardner Bay from Outfall 001 located at the southwest end of the Site.

Additionally, a man-made drainage feature conveying stormwater collected from South Terminal also discharges to Port Gardner Bay through Outfall 001. This drainage feature was historically referred to as Mill A Creek but was improved in the 2000s to function as a stormwater treatment bioswale for terminal stormwater. The Port manages the terminal stormwater under an Ecology Industrial General Stormwater Permit (ISGP).

The Port's terminal facilities in the Upland Area are secured by fencing and gates. Access to the terminal areas is controlled by the Port in accordance with the Federal Department of Homeland Security (DHS) and Federal Emergency Management Agency (FEMA) regulations.

2.3 Historical Operations and Site Uses

2.3.1 Wood Milling

Wood milling and lumber production occurred at the Site between 1896 and 1933. During this time, mill operations involved receiving and storing rafted logs, hauling the logs onshore, sorting and debarking the logs, cutting the logs, drying the cut lumber, and storing lumber prior to shipment. Early mill operations were performed over the water, on piers supported by pilings. Milling operations included burning wood debris generated by the mill, with boilers fueled by wood debris. Wood debris was released into the marine environment by the mill facilities as a result of the log raft handling and storage, log haul out, debarking, and other mill discharge activities. Lumber milling continued at the Site until around 1933 at which time Weyerhaeuser closed and dismantled the lumber mill and began construction of an unbleached sulfite pulp mill known as Mill A as described below.

2.3.2 Pulp Production

Following the decline in lumber demand, Weyerhaeuser constructed Mill A and converted wood milling and lumber production to production of unbleached sulfite pulp. Construction of Mill A was completed in 1936. In the early 1940s simple bleaching facilities were added to the Mill A operations. During this time, Weyerhaeuser also constructed a shoreline bulkhead at the same approximate location of the current bulkhead (Figure 4).

The area behind the bulkhead was subsequently infilled. A cargo dock constructed sometime between 1919 and 1931, using treated timber piling, was located offshore of the bulkhead as shown in Figure 4. It was connected to the shoreline by a series of bridges.

Weyerhaeuser's sulfite pulp mill produced approximately 300 tons of pulp daily by digesting wood chips in a calcium sulfite solution. This process involved burning elemental sulfur to produce sulfur dioxide which was absorbed into a lime solution used as cooking liquor. Spent cooking liquor may also be referred to as sulfite waste liquor (SWL) or concentrated digester liquor. In 1975, the sulfite pulp mill operation was converted into a thermomechanical mill, a process using heat and friction to produce pulp by grinding wood chips between refiner discs.

All pulp produced by the mill after the early- to mid-1940s was bleached with a chlorine solution. During the 1970s, Weyerhaeuser created additional land and constructed a dock southwest of the initial dock structure (current location of the South Terminal Wharf) on timber piles and using dredged fill material placed behind a containment berm. Although not confirmed, the source of the dredged fill material was likely material dredged from the general vicinity of the South Terminal berthing area.

2.3.3 Log Storage

The practice of log rafting and storage has occurred throughout the East Waterway (located north/northeast of the Marine Area) since the late 1800s, according to Port and DNR records. DNR records show that between 1924 and 1984 Weyerhaeuser leased state owned tidelands adjacent to the former mill for log storage. From 1983 through 1987, the Port operated a log yard that included three in-water log storage areas located within and northeast of the current South Terminal Wharf area, within the current berthing area of Pacific Terminal and on the southwest side of Pier 1.

A 1987 Port memorandum (Port 1987) shows that three established in-water log storage areas located in the vicinity of Mill A were used by tenants of the Port for log handling and storage until the mid-2000s. Between 1987 and mid-2000s, the South Terminal was used as a log sorting yard for receipt and storage of whole logs, as well as debarking, loading, and shipping of the logs for export; in-water log storage continued by the Port (or their lessees) until approximately the mid-2000s.

2.4 Current And Future Land Use

The Site is zoned for heavy manufacturing (M-2) and is currently used for shipping and marine terminal operations break-bulk cargo and other goods. The South and Pacific Terminals are deep-water marine terminals on Port Gardner Bay that are a component in the west coast marine transportation network. Consistent with the Port's Master Plan of Terminal

Improvements (Port 2008), the Site will be used for maritime commerce. Acknowledging global shipping trends and the continued increase in vessel size, the Port will be required to provide deeper navigational depths and longer berths in order to maintain the viability of their marine terminals. The current and future Site use assumptions are summarized in Figure 5.

Consistent with the Port's Master Plan to facilitate current and future operations, the Port has completed recent improvements to their marine terminal facilities, including:

- Pacific Terminal – Dredging to expand the navigational approach at Pacific Terminal[4] to accommodate larger vessels.
- South Terminal – Strengthening of the wharf, installation of a crane rail system, the addition of two 100-foot gauge gantry cranes, and the installation of dock side electrical system to support larger, post-Panamax class vessels.
- Operational Equipment – Acquisition of a heavy-lift rubber-tired harbor crane designed to efficiently handle both containerized and breakbulk cargoes.

The Port has documented with Ecology that it will need to continue to make improvements to the marine terminals to support cargo operations, including:

- At the South Terminal, deepening of the berth area is needed to allow Post-Panamax class vessels to access the berth and cranes. The anticipated berth to facilitate Post-Panamax vessels is in excess of 1,200 feet in length and would require a navigation depth of up to -50 feet MLLW to allow sufficient draft depths over a range of tide conditions and will require a 2-foot over dredging allowance for ongoing maintenance. As such, the future use assumption for the South Terminal Berth and associated navigation areas is -52 feet MLLW.
- The navigation depths at the Pacific Terminal and Pier 1 will need to be maintained at -42 feet MLLW to allow sufficient draft depths over a range of tide conditions and will require a 2-foot over dredging allowance for ongoing maintenance. As such, the future use assumption for the Pacific Terminal Berth and associated navigation areas is -44 feet MLLW.
- As part of the future use assumptions, the Port also anticipates expansion of cargo handling in the Marine Area located to the south of the South Terminal Wharf.

Southwest of the marine terminals, existing Site features including the Public Open Space and adjacent Public Beach, armored slopes and bulkheads will be maintained to prevent destabilization of the shoreline separating the Upland and Marine Areas. Maintenance of the

[4] Near-term improvements for the Pacific Terminal expansion were performed under an Interim Action as described in Section 2.2.1.1 to remove shallow sediment and increase the navigable area within the facility approach.

Public Open Space and Public Beach areas will continue to be performed by the City consistent with the agreement it has with the Port.

Additional details on the Port's current and future use, designations relevant to seaport operations, operational considerations that affect those uses, and expected evolution of terminal uses in the reasonably foreseeable future (10-15 years post-cleanup) are presented in Marine Area RI/FS.

3.0 Environmental Conditions

Multiple characterization studies completed to obtain data on the characteristics of the Marine Area including:

- Bathymetric surveys to document mudline elevations.
- A geochronology study to evaluate sedimentation rate.
- A vessel propeller wash scour analysis to evaluate the potential for scour impacts of vessel navigation on Marine Area sediment.
- Sediment sampling to map sediment stratigraphy.
- Sediment sampling and laboratory analysis for conventional, chemical and/or bioassay parameters to define the nature and extent of contamination.

The Marine Area characterization studies include:

- Former Mill A Sediment Study (Geomatrix 2007).
- Port Gardner and Lower Snohomish Estuary Sediment Study (SAIC 2009).
- Whidbey Basin Sediment Study (Ecology 2013a).
- Port Gardner and East Waterway Sediment Study (Ecology 2013b).
- Port Gardner Bay Regional Background Sediment Study (Ecology 2014).
- Pacific Terminal Interim Action Dredged Material Characterization Study (GeoEngineers 2015).
- South Terminal Dredged Material Characterization Study (GeoEngineers 2019).
- Remedial Investigation/Feasibility Study (GeoEngineers 2024).

The Marine Area characterization studies listed above resulted in the collection of surface samples from 89 stations and the completion of 82 sediment cores in and near the Marine Area and other data as described below. The approximate location of the sampling points is shown in Figure 6.

The Marine Area RI/FS utilized the information collected as part of the sediment characterization studies to estimate the nature and extent of contamination and develop a conceptual site model to identify potential receptors and exposure pathways to the contamination and identify the remedial action alternatives to address contamination. The information collected as part of the Marine Area characterization studies are detailed in the Marine Area RI/FS and summarized in the following sections.

3.1 Bathymetric Surveys

Two bathymetric surveys were performed during the RI to characterize the current sediment elevations in the Marine Area. Between September 8 and 11, 2014, a multibeam survey encompassing the intertidal and subtidal portions of the Marine Area between Pier 1 and the Pigeon Creek delta was performed by Pacific Geomatic Services, Inc. of Mountlake Terrace, Washington. Additionally, a multibeam survey was performed of the intertidal and subtidal portions of interim action area on February 21 and 22, 2017 by Tetra Tech of Bothell, Washington following completion of the interim action dredging. The February 2017 bathymetric survey was completed to document the post-construction sediment elevations in the interim action area.

The 2014 and 2017 surveys have been merged to represent the current bathymetry for the Marine Area. The bathymetry recorded by the merged surveys is presented in Figure 4 and in subsequent figures in the CAP.

3.2 Geochronology Investigation

A geochronology investigation was completed to evaluate net sedimentation rates in the deeper areas of the Marine Area. Three sediment cores collected from locations MAF-GC-01 through MAF-GC-03 (Figure 6) were utilized for the purpose of geochronology investigation. The sediment cores collected were sectioned into approximately 2-centimeter (cm) sample intervals, homogenized to a uniform color and texture, and placed into laboratory-prepared sample containers for lead-210 (Pb-210) and cesium-137 (Cs-137) analysis.

The Cs-137 and Pb-210 analytical results were evaluated to calculate sedimentation rates for the area in which the cores were collected. Two methodologies, one using a Pb-210 radioactive decay coefficient and a second using a Pb-210 radioactive decay constant, were utilized. CS-137 results were not used to evaluate deposition rates since the results were non-conclusive as described in the Marine Area RI/FS. Based on the pattern of Pb-210 in the sediment cores collected, an average sedimentation rate of 1.27 cm per year was calculated. The results of the geochronology study are representative of the deeper areas of the site that are not subject to anthropogenic disturbances. The results of the geochronology investigation are not applicable to parts of the Marine Area that are subject to periodic disturbance to the sediment bed such as by wave action and/or scour by vessel activity.

Specific details of the geochronology investigation including sample collection, processing, laboratory analysis and results are presented in the Site Sediment Geochronology Study Report provided in Marine Area RI/FS.

3.3 Vessel Propeller Wash Scour Analysis

At the request of Ecology, a vessel propeller wash scour analysis was completed for the Marine Area. The purpose of the scour study was to evaluate the potential scour impacts of vessel navigation in the Marine Area on the sediment bed for consideration in the evaluation of the cleanup point of compliance and remedial alternatives.

The scour study utilized parameters determined for a range of tug and cargo vessels representative of the current operations at South and Pacific Terminals. The vessel length used in scour study ranged from 685 feet to 556 feet long. The vessel draft depth ranged from 38 to 32 feet deep. The tug used in the scour study was a tractor-type tug, which is the predominant tug type used at the terminal currently and anticipated to be used in the future. The scour study did not consider larger future cargo vessels (e.g., post-Panamax) that may operate at the marine terminals since the parameters of these vessels are vessel-specific and therefore, difficult to predict. However, the tugs that are currently in operation are expected to be similar to those that will service the larger cargo vessels in the future. Vessel approach, mooring, and departure scenarios for identified vessels and tugs were developed. These scenarios were subsequently evaluated using FLOW-3D model software to evaluate potential scour from ship and tug operations.

The results of the scour study for Pacific Terminal indicated that the primary scour risks are associated with propeller wash from tug operations and main vessel propeller operations. The results of the scour study are applicable to size of the vessels/tug currently in operation at the terminals as identified above. However, since the cargo vessel and tug operations for Pacific Terminal are not expected to change in the future, the results of the scour study are considered applicable for future conditions at Pacific Terminal. The results of the scour study for South Terminal indicated that the primary scour risks are associated with propeller wash from tug operations, with scour from vessel propulsion playing a minor role. The primary risk of scour at the South Terminal area is associated with tug operations and it is anticipated that the future size and type of tugs at the terminal facilities are similar to what are currently in operation. As a result, the results of the scour study are considered applicable for future conditions in the Marine Area.

In general, the scour study identified the potential of vessel scour in the Marine Area from mudline to an elevation of -55 feet MLLW.

The Vessel Propeller Wash Scour Analysis completed by Mott MacDonald (2019) including detailed descriptions of how the scour analysis was performed is included in the Marine Area RI/FS.

3.4 Sediment Stratigraphy

The sediment stratigraphy in the Marine Area was characterized using the documented observations of materials encountered in the surface and core samples, which were completed as part of the sediment characterization studies (Section 3.0). The information from the sediment explorations was used to prepare cross-sections illustrating the general sediment stratigraphy in the Marine Area. Cross-section locations in the Marine Area are shown on Figure 6. Cross-sections illustrating sediment stratigraphy are presented on Figures 7 through 10.

The stratigraphy within the Marine Area generally consists of a combination of native alluvial sediment from the Snohomish Basin that predates the industrial development of the Everett waterfront and more recently deposited sediment comprised of silts, sands and wood debris. The recently deposited sediments are representative of the period of industrial development on the Everett Waterfront since the late 1800s and vary in thickness from 1-2 feet farther offshore up to approximately 20 feet thick in the nearshore area between South and Pacific Terminal Wharfs and are comprised of a specific type of material (e.g., silts, sands, sawdust, etc.) or layers of more than one material. The upper 10 cm surface sediments within the Marine Area are generally comprised of recently deposited sediment. However, the interim action dredging completed on the southwest end of the Pacific Terminal in 2016/2017, previous dredging for the construction of the South Terminal Wharf and in the area offshore of Pacific Terminal and propeller scour has exposed native sediments at the surface.

3.4.1 Recently Deposited (Non-Native) Sediment

Recently deposited sediment is comprised of silts, sands and wood debris that have accumulated on the native sediments at the Site since the beginning of the industrial development of the Everett waterfront (i.e., after the late 1800s) including the periods of pre-Weyerhaeuser operations, Weyerhaeuser mill operations, and Port and Port-tenant log yard and marine terminal operations. Specific components of the recently deposited sediment include the following:

- Wood debris greater than 15 percent by volume (exceeding the screening level) is located within the nearshore area between the South Terminal Wharf and the interim action on the southwest end of Pacific Terminal, up to 20 feet of wood debris containing up to 100 percent wood are present. The wood debris deposits decrease in thickness with increased distance from the shoreline. The source of wood debris to the Site is historical milling and log rafting operations and includes varying amounts of sawdust, wood chips, bark, twigs, fibers, and dimensional lumber. This unit is characterized by fine, granular, degraded (dark colored) wood particles and non-degraded (light colored) angular wood chips (0.5-inch or larger) containing variable amounts of silt, sand and shell fragments, which are minor components of this unit.

- Mixed sand and silt with variable amounts of shell fragments. The mixed sand and silt may also contain wood debris and grades into adjacent units without an obvious horizon or interface. The mixed sand and silt with shell fragments is likely the result of redeposition following sediment bed disturbances (i.e., wave action, propeller scour, bioturbation, etc.) as evidenced by the detection of contaminants greater than the sediment cleanup level. Contaminant nature and extent is further discussed in Section 3.5 and Table 1.
- Unconsolidated sand and silt showing evidence of disturbance (i.e., wave action, propeller scour, bioturbation, etc.). Unconsolidated sand and silt typically contain shell fragments and less than 15 percent wood debris.
- Sediment originating from Pigeon Creek is comprised of brown silt and sand and forms an intertidal delta southwest of the Equipment Storage Area. Wood debris containing less than 15 percent by volume is periodically observed in the Pigeon Creek intertidal sediment.
- Imported sand and gravel, comprising the Public Beach restoration area was placed by the City and Kimberly-Clark between 2012 and 2014 to stabilize the shoreline and prevent erosion of the shoreline southwest of the Equipment Storage Area.

3.4.2 Native Sediment

Native sediments at the Site are comprised of alluvial sediment deposits from the Snohomish River Basin that pre-date the industrial development of the Everett waterfront. These sediments are generally comprised of gray, moderately dense, poorly graded sand, silty sand, sandy silt to moderately soft silts representing alluvial sediments from the Snohomish Basin. This unit may contain shells or shell fragments. In addition, this unit may contain trace amounts (less than 5 percent) of wood and/or other organics. Native sediments do not exceed criteria for Site contaminants of concern (COCs), substances of concern (SOCs) or anthropogenically sourced wood debris as evidenced by sampling data detailed in the Marine Area RI/FS.

3.5 Nature and Extent of Contamination

The nature and extent of contamination in the Marine Area is based on the sediment stratigraphy (Section 3.2) and the results of analyses performed on the samples collected as part of sediment characterization studies (Section 3.0).

The sediment conventional and chemical analyses and bioassay testing performed on the sample(s) collected as part of sediment characterization studies included one or more of the following:

Conventional Analyses:

- Grain size.
- Total solids (TS).
- Total organic carbon (TOC).
- Total volatile solids (TVS).
- Total and porewater ammonia.
- Total and porewater sulfide.
- Porewater pH.
- Chemical Analyses:
- Metals including arsenic, cadmium, chromium, copper, lead, mercury, silver, and zinc.
- Bulk and porewater tributyltin ion.
- Low Molecular Polycyclic aromatic hydrocarbons (LPAHs) including 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene and phenanthrene.
- High Molecular Polycyclic aromatic hydrocarbons (HPAHs) including benzo(a)anthracene, benzo(a)pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo(g,h,i)perylene, fluoranthene, indeno(1,2,3-c,d)pyrene, and pyrene.
- Chlorinated Hydrocarbons including 1,2,4-trichlorobenzene, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, and hexachlorobenzene.
- Phthalates including bis(2-ethylhexyl) phthalate, butyl benzyl phthalate, dibutyl phthalate, diethyl phthalate, dimethyl phthalate, and di-N-octyl phthalate
- Phenols including 2,4-dimethylphenol, 2-methylphenol, 4-methylphenol, pentachlorophenol, and phenol.
- Miscellaneous Extractables including dibenzofuran, hexachlorobutadiene, N-nitrosodiphenylamine, benzoic acid, and benzyl alcohol.

- Chlorinated Phenols and Guaiacols including 2,3,4,6-tetrachlorophenol, 2,4,5-trichlorophenol, 2,4,6-trichlorophenol, 2,4-dichlorophenol, guaiacol, tetrachloroguaiacol, 3,4,5-trichloroguaiacol (Ac), 3,4,6-trichloroguaiacol (Ac), and 4,5,6 trichloroguaiacol.
- Resin Acids including linolenic acid, pimaric acid, sandaracopimaric acid, isopimaric acid, dehydroabietic acid, palustric acid, abietic acid, neoabietic acid, 9,10-dichlorostearic acid, 12-chlorodehydroabietic acid, 14-chlorodehydroabietic acid, and dichlorodehydroabietic acid.
- Pesticides including 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, aldrin, alpha-chlordane, beta/gamma-chlordane, dieldrin, and heptachlor.
- Herbicides including 2,4,5-T, 2,4-D, 2,4-DB, dalapon, dicamba, dichlorprop, and silvex.
- PCB aroclors and congeners.
- Dioxins/Furans.

Bioassay Analyses:

- 10-day amphipod mortality test (acute toxicity).
- 20-day juvenile infaunal growth test (chronic toxicity).
- Sediment larval test (acute toxicity) using the resuspension method.

The results of the Marine Area investigation including data tables, laboratory reports and data validation reports are presented in the Marine Area RI/FS. The confirmed sampling locations are shown on Figure 6 and a summary of the chemical analytical results is presented in Table 1. Based on sediment stratigraphy (Section 3.2) and chemical analytical results, the Marine Area RI/FS identified contaminated media, SOC and COCs as summarized in Section 5.0.

The RI/FS Report estimated the depth of contamination in the Marine Area to support the remedial alternatives development. Table 1 summarizes Marine Area sediment data and the rationale used in estimating the depth of contamination. For the depth of contamination evaluation, Ecology required that the elevation of the native contact be used to represent the full depth of contamination where chemical analytical data was not available at a sampling location to confirm a clean sediment contact. Additional considerations to estimate the depth of contamination and native contact included:

- Navigation Areas – Within the areas subject to potential scour, sediment deposits initially classified as “native” during the RI were found to contain one or more COCs greater than the cleanup levels (Section 4.1). In these cases, the material was determined to not be native due to the presence of anthropogenic contamination and had likely been subject to redistribution (i.e., suspension and redeposit due to scour).

Without supporting chemical analytical data, the depth of the cleanup level exceedance in these areas would have been underestimated if the native sediment contact was determined by visual observations alone, particularly given the potential for reworking of the sediment by vessel scour to result in deposits that visually appear as native but contain contaminated material.

In these areas, chemical analytical data that did not identify the base of contamination were not used to define vertical extent of contamination. Only those sediment core logs identifying native contact that could be reliably confirmed by chemical analytical data were used to determine the vertical extent of contamination for these areas.

- Transitional Slope between the South Terminal Wharf and the Pacific Terminal Wharf – Wood debris up to 100% was identified to a depth of approximately 20 feet below the existing mudline. Contained within the wood debris were deposits of silt and sand with varying wood content. As noted above, sediment deposits resembling native materials were found to contain one or more COCs greater than the cleanup levels, refer to Section 4.1. Additionally, silt and sand layers contained within wood deposits are by definition, not native. Therefore, reliance on visual determination of the material condition alone was insufficient to identify the native sediment contact.
- Use of Upland Area Investigation Results – Under natural conditions sediments in the Marine Area are deposited uniformly. Because the native contact in the Upland Area was deposited through the same process as the Marine Area prior to filling of the uplands, the native contact from upland boring locations near the South Terminal shoreline were used to estimate the depth of the native contact between the bulkhead and the core locations in the Marine Area.
- Areas Not Influenced by Vessel Scour – The depth of contamination in areas not influenced by vessel scour was determined based on the native contact as identified in sediment core logs. In these areas, the potential for reworking of sediment is low because they are outside the -55-foot MLLW scour elevations/navigational channel. In offshore locations where sediment core data was not available, the depth of contamination was assigned to be 0.5-foot – the approximate depth of the surface sample interval rounded to the nearest half-foot.

Additionally, the depth of contamination could not be estimated for all the RI sampling locations within the Marine Area (including those completed more than a decade ago as noted in Table 1) because of one or more of the following reasons.

- The sample location does not have accompanying chemical analytical data to support the confirmation of the native sediment contact. Due to the potential for reworking of the sediment bed by vessel scour, visual determination of the material condition alone is insufficient to identify the native contact in the parts of the Marine Area that are subject to scour.
- Due to the dynamic nature within a scour environment and potential for ongoing disturbance to the sediment bed, relying on data that is more than a decade old would increase the uncertainty in estimating the depth of contamination as a result of high potential of reworking due to scour. Therefore, data more than a decade old located within areas subject to scour, as identified in Table 1, was not considered in estimating the depth of contamination.
- Sediment core logs were not available and/or the only data available was surficial sediment data.

The Marine Area sediment data and the specific rationale used in estimating the depth of contamination are presented in Table 1. The estimated extent and depth of contamination for the Marine Area is shown on Figure 11. The horizontal extent of contaminated media in the Marine Area is estimated to be approximately 70 acres with existing mudline elevations ranging from +18 feet to -215 feet mean lower low water (MLLW). The depth of contaminated media is estimated to extend to 24 feet below mudline with the deepest portions generally located near the shoreline in an area located between South and Pacific Terminals and shallowest portions containing surficial contamination generally located away from the shoreline within the deeper mudline elevations.

3.6 Conceptual Site Model, Potential Receptors and Exposure Pathways

A conceptual site model (CSM) was developed for the Site as part of the Marine Area RI/FS based on the physical conditions of the Site, potential contaminant sources and release mechanisms, transport processes, and exposure routes by which receptors may be affected. A detailed description of CSM is presented in the Marine Area RI/FS. A graphical presentation of the CSM is presented in the three cross-section figures shown in Figures 12 through 14 that represent the general range of conditions for the Marine Area. The following sections summarize the potential receptors and exposure pathways applicable to the Marine Area based on the CSM.

3.6.1 Human Receptors

Based on the current and anticipated future land use and Site characteristics, the following are potential human receptors for the Marine Area:

- On-Site industrial and construction workers.
- On-Site subsistence and recreational fish and shellfish consumers.
- Public Open Space beach area users.
- Indian Tribes.
- Vulnerable Populations and Overburdened Communities.

Each of these potential human receptors is described in the following sections.

3.6.1.1 On-Site Industrial and Construction Workers

Current and future on-Site industrial workers are considered potential receptors based on use of the Site for work. Industrial workers include persons involved with current and future terminal operations. Construction may include shoreline work, dredging, and other activities involving contact with sediment that contain hazardous substances.

3.6.1.2 On-Site Subsistence and Recreational Fish and Shellfish Consumers

Current and future on-Site subsistence and recreational fish and shellfish consumers are potential receptors based on their potential to contact hazardous substances in sediment and/or ingest fish or shellfish that contain hazardous substances.

3.6.1.3 Public Open Space Beach Area Users

The Public Open Space with beach access is located at the southwest end of the South Terminal. Current and future users of this area, including children and adults may come into direct contact with hazardous substances. Exposure scenarios for human health typically assume activities such as beach play and clam digging that may involve exposure to sediment at least as deep as targeted shellfish species are found.

3.6.1.4 Indian Tribes

Indian Tribes potentially interested in or affected by the Site include the Tulalip Tribes and the Suquamish Tribe, both of which are signatories to the 1855 Treaty of Point Elliott and serve as the Tribal trustees for assessment and restoration of natural resource damages for the Port Gardner area under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Additional discussion regarding Indian Tribes potentially affected is presented in Section 7.3.

3.6.1.5 Vulnerable Populations and Overburdened Communities

Pursuant to WAC 173-340-350 vulnerable populations and overburdened communities determined to be potentially affected by remedial actions at the Site were evaluated. Additional discussion regarding vulnerable populations and overburdened communities potentially affected by the Site is presented in Section 7.3.

3.6.2 Ecological Receptors

Aquatic wildlife found in the Marine Area are potential ecological receptors. Ecological receptors include benthic (i.e., sediment-dwelling) invertebrates (e.g., worms, crabs, clams, etc.), fish (e.g., salmonids), and mammals (e.g., waterfowl, harbor seals, etc.).

3.6.3 Exposure Pathways

The following are the potential complete exposure pathways and receptors for contaminants in Marine Area sediment:

- Direct contact (dermal exposure) with sediment by humans and ecological receptors.
- Incidental ingestion of sediment by humans and ecological receptors.
- Exposure of benthic organisms, which may result in acute or chronic effects, to hazardous substances. This may also result in the uptake and bioaccumulation of contaminants in these organisms.
- Ingestion of contaminated benthic organisms as prey by higher trophic level organisms in the food chain (e.g., foraging fish, aquatic birds, marine mammals, etc.).
- Human ingestion of marine organisms contaminated by hazardous substances.

4.0 Cleanup Requirements

MTCA regulations provide that a cleanup action must comply with site-specific cleanup standards (WAC 173-340-700), including:

- Cleanup levels that are protective of human health and the environment.
- A point of compliance or points of compliance at which the cleanup levels must be met.
- Applicable state and federal laws (as described in WAC 173-340-710).

The following sections present the cleanup levels, points of compliance and applicable state and federal laws for the Marine Area.

4.1 Cleanup Levels

Cleanup levels for the Marina Area were developed as part of the Marine Area RI/FS and include cleanup levels for the protection of benthic organisms, cleanup levels for the protection of human health and higher trophic level ecological receptors and a screening level for wood waste. The cleanup levels established for the Marine Area are summarized in the following sections.

4.1.1 Benthic Cleanup Levels

In accordance with SMS and SCUM, a two-tier framework including Sediment Cleanup Objective (SCO), and Cleanup Screening Level (CSL) was used to develop cleanup levels for the protection of benthic organisms (Benthic cleanup levels) as described below:

- The SCO is the long-term sediment quality objective that will result in no adverse effects to the benthic community (WAC 173-204-562). The SCO is the lower end of the range of chemical concentrations or biological effects level used to establish a sediment cleanup level.
- The CSL is the maximum chemical concentration or biological effects level allowed as a sediment cleanup level (WAC 173-204-560(4)). The CSL is the high end of the range of chemical concentrations or biological effects level used to identify sediment cleanup sites.

The SMS states that the sediment cleanup level is initially established at the SCO but may be adjusted upwards to the CSL based on technical possibility or determination of net adverse environmental benefit. WAC 173-204-500(5)(a)(i). The SCO and CSL for the Marine Area are the numeric chemical benthic criteria for marine sediment based on acute and chronic toxicity to the benthic community (i.e., benthic risk; WAC 173-204-562 through 173-204-563; Table 8-1, SCUM). In accordance with SCUM, for polar organics, the analytical results are compared to the dry-weight SCO and CSL chemical criteria. In accordance with SCUM, for nonpolar organics, the analytical results are compared to the organic carbon-normalized chemical criteria when the TOC concentration for a sample range from 0.5 to 3.5 percent (inclusive). Analytical results for nonpolar organics with TOC concentrations that are outside of the 0.5 to 3.5 percent range are compared to the Lowest Apparent Effects Threshold (LAET) chemical criteria (i.e., SCO) or second LAET (2LAET) chemical criterial (i.e., CSL) on a dry-weight basis.

The Benthic cleanup levels are established at the SCO for the Marine Area and are presented in Table 2.

4.1.2 Human Health Cleanup Levels

Cleanup levels for the protection of human health and higher trophic level ecological receptors (Human Health cleanup levels) were developed in accordance with the SMS and Ecology's

SCUM guidance using the exposure scenarios listed below. These scenarios address potential ecological receptors and exposure pathways listed in Section 3.6.

- A child exposed during beach play.
- An adult exposed during clam digging (subsistence harvesting).
- An adult exposed during net fishing (subsistence harvesting).

For evaluating exposure scenarios, the intertidal area is defined as beach above -3 feet MLLW and the subtidal area is defined as the sediment areas below -3 feet MLLW. Children exposed to sediment during beach play and adults exposed to sediment during clam digging are assumed to be exposed primarily to intertidal sediment. The potential exposure scenario for net fishing assumes exposure could occur to both intertidal and subtidal sediment.

Tissue data do not exist for the Marine Area and site-specific biota-sediment accumulation factors (BSAFs) are not available to back-calculate site-specific risk-based sediment cleanup levels. Therefore, a simplified approach using Option 1 of SCUM, Section 9.2 where the cleanup levels for bioaccumulative chemicals including arsenic, cadmium, lead, mercury, tributyltin ion (TBT), cPAHs, dioxin-like PCBs and dioxins/furans are established at background (natural or regional, respectively) or practical quantitation limit (PQL), whichever value is higher was used.

Cleanup levels for other chemicals are based on calculated risk-based concentrations via ingestion and dermal contact using equations and input parameters provided in Ecology's SCUM guidance, natural background concentrations based on the 90/90 Upper Tolerance Limit (UTL) from the entire Bold Plus dataset (DMMP 2009; Table 10-1, SCUM), regional background based on the Port Gardner Bay Background Study (Ecology 2014; Table 10-2, SCUM) and PQL.

These calculated values relied upon the SMS default reasonable maximum exposure scenario (RME, WAC 173-204-561(2)(b)), which is based on a tribal exposure scenario, to derive human health cleanup levels protective of the consumption of fish and shellfish (Section 3.3.4.2 and 9.2, Ecology 2021). These human health cleanup levels are therefore considered protective of fishing activities by Indian Tribes, vulnerable populations, and overburdened communities since their potential exposure, through fishing, can reasonable be assumed to be equal to or less than the RME.

Consistent with the SCUM guidance, where the risk-based value is lower than background or the PQL, the cleanup level defaults to the higher of the natural background concentration, regional background concentration or the PQL value for that contaminant. The Human Health cleanup levels established for the Marine Area are presented in Table 3.

4.1.3 Wood Waste Screening Level

Studies conducted in Washington State (Kathman et al. 1984; Kirkpatrick et al. 1998; Floyd|Snider 2000; and SAIC 1999) and followed by Ecology show that wood debris in marine environment could negatively impact the benthic community. These adverse impacts are caused by:

- The physical presence of wood debris, which prevents biota from thriving and recruiting in and on native, healthy substrate.
- Decreased dissolved oxygen due to microbial decomposition, which can create an unhealthy or toxic environment for biota.
- Wood waste decomposition by-products such as sulfides, ammonia, and phenols, which can cause or contribute to toxicity.

Ecology manages wood debris and resultant sediment impacts under the SMS as a deleterious substance (WAC 173-204). The degree that wood debris impacts the benthic community depends on factors such as physical attributes or form of the wood debris (i.e., bark, scraps, chips, sawdust, logs, or dimensional lumber), degree of incorporation into sediment, volume present, water currents and flushing in the area, type of habitat present, source of the wood debris and degree of decomposition and weathering.

Although there is no current sediment cleanup level established for wood debris, a screening level of 15 percent by volume for visual wood content is used to evaluate wood debris within the Marine Area and sediment compliance interval (further discussed in Section 4.2). A screening level of 15 percent is supported by Site-specific sediment bioassay data described in the Marine Area RI/FS which correlated bioassay failures to sediment with visual wood debris of 15 percent or greater.

4.2 Point of Compliance

In accordance with SMS requirements, the point of compliance must be protective of benthic organisms, human health and higher trophic level receptors. SMS requires that the point of compliance consider site-specific parameters such as the potential to be disturbed by scour by vessel activity, wave action, anchor drag, etc., that may extend deeper than the typical depth for the exposure pathway for receptors of concern. Scour and other disturbances act to destabilize near surface sediment resulting in the exposure and redistribution of underlying subsurface contamination, if present.

Considerations for determination of the compliance interval for the intertidal and subtidal areas are described in the following sections (Sections 4.3.1 and 4.3.2). Points of compliance for the intertidal and subtidal portions of the Marine Area based on these considerations are presented in Section 4.3.3.

4.2.1 Considerations for Establishing Point of Compliance in Intertidal Areas

Intertidal portions of the Site that can reasonably be accessed by the general public are located within the Public Open Space/Beach Area south of the South Terminal. In this part of the Site, the compliance interval for the intertidal area considered both the depth of the biologically active zone (BAZ) and harvestable resources to ensure protection of the environment and human health including consideration of Indian Tribes, vulnerable populations and overburdened communities potentially affected by the cleanup action (further discussed in Section 7.3). Exposure scenarios for human health typically assume activities such as beach play and clam digging that may involve exposure to sediment at least as deep as the depth at which targeted shellfish species are found.

Based on the results of the RI, evidence of biota was observed withing the upper 1-foot of intertidal sediment (approximately 30.5 cm) in samples collected from RI locations MAF-16, MAF-17, MAF-24, MAF-26, MAF-29 and MAF-30. As a conservative estimate, and as indicated by Ecology in an email correspondence from Andy Kallus on September 23, 2019, the compliance interval in areas where human contact with sediments would most likely occur (i.e., the Public Beach and intertidal area located southwest of the Public Open Space) is the upper 40 cm of sediment. This sediment interval considers both the BAZ and depth needed to be protective of humans under shellfish harvest and beach play scenarios.

4.2.2 Considerations for Establishing Point of Compliance in Subtidal Areas

For subtidal sediment, SCUM states that the exposure depth is the same for benthic and bioaccumulative endpoints, as it is assumed that fish are consuming the benthic community and that both sets of receptors are exposed to chemicals over the BAZ for benthic organisms. SMS also requires that the point of compliance consider site-specific circumstances such as the current and future site uses and potential for the sediments to be disturbed by scour by vessel activity (further discussed in Section 3.3) and consideration of Indian Tribes, vulnerable populations and overburdened communities potentially affected by the cleanup action (further discussed in Section 7.3). These considerations for establishment of the point of compliance for the subtidal portion of the Marine Area are described in the following sections:

- Navigation and Berth Area – The navigation and berth areas are the parts of the Site where vessel activities related to the marine terminals occur and these areas are expected to be used for these activities in the future. As part of the RI, Mott MacDonald completed a Vessel Propeller Wash Scour Analysis for the Marine Area to evaluate the degree of potential scour impacts from vessels operating at the Site.

The purpose of the scour study was to evaluate the potential scour impacts of vessel navigation on Marine Area sediments and included the area adjacent to the South Terminal and Pacific Terminal for consideration in the evaluation of the cleanup point of compliance and remedial alternatives. The scour study results showed potential for scour from vessel operations at the South and Pacific Terminals at elevations shallower than -55 feet MLLW.

As a result of the current and future uses and the potential for scour in the navigation and berth area, the compliance interval for the navigation and berth area must extend to the maximum depth of scour (-55 feet MLLW), which is inclusive of the current and future dredge depths of -44 feet MLLW for Pacific Terminal and -52 feet MLLW for South Terminal.

- Future Cargo Handling Area – The future cargo handling area is the transitional slope between the Uplands Area and the South/Pacific Terminal navigation areas where sediment up to 10 feet below current mudline may be subject to scour based on the results of the scour analysis. The cleanup action in this area must also consider the future use of this area for cargo handling and ensure that the future use is unencumbered by the presence of contamination or wood debris. As a result, the point of compliance must extend to the full depth of contamination or native contact.
- Offshore Areas Located Below the Scour Depth – The offshore areas that are located below the scour depth are currently used for navigation and this use is anticipated for the future, however, the potential for scour is low. The compliance interval for the offshore areas that are located deeper than the maximum scour depth must consider the depth of the BAZ for a typical subtidal, soft-bottom marine sediment based on the fish consumption exposure pathway. According to SCUM, the exposure potential and sediment unit of concern is the BAZ (often the top 10 cm).

Past studies in Puget Sound have demonstrated that the majority of benthic macroinvertebrates are generally found within the uppermost 10 cm of sediment (Ecology 2008b). Although some species may be found at greater depths below the sediment surface, 10 cm is generally assumed by Ecology to represent a reasonable estimate of the BAZ. Additionally, based on the results of the sediment profile imagery (SPI) imaging completed on behalf of Ecology in general proximity to the Site as part of the Port Gardner Bay Investigation (SAIC 2009), sediment at the majority of stations contained an apparent redox potential discontinuity (RPD) depth ranging from approximately 2 to 4 cm. The RPD is generally considered as evidence of the burrowing depth of benthic communities present.

Because results of the scour study indicate that the sediment is not subject to scour in areas deeper than an elevation of -55 feet MLLW, a BAZ of 10 cm is assumed for the offshore portions of the Marine Area.

4.2.3 Marine Area Points of Compliance

Based on considerations discussed in Section 4.3.1 and 4.3.2, the following are the points of compliance (compliance intervals) for the Marine Area:

- Public Open Space/Beach Area (Intertidal Area) – The compliance interval for intertidal area south of South Terminal that could reasonably be accessed by the general public is 0-40 cm. This compliance interval considers the BAZ, a potential exposure to a human receptor engaged in beach play and/or shell fishing, and burrowing organisms that may dig down to 40 cm below the sediment surface in this area.
- Navigation and Berth Area (Subtidal Area) – The compliance interval for the navigation and berth area is -55 feet MLLW. This compliance interval considers the results of the scour analysis in addition to the current and future dredge depths of -44 feet MLLW for Pacific Terminal and -52 feet MLLW for South Terminal.
- Future Cargo Handling Area (Subtidal Area) – The compliance interval for the future cargo handling Area is the full depth of sediment contamination or native contact to ensure that future use is unencumbered by the presence of contamination or wood debris.
- Offshore Areas Below the Scour Depth (Subtidal Area) – The compliance interval for the offshore areas located below scour depth (areas deeper than elevation of -55 feet MLLW) is 0-10 cm. This compliance interval is the BAZ for a typical Puget Sound subtidal, soft-bottom marine sediment based on the fish consumption exposure pathway. Results of the scour analysis indicate that the sediment is not subject to scour in areas deeper than an elevation of -55 feet MLLW.

4.3 Additional Regulatory Requirements

Cleanup actions conducted under MTCA and SMS must comply with the local, state and federal laws (WAC 173-340-710) that have jurisdiction over the cleanup or that Ecology otherwise determines may apply to the cleanup. The potentially applicable laws identified for cleanup and regulatory requirements that may impact project permitting and implementation are listed in Table 4. The procedures, standards and other requirements specified in MTCA and SMS are the primary laws governing Marine Area cleanup action. Additional laws regulate specific components of the cleanup, such as waste disposal, management of stormwater during construction, and worker safety during implementation.

In addition, MTCA requires that the parties conducting the cleanup obtain all required permits and/or approvals, and where a cleanup action is exempt from obtaining permits that the substantive requirements of the exempt permits are met. The sections below outline the permits to be obtained and the additional substantive requirements that must be met as part of the cleanup.

4.3.1 Permits

Federal and state permitting for in-water construction is addressed through the Joint Aquatic Resource Permit Application (JARPA). The JARPA coordinates information applicable to the United States Army Corps of Engineers (USACE) issued Clean Water Act (CWA) Section 10 and Section 404 permits. It is anticipated that the selected cleanup action will qualify for a Nationwide Permit 38 which is for the specific purpose of cleanup of hazardous and toxic waste as ordered or sponsored by a government agency with established legal or regulatory authority. The JARPA also coordinates information applicable to an Ecology-issued CWA Section 401 Water Quality Certification and the WDNR Use Authorization for State-Owned Aquatic Lands, among others. The federal permitting process includes review of issues relating to waters of the United States (including wetlands), Tribal resources and treaty rights, threatened and endangered species, habitat impacts and other factors.

As part of the federal permitting process, the USACE will consult with the following:

- Tribes.
- Natural resource trustees regarding potential project impacts on species and habitats protected under the ESA and related requirements.
- State Department of Archaeology and Historic Preservation to determine the effects of the cleanup action under Section 106 of the National Historic Preservation Act.

The USACE's CWA review will also require ESA consultation with the federal wildlife agencies, and completion of Ecology's 401 water quality certification review.

The following describes several permitting considerations:

- **Endangered Species Act Review** – Cleanup actions conducted where there is potential to affect threatened and/or endangered species or critical habitat will be subject to Endangered Species Act Section 7 review. USACE will consult (either formally or informally) with National Marine Fisheries Service and the U.S. Fish and Wildlife Service will perform the review as part of the permit process.
- **Historical/Archaeological Review** – The permit process will involve review of the cleanup action by USACE to evaluate the potential to disturb historical or archaeological resources.

- **State and National Environmental Policy Act Review** – This cleanup is subject to environmental impact review under State Environmental Policy Act (SEPA) regulations. The SEPA provides a way to identify possible environmental impacts that may result from governmental decisions. Information provided during the SEPA review process helps agency decision-makers, applicants, and the public understand how a project will affect the environment. SEPA is intended to ensure that state and local government officials consider environmental values when making decisions or taking an official action such as approving the CAP. The SEPA regulations contain specific provisions for MTCA actions. Those provisions and the general requirements of SEPA will be followed, including the preparation of a SEPA checklist and obtaining a SEPA determination from the lead agency. The Port typically performs the SEPA lead agency role on Port cleanup projects and is the lead agency for the MTCA actions at the Site.
- **Water Quality Certification** – As part of the USACE Section 404 permitting process, a Section 401 water quality certification must be obtained from Ecology. Certification ensures that any dredge or fill in waters of the U.S. will comply with State water quality standards and other aquatic resource protection requirements under Ecology's authority.
- **National Pollutant Discharge Elimination System (NPDES)** – Permit for the discharge of pollutants to waters of the United States pursuant to CWA Section 402: To the extent that the cleanup action requires discharges to the local sanitary sewer system or to surface water, any necessary permitting, including under CWA Section 402, will be obtained to ensure compliance with state water quality standards. The NPDES is a federal regulation that is administered by individual states. Therefore, NPDES permits will be obtained from Ecology.
- **Construction Stormwater General Permit (CSWGP)** – Construction site operators are required to be covered by a CSWGP if they are engaged in clearing, grading, and excavating activities that disturb one or more acres and discharge stormwater to surface waters of the state. The Marine Area cleanup action is primarily implemented in the marine environment and is not expected to disturb the upland areas greater than one acre and therefore CSWGP is not anticipated to be required for the cleanup action. If CSWGP is required then an application will be completed and submitted to Ecology's Water Quality division to obtain coverage under CSWGP and Ecology's Companion Order will also be obtained, if necessary.

4.3.2 Permit Exemption Substantive Requirements

Cleanup actions conducted under a MTCA Agreed Order or Consent Decree are exempt from the procedural requirements of the following state and local permits: Washington State Clean Air Act, Solid and Hazardous Waste Management Act, Hydraulic Code Rules, Water Pollution Control Act, Shoreline Management Act, and local regulations. However, the cleanup action must meet the substantive requirements of the permits or approvals that are procedurally exempt under RCW 70A.305.090. The JARPA may be provided to state and local agencies to obtain permit exemption confirmation letters.

Projects involving in-water construction activities typically require a Hydraulic Project Approval (HPA). HPAs are issued by the Washington Department of Fish and Wildlife (WDFW) and define state requirements for construction activities that could adversely affect fisheries and water resources. The cleanup action is exempt from obtaining an HPA, but WDFW will review the project for adherence with the substantive requirements of the HPA.

Shoreline Master Programs are local land-use policies under the State Shoreline Management Act that guide use of Washington shorelines. Ecology conducts site-specific review of cleanup actions conducted under MTCA, to evaluate whether those actions are consistent with the substantive requirements of the Shoreline Master Program. In addition, the City of Everett (City) Shoreline Master Program regulates development in the shoreline environment within the City and typically requires a shoreline substantial development permit or a shoreline exemption for shoreline development construction.

The cleanup action is expected to trigger a City of Everett shoreline substantial development permit process. The cleanup action is exempt from obtaining the actual permit, but the City will review the project for adherence with the substantive requirements of the shoreline substantial development permit.

Other permits for which substantive requirements may need to be met include a Puget Sound Clean Air Agency operating permit, City of Everett Wastewater Discharge Authorization permit, City Street Use permit, City's noise ordinance, City's building and construction code and City's traffic code.

5.0 Contaminated Media, Contaminants of Concern, and Substance of Concern

The contaminated media present within the Marine Area are sediment and wood debris.

The COCs for the Marine Area were developed as part of the Marine Area RI/FS by comparing sediment characterization data (Section 3.0) to the Benthic and Human Health cleanup levels (Tables 2 and 3, respectively). A contaminant was retained as a COC if the detected concentration of the contaminant exceeds its respective cleanup level. The following sections summarize the COCs for the protection of benthic organisms, and COCs for the protection of human health and higher trophic level ecological receptors and SOCs.

In addition to COCs, wood debris is a SOC for the Marine Area as described in Section 5.3.

5.1 Contaminants of Concern for Benthic Organisms

The following COCs are identified for protection of benthic organisms:

- Metals including arsenic, copper, mercury and zinc.
- Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs) including 2-methylnaphthalene, acenaphthene, anthracene, fluorene, naphthalene and phenanthrene.
- High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs) including benzo(a)anthracene, benzo(a)pyrene, total benzofluoranthenes, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-c,d)pyrene and pyrene.
- Chlorinated hydrocarbons including 1,2,4-trichlorobenzene, 1,2-diclorobenze and hexachlorobenzene.
- Phthalates including bis (2-ethylhexyl) phthalate, butyl benzyl phthalate and diethyl phthalate.
- Phenols including 2,4-dimethylphenol, 2-methylphenol, 4-methyphenol and phenol.
- Miscellaneous extractables including dibenzofuran, hexachlorobutadiene, benzoic acid and benzyl alcohol.
- Polychlorinated Biphenyls (PCBs).

5.2 Contaminants of Concern for Human Health and Higher Trophic Level Ecological Receptors

The following COCs are identified for protection of human health and higher trophic level ecological receptors:

- Metals including arsenic, cadmium, lead and mercury.
- Total carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs) toxic equivalent (TEQ), which is a toxic equivalent concentration of cPAH mixture containing benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-c,d).
- Total PCBs and dioxin-like PCBs.
- Dioxins and Furans TEQ.

5.3 Substances of Concern (SOC)

Wood debris is a SOC due to its potential adverse effects to the benthic community as described in Section 4.1.3. Wood debris in the Marine Area is predominantly comprised of sawdust and chips. Tree bark, logs, dimensional lumber, pulp waste and other wood debris, although present, comprises a relatively small amount of the wood debris observed compared to the amount of sawdust and chips within the Marine Area.

6.0 Cleanup Action Selection and Analysis

6.1 Cleanup Action Objectives

The cleanup action objective (CAO) consists of location-, chemical- and media-specific goals for protecting human health and the environment. The CAO is dependent on the chemicals and pathways that represent a risk to people and natural resources associated with a site. In general accordance with the MTCA Cleanup Regulation (WAC 173-340), SMS regulations (WAC 173-204) and other applicable regulatory requirements including consideration of Indian Tribes, vulnerable populations and overburdened communities potentially affected by the cleanup action, the CAO for the Marine Area is to eliminate, reduce, or otherwise control to the extent feasible and practicable, unacceptable risks to human health and the environment posed by Site-related hazardous substances in marine sediment.

Specifically, the CAO for the Marine Area of the Site is to mitigate risks associated with the SOC and COCs discussed in Section 5.0 and to address potential exposure routes and receptors based on the known subsurface conditions as well as the current and future land uses. The following potential exposure routes and receptors are included in the CAO for the Marine Area:

- Contact (dermal or incidental ingestion) by residents, visitors, workers and other Site users with hazardous substances in sediment.
- Human ingestion of marine organisms that are contaminated by Site-related hazardous substances in sediment.
- Exposure of benthic organisms and higher trophic level ecological receptors to Site-related hazardous substances in the biologically active zone of sediment.
- Ingestion of benthic organisms that are contaminated by Site-related hazardous substances by aquatic organisms and higher trophic level ecological receptors.

6.2 Areas Requiring Cleanup Action Evaluation

To assist in the development and evaluation of remedial alternatives, the Marine Area is divided into seven sediment management areas (SMAs) identified as SMA-1 through SMA-7. The factors used to delineate the Marine Area SMAs are presented below. The description of SMAs 1 through 7 are presented in Section 6.2.2 through 6.2.8, respectively. The approximate locations of SMAs are shown in Figure 15.

6.2.1 Factors Used to Delineate Sediment Management Areas

According to SCUM guidance, larger complex sediment sites may be divided into discrete SMAs, which represent the smallest area for which individual cleanup decisions are made. SCUM guidance Section 6.7 outlines the process to divide sediment sites into SMAs. Marine Area SMAs were delineated using the following considerations that affect remedy implementation and performance:

- Current and future site use assumptions presented in Section 2.4 and in a memorandum from the Port to Ecology (Port 2021) were one of the primary factors in delineating the SMAs to ensure that the remedial action is compatible with the current and future site uses. Key assumptions for the Marine Area include future navigational elevation of -52 feet MLLW in the navigation area of the South Terminal, future navigational elevation of -44 feet MLLW in the navigation area of the Pacific Terminal, and the location of future cargo handling area located between the South and Pacific Terminals[5]. COC distribution and magnitude of concentrations including the following:
    - Estimated horizontal and vertical extent of wood debris with percentage greater than the cleanup level for wood debris.
    - Estimated horizontal and vertical extent of one or more COCs with concentrations greater than Benthic cleanup levels.
    - Estimated horizontal and vertical extent of one or more COCs with concentrations greater than Human Health cleanup levels.
- Physical attributes of the sediment, sediment bed, water depth and the area in which the sediments are located.

[5] The future navigational elevations reflect the long-term planning by the Port. The dredge depths for full removal considered in the remedial alternatives are based on the extent of contamination and necessary extent of dredging that is required to achieve the cleanup objectives. Dredging beyond what is required to remove contamination is not included in the remedial alternatives.

- Potential for scour from vessel operations. The results of scour study completed at part of the RI showed potential for scour from vessel operations at the South and Pacific Terminals to an elevation of -55 feet MLLW (the maximum scour elevation).
- While sufficient data was available for evaluation of the remedial alternatives as noted in the Marine Area RI/FS, additional data collection as part of the remedial design process will help to further refine the extent of contamination, limits of the SMAs and provide data for the design and implementation of the selected remedy.

6.2.2 SMA-1

SMA-1 comprises a subtidal area that is approximately 40.2 acres in size (Figure 15). The eastern and northeastern limits of SMA-1 is defined by the existing bathymetric contour line of -55 feet MLLW (the maximum scour elevation) and the northern, western and southern limits are defined by the estimated horizontal extent of contamination as identified in Marine Area RI/FS and shown on Figure 16. The horizontal extent of contamination in SMA-1 is estimated to extend to an approximate elevation of -215 feet MLLW. SMA-1 is divided into four subareas SMA-1a through SMA-1d based on the nature of contamination in sediment as described in Marine Area RI/FS and summarized in Section 3.5.

The existing surfaces within SMA-1 are deeper than the maximum scour elevation and therefore, remedial actions that will be implemented in SMA-1 are not expected to be subject to vessel scour. Because SMA-1 is deeper than the depth of potential scour by vessel activity and outside of the navigation area, surface sediment (0-10 cm) is identified as the compliance interval in which the CAOs must be met.

The environmental investigations completed within SMA-1 include 16 surface sediment sampling locations (ST-28, ST-30, ST-31, ST-33, ST-36, ST-41, A1-17, EW-12-07, MAF-22, MAF-37, MAF-38, MAF-39, MAF-41, MAF-42, MAF-44 and MAF-45) and 5 sediment cores (MAF-10, MAF-12, MAF-19, MAF-20, MAF-21) completed to depths ranging from approximately 4.5 to 12 feet below mudline (bml). The sediment sampling locations and estimated depth of contamination are summarized in Table 1 and shown on Figure 16. The horizontal and vertical limits of contamination in SMA-1 are estimated based on limited data density given the relatively large size of the area.

6.2.2.1 SMA-1a

SMA-1a is approximately 26.8 acres in size and is located between Elevations -55 feet to approximately -215 feet MLLW (Figure 15).

Based on the environmental data presented in Section 3.0 and Table 1, the following is the summary of contamination present in SMA-1a:

- Arsenic, cadmium, lead, cPAHs, and dioxins and furans were detected at concentrations greater than the Human Health cleanup levels.
- 4-methylphenol was detected at concentrations greater than the Benthic cleanup levels.
- SOC (wood debris) greater than 15 percent by volume is not present.
- The depth of contamination is estimated to be up to approximately 4 feet bml as shown on Figure 16.
- The estimated in-place volume of contaminated media is approximately 25,790 CY. For dredging alternatives, a 2-foot overdredge allowance is included and the total contaminated media volume in SMA-1a is approximately 112,340 CY. The volumes are calculated using the estimated depth of contamination presented for each SMA as shown on Figure 16.

6.2.2.2 SMA-1b

SMA-1b is approximately 5.7 acres in size and is located between Elevations -55 feet to approximately -90 feet MLLW (Figure 15).

Based on the environmental data presented in Section 3.0 and Table 1, the following is the summary of contamination present in SMA-1b:

- Arsenic, cadmium, lead, mercury, cPAHs, dioxin-like PCBs, and dioxin and furans were detected at concentrations greater than the Human Health cleanup levels.
- LPAHs and phenols were detected at concentrations greater than the Benthic cleanup levels.
- SOC (wood debris) greater than 15 percent by volume is present.
- The depth of contamination is estimated to be up to approximately 8 feet bml as shown on Figure 16.
- The estimated in-place volume of contaminated media is approximately 26,980 CY. For dredging alternatives, a 2-foot overdredge allowance is included and the total contaminated media volume in SMA-1b is approximately 45,430 CY. The volumes are calculated using the estimated depth of contamination presented for each SMA as shown on Figure 16.

6.2.2.3 SMA-1c

SMA-1c is approximately 3.2 acres in size and is located between Elevations -55 feet to approximately -115 feet MLLW (Figure 15).

Based on the environmental data presented in Section 3.0 and Table 1, the following is the summary of contamination present in SMA-1c:

- cPAHs were detected at concentrations greater than the Human Health cleanup levels.
- Benthic data is not available at the investigation completed within this SMA.[6]
- SOC (wood debris) greater than 15 percent by volume is present.
- The depth of contamination is estimated to be up to approximately 4 feet bml as shown on Figure 16.
- The estimated in-place volume of contaminated media is approximately 5,970 CY. For dredging alternatives, a 2-foot overdredge allowance is included and the total contaminated media volume in SMA-1c is approximately 16,330 CY. The volumes are calculated using the estimated depth of contamination presented for each SMA as shown on Figure 16.

6.2.2.4 SMA-1d

SMA-1d is approximately 4.5 acres in size and is located between Elevations -55 feet to approximately -75 feet MLLW (Figure 15).

Based on the environmental data presented in Section 3.0 and Table 1, the following is the summary of contamination present in SMA-1d:

- Arsenic, cadmium, lead, cPAHs, dioxin-like PCBs, and dioxin and furans were detected at concentrations greater than the Human Health cleanup levels.
- LPAHs, phenols, miscellaneous extractables, and PCBs were detected at concentrations greater than the Benthic cleanup levels.
- SOC (wood debris) greater than 15 percent by volume is present.
- The depth of contamination is estimated to be up to approximately 9 feet bml as shown on Figure 16.
- The estimated in-place volume of contaminated media is approximately 36,320 CY. For dredging alternatives, a 2-foot overdredge allowance is included and the total

[6] The available sample taken from within this SMA (MAF-39) was not analyzed for benthic COC analytes. Refer to RI/FS Section 5.0 for additional details.

contaminated media volume in SMA-1d is approximately 50,720 CY. The volumes are calculated using the estimated depth of contamination presented for each SMA as shown on Figure 16.

6.2.3 SMA-2

SMA-2 is a subtidal area that is approximately 7.4 acres in size (Figure 15). The eastern limit of SMA-2 is defined by the existing bathymetric contour line -52 feet MLLW (future navigational elevation at the South Terminal) and contour line -44 feet MMLW (Port's current/future navigational elevation at the Pacific Terminal), and the western limit is defined by the existing bathymetric contour line -55 feet MLLW (the maximum scour elevation). The northern and southern limits are defined by the estimated horizontal extent of contamination as identified in the Marine Area RI/FS and shown on Figure 16. SMA-2 is divided into two subareas SMA-2a and SMA-2b based on their locations relative of Pacific and South Terminals as described in Sections 6.2.3.1 and 6.2.3.2, respectively.

SMA-2a is located offshore of the South Terminal between -52 feet MLLW (future navigational elevation at the South Terminal) and -55 feet MLLW (the maximum scour elevation). SMA-2b is located offshore of the Pacific Terminal between -44 feet MLLW (current/future navigational elevation at the Pacific Terminal) and -55 feet MLLW (the maximum scour elevation).

The existing surfaces within SMA-2 are shallower than the maximum scour elevation and therefore, are subject to vessel scour. Vessel scour can impact the integrity and effectiveness of the remedial action and therefore remedy(s) selected for SMA-2 must account for such potential impacts. Because SMA-2 is within the depth of potential propeller scour, surface sediment (0-10 cm) and subsurface sediment to Elevation -55 feet MLLW is identified as the compliance interval in which the CAOs must be met.

The environmental Investigations completed within SMA-2 include five surface sediment sampling locations (A1-20, MAF-09, MAF-35, MAF-36 and MAF-46) and six sediment cores (ST-32, SP-151, A1-15, A1-24, MAF-11 and MAF-58) completed to depths ranging from approximately 1-to-11 feet bml. The sediment sampling locations and estimated depth of contamination are summarized in Table 1 and shown on Figure 16.

6.2.3.1 SMA-2a

SMA-2a is approximately 1.2 acres in size and is located offshore of the South Terminal between Elevations -52 feet MLLW and -55 feet MLLW (Figure 15).

Based on the environmental data presented in Section 3.0 and Table 1, the following is the summary of contamination present in SMA-2a:

- Arsenic, cadmium, lead, mercury, cPAHs, dioxin-like PCBs, and dioxins and furans were detected at concentrations greater than the Human Health cleanup levels.
- Arsenic, zinc, mercury, LPAHs, phenols and miscellaneous extractables detected at concentrations greater than the Benthic cleanup levels.
- SOC (wood debris) greater than 15 percent by volume is present.
- The depth of contamination is estimated to be up to approximately 10 feet bml as shown on Figure 16.
- The estimated in-place volume of contaminated media is approximately 10,490 CY. For dredging alternatives, a 2-foot overdredge allowance is included and the total contaminated media volume in SMA-2a is approximately 14,480 CY. The volumes are calculated using the estimated depth of contamination presented for each SMA as shown on Figure 16.

6.2.3.2 SMA-2b

SMA-2b is approximately 6.2 acres in size and is located offshore of the Pacific Terminal between Elevations -44 feet MLLW and -55 feet MLLW (Figure 15). The pile-supported wharf structure of Pier 1 is adjacent to the northwest portion of SMA-2b.

Based on the environmental data presented in Section 3.0 and Table 1, the following is the summary of contamination present in SMA-2b:

- cPAHs, dioxin-like PCBs and dioxins and furans were detected at concentrations greater than the Human Health cleanup levels.
- Phenols and miscellaneous extractables were detected at concentrations greater than the Benthic cleanup levels.
- SOC (wood debris) greater than 15 percent by volume is present.
- The depth of contamination is estimated to be up to approximately 1-foot bml as shown on Figure 16.
- The estimated in-place volume of contaminated media is approximately 3,760 CY. For dredging alternatives, a 2-foot overdredge allowance is included and the total contaminated media volume in SMA-2b is approximately 23,670 CY. The volumes are calculated using the estimated depth of contamination presented for each SMA as shown on Figure 16.

6.2.4 SMA-3

SMA-3 is a subtidal area that is approximately 2 acres in size (Figure 15). SMA-3 is the location of the current and future vessel berth and navigational area at the Pacific Terminal and the future site use identifies an elevation of -44 feet MLLW (including overdredge allowance) as the anticipated navigational elevation requirement in this area. The existing surfaces within SMA-3 extend approximately from Elevation -5 feet MLLW to the current/future navigational elevation at the Pacific Terminal (-44 feet MLLW). SMA-3 is divided into three subareas SMA-3a through SMA-3c since contamination present in these subareas are physically isolated from each other. Additional description on SMA-3a through SMA-3c are presented in Sections 6.2.4.1 through 6.2.4.3, respectively.

SMA-3 is subject to vessel scour since it is the location of an active vessel berth and the existing mudline elevations are shallower than the maximum scour elevation (-55 feet MLLW). Vessel scour can impact the integrity and effectiveness of the remedial action and therefore remedy(s) selected for SMA-3 must account for such potential impacts. Because SMA-3 is within the navigation area and shallower than the depth of potential propeller scour, surface sediment (0-10 cm) and subsurface sediment to an elevation of -55 feet MLLW is identified as the compliance interval in which the CAOs must be met.

The environmental investigations completed within SMA-3 include three surface sediment sampling locations (MAF-31, MAF-32 and MAF-33) and one sediment core (ST-42) completed to a depth of approximately 12 feet bml. The sediment sampling locations and estimated depth of contamination are summarized in Table 1 and shown on Figure 16. The horizontal and vertical limits of contamination in SMA-3 are estimated based on limited data density.

6.2.4.1 SMA-3a

SMA-3a is approximately 1.1 acres in size and is located offshore of the Pacific Terminal approximately between Elevations -42 and -44 feet MLLW.

Based on the environmental data presented in Section 3.0 and Table 1, the following is the summary of contamination present in SMA-3a:

- Cadmium, lead, cPAHs, and dioxin and furans were detected at concentrations greater than the Human Health cleanup levels.
- Phenols and miscellaneous extractables were detected at concentrations greater than the Benthic cleanup levels.
- SOC (wood debris) greater than 15 percent by volume is not present.

- The depth of contamination is estimated to be up to approximately 1-foot bml as shown on Figure 16.
- The estimated in-place volume of contaminated media is approximately 1,120 CY. For dredging alternatives, a 2-foot overdredge allowance is included and the total contaminated media volume in SMA-3a is approximately 4,800 CY. The volumes are calculated using the estimated depth of contamination presented for each SMA in Figure 16.

6.2.4.2 SMA-3b

SMA-3b is approximately 0.6 acres in size and is located in front of the pile-supported wharf of the Pacific Terminal approximately between Elevations -34 and -41 feet MLLW. The eastern edge of SMA-3b is adjacent to the pile-supported wharf structure of the Pacific Terminal and the armored slopes of the Pacific Terminal Wharf/Nearshore Confined Disposal (NCD) facility. The extent of the toe of the armored slopes is unknown and therefore, there is a potential that armored slopes may be present below the contaminated media at SMA-3b.

Based on the environmental data presented in Section 3.0 and Table 1, the following is the summary of contamination present in SMA-3b:

- Arsenic and cPAHs were detected at concentrations greater than the Human Health cleanup levels.
- LPAHs and miscellaneous extractables were detected at concentrations greater than the Benthic cleanup levels.
- SOC (wood debris) greater than 15 percent by volume is not present.
- The depth of contamination is assumed to be 0.5 feet bml as shown on Figure 16.
- The estimated in-place volume of contaminated media is approximately 460 CY. For dredging alternatives, a 2-foot overdredge allowance is included and the total contaminated media volume in SMA-3b is approximately 2,290 CY. The volumes are calculated using the estimated depth of contamination presented for each SMA as shown on Figure 16.

6.2.4.3 SMA-3c

SMA-3c is approximately 0.3 acres in size and is located adjacent to the shoreline between the Pacific Terminal and Pier 1 approximately between Elevations -5 and -44 feet MLLW. SMA-3c is surrounded by the pile-supported wharf structure of Pier 1 in the north, subtidal navigable areas in the west, and the pile-supported wharf structure of the Pacific Terminal and the armored slopes of the Pacific Terminal Wharf/NCD facility in the south and southeast. Approximately the eastern half of SMA-3c is within the footprint of the Pacific Terminal NCD boundary. The extent of the toe of the armored slopes is unknown and therefore, there is a potential that armored slopes may be present below the contaminated media at SMA-3c. The existing conditions in the eastern part of SMA-3c are unknown but anticipated to be a pile-supported wharf structure that adjoins the adjacent upland areas.

Based on the environmental data presented in Section 3.0 and Table 1, the following is the summary of contamination present in SMA-3c:

- Arsenic and cPAHs were detected at concentrations greater than the Human Health cleanup levels.
- COCs detected at concentrations greater than the Benthic cleanup levels are not present.
- SOC (wood debris) greater than 15 percent by volume is present.
- The depth of contamination is assumed to be 0.5 feet bml as shown on Figure 16.
- The estimated in-place volume of contaminated media is approximately 260 CY. For dredging alternatives, a 2-foot overdredge allowance is included and the total contaminated media volume in SMA-3c is approximately 1,290 CY. The volumes are calculated using the estimated depth of contamination presented for each SMA as shown on Figure 16.

6.2.5 SMA-4

SMA-4 is a subtidal area that is approximately 1.2 acres in size and is the location of 2016 Pacific Terminal Interim Action (IA) dredge base and the location of the current and future vessel berth and navigational area at the Pacific Terminal (Figure 15). SMA-4 is surrounded by subtidal navigable areas in the north and west, the armored dredge slopes of the Pacific Terminal IA in the south and southeast, and the armored slopes of the Pacific Terminal Wharf/NCD facility in the east. The pile-supported wharf structure of the Pacific Terminal is in the northeast corner of SMA-4, and the Pacific Terminal NCD facility is adjacent to the eastern edge of SMA-4. Because SMA-4 is within the navigation area and shallower than the depth of potential propeller scour, surface sediment (0-10 cm) and subsurface sediment to an elevation of -55 feet MLLW is identified as the compliance interval in which the CAOs must be met.

As part of the IA, dredging was completed within SMA-4 to the approximate elevations of -42 to -44 feet MLLW (the current/future navigational elevation at the Pacific Terminal). As a result of the Pacific Terminal IA, contamination was completely removed from SMA-4. Additional remedial action is not needed in this area. The dredging activities completed as part of the IA are described in the Ecology approved Construction Completion Report (GeoEngineers 2018). This area was retained in the Marine Area RI/FS and the CAP for completeness.

6.2.6 SMA-5

SMA-5 is an intertidal and subtidal area that is approximately 6 acres in size (Figure 15). The future site use identified for the location of SMA-5 is cargo handling. The eastern limit of SMA-5 is defined by the upland areas and existing creosote-treated timber bulkhead that is located along a portion of the eastern edge of SMA-5. The as-built details of this bulkhead, including the depth of the structure, are unknown. It appears though that the treated timber bulkhead was constructed to support mill operations at some time prior to the Port's acquisition of the property in 1984. The northern limit of SMA-5 is defined by the edge of the pile-supported wharf structure of the Pacific Terminal and the toe of the armored dredge slopes of the Pacific Terminal IA. The western limit is defined by the current/future navigational area at the South Terminal and the southern limit is defined by the edge of South Terminal pile-supported wharf structure and upland areas. A portion of the South Terminal pile-supported roll-on/roll-off berthing pier is in the southwest portion of SMA-5.

The existing mudline within SMA-5 transition from an approximate elevation of +18 feet MLLW in the east (adjacent to the uplands) to approximate Elevations -23 to -34 feet MLLW in the west (adjacent to the current/future navigational area at the South Terminal) and approximate Elevations -42 to -44 feet MLLW in the northwest (adjacent to the current/future navigational area at the Pacific Terminal).

Armored slopes are present within SMA-5 along the northern, southern and eastern portions as shown on Figure 15. The armoring in the north was placed as part of the Pacific Terminal IA to cover the dredged slopes containing contaminated sediment and wood debris. The armoring along the southern and eastern portions of SMA-5 was placed as part of the construction of the South Terminal facility, Pacific Terminal Wharf/NCD facility and upland area/retaining wall.

For the purposes of the Marine Area RI/FS and CAP, the quantity of armoring within SMA-5 covering potentially contaminated sediment and/or wood debris is estimated to be 19,000 CY.

Because SMA-5 represents the transitional slope between the Uplands Area and the South and Pacific Terminal navigation areas, surface sediment and up to 10 feet below current mudline may be subject to scour based on the results of the scour analysis. The cleanup action in this area must also consider the future use of this area for cargo handling and ensure that the facility can be expanded unencumbered by the presence of contamination or wood debris. As a result, surface sediment (0-10 cm) and subsurface sediment to the elevation of the native contact within the limits of the SMA is identified as the compliance interval for this area in which the CAOs must be met.

The environmental investigations completed within SMA-5 include one surface sediment sampling location (MAF-34) and 23 sediment cores (ST-1, ST-3, ST-5, ST-6, ST-8, ST-9, ST-11,

ST-12, ST-14, ST-17, ST-19, ST-20, ST-21, ST-109, MAF-01, MAF-02, MAF-03, MAF-04, MAF-05, PT11, PT12, PT13 and PT14) completed to depths ranging from approximately -4 to -25 feet bml. In general, environmental conditions within SMA-5 are well characterized except for areas of existing armored slopes located along the southern and eastern portions. No environmental data has been collected within these armored slopes and therefore, it is unknown if contaminated media is present underneath these armored slopes. For the purposes of the Marine Area RI/FS and CAP, it is estimated that contaminated media may be present underneath these armored slopes, based on the depth of contamination information available in SMA-5 and the stratigraphy in the adjacent upland areas.

Based on the environmental data presented in Section 3.0 and Table 1, the following is the summary of contamination present in SMA-5:

- Arsenic, cadmium, lead, mercury, cPAHs, dioxin-like PCBs, PCBs and dioxins and furans were detected at concentrations greater than the Human Health cleanup levels.
- LPAHs, HPAHs, phthalates, phenols, miscellaneous extractables and PCBs were detected at concentrations greater than the Benthic cleanup levels.
- SOC (wood debris) greater than 15 percent by volume is present.
- The depth of contamination is estimated to be up to approximately 24 feet bml as shown on Figure 16.
- The estimated in-place volume of contaminated media is approximately 131,800 CY. For dredging alternatives, a 2-foot overdredge allowance is included and the total contaminated media volume in SMA-5 is approximately 151,190. The volumes are calculated using the estimated depth of contamination presented for each SMA as shown on Figure 16.

6.2.7 SMA-6

SMA-6 is an intertidal and subtidal area that is approximately 9.7 acres in size (Figure 15). SMA-6 is the location of the current and future vessel berth and navigational area at the South Terminal and the future site use identifies an elevation of -52 feet MLLW (including overdredge allowance) as the future navigational elevation in this area. The western limit of SMA-6 is defined by the existing bathymetric contour line -52 feet MLLW. The northern limit is defined by the limits of adjacent SMAs 2b, 3a and 4. A portion of the eastern limit is defined by the limits of adjacent remedial action SMA-5. A portion of the eastern limit and the southern limit are defined based on the estimated horizontal extent of contamination as identified in the Marine Area RI/FS and shown on Figure 16. A portion of the South Terminal pile-supported roll-on/roll-off berthing pier is in the eastern portion of SMA-6, including associated pile supported dolphins.

Armored slopes are present within SMA-6 along the northern and eastern portions as shown on Figure 15. The armoring in the north was placed as part of Pacific Terminal IA to cover the dredged slopes where contaminated sediment and wood debris was exposed. The armoring along the eastern portions includes an area underneath the South Terminal pile-supported wharf and an area along the southern end of South Terminal facility.

For the purposes of the Marine Area RI/FS and CAP, the quantity of armoring within SMA-6 covering potentially contaminated sediment and/or wood debris is estimated to be 1,750 CY.

SMA-6 is subject to vessel scour since it is the location of an active vessel berth and the existing mudline surfaces are shallower than the maximum scour elevation (-55 feet MLLW). Vessel scour can impact the integrity and effectiveness of the remedial action and therefore, the remedy selected for SMA-6 must account for such potential impacts. Because SMA-6 is within the navigation area and shallower than the depth of potential propeller scour, surface sediment (0-10 cm) and subsurface sediment to an elevation of -55 feet MLLW is identified as the compliance interval in which the CAOs must be met.

The environmental investigations completed within SMA-6 include seven surface sediment sampling locations (ST-23, ST-24, ST-25, ST-26, ST-27, ST-35 and ST-44) and 26 sediment cores (ST-2, ST-15, ST-29, ST-34, ST-37, ST-39, ST-43, ST-44, ST-101, ST-102, ST-103, ST-104, ST-105, ST-106, ST-107, ST-108, MAF-13, MAF-14, MAF-18, MAF-55, MAF-56, MAF-57, MAF-59, MAF-60, MAF-61 and PT10) completed to depths ranging from approximately 6 feet to 20 feet bml.

Since no environmental data is available within the footprint of the armored slopes below the South Terminal and in the southeast portion of SMA-6 along the side slope, the following assumptions are made for the purposes of the cleanup:

- SMA-6 includes the lower portions of armored slopes located below the South Terminal pile-supported wharf. Environmental data representative of the surficial sediment is not available. It is assumed that contaminated sediment has been deposited in this area on top of the slope armoring below Elevation -25 feet MLLW. The area of contaminated sediment is estimated to be 0.5 acres.
- In the southeastern portion of SMA-6, the horizontal extent of contamination is not well defined. Sediment cores ST-101 through ST-106 completed in southeastern portion identify presence of contamination. However, environmental data to define horizontal extent of contamination identified by ST-101 through ST-106 in the south and southeastern direction was not collected as part of the Marine Area RI/FS. It is assumed that the contamination does not extend outside the southeastern limits of SMA-6 as shown on Figure 16.

Based on the environmental data presented in Section 3.0 and Table 1, the following is the summary of contamination present in SMA-6:

- Arsenic, cadmium, lead, mercury, cPAHs, dioxin-like PCBs, and dioxins and furans were detected at concentrations greater than the Human Health cleanup levels.
- Zinc, LPAHs, HPAHs, phthalates, phenols and miscellaneous extractables were detected at concentrations greater than the Benthic cleanup levels.
- SOC (wood debris) greater than 15 percent by volume is present.
- The depth of contamination is estimated to be up to approximately 18.5 feet bml as shown on Figure 16.
- The estimated in-place volume of contaminated media is approximately 94,190 CY. For dredging alternatives, a 2-foot overdredge allowance is included and the total contaminated media volume in SMA-6 is approximately 123,880 CY. The volumes are calculated using the estimated depth of contamination presented for each SMA as shown on Figure 16.

6.2.8 SMA-7

SMA-7 is an intertidal and subtidal area that is approximately 2.9 acres in size and is located approximately between the elevations of +9 feet and 0 feet MLLW (Figure 15). SMA-7 is located adjacent to the armored shoreline in the southern area of the Site, offshore of the Public Open Space. The northeastern and eastern limits are defined by the shoreline armoring and the southern, western and northwestern limits are defined by the estimated horizontal extent of contamination as identified in the Marine Area RI/FS and shown on Figure 16.

Vessel scour is not considered to be a concern for SMA-7 since mudline within SMA-7 is shallow and not suitable for vessel navigation and it is away from other navigable areas at the Site. Because SMA-7 is located in an area accessible by the general public, the compliance interval considers that a human receptor, shellfish fisher or burrowing organism may dig down to 40 cm below the sediment surface.

The environmental investigations completed within SMA-7 include only one sediment core (MAF-15) completed to a depth of approximately 7.5 feet bml.

Based on the environmental data presented in Section 3.0 and Table 1, the following is the summary of contamination present in SMA-7:

- Arsenic, cPAHs, and dioxins and furans were detected at concentrations greater than the Human Health cleanup levels.

- COCs detected at concentrations greater than the Benthic cleanup levels are not present.
- SOC (wood debris) greater than 15 percent by volume is not present.
- The depth of contamination is assumed to be 4 feet bml as shown on Figure 16.
- The estimated in-place volume of contaminated media is approximately 18,100 CY. For dredging alternatives, a 2-foot overdredge allowance is included and the total contaminated media volume in SMA-7 is approximately 27,150 CY. The volumes are calculated using the estimated depth of contamination presented for each SMA as shown on Figure 16.

6.3 Identification and Screening of Remedial Technologies

A remedial technology screening process was used to ensure that the cleanup action alternatives are based on technologies that are effective and implementable for the various conditions present in the Marine Area.

Remediation technologies were evaluated independently, as well as relative to other similar technologies with respect to the three primary screening criteria—effectiveness, implementability, and relative cost. For the technology screening process, effectiveness considered the ability of a technology to achieve the established cleanup objectives, the degree to which the technology protects human health and the environment during construction and implementation, and likely effectiveness, considering site-specific conditions. The evaluation of technology implementability included both technical and administrative feasibility—including the availability of products, services, and equipment needed to implement the technology safely and effectively, degree to which the technology has been demonstrated to be successfully implementable, ability to obtain necessary permits, regulatory and public acceptance, and compatibility with future uses of the Marine Area.

Cost is also considered at the technology screening level, but initially to a lower degree than effectiveness and implementability in favor of deferring the consideration of cost to the evaluation of alternatives. However, when multiple similar technologies are being evaluated, cost is considered to reduce the number of similar technologies used to develop the range of alternatives. Each technology is evaluated based on whether the relative costs (based on engineering judgment) are expected to be low, moderate, or high compared to other remedial technologies. The technologies that are identified to be technically effective, implementable, and cost-effective to address the specific parameters at the Marine Area are retained. Technologies are not retained for further evaluation if they are determined to be not effective, not applicable to Marine Area conditions or are anticipated to be technically too difficult or costly to implement.

The range of remedial technologies evaluated was drawn from criteria listed in SMS (WAC 173-204- 570(4)(b)) for cleanup of contaminated sediment, and those technologies listed in EPA publications, vendor information, and professional experience gained at similar sites. The technologies screened for the Marine Area are identified in a list below. The following list also identifies whether the technology was retained or not based on technology screening results for the screening criteria (implementability, effectiveness and relative cost) for each technology. Refer to Table 5 for additional detail.

- No Action (retained).
- Institutional controls (ICs; retained).
- Natural recovery, including:
  - Monitored natural recovery (MNR; retained).
  - Enhanced natural recovery (ENR; retained).
- Capping, including:
  - Conventional sand caps, with and without armoring (not retained).
  - Amended/reactive caps, with and without armoring (not retained).
  - Dynamic sand caps (retained).
- In-place containment (retained).
- Removal through excavation or dredging (retained).
- Disposal, including:
  - Off-site upland landfill disposal (retained).
  - Confined disposal facility (CDF; retained).
  - Contained aquatic disposal (not retained),
  - Aquatic open water disposal (not retained).
  - Beneficial reuse (not retained).
- Ex-situ sediment treatment, including:
  - Bioremediation (not retained).
  - Incineration (not retained).
  - Sediment washing (not retained).
  - Solidification/stabilization (not retained).
- In-situ sediment chemical treatment (not retained).

The applicability of retained remedial technologies was evaluated for each SMA. The SMAs and applicable remedial technologies used in the development of alternatives are summarized below and described relative to the technology screening in Table 5:

- SMA-1:
  - 1a – MNR and ENR
  - 1b – MNR and ENR
  - 1c – MNR and ENR
  - 1d – MNR, ENR, Dynamic Sand Capping, and Removal
- SMA-2:
  - 2a – Removal
  - 2b – Removal
- SMA-3:
  - 3a – Removal
  - 3b – Removal
  - 3c – Removal
- SMA-4: No Action
- SMA-5: Removal and Containment/CDF
- SMA-6: Removal
- SMA-7: MNR, ENR, and Removal with Backfill

Additionally, the following technologies are applicable to the Marine Area under the circumstances described below:

- Institutional controls are applicable if the remedial actions implemented in the Marine Area leave contamination in place.
- Off-site transport and disposal of contaminated dredged material is applicable if the remedial actions implemented in the Marine Area involve removal of contaminated material and a CDF is not utilized, or volume is in excess of the CDF capacity.
- Disposal of contaminated dredged material into an on-Site CDF is applicable if the remedial actions implemented involve generation of contaminated material and the CDF facility can be constructed in a manner that does not conflict overall cleanup or with the future uses of the Site.

6.4 Remedial Alternatives

Ten remedial alternatives (Alternatives 1 through 10) were developed using the retained remediation technologies as applicable to the conditions at the Marine Area and within each SMA. The remedial alternatives were created to achieve the CAOs, meet MTCA and SMS minimum requirements, meet cleanup standards at the completion of construction or within a 10-year restoration timeframe,[7] and considers current and future use requirements at the Site.

The remedial alternatives share several common elements. These elements were consistent across the ten alternatives and therefore, did not affect the relative comparison of the alternatives. However, to estimate the cost more completely for each alternative, the costs for the common elements are included in the total estimated cost for each alternative. The following elements are common to the alternatives evaluated.

- Perform dredging activities to fully remove contaminated media from SMA-2 (2a and 2b), SMA-3 (3a through 3c) and SMA-6.
- No action in SMA-4 because contamination was completely removed from this SMA as part of 2016 Pacific Terminal Interim Action and therefore, additional remedial action is not needed.
- Install South Terminal toe wall to facilitate full removal of contaminated media in SMA-6 and protect the adjacent South Terminal wharf structure and underlying armored slopes from dredging activities.
- Perform removal and off-site disposal of the existing pile-supported roll-on/roll-off berthing pier and associated dolphins, located within SMA-5 and SMA-6 to allow for implementation of remedial technologies selected for these SMAs as described in the following sections.
- Implement ICs.
- Perform compliance and long-term monitoring.

Alternatives 1 through 5 are like Alternatives 6 through 10, respectively, except for the remedial technologies considered for SMA-5 and the disposal options considered for contaminated dredged material. Alternatives 1 through 5 include full removal of contaminated media from SMA-5 and disposal of contaminated dredged material at an offsite permitted landfill facility.

[7] As defined in WAC 173-340-360(4), restoration timeframe is a period needed for a cleanup action to achieve cleanup standards. In accordance with SCUM, a 10-year period is considered a reasonable restoration timeframe. If restoration takes longer, the impacted area is designated as a sediment recovery zone (SRZ), and additional cleanup and monitoring requirements are applicable as per the SCUM. Each alternative is expected to meet the 10-year reasonable restoration timeframe and therefore establishment of SRZ is not required.

Alternatives 6 through 10 include establishing a CDF within SMA-5 that contains the in-place contamination and creates capacity for disposal of dredged material from other SMAs. Alternatives 6 through 10 include disposal of contaminated dredged material in the on-site CDF and disposal of remaining contaminated dredged material that cannot be accommodated into the CDF at an offsite permitted landfill facility.

For each alternative, a concept-level cost estimate was developed as part of Marine Area RI/FS using a combination of published engineering reference manuals (i.e., RS Means Heavy Construction Cost Data Manual), construction cost estimates solicited from applicable vendors and contractors, review of actual costs incurred during similar projects and professional engineering judgment. The FS-level cost estimates include cost for construction, professional services and long-term monitoring, and includes a 30 percent contingency. According to EPA's FS cost estimate guidance (EPA 2000), the accuracy of FS-level cost estimate should be in the range of -30 to +50 percent.

The sections below present a general summary and total estimated cost of each remedial alternative. A detailed description of each alternative is presented in the Marine Area RI/FS.

6.4.1 Summary of Alternative 1

The components of Alternative 1 are summarized below and in Figures A-1 and A-1A through A-1D of Appendix A. The total cost including construction, professional/technical services, long-term monitoring, and contingency for Alternative 1 is estimated at $230.9 million as detailed in the Marine Area RI/FS.

- Implement MNR in SMA-1 (1a through 1d) and SMA-7.
- Perform removal and off-site disposal of existing pile-supported roll-on/roll-off berthing pier and associated dolphins. Rebuild the structures following the completion of the cleanup action.
- Remove existing armoring located within SMA-5 and SMA-6 to provide access to the underlying contaminated material. Temporarily stockpile the removed armoring in the upland portions of the Site and reuse for site restoration, as necessary.
- Install an upland retaining wall to facilitate full removal of contaminated media in SMA-5 and protect the adjacent upland areas and wharf structures from dredging activities. Perform ground improvement activities to provide seismic stability to the upland retaining wall.
- Install a toe wall at the South Terminal to facilitate full removal of contaminated media in SMA-6 and protect the adjacent South Terminal wharf structure and underlying armored slopes from dredging activities.

- Perform dredging activities to fully remove contaminated media from SMA-2 (2a and 2b), -3 (3a through 3c), -5 and -6. Perform dredging activities in SMA-1d to provide stable transition slopes to allow full removal in adjacent SMA-2a.
- Perform progress and post-construction bathymetric surveys of dredged areas for quality control purposes and to document as-built conditions.
- Dewater dredged material on the material barges and release the collected water back to the marine waters in accordance with the requirements of the permits.
- Offload contaminated dredged material from material barges directly into trucks and trailers (or containers) at the South Terminal facility for off-Site transport.
- Transport and dispose contaminated dredged material at a permitted upland landfill facility.
- Implement institutional controls, as necessary.
- Perform compliance and long-term monitoring activities including:
    - Post-dredge surface sediment sampling and analysis within SMA-2, -3, -5 and -6 to meet the compliance monitoring requirements of MTCA and SMS.
    - Baseline and long-term periodic surface sediment sampling and analysis within SMA-1 and -7 to evaluate the natural recovery processes.

At the completion of construction of Alternative 1, cleanup standards will be met in SMAs where full removal is implemented. As a result of MNR being implemented in the remaining SMAs, cleanup standards are expected to be met throughout the Marine Area within a 10-year restoration timeframe. The COCs and SOC exceeding the cleanup standards remaining at the completion of construction will be subject to reduction in concentration over time through natural recovery and include:

- cPAHs and dioxin/furans exceeding the cleanup standards for the protection of human health and higher trophic level ecological receptors with surface weighted average concentration (SWAC) exceedance ratio (ER) of 1.51 and 1.32, respectively in SMA-1 (1a through 1d) and -7 as presented in the Marine Area RI/FS.
- PCB, LPAHs, phenols and miscellaneous extractables exceeding the cleanup standards for the protection of benthic organisms with ER of up to 1.6, 1.7, 1.5, and 1.5, respectively, in SMA-1 (1a, 1b and 1d).
- Wood debris more than 15 percent in SMA-1c and 1d.

6.4.2 Summary of Alternative 2

The components of Alternative 2 are summarized below and in Figures A-2 and A-2A through A-2D of Appendix A. The total cost including construction, professional/technical services, long-term monitoring, and contingency for Alternative 2 is estimated at $233.1 million as detailed in the Marine Area RI/FS.

- Implement MNR in SMA-1a.
- Implement ENR (placement of clean imported sand mass equivalent of a 6-inch layer) in SMA-1b, -1c, -1d and -7.
- Perform removal and off-site disposal of existing pile-supported roll-on/roll-off berthing pier and associated dolphins. Rebuild the structures following the completion of the cleanup action.
- Remove existing armoring located within SMA-5 and SMA-6 to provide access to the underlying contaminated material. Temporarily stockpile the removed armoring in the upland portions of the Site and reuse for site restoration, as necessary.
- Install an upland retaining wall to facilitate full removal of contaminated media in SMA-5 and protect the adjacent upland areas and wharf structures from dredging activities. Perform ground improvement activities to provide seismic stability to the upland retaining wall.
- Install a toe wall at the South Terminal to facilitate full removal of contaminated media in SMA-6 and protect the adjacent South Terminal wharf structure and underlying armored slopes from dredging activities.
- Perform dredging activities to fully remove contaminated media from SMA-2 (2a and 2b), -3 (3a through 3c), -5 and -6. Perform dredging activities in SMA-1d to provide stable transition slopes to allow full removal in adjacent SMA-2a.
- Perform progress and post-construction bathymetric surveys of dredged areas for quality control purposes and to document as-built conditions.
- Dewater dredged material on the material barges and release the collected water back to the marine waters in accordance with the requirements of the permits.
- Offload contaminated dredged material from material barges directly into trucks and trailers (or containers) at the South Terminal facility for off-Site transport.
- Transport and dispose contaminated dredged material at a permitted upland landfill facility.
- Implement institutional controls, as necessary.
- Perform compliance and long-term monitoring activities including:

- Post-dredge surface sediment sampling and analysis within SMA-2, -3, -5 and -6 to meet the compliance monitoring requirements of MTCA and SMS.
- Baseline and long-term periodic surface sediment sampling and analysis within SMA-1 and -7 to evaluate the natural recovery processes.

At the completion of construction of Alternative 2, cleanup standards will be met in SMAs where full removal is implemented. As a result of MNR and ENR being implemented in the remaining SMAs, cleanup standards are expected to be met throughout the Marine Area within a 10-year restoration timeframe. The COCs exceeding the cleanup standards remaining at the completion of construction will be subject to reduction in concentration over time through natural recovery and include:

- cPAHs exceeding the cleanup standards for the protection of human health and higher trophic level ecological receptors with SWAC ER of 1.22 and in SMA-1 (1a through 1d) and -7 as presented in the Marine Area RI/FS.
- 4-methylphenol exceeding the cleanup standards for the protection of benthic organisms with ER of up to 1.2 in SMA-1a.

6.4.3 Summary of Alternative 3

The components of Alternative 3 are summarized below and in Figures A-3 and A-3A through A-3D of Appendix A. The total cost including construction, professional/technical services, long-term monitoring, and contingency for Alternative 3 is estimated at $238.8 million as detailed in the Marine Area RI/FS.

- Implement MNR in SMA-1a.
- Implement ENR (placement of clean imported sand mass equivalent of a 6-inch layer) in SMA-1b, -1c, and -7.
- Perform removal and off-site disposal of existing pile-supported roll-on/roll-off berthing pier and associated dolphins. Rebuild the structures following the completion of the cleanup action.
- Remove existing armoring located within SMA-5 and SMA-6 to provide access to the underlying contaminated material. Temporarily stockpile the removed armoring in the upland portions of the Site and reuse for site restoration, as necessary.
- Install an upland retaining wall to facilitate full removal of contaminated media in SMA-5 and protect the adjacent upland areas and wharf structures from dredging activities. Perform ground improvement activities to provide seismic stability to the upland retaining wall.

- Install a toe wall at the South Terminal to facilitate full removal of contaminated media in SMA-6 and protect the adjacent South Terminal wharf structure and underlying armored slopes from dredging activities.
- Perform dredging activities to fully remove contaminated media from SMA-2 (2a and 2b), -3 (3a through 3c), -5 and -6. Perform dredging activities in SMA-1d to provide stable transition slopes to allow full removal in adjacent SMA-2a and to ensure that the dynamic sand cap placed in SMA-1d is not above the maximum scour elevation (i.e., -55 feet MLLW).
- Implement dynamic sand capping (placement of clean imported sand mass equivalent of a 3-foot layer) in SMA-1d.
- Perform progress and post-construction bathymetric surveys of dredged areas for quality control purposes and to document as-built conditions.
- Dewater dredged material on the material barges and release the collected water back to the marine waters in accordance with the requirements of the permits.
- Offload contaminated dredged material from material barges directly into trucks and trailers (or containers) at the South Terminal facility for off-Site transport.
- Transport and dispose contaminated dredged material at a permitted upland landfill facility.
- Implement institutional controls, as necessary.
- Perform compliance and long-term monitoring activities including:
  - Post-dredge surface sediment sampling and analysis within SMA-2, -3, -5 and -6 to meet the compliance monitoring requirements of MTCA and SMS.
  - Baseline and long-term periodic surface sediment sampling and analysis within SMA-1a, 1b, 1c and -7 to evaluate the natural recovery processes.
  - Baseline and long-term periodic surface sediment sampling and analysis within SMA-1d to evaluate the effectiveness of the dynamic sand cap.

At the completion of construction of Alternative 3, cleanup standards will be met in SMAs where full removal is implemented. As a result of MNR and ENR being implemented in the remaining SMAs, cleanup standards are expected to be met throughout the Marine Area within a 10-year restoration timeframe. The COCs exceeding the cleanup standards remaining at the completion of construction will be subject to reduction in concentration over time through natural recovery and include:

- cPAHs exceeding the cleanup standards for the protection of human health and higher trophic level ecological receptors with SWAC ER of 1.12 and in SMAs-1a through -1c and -7 as presented in the Marine Area RI/FS.

- 4-methylphenol exceeding the cleanup standards for the protection of benthic organisms with ER of up to 1.2 in SMA-1a.

6.4.4 Summary of Alternative 4

The components of Alternative 4 are summarized below and in Figures A-4 and A-4A through A-4D of Appendix A. The total cost including construction, professional/technical services, long-term monitoring, and contingency for Alternative 4 is estimated at $243.7 million as detailed in the Marine Area RI/FS.

- Implement MNR in SMA-1a.
- Implement ENR (placement of clean imported sand mass equivalent of a 6-inch layer) in SMA-1b, -1c, and -7.
- Perform removal and off-site disposal of existing pile-supported roll-on/roll-off berthing pier and associated dolphins. Rebuild the structures following the completion of the cleanup action.
- Remove existing armoring located within SMA-5 and SMA-6 to provide access to the underlying contaminated material. Temporarily stockpile the removed armoring in the upland portions of the Site and reuse for site restoration, as necessary.
- Install an upland retaining wall to facilitate full removal of contaminated media in SMA-5 and protect the adjacent upland areas and wharf structures from dredging activities. Perform ground improvement activities to provide seismic stability to the upland retaining wall.
- Install a toe wall at the South Terminal to facilitate full removal of contaminated media in SMA-6 and protect the adjacent South Terminal wharf structure and underlying armored slopes from dredging activities.
- Perform dredging activities to fully remove contaminated media from SMA-1d, -2 (2a and 2b), -3 (3a through 3c), -5 and -6. Perform dredging activities in SMA-1d to provide stable transition slopes to allow full removal in adjacent SMA-2a.
- Perform progress and post-construction bathymetric surveys of dredged areas for quality control purposes and to document as-built conditions.
- Dewater dredged material on the material barges and release the collected water back to the marine waters in accordance with the requirements of the permits.
- Offload contaminated dredged material from material barges directly into trucks and trailers (or containers) at the South Terminal facility for off-Site transport.

- Transport and dispose contaminated dredged material at a permitted upland landfill facility.
- Implement institutional controls, as necessary.
- Perform compliance and long-term monitoring activities including:
    - Post-dredge surface sediment sampling and analysis within SMA-1d, -2, -3, -5 and -6 to meet the compliance monitoring requirements of MTCA and SMS.
    - Baseline and long-term periodic surface sediment sampling and analysis within SMA-1a, 1b, 1c and -7 to evaluate the natural recovery processes.

At the completion of construction of Alternative 4, cleanup standards will be met in SMAs where full removal is implemented. As a result of MNR and ENR being implemented in the remaining SMAs, cleanup standards are expected to be met throughout the Marine Area within a 10-year restoration timeframe. The COCs exceeding the cleanup standards remaining at the completion of construction will be subject to reduction in concentration over time through natural recovery and include:

- cPAHs exceeding the cleanup standards for the protection of human health and higher trophic level ecological receptors with SWAC ER of 1.13 and in SMAs-1a through -1c and -7 as presented in the Marine Area RI/FS.
- 4-methylphenol exceeding the cleanup standards for the protection of benthic organisms with ER of up to 1.2 in SMA-1a.

6.4.5 Summary of Alternative 5

The components of Alternative 5 are summarized below and in Figures A-5 and A-5A through A-5D of Appendix A. The total cost including construction, professional/technical services, long-term monitoring, and contingency for Alternative 5 is estimated at $258.0 million as detailed in the Marine Area RI/FS.

- Implement ENR (placement of clean imported sand mass equivalent of a 6-inch layer) in SMA-1a, -1b and -1c.
- Perform removal and off-site disposal of existing pile-supported roll-on/roll-off berthing pier and associated dolphins. Rebuild the structures following the completion of the cleanup action.
- Remove existing armoring located within SMA-5 and SMA-6 to provide access to the underlying contaminated material. Temporarily stockpile the removed armoring in the upland portions of the Site and reuse for site restoration, as necessary.

- Install an upland retaining wall to facilitate full removal of contaminated media in SMA-5 and protect the adjacent upland areas and wharf structures from dredging activities. Perform ground improvement activities to provide seismic stability to the upland retaining wall.
- Install a toe wall at the South Terminal to facilitate full removal of contaminated media in SMA-6 and protect the adjacent South Terminal wharf structure and underlying armored slopes from dredging activities.
- Perform dredging activities to fully remove contaminated media from SMA-1d, -2 (2a and 2b), -3 (3a through 3c), -5, -6 and -7. Perform dredging activities in SMA-1d to provide stable transition slopes to allow full removal in adjacent SMA-2a.
- Perform progress and post-construction bathymetric surveys of dredged areas for quality control purposes and to document as-built conditions.
- Dewater dredged material on the material barges and release the collected water back to the marine waters in accordance with the requirements of the permits.
- Offload contaminated dredged material from material barges directly into trucks and trailers (or containers) at the South Terminal facility for off-Site transport.
- Transport and dispose contaminated dredged material at a permitted upland landfill facility.
- Backfill SMA-7 with clean imported sand to restore existing critical habitat elevations.
- Implement institutional controls, as necessary.
- Perform compliance and long-term monitoring activities including:
  - Post-dredge surface sediment sampling and analysis within SMA-1d, -2, -3, -5, -6 and -7 to meet the compliance monitoring requirements of MTCA and SMS.
  - Baseline and long-term periodic surface sediment sampling and analysis within SMA-1a, 1b, and 1c to evaluate the natural recovery processes.

At the completion of construction of Alternative 5, cleanup standards will be met at the Marine Area.

6.4.6 Summary of Alternative 6

The components of Alternative 6 are summarized below and in Figures A-6 and A-6A through A-6D of Appendix A. The total cost including construction, professional/technical services, long-term monitoring, and contingency for Alternative 6 is estimated at $201.9 million as detailed in the Marine Area RI/FS.

- Implement MNR in SMA-1 (1a through 1d) and SMA-7.

- Perform removal and off-site disposal of existing pile-supported roll-on/roll-off berthing pier and associated dolphins. The structures would not be replaced due to the presence of the containment and CDF structure as discussed below.
- Remove existing armoring located within SMA-6 to provide access to the underlying contaminated material. Temporarily stockpile the removed armoring in the upland portions of the Site and reuse for site restoration, as necessary.
- Install a containment and CDF wall to contain the contaminated media located within SMA-5 and provide confined space for on-Site disposal of contaminated dredged material generated from the other SMAs. Perform ground improvement activities to provide seismic stability to the containment and CDF wall. Reroute storm drain system for outfalls discharging into SMA-5.
- Install a toe wall at the South Terminal to facilitate full removal of contaminated media in SMA-6 and protect the adjacent South Terminal wharf structure and underlying armored slopes from dredging activities.
- Perform dredging activities to fully remove contaminated media from SMA-2 (2a and 2b), -3 (3a through 3c), and -6. Perform dredging activities in SMA-1d to provide stable transition slopes to allow full removal in adjacent SMA-2a.
- Perform progress and post-construction bathymetric surveys of dredged areas for quality control purposes and to document as-built conditions.
- Dewater dredged material on the material barges and release the collected water back to the marine waters in accordance with the requirements of the permits.
- Place contaminated dredged material from barges into the CDF. Perform material management such that the disposed material is evenly distributed, consolidated, amended (if necessary) and compacted within the CDF facility below the mean groundwater elevation in the adjacent upland areas.
- Cover the CDF area with a cap (a layer of clean imported fill material overlain by an asphalt surface with a stormwater management system) to isolate the contaminated dredge material and prevent stormwater infiltration and exposure.
- Offload contaminated dredged material that cannot be accommodated inside the CDF from material barges directly into trucks and trailers (or containers) at the South Terminal facility for off-Site transport.
- Transport and dispose of contaminated dredged material that cannot be accommodated inside the CDF at a permitted upland landfill facility.
- Implement institutional controls, as necessary.

- Perform compliance and long-term monitoring activities including:
  - Post-dredge surface sediment sampling and analysis within SMA-2, -3, and -6 to meet the compliance monitoring requirements of MTCA and SMS.
  - Baseline and long-term periodic surface sediment sampling and analysis within SMA-1 and -7 to evaluate the natural recovery processes.
  - Long-term monitoring of the CDF in SMA-5.

At the completion of construction of Alternative 6, cleanup standards will be met in SMAs where full removal and containment/CDF are implemented. As a result of MNR being implemented in the remaining SMAs, cleanup standards are expected to be met throughout the Marine Area within a 10-year restoration timeframe. The COCs and SOC exceeding the cleanup standards remaining at the completion of construction will be subject to reduction in concentration over time through natural recovery and include:

- cPAHs and dioxin/furans exceeding the cleanup standards for the protection of human health and higher trophic level ecological receptors with SWAC ER of 1.51 and 1.32, respectively in SMA-1 (1a through 1d) and SMA-7 as presented in the Marine Area RI/FS.
- PCB, LPAHs, phenols and miscellaneous extractables exceeding the cleanup standards for the protection of benthic organisms with ER of up to 1.6, 1.7, 1.5, and 1.5, respectively, in SMA-1 (1a, 1b and 1d).
- Wood debris in excess of 15 percent in SMA-1c and 1d.

6.4.7 Summary of Alternative 7

The components of Alternative 7 are summarized below and in Figures A-7 and A-7A through A-7D of Appendix A. The total cost including construction, professional/technical services, long-term monitoring, and contingency for Alternative 7 is estimated at $204.0 million as detailed in the Marine Area RI/FS.

- Implement MNR in SMA-1a.
- Implement ENR (placement of clean imported sand mass equivalent of a 6-inch layer) in SMA-1b, -1c, -1d and -7.
- Perform removal and off-site disposal of existing pile-supported roll-on/roll-off berthing pier and associated dolphins. The structures would not be replaced due to the presence of the containment and CDF structure as discussed below.
- Remove existing armoring located within SMA-6 to provide access to the underlying contaminated material. Temporarily stockpile the removed armoring in the upland portions of the Site and reuse for site restoration, as necessary.

- Install a containment and CDF wall to contain the contaminated media located within SMA-5 and provide confined space for on-Site disposal of contaminated dredged material generated from the other SMAs. Perform ground improvement activities to provide seismic stability to the containment and CDF wall. Reroute storm drain system for outfalls discharging into SMA-5.
- Install a toe wall at the South Terminal to facilitate full removal of contaminated media in SMA-6 and protect the adjacent South Terminal wharf structure and underlying armored slopes from dredging activities.
- Perform dredging activities to fully remove contaminated media from SMA-2 (2a and 2b), -3 (3a through 3c), and -6. Perform dredging activities in SMA-1d to provide stable transition slopes to allow full removal in adjacent SMA-2a.
- Perform progress and post-construction bathymetric surveys of dredged areas for quality control purposes and to document as-built conditions.
- Dewater dredged material on the material barges and release the collected water back to the marine waters in accordance with the requirements of the permits.
- Place contaminated dredged material from barges into the CDF. Perform material management such that the disposed material is evenly distributed, consolidated, amended (if necessary) and compacted within the CDF facility below the mean groundwater elevation in the adjacent upland areas.
- Cover the CDF area with a cap (a layer of clean imported fill material overlain by an asphalt surface with a stormwater management system) to isolate the contaminated dredge material and prevent stormwater infiltration and exposure.
- Offload contaminated dredged material that cannot be accommodated inside the CDF from material barges directly into trucks and trailers (or containers) at the South Terminal facility for off-Site transport.
- Transport and dispose of contaminated dredged material that cannot be accommodated inside the CDF at a permitted upland landfill facility.
- Implement institutional controls, as necessary.
- Perform compliance and long-term monitoring activities including:
  - Post-dredge surface sediment sampling and analysis within SMA-2, -3, and -6 to meet the compliance monitoring requirements of MTCA and SMS.
  - Baseline and long-term periodic surface sediment sampling and analysis within SMA-1 and -7 to evaluate the natural recovery processes.
  - Long-term monitoring of the CDF in SMA-5.

At the completion of construction of Alternative 7, cleanup standards will be met in SMAs where full removal and containment/CDF are implemented. As a result of MNR and ENR being implemented in the remaining SMAs, cleanup standards are expected to be met throughout the Marine Area within a 10-year restoration timeframe. The COCs exceeding the cleanup standards remaining at the completion of construction will be subject to reduction in concentration over time through natural recovery and include:

- Total cPAHs exceeding the cleanup standards for the protection of human health and higher trophic level ecological receptors with SWAC ER of 1.22 and in SMA-1 (1a through 1d) and 7 as presented in the Marine Area RI/FS.
- 4-methylphenol exceeding the cleanup standards for the protection of benthic organisms with ER of up to 1.2 in SMA-1a.

6.4.8 Summary of Alternative 8

The components of Alternative 8 are summarized below and in Figures A-8 and A-8A through A-8D of Appendix A. The total cost including construction, professional/technical services, long-term monitoring, and contingency for Alternative 8 is estimated at $209.8 million as detailed in the Marine Area RI/FS.

- Implement MNR in SMA-1a.
- Implement ENR (placement of clean imported sand mass equivalent of a 6-inch layer) in SMA-1b, -1c, and -7.
- Perform removal and off-site disposal of existing pile-supported roll-on/roll-off berthing pier and associated dolphins. The structures would not be replaced due to the presence of the containment and CDF structure as discussed below.
- Remove existing armoring located within SMA-6 to provide access to the underlying contaminated material. Temporarily stockpile the removed armoring in the upland portions of the Site and reuse for site restoration, as necessary.
- Install a containment and CDF wall to contain the contaminated media located within SMA-5 and provide confined space for on-Site disposal of contaminated dredged material generated from the other SMAs. Perform ground improvement activities to provide seismic stability to the containment and CDF wall. Reroute storm drain system for outfalls discharging into SMA-5.
- Install a toe wall at the South Terminal to facilitate full removal of contaminated media in SMA-6 and protect the adjacent South Terminal wharf structure and underlying armored slopes from dredging activities.

- Perform dredging activities to fully remove contaminated media from SMA-2 (2a and 2b), -3 (3a through 3c), and -6. Perform dredging activities in SMA-1d to provide stable transition slopes to allow full removal in adjacent SMA-2a and to ensure that the dynamic sand cap placed in SMA-1d is not above the maximum scour elevation (i.e., -55 feet MLLW).
- Implement dynamic sand capping (placement of clean imported sand mass equivalent of a 3-foot layer) in SMA-1d.
- Perform progress and post-construction bathymetric surveys of dredged areas for quality control purposes and to document as-built conditions.
- Dewater dredged material on the material barges and release the collected water back to the marine waters in accordance with the requirements of the permits.
- Place contaminated dredged material from barges into the CDF. Perform material management such that the disposed material is evenly distributed, consolidated, amended (if necessary) and compacted within the CDF facility below the mean groundwater elevation in the adjacent upland areas.
- Cover the CDF area with a cap (a layer of clean imported fill material overlain by an asphalt surface with a stormwater management system) to isolate the contaminated dredge material and prevent stormwater infiltration and exposure.
- Offload contaminated dredged material that cannot be accommodated inside the CDF from material barges directly into trucks and trailers (or containers) at the South Terminal facility for off-Site transport.
- Transport and dispose of contaminated dredged material that cannot be accommodated inside the CDF at a permitted upland landfill facility.
- Implement institutional controls, as necessary.
- Perform compliance and long-term monitoring activities including:
    - Post-dredge surface sediment sampling and analysis within SMA-2, -3, and -6 to meet the compliance monitoring requirements of MTCA and SMS.
    - Baseline and long-term periodic surface sediment sampling and analysis within SMA-1a, 1b, 1c and -7 to evaluate the natural recovery processes.
    - Baseline and long-term periodic surface sediment sampling and analysis within SMA-1d to evaluate the effectiveness of the dynamic sand cap.
    - Long-term monitoring of the CDF in SMA-5.

At the completion of construction of Alternative 8, cleanup standards will be met in SMAs where full removal, containment/CDF and capping are implemented. As a result of MNR and ENR being implemented in the remaining SMAs, cleanup standards are expected to be met throughout the Marine Area within a 10-year restoration timeframe. The COCs exceeding the cleanup standards remaining at the completion of construction will be subject to reduction in concentration over time through natural recovery and include:

- Total cPAHs exceeding the cleanup standards for the protection of human health and higher trophic level ecological receptors with SWAC ER of 1.12 and in SMAs-1a through -1c and -7 as presented in the Marine Area RI/FS.
- 4-methylphenol exceeding the cleanup standards for the protection of benthic organisms with ER of up to 1.2 in SMA-1a.

6.4.9 Summary of Alternative 9

The components of Alternative 9 are summarized below and in Figures A-9 and A-9A through A-9D of Appendix A. The total cost including construction, professional/technical services, long-term monitoring, and contingency for Alternative 9 is estimated at $214.7 million as detailed in the Marine Area RI/FS.

- Implement MNR in SMA-1a.
- Implement ENR (placement of clean imported sand mass equivalent of a 6-inch layer) in SMA-1b, -1c, and -7.
- Perform removal and off-site disposal of existing pile-supported roll-on/roll-off berthing pier and associated dolphins. The structures would not be replaced due to the presence of the containment and CDF structure as discussed below.
- Remove existing armoring located within SMA-6 to provide access to the underlying contaminated material. Temporarily stockpile the removed armoring in the upland portions of the Site and reuse for site restoration, as necessary.
- Install a containment and CDF wall to contain the contaminated media located within SMA-5 and provide confined space for on-Site disposal of contaminated dredged material generated from the other SMAs. Perform ground improvement activities to provide seismic stability to the containment and CDF wall. Reroute storm drain system for outfalls discharging into SMA-5.
- Install a toe wall at the South Terminal to facilitate full removal of contaminated media in SMA-6 and protect the adjacent South Terminal wharf structure and underlying armored slopes from dredging activities.

- Perform dredging activities to fully remove contaminated media from SMA-1d, -2 (2a and 2b), -3 (3a through 3c), and -6. Perform dredging activities in SMA-1d to provide stable transition slopes to allow full removal in adjacent SMA-2a.
- Perform progress and post-construction bathymetric surveys of dredged areas for quality control purposes and to document as-built conditions.
- Dewater dredged material on the material barges and release the collected water back to the marine waters in accordance with the requirements of the permits.
- Place contaminated dredged material from barges into the CDF. Perform material management such that the disposed material is evenly distributed, consolidated, amended (if necessary) and compacted within the CDF facility below the mean groundwater elevation in the adjacent upland areas.
- Cover the CDF area with a cap (a layer of clean imported fill material overlain by an asphalt surface with a stormwater management system) to isolate the contaminated dredge material and prevent stormwater infiltration and exposure.
- Offload contaminated dredged material that cannot be accommodated inside the CDF from material barges directly into trucks and trailers (or containers) at the South Terminal facility for off-Site transport.
- Transport and dispose of contaminated dredged material that cannot be accommodated inside the CDF at a permitted upland landfill facility.
- Implement institutional controls, as necessary.
- Perform compliance and long-term monitoring activities including:
    - Post-dredge surface sediment sampling and analysis within SMA-1d, 2, -3, and -6 to meet the compliance monitoring requirements of MTCA and SMS.
    - Baseline and long-term periodic surface sediment sampling and analysis within SMA-1a, 1b, 1c and -7 to evaluate the natural recovery processes.
    - Long-term monitoring of the CDF in SMA-5.

At the completion of construction of Alternative 9, cleanup standards will be met in SMAs where full removal and containment/CDF are implemented. As a result of MNR and ENR being implemented in the remaining SMAs, cleanup standards are expected to be met throughout the Marine Area within a 10-year restoration timeframe. The COCs exceeding the cleanup standards remaining at the completion of construction will be subject to reduction in concentration over time through natural recovery and include:

- cPAHs exceeding the cleanup standards for the protection of human health and higher trophic level ecological receptors with SWAC ER of 1.13 and in SMAs-1a through -1c and -7 as presented in the Marine Area RI/FS.
- 4-methylphenol exceeding the cleanup standards for the protection of benthic organisms with ER of up to 1.2 in SMA-1a.

6.4.10 Summary of Alternative 10

The components of Alternative 9 are summarized below and in Figures A-10 and A-10A through A-10D of Appendix A. The total cost including construction, professional/technical services, long-term monitoring, and contingency for Alternative 9 is estimated at $229.0 million as detailed in the Marine Area RI/FS.

- Implement ENR (placement of clean imported sand mass equivalent of a 6-inch layer) in SMA-1a, -1b and -1c.
- Perform removal and off-site disposal of existing pile-supported roll-on/roll-off berthing pier and associated dolphins. The structures would not be replaced due to the presence of the containment and CDF structure as discussed below.
- Remove existing armoring located within SMA-6 to provide access to the underlying contaminated material. Temporarily stockpile the removed armoring in the upland portions of the Site and reuse for site restoration, as necessary.
- Install a containment and CDF wall to contain the contaminated media located within SMA-5 and provide confined space for on-Site disposal of contaminated dredged material generated from the other SMAs. Perform ground improvement activities to provide seismic stability to the containment and CDF wall. Reroute storm drain system for outfalls discharging into SMA-5.
- Install a toe wall at the South Terminal to facilitate full removal of contaminated media in SMA-6 and protect the adjacent South Terminal wharf structure and underlying armored slopes from dredging activities.
- Perform dredging activities to fully remove contaminated media from SMA-1d, -2 (2a and 2b), -3 (3a through 3c), -6, and -7. Perform dredging activities in SMA-1d to provide stable transition slopes to allow full removal in adjacent SMA-2a.
- Perform progress and post-construction bathymetric surveys of dredged areas for quality control purposes and to document as-built conditions.
- Dewater dredged material on the material barges and release the collected water back to the marine waters in accordance with the requirements of the permits.

- Place contaminated dredged material from barges into the CDF. Perform material management such that the disposed material is evenly distributed, consolidated, amended (if necessary) and compacted within the CDF facility below the mean groundwater elevation in the adjacent upland areas.
- Cover the CDF area with a cap (a layer of clean imported fill material overlain by an asphalt surface with a stormwater management system) to isolate the contaminated dredge material and prevent stormwater infiltration and exposure.
- Offload contaminated dredged material that cannot be accommodated inside the CDF from material barges directly into trucks and trailers (or containers) at the South Terminal facility for off-Site transport.
- Transport and dispose of contaminated dredged material that cannot be accommodated inside the CDF at a permitted upland landfill facility.
- Backfill SMA-7 with clean imported sand to restore existing critical habitat elevations.
- Implement institutional controls, as necessary.
- Perform compliance and long-term monitoring activities including:
  - Post-dredge surface sediment sampling and analysis within SMA-1d, 2, -3, -6, and -7 to meet the compliance monitoring requirements of MTCA and SMS.
  - Baseline and long-term periodic surface sediment sampling and analysis within SMA-1a, 1b, and 1c to evaluate the natural recovery processes.
  - Long-term monitoring of the CDF in SMA-5.

At the completion of construction of Alternative 10, cleanup standards will be met at the Marine Area.

7.0 Basis for the Selection of the Cleanup Action

This section summarizes evaluation criteria and evaluation results for the selection of the cleanup action based on the detailed evaluation performed as part of the Marine Area RI/FS. The Marine Area RI/FS evaluated the ten remedial alternatives against the minimum requirements and procedures described in WAC 173-340-360 and WAC 173-204-570.

7.1 MTCA/SMS Minimum Requirements

Cleanup actions performed under the SMS are evaluated based on the minimum requirements specified in WAC 173-204-570(3) and summarized below:

- Protect human health and the environment.
- Comply with all applicable laws, as defined in WAC 173-204-505(2).
- Comply with sediment cleanup standards specified in WAC 173-204-560 through 173-204-564.
- Use permanent solutions to the maximum extent practicable, as specified in WAC 173-204-570(4).
- Provide a reasonable restoration timeframe with a preference for those alternatives that, while equivalent in other respects, provide a shorter restoration time frame. Alternatives that achieve cleanup standards within 10 years of completion of construction of the active components of the cleanup action are presumed to have a reasonable restoration timeframe (Ecology 2021).
- Implement effective source controls where needed, with preference for source control measures more effective at minimizing future accumulation of contaminants in sediment caused by discharges.
- Meet the requirements for implementation of a sediment recovery zone (WAC 173-204-590) if cleanup standards cannot be achieved within 10 years.
- Provide for a permanent cleanup action where technically feasible instead of relying exclusively on MNR or institutional controls and monitoring. Where institutional controls are used, they must comply with WAC 173-340-440 to include measures that control exposures and ensure the integrity of the cleanup action.
- Provide an opportunity for review and comment by affected landowners and the general public consistent with the public participation plan, and consider concerns identified in these comments.
- Include adequate monitoring to ensure remedy effectiveness.
- Provide periodic review of remedy effectiveness where elements of a cleanup action include containment, enhanced or natural recovery, institutional controls, sediment cleanup levels based on practical quantitation limits, or sediment recovery zones.

In addition to the above minimum requirements, SMS stipulates that the evaluation of sediment cleanup actions shall provide sufficient information to fulfill the SEPA requirements (chapter 43.21C RCW) for the preferred remedy. A SEPA analysis of environmental impacts was undertaken for the cleanup action selected by Ecology. The SEPA evaluation and determination was provided for public review in parallel with public review of the CAP.

Table 6 presents the SMS evaluation criteria (minimum requirements) for the ten remedial alternatives. As identified in Table 6, the ten remedial alternatives meet the SMS minimum requirements for sediment cleanup actions. With regard to the minimum requirement that cleanup actions use permanent solutions to the maximum extent practicable, this is determined by a disproportionate cost analysis (DCA) of the alternatives as described in the following sections.

7.2 Disproportionate Cost Analysis (DCA)

MTCA and SMS require use of the DCA as a tool to compare benefits and costs of alternatives for the purpose of determining which alternative uses permanent solutions to the maximum extent practicable. The DCA process in the Marine Area RI/FS evaluated benefits and costs to make a relative comparison of cleanup action alternatives and identified the alternative whose incremental costs are not disproportionate to its incremental benefits (identified as the preferred alternative).

The following criteria defined in WAC 173-340-360(3)(f) and WAC 173-204-570(4) were used in the Marine Area RI/FS to evaluate and compare cleanup action alternatives in the DCA. Except for cost, each alternative was assigned a score for each of the criteria on a scale from 1 (low benefit) to 10 (high benefit). The raw scores and rationale for the scores for each alternative are presented in Table 7.

The scores for each alternative were adjusted using the following weighting factors, as outlined in Ecology's SCUM guidance (Ecology 2021):

- Protectiveness (30 percent of total benefit score).
- Permanence (20 percent of total benefit score).
- Long-term effectiveness (20 percent of total benefit score).
- Management of short-term risks (10 percent of total benefit score).
- Technical and administrative implementability (10 percent of total benefit score).
- Consideration of public concerns (10 percent of total benefit score).

The weighted benefit scores for each alternative were summed to create a total weighted benefit score for each alternative.

- The total cost is compared to the total weighted benefits score for each alternative.
- A relative benefit-to-cost ratio (the total weighted benefit score divided by the cost for each alternative) was completed to compare the cleanup action alternatives to determine whether costs are disproportionate to benefits. The cleanup action alternative with the highest benefit-to-cost ratio was determined to be permanent to the maximum extent practicable and identified as the preferred alternative. The

weighted benefit scores, total weighted relative benefit scores, costs and the benefit/cost ratio for each alternative are summarized in Table 8 and on Figure 17.

Alternative 8 has the highest benefit-to-cost ratio (7.60) and Alternative 1 has the lowest (6.16). Although the total weighted relative benefit scores for Alternatives 5, 9 and 10 are marginally higher than the total weighted relative benefit score for Alternative 8, the incremental cost required to achieve the marginally higher benefits for Alternatives 5, 9 and 10 are disproportionate, as indicated by the respective benefit-to-cost ratios. Therefore, Alternatives 5, 9 and 10 are disproportionately more costly relative to Alternative 8 and not considered to be practicable. Alternatives 1, 2, 3, 4, 6 and 7 provide lower benefits than Alternative 8, but also have lower benefit to cost ratios (range of 6.16 to 7.52), indicating that Alternative 8 is also not disproportionately costly relative to these alternatives.

Alternative 8 is identified to be permanent to the maximum extent practicable and is the preferred alternative for the Marine Area.

7.3 Indian Tribes, Vulnerable Populations, and Overburdened Communities

Pursuant to the requirements of WAC 173-340-351, WAC 173-340-360 and WAC 173-340-370, remedial alternatives were evaluated in the Marine Area RI/FS for their possible effects on Indian Tribes, vulnerable populations, and overburdened communities.

7.3.1 Identification of Potentially Affected Indian Tribes and Likely Vulnerable Populations and Overburdened Communities

Indian Tribes potentially interested in or affected by the Cleanup Action were initially identified in the Marine Area RI/FS based on the proximity of their reservation lands, traditional ceded lands, hunting areas, and usual and accustomed fishing grounds and stations (“U&A”) to the Site, as well as by use of the Department of Archeology and Historic Preservation’s Map of Tribal Areas of Interest. These Indian Tribes included the Tulalip Tribes, Suquamish Tribe, Swinomish Indian Tribal Community, Stillaguamish Tribe of Indians, Snoqualmie Indian Tribe, Sauk-Suiattle Indian Tribe, and Muckleshoot Indian Tribe. Engagement with these Indian Tribes consistent with WAC 173-340-620 confirmed the final list of Indian Tribes considered in this Site-specific analysis: the Tulalip Tribes and the Suquamish Tribe, both of which are signatories to the 1855 Treaty of Point Elliott. Additionally, the Tulalip Tribes and the Suquamish Tribe serve as the Tribal trustees for assessment and restoration of natural resource damages for the Port Gardner area under CERCLA, MTCA, chapter 90.48 RCW, the federal Clean Water Act, and the federal Oil Pollution Act of 1990. Possible impacts specific to these two Indian Tribes were evaluated in the Marine Area RI/FS primarily through review of information related to their exercise of tribal Treaty rights, reserved rights, and activities and measures identified from the Washington Department of Health's ("DOH's") Environmental Health Disparities (EHD) Mapping Tool.[8]

Likely vulnerable populations and overburdened communities potentially affected by the Site and/or Cleanup Action were identified using the EHD Mapping Tool and the EPA Environmental Justice Screening and Mapping Tool (EJScreen)[9]. In accordance with Ecology's Implementation Memorandum No. 25 (Ecology 2024), a vulnerable population or overburdened community has the potential to be exposed if any one of the following three criteria is met in census tracts located at the Site or along transportation routes used for the cleanup action:

- The potentially exposed population is located in a census tract that ranks a 9 or 10 on the EHD Index from the EHD Map.
- The potentially exposed population is located in a census tract that is at or above the 80th Washington State percentile of the Demographic Index from EJScreen.
- The potentially exposed population is located in a census tract that is at or above the 80th Washington State percentile of the Supplemental Demographic Index from EJScreen.

Likely vulnerable populations and overburdened communities potentially affected by the cleanup action were evaluated using the EHD Index from the EHD Map, and the Demographic Index and Supplemental Demographic Index from EJScreen as detailed in the Marine Area RI/FS and summarized below.

7.3.2 Analysis of Potential Impacts to Potentially Affected Indian Tribes

The Marine Area portion of the Site lies within the U&A of multiple Tribes. Because the Marine Area lies significantly waterward of the historical shoreline, it is not expected that submerged Tribal cultural resources will be encountered as part of the chosen remedy. However, the selected remedy will include an Inadvertent Discovery Plan (IDP) consistent with WAC 173-340-815.As described in the Marine Area RI/FS, all the remedial alternatives evaluated are considered to have similar post-construction benefits related to tribal consumption of fish and shellfish at the Site because each alternative would remediate sediment contamination and address human health risks. Other benefits of the alternatives were considered uniform because land use is expected to remain the same for the foreseeable future. Additionally, the intertidal area adjacent to the public access area at the south end of the Site will remain accessible following the cleanup.

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[8] Washington Environmental Health Disparities Map – https://fortress.wa.gov/doh/wtnibl/WTNIBL/
[9] EPA Environmental Justice Screening and Mapping Tool (EJScreen) – https://www.epa.gov/ejscreen

Current land use is assumed to remain unchanged and therefore under all alternatives are likely to have the same impacts. Impacts to the Tulalip Tribes and the Suquamish Tribe were also evaluated in the Marine Area RI/FS for construction impacts and post-construction effects.

- Alternatives 1 through 5 were determined to primarily impact tribal communities through emissions from off-Site truck and rail transportation of contaminated material. Net impacts from emissions due to off-Site truck and rail transportation for disposal are greater for Alternatives 1 through 5 as compared to Alternatives 6 through 10. This is the result of the increased volume of contaminated material requiring transportation off-Site for disposal and the resulting emissions as compared to on-site disposal which will not require the same level of off-Site transportation. To the extent Tribal members live in the vicinity of the offsite disposal transportation routes, they would be impacted in the same manner as described below for vulnerable populations and overburdened communities (see Section 7.3.3). Some emissions will be generated as part of importing materials for the construction of the CDF under Alternatives 6 through 10. However, the number of truck and rail loads is expected to be significantly lower than what will be required for the offsite disposal.
- Each alternative will have impacts on tribal interests from the loss of aquatic habitat. Such impacts can be mitigated on or off-Site, however the type and location of the mitigation will be determined as part of the federal permitting process for the cleanup action.

It is anticipated that additional information regarding Tribal interests will be gathered through government-to-government consultation and public notice and comment associated with the federal permitting process. The lead federal agency is expected to be the USACE. Any information shared with the State prior to implementation of the Cleanup Action will be considered.

7.3.3 Analysis of Potential Impacts to Likely Vulnerable Populations and Overburdened Communities

Impacts and benefits to vulnerable populations and overburdened communities were evaluated in the Marine Area RI/FS for construction impacts, post-construction effects, and land use impacts. Census tract information for areas potentially affected by the Site and/or cleanup action (including potential transportation routes) have an EHD Index rank of 7 or higher and has a Washington State Demographic Index and Supplemental Demographic Index at or greater than the 80th percentile for diesel emissions from EJScreen. This census tract information indicates that potentially exposed vulnerable populations or overburdened communities are along transportation routes in accordance with Ecology Implementation Memorandum No. 25.

Because County tax records indicate that parcels immediately adjacent to or overlooking the Site are either uninhabited industrial (e.g. railroad right-of-way) or affluent (high value residential), this report assumes that these areas do not contain vulnerable populations and overburdened communities. As such, analysis of construction benefits and impacts was limited to transportation routes.

- Because it is assumed the alternatives will require varying degrees of truck transport for import of construction materials and export of materials for upland disposal of contaminated material, truck traffic was utilized in the Marine Area RI/FS as the metric for gauging impacts to vulnerable populations and overburdened communities. Specifically, DOH and EPA health maps were consulted to identify communities along potential haul routes that experience higher impacts from diesel emissions. Alternatives 1 through 5 were determined to have a greater net impact to vulnerable populations and overburdened communities due to diesel emissions from off-Site truck and rail transportation for disposal as compared to Alternatives 6 through 10. This is the result of the increased volume of contaminated material requiring transportation off-Site as compared to the on-Site disposal of the contaminated material within the CDF. As indicated above, it is assumed that some emissions will be generated for the import of materials to construction of the CDF. However, the number of truck and rail loads is expected to be significantly lower than what will be required for the off-Site disposal.

All remedial alternatives were considered to have similar post-construction benefits for vulnerable populations and overburdened communities related to subsistence fishing and shellfish harvesting because each alternative would remediate sediment contamination and address human health risks from seafood consumption. Land use benefits and impacts were determined to be neutral for all alternatives because overall land use is not anticipated to change.

8.0 Selected Cleanup Action

Based on the DCA evaluation in the Marine Area RI/FS (GeoEngineers 2024), Alternative 8 is permanent to the maximum extent practicable. Ecology has selected Alternative 8 as the cleanup action for the Marine Area. The selected cleanup action is shown on Figure 18 and described below.

8.1 Elements of the Selected Cleanup Action

The elements of the selected cleanup action are described below and shown in Figures 18 through 22. Regulatory requirements applicable to the cleanup action are detailed in Table 4. A list of permits/substantive requirements anticipated to be applicable to the cleanup action is presented in Section 8.5.

The selected cleanup action generally includes the following activities:

- Site preparation.
- Demolition of structures necessary to construct the CDF/containment.
- Installation of the South Terminal Toe wall.
- Installation of the Containment/CDF wall.
- Dredging of contaminated material.
- Containment and disposal of contaminated material in the Containment/CDF Structure.
- Upland transport and disposal of contaminated dredged materials that are in excess of the Containment/CDF structure capacity.
- Installation of dynamic sand cap.
- Implementation of ENR
- Implementation of MNR
- Construction of habitat mitigation.
- Implementation of institutional controls.

Further detail regarding the elements of the selected cleanup action is described in the following sections. As is common in the cleanup process, agency decisions, permit requirements, evaluation of existing conditions, coordination requirements of current and future uses and construction activities, pre-design investigation data and detailed engineering analysis, may modify the selected cleanup action from descriptions presented below

The estimated cost of the selected cleanup action is $209.8 million. A detailed cost summary for the selected cleanup action, which is Alternative 8, is presented in Appendix B.

8.1.1 Site Preparation

Site preparation activities are anticipated to include the following:

- Establish contractor staging area in the upland portions of the Site adjacent to the Marine Area where construction equipment, supplies and materials can be temporarily stored to support construction activities.
- Establish upland sediment and erosion control measures to ensure that sediment is not tracked outside the work area boundary and stormwater management is completed in accordance with applicable laws, regulations and project permits.

- Implement traffic controls necessary for safe movement of construction equipment, supplies and material in and out of the work area boundaries, Port's terminal facilities and on public roads.
- Implement marine water quality control best management practices (BMPs) including but not limited to silt curtain to minimize marine water quality impacts during in-water construction activities in compliance with project permit requirements.
- Implement other BMPs to meet the requirements of local noise ordinance, air quality standards, dust prevention, spill prevention and health and safety standards.
- Reroute storm drain system for outfalls discharging into SMA-5.
- Remove existing shoreline and subtidal armoring from SMA-6 to provide dredging access to the underlying contaminated material. Armoring is located in the northern portion of SMA-6 (adjacent to SMA-4) and southern portions of SMA-6 (immediately south of the South Terminal wharf). As identified in Section 6.2.7, 1,750 CY of armoring is estimated for removal from SMA-6. Temporarily stockpile the removed armoring in the upland portions of the Site for reuse.
- If an offsite offloading facility is not used, construct a temporary material offloading facility at the South Terminal wharf to facilitate transfer of materials (contaminated dredged material and clean imported material) between marine and upland sides. Implement sediment and erosion control measures, stormwater management and marine water quality controls at the South Terminal offloading facility.

8.1.2 Demolition

The demolition activities planned as part of the selected cleanup action include demolition and removal of existing pile-supported roll-on/roll-off berthing pier and associated dolphins, identified in Figure 18, to facilitate implementation of cleanup action activities in SMA-5 and SMA-6. Due to its construction, location, and the cleanup action activities proposed in its vicinity, protection of the roll-on/roll-off berthing pier and associated dolphins is not feasible.

The roll-on/roll-off berthing pier (and associated dolphins) will not be replaced due to the presence of the proposed containment/CDF structure in SMA-5 as discussed Section 8.1.4. Removed components of pile supported roll-on/roll-off berthing pier and dolphins will be transported off-site and either disposed at a permitted landfill facility or recycled, as appropriate.

It is anticipated that demolition activities will be completed using equipment such as cranes, excavators and loaders deployed from uplands and/or from marine barges. It is estimated that demolition activities can be completed within one permit-allowed in-water work season.

8.1.3 Installation of the South Terminal Toe Wall

The selected cleanup action includes installation of a toe wall along the western, northern and southern face of the South Terminal wharf to allow for the full removal of contaminated material in SMA-6 by protecting the adjacent wharf structure and underlying armored slopes from the dredging activities. The approximate location of South Terminal toe wall in plan and cross-section view is shown in Figures 18 and 20, respectively.

The approximate horizontal length of the toe wall is estimated to be 900 feet. The existing mudline elevations along the alignment of the toe wall range from approximately 5 feet MLLW to -37 feet MLLW.

The toe wall will be designed to allow the dredge cut needed to remove contaminated media adjacent to the South Terminal wharf as shown in Figure 18. Based on the estimated depth of contamination (Figure 16), the base of the dredge cut (including 2-foot over-dredge allowance) adjacent to the toe wall is estimated to be up to 15.5 feet below mudline or to approximately -47 feet MLLW. The toe will be designed to allow for the estimated dredge cut needed to completely remove contaminated media west and south of the toe wall. In general, toe of the wall will be constructed with vertical steel elements that will be keyed into the underlying sediment and the top of the wall will be at or above the approximate surface elevations of the adjacent armored slopes. The wall will be designed and constructed in a manner that provides the ability to monitor and maintain the structure. The toe wall must be constructed prior to performing dredging activities adjacent to the South Terminal wharf to protect the structures.

It is anticipated that the toe wall steel components will be installed using crane-mounted vibratory and/or impact hammer deployed from uplands and/or marine barges. Construction of the toe wall is expected to require the removal and replacement of the existing fender pile system on the face of the wharf. It is estimated that the toe wall can be constructed within one permit-allowed in-water work season. The components of the toe wall will need to be ordered and fabricated in advance so they can be delivered to the Site as needed for the wall construction activities.

8.1.4 Installation of the Containment/CDF Wall

The selected cleanup action includes installation of a containment/CDF wall along the western, northern and a portion of the southern limits of SMA-5 to allow for the confinement of in place contamination and disposal of contaminated dredged material generated from the Marine Area. The approximate location of the containment/CDF wall in plan and cross-section view is shown in Figures 18 and 21, respectively.

The approximate length of the containment/CDF wall is estimated to be 1,400 feet. The existing mudline elevations along the alignment of the containment/CDF wall ranges from approximately 17 feet MLLW to -43 feet MLLW.

The containment/CDF wall will be designed to allow for the dredge cut needed to remove contaminated media west/adjacent to the wall and support containment of dredged contaminated material to be disposed within the CDF. The selected cleanup action includes full removal of contaminated media from SMA-6 west of the containment/CDF wall as shown in Figure 18. Based on the estimated depth of contamination (Figure 16), the bottom of the dredge cut (including 2-foot over-dredge allowance) west of the containment/CDF wall extends to 20 feet below mudline (i.e., -47 feet MLLW). In general, the containment/CDF wall will be constructed of vertical steel elements that will be keyed into the underlying sediment and will extend upward such that the top of the wall is at or above the surface elevations of the adjacent upland areas. The containment/CDF wall will be designed and constructed in a manner that avoids contaminant loss and provides for monitoring and maintenance. The containment/CDF must be constructed prior to performing dredging activities to allow for disposal of dredged material removed from other parts of the Marine Area.

It is anticipated that the containment/CDF wall steel components will be driven using crane-mounted vibratory and/or impact hammer deployed from uplands and/or marine barges. It is estimated that the construction of the containment/CDF wall will require two to three permit-allowed in-water work seasons. The sequence of containment/CDF wall construction and disposal of dredged material within the CDF will be evaluated as part of project permitting and designing. If the disposal of dredged material is performed within the CDF prior to the construction of the full extent of the containment/CDF wall, then internal baffle walls will be constructed to isolate the placed dredged material from the marine environment. Contaminated dredged material disposal in the CDF is described in Section 8.1.6. The components of the containment/CDF wall will need to be ordered and fabricated in advance so they can be delivered to the Site as needed for the wall construction activities.

8.1.5 Dredging of Contaminated Material

The selected cleanup action includes full removal of contaminated media from SMA-2 (2a and 2b), -3 (3a through 3c) and -6, and partial removal of contaminated media from SMA-1d as described below and shown on Figures 18 through 22.

Based on the estimated depth of contamination (Figure 16), the depth of dredging to completely remove contaminated media (not including 2-foot overdredge allowance) from SMA-2a, -2b, -3a, -3b, -3c and -6 are estimated to be up to approximately 10 feet, 1 foot, 1 foot, 0.5 feet, 0.5 feet and 18.5 feet below mudline, respectively. The actual dredge depths within these SMAs may vary based on pre-remedial design investigation and conditions observed at the time of the construction. Dredging will be designed and implemented to achieve full removal of contaminated media from within these SMAs and to provide stable slide slopes to transition between the base of the dredged cut and the surrounding mudline elevations.

In addition to performing dredging in SMA-2a, -2b, -3a, -3b, -3c and -6, partial dredging will be performed in SMA-1d to (1) provide stable transition slopes to allow full removal of contaminated media in adjacent SMA-2a, and (2) to remove contaminated media in SMA-1d above Elevation -60 feet MLLW such that the as-built surfaces of the dynamic sand cap proposed in SMA-1d (Section 8.1.8) are not above the maximum scour elevation (-55 feet MLLW). With the exception of SMA-1d, side slope dredging outside of SMA-2, -3 and -6 is not required because either the depth of dredging is shallow (e.g., less than or equal to 1 foot of dredging proposed in SMA-2b and -3) negating the need for side slopes or the deeper vertical dredge cuts (e.g., dredge cuts proposed in SMA-6) are supported by vertical structures including South Terminal toe wall (Section 8.1.3) and the containment/CDF wall (Section 8.1.4).

The baseline contaminated dredged material volume plus 2-foot overdredge allowance in SMA-1d, -2a, -2b, -3a, -3b, -3c and -6 is estimated to be approximately 15,390 CY, 14,480 CY, 23,670 CY, 4,800 CY, 2,290 CY, 1,290 CY and 123,880 CY, respectively, totaling approximately 185,800 CY. A 2-foot overdredge allowance is assumed for dredging activities except for in the area of armored slopes of the South Terminal pile-supported wharf located within SMA-6 east of the toe wall. Within the armored slope area of the South Terminal, the 2-foot overdredge allowance is not applicable because contaminated media is expected to be surficial (if present) and the sediment will be removed to the top of armored slope (i.e., the underlying armor will not allow for overdredging).

Based on an assumed density of 1.3 tons/CY, the weight of the contaminated dredge material plus overdredge allowance is estimated to be 241,520 tons. Contaminated media dredging activities will be performed to a depth at which sample results confirm that cleanup standards are met in SMA-2 (2a and 2b), -3 (3a through 3c) and -6 with an exception. If unanticipated contamination is found during construction adjacent to the South Terminal toe wall and Containment/CDF wall that is deeper than the dredge depth that can be supported by these structures, then the dredging activities will be terminated prior to achieving cleanup standards to protect the integrity of the structure and the extent of contamination that would be left in-place will be documented. A contingency response will be developed as part of the design and in consultation with Ecology to address the contaminated media that might be left in-place in this scenario. As discussed in Section 8.5.2, the results of pre-remedial design investigation completed in SMA-2, -3 and -6 will be used to (1) refine the extent of dredging required to meet the cleanup standards, and (2) pre-characterize the post-dredge surface sediment conditions. This approach will minimize or eliminate the need for post-dredge surface sediment sampling at the time of construction and therefore, help minimize potential contractor delays and stand-by costs that may arise from analytical turn-around times and sample result unpredictability. However, post-dredge surface sediment sampling and analysis may be performed at the time of construction, if necessary.

Cleanup standards are expected to be met within SMA-2, -3 and -6 immediately following the completion of construction because of full removal. Compliance monitoring activities including post-dredge surface sediment sampling and analysis are described in Section 8.4. Progress and post-construction bathymetric surveys of dredged areas will be performed for quality control purposes and to document the as-built conditions.

Removal methods applicable to the Marine Area include mechanical dredging from land-based or water-based platforms and diver-assisted hydraulic dredging in the under-pier areas. Due to the presence of extensive wood debris and limitations on space for dewatering, hydraulic dredging is considered applicable only to limited access areas such as the under-pier portion of SMA-6. It is estimated that contaminated media dredging will require at least two in-water work seasons based on a dredge production rate of approximately 600 to 800 CY per day, which was the approximate average production rate during the 2016 Pacific Terminal Interim Action.

8.1.6 Containment and Disposal of Contaminated Material in the Containment/CDF Structure

The selected cleanup action includes establishing a containment/CDF within SMA-5 as discussed in Section 8.1.4. The location of the proposed on-Site containment/CDF is shown in plan and cross-section view on Figures 18 and 21. The containment/CDF in SMA-5 will result in an in-place containment of an estimated 131,800 CY of contaminated media present in SMA-5. Additionally, the containment/CDF is estimated to provide a dredged material storage capacity of approximately 174,000 CY based on placement of the dredged material below elevation of +9 feet MLLW, which is the mean groundwater elevation in the adjacent upland areas. Placement of the dredged material will allow for contaminated dredged material including wood debris disposed in the containment/CDF to remain saturated and will reduce potential for decomposition and phase change. Approximately, 174,000 CY (i.e., approximately 226,200 tons based an assumed density of 1.3 tons/CY) of contaminated dredged material generated from the Marine Area will be disposed in the containment/CDF structure. The remaining contaminated dredged material that cannot be accommodated in the containment/CDF will be transported and disposed of at a permitted upland landfill as described in Section 8.1.7.

The dredged material will be disposed directly into the containment/CDF from material barges or pumped from the diver assisted hydraulic dredge (if used). If necessary, dredged material may be offloaded into the temporary materials management area established in the upland area of the Site to facilitate dewatering and amendment of the dredged material prior to its disposal in the containment/CDF. It is assumed that the dredged material dewatering activities will primarily occur on the material barges. Dredged material dewatering activities may also occur within the temporary materials management area (if used) and following the disposal and within the CDF. Water generated from dewatering will be filtered/treated, as necessary, and released back into the bay in accordance with the project permit requirements.

Dredged material management activities will be performed within the CDF to ensure that material is evenly distributed, consolidated, amended (if necessary) and compacted. Following the placement of the contaminated dredged material, the CDF area will be backfilled with clean imported fill material between elevation +9 feet MLLW (i.e., the approximate top of the contaminated dredged fill as discussed above) and below the proposed asphalt pavement. It is estimated that approximately 80,000 CY of imported fill material will be required. Imported material will be tested for Site COCs and confirmed that COC concentrations are below the cleanup levels prior to its use on Site. The surface of the CDF will be finished with asphalt pavement to cap and isolate the contaminated dredge material and prevent stormwater infiltration. The asphalt surface will be equipped with an appropriate stormwater management system.

Ground improvements will be performed within the containment/CDF structure to provide seismic and structural stability. Ground improvements will be completed to improve the geotechnical properties of the in-situ contaminated media and contaminated dredged material placed in the containment/CDF. The goal of ground improvement is to ensure that the soil/hydraulic pressure on the steel structure of the containment/CDF wall are minimized and to prevent liquefaction of soil/sediment during a design seismic event and thereby, provide seismic stability. Ground improvements methods may include injecting grout or concrete using an augercast method (i.e., drilling the hollow-stem auger into the ground to the desired elevation and pumping grout or concrete through the hollow-stem while steadily withdrawing the auger) to build solidified columns of soil/sediment. Auger cast columns will be completed adjacent to each other with a sufficient overlap to create a continuous section of improved ground. Other ground improvement methods may be considered by the contractor. The depth and width of ground improvement zone adjacent to the containment/CDF wall will be determined as part of the design.

It is anticipated that disposal of contaminated dredged material and material management in the containment/CDF will be completed using mechanical or hydraulic dredge and commonly available earthwork equipment such as excavators, loaders, dozers and roller compactors. The primary equipment used for ground improvement is expected to be a hollow-stem auger rig. Imported material is expected to be locally sourced (for e.g., from a quarry) and imported to the Site using upland trucks and trailers and/or marine barges. It is estimated that the dredged material disposal in the containment/CDF, backfilling, ground improvement and finishing the surface of the containment/CDF with asphalt and stormwater drainage features will require two to three permit-allowed in-water work seasons.

8.1.7 Upland Transport and Disposal of Contaminated Dredged Materials

The selected cleanup action includes disposal of contaminated dredged material that cannot be accommodated into the on-Site CDF at a permitted upland landfill. It is estimated that approximately 11,800 CY (i.e., approximately 15,335 tons based on an assumption of 1.3 tons/CY density) of contaminated dredged material generated from the Marine Area cannot be accommodated into the on-Site CDF and therefore, will be transported and disposed at a permitted upland landfill.

Dredged material requiring upland landfill disposal will be offloaded from material barges onto trucks and trailers for off-Site transport at the South Terminal or to an offsite offload facility. If necessary, dredged material may be temporarily stockpiled in a materials management area to facilitate dewatering and amendment of the dredged material prior to its off-site transport and disposal. Dredged material dewatering activities will primarily occur on the material barges but may also occur in a temporary materials management area, if necessary. Water generated from dewatering will be treated, as necessary in accordance with the project permit requirements.

It is anticipated that the transport of contaminated dredged material from the offload facility will be completed using trucks and trailers. The transportation activities will be completed either through use of streets and highways or through a combination of streets, highways and railroads. The duration of contaminated media upland transport and disposal will be contingent on dredging and offloading rates, and overall construction sequence.

8.1.8 Installation of the Dynamic Sand Cap

The selected cleanup action includes placement of dynamic sand cap materials in SMA-1d. Dynamic sand capping includes placement of clean imported sand on top of the existing sediment surface on a mass per area basis with individual materials placements overlapping each other to achieve cap thickness that is equivalent to or greater than the thickness of the compliance zone (i.e., 10 cm) at the time of construction. The thickness of dynamic sand cap is not expected to be even following the placement of materials during construction. However, the dynamic sand cap materials are expected to be distributed over time by current action to achieve a more even thickness. The distribution of the placed dynamic sand cap materials across the placement area is expected reach equilibrium within a reasonable restoration timeframe. The purpose of the dynamic sand cap is to prevent exposure to contamination and to prevent resuspension and transport of contaminants to other areas of the Site.

It is assumed that a 3-foot equivalent thickness of sand will be placed over SMA-1d on a mass per area basis. SMA-1d measures approximately 4.5 acres and approximately 22,320 CY (i.e., 35,720 tons based on an assumed density of 1.6 tons/CY) of sand is estimated to be placed.

Compliance monitoring activities will be completed to evaluate the effectiveness of the dynamic sand cap as described in Section 8.4.

Prior to the placement of dynamic sand cap, contaminated media along the eastern portions of SMA-1d, adjacent to SMA-2a, will be partially removed as described in Section 8.1.5. The existing mudline elevation in SMA-1d ranges from -55 feet MLLW in the east to -75 feet MLLW in the west. Without partial removal, the dynamic sand cap in the eastern portion of SMA-1d would be situated shallower than -55 feet MLLW (maximum scour elevation) and would be subject to vessel scour, which would potentially jeopardize the success of the remedial action-. Partial removal dredging will be performed to ensure that the as-built surfaces of the dynamic sand cap are deeper than -55 feet MLLW. Following the partial removal, 26,750 CY of contaminated media are estimated to remain within SMA-1d, which will be capped using the dynamic sand cap.

Dynamic sand cap placement methods may include use of a clamshell or other materials handling bucket, direct dumping from a barge, hydraulic spreading (washing from a barge), broadcasting, use of a tremie tube, and pumping a slurry through a pipeline or diffuser. Imported sand cap material is expected to be locally sourced (e.g., clean dredged material, quarry material) and imported to the Site using trucks and trailers or barges. Materials transported to the Site by truck will require offloading to a placement barge.

8.1.9 Implement Enhanced Natural Recovery (ENR)

The selected cleanup action includes implementation of ENR in SMA-1b, -1c and 7, which collectively measure approximately 11.7 acres and is estimated to contain approximately 51,050 CY of contaminated media. ENR includes placement of clean imported sand on top of existing sediment surface on a mass per area basis and allowing the sand to mix with the in-place sediments through physical (e.g., wave action and current) and biological (e.g., reworking of sediments by organisms) processes. The goal of ENR is to reduce contaminant concentrations through the placement and mixing of clean material with contaminated media and therefore, reduce the timeframe required to meet the cleanup standards as compared to MNR. ENR also relies on natural recovery processes including natural deposition of clean sediment, physical and biological mixing of clean and contaminated sediment, and biodegradation to reduce toxicity and bioavailability of contaminants. Since ENR relies on natural recovery processes, the cleanup standards are expected to be met within a reasonable restoration timeframe as further discussed in Section 8.3.

It is assumed that a 6-inch equivalent thickness of sand will be placed over SMA-1b, -1c and -7 on a mass per area basis for the purposes of ENR. Approximately 9,460 CY (i.e., 15,140 tons based on an assumed density of 1.6 tons/CY) of sand is estimated to be placed on the surfaces of SMA-1b, -1c and -7.

Compliance monitoring activities will be completed to evaluate the effectiveness of the natural recovery processes as described in Section 8.4.

ENR sand placement methods may include use of a clamshell or other materials handling bucket, direct dumping from a barge, hydraulic spreading (washing from a barge), broadcasting, use of a tremie tube, and pumping a slurry through a pipeline or diffuser. Imported sand cap material is expected to be locally sourced (e.g., clean dredged material, quarry material) and imported to the Site using trucks and trailers or barges. Materials transported to the Site by truck will require offloading to a placement barge.

8.1.10 Implement Monitored Natural Recovery (MNR)

The selected cleanup action includes implementation of MNR in SMA-1a, which measures approximately 26.8 acres and is estimated to contain approximately 25,790 CY of contaminated media. MNR does not involve an active construction activity. MNR relies on natural recovery processes including natural deposition of clean sediment, physical and biological mixing of clean and contaminated media, and biodegradation to reduce toxicity and bioavailability of contaminants. Since MNR relies on natural recovery processes, the cleanup standards are expected to be met within a reasonable restoration timeframe as further discussed in Section 8.3.

Compliance monitoring activities will be completed to evaluate the effectiveness of the natural recovery processes as described in Section 8.4.

8.1.11 Implement Institutional Controls

Institutional controls are required by MTCA (WAC 173-340-440(4)) when cleanup actions leave contamination in place. As discussed in the prior sections, the selected cleanup action will leave contaminated media in place in SMA-1, -5 and -7. Therefore, the selected cleanup action will require institutional controls to limit or prohibit activities that may interfere with the integrity of the cleanup action or that may result in exposure to contamination. Institutional controls for the Marine Area may include proprietary controls (e.g., environmental covenant, deed restrictions, and/or other similar legal administrative mechanisms), governmental controls (e.g., notices in local zoning or building department records describing land use restrictions, commercial and recreational fishing bans/limits), and informational devices (e.g., warning signage and health advisories). An environmental covenant is a legal instrument executed pursuant to RCW 64.70 (Uniform Environmental Covenants Act) that describes with specificity the activity or use limitations of the real property and is signed by Ecology and entities that own an interest in the real property. Institutional controls will be identified by Ecology following completion of the cleanup action and implemented based on the as-built condition of the Marine Area.

8.2 Habitat Impact and Mitigation

The selected cleanup action will result in impacts to habitat including removal of eelgrass and loss of the waters of the United States components due to the dredging activities and construction of the containment/CDF. Therefore, mitigation activities are anticipated to be required as part of the selected cleanup action to offset impacts. The project mitigation requirements will be determined by the federal permitting process.

The intertidal and shallow subtidal mudline elevations critical for marine habitat are present in SMA-3c, -5, -6 and -7. In September 2022, Grette Associates (Grette) completed a shoreline and a diver-based habitat survey to assess habitat conditions (eelgrass, macroalgae, substrates, etc.) of the Marine Area and the results of the survey are detailed in the Marine Area RI/FS.

Eelgrass (Zostera marina) and dwarf eelgrass (Zostera japonica) beds were observed in the following areas:

- Eelgrass beds running parallel to the shoreline in SMA-5 covering approximately 1.27 acres and, in an area south of the South Terminal, which includes southern portions of SMA-6 and areas to the south of SMA-6, covering approximately 0.31 acres. In general, eelgrass beds were observed to range from approximately -3 feet MLLW to -10 feet MLLW, extending as deep as -13 feet MLLW.
- A dwarf eelgrass bed adjacent to the southern edge of the South Terminal, which includes southern portions of SMA-6 and areas to the southeast of SMA-6, between approximately -2 feet MLLW to +1 foot MLLW covering approximately 0.14 acres.

Eelgrass beds were not observed in other portions of the Marine Area that were surveyed. The habitat survey included in the Marine Area RI/FS presents mapped eelgrass and dwarf eelgrass beds, and other information including observations of macroalgae and macrofauna, and substrate type and conditions in the Marine Area.

The selected cleanup action includes construction of a containment/CDF in SMA-5 and full removal of contaminated media in SMA-6 which will impact known eelgrass and dwarf eelgrass beds. As a result, mitigation will be required to offset the loss of eelgrass. Additionally, due to the construction of CDF, the offshore SMA-5 will be filled, and mitigation will be required to offset losses of waters of the United States.

A habitat mitigation plan will be developed as part of the project permitting process in consultation with regulatory agencies and will be implemented to offset the loss of aquatic habitat and the waters of the United State resulting from the construction of the selected cleanup action. The mitigation activities are currently not defined and will be developed as part of the permitting mitigation plan. The mitigation activities that may be considered include the following:

- Placement of fill (e.g., clean dredged material) at an off-site location to achieve depths suitable for eelgrass growth adjacent to an existing eelgrass bed.
- Placement of a thin layer of material in an area that is already at an appropriate depth for eelgrass to increase substrate stability to facilitate eelgrass colonization and persistence. This option can be considered both at on-site and off-site locations.
- Dredging to achieve appropriate depth for eelgrass at an appropriate on-site location (e.g., immediately southwest of South Terminal where estimated dredge depth in SMA-6 "daylight" into, and impact, existing eelgrass).
- Use mitigation that the Port has access to from the 353-acre Blue Heron Slough Conservation and Mitigation Bank, located near the mouth of the Snohomish River where tidal marsh habitat has been restored and reconnected in the Snohomish River estuary to provide off-channel fish rearing and refuge habitat.

Periodic monitoring is anticipated to evaluate the effectiveness and function of the mitigation.

8.3 Compliance with Cleanup Standards and Restoration Timeframe

At the completion of the selected cleanup action construction, cleanup standards, which includes cleanup levels and points of compliance, will be met in SMA-1d, -2, -3, -5 and -6, where full removal, containment/CDF or capping are implemented. However, the dynamic sand cap placed in SMA-1d is expected to be distributed within the placement area to achieve a more even thickness over time by current action. The redistribution of the dynamic sand cap material is expected to reach equilibrium within a 10-year restoration timeframe. As discussed in Section 6.2.5, the 2016 Pacific Terminal Interim Action resulted in complete removal of contaminated media in SMA-4 and therefore, SMA-4 is in compliance with the cleanup standards. As a result of natural recovery (MNR and ENR) being implemented in SMA-1a through -1c and 7, cleanup standards are expected to be met throughout the Marine Area within a 10-year restoration timeframe. As discussed in Section 6.4.8, the COCs exceeding the cleanup standards remaining at the completion of cleanup construction will be subject to reduction in concentration over time through natural recovery and include:

- Total cPAHs exceeding the cleanup standards for the protection of human health and higher trophic level ecological receptors with SWAC ER of 1.12 and in SMAs-1a through -1c and -7 as presented in the Marine Area RI/FS.

- 4-methylphenol exceeding the cleanup standards for the protection of benthic organisms with ER of up to 1.2 in SMA-1a.

MNR and ENR are expected to achieve cleanup standards within a 10-year reasonable restoration timeframe due to the following factors:

- The calculated sedimentation rates (i.e., 1.27 cm per year) representative of the outer part of Marine Area (i.e., SMA-1) located outside of the areas that are subject to scour are anticipated to deposit new sediment at a thickness that is equivalent to or greater than the thickness of the compliance interval and biologically active zone (i.e., 10 cm). The results of the geochronology study to calculate sedimentation rate is summarized in Section 3.2 and detailed in Marine Area RI/FS.
- The placement of ENR sand in SMA-1b, -1c and -7 will result in immediate reduction of contaminant concentration through addition of mass to the compliance interval. Over time, physical and biological mixing of clean and contaminated materials will accelerate the natural recovery processes.
- A significant portion of the historically dredged area located adjacent to Pacific Terminal and Pier 1, although subject to vessel scour, has remained below the cleanup standards since the 1990s, indicating that new sediment that may have been deposited in this area meets cleanup standards.

Additional natural recovery studies and evaluation will be completed as part of the design process to further evaluate the sedimentation and contaminant reduction rates to confirm the time period for recovery and the degree of clean material enhancement that may be necessary.

8.4 Compliance Monitoring and Contingency Responses

Compliance monitoring and contingency responses (as necessary) will be implemented consistent with MTCA (WAC 173-340-410) and SMS (WAC 173-204-560(7)). Three types of compliance monitoring will be performed:

- Protection monitoring will be completed during construction to confirm human health and the environment are adequately protected during the cleanup action construction.
- Performance monitoring will be completed at the end of the construction period to confirm that design specifications (e.g., dredge slopes and grades) and cleanup standards have been achieved.

- Confirmational monitoring will be completed to collect information that allows the performance of the cleanup action to be evaluated over-time and ensures that the efficacy and integrity of the cleanup action is maintained. Confirmational monitoring is also used to assess rates of recovery in ENR and MNR areas, and to assess recontamination, if any.

Elements of the compliance monitoring will be documented in the Engineering Design Report (EDR) and submitted for Ecology review and approval prior to the implementation of the cleanup action as discussed in Section 8.5.3. The compliance monitoring and contingency response plan (CMCRP) will include site-specific objectives, scope, quality assurance, duration, and timing for the planned monitoring activities as well as an overall framework for contingency actions and adaptive management.

Compliance monitoring activities are summarized in the following sections. Contingency response will be developed as part of the EDR as identified in Section 8.4.4.

8.4.1 Protection Monitoring

Protection monitoring will be completed during the construction of the cleanup action to confirm human health and the environment are adequately protected. Cleanup action activities will be completed in general accordance with the requirements of the Washington Industrial Safety and Health Act (WISHA; RCW 49.17) and the Federal Occupational Safety and Health Act (OSHA; 29 CFR 1910, 1926). These regulations include requirements that workers be protected from hazards (physical and chemical) at the Site. A site-specific Health and Safety Plan (HASP) will be prepared by each entity (e.g., contractor, owner, owner's representative) engaged in performing or observing construction activities. Personnel engaged in work that involves contamination will be required to comply with the provisions of WAC 173-340-810 (MTCA Cleanup Regulation, Worker Safety and Health) and be Hazardous Waste Operations and Emergency Response (HAZWOPER) certified, as applicable.

The monitoring activities for the protection of the environment will be determined based on permit conditions and may include the following:

- Water quality monitoring in the vicinity of in-water construction activities (e.g., dredging, placement of cap material, dewatering of dredged material) to address requirements of CWA Section 401 water quality certification.
- Air quality monitoring in, upwind of, and downwind of the immediate work area.
- Visual inspection of physical BMPs for water quality (e.g., silt curtain), temporary erosion and sediment controls, stormwater runoff controls, traffic controls, dust and noise control, spill prevention and pollution controls, etc.

8.4.2 Performance Monitoring

Performance monitoring will be completed to confirm that the design specifications and cleanup standards are met. Performance monitoring activities for the cleanup action are expected to include the following:

- **Bathymetric Surveys** – Bathymetric surveys will be conducted for assessing progress, quality control and to document as-built conditions. Bathymetric surveys may include:
  - Pre-construction survey(s) to document existing conditions in the Marine Area prior to the start of the construction.
  - Progress surveys to confirm that dredging activities in SMA-1d, -2, -3 and -6 are performed to designed limits and grades and in accordance with project plans and specifications.
  - Progress surveys to confirm that sand placed for the purposes of dynamic sand capping and ENR is placed within the appropriate SMA boundaries and is placed to meet the requirements of project plans and specifications.[10]
  - Post-construction survey(s) to document as-built conditions of the cleanup actions in the Marine Area.
- **Post-Dredge Surface Sediment Sampling and Analysis** – To the extent practicable, post-dredge surface sediment conditions in SMA-2, -3 and -6, where full removal of contaminated media is proposed, will be pre-characterized as part of pre-remedial design investigation as discussed in Sections 8.1.5 and 8.5.2. Post-dredge surface sediment samples may be collected at the time of construction, if necessary. Samples will be analyzed for Site COCs to confirm compliance with cleanup standards. Sampling and analysis plan and procedures will be developed as part of the pre-remedial design investigation work plan and EDR.
- **Inspection of Cleanup Construction Activities** – Port or Port's representative will observe construction activities to ensure that the work is completed in accordance with design requirements that will be developed as part of EDR, plans and specifications.

[10] Sand for dynamic sand capping and ENR will be placed on a mass per area basis as described in Sections 8.1.8 and 8.1.9. The intent of progress surveys is to confirm that sand is placed within the SMA boundaries, and that coverage is achieved to the maximum extent practicable. The intent of progress surveys is not to evaluate effectiveness of dynamic sand cap or ENR. Effectiveness of dynamic sand cap and ENR will be evaluated using confirmational monitoring activities described in Section 8.4.3.

8.4.3 Confirmational Monitoring

Confirmational monitoring for the selected cleanup action will assess two general areas of performance over time:

- Performance of the natural recovery.
- Compliance with the cleanup standards.

SMA-1a, -1b, -1c and -7, where MNR or ENR is implemented, and SMA-1d, where dynamic sand cap is implemented, will be subject to periodic surface sediment sampling and analysis. Monitoring will be completed in SMA-1a, -1b, -1c and -7 to evaluate the rate of contaminant reduction and performance of natural recovery. Monitoring will be completed in SMA-1d to monitor the dynamic sand cap's continued effectiveness at meeting compliance with cleanup standards. Within SMA-1d, monitoring will also including periodic bathymetric surveys to monitor distribution of dynamic sand cap over time. Sampling and analysis plan and procedures will be developed as part of the EDR. It is assumed that a baseline monitoring event will be completed prior to the implementation of the cleanup action to document baseline conditions. The post construction monitoring frequency will be determined as part of the EDR and may be modified based on monitoring results. Monitoring will initially be conducted SMA-wide; however, the focus may change over-time depending on results.

Visual monitoring activities will be completed to ensure that structural integrity of CDF is maintained over time. Monitoring activities will be developed as part of the EDR.

8.4.4 Contingency Response Actions

In addition to the monitoring information described above, the CMCRP (Section 8.5.3) will include contingency actions and adaptive management strategies that may be applicable in response to monitoring observations and/or results. The EDR will provide additional details regarding the contingency response actions for the selected cleanup action.

8.5 Public Participation, Design and Permitting

Implementation of the cleanup action for the Marine Area described in this CAP requires completion of public participation requirements, engineering design and permitting prior to construction. The following sections summarize these requirements.

8.5.1 Public Participation

MTCA (WAC 173-340-600(14)(a)) requires that Ecology notify the public of preparation of the CAP to provide the opportunity for public comment. After review and consideration of the comments received from the public, Ecology will issue the final CAP that provides the basis for the cleanup to be implemented in the Marine Area.

8.5.2 Pre-Remedial Design Investigation

Pre-remedial design activities will refine the delineation of the extent of contamination, boundaries of the SMAs and provide data for the design and implementation of the selected cleanup action. A pre-remedial design investigation work plan will be developed to identify proposed location and depth of investigations and analyses/studies that will be performed on samples. A pre-remedial design investigation is anticipated to include the following:

- Perform sediment investigation along the alignment of South Terminal Toe Wall and containment/CDF wall to further understand geotechnical properties of in-situ sediment, which will be required for design of these walls and ground improvement activities.
- Perform sediment investigation to further evaluate the sedimentation rates, rate of chemical attenuation and chemical quality of the newly deposited sediment within SMA-1a through -1c and -7, where natural recovery (MNR or ENR) is proposed to confirm the time period for recovery and the degree of clean material enhancement that may be necessary.
- Perform sediment investigations in SMA-1b, -1c, -1d and 7, where placement of clean imported sand for ENR or dynamic sand capping is proposed. As discussed in Section 6.2, the extent of these SMAs were defined based on limited data density for the purposes of RI/FS, and additional data will help further refine the horizontal extent of contamination and SMA boundaries, and acreage and volume of sand that will be required for ENR and dynamic sand capping purposes.
- Perform sediment investigations in SMA-2 (2a and 2b), -3 (3a through 3c), and -6, where full removal of contaminated media is proposed. As discussed in Section 6.2, the extent of these SMAs were defined based on limited data density for the purposes of RI/FS. Also as noted in Section 6.2.7, no environmental data is available within the footprint of the armored slopes below the South Terminal wharf and the extent of contamination in the southeastern portion of SMA-6 along the existing side slopes is not well defined. Additional data will help fill these data gaps, help further refine both the horizontal and vertical extent of contamination and SMA boundaries, and volume of contaminated media that will be removed from SMA-2, -3 and -6 as part of full removal. Moreover, the results of pre-remedial design investigation will be used to pre-characterize post-dredge surface sediment conditions in SMA-2, -3 and -6, where full removal of contaminated media is proposed.

8.5.3 Engineering Design and Permitting

Engineering design including preparation of an engineering design report (EDR) and construction plans and specifications will be performed after Ecology has issued a final CAP and following the completion of pre-remedial design investigations. An EDR will be prepared in accordance with the requirements of WAC 173-340-400(4)(a) to document engineering concepts and design criteria used for design of the cleanup action and will include sufficient information for the development of construction plans and specifications as well as support project permitting.

A CMCRP will be prepared as an attachment to the EDR to describe compliance monitoring, sampling and analyses activities and contingency response to be performed during and/or following the cleanup action in accordance with WAC 173-340-410 and 173-340-820. Attachments to the EDR will also include a site-specific HASP that will present health and safety requirement for personnel monitoring the remedial actions and a Quality Assurance Project Plan (QAPP) to present quality assurance/quality control (QC/QC) requirements applicable to the sampling and analyses activities.

MTCA reporting requirements (WAC 173-340-400) will be followed during all cleanup activities. Construction plans and specifications will be prepared with sufficient details and in conformance with currently accepted engineering practices and techniques to support selection of a contractor and execution of contract work.

Applicable permits will be obtained prior to the cleanup action construction and permit/substantive requirements will be followed in implementing the cleanup action components. Permit/substantive requirements applicable to the cleanup action are described in Section 4.3. The following list of permits/substantive requirements is anticipated to be applicable to the selected cleanup action:

- USACE issued Nationwide Permit 38.
- Washington Department of Ecology issued Water Quality Certification (WQC).
- Washington Department of Fish and Wildlife (WDFW) issued Hydraulic Project Approval (HPA).
- Washington SEPA Determination.
- Washington Department of Natural Resource (WDNR) Use Authorization.
- Local permits/substantive requirements including but not limited to City of Everett’s shoreline substantial development permit, wastewater discharge authorization permit, street use permit, noise ordinance, building and construction code and traffic code, and Puget Sound Clean Air Agency operating permit.

8.6 Schedule

The overall duration to perform pre-remedial design investigations and to design, permit and construct the selected cleanup action is estimated to be 7 to 10 years. Contingent on Ecology and permit agency approvals, the pre-remedial design investigations, design and permitting phase is estimated to be completed between 2025 and 2026. The bidding phase for construction is estimated to be initiated in 2026 subject to agency granting of the required permits.

8.7 Periodic Review

Because the selected cleanup action includes institutional controls, Ecology will conduct periodic review of post-cleanup site conditions and monitoring data in the Marine Area at least every 5 years to ensure protection of human health and the environment. Consistent with the requirements of WAC 173-340-420, the periodic review shall include the following:

- A review of the title of the real property subject to the environmental covenant to verify that the covenant is properly recorded.
- A review of available monitoring data to verify the effectiveness of completed cleanup actions, including dynamic sand caps, ENR, MNR and institutional controls, in limiting exposure to hazardous substances remaining in the Marine Area.
- A review of new scientific information for COCs present in the Marine Area.
- A review of new applicable and/or relevant and appropriate state and federal laws for hazardous substances present in the Marine Area.
- A review of current and projected future land and resource uses in the Marine Area.
- A review of the availability and practicability of more permanent remedies.
- A review of the availability of improved analytical techniques to evaluate compliance with cleanup levels.

Ecology will publish a notice of all periodic reviews in the Site Register and will provide an opportunity for review and comment by the potentially liable persons and the public.

9.0 References

Dredged Material Management Program (DMMP) 2009, *OSV Bold Summer 2008 Survey: Data Report*, Prepared by the Washington State Dredged Material Management Program, with assistance from Science Applications International, Avocet Consulting, TerraStat Consulting Group, June 25, 2009.

GeoEngineers Inc. (GeoEngineers) 2015, *Final Dredged Material Characterization Report, Weyerhaeuser Mill A Former Cleanup Site, Interim Action Dredging Project, Everett, Washington*, prepared for the Dredged Material Management Office and Washington State Department of Ecology, GEI File No. 0676-020-03, June 19, 2015.

GeoEngineers, Inc. (GeoEngineers) 2018, *Construction Completion (As-Built) Report, Weyerhaeuser Mill A Former Cleanup Site, Interim Action, Everett, Washington*, prepared for Washington State Department of Ecology on behalf of the Port of Everett, GEI File No. 0676-020-05, January 16, 2018.

GeoEngineers Inc. (GeoEngineers) 2019, *Supplemental Marine Area Investigation, Weyerhaeuser Mill A Former Site, Everett, Washington*, prepared for the Washington State Department of Ecology, GEI File No. 0676-020-06, June 4, 2019.

GeoEngineers Inc. (GeoEngineers) 2024, *Remedial Investigation/Feasibility Study Report – Marine Area, Weyerhaeuser Mill A Former, Everett, Washington*, prepared for the Washington State Department of Ecology, GEI File No. 0676-020-07, September 13, 2024.

Geomatrix Consultants, Inc. (Geomatrix) 2007, *Data Report, Former Mill A MTCA Support Collection, Everett, Washington*, prepared for the Port of Everett, November 2007.

Port of Everett (Port) 1987, *Log Storage at the Port of Everett*, prepared for the Port Working Group Membership and Commissioners, January 2, 1987.

Port of Everett (Port) 2021, *Current and Future Uses at the Former Weyerhaeuser Mill A Cleanup*, prepared by the Port of Everett to the Washington State Department of Ecology, October 13, 2021.

Science Applications International Corporation (SAIC) 2009, *Sediment Characterization Study in Port Gardner and Lower Snohomish Estuary, Port Gardner, WA*, prepared for the Washington State Department of Ecology, July 10, 2009.

U.S. Environmental Protection Agency (EPA) 2000, *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study*, prepared by Environmental Protection Agency (EPA) and US Army Corps of Engineers (USACE), dated July 2000.

Washington State Department of Ecology (Ecology) 2008a, *Year 10 Monitoring Report, November 2007, Port of Everett Nearshore-Confined Disposal Facility, Everett, Washington*, No Further Action Letter from Grant Yang (Ecology) to Robert Gilmore (Geomatrix), January 2008.

Washington State Department of Ecology (Ecology) 2008b, *Sediment sampling and analysis plan appendix: guidance on the development of sediment sampling and analysis plans meeting the requirements of the sediment management standards (chapter 173-204 WAC)*, Washington State Department of Ecology Publication No. 03-09-043. Revised February.

Washington State Department of Ecology (Ecology) 2012, *Agreed Order for Remedial Investigation/Feasibility Study and Draft Cleanup Action Plan – Weyerhaeuser Mill A Former Site, No. DE 8979*, In the Matter of Remedial Action by: Port of Everett, Weyerhaeuser, and Washington State Department of Natural Resources, filed August 9, 2012.

Washington State Department of Ecology (Ecology) 2013a, *Sediment Quality in the Whidbey Basin, Changes from 1997 to 2007*, Washington State Department of Ecology Publication 13-03-003, February 2013.

Washington State Department of Ecology (Ecology) 2013b, *Port Gardner, East Waterway Sediment Monitoring, 2012*, Washington State Department of Ecology Publication 13-03-023, May 2013.

Washington State Department of Ecology (Ecology) 2021, *Sediment Cleanup User's Manual (SCUM), Guidance for Implementing the Cleanup Provisions of the Sediment Management Standards, chapter 173-204 WAC*, Publication No. 12-09-057, original publication March 2015, revised December 2021.

Tables and Figures

Table 1

Estimation of Contamination Depth in the Marine Area

Weyerhaeuser Mill A Former

Everett, Washington

SMA	Investigation Location[1]	Investigation Date	Mudline Elevation[2] (ft MLLW)	Investigation Depth (dbm)	Sample/ Depth Interval (dbm)	Observed Wood Condition: Visual Wood Content (%)	Observed Wood Condition: Observed Wood Type	Chemical Analytical Condition: Benthic Cleanup Level Exceedance[3]	Chemical Analytical Condition: Human Health Cleanup Level Exceedance[4]	Native Sediment Contact[5] (dbm)	Estimated Depth of Contamination (dbm)	Estimated Base of Contamination (ft MLLW)	Rationale
Sediment Management Area 1a													
1a	ST-41	May-2007	-55.67	0.6 ft	0 - 0.6 ft	<1	Not Observed	No Data	No Data	n/a	n/a	n/a	<u>Rationale 1:</u> No chemical analytical data is available at this location. Either sub-surface investigation was not completed or sub-surface data is not available and therefore, native contact could not be identified at this location. Due to insufficient information, the depth of contamination could not be estimated at this location.
1a	A1-17	Aug-2008	-60.99	11 cm	0 - 11 cm	25	Unspecified	No Data	No Data	n/a	n/a	n/a	See Rationale 1. As discussed in the RI/FS, wood debris observed at this location are not associated with Mill A Site.
1a	EW-12-07	Jun-2012	-115.1	17 cm	0 - 17 cm	<1	Not Observed	No Exceedance	Total cPAH TEQ	n/a	0.5 ft	-115.6	<u>Rationale 2:</u> A sample collected from surface sediment at this location identified exceedances of the PCUL. Either sub-surface investigation was not completed or sub-surface data is not available and therefore, native contact could not be identified at this location. This location is in the outermost portions of the Marine Area is at a distance away from source areas and therefore, the depth of contamination at this location is expected to be surficial. The depth of contamination is assumed to be 0.5 feet bml (i.e., the approximate depth of the surface sample interval rounded to nearest half foot) for the purposes of the FS.
1a	MAF-19	Oct-2015	-82.3	10 ft	0 - 10 cm	10	Lumber	No Exceedance	Arsenic, Total cPAH TEQ Total Dioxin/Furan TEQ	2 ft	2 ft	-84.3	<u>Rationale 3:</u> Sample(s) collected from sediment above the native contact at this location identified exceedances of the PCUL. Sample representative of native sediment was either not collected or analyzed at this location. This location is situated in an area that is not subject to vessel scour and reworking of the sediment and therefore, the observed native contact is expected to be undisturbed and representative of a depth below which contamination is not expected to be present. Therefore, the depth of contamination at this location is assumed to be at the native contact for the purposes of the FS.
					0 - 1 ft	<1	Bark	No Data	No Data				
					1 - 10 ft	<1	n/a	No Data	No Data				
1a	MAF-20	Oct-2015	-78.35	4.5 ft	0 - 10 cm	<5	Lumber	No Exceedance (Based on Bioassay)	Arsenic, Cadmium, Lead Total cPAH TEQ Total Dioxin/Furan TEQ	2 ft	2 ft	-80.35	<u>Rationale 4:</u> A sample collected from surface sediment at this location identified exceedances of the PCUL. Sample(s) collected from sub-surface sediment above the native contact at this location did not identify any PCUL exceedances; however, not all Marine Area COCs were tested. Sample representative of native sediment was either not collected or analyzed at this location. This location is situated in an area that is not subject to vessel scour and reworking of the sediment and therefore, the observed native contact is expected to be undisturbed and representative of a depth below which contamination is not expected to be present. Therefore, the depth of contamination at this location is assumed to be at the native contact for the purposes of the FS.
					0 - 1 ft	<1	Chips	No Data	No Data				
					1 - 2 ft	<1	Chips	No Exceedance	No Exceedance				
					2 - 4.5 ft	<1	Not Observed	No Data	No Data				
1a	MAF-22	Oct-2015	-61.6	10 cm	0 - 10 cm	<1	Bark	4-methylphenol (p-Cresol) Larval Development Test Failure	Total cPAH TEQ Total Dioxin/Furan TEQ	n/a	0.5 ft	-62.1	See Rationale 2.
1a	MAF-37	Sep-2016	-94.9	10 cm	0 - 10 cm	<1	Not Observed	No Exceedance	Total cPAH TEQ Total Dioxin/Furan TEQ	n/a	0.5 ft	-95.4	See Rationale 2.
1a	MAF-41	Sep-2016	-102.6	10 cm	0 - 10 cm	<1	Not Observed	No Data	Total cPAH TEQ	n/a	0.5 ft	-103.1	See Rationale 2.
1a	MAF-42	Sep-2016	-181.8	10 cm	0 - 10 cm	<1	Not Observed	No Data	Total cPAH TEQ	n/a	0.5 ft	-182.3	See Rationale 2.
1a	MAF-44	Sep-2016	-81.5	10 cm	0 - 10 cm	50	Bark	No Data	Total cPAH TEQ	n/a	0.5 ft	-82.0	See Rationale 2. As discussed in the RI/FS, wood debris observed at this location are not associated with Mill A Site.
1a	MAF-45	Sep-2016	-63.3	10 cm	0 - 10 cm	<1	Not Observed	No Data	Total cPAH TEQ	n/a	0.5 ft	-63.8	See Rationale 2.

SMA	Investigation Location[1]	Investigation Date	Mudline Elevation[2] (ft MLLW)	Investigation Depth (dbm)	Sample/ Depth Interval (dbm)	Observed Wood Condition		Chemical Analytical Condition		Native Sediment Contact[5] (dbm)	Estimated Depth of Contamination (dbm)	Estimated Base of Contamination (ft MLLW)	Rationale
						Visual Wood Content (%)	Observed Wood Type	Benthic Cleanup Level Exceedance[3]	Human Health Cleanup Level Exceedance[4]				
Sediment Management Area 1b													
1b	MAF-21	Oct-2015	-71.4	6 ft	0 - 10 cm	10	Bark and Lumber	No Exceedance (Based on Bioassay)	Arsenic, Cadmium Lead, Total cPAH TEQ Total Dioxin-Like PCB TEQ Total Dioxin/Furan TEQ	2 ft	2 ft	-73.4	<u>Rationale 5:</u> Sample(s) collected from sediment above the native contact at this location identified exceedances of the PCUL. Sample(s) collected at and/or below the native contact did not identify the exceedances of PCUL for tested COCs. Therefore, the depth of contamination at this location is assumed to be at the native contact for the purposes of the FS.
					0 - 1 ft	10	Bark, Sawdust, and Chips	4-methylphenol (p-Cresol) Fluorene	Arsenic, Cadmium, Lead Mercury, Total cPAH TEQ				
					1 - 2 ft	5	Bark, Sawdust, and Chips	No Data	No Data				
					2 - 4 ft	<1	Not Observed	No Exceedance	No Exceedance				
					4 - 6 ft	<1	Not Observed	No Data	No Data				
1b	MAF-38	Sep-2016	-82.1	10 cm	0 - 10 cm	<1	n/a	No Exceedance	Total cPAH TEQ Total Dioxin/Furan TEQ	n/a	0.5 ft	-82.6	See Rationale 2.
1b	ST-33	May-2007	-61.2	0.7 ft	0 - 0.7 ft	<5	Unspecified	No Data	No Data	n/a	n/a	n/a	See Rationale 1.
Sediment Management Area 1c													
1c	MAF-39	Sep-2016	-67.5	10 cm	0 - 10 cm	35	Chips and Sawdust	No Data	Total cPAH TEQ	n/a	0.5 ft	-68.0	See Rationale 2.
Sediment Management Area 1d													
1d	MAF-10	Oct-2015	-55.1	9 ft	0 - 10 cm	<5	Bark and Sawdust	Sum of LPAHs, Acenaphthene Fluorene, Naphthalene 2,4-Dimethylphenol 4-methylphenol (p-Cresol) Dibenzofuran Larval Development Test Failure	Arsenic, Cadmium Total cPAH TEQ Total Dioxin-Like PCB TEQ Total Dioxin/Furan TEQ	7.5 ft	7.5 ft	-62.6	See Rationale 3.
					0 - 2 ft	<5 - 15	Chips and Sawdust	Sum of LPAHs 2-Methylnaphthalene Acenaphthene, Fluorene Naphthalene, Phenanthrene Fluoranthene 2,4-Dimethylphenol 4-methylphenol (p-Cresol) Phenol, Dibenzofuran Benzyl Alcohol	Arsenic, Cadmium, Lead Total cPAH TEQ Total Dioxin-Like PCB TEQ				
					2 - 5.5 ft	10 - 15	Sawdust	No Data	No Data				
					5.5 - 5.7 ft	100	Lumber	No Data	No Data				
					5.7 - 6 ft	<1	Bark	No Data	No Data				
					6 - 7.6 ft	<1	Bark	No Exceedance	Total cPAH TEQ				
					7.6 - 9 ft	<1	Not Observed	No Data	No Data				
1d	MAF-12	Oct-2015	-56.9	12 ft	0 - 10 cm	15	Lumber	Dibenzofuran, Total PCBs Larval Development Test Failure	Arsenic, Cadmium Total cPAH TEQ Total Dioxin-Like PCB TEQ Total Dioxin/Furan TEQ	4 ft	4 ft	-60.9	See Rationale 3.
					0 - 2 ft	10	Chips	4-methylphenol (p-Cresol)	Arsenic, Cadmium, Lead Total cPAH TEQ				
					2 - 4 ft	<5	Chips	No Exceedance	Arsenic				
					4 - 12 ft	<1	Not Observed	No Data	No Data				
1d	ST-28	May-2007	-61.7	n/a	n/a	25	Bark	No Data	No Data	n/a	n/a	n/a	See Rationale 1.

SMA	Investigation Location[1]	Investigation Date	Mudline Elevation[2] (ft MLLW)	Investigation Depth (dbm)	Sample/ Depth Interval (dbm)	Observed Wood Condition: Visual Wood Content (%)	Observed Wood Condition: Observed Wood Type	Chemical Analytical Condition: Benthic Cleanup Level Exceedance[3]	Chemical Analytical Condition: Human Health Cleanup Level Exceedance[4]	Native Sediment Contact[5] (dbm)	Estimated Depth of Contamination (dbm)	Estimated Base of Contamination (ft MLLW)	Rationale
1d	ST-30	May-2007	-67.9	0.7 ft	0 - 10 cm	95	Unspecified	No Exceedance	Total cPAH TEQ	n/a	n/a	n/a	Rationale 6: A sample collected from surface sediment at this location identified exceedances of the PCUL. Other investigation(s) completed in the vicinity of this location identified the presence of contamination in sediment above native contact. Either sub-surface investigation was not completed or sub-surface data is not available and therefore, native contact could not be identified at this location. Due to insufficient information, the depth of contamination could not be estimated at this location.
					10 - 21 cm	95	Unspecified	No Data	No Data				
1d	ST-31	May-2007	-55.7	n/a	n/a	20	Bark	No Data	No Data	n/a	n/a	n/a	See Rationale 1.
1d	ST-36	May-2007	-57.0	0.6 ft	n/a	<1	Not Observed	No Data	No Data	n/a	n/a	n/a	See Rationale 1.
Sediment Management Area 2a													
2a	A1-24	Aug-2008	-53.0	13 ft	0 - 10 cm	20	Unspecified	Zinc	Arsenic, Cadmium, Lead, Total cPAH TEQ Total Dioxin/Furan TEQ	n/a	n/a	n/a	Rationale 7: Sample(s) at this location identified exceedances of the PCUL. The chemical analytical data at this location did not identify the base of contamination. The native contact was either not identified or could not be confirmed because 1) the location does not have chemical analytical data representative of native sediment that meets the PCUL for Marine Area COCs to support the confirmation of the native contact, and/or 2) the location is subject to scour and therefore, relying on aged data that may not be representative of current conditions increases the uncertainty in estimating the depth of contamination as a result of high potential of reworking. Therefore, the depth of contamination could not be estimated at this location.
					0 - 1 ft	20	Unspecified	No Data	No Data				
					1 - 3 ft	25 - 30	Unspecified	4-methylphenol (p-Cresol)	Cadmium, Lead, Mercury, Total cPAH TEQ Total Dioxin/Furan TEQ				
					3 - 5 ft	25 - 30	Unspecified	2,4-Dimethylphenol, 4-methylphenol (p-Cresol)	Arsenic, Cadmium Lead, Mercury Total cPAH TEQ				
					5 - 13 ft	<1	Not Observed	No Data	No Data				
2a	MAF-11	Oct-2015	-54.8	11 ft	0 - 10 cm	75	Chips	4-methylphenol (p-Cresol), Phenol	Arsenic, Cadmium, Total cPAH TEQ	8 ft	8 ft	-62.8	Rationale 8: Sample(s) collected from sediment above the native contact at this location identified exceedances of the PCUL. Sample representative of native sediment was either not collected or analyzed at this location. For the purposes of the FS, the depth of contamination at this location is assumed to be at the native contact, which is estimated to be located below the deepest sample interval identifying the exceedances of the PCUL.
					0 - 2 ft	25	Chips	Arsenic, Zinc, Sum of LPAHs, Acenaphthene Fluorene, Phenanthrene Fluoranthene 4-methylphenol (p-Cresol) Dibenzofuran	Arsenic, Cadmium, Lead, Benzo(a)pyrene Total cPAH TEQ				
					2 - 4 ft	50	Sawdust and Twigs	Sum of LPAHs 2-Methylnaphthalene Acenaphthene, Fluorene Naphthalene, Phenanthrene 2,4-Dimethylphenol 4-methylphenol (p-Cresol) Dibenzofuran, Total PCBs	Arsenic, Cadmium, Lead Benzo(a)pyrene, Total cPAH TEQ, Total PCBs, Total Dioxin-Like PCB TEQ				
					4 - 6 ft	75	Sawdust and Twigs	No Data	No Data				
					6 - 8 ft	<1	Not Observed	2,4-Dimethylphenol 4-methylphenol (p-Cresol)	Lead, Mercury				
					8 - 11 ft	<1	Not Observed	No Data	No Data				
2a	MAF-58	Nov-2018	-54.7	10 ft	0 - 10 cm	5	Chips and Bark	No Exceedance	Cadmium, Total cPAH TEQ Total Dioxin/Furan TEQ	2 ft	2 ft	-56.7	See Rationale 5.
					0 - 2 ft	35	Chips and Bark	No Data	No Data				
					2 - 4 ft	<1	Not Observed	No Exceedance	No Exceedance				
					4 - 10 ft	<1	Not Observed	No Data	No Data				

SMA	Investigation Location[1]	Investigation Date	Mudline Elevation[2] (ft MLLW)	Investigation Depth (dbm)	Sample/ Depth Interval (dbm)	Observed Wood Condition		Chemical Analytical Condition		Native Sediment Contact[5] (dbm)	Estimated Depth of Contamination (dbm)	Estimated Base of Contamination (ft MLLW)	Rationale
						Visual Wood Content (%)	Observed Wood Type	Benthic Cleanup Level Exceedance[3]	Human Health Cleanup Level Exceedance[4]				
2a	MAF-59	Nov-2018	-51.9	12 ft	0 - 10 cm	20	Bark and Chips	No Exceedance	Total cPAH TEQ Total Dioxin/Furan TEQ	10 ft	10 ft	-61.9	See Rationale 5.
					0 - 2 ft	50	Fibers and Chips	No Data	No Data				
					2 - 4 ft	<5	Fibers	2,4-Dimethylphenol 4-methylphenol (p-Cresol)	Lead, Mercury, Total cPAH TEQ Total Dioxin-Like PCB TEQ Total Dioxin/Furan TEQ				
					4 - 6 ft	<5	Fibers	No Data	No Data				
					6 - 8 ft	<1	Not Observed	Mercury	Lead, Mercury Total Dioxin/Furan TEQ				
					8 - 10 ft	<1	Not Observed	No Data	No Data				
					10 - 12 ft	<1	Not Observed	No Exceedance	No Exceedance				
2a	ST-32	May-2007	-54.5	10 ft	0 - 10 cm	10	Bark	No Exceedance	Total cPAH TEQ	n/a	n/a	n/a	See Rationale 6.
					0 - 7.2 ft	10	Bark	No Data	No Data				
					7.2 - 10 ft	<1	Not Observed	No Data	No Data				
Sediment Management Area 2b													
2b	A1-15	Aug-2008	-51.5	12 ft	0 - 10 cm	10	Unspecified	No Exceedance	Total cPAH TEQ	1 ft	n/a	n/a	<u>Rationale 9:</u> A sample collected from surface sediment at this location identified exceedances of the PCUL. Sample(s) collected from sub-surface sediment at this location did not identify any PCUL exceedances; however, not all Marine Area COCs were tested. The native contact was either not identified or could not be confirmed because 1) the location does not have chemical analytical data representative of native sediment that meets the PCUL for Marine Area COCs to support the confirmation of the native contact, and/or 2) the location is subject to scour and therefore relying on aged data that may not be representative of current conditions increases the uncertainty in estimating the depth of contamination as a result of high potential of reworking. Therefore, the depth of contamination could not be estimated at this location.
					0 - 1 ft	<1	Not Observed	No Data	No Data				
					1 - 3 ft	<1	Not Observed	No Exceedance	No Exceedance				
					3 - 5 ft	<1	Not Observed	No Exceedance	No Exceedance				
					5 - 12 ft	<1	Not Observed	No Data	No Data				
2b	A1-20	Aug-2008	-44.8	13 cm	0 - 13 cm	10	Unspecified	No Data	No Data	n/a	n/a	n/a	See Rationale 1.
2b	MAF-09	Oct-2015	-46.0	10 cm	0 - 10 cm	<25	Bark, Twigs, and Sawdust	Phenol	Total cPAH TEQ	n/a	0.5 ft	-46.5	See Rationale 2.
2b	MAF-35	Oct-2015	-54.6	10 cm	0 - 10 cm	10	Bark and Twigs	No Exceedance	Total cPAH TEQ Total Dioxin-Like PCB TEQ Total Dioxin/Furan TEQ	n/a	n/a	n/a	See Rationale 2.
2b	MAF-36	Oct-2015	-45.8	10 cm	0 - 10 cm	<1	Bark	No Exceedance	Total cPAH TEQ Total Dioxin-Like PCB TEQ Total Dioxin/Furan TEQ	n/a	n/a	n/a	See Rationale 2.
2b	MAF-46	Sep-2016	-53.9	10 cm	0 - 10 cm	<1	Not Observed	No Data	Total cPAH TEQ	n/a	n/a	n/a	See Rationale 2.
2b	SP-151	Jun-2007	-51.6	30 cm	0 - 30 cm	<1	Not Observed	2,4-Dimethylphenol, Benzoic Acid	Total cPAH TEQ	n/a	n/a	n/a	See Rationale 7.
Sediment Management Area 3a													
3a	MAF-31	Oct-2015	-43.1	10 cm	0 - 10 cm	10	Bark	2,4-Dimethylphenol, 4-methylphenol (p-Cresol), Benzoic Acid	Cadmium, Lead Total cPAH TEQ Total Dioxin/Furan TEQ	n/a	0.5 ft	-43.6	See Rationale 2.
3a	ST-42	May-2007	-42.0	12 ft	0 - 10 cm	5	Chips	No Exceedance	No Exceedance	n/a	n/a	n/a	<u>Rationale 10:</u> A sample collected from surface sediment at this location did not identify exceedances of the PCUL; however, the sample was not tested for all of the Marine Area COCs. The native contact was either not identified or could not be confirmed because 1) the location does not have chemical analytical data representative of native sediment that meets the PCUL for Marine Area COCs to support the confirmation of the native contact, and/or 2) the location is subject to scour and therefore relying on aged data that may not be representative of current conditions increases the uncertainty in estimating the depth of contamination as a result of high potential of reworking. Therefore, the depth of contamination could not be estimated at this location.
					0 - 12 ft	5	Chips and Chunks	No Data	No Data				

SMA	Investigation Location[1]	Investigation Date	Mudline Elevation[2] (ft MLLW)	Investigation Depth (dbm)	Sample/ Depth Interval (dbm)	Observed Wood Condition: Visual Wood Content (%)	Observed Wood Condition: Observed Wood Type	Chemical Analytical Condition: Benthic Cleanup Level Exceedance[3]	Chemical Analytical Condition: Human Health Cleanup Level Exceedance[4]	Native Sediment Contact[5] (dbm)	Estimated Depth of Contamination (dbm)	Estimated Base of Contamination (ft MLLW)	Rationale
Sediment Management Area 3b													
3b	MAF-33	Oct-2015	-39.7	10 cm	0 - 10 cm	<1	Bark	Acenaphthene, Dibenzofuran	Arsenic, Total cPAH TEQ	n/a	0.5 ft	-40.2	See Rationale 2.
Sediment Management Area 3c													
3c	MAF-32	Oct-2015	-23.4	10 cm	0 - 10 cm	40	Bark	No Exceedance	Arsenic, Total cPAH TEQ	n/a	0.5 ft	-23.9	See Rationale 2.
Sediment Management Area 4													
4	PT3[6]	Jan-2015	-42.48	5 ft	0 - 1 ft	<1	Not Observed	No Exceedance	No Exceedance	0 ft	0 ft	n/a	Rationale 11: At this location, contaminated material were completely removed as part the 2016 Pacific Terminal Interim Action. For the purposes of the FS, contamination is assumed to be not present at this location.
					1 - 5 ft	<1	Not Observed	No Data	No Data				
4	PT5[6]	Jan-2015	-43.9	5 ft	0 - 1 ft	<1	Not Observed	No Exceedance	No Exceedance	0 ft	0 ft	n/a	See Rationale 11.
					1 - 5 ft	<1	Not Observed	No Data	No Data				
4	PT6[6]	Jan-2015	-42.09	2 ft	0 - 1 ft	<1	Not Observed	No Exceedance	No Exceedance	0 ft	0 ft	n/a	See Rationale 11.
					1 - 2 ft	<1	Not Observed	No Data	No Data				
4	PT8[6]	Jan-2015	-42.61	3 ft	0 - 1 ft	<1	Not Observed	No Exceedance	No Exceedance	0 ft	0 ft	n/a	See Rationale 11.
					1 - 3 ft	<1	Not Observed	No Data	No Data				
Sediment Management Area 5													
5	MAF-01	Oct/ Nov-2015	-4.7	23.5 ft	0 - 10 cm	<5	Bark	Acenaphthene, Fluorene, Naphthalene, Dibenzofuran Total PCBs	Arsenic, Cadmium, Lead Total cPAH TEQ Total Dioxin-Like PCB TEQ	20 ft	20 ft	-24.7	See Rationale 5.
					0 - 4 ft	100	Sawdust and Chips	No Data	No Data				
					4 - 6 ft	90	Chips	Sum of LPAHs 2-Methylnaphthalene Acenaphthene, Fluorene Naphthalene 2,4-Dimethylphenol 2-methylphenol (o-Cresol) 4-methylphenol (p-Cresol) Dibenzofuran, Benzoic Acid	Arsenic, Cadmium Lead, Mercury Total cPAH TEQ				
					6 - 11 ft	50 - 100	Sawdust and Chips	No Data	No Data				
					11 - 20 ft	<1	Lumber	No Data	No Data				
					20 - 22 ft	<1	Not Observed	No Exceedance	No Exceedance				
5	MAF-02	Oct/ Nov-2015	-5.0	23.5 ft	0 - 10 cm	10	Lumber	Acenaphthene Dibenzofuran	Arsenic, Cadmium, Lead Total cPAH TEQ Total Dioxin/Furan TEQ	18 ft	18 ft	-23.0	See Rationale 5.
					0 6 ft	100	Sawdust	Sum of LPAHs 2-Methylnaphthalene Acenaphthene, Naphthalene Hexachlorobenzene 2,4-Dimethylphenol 2-methylphenol (o-Cresol) 4-methylphenol (p-Cresol) Hexachlorobutadiene Dibenzofuran	Arsenic Lead Mercury				
					6 - 18 ft	25 - 100	Sawdust, Fibers and Lumber	No Data	No Data				
					18 - 20 ft	<1	Not Observed	No Data	No Data				
					20 - 22 ft	<1	Not Observed	No Exceedance	No Exceedance				

SMA	Investigation Location[1]	Investigation Date	Mudline Elevation[2] (ft MLLW)	Investigation Depth (dbm)	Sample/ Depth Interval (dbm)	Observed Wood Condition: Visual Wood Content (%)	Observed Wood Condition: Observed Wood Type	Chemical Analytical Condition: Benthic Cleanup Level Exceedance[3]	Chemical Analytical Condition: Human Health Cleanup Level Exceedance[4]	Native Sediment Contact[5] (dbm)	Estimated Depth of Contamination (dbm)	Estimated Base of Contamination (ft MLLW)	Rationale
5	MAF-03	Oct/ Nov-2015	-21.2	23.5 ft	0 - 10 cm	50	Sawdust	Sum of LPAHs 2-Methylnaphthalene Acenaphthene, Anthracene Fluorene, Naphthalene Phenanthrene, Sum of HPAHs Fluoranthene, Pyrene 2,4-Dimethylphenol 4-methylphenol (p-Cresol) Dibenzofuran, Total PCBs	Arsenic, Cadmium, Lead Mercury, Total cPAH TEQ Total Dioxin-Like PCB TEQ	20 ft	20 ft	-41.2	See Rationale 5.
					0 - 10 ft	100	Sawdust and Chips	Sum of LPAHs 2-Methylnaphthalene Acenaphthene, Anthracene Fluorene, Naphthalene Phenanthrene, Fluoranthene 1,2,4-Trichlorobenzene Bis(2-Ethylhexyl) Phthalate Diethyl Phthalate 2,4-Dimethylphenol 2-methylphenol (o-Cresol) 4-methylphenol (p-Cresol) Phenol, Dibenzofuran Benzoic Acid	Arsenic, Cadmium, Lead Mercury, Total cPAH TEQ Total PCBs Total Dioxin-Like PCB TEQ				
					10 - 20 ft	80 - 100	Sawdust, Fibers and Chips	No Data	No Data				
					20 - 21 ft	<1	Not Observed	No Data	No Data				
					21 - 23 ft	<1	Not Observed	No Exceedance	No Exceedance				
5	MAF-04	Oct/ Nov-2015	-15.7	20 ft	0 - 10 cm	75	Sawdust	Sum of LPAHs 2-Methylnaphthalene Acenaphthene, Fluorene Naphthalene, Phenanthrene 2,4-Dimethylphenol 2-methylphenol (o-Cresol) 4-methylphenol (p-Cresol) Dibenzofuran, Benzyl Alcohol	Arsenic, Cadmium, Lead Total cPAH TEQ Total Dioxin-Like PCB TEQ	15 ft	15 ft	-30.7	See Rationale 5.
					0 - 16 ft	25 - 85	Sawdust and Chips	Sum of LPAHs, 2-Methylnaphthalene, Acenaphthene, Anthracene, Fluorene, Naphthalene, Phenanthrene, Fluoranthene, 2,4-Dimethylphenol, 2-methylphenol (o-Cresol), 4-methylphenol (p-Cresol), Phenol, Dibenzofuran, Benzyl Alcohol	Arsenic, Cadmium, Lead, Mercury, Total cPAH TEQ Total Dioxin-Like PCB TEQ				
					10 - 15 ft	25	Sawdust, Chips, and Fibers	No Data	No Data				
					15 - 16 ft	<1	Not Observed	No Data	No Data				
					16 - 18 ft	<1	Not Observed	No Exceedance	No Exceedance				

SMA	Investigation Location[1]	Investigation Date	Mudline Elevation[2] (ft MLLW)	Investigation Depth (dbm)	Sample/ Depth Interval (dbm)	Observed Wood Condition		Chemical Analytical Condition		Native Sediment Contact[5] (dbm)	Estimated Depth of Contamination (dbm)	Estimated Base of Contamination (ft MLLW)	Rationale
						Visual Wood Content (%)	Observed Wood Type	Benthic Cleanup Level Exceedance[3]	Human Health Cleanup Level Exceedance[4]				
5	MAF-05	Oct/Nov-2015	-5.1	15 ft	0 - 10 cm	<1	Not Observed	Sum of LPAHs 2-Methylnaphthalene Acenaphthene, Fluorene Naphthalene, Phenanthrene 2,4-Dimethylphenol Dibenzofuran	Arsenic, Lead Total cPAH TEQ Total Dioxin-Like PCB TEQ	10.5 ft	10.5 ft	-15.6	See Rationale 5.
					0 - 6 ft	100	Chips and Sawdust	Sum of LPAHs, 2-Methylnaphthalene Acenaphthene, Fluorene Naphthalene, Phenanthrene 2,4-Dimethylphenol 4-methylphenol (p-Cresol) Dibenzofuran	Arsenic, Cadmium, Lead Total cPAH TEQ				
					6 - 10.5 ft	100	Chips and Sawdust	No Data	No Data				
					10.5 - 12 ft	<1	Not Observed	No Data	No Data				
					12 - 14 ft	<1	Not Observed	No Exceedance	No Exceedance				
5	MAF-34	Oct-2015	-10.0	10 cm	0 - 10 cm	<1	Not Observed	Acenaphthene, Dibenzofuran, Total PCBs	Arsenic, Total cPAH TEQ Total Dioxin-Like PCB TEQ Total Dioxin/Furan TEQ	n/a	n/a	n/a	See Rationale 6.
5	PT11[6]	Jan-2015	-27.0	13 ft	0 - 3.5 ft	n/a	n/a	n/a (Bedding/Rock Armor Layer)	n/a (Bedding/Rock Armor Layer)	4 ft	4 ft	-31.0	Rationale 12: At this location, a portion of the contaminated material was removed as part of the 2016 Pacific Terminal Interim Action. Following dredging, approximately 3.5 feet layer of bedding and armor rock was placed on the dredged surface to cover the exposed contamination. The estimated depth of contamination below mudline presented in this table is referenced to the existing mudline and includes the layer of rock. Rationale that that the volume of contaminated material calculated for the purposes of the FS does not include the armor rock volume.
					3.5 - 4 ft	<5	Chips	No Data	No Data				
					4 - 9 ft	<1	Not Observed	No Data	No Data				
					9 - 10 ft	<1	Not Observed	No Exceedance	No Exceedance				
					10 - 13 ft	<1	Not Observed	No Data	No Data				
5	PT12[6]	Jan-2015	-26.5	12.5 ft	0 - 3.5 ft	n/a	n/a	n/a (Bedding/Rock Armor Layer)	n/a (Bedding/Rock Armor Layer)	7.5 ft	7.5 ft	-34.0	See Rationale 12.
					3.5 - 4.5 ft	10	Unspecified	No Exceedance	Cadmium, Lead Total cPAH TEQ, Total Dioxin/Furan TEQ				
					4.5 - 7.5 ft	10	Unspecified	No Data	No Data				
					7.5 - 12.5 ft	<1	Not Observed	No Data	No Data				
5	PT13[6]	Jan-2015	-24.3	11.5 ft	0 - 3.5 ft	n/a	n/a	n/a (Bedding/Rock Armor Layer)	n/a (Bedding/Rock Armor Layer)	3.5 ft	3.5 ft	-27.8	See Rationale 11.
					3.5 - 4.5 ft	<1	Not Observed	No Data	No Data				
					4.5 - 5.5 ft	<1	Not Observed	No Exceedance	No Exceedance				
					5.5 - 11.5 ft	<1	Not Observed	No Data	No Data				
5	PT14[6]	Jan-2015	-25.4	12.5 ft	0 - 3.5 ft	n/a	n/a	n/a (Bedding/Rock Armor Layer)	n/a (Bedding/Rock Armor Layer)	3.5 ft	3.5 ft	-28.9	See Rationale 11.
					3.5 - 12.5	<1	Not Observed	No Exceedance	No Exceedance				
					4.5 - 12.5 ft	<1	Not Observed	No Data	No Data				

SMA	Investigation Location[1]	Investigation Date	Mudline Elevation[2] (ft MLLW)	Investigation Depth (dbm)	Sample/ Depth Interval (dbm)	Observed Wood Condition		Chemical Analytical Condition		Native Sediment Contact[5] (dbm)	Estimated Depth of Contamination (dbm)	Estimated Base of Contamination (ft MLLW)	Rationale
						Visual Wood Content (%)	Observed Wood Type	Benthic Cleanup Level Exceedance[3]	Human Health Cleanup Level Exceedance[4]				
5	ST109	Oct-2018	-28.8	18 ft	0 - 10 cm	25	Sawdust and Chips	Acenaphthene, Chrysene Fluoranthene, 4-methylphenol (p-Cresol), Dibenzofuran	Arsenic, Cadmium, Lead Benzo(a)pyrene, Total cPAH TEQ Total Dioxin-Like PCB TEQ Total Dioxin/Furan TEQ	9.5 ft	9.5 ft	-38.3	See Rationale 5.
					0 - 8.3 ft	50 - 75	Sawdust and Chips	No Data	No Data				
					8.3 - 9.3 ft	30 - 50	Unspecified	Sum of LPAHs, Acenaphthene Anthracene, Fluorene Phenanthrene, Fluoranthene 2,4-Dimethylphenol Dibenzofuran	Lead, Mercury Total cPAH TEQ Total Dioxin/Furan TEQ				
					9.3 - 11.3 ft	<1	Not Observed	No Data	No Data				
					11.3 - 12.3 ft	<1	Not Observed	No Exceedance	No Exceedance				
					12.3 - 18 ft	< 1	Not Observed	No Data	No Data				
5	ST-1	May-2007	-1.8	8 ft	0 - 8 ft	0 - 5	Twigs and Chips	No Data	No Data	n/a	n/a	n/a	<u>Rationale 13:</u> Chemical analytical data is not available at this location. The native contact was either not identified or could not be confirmed because 1) the location does not have chemical analytical data representative of native sediment that meets the PCUL for Marine Area COCs to support the confirmation of the native contact, and/or 2) the location is subject to scour and therefore relying on aged data that may not be representative of current conditions increases the uncertainty in estimating the depth of contamination as a result of high potential of reworking. Due to insufficient information, the depth of contamination could not be estimated at this location.
5	ST-2	May-2007	-32.3	14 ft	0 - 5 ft	10 - 90	Sawdust, Chips and Bark	No Data	No Data	n/a	n/a	n/a	See Rationale 7.
					5 - 6 ft	90	Sawdust and Bark	Sum of LPAHs 2-Methylnaphthalene Acenaphthene, Anthracene Fluorene, Naphthalene Phenanthrene, Fluoranthene 2,4-Dimethylphenol 2-methylphenol (o-Cresol) Dibenzofuran	Total cPAH TEQ				
					6 - 6.8 ft	90	Sawdust and Bark	No Data	No Data				
					6.8 - 14 ft	<1	Not Observed	No Data	No Data				
5	ST-3	May-2007	-6.7	18 ft	0 - 3.5 ft	25	Chips	No Data	No Data	n/a	n/a	n/a	See Rationale 7.
					3.5 - 6.2 ft	85	Sawdust	Butyl benzyl Phthalate, 2,4-Dimethylphenol, 4-methylphenol (p-Cresol)	No Exceedance				
					6.2 - 14 ft	85	Sawdust	No Data	No Data				
					14 - 15.9 ft	80	Chips	Sum of LPAHs 2-Methylnaphthalene Acenaphthene, Anthracene Fluorene, Naphthalene Phenanthrene, Sum of HPAHs Fluoranthene, Pyrene 2,4-Dimethylphenol Dibenzofuran, Benzyl Alcohol	Total cPAH TEQ				
					15.9 - 18 ft	0 - 10	Chips	No Data	No Data				

SMA	Investigation Location[1]	Investigation Date	Mudline Elevation[2] (ft MLLW)	Investigation Depth (dbm)	Sample/ Depth Interval (dbm)	Observed Wood Condition: Visual Wood Content (%)	Observed Wood Condition: Observed Wood Type	Chemical Analytical Condition: Benthic Cleanup Level Exceedance[3]	Chemical Analytical Condition: Human Health Cleanup Level Exceedance[4]	Native Sediment Contact[5] (dbm)	Estimated Depth of Contamination (dbm)	Estimated Base of Contamination (ft MLLW)	Rationale
5	ST-5	May-2007	-15.7	20 ft	0 - 0.9 ft	90	Chips	No Data	No Data	n/a	n/a	n/a	See Rationale 7.
					0.9 - 2.5 ft	90	Chips	No Exceedance	Total Dioxin/Furan TEQ				
					2.5 - 5 ft	50	Chips, Twigs, and Bark	No Data	No Data				
					5 - 19 ft	100	Sawdust and Chips	No Data	No Data				
					19 - 20 ft	5	Chips	No Data	No Data				
5	ST-6	May-2007	-5.2	12 ft	0 - 2 ft	30	Fibers and Bark	No Data	No Data	n/a	n/a	n/a	See Rationale 13.
					2 - 12 ft	100	Sawdust and Chips	No Data	No Data				
5	ST-8	May-2007	-16.7	20 ft	0 - 4.4 ft	60	Bark and Fibers	No Data	No Data	n/a	n/a	n/a	See Rationale 7.
					4.4 - 7.3 ft	100	Sawdust and Chips	No Data	No Data				
					7.3 - 10.5 ft	100	Sawdust and Chips	Sum of LPAHs, Naphthalene, Butyl benzyl Phthalate, 2,4-Dimethylphenol, 4-methylphenol (p-Cresol)	No Exceedance				
					10.5 - 18 ft	100	Sawdust and Chips	No Data	No Data				
					18 - 20 ft	<1	Not Observed	No Data	No Data				
5	ST-9	May-2007	-6.6	20 ft	0 - 1.3 ft	10	Chips	No Data	No Data	n/a	n/a	n/a	See Rationale 7.
					1.3 - 10.1 ft	100	Sawdust and Chips	No Data	No Data				
					10.1 - 12 ft	100	Sawdust and Chips	No Data	Total Dioxin/Furan TEQ				
					12 - 14.7 ft	80	Bark	No Data	No Data				
					14.7 - 17 ft	20	Bark	No Data	No Data				
					17 - 20 ft	<1	Not Observed	No Data	No Data				
5	ST-11	May-2007	-23.9	20 ft	0 - 6.2 ft	85	Sawdust	Sum of LPAHs 2-Methylnaphthalene Acenaphthene, Anthracene Fluorene, Naphthalene Phenanthrene, Sum of HPAHs Benzo(a)anthracene Benzo(a)pyrene Benzofluoranthenes Benzo(g,h,i)perylene Chrysene Dibenzo(a,h)anthracene Fluoranthene Indeno(1,2,3-c,d)pyrene Pyrene, 2,4-Dimethylphenol 2-methylphenol (o-Cresol) Dibenzofuran, Benzoic Acid Benzyl Alcohol	Total cPAH TEQ	n/a	n/a	n/a	See Rationale 7.
					6.2 - 10.2 ft	85	Sawdust	No Data	No Data				
					10.2 - 20 ft	<1	Not Observed	No Data	No Data				

SMA	Investigation Location[1]	Investigation Date	Mudline Elevation[2] (ft MLLW)	Investigation Depth (dbm)	Sample/ Depth Interval (dbm)	Observed Wood Condition: Visual Wood Content (%)	Observed Wood Condition: Observed Wood Type	Chemical Analytical Condition: Benthic Cleanup Level Exceedance[3]	Chemical Analytical Condition: Human Health Cleanup Level Exceedance[4]	Native Sediment Contact[5] (dbm)	Estimated Depth of Contamination (dbm)	Estimated Base of Contamination (ft MLLW)	Rationale
5	ST-12	May-2007	-7.2	11 ft	0 - 11 ft	100	Sawdust and Chips	No Data	No Data	n/a	n/a	n/a	See Rationale 13.
5	ST-14	May-2007	-9.1	20 ft	0 - 3.4 ft	30	Sawdust	No Data	No Data	n/a	n/a	n/a	See Rationale 7.
					3.4 - 4.6 ft	90	Sawdust	Naphthalene 2,4-Dimethylphenol 2-methylphenol (o-Cresol) 4-methylphenol (p-Cresol) Benzyl Alcohol	No Exceedance				
					4.6 - 9.4 ft	90	Sawdust	No Data	No Data				
					9.4 - 10.5 ft	90	Sawdust	Naphthalene 2,4-Dimethylphenol 2-methylphenol (o-Cresol) 4-methylphenol (p-Cresol)	No Exceedance				
					10.5 - 12.2 ft	30	Chunks	No Data	No Data				
					12.2 - 20 ft	<1	Not Observed	No Data	No Data				
5	ST-15	May-2007	-23.5	20 ft	0 - 0.8 ft	90	Sawdust and Chips	No Data	No Data	n/a	n/a	n/a	See Rationale 7.
					0.8 - 2.2 ft	90	Sawdust and Chips	No Data	Total Dioxin/Furan TEQ				
					2.2 - 7 ft	90	Sawdust and Chips	No Data	No Data				
					7 - 20 ft	<1	n/a	No Data	No Data				
5	ST-17	May-2007	-12.1	18 ft	0 - 5.9 ft	100	Sawdust and Twigs	No Data	No Data	n/a	n/a	n/a	See Rationale 7.
					5.9 - 7.1 ft	100	Sawdust and Twigs	No Data	Total Dioxin/Furan TEQ				
					7.1 - 8 ft	100	Sawdust and Twigs	No Data	No Data				
					8 - 14.8 ft	<1	n/a	No Data	No Data				
					14.8 - 18 ft	<5	Unspecified	No Data	No Data				
5	ST-19	May-2007	-11.2	4.25 ft	0 - 4.25 ft	95	Sawdust and Chips	No Data	No Data	n/a	n/a	n/a	See Rationale 13.
5	ST-20	May-2007	-20.9	20 ft	0 - 9.9 ft	50 - 90	Fibers, Sawdust and Chips	No Data	No Data	n/a	n/a	n/a	See Rationale 7.
					9.9 - 11.2 ft	90	Sawdust and Chips	Butyl benzyl Phthalate 2,4-Dimethylphenol 2-methylphenol (o-Cresol) 4-methylphenol (p-Cresol) Benzyl Alcohol	Total cPAH TEQ				
					11.2 - 14 ft	90	Sawdust and Chips	No Data	No Data				
					14 - 15.5 ft	90	Sawdust and Chips	2,4-Dimethylphenol 2-methylphenol (o-Cresol) 4-methylphenol (p-Cresol) Benzyl Alcohol	Total cPAH TEQ				
					15.5 - 17.5 ft	90	Sawdust and Chips	No Data	No Data				
					17.5 - 20 ft	<1	n/a	No Data	No Data				
5	ST-21	May-2007	-12.6	20 ft	0 - 9.1 ft	5 - 70	Bark, Fibers and Chips	No Data	No Data	n/a	n/a	n/a	See Rationale 7.
					9.1 - 11.2 ft	70	Bark and Fibers	Butyl benzyl Phthalate, 2,4-Dimethylphenol	Total cPAH TEQ				
					11.2 - 12.3 ft	70	Bark and Fibers	No Data	No Data				
					12.3 - 20 ft	<1	n/a	No Data	No Data				

SMA	Investigation Location[1]	Investigation Date	Mudline Elevation[2] (ft MLLW)	Investigation Depth (dbm)	Sample/ Depth Interval (dbm)	Observed Wood Condition: Visual Wood Content (%)	Observed Wood Condition: Observed Wood Type	Chemical Analytical Condition: Benthic Cleanup Level Exceedance[3]	Chemical Analytical Condition: Human Health Cleanup Level Exceedance[4]	Native Sediment Contact[5] (dbm)	Estimated Depth of Contamination (dbm)	Estimated Base of Contamination (ft MLLW)	Rationale
Sediment Management Area 6													
6	MAF-13	Oct-2015	-43.2	6 ft	0 - 10 cm	<1	n/a	No Exceedance	No Exceedance	1 ft	1 ft	-44.2	Rationale 14: A sample collected from surface sediment at this location did not identify exceedances of the PCUL. Sample(s) from sub-surface sediment were either not collected or analyzed at this location. The native contact was identified at this location. The depth of contamination at this location is assumed to be at the native contact for the purposes of the FS because of one or more of the following reasons: 1) the presence of contamination was identified in the RI at investigation locations adjacent to this location indicating that there is a potential for contamination to be present in this area above native contact and the location could not be reasonably eliminated from the SMA. 2) The area of this location is subject to scour as evidenced by the scour features in the bathymetric survey confirming uncertainty in the distribution of recent deposits containing contamination in this area. Because of the scour, the shallow subsurface condition is variable and dynamic. 3) sub-surface sediment chemical analytical data is not available at the location. Review of chemical analytical data of adjacent core locations identify that recent deposits (above the native contact) have contamination exceeding the PCULs. Recent deposit material observed at this location is similar to that observed at adjacent core locations and therefore, because of the lack of chemical analytical data, sediment above native contact is considered to be contaminated.
					0 - 1 ft	5	Chips	No Data	No Data				
					1 - 6 ft	<1	n/a	No Data	No Data				
6	MAF-14	Oct-2015	-0.5	4.5 ft	0 - 10 cm	<1	Not Observed	No Exceedance	No Exceedance	4 ft	4 ft	-4.5	See Rationale 14.
					0 - 4.5 ft	<1	Not Observed	No Data	No Data				
6	MAF-18	Oct-2015	-33.4	8 ft	0 - 10 cm	<1	Bark	No Exceedance	No Exceedance	6.5 ft	6.5 ft	-39.9	See Rationale 14.
					0 - 8 ft	<1 - 5	Chips and Twigs	No Data	No Data				
6	MAF-55	Nov-2018	-44.0	10 ft	0 - 10 cm	<1	Not Observed	No Exceedance	No Exceedance	0 ft	Surficial	Surficial	Rationale 15: A sample collected from surface sediment at this location did not identify exceedances of the PCULs. Sample(s) of sub-surface sediment were either not collected or analyzed at this location. The native contact was identified at the surface at this location. However, there is a potential for contamination to be present because sediments in the area of this location are dynamic and can be redistributed by scour as evidenced by the scour features in the bathymetric survey. Therefore, surficial contamination is assumed to be present at this location for the purposes of the FS.
					0 - 10 ft	<1	Not Observed	No Data	No Data				
6	MAF-56	Nov-2018	-45.3	10 ft	0 - 10 cm	<1	Not Observed	No Exceedance	No Exceedance	0 ft	Surficial	Surficial	See Rationale 15.
					0 - 4 ft	<5	Unspecified	No Exceedance	No Exceedance				
					0 - 10 ft	<1	Unspecified	No Data	No Data				
6	MAF-57	Nov-2018	-38.9	10 ft	0 - 10 cm	<1	Twigs	No Exceedance	Total cPAH TEQ Total Dioxin/Furan TEQ	2 ft	2 ft	-40.9	See Rationale 5.
					0 - 2 ft	15	Twigs	No Exceedance	Total cPAH TEQ Total Dioxin/Furan TEQ				
					2 - 4 ft	< 1	Not Observed	No Exceedance	No Exceedance				
					4 - 10 ft	<1	Not Observed	No Data	No Data				
6	MAF-60	Nov-2018	-38.7	14.5 ft	0 - 10 cm	<1	Twigs	Acenaphthene, Fluorene Dibenzofuran	Total cPAH TEQ Total Dioxin/Furan TEQ	6.5 ft	6.5 ft	-45.2	See Rationale 5.
					0 - 4 ft	10 - 15	Fibers	No Data	No Data				
					4 - 6 ft	10	Fibers	Acenaphthene Dibenzofuran	Total cPAH TEQ, Total Dioxin-Like PCB TEQ, Total Dioxin/Furan TEQ				
					6 - 8 ft	<1	Not Observed	No Data	No Data				
					8 - 10 ft	<1	Not Observed	No Exceedance	No Exceedance				
					10 - 14.5 ft	<1	Not Observed	No Data	No Data				

SMA	Investigation Location[1]	Investigation Date	Mudline Elevation[2] (ft MLLW)	Investigation Depth (dbm)	Sample/ Depth Interval (dbm)	Observed Wood Condition		Chemical Analytical Condition		Native Sediment Contact[5] (dbm)	Estimated Depth of Contamination (dbm)	Estimated Base of Contamination (ft MLLW)	Rationale
						Visual Wood Content (%)	Observed Wood Type	Benthic Cleanup Level Exceedance[3]	Human Health Cleanup Level Exceedance[4]				
6	MAF61	Nov-2018	-44.0	10 ft	0 - 10 cm	<5	Bark and Chips	No Data	Total cPAH TEQ	0.5 ft	0.5 ft	-44.5	See Rationale 8.
					0 - 2 ft	<5	Bark	No Data	No Data				
					2 - 10 ft	<1	Not Observed	No Data	No Data				
6	PT10[6]	Jan-2015	-29.2	15 ft	0-3.5 ft	n/a	Not Observed	Bedding/Rock Armor Layer	Bedding/Rock Armor Layer	7.5 ft	7.5 ft	-36.7	See Rationale 12.
					3.5-6.5 ft	20 - 50	Sawdust, Chips and Lumber	No Data	No Data				
					6.5-7.5 ft	20	Chips and Lumber	No Exceedance	Total cPAH TEQ				
					7.5-15 ft	<1	Not Observed	No Data	No Data				
6	ST101	Oct-2018	-33.7	18 ft	0 - 10 cm	<1	Not Observed	No Exceedance	Total cPAH TEQ	13.5 ft	13.5 ft	-47.2	See Rationale 5.
					0 - 13.2 ft	0 - 10	Unspecified	No Data	No Data				
					13.2 - 14.2 ft	<1	Not Observed	No Exceedance	No Exceedance				
					14.2 - 18 ft	<1	Not Observed	No Data	No Data				
6	ST102	Oct-2018	-15.8	10.5 ft	0 - 10 cm	<1	Not Observed	No Exceedance	No Exceedance	9 ft	9 ft	-24.8	See Rationale 5.
					0 - 6.3 ft	0 - 10	Twigs, Fibers and Chips	No Data	No Data				
					6.3 - 7.3 ft	<1	Not Observed	No Exceedance	Lead Total Dioxin/Furan TEQ				
					7.3 - 8.3 ft	<1	Not Observed	No Exceedance	Total Dioxin/Furan TEQ				
					8.3 - 9.3 ft	<1	Not Observed	No Data	No Data				
					9.3 - 10.3 ft	<1	Not Observed	No Exceedance	No Exceedance				
					10.3 - 10.5 ft	<1	Not Observed	No Data	No Data				
6	ST103	Oct-2018	-12.9	18 ft	0 - 10 cm	<1	Not Observed	No Exceedance	No Exceedance	15.5 ft	15.5 ft	-28.4	See Rationale 14.
					0 - 15.5 ft	0 - 10	Twigs, Bark and Chips	No Data	No Data				
					15.5 - 17.7 ft	<1	Not Observed	No Data	No Data				
6	ST104	Oct-2018	-17.1	19 ft	0 - 10 cm	<1	Not Observed	No Exceedance	Total cPAH TEQ	12 ft	12 ft	-29.1	See Rationale 8.
					0 - 7.3 ft	<1	Not Observed	No Data	No Data				
					7.3 - 8.3 ft	10	Twigs and Chips	No Exceedance	Lead				
					8.3 - 9.3 ft	10	Twigs and Chips	No Exceedance	Lead, Total cPAH TEQ Total Dioxin-Like PCB TEQ Total Dioxin/Furan TEQ				
					9.3 - 11.3 ft	5 - 10	Twigs and Chips	4-methylphenol (p-Cresol)	Lead, Total Dioxin-Like PCB TEQ Total Dioxin/Furan TEQ				
					11.3 - 19 ft	<1	Not Observed	No Data	No Data				
6	ST105	Oct-2018	-34.2	19 ft	0 - 10 cm	<1	Not Observed	No Exceedance	Total cPAH TEQ	11 ft	11 ft	-45.2	See Rationale 5.
					0 - 11 ft	<1 - 5	Unspecified	No Data	No Data				
					11 - 12 ft	<1	Not Observed	No Exceedance	No Exceedance				
					12 - 19 ft	<1	Not Observed	No Data	No Data				

SMA	Investigation Location[1]	Investigation Date	Mudline Elevation[2] (ft MLLW)	Investigation Depth (dbm)	Sample/ Depth Interval (dbm)	Observed Wood Condition		Chemical Analytical Condition		Native Sediment Contact[5] (dbm)	Estimated Depth of Contamination (dbm)	Estimated Base of Contamination (ft MLLW)	Rationale
						Visual Wood Content (%)	Observed Wood Type	Benthic Cleanup Level Exceedance[3]	Human Health Cleanup Level Exceedance[4]				
6	ST106	Oct-2018	-20.0	16 ft	0 - 10 cm	<1	Not Observed	No Exceedance	Total cPAH TEQ	7.5 ft	7.5 ft	-27.5	See Rationale 8.
					0 - 3.1 ft	<1	Not Observed	No Data	No Data				
					3.1 - 4.1 ft	<1	Not Observed	No Exceedance	Total cPAH TEQ				
					4.1 - 5.1 ft	<1	Not Observed	No Exceedance	Total cPAH TEQ, Total Dioxin/Furan TEQ				
					6.1 - 7.1 ft	<1	Not Observed	Bis(2-Ethylhexyl) Phthalate	Total cPAH TEQ, Total Dioxin/Furan TEQ				
					7.5 - 16 ft	<1	Not Observed	No Data	No Data				
6	ST107	Oct-2018	-36.7	14.5 ft	0 - 10 cm	<1	Not Observed	No Exceedance	Total cPAH TEQ	4 ft	4 ft	-40.7	See Rationale 5.
					0 - 4.2 ft	<1	Not Observed	No Data	No Data				
					4.2 - 5.2 ft	<1	Not Observed	No Exceedance	No Exceedance				
					5.2 - 9.3 ft	<1	Not Observed	No Data	No Data				
					9.3 - 10.3 ft	<1	Not Observed	No Exceedance	No Exceedance				
					10.3 - 14.5 ft	<1	Not Observed	No Data	No Data				
6	ST108	Oct-2018	-37.0	16 ft	0 - 10 cm	<1	Not Observed	Acenaphthene, Chrysene Dibenzofuran	Arsenic, Lead, Total cPAH TEQ Total Dioxin/Furan TEQ	8 ft	8 ft	-45.0	See Rationale 5.
					0 - 6.6 ft	30 - 50	Unspecified	No Data	No Data				
					6.6 - 7.6 ft	<1	Not Observed	Zinc, Phenanthrene, 2,4-Dimethylphenol, 4-methylphenol (p-Cresol) Dibenzofuran	Cadmium, Lead, Total cPAH TEQ Total Dioxin-Like PCB TEQ Total Dioxin/Furan TEQ				
					7.6 - 8.6 ft	<1	Not Observed	No Data	No Data				
					8.6 - 9.6 ft	<1	Not Observed	No Exceedance	No Exceedance				
					9.6 - 16 ft	<1	Not Observed	No Data	No Data				
6	ST-23	May-2007	-3.1	20 cm	0 - 20 cm	<1	Not Observed	No Data	No Data	n/a	n/a	n/a	See Rationale 1.
6	ST-24	May-2007	-41.8	0.8 ft	0 - 0.8 ft	<1	Not Observed	No Exceedance	Total cPAH TEQ	n/a	n/a	n/a	See Rationale 6.
6	ST-25	May-2007	-30.7	20 cm	0 - 20 cm	<1	Not Observed	No Data	No Data	n/a	n/a	n/a	See Rationale 1.
6	ST-26	May-2007	-47.5	n/a	n/a	<1	Not Observed	No Data	No Data	n/a	n/a	n/a	See Rationale 1.
6	ST-27	May-2007	-40.5	20 cm	0 - 20 cm	10	Twigs	No Data	No Data	n/a	n/a	n/a	See Rationale 1.
6	ST-29	May-2007	-44.8	9.5 ft	0 - 10 cm	5	Twigs	No Exceedance	Total cPAH TEQ	n/a	n/a	n/a	See Rationale 7.
					10 cm - 4 ft	5	Twigs	No Data	No Data				
					4 - 9.5 ft	<1	n/a	No Data	No Data				
6	ST-34	May-2007	-51.7	10 ft	0 - 10 cm	15	Chips	No Exceedance	Total cPAH TEQ	n/a	n/a	n/a	See Rationale 7.
					0 - 2.8 ft	15	Chips	Acenaphthene Phenanthrene Fluoranthene	Arsenic, Cadmium, Lead Total cPAH TEQ Total PCBs				
					2.8 - 4.5 ft	15	Chips	No Data	No Data				
					4.5 - 10 ft	<1	n/a	No Data	No Data				
6	ST-35	May-2007	-32.9	0.6 ft	0 - 0.6 ft	100	Unspecified	No Data	No Data	n/a	n/a	n/a	See Rationale 1.

SMA	Investigation Location[1]	Investigation Date	Mudline Elevation[2] (ft MLLW)	Investigation Depth (dbm)	Sample/ Depth Interval (dbm)	Observed Wood Condition: Visual Wood Content (%)	Observed Wood Condition: Observed Wood Type	Chemical Analytical Condition: Benthic Cleanup Level Exceedance[3]	Chemical Analytical Condition: Human Health Cleanup Level Exceedance[4]	Native Sediment Contact[5] (dbm)	Estimated Depth of Contamination (dbm)	Estimated Base of Contamination (ft MLLW)	Rationale
6	ST-37	May-2007	-36.9	10 cm	0 - 10 cm	30	Chips	No Exceedance	Total cPAH TEQ	n/a	n/a	n/a	See Rationale 7.
				10 ft	0 - 2.8 ft	30	Chips	No Data	No Data				
					2.8 - 6.8 ft	15	Fibers	No Data	No Data				
					6.8 - 10 ft	<1	Not Observed	No Data	No Data				
6	ST-39	May-2007	-50.6	10 ft	0 - 10 cm	5	Twigs, Fibers and Chunks	No Exceedance	Total cPAH TEQ	n/a	n/a	n/a	See Rationale 7.
					0 - 4 ft	5	Twigs, Fibers and Chunks	Total PCBs	Cadmium, Lead Total cPAH TEQ				
					4 - 5.9 ft	5	Twigs, Fibers and Chunks	No Data	No Data				
					5.9 - 10 ft	<1	Not Observed	No Data	No Data				
6	ST-43	May-2007	-39.0	14 ft	0 - 3.1 ft	30	Fibers	No Data	No Data	n/a	n/a	n/a	See Rationale 7.
					3.1 - 4.4 ft	5	Fibers	No Data	No Data				
					4.4 - 5.7 ft	100	Sawdust and Chunks	No Data	No Data				
					5.7 - 7.2 ft	100	Sawdust and Chunks	Mercury, Sum of LPAHs 2-Methylnaphthalene Acenaphthene, Anthracene Fluorene, Naphthalene Phenanthrene, Sum of HPAHs Benzo(a)anthracene Benzo(a)pyrene Benzofluoranthenes Chrysene, Fluoranthene Pyrene, 1,2-Dichlorobenzene Butyl benzyl Phthalate 2,4-Dimethylphenol 2-methylphenol (o-Cresol) 4-methylphenol (p-Cresol) Dibenzofuran	Total cPAH TEQ				
					7.2 - 8.1 ft	100	Sawdust and Chunks	No Data	No Data				
					8.1 - 14 ft	<1	Not Observed	No Data	No Data				
6	ST-44	May-2007	-27.0	19 ft	0 - 2.4 ft	<1	Not Observed	No Data	No Data	n/a	n/a	n/a	See Rationale 1.
					2.4 - 7.8 ft	25-30	Bark and Twigs	No Data	No Data				
					7.8 - 12.7 ft	90	Bark and Chunks	No Data	No Data				
					12.7 - 19 ft	<1	Not Observed	No Data	No Data				
6	North DMMU Area (ST-108 and ST-109)	Oct-2018	Varies	Varies	6.2 - 9.3 ft	<1	Not Observed	Sum of LPAHs 2-Methylnaphthalene Acenaphthene, Anthracene Fluorene, Naphthalene Phenanthrene, Sum of HPAHs Fluoranthene, Pyrene 2,4-Dimethylphenol 4-methylphenol (p-Cresol) Dibenzofuran	Cadmium, Lead, Mercury Total cPAH TEQ Total Dioxin/Furan TEQ	Varies	See investigation locations ST-108 and ST-109	See investigation locations ST-108 and ST-109	Rationale 16: North DMMU Area sample is a composite sample collected from investigation locations ST-108 and ST-109. See Rationales for investigation locations ST-108 and ST-109.

SMA	Investigation Location[1]	Investigation Date	Mudline Elevation[2] (ft MLLW)	Investigation Depth (dbm)	Sample/ Depth Interval (dbm)	Observed Wood Condition		Chemical Analytical Condition		Native Sediment Contact[5] (dbm)	Estimated Depth of Contamination (dbm)	Estimated Base of Contamination (ft MLLW)	Rationale
						Visual Wood Content (%)	Observed Wood Type	Benthic Cleanup Level Exceedance[3]	Human Health Cleanup Level Exceedance[4]				
6	South DMMU Area (ST-101 through ST-107)	Oct-2018	Varies	Varies	2 - 3.7 ft	<1	Not Observed	No Exceedance	No Exceedance	Varies	See investigation locations ST-101 and ST-107	See investigation locations ST-101 and ST-107	Rationale 17: South DMMU Area sample(s) are composite of sample(s) collected from investigation locations ST-101 through ST-107. See Rationales for investigation locations ST-101 through ST-107.
					3.7 - 13.7 ft	<1	Not Observed	4-methylphenol (p-Cresol) Hexachlorobutadiene	Lead, Mercury, Total cPAH TEQ, Total Dioxin-Like PCB Congeners TEQ, Total Dioxin/Furan TEQ				
					6.8 - 10.8 ft	<1	n/a	No Exceedance	Total Dioxin/Furan TEQ				
Sediment Management Area 7													
7	MAF-15	Oct-2015	7.3	10 cm	0 - 10 cm	<1	Bark	No Exceedance	Total Dioxin/Furan TEQ	4 ft	4 ft	1.0	See Rationale 3.
				7.5 ft	0 - 2 ft	<5	Bark and Chips	No Exceedance	Arsenic Total cPAH TEQ				
					2 - 4 ft	<1	n/a	No Data	No Data				
					4 - 7.5 ft	<1	Chips	No Data	No Data				
Sediment Investigation Locations Outside Sediment Management Areas													
Outside SMA	MAF-50	Sep-2016	-66.8	10 cm	0 - 10 cm	<1	Unspecified	No Data	Total cPAH TEQ	n/a	n/a	n/a	Rationale 18: This investigation location is situated outside of the Marine Area SMA. Contamination observed at this location is not considered associated with Mill A Site as identified in the RI. Environmental data at this location is not applicable for contamination depth estimation at the Marine Area.
Outside SMA	MAF-51	Sep-2016	-42.9	10 cm	0 - 10 cm	25	Chips and Bark	No Data	Total cPAH TEQ	n/a	n/a	n/a	See Rationale 18.
Outside SMA	MAF-52	Sep-2016	-102.2	10 cm	0 - 10 cm	35	Bark	No Data	Total cPAH TEQ	n/a	n/a	n/a	See Rationale 18.
Outside SMA	MAF-53	Sep-2016	-38.6	10 cm	0 - 10 cm	65	Chips and Bark	No Data	Total cPAH TEQ	n/a	n/a	n/a	See Rationale 18.
Outside SMA	MAF-54	Sep-2016	-45.7	10 cm	0 - 10 cm	<1	Unspecified	No Data	Total cPAH TEQ	n/a	n/a	n/a	See Rationale 18.
Outside SMA	A1-18	Aug-2008	-98.0	11.5 ft	0 - 10 cm	5	Fibers	No Exceedance	No Exceedance	n/a	n/a	n/a	See Rationale 18.
					0 - 1 ft	5	Fibers	No Data	No Data				
					1 - 3 ft	<1	n/a	No Exceedance	Total cPAH TEQ				
					3 - 5 ft	3	Fibers	No Exceedance	No Exceedance				
					5 - 11.5 ft	<5	Twigs, Fibers, Chunks	No Data	No Data				
Outside SMA	A1-23	Aug-2008	-233.0	15 cm	0 - 10 cm	<1	n/a	No Exceedance	Total cPAH TEQ	n/a	n/a	n/a	See Rationale 18.
					10 - 15 cm	<1	n/a	No Data	No Data				
Outside SMA	A1-31	Aug-2008	-8.6	12 cm	0 - 10 cm	<1	n/a	No Exceedance	No Exceedance	n/a	0 ft	n/a	Rationale 19: This investigation location is situated outside of the Marine Area SMA. The surface sample at this location did not identified exceedance of the PCULs for the COCs analyzed. Based on the available data, contamination exceeding the PCULs is assumed to be not present at this location, for the purposes of the FS.
					10 - 12 cm	<1	n/a	No Data	No Data				
Outside SMA	EW-12-05	Jun-2012	-48.5	17 cm	0 - 17 cm	<1	n/a	Copper	Lead	n/a	n/a	n/a	See Rationale 18.
Outside SMA	EW-12-06	Jun-2012	-57.1	17 cm	0 - 17 cm	<1	n/a	No Exceedance	No Exceedance	0 ft	0 ft	n/a	See Rationale 19.
Outside SMA	MAF-07	Oct-2015	-41.2	5 ft	0 - 10 cm	5	Chips	No Exceedance	No Exceedance	1.5 ft	0 ft	n/a	See Rationale 19.
					0 - 1.5 ft	10	Chips	No Data	No Data				
					1.5 - 5 ft	<1	n/a	No Data	No Data				
Outside SMA	MAF-08	Oct-2015	-44.6	10 cm	0 - 10 cm	<1	Bark	No Exceedance	No Exceedance	n/a	0 ft	n/a	See Rationale 19.
Outside SMA	MAF-16	Oct-2015	10.1	4 ft	0 - 10 cm	<1	Bark	No Exceedance	No Exceedance	2 ft	0 ft	n/a	See Rationale 19.
					0 - 4 ft	<1	n/a	No Data	No Data				

SMA	Investigation Location[1]	Investigation Date	Mudline Elevation[2] (ft MLLW)	Investigation Depth (dbm)	Sample/ Depth Interval (dbm)	Observed Wood Condition: Visual Wood Content (%)	Observed Wood Condition: Observed Wood Type	Chemical Analytical Condition: Benthic Cleanup Level Exceedance[3]	Chemical Analytical Condition: Human Health Cleanup Level Exceedance[4]	Native Sediment Contact[5] (dbm)	Estimated Depth of Contamination (dbm)	Estimated Base of Contamination (ft MLLW)	Rationale
Outside SMA	MAF-17	Oct-2015	0.5	9 ft	0 - 10 cm	<1	Bark	No Exceedance	No Exceedance	3 ft	0 ft	n/a	See Rationale 19.
					0 - 2 ft	<5	Unspecified	No Data	No Data				
					2 - 9 ft	<1	n/a	No Data	No Data				
Outside SMA	MAF-23	Oct-2015	-2.1	10 ft	0 - 10 cm	<1	Bark	No Exceedance	No Data	9 ft	0 ft	n/a	See Rationale 19.
					0 - 2 ft	<5	Chips	No Data	No Data				
					2 - 10 ft	<1	Chips, Bark and Twigs	No Data	No Data				
Outside SMA	MAF-24	Oct-2015	4.9	5 ft	0 - 10 cm	<1	Bark	No Exceedance	No Exceedance	2 ft	0 ft	n/a	See Rationale 19.
					0 - 5 ft	<1	n/a	No Data	No Data				
Outside SMA	MAF-25	Oct-2015	4.0	4 ft	0 - 10 cm	<1	Bark	No Exceedance	No Exceedance	2 ft	0 ft	n/a	See Rationale 19.
					0 - 4 ft	<1	Bark	No Data	No Data				
Outside SMA	MAF-26	Oct-2015	9.7	3 ft	0 - 10 cm	<1	Bark	No Exceedance	No Exceedance	3 ft	0 ft	n/a	See Rationale 19.
					0 - 3 ft	<1	Twigs	No Data	No Data				
Outside SMA	MAF-27	Oct-2015	9.4	3.5 ft	0 - 10 cm	<1	Bark	No Exceedance	No Exceedance	2 ft	0 ft	n/a	See Rationale 19.
					0 - 3.5 ft	<1	n/a	No Data	No Data				
Outside SMA	MAF-28	Oct-2015	8.7	8 ft	0 - 10 cm	<1	Bark	No Exceedance	No Data	4 ft	0 ft	n/a	See Rationale 19.
					0 -8 ft	<1	Bark	No Data	No Data				
Outside SMA	MAF-29	Oct-2015	4.0	8 ft	0 - 10 cm	<1	Bark	No Exceedance	No Data	2 ft	0 ft	n/a	See Rationale 19.
					0 - 8 ft	<1	n/a	No Data	No Data				
Outside SMA	MAF-30	Oct-2015	2.0	10 ft	0 - 10 cm	<1	Bark	No Exceedance	No Data	7 ft	0 ft	n/a	See Rationale 19.
					0 - 10 ft	<1	Chips and Fibers	No Data	No Data				
Outside SMA	MAF-40	Sep-2016	-165.3	16 cm	0 - 10 cm	<1	Unspecified	No Data	No Exceedance	n/a	0 ft	n/a	See Rationale 19.
					10 - 16 cm	<1	Unspecified	No Data	No Data				
Outside SMA	MAF-43	Sep-2016	-138.7	25 cm	0 - 10 cm	<1	Unspecified	No Data	No Exceedance	n/a	0 ft	n/a	See Rationale 19.
					10 - 25 cm	<1	Unspecified	No Data	No Data				
Outside SMA	MAF-47	Sep-2016	-49.5	25 cm	0 - 10 cm	<1	Unspecified	No Data	No Exceedance	n/a	0 ft	n/a	See Rationale 19.
					10 - 25 cm	<1	Unspecified	No Data	No Data				
Outside SMA	MAF-48	Sep-2016	-110.0	26 cm	0 - 10 cm	<1	Unspecified	No Data	No Exceedance	n/a	0 ft	n/a	See Rationale 19.
					10 - 26 cm	<1	Unspecified	No Data	No Data				
Outside SMA	MAF-49	Sep-2016	-55.8	25 cm	0 - 10 cm	<1	Unspecified	No Data	No Exceedance	n/a	0 ft	n/a	See Rationale 19.
					10 - 25 cm	<1	Unspecified	No Data	No Data				
Outside SMA	PG-62	Apr-2014	-302.2	10 cm	0 - 10 cm	<1	n/a	No Exceedance	No Exceedance	n/a	0 ft	n/a	See Rationale 19.
Outside SMA	ST-22	May-2007	0.9	n/a	n/a	<1	n/a	No Data	No Data	n/a	n/a	n/a	See Rationale 1.
Upland Area Investigation Locations Adjacent to the Marine Area													
Uplands	EDP36	Jun-2016	19.3	25 ft	0 - 23 ft	n/a	Chips, Chunks, Sawdust, Lumber and Bark	n/a	n/a	23 ft	n/a	n/a	Rationale 20: Upland boring locations located adjacent to the Marine Area were used to estimate the depth of contamination based on the elevation of the native contact.
					23 - 25 ft	n/a	Not Observed	n/a	n/a				

SMA	Investigation Location[1]	Investigation Date	Mudline Elevation[2] (ft MLLW)	Investigation Depth (dbm)	Sample/ Depth Interval (dbm)	Observed Wood Condition: Visual Wood Content (%)	Observed Wood Condition: Observed Wood Type	Chemical Analytical Condition: Benthic Cleanup Level Exceedance[3]	Chemical Analytical Condition: Human Health Cleanup Level Exceedance[4]	Native Sediment Contact[5] (dbm)	Estimated Depth of Contamination (dbm)	Estimated Base of Contamination (ft MLLW)	Rationale
Uplands	EDP44	Jun-2016	18.4	30 ft	0 - 24 ft	n/a	Chips and Lumber	n/a	n/a	24 ft	n/a	n/a	See Rationale 20.
					24 - 30 ft	n/a	Not Observed	n/a	n/a				
Uplands	EST09	Jan-2010	17.9	25 ft	0 - 22.5 ft	n/a	Bark	n/a	n/a	22.5 ft	n/a	n/a	See Rationale 20.
					22.5 - 25 ft	n/a	Unspecified	n/a	n/a				
Uplands	EST10	Jan-2010	17.7	26.5 ft	0 - 25 ft	n/a	Lumber	n/a	n/a	25 ft	n/a	n/a	See Rationale 20.
					25 - 26.5 ft	n/a	Unspecified	n/a	n/a				
Uplands	EST10D	Aug-2016	18.3	35 ft	0 - 25.5 ft	n/a	Logs, Lumber, Fibers and Chips	n/a	n/a	25.5 ft	n/a	n/a	See Rationale 20.
					25.5 - 30 ft	n/a	Not Observed	n/a	n/a				
Uplands	EST11	Jan-2010	17.5	66.25 ft	0 - 29 ft	n/a	Sawdust, Fibers, Bark and Chunks	n/a	n/a	29 ft	n/a	n/a	See Rationale 20.
					29 - 66.25 ft	n/a	Not Observed	n/a	n/a				
Uplands	EST11D	Aug-2016	17.6	40 ft	0 - 28 ft	n/a	Sawdust, Fibers, Logs, Lumber and Chunks	n/a	n/a	28 ft	n/a	n/a	See Rationale 20.
					28 - 40 ft	n/a	Not Observed	n/a	n/a				
Uplands	EST12	Jan-2010	18.0	75.5 ft	0 - 27 ft	n/a	Lumber and Chunks	n/a	n/a	27 ft	n/a	n/a	See Rationale 20.
					27 - 75.5 ft	n/a	Chunk to Not Observed	n/a	n/a				
Uplands	EST13	Jan-2010	17.5	24.5 ft	0 - 21.5 ft	n/a	Unspecified	n/a	n/a	21.5 ft	n/a	n/a	See Rationale 20.
					21.5 - 24.5 ft	n/a	Not Observed	n/a	n/a				

Notes:

[1] Sample locations shown on Figure 11.

[2] Mudline elevation based on bathymetric surveys completed by Pacific Geomatic Services Inc. in December 2014 incorporating the Tetra Tech February 2017 bathymetric survey following completion of the 2016/2017 Pacific Terminal Interim Action dredging.

[3] Contaminant exceedances for the protection of benthic organisms (Benthic PCUL) referenced from the Marine Area RI/FS Report (GeoEngineers 2023).

[4] Contaminant exceedances for the protection of human health and higher level trophic ecological receptors (Human Health PCUL) referenced from the Marine Area RI/FS Report (GeoEngineers 2023).

[5] Native sediment contact was determined based on sediment stratigraphy observed in the core log and chemical analytical results of samples collected at the investigation location. Additionally, stratigraphy and chemical analytical information from neighboring locations were also considered if the information at an investigation location was insufficient in interpreting the native contact.

[6] Contaminated sediment and observed wood debris were dredged at this location in conjunction with the 2016/2017 Pacific Terminal Interim Action. Mudline elevations referenced by the sediment core log no longer represent current conditions. The approximate investigation depth indicated is based on the existing post-interim action mudline elevation.

bml = below mudline
cm = centimeter
cPAH = carcinogenic polycyclic aromatic hydrocarbon
FS = Feasibility Study
ft = feet
MLLW = Mean Lower Low Water
n/a = not applicable
PCB = polychlorinated biphenyl
PCUL = Proposed Cleanup Level
SMA = Sediment Management Areas
TEQ = toxic equivalent quotient

Table 2

Sediment Cleanup Levels for the Protection of Benthic Organisms

Weyerhaeuser Mill A Former

Everett, Washington

Analyte	CAS Number	Units	Criteria for the Protection of Benthic Organisms				Sediment Cleanup Levels for the Protection of Benthic Organisms[3]
			Sediment Management Standard[1] (SMS)		Apparent Effects Threshold (AET) Criteria[2]		
			Sediment Cleanup Objective (SCO)	Cleanup Screening Level (CSL)	Lowest AET (LAET)	Second Lowest AET (2LAET)	SCO/ LAET
Metals							
Arsenic	7440-38-2	mg/kg	57	93	57	93	57
Cadmium	7440-43-9	mg/kg	5.1	6.7	5.1	6.7	5.1
Chromium	16065-83-1	mg/kg	260	270	260	270	260
Copper	7440-50-8	mg/kg	390	390	390	390	390
Lead	7439-92-1	mg/kg	450	530	450	530	450
Mercury	7439-97-6	mg/kg	0.41	0.59	0.41	0.59	0.41
Silver	7440-22-4	mg/kg	6.1	6.1	6.1	6.1	6.1
Zinc	7440-66-6	mg/kg	410	960	410	960	410
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs) (OC Normalized)							
Sum of LPAHs[4]	n/a	mg/kg OC	370	780	--	--	370
2-Methylnaphthalene	91-57-6	mg/kg OC	38	64	--	--	38
Acenaphthene	83-32-9	mg/kg OC	16	57	--	--	16
Acenaphthylene	208-96-8	mg/kg OC	66	66	--	--	66
Anthracene	120-12-7	mg/kg OC	220	1,200	--	--	220
Fluorene	86-73-7	mg/kg OC	23	79	--	--	23
Naphthalene	91-20-3	mg/kg OC	99	170	--	--	99
Phenanthrene	85-01-8	mg/kg OC	100	480	--	--	100
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs) (Dry Weight)							
Sum of LPAHs[4]	n/a	µg/kg	--	--	5,200	5,200	5,200
2-Methylnaphthalene	91-57-6	µg/kg	--	--	670	670	670
Acenaphthene	83-32-9	µg/kg	--	--	500	500	500
Acenaphthylene	208-96-8	µg/kg	--	--	1,300	1,300	1,300
Anthracene	120-12-7	µg/kg	--	--	960	960	960
Fluorene	86-73-7	µg/kg	--	--	540	540	540
Naphthalene	91-20-3	µg/kg	--	--	2,100	2,100	2,100
Phenanthrene	85-01-8	µg/kg	--	--	1,500	1,500	1,500
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs) (OC Normalized)							
Sum of HPAHs[5]	n/a	mg/kg OC	960	5,300	--	--	960
Benzo(a)anthracene	56-55-3	mg/kg OC	110	270	--	--	110
Benzo(a)pyrene	50-32-8	mg/kg OC	99	210	--	--	99
Benzo[b]fluoranthene	205-99-2	mg/kg OC	--	--	--	--	NE
Benzo[k]fluoranthene	207-08-9	mg/kg OC	--	--	--	--	NE
Benzofluoranthenes[6] (Total)	n/a	mg/kg OC	230	450	--	--	230
Benzo(g,h,i)perylene	193-39-5	mg/kg OC	31	78	--	--	31
Chrysene	218-01-9	mg/kg OC	110	460	--	--	110
Dibenzo(a,h)anthracene	53-70-3	mg/kg OC	12	33	--	--	12
Fluoranthene	206-44-0	mg/kg OC	160	1,200	--	--	160
Indeno(1,2,3-c,d)pyrene	193-39-5	mg/kg OC	34	88	--	--	34
Pyrene	129-00-0	mg/kg OC	1,000	1,400	--	--	1,000
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs) (Dry Weight)							
Sum of HPAHs[5]	n/a	µg/kg	--	--	12,000	17,000	12,000
Benzo(a)anthracene	56-55-3	µg/kg	--	--	1,300	1,600	1,300
Benzo(a)pyrene	50-32-8	µg/kg	--	--	1,600	1,600	1,600
Benzo[b]fluoranthene	205-99-2	µg/kg	--	--	--	--	NE
Benzo[k]fluoranthene	207-08-9	µg/kg	--	--	--	--	NE
Benzofluoranthenes[6] (Total)	n/a	µg/kg	--	--	3,200	3,600	3,200
Benzo(g,h,i)perylene	193-39-5	µg/kg	--	--	670	720	670
Chrysene	218-01-9	µg/kg	--	--	1,400	2,800	1,400
Dibenzo(a,h)anthracene	53-70-3	µg/kg	--	--	230	230	230
Fluoranthene	206-44-0	µg/kg	--	--	1,700	2,500	1,700
Indeno(1,2,3-c,d)pyrene	193-39-5	µg/kg	--	--	600	690	600
Pyrene	129-00-0	µg/kg	--	--	2,600	3,300	2,600
Chlorinated Hydrocarbons (OC Normalized)							
1,2,4-Trichlorobenzene	120-82-1	mg/kg OC	0.81	1.8	--	--	0.81
1,2-Dichlorobenzene (o-Dichlorobenzene)	95-50-1	mg/kg OC	2.3	2.3	--	--	2.3
1,3-Dichlorobenzene	541-73-1	mg/kg OC	--	--	--	--	NE
1,4-Dichlorobenzene (p-Dichlorobenzene)	106-46-7	mg/kg OC	3.1	9.0	--	--	3.1
Hexachlorobenzene	118-74-1	mg/kg OC	0.38	2.3	--	--	0.38
Chlorinated Hydrocarbons (Dry Weight)							
1,2,4-Trichlorobenzene	120-82-1	µg/kg	--	--	31	51	31
1,2-Dichlorobenzene (o-Dichlorobenzene)	95-50-1	µg/kg	--	--	35	50	35
1,3-Dichlorobenzene	541-73-1	µg/kg	--	--	--	--	NE
1,4-Dichlorobenzene (p-Dichlorobenzene)	106-46-7	µg/kg	--	--	110	110	110
Hexachlorobenzene	118-74-1	µg/kg	--	--	22	70	22

Analyte	CAS Number	Units	Criteria for the Protection of Benthic Organisms: Sediment Management Standard[1] (SMS): Sediment Cleanup Objective (SCO)	Sediment Management Standard[1] (SMS): Cleanup Screening Level (CSL)	Apparent Effects Threshold (AET) Criteria[2]: Lowest AET (LAET)	Apparent Effects Threshold (AET) Criteria[2]: Second Lowest AET (2LAET)	Sediment Cleanup Levels for the Protection of Benthic Organisms[3]: SCO/ LAET
Phthalates (OC Normalized)							
Bis(2-Ethylhexyl) Phthalate	117-81-7	mg/kg OC	47	78	--	--	47
Butyl benzyl Phthalate	85-68-7	mg/kg OC	4.9	64	--	--	4.9
Dibutyl Phthalate	84-74-2	mg/kg OC	220	1,700	--	--	220
Diethyl Phthalate	84-66-2	mg/kg OC	61	110	--	--	61
Dimethyl Phthalate	131-11-3	mg/kg OC	53	53	--	--	53
Di-N-Octyl Phthalate	117-84-0	mg/kg OC	58	4,500	--	--	58
Phthalates (Dry Weight)							
Bis(2-Ethylhexyl) Phthalate	117-81-7	µg/kg	--	--	1,300	1,900	1,300
Butyl benzyl Phthalate	85-68-7	µg/kg	--	--	63	900	63
Dibutyl Phthalate	84-74-2	µg/kg	--	--	1,400	1,400	1,400
Diethyl Phthalate	84-66-2	µg/kg	--	--	200	>1,200	200
Dimethyl Phthalate	131-11-3	µg/kg	--	--	71	160	71
Di-N-Octyl Phthalate	117-84-0	µg/kg	--	--	6,200	6,200	6,200
Phenols (Dry Weight)							
2,4-Dimethylphenol	105-67-9	µg/kg	29	29	29	29	29
2-methylphenol (o-Cresol)	95-48-7	µg/kg	63	63	63	63	63
4-methylphenol (p-Cresol)	106-44-5	µg/kg	670	670	670	670	670
Pentachlorophenol	87-86-5	µg/kg	360	690	360	690	360
Phenol	108-95-2	µg/kg	420	1,200	420	1,200	420
Miscellaneous Extractables (OC Normalized)							
Dibenzofuran	132-64-9	mg/kg OC	15	58	--	--	15
Hexachlorobutadiene	87-68-3	mg/kg OC	3.9	6.2	--	--	3.9
N-Nitrosodiphenylamine (as diphenylamine)	86-30-6	mg/kg OC	11	11	--	--	11
Miscellaneous Extractables (Dry Weight)							
Dibenzofuran	132-64-9	µg/kg	--	--	540	540	540
Hexachlorobutadiene	87-68-3	µg/kg	--	--	11	120	11
N-Nitrosodiphenylamine (as diphenylamine)	86-30-6	µg/kg	--	--	28	40	28
Benzoic Acid	65-85-0	µg/kg	--	--	650	650	650
Benzyl Alcohol	100-51-6	µg/kg	--	--	57	73	57
Polychlorinated Biphenyls (PCBs) (OC Normalized)							
Total PCBs (Total for Aroclors or Congeners)	1336-36-3	mg/kg OC	12	65	--	--	12
Polychlorinated Biphenyls (PCBs) (Dry Weight)							
Total PCBs (Total for Aroclors or Congeners)	1336-36-3	µg/kg	--	--	130	1,000	130

Notes:

[1] Sediment Management Standards (SMS; Washington Administrative Code [WAC] Chapter 173-204).

[2] Apparent Effects Threshold (AET) Criteria from Ecology's SCUM guidance (Table 8-1; Ecology 2021).

[3] The organic carbon normalized screening levels are applicable to sediment with a total organic carbon (TOC) concentration ranging from 0.5 to 3.5 percent. Results for sediment samples with TOC concentrations outside of the 0.5 to 3.5 percent range are screened against the dry weight screening levels (EPA 1988).

[4] Total LPAHs are the total of naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene and anthracene; 2-methylnapthalene is not included in the sum of LPAHs.

[5] Total HPAHs are the total of fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzofluoranthenes, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenzo(a,h)anthracene and benzo(g,h,i)perylene.

SCO = Sediment Cleanup Objective

CSL = Cleanup Screening Level

LAET = Lowest Apparent Effects Threshold

2LAET = Second Lowest Apparent Effects Threshold

LPAHs = low molecular weight polycyclic aromatic hydrocarbons

HPAHs = high molecular weight polycyclic aromatic hydrocarbons

mg/kg = milligram per kilogram

mg/kg OC = milligram per kilogram normalized to organic carbon

µg/kg = microgram per kilogram

-- = Criterion not applicable or not available

n/a = not available

NE = not established

Table 3

Sediment Cleanup Levels for the Protection of Human Health and Higher Trophic Level Ecological Receptors

Weyerhaeuser Mill A Former
Everett, Washington

Analyte	CAS Number	Units	Criteria for the Protection of Human Health								PQL[5]	Sediment Cleanup Levels for the Protection of Human Health and Higher Trophic Level Ecological Receptors[6,7,8]	
			Direct Contact via Beach Play[1]		Direct Contact via Clamming[1]		Direct Contact via Net Fishing[1]		Bioaccumulation via Consumption of Aquatic Organisms[2]				
			Carcinogenic (at 10^{-6} risk)	Non-Carcinogenic	Carcinogenic (at 10^{-6} risk)	Non-Carcinogenic	Carcinogenic (at 10^{-6} risk)	Non-Carcinogenic	Natural Background[3]	Regional Background[4]		Intertidal Sediment (Above -3 ft MLLW)	Subtidal Sediment (below -3 ft MLLW)
Metals													
Arsenic	7440-38-2	mg/kg	2.0	80	0.80	360	1.8	830	11	12	5	12	12
Cadmium	7440-43-9	mg/kg	--	110	--	530	--	1,200	0.8	0.52	0.2	0.8	0.8
Chromium (as Chromium III)	16065-83-1	mg/kg	--	25,000	--	150,000	--	400,000	--	--	0.5	25,000	400,000
Copper	7440-50-8	mg/kg	--	8,000	--	38,000	--	90,000	--	--	0.2	8,000	90,000
Lead	7439-92-1	mg/kg	--	--	--	--	--	--	21	--	2	21	21
Mercury (as Mercuric Chloride)	7487-94-7	mg/kg	--	20	--	140	--	300	0.2	0.14	0.05	0.2	0.2
Silver	7440-22-4	mg/kg	--	200	--	1,400	--	4,000	--	--	0.3	200	4,000
Zinc	7440-66-6	mg/kg	--	60,000	--	280,000	--	700,000	--	--	1	60,000	700,000
Organometallic Compounds													
Tributyltin Ion (Bulk Sediment)	56-35-9	µg/kg	--	18	--	100	--	260	73[9]	--	4	73	73
Tributyltin Ion (Interstitial Water)	56-35-9a	µg/L	--	--	--	--	--	--	0.15[9]	--	0.0052	0.15	0.15
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs)													
2-Methylnaphthalene	91-57-6	mg/kg	--	320	--	1,800	--	4,500	--	--	0.005	320	4,500
Acenaphthene	83-32-9	mg/kg	--	4,800	--	27,000	--	67,000	--	--	0.005	4,800	67,000
Acenaphthylene	208-96-8	mg/kg	--	--	--	--	--	--	--	--	0.005	NE	NE
Anthracene	120-12-7	mg/kg	--	24,000	--	130,000	--	340,000	--	--	0.005	24,000	340,000
Fluorene	86-73-7	mg/kg	--	3,200	--	18,000	--	40,000	--	--	0.005	3,200	40,000
Naphthalene	91-20-3	mg/kg	--	1,600	--	8,900	--	22,000	--	--	0.005	1,600	22,000
Phenanthrene	85-01-8	mg/kg	--	--	--	--	--	--	--	--	0.005	NE	NE
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs)													
Benzo(a)anthracene	56-55-3	mg/kg	--	--	--	--	--	--	--	--	0.005	See cPAH TEQ	See cPAH TEQ
Benzo(a)pyrene	50-32-8	mg/kg	0.9	20	0.44	130	1.1	340	--	--	0.005	See cPAH TEQ	See cPAH TEQ
Benzofluoranthenes (Total)	n/a	mg/kg	--	--	--	--	--	--	--	--	0.005	See cPAH TEQ	See cPAH TEQ
Benzo(g,h,i)perylene	193-39-5	mg/kg	--	--	--	--	--	--	--	--	0.005	See cPAH TEQ	See cPAH TEQ
Chrysene	218-01-9	mg/kg	--	--	--	--	--	--	--	--	0.005	See cPAH TEQ	See cPAH TEQ
Dibenzo(a,h)anthracene	53-70-3	mg/kg	--	--	--	--	--	--	--	--	0.005	See cPAH TEQ	See cPAH TEQ
Fluoranthene	206-44-0	mg/kg	--	3,200	--	18,000	--	45,000	--	--	0.005	3,200	45,000
Indeno(1,2,3-c,d)pyrene	193-39-5	mg/kg	--	--	--	--	--	--	--	--	0.005	See cPAH TEQ	See cPAH TEQ
Pyrene	129-00-0	mg/kg	--	2,400	--	13,000	--	30,000	--	--	0.005	2,400	30,000
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)													
Total cPAHs - TEQ	See Benzo(a)pyrene	mg/kg	0.9	20	0.440	130	1.12	340	0.021	0.056	0.005	0.056	0.056

Analyte	CAS Number	Units	Criteria for the Protection of Human Health: Direct Contact via Beach Play[1] – Carcinogenic (at 10^{-6} risk)	Direct Contact via Beach Play[1] – Non-Carcinogenic	Direct Contact via Clamming[1] – Carcinogenic (at 10^{-6} risk)	Direct Contact via Clamming[1] – Non-Carcinogenic	Direct Contact via Net Fishing[1] – Carcinogenic (at 10^{-6} risk)	Direct Contact via Net Fishing[1] – Non-Carcinogenic	Bioaccumulation via Consumption of Aquatic Organisms[2] – Natural Background[3]	Bioaccumulation via Consumption of Aquatic Organisms[2] – Regional Background[4]	PQL[5]	Sediment Cleanup Levels for the Protection of Human Health and Higher Trophic Level Ecological Receptors[6,7,8] – Intertidal Sediment (Above -3 ft MLLW)	Sediment Cleanup Levels for the Protection of Human Health and Higher Trophic Level Ecological Receptors[6,7,8] – Subtidal Sediment (below -3 ft MLLW)
Chlorinated Hydrocarbons													
1,2,4-Trichlorobenzene	120-82-1	mg/kg	90	2,300	38	11,000	88	26,000	--	--	0.2	38	88
1,2-Dichlorobenzene (o-Dichlorobenzene)	95-50-1	mg/kg	--	21,000	--	100,000	--	230,000	--	--	0.2	21,000	230,000
1,3-Dichlorobenzene	541-73-1	mg/kg	--	--	--	--	--	--	--	--	0.2	NE	NE
1,4-Dichlorobenzene (p-Dichlorobenzene)	106-46-7	mg/kg	500	16,000	200	77,000	474	180,000	--	--	0.2	200	474
Hexachlorobenzene	118-74-1	mg/kg	1.7	190	0.69	880	1.6	2,000	--	--	0.001	0.69	1.6
Phthalates													
Bis(2-Ethylhexyl) Phthalate	117-81-7	mg/kg	51	1,200	24	7,000	60	18,000	--	--	0.05	24	60
Butyl benzyl Phthalate	85-68-7	mg/kg	370	12,000	180	70,000	460	180,000	--	--	0.02	180	460
Dibutyl Phthalate	84-74-2	mg/kg	--	6,000	--	34,000	--	90,000	--	--	0.02	6,000	90,000
Diethyl Phthalate	84-66-2	mg/kg	--	49,000	--	270,000	--	700,000	--	--	0.02	49,000	700,000
Dimethyl Phthalate	131-11-3	mg/kg	--	--	--	--	--	--	--	--	0.02	NE	NE
Di-N-Octyl Phthalate	117-84-0	mg/kg	--	600	--	3,400	--	9,000	--	--	0.02	600	9,000
Phenols													
2,4-Dimethylphenol	105-67-9	mg/kg	--	1,200	--	7,000	--	18,000	--	--	0.025	1,200	18,000
2-methylphenol (o-Cresol)	95-48-7	mg/kg	--	3,000	--	17,000	--	44,000	--	--	0.02	3,000	44,000
4-methylphenol (p-Cresol)	106-44-5	mg/kg	--	6,000	--	30,000	--	90,000	--	--	0.02	6,000	90,000
Pentachlorophenol	87-86-5	mg/kg	1.1	190	0.55	1,100	1.4	2,900	--	--	0.1	0.55	1.4
Phenol	108-95-2	mg/kg	--	18,000	--	100,000	--	260,000	--	--	0.1	18,000	260,000
Miscellaneous Extractables													
Dibenzofuran	132-64-9	mg/kg	--	170	--	800	--	2,000	--	--	0.02	170	2,000
Hexachlorobutadiene	87-68-3	mg/kg	35	230	14	1,100	33	2,600	--	--	0.001	14	33
N-Nitrosodiphenylamine (as diphenylamine)	86-30-6	mg/kg	140	--	70	--	180	--	--	--	0.02	70	180
Benzoic Acid	65-85-0	mg/kg	--	240,000	--	1,400,000	--	3,500,000	--	--	0.2	240,000	3,500,000
Benzyl Alcohol	100-51-6	mg/kg	--	6,000	--	34,000	--	90,000	--	--	0.02	6,000	90,000
Polychlorinated Biphenyls (PCBs)													
Total PCBs (Aroclors or Congeners)	1336-36-3	mg/kg	0.4	--	0.19	--	0.49	--	--	--	0.000002	0.19	0.49
Total Dioxin-Like PCB Congeners TEQ	See Total Dioxins/Furans	ng/kg	15	120	6.5	590	16	1,400	0.20	0.38	0.2	0.38	0.38
Dioxins and Furans													
Total Dioxin/Furan TEQ	1746-01-6	ng/kg	17	130	7.6	690	19	17,200	4	3.9	5[10]	5	5

Notes:

[1] Sediment screening levels for the protection of human health via direct contact are calculated using equations and input parameters provided in Ecology's SCUM guidance (Ecology 2021). The toxicity equivalency factors (TEFs) used to calculate the screening levels are from Table 708-1 (chlorinated dibenzo-p-dioxins and chlorinated dibenzofurans congeners) and Table 708-2 (cPAHs) of the Model Toxics Control Act (MTCA) Cleanup regulation (Chapter 173-340 WAC). Non-carcinogenic toxicity values are not currently available for acenaphthylene, phenanthrene and benzo(g,h,i)perylene and surrogate toxicity values were used for these analytes. The non-carcinogenic toxicity value for acenaphthene was used for acenaphthylene, anthracene for phenanthrene and pyrene for benzo(g,h,i)perylene. Additionally, the non-carcinogenic toxicity value for Aroclor 1254 was used for as a surrogate for total PCBs for Aroclors and PCB congeners. The dermal absorption fractions (ABS) specified by Ecology (in an email from Andy Kallus, Ecology, October 9, 2014) during development of the Work Plan are used for development of the screening levels for arsenic (0.03), PAHs, including cPAHs, LPAHs and HPAHs (0.13), total PCBs (0.14) and pentachlorophenol (0.25). The source of these dermal absorption fractions is Environmental Protection Agency (EPA) Risk Assessment Guidance (RAGs) Part E, Dermal Risk Assessment dated July 2004, Exhibit 3-4. The gastrointestinal absorption conversion factors (GI) specified by Ecology (in an email from Andy Kallus, Ecology, October 9, 2014) during development of the Work Plan are used for development of the screening levels for cadmium (0.025) and chromium (0.013). The source of the gastrointestinal absorption conversion factors is EPA RAGs Part E, Dermal Risk Assessment dated July 2004, Exhibit 4-1.

[2] Bioaccumulative chemicals include arsenic, cadmium, lead, mercury, carcinogenic polycyclic aromatic hydrocarbons (cPAHs), dioxin-like polychlorinated biphenyls (PCBs), and dioxins/furans. Currently site-specific human health and ecological risk-based sediment screening levels have not been developed for bioaccumulative chemicals. Therefore, sediment screening levels for these chemicals are based on the natural background, regional background or the practical quantification limit (PQL), whichever is higher.

[3] Natural background values calculated as the 90/90 Upper Tolerance Limit from Ecology's SCUM guidance (Table 10-1; Ecology 2021).

[4] Regional background values for bioaccumulative compounds in Port Gardner sediment identified by Ecology in the Port Gardner Bay Regional Background Sediment Characterization report. The report identifies regional background values for arsenic, cadmium, mercury, cPAHs and dioxin-like PCBs based on the regional background study for Port Gardner Bay (Table 10-2; Ecology 2021).

[5] PQL values are from Analytical Resources, Inc. of Tukwila, Washington.

[6] The screening levels presented in this table are to provide a preliminary evaluation of human health and ecological risk for higher trophic level ecological receptors. Human health and higher trophic level ecological receptor screening levels are chosen from lowest of bioaccumulative and direct contact pathways. The risk-based value adjusted for the higher of natural background and PQL is the SCO. The risk-based value adjusted for the higher of regional background and PQL is the CSL. The human health screening level for intertidal areas includes marine areas at elevations higher than -3 feet mean lower low water (MLLW) and the applicable direct contact pathways include beach play, clamming and net fishing. The human health screening levels for subtidal areas include marine areas at elevations below -3 feet MLLW and the applicable direct contact pathway is net fishing.

[7] Natural and regional background (natural background/regional background) concentrations are being applied as preliminary cleanup levels. The SCO is the risk-based value adjusted for natural background and PQL, whichever is higher. The CSL is the risk-based value adjusted for regional background and PQL, whichever is higher.

[8] When natural background is greater than the regional background, the natural background concentration is being applied as preliminary cleanup level.

[9] Dredged Material Management Program (DMMP) Marine Guidelines Bioaccumulation Trigger value; from Dredged Material Evaluation and Disposal Procedures User Manual (DMMP User Manual) (Table 8-3; USACE 2021).

[10] PQL for total dioxin/furan TEQ is the programmatic PQL value from Ecology's SCUM guidance (Table 11-1; Ecology 2021).

PQL = practical quantitation limit

mg/kg = milligram per kilogram

µg/kg = microgram per kilogram

ng/kg = nanogram per kilogram

TEQ = toxic equivalent quotient

-- = Criterion not applicable or not available

Table 4

Applicable or Relevant and Appropriate Requirements

Weyerhaeuser Mill A Former
Everett, Washington

Authorizing Statute and Implementing Regulation	Citation	Description, Procedural/Substantive Requirements	Applicability
Federal ARARs			
Clean Air Act (CAA)	42 United States Code (USC) 7401 et seq. 40 Code of Federal Regulations (CFR) 50	Provides air quality standards for six criteria pollutants, including particulate matter, to protect public health and welfare. The requirements of the Clean Air Act are administered by a local agency - Northwest Clean Air Agency.	Air emission permits are required at MTCA cleanup sites if air emissions are sufficient enough to trigger the need for Title V air operating permits (7661A), prevention of significant deterioration permits (7475), or nonattainment new source review permits (7502(c)(5)). These permits are mandated by the Federal Clean Air Act (42 U.S.C.) and are required because an exemption would result in the state's loss of federal authorization to implement these permitting requirements in Washington.
Clean Water Act (CWA)	Section 401 - Water Quality Certification	Section 401 requires that any activity which may result in a discharge into the navigable waters shall obtain a certification from the Washington State Department of Ecology that the water quality standards will be met.	These requirements are applicable to proposed remedial alternatives that consist of in-water dredging, filling, capping and/or enhanced natural recovery (ENR) actions. The requirements will be identified by preparing Joint Aquatic Resource Permit Application (JARPA) for Washington State Department of Ecology's review to obtain 401 Water Quality Certification.
	Section 404 - Dredge and Fill Regulations	Section 404 requires a permit for the discharge of dredge or fill material into waters of the United States, including filling or construction activities in navigable waters and wetlands.	These requirements are applicable to proposed remedial alternatives that include in-water dredging, filling, capping and/or enhanced natural recovery (ENR) actions. The requirements will be identified by preparing JARPA for U.S Army Corps of Engineers (USACE) review to obtain coverage under an USACE Nationwide Permit (NWP) 38. NWP 38 applies to the "Cleanup of Hazardous and Toxic Waste" or standalone permit.
Endangered Species Act (ESA)	16 USC. 1531 – 1544 50 CFR Parts 17, 402	Provides for the protection of species of fish, wildlife, and plants that are listed as threatened or endangered with extinction. It also protects designated critical habitat for listed species. The Act outlines procedures for federal agencies to follow when taking actions that may jeopardize listed species, including consultation with resource agencies.	Applicable to the site for listed and proposed to be listed threatened or endangered species and their habitat areas which will, or could, be impacted by cleanup action. The requirements include consultation with United States Fish and Wildlife Service (USFWS), National Oceanic and Atmospheric Administration (NOAA) Fisheries, and Ecology to evaluate whether threatened or endangered species will be impacted. This consultation will be coordinated by USACE as part of coverage under the CWA Section 404 Nationwide Permit 38. Based on consultation, development of a biological assessment (BA) or biological opinion (BO) may be needed to demonstrate compliance.
Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA)	16 USC 1801 et. seq., 50 CFR Part 600	The MSFCMA was adopted to conserve and manage the fishery resources found off the coasts of the United States and the anadromous species and Continental Shelf fishery resources of the United States by protecting essential fish habitat.	Applicable to alternatives that have potential to impact habitat covered under MSFCMA. The requirements include consultation with USFWS, NOAA Fisheries, and Ecology to evaluate MSFCMA requirements. This consultation will be coordinated with the Endangered Species Act consultation by USACE as part of coverage under the CWA Section 404 Nationwide Permit 38. Based on consultation, development of a BA or BO may be needed to demonstrate compliance.
Federal Coastal Zone Management Act (CZMA)	16 USC 1451-1464 15 CFR 923-930	The CZMA requires that federal agency action that is reasonably likely to affect use of shorelines be consistent with the approved coastal zone management plan to the maximum extent practicable, subject to limitations set forth in the CZMA.	Applicable if construction is completed within 200 feet of the shoreline. These requirements are applicable to proposed remedial alternatives that include in-water dredging, filling, capping and/or ENR actions. The requirements will be met by preparing a CMZA form for Washington State Department of Ecology's review. Ecology reviews the proposed project for consistency with state environmental requirements, including shoreline permitting requirements.
Fish and Wildlife Conservation Act (FWCA)	16 USC. 661 et seq 50 CFA 83	Requires that adequate provision must be made for the conservation, maintenance, and management of wildlife resources and habitat and requires consultation with the USFWS and appropriate state agencies.	Applicable to the site if listed threatened or endangered species habitat areas will, or could, be impacted by cleanup action. Requirements of the FWCA will be evaluated in conjunction with the ESA consultation with USFWS and NOAA Fisheries.
Occupational Safety and Health Act (OSHA)	29 CFR 1904 29 CFR 1910 29 CFR 1926	Specifies minimum requirements to maintain worker health and safety during hazardous waste operations, including training and construction safety requirements.	Applicable to construction phases of a cleanup. Construction activities will be conducted in accordance with the requirements of OSHA.
Identification and Management of Hazardous Wastes	40 CFR 261 et seq.	Specifies how to determine whether a solid waste is considered hazardous (whether listed or based on characteristic) and how to manage hazardous wastes.	Applicable to remedial alternatives that involve dredging of contaminated sediment and wood debris. Dredged sediment will be evaluated in accordance with the requirement of Resource Conservation and Recovery Act (RCRA) to determine hazardous waste designation of the material for the purposes of appropriate management, transport and disposal of dredged material.

Authorizing Statute and Implementing Regulation	Citation	Description, Procedural/Substantive Requirements	Applicability
State ARARs			
Model Toxics Control Act (MTCA) Cleanup Regulation	Revised Code of Washington (RCW) 70.105D Chapter 173-340 Washington Administrative Code (WAC)	MTCA is the primary regulation governing cleanup actions.	Cleanup actions conducted by Ecology under MTCA are exempt from the procedural requirements of most state and local laws/permits; however, must meet substantive requirements of the laws/permits.
Sediment Management Standards (SMS)	Chapter 70.105D RCW Chapter 90.48 RCW Chapter 173-204 WAC	SMS is the primary regulation governing sediment cleanup actions.	MTCA is one of the authorities defining the SMS; thus, waivers of state and local laws/permits also apply to sediment cleanups.
State Environmental Policy Act (SEPA)	Chapter 43.21C RCW Chapter 173-802 WAC Chapter 197-11 WAC	SEPA (Chapter 43.21C RCW; WAC 197-11) and the SEPA procedures (WAC 173-802) are intended to ensure that state and local government officials consider environmental values when making decisions. Prior to taking any action on a proposal, including initiating a remedial construction activity, agencies must follow specific procedures to ensure that appropriate consideration has been given to the environment. This includes issuing an environmental determination and holding a public comment period. If there is a probable significant adverse environmental impact associated with the project, then a Determination of Significance is issued, and an Environmental Impact Statement (EIS) is required. If there is no probable significant adverse environmental impact associated with the project, then a Determination of Non-Significance is issued.	Applicable. A SEPA checklist and determination is required prior remedial construction activities.
Archeological Sites and Resources, Archeological Excavation and Removal Permit	Chapter 27.53 RCW Chapter 25-46 WAC Chapter 25-48 WAC	Prohibits the unauthorized disturbance of cultural and archaeological resources without a permit, and any archaeological investigations and monitoring at a site must be conducted by a professional archeologist. Agencies are required to notify the Department of Archaeology and Historic Preservation (DAHP), the Governor's Office of Indian Affairs (GOIA), and concerned tribes and provide them an opportunity to review and provide comments about potential project impacts.	Potentially applicable to a site where response actions involve disturbance or alteration of the ground and/or site terrain. Appropriate measures will be taken to evaluate the presence of cultural and archeological resources. If a potential for an existence of cultural or archeological resources exists, then appropriate measures will be taken during excavation/dredging activities and appropriate tribal members will be contacted if an artifact is encountered.
Construction Stormwater General Permit (CSWGP), Water Pollution Control Act	Chapter 90.48 RCW	Coverage under the CSWGP is generally required for any clearing, grading, or excavating if the project site discharges a) Stormwater from the site into surface waters of the State, or b) Stormwater into storm drainage systems that discharge to surface waters of the State. And c) Disturbs one or more acres of land area (including off Site disturbance acreage), or d) Disturb less than one acre of land area, if the project or activity is part of a larger common plan of development or sale, if the common plan of development or sale will ultimately disturb one or more acres.	Applicable if the cleanup action meets the identified criteria under Description, Procedural/Substantive Requirements. If required, the project will obtain coverage under the CSWGP. In addition, a stormwater pollution prevention plan (SWPPP) will be prepared before start of land disturbing activities, which will describe the best management practices (BMPs) that will be implemented to protect surface water quality.
Washington Hydraulic Project Approval (HPA)	Chapter 77.55.061 RCW Chapter 220-110 WAC	HPA and associated requirements for construction projects in state waters have been established for the protection of fish and shellfish. Any form of work that uses, diverts, obstructs, or changes the natural flow or bed of any fresh water or saltwater of the state requires an HPA.	Substantive requirements of HPA are applicable. These requirements are applicable to proposed remedial alternatives that consist of in-water dredging, filling, capping and/or include ENR actions. The requirements will be identified by preparing JARPA for the Washington Department of Fish and Wildlife (WDFW) review. The substantive requirements of an HPA include restrictions on dates of in-water work (in-water windows) to protect fish species at critical life history stages (e.g., spawning season for salmonids). For cleanup action alternatives in marine waters, the in-water work windows will be utilized during performance of the cleanup action.
Shoreline Management Act	Chapter 90.58 RCW Chapter 173-27-060 WAC	The Shoreline Management Act and its implementing regulations establish requirements for substantial developments occurring within waters of the state or within 200 feet of the shoreline. Local shoreline management programs are adopted under state regulations, creating an enforceable state law.	Applicable to remedial alternatives that include activities within 200 feet of the shoreline. Cleanup actions under MTCA are exempt from shoreline management act permitting set forth for Shorelands under RCW 90.58; however, will need to meet substantive requirements. The City of Everett has set forth requirements based on local considerations such as shoreline use, economic development, public access, circulation, recreation, conservation, and historical and cultural features. The Port and Potentially Liable Parties (PLPs) must work with the City of Everett to meet the substantive requirements set forth in their Shoreline Master Program prior to initiating the cleanup action. The Shoreline Master Program must be consistent with the policies and requirements of the Shoreline Management Act and the State Shoreline Master Program Guidelines.

Authorizing Statute and Implementing Regulation	Citation	Description, Procedural/Substantive Requirements	Applicability
Solid Waste Management, Dangerous Waste Regulations	Chapter 70A.205 RCW Chapter 70.105 RCW Chapter 173-303 WAC	Governs solid and dangerous waste handling and management, including identification, accumulation, storage, transport, treatment, and disposal.	The project is exempt from the procedural requirements for state-only designated dangerous waste set forth in RCW 70.105 but must meet the substantive requirements for designating state-only dangerous waste. The project is exempt from the procedural requirements for solid waste set forth in RCW 70A.205. The project must follow the substantive requirements for waste designation, handling, and disposal of solid waste set forth by the receiving facility. The receiving facility must provide permission to dispose of waste at the facility prior to delivering waste to the intended destination. The Port and PLP is required to designate waste and if dangerous waste is present, manage and dispose of the dangerous waste based on generator status and the requirements set forth by your chosen permitted disposal facility.
Washington Industrial Safety and Health Act (WISHA)	Chapter 49.17 RCW Chapter 296-62 WAC Chapter 296-843 WAC	Specifies minimum requirements to maintain worker health and safety during hazardous waste operations, including training and construction safety requirements.	Applicable to construction phases of a cleanup. Construction activities will be conducted in accordance with the requirements of WISHA.
Local ARARs			
City of Everett Noise Control	Chapter 20.08 Everett Municipal Code (EMC)	Establishes noise levels and standards.	Cleanup actions conducted by Ecology under MTCA are exempt from the procedural requirements of most state and local laws/permits; however, must meet substantive requirements of the laws/permits. Substantive requirements are applicable to construction noise generated due to a cleanup action. Construction activities associated with the remedial alternatives will comply with City of Everett noise control requirements.
City of Everett Publicly Owned Treatment Water (POTW) discharge authorization	Chapter 14.40 EMC	Establishes the requirements and limitations for discharges to the POTW.	Cleanup actions conducted by Ecology under MTCA are exempt from the procedural requirements of most state and local laws/permits; however, must meet substantive requirements of the laws/permits. Substantive requirements are potentially applicable if dredged material is processed upland of the Site to permitted landfill disposal. The cleanup action would be permit exempt; however, substantive requirements would apply.
City of Everett stormwater management program	Chapter 14.28 EMC	Provides the necessary measures to control the quantity and quality of stormwater produced by new development and redevelopment such that they comply with water quality standards and contribute to the protection of beneficial uses of the receiving waters.	Cleanup actions conducted by Ecology under MTCA are exempt from the procedural requirements of most state and local laws/permits; however, must meet substantive requirements of the laws/permits. Substantive requirements are potentially applicable if dredged material is processed upland of the Site prior to permitted landfill disposal.
City of Everett Building and Construction Code	Chapter 16 EMC	The purpose of the Building and Construction Code is to protect public health, safety, and general welfare as they relate to the construction and occupancy of buildings and structures.	Cleanup actions conducted by Ecology under MTCA are exempt from the procedural requirements of most state and local laws/permits; however, must meet substantive requirements of the laws/permits. Substantive requirements are applicable for remedial alternatives that involve construction of structures.
City of Everett Traffic Code	Chapter 46 EMC	Establishes the requirements for traffic control.	Cleanup actions conducted by Ecology under MTCA are exempt from the procedural requirements of most state and local laws/permits; however, must meet substantive requirements of the laws/permits. Substantive requirements are applicable to construction traffic associated with a cleanup action. Construction activities such as haul truck operations may require appropriate traffic control including signage or flaggers as per the requirements of the City of Everett Traffic Code.

Table 5
Remedial Technology Screening
Weyerhaeuser Mill A Former
Everett, Washington

Remedial Technology Identification			Description	Implementability	Effectiveness	Relative Cost		Applicability	Technology Retained (Yes/No)
Category	Type	Option				Capital	O&M		
No Action	No Action	None	No institutional controls or treatment.	Technically implementable at the Site, however, does not meet MTCA threshold criteria and will not meet remedial action objectives.	Not effective for protecting human health and environment.	None	None	No action is retained as it is applicable to SMA-4, which is the location of 2016 Pacific Terminal Interim Action (IA). As discussed in Section 7.5, contamination was completely removed from SMA-4. Additional remedial action is therefore not needed in this area. No action is not considered appliable to other SMAs.	Yes
Institutional Controls (IC)	Proprietary and Governmental Controls, Informational Devices and Access Restrictions	Proprietary Controls include restrictive convent/deed restrictions. Governmental Controls include notices in local zoning or building department records describing land use restrictions, commercial and recreational fishing bans/limits. Informational Devices include warning signage and health advisories. Access Restrictions include fencing.	Proprietary Controls are agreements between Ecology and a landowner that are filed with the county register of deeds along with property deeds/covenants and may be used to prohibit activities on a property that may adversely impact cleanup activities that have been completed. Governmental Controls impose restrictions on land or resource use using the authority of a government entity. Warning signage are physically installed to inform the public regarding health risks. Health advisories are issued to the public that residual contamination remains on site. Fencing is physically installed to prevent public access to contamination.	Technically implementable at the Site except for access restrictions (fencing). The upland portion of the Site is a Port terminal facility, which is already fenced and has a gated entry. Fencing is not applicable in the marine intertidal and subtidal environment.	Not effective for remediating contaminants but can be effective at reducing risks and maintaining the integrity of remedies that are implemented on site.	Low	Low	The SMS (WAC 173-204-570(3)(h)) does not allow cleanup actions at the Site to rely exclusively on institutional controls and monitoring. Institutional controls with the exception of access restrictions (fencing) are retained as a component of cleanup action alternatives and are most likely to be identified following the completion of the cleanup action, based on the built condition of the remedy.	Yes
Natural Recovery	Sedimentation /Deposition	Monitored Natural Recovery (MNR)	Reduction of toxicity and bioavailability of contaminants through natural deposition of clean sediment, physical and biological mixing, and biodegradation. Monitoring in the form of periodic sediment sampling is performed to verify natural recovery is occurring within a reasonable restoration timeframe.	Technically implementable at the Site. Monitoring is required to confirm the natural recovery rate overtime.	In general, the effectiveness of Natural Recovery is limited to areas with lower contaminant concentrations that are net depositional. Not effective in areas where sediment and wood debris may be subject to erosive forces such as tidal forces, wave-induced currents, vessel scour or disturbances due to other physical means or where natural sedimentation rates are low. The scour study completed as part of the RI identified scour potential from vessel operations within and adjacent to the navigable areas of the Site where mudline elevations are shallower than -55 feet MLLW and therefore, MNR is not effective within these areas. Based on the sedimentation rate calculated for the Marine Area outside of the potential scour area as part of the RI, long-term risk reduction within the biologically active zone (i.e., 10 cm) is expected to occur within a 10-year period due to natural sedimentation.	Low	Moderate	MNR is retained given that the calculated sedimentation rates for the Marine Area are anticipated to deposit new sediment at a thickness that is equivalent to, or greater than the thickness of the compliance interval within a 10-year period and the technology can be reliably implemented outside of the identified scour areas at the Site. MNR is applicable to SMA-1 because this area is expected to be net depositional due to it being outside of the identified scour areas at the Site (deeper than -55 feet MLLW). MNR is also applicable to SMA-7 because this area is located at a distance away from scour influence and is part of the depositional delta feature emanating from Pigeon Creek. MNR is not applicable to other SMAs because they are located within areas of the Site that are subject to scour.	Yes

Remedial Technology Identification			Description	Implementability	Effectiveness	Relative Cost		Applicability	Technology Retained (Yes/No)
Category	Type	Option				Capital	O&M		
Natural Recovery	Sedimentation /Deposition	Enhanced Natural Recovery (ENR)	Natural sedimentation is enhanced by placement of clean sand over the recovery area. The sand is typically placed on a mass per area basis since the material is intended to mix with the in-place sediments rather than to isolate the contamination. As a result, ENR does not require highly precise placement techniques such as are used for the construction of caps. Technology relies on natural mixing processes (e.g., bioturbation) to reduce contaminant levels over time. Similar to MNR, monitoring is performed to confirm performance and rate of recovery within a reasonable restoration timeframe.	Technically implementable at the Site. The ability to place the clean sand materials precisely decreases with water depth. However, the clean materials placement does not require the same level of precision as placement of cap materials so the technology can effectively be implemented in deeper water. Monitoring is required to confirm the materials placement and natural recovery rate over-time.	In general, the effectiveness of ENR is limited to areas with lower contaminant concentrations that are net depositional. ENR sand is intended to mix with the surface sediments to lower concentrations and speed up natural recovery. ENR is not effective in areas where sediment and wood debris may be subject to erosive forces such as tidal forces, wave-induced currents, vessel scour or disturbances due to other physical means. Similar to MNR, ENR is not effective in areas within/adjacent to the navigable areas of the Site with mudline elevations shallower than -55 feet MLLW due to disturbances from vessel scour. ENR includes placement of a mass of clean sand over the surface of contaminated sediments to ultimately redistribute over the area and mix with the existing sediments to reduce the risks and enhance natural recovery processes. For the Site, the placement of a six-inch equivalent layer of sand is assumed and the movement and mixing of the placed sand are expected over-time to achieve the long-term reduction in surface sediment concentrations. Natural recovery will continue on the surface to provide further risk reduction. Long-term risk reduction timeframe for ENR can be shorter than MNR due to the placement of the clean sand.	Moderate	Moderate	ENR is retained given that the calculated sedimentation rates for the Marine Area are anticipated to deposit new sediment at a thickness that is equivalent to, or greater than the thickness of the compliance interval within a 10-year period and the technology can be reliably implemented outside of the identified scour areas at the Site. ENR is applicable to SMA-1 because this area is expected to be net depositional due to it being outside of the identified scour areas at the Site (deeper than -55 feet MLLW). ENR is also applicable to SMA-7 because this area is located at a distance away from scour influence and is part of the depositional delta feature emanating from Pigeon Creek. ENR is not applicable to other SMAs because they are located within areas of the Site that are subject to scour.	Yes
Capping	Conventional Cap	Conventional Sand Cap	Conventional sand capping includes covering contaminated sediment and/or wood debris with a thick layer of clean sand. A three-foot sand layer is assumed For the Site. Capping requires precision placement of materials to ensure that the engineered elements of the cap are properly constructed. A sand cap provides physical isolation of contaminated sediment and reduces direct-contact exposure risk and decreases the ability of burrowing organisms to move buried contaminants to the surface (i.e., bioturbation). Sand caps are designed to be of sufficient thickness to meet this purpose and should have an allowance for consolidation so that a minimum cap thickness is maintained following placement. Fine fraction and organic carbon content typically found in naturally occurring sands can also provide chemical isolation from contaminated sediment by treating/ sequestering dissolved contaminants migrating through the cap. Sand caps without an armoring layer typically do not provide for erosion protection.	Technically implementable except for in the deeper areas of the Site where increases in the depth of water significantly decreases the ability to accurately and precisely place the cap material to the required thickness. Increased water depth also limits the ability to readily maintain caps over-time, due to the reduced ability to precisely place cap materials in deeper water. Sand caps have been successfully constructed in multiple Puget Sound locations. In general, capping (without dredging) increases bottom elevations, which can reduce the water depth required for navigation and alter pre-existing habitat. Capping, when implemented in navigation areas, must account for a factor of safety to protect the surface of the cap from potential damage from the navigation activities and maintenance dredging. The capping material must provide protection from erosive forces in areas subject to scour. If changes in bottom elevations are expected to degrade aquatic habitat, mitigation may be required by regulatory agencies.	A conventional sand cap is effective at providing stable physical isolation and chemical isolation from contamination. Sand caps (without armoring) are not effective in areas that are subject to erosive forces such as tidal forces, wave-induced currents, vessel scour, etc. Due to the requirement for precision placement of cap material, the effectiveness of capping will decrease with water depth due to the inability to adequately construct and maintain the technology.	Moderate to High	Low to Moderate	Significant portions of SMA-1 are located in the deepest parts of the Site and as a result conventional sand capping within these SMAs is not applicable due to the significant challenges to precision construction and maintenance requirements of conventional sand caps. Capping without armoring is not applicable within SMAs-2, 3 and 6 because these areas are subject to vessel scour. Capping is not applicable in SMA-4 as this SMA does not require further remedial actions. Capping is not applicable in SMA-5 as this area is identified as a future cargo handling area and capping contaminated sediment and wood debris in this area will pose limitations or restrictions to the potential future site uses in this area of the Site. Capping is not applicable in SMA-7 because it will raise the grade in this shallow, intertidal area and impact the existing critical habitat elevations. A dredge and cap approach are not applicable in SMA-7 because dredging to accommodate the required cap thickness will result in complete removal of contamination.	No

Remedial Technology Identification			Description	Implementability	Effectiveness	Relative Cost		Applicability	Technology Retained (Yes/No)
Category	Type	Option				Capital	O&M		
Capping	Conventional Cap	Conventional Armored Sand Cap	An armored sand cap includes a layer of armoring on top of a sand layer to provide erosion protection component. Armoring layer is designed to withstand erosive forces such as tidal forces, wave-induced currents, vessel scour, etc. The armored sand cap includes covering contaminated sediment and/or wood debris with a thick layer of clean sand. Capping requires precision placement of materials to ensure that the engineered elements of the cap are properly constructed. For the Site, a three-foot sand layer covered by a three-foot armor layer is assumed. An armored sand cap provides physical isolation of contaminated sediment, reduces direct-contact exposure risk and decreases the ability of burrowing organisms to move buried contaminants to the surface (i.e., bioturbation). Armored sand caps are designed to be of sufficient thickness to meet this purpose and should have an allowance for consolidation so that a minimum cap thickness is maintained following placement. Fine fraction and organic carbon content typically found in naturally occurring sands can also provide chemical isolation from contaminated sediment by treating/ sequestering dissolved contaminants migrating through the cap.	Technically implementable except for in the deeper areas of the Site where increases in the depth of water significantly decreases the ability to place the cap material accurately and precisely to the required thickness. Increased water depth also limits the ability to readily maintain caps over-time, due to the reduced ability to precisely place cap materials in deeper water. Armored sand caps have been successfully constructed in multiple Puget Sound locations. In general, capping (without dredging) increases bottom elevations, which can reduce the water depth required for navigation and alter pre-existing habitat. Capping, when implemented in navigation areas, must account for a factor of safety to protect the surface of the cap from the navigation activities and maintenance dredging activities. The capping material must provide protection from erosive forces in areas subject to scour. If changes in bottom elevations are expected to degrade aquatic habitat, mitigation may be required by regulatory agencies.	An armored sand cap is effective at providing physical isolation from contamination, provides protection from erosive forces, and chemical isolation from contamination. Due to the requirement for precision placement of cap material, the effectiveness of capping may decrease with water depth due to the inability to adequately construct the technology.	Moderate to High	Low to Moderate	Armored cap is not applicable in SMA-1 since this SMA is not subject to erosive forces such as vessel scour. Armored caps are not applicable within SMAs-2, 3 and 6 because placement of caps in these areas of the Site will decrease navigation elevations and prevent future dredging which is inconsistent with the current and anticipated future uses of the Site. A dredge and cap approach to place an armored cap is not considered applicable within SMAs-2, 3 and 6 because dredging to accommodate the cap thickness will either result in complete removal of contamination to meet armored cap thickness requirements or result in leaving only a small volume of contamination in-place that would be more expensive to cap than to completely remove. Armored cap is not applicable in SMA-4, 5 and 7 for similar reasons as described above under sand cap.	No
	Amended/ Reactive Cap	Amended/ Reactive Sand Cap	An amended/reactive sand cap includes use of specialized material (i.e., amendments) to enhance the chemical isolation capacity (i.e., ability of the cap to treat/sequester dissolved contaminants migrating through the cap) or otherwise decrease the thickness of caps compared to sand cap. Specialized material are mixed with sand or placed in layers. Capping requires precision placement of materials to ensure that the engineered elements of the cap are properly constructed. Specialized material could include one or more of the following - activated carbon (AC), granular organoclay or metal hydroxides such as zero-valent iron and alumina material. AC can absorb a wide range of Site contaminants including organics and certain metals, granular organoclay can absorb organic Site contaminants including dissolved polycyclic aromatic hydrocarbons (PAHs) and semi-volatile organic compounds (SVOCs) and metal hydroxides are capable of binding metals. Amended/reactive sand caps without an armoring layer typically do not provide for erosion protection.	Technically implementable except for in the deeper areas of the Site where increases in the depth of water significantly decreases the ability to precisely place the cap material to the required thickness. Increased water depth also limits the ability to readily maintain caps over-time, due to the reduced ability to precisely place cap materials in deeper water. Water depth also limits the ability to readily maintain caps over-time, due to the reduced ability to precisely place cap materials in deeper water. In general, capping (without dredging) increases bottom elevations, which can reduce the water depth required for navigation and alter pre-existing habitat. Capping, when implemented in navigation areas, must account for a factor of safety to protect the surface of the cap from the navigation activities and maintenance dredging activities. The capping material must provide protection from erosive forces in areas subject to scour. If changes in bottom elevations are expected to degrade aquatic habitat, mitigation may be required by regulatory agencies.	An amended/reactive sand cap is effective at providing physical and chemical isolation from contamination. Amended/reactive sand caps (without armoring) are not effective in areas that are subject to erosive forces such as tidal forces, wave-induced currents, vessel scour, etc. Due to the requirement for precision placement of cap material, the effectiveness of capping may decrease with water depth due to the inability to adequately construct the technology.	Moderate to High	Moderate	Significant portions of SMAs-1 are located in the deepest parts of the Site and as a result, amended/reactive sand capping within these SMAs is not applicable due to the significant challenges to precision construction and maintenance requirements of amended/reactive sand caps. Capping without armoring is not applicable within SMAs-2, 3 and 6 because these areas are subject to vessel scour. Capping is not applicable in SMA-4 as this SMA does not require further remedial actions. Capping is not applicable in SMA-5 as this area is identified as a future cargo handling area and capping contaminated sediment and wood debris in this area will pose limitations or restrictions to the potential future site uses in this area of the Site. Capping is not applicable in SMA-7 because it will raise the grade in this shallow, intertidal area and impact the existing critical habitat elevations. A dredge and cap approach are not applicable in SMA-7 because dredging to accommodate the required cap thickness will result in complete removal of contamination.	No

Remedial Technology Identification			Description	Implementability	Effectiveness	Relative Cost		Applicability	Technology Retained (Yes/No)
Category	Type	Option				Capital	O&M		
Capping	Amended/ Reactive Cap	Amended/ Reactive Sand Cap with Armoring	The remedy includes a layer of armoring on top of the amended/reactive cap to provide erosion protection component. Armoring layers are designed to withstand erosive forces such as tidal forces, wave-induced currents, vessel scour, etc. Capping requires precision placement of materials to ensure that the engineered elements of the cap are properly constructed. An amended/reactive sand cap includes use of specialized material (i.e., amendments) to enhance the chemical isolation capacity (i.e., ability of the cap to treat/sequester dissolved contaminants migrating through the cap) or otherwise decrease the thickness of caps compared to sand cap. Specialized material are mixed with sand or placed in layers. Specialized material could include one or more of the following - AC, granular organoclay or metal hydroxides such as zero-valent iron and alumina material. AC can absorb a wide range of Site contaminants including organics and certain metals, granular organoclay can absorb organic Site contaminants including dissolved PAHs and SVOCs and metal hydroxides are capable of binding metals.	Technically implementable except for in the deeper areas of the Site where increases in the depth of water significantly decreases the ability to precisely place the cap material to the required thickness. Increased water depth also limits the ability to readily maintain caps over-time, due to the reduced ability to precisely place cap materials in deeper water. Water depth also limits the ability to readily maintain caps over-time, due to the reduced ability to precisely place cap materials in deeper water. In general, capping (without dredging) increases bottom elevations, which can reduce the water depth required for navigation and alter pre-existing habitat. Capping, when implemented in navigation areas, must account for a factor of safety to protect the surface of the cap from the navigation activities and maintenance dredging activities. The capping material must provide protection from erosive forces in areas subject to scour. If changes in bottom elevations are expected to degrade aquatic habitat, mitigation may be required by regulatory agencies.	An amended/reactive sand cap with armoring is effective in providing physical and chemical isolation and provides protection from erosive forces. Due to the requirement for precision placement of cap material, the effectiveness of capping may decrease with water depth due to the inability to adequately construct the technology.	Moderate to High	Moderate	An amended/reactive sand cap with armoring is not applicable in SMA-1 since this SMA is not subject to erosive forces such as vessel scour. Armored caps are not applicable within SMAs-2, 3 and 6 because placement of caps in these areas of the Site will decrease navigation elevations and prevent future dredging which is inconsistent with the current and anticipated future uses of the Site. A dredge and cap approach to place an armored cap is not considered applicable within SMAs-2, 3 and 6 because dredging to accommodate the cap thickness will either result in complete removal of contamination to meet armored cap thickness requirements or result in leaving only a small volume of contamination in-place that would be more expensive to cap than to completely remove. Armored cap is not applicable in SMA-4, 5 and 7 for similar reasons as described above under amended/reactive sand cap.	No
Capping	Dynamic Cap	Dynamic Sand Cap	Dynamic sand capping includes placement of clean imported sand on top of the existing sediment surface on a mass per area basis with individual materials placements overlapping each other to achieve cap thickness that is equivalent to or greater than the thickness of the compliance zone (i.e., 10 cm) at the time of construction. The thickness of dynamic sand cap is not expected to be even following the placement of materials during construction. However, the dynamic sand cap materials are expected to be distributed over time by current action to achieve a more even thickness. The distribution of the placed dynamic sand cap materials across the placement area is expected reach equilibrium within a reasonable restoration timeframe. The purpose of the dynamic sand cap is to prevent exposure to contamination and to prevent resuspension and transport of contaminants to other areas of the Site. For the purposes of this FS, a three-foot thickness equivalent mass of sand over the area of placement is assumed. Since dynamic sand caps are placed on a mass per area basis, they do not require precise placement techniques such as are used for the construction of conventional or amended/ reactive sand caps. Fine fraction and organic carbon content typically found in naturally occurring sands can treat/sequester dissolved contaminants migrating through the cap. To allow the dynamic sand caps to distribute within the placement area, they are not armored and therefore, do not provide erosion protection. The performance of dynamic sand caps is evaluated by sampling and analysis of surface sediment in the placement area over a reasonable restoration timeframe.	Technically implementable at the Site. In general, the ability to place a sediment cap precisely decreases with water depth. However, dynamic sand cap placement does not require the same level of precision as the placement of conventional or amended/reactive cap materials, so the technology is expected to be reasonably implemented in moderately deep water. Monitoring the dynamic sand cap is required to evaluate effectiveness over time. In general, capping (without dredging) increases bottom elevations, which can reduce the water depth required for navigation and alter pre-existing habitat. Capping, when implemented in navigation areas, must account for a factor of safety to protect the surface of the cap from potential damage from the navigation activities and interference with maintenance dredging. If changes in bottom elevations are expected to degrade aquatic habitat, mitigation may be required by regulatory agencies.	Dynamic sand caps do not require the precise placement techniques as the conventional sand cap and therefore, can effectively be implemented in moderately deep water. To allow the dynamic sand caps to distribute within the placement area, they are not armored and therefore, are not effective in areas of the Site that are subject to vessel scour (i.e., areas with mudline elevations shallower than -55 feet MLLW). Vessel scour is expected to disrupt the distribution of sand and prevent the isolation of underlying contamination.	Moderate to High	Moderate	Dynamic sand cap placement does not require the same level of precision as the placement of conventional or amended/reactive cap materials so the technology is expected to be reasonably implemented in moderately deep mudline (up to -75 feet MLLW) of SMA-1d. Significant portions of SMAs 1a, 1b and 1c are in the deepest part of the Site (up to 215 feet, 90 feet and 115 feet MLLW, respectively) and as a result, dynamic sand capping is expected to become challenging to implement and therefore not considered applicable in these SMAs. Dynamic sand caps cannot be armored and therefore not applicable within SMAs-2, 3 and 6 because these areas are subject to vessel scour and cap without armoring would not be effective. Placement in SMA-1d will require partial dredging to ensure that the cap material is located below the scour depth. Capping is not applicable in SMA-4 as this SMA does not require further remedial actions. Capping is not applicable in SMA-5 as this area is identified as a future cargo handling area and capping contaminated sediment and wood debris in this area will pose limitations or restrictions to the potential future site uses in this area of the Site. Capping is not applicable in SMA-7 because it will raise the grade in this shallow, intertidal area and impact the existing critical habitat elevations. A dredge and cap approach is not applicable in SMA-7 because dredging to accommodate the required cap thickness will result in complete removal of contamination.	Yes

Remedial Technology Identification			Description	Implementability	Effectiveness	Relative Cost		Applicability	Technology Retained (Yes/No)
Category	Type	Option				Capital	O&M		
Containment	Low-Permeability Physical Barriers	Containment structure using sheet piles, berms or similar	Placement of a low-permeability containment structure to isolate and prevent potential lateral movement of contaminated source area sediment and wood debris. A containment structure (sheet pile, berm or similar) is installed to provide containment of in-place contaminated sediment and wood debris. The containment structure can be extended vertically upwards to create space for disposal of dredged material - see CDF remedial technology description below.	Technically implementable at the Site. The containment structure would be designed by a structural engineer for site conditions for structural stability. Buried debris or subsurface obstructions such as utilities may interfere and would require removal as part of the barrier installation.	Effective for long-term containment and environmental protection. Engineered containment structure will be designed for seismic stability and other conditions to achieve a high degree of protectiveness and permanence.	High	High	In-place containment is retained for SMA-5 as a compatible element of the CDF technology. In-place containment is not considered applicable to other SMAs.	Yes
Removal	Dredging/Excavation of Sediment and Wood Debris	Mechanical Dredging/ Excavation	Dredging/excavation of contaminated sediment and wood debris using land-based and/or water-based equipment outfitted with a clamshell or equivalent dredging bucket. Removal requires precision placement of the dredging bucket at the sediment surface to ensure that complete removal of the contamination, both horizontally and vertically, is achieved. Land-based removal would include use of land-based excavation equipment and transport vehicles (ex. dump trucks) operated from the shoreline during low tides when the work area is exposed. Water-based removal would include use of a barge-mounted dredge and a material barge for dredged material transport.	Technically implementable at the Site except for in the deeper areas of the Site where increases in the depth of water significantly decreases the ability to precisely remove contaminated material to the required depth. Dredging is commonly used in the marine environment to remove contaminated sediment and/or wood debris. Implementation is less effective in deeper areas of the Site where increases in the depth of water significantly lowers the ability to precisely place the dredging bucket which could result in incomplete removal or residuals that may result in additional dredging passes and/or placement of clean sand on the dredged surface. Dredging cycle times increase significantly with depth thus elongating the construction duration. Dredging action must rely on stable side cuts and/or shoring systems, as applicable, to protect the upland areas of the Site and existing structures including pile supported wharfs, piers, and slope armor. For the Site, a toe wall is assumed to be required to complete dredging in front of the South Terminal in SMA-6 to protect the structure as the depth of contamination exceeds the design dredge depth at the structure. Structural support to the existing aged wooden bulkhead wall between the South and Pacific Terminals in SMA-5 is also assumed to be required to provide structural stability during removal of contaminated material. The dredging action must consider debris management, given the presence of wood debris in the contaminated sediment.	Effective where complete contaminant removal is achieved. Effectiveness decreases with water depth due to the decrease in dredging accuracy and an increase in potential for incomplete dredging or residuals. In areas of incomplete dredging or where contaminant residuals cannot be eliminated a sand cover may be required to compensate for the reduced effectiveness and manage chemical concentrations on the exposed surface. In areas where only a thin layer of contamination is present, over-dredging allowances that are required to achieve complete removal will lower effectiveness by substantially increasing disposal volumes.	Moderate to High	Low	Significant portions of SMAs-1a, 1b and 1c are located in the deepest areas of the Site (up to -215 feet, -90 feet and -115 feet MLLW, respectively) and contain relatively large areas where the thickness of contamination and wood debris to be removed is on the order of thickness of the over dredge allowance. The water depth and removal thickness conditions in SMAs-1a, 1b and 1c make removal technically challenging, ineffective and costly and as a result, removal in not applicable in these SMAs. Water depths within SMA-1d are less deep than in SMAs-1a, 1b and 1c, although range up to -75 feet MLLW. As a result, removal is assumed to be applicable to SMA-1d, although difficult to implement due to water depths and may result in reduced effectiveness. Removal is applicable in SMAs-2, 3, 5, 6 and 7 as the mudline in these SMAs is relatively shallow which increases the ability to deploy and control the dredge bucket with precision and increases the overall effectiveness of removal. Within SMA-7, removal is followed by backfilling to restore elevations and mitigate impacts to critical habitat elevations.	Yes

Remedial Technology Identification			Description	Implementability	Effectiveness	Relative Cost		Applicability	Technology Retained (Yes/No)
Category	Type	Option				Capital	O&M		
Management of Removed Sediment/ Dredged Materials	Upland Disposal	Landfill	Disposal of contaminated sediment and wood debris at an off-site, permitted landfill.	Technically implementable. Offloading, dewatering and processing are required prior to transport. Waste characterization is required for disposal approval at the landfill facility. Given the large volume of dredged material at the Site, dredging production rates may be limited by limits in offsite transportation (e.g., availability of trucks, containers and train cars) and disposal throughput (e.g., daily disposal volumes given by the landfill facility).	Proven technology effective for the long-term management of contaminated sediments and wood debris. Common disposal option for dredged sediments and wood debris.	High	Low	Applicable. Commonly used method to dispose contaminated dredged/excavated material.	Yes
	Confined Disposal Facility (CDF)	Upland, Nearshore, or In-Water Facility	Engineered containment structure to contain dredged sediment and wood debris. A CDF can be located upland, partially in water (nearshore facility), or completely in water. In addition to lateral confinement provided by uplands and shoring walls, a CDF relies on capping technology to provide for surface confinement.	Technically implementable at the Site. A CDF structure has been previously constructed at the Pacific Terminal and has been shown to be successful at containing contaminated dredged material. A containment structure must be designed to minimize/prevent contaminant migration. A CDF must be designed by a structural engineer for site conditions and to provide long-term structural stability. Buried debris or subsurface obstructions such as utilities may interfere with the wall installation. Dredged material placed in the CDF must be capped at the surface to contain the material and prevent exposure and infiltration of stormwater. A CDF may have capacity limitations and require offsite upland disposal where the volume of dredged material exceeds the disposal volume of the CDF.	A CDF is effective for the permanent and long-term containment of dredged material. CDF structures have been effectively used at the Mill A Site and at other sediment cleanups in the Puget Sound. A CDF can reduce schedule delays, project costs and carbon emissions by reducing offsite transportation and disposal of dredged material.	High	High	Applicable within SMA-5 where CDF structure can be constructed and remain compatible with the current and future uses.	Yes
	Contained Aquatic Disposal (CAD)	In-Water Disposal and Containment	Removed impacted sediment and wood debris is placed in a natural or artificial in-water depression in the water body and contained with cap material.	Not implementable at the Site due to the lack of a location for the facility.	Effective for long-term containment and environmental protection if a suitable site is available.	High	High	Not applicable for the current project due to absence of suitable location. Unlikely to provide additional benefit over other technologies.	No
	Aquatic Open-Water Disposal	Open-Water Disposal at Designated Site	Sediment that meets the Dredged Material Management Program (DMMP) criteria are allowed to be disposed at one of the Department of Natural Resources (DNR) open-water disposal sites in Puget Sound. The Port Gardner open-water disposal site is the closest open water disposal location to the Site. Sediment targeted for open-water disposal would require a formal Dredged Material Suitability Determination from the DMMP. Larger wood debris are not allowed to be disposed at the open water disposal site.	Uncertain implementability due to the known levels of contamination at the Site. Technically implementable using available equipment and methods. Subject to DMMP screening criteria and suitability determination.	Effective for removal and disposal of sediment with contaminant concentrations that meet the open water disposal criteria and contain limited or no debris. Approval for open-water disposal is expected to be difficult for contaminated sediment containing wood waste originating from a known cleanup project.	Low	Low	Not applicable. Dredge material containing contamination and wood waste makes open-water disposal approval unlikely.	No
	Beneficial Reuse	Placement in Other Upland or Aquatic Environment	Reuse for engineering purposes, habitat enhancement or other beneficial needs. Dredged material would require a beneficial use determination.	Uncertain implementability due to the known levels of contamination at the Site. A suitable reuse for the dredged material has not been identified.	The general fine-grained nature and presence of wood waste and contaminants limit the potential for reuse of the Site dredged material.	Moderate to High	Low	Dredge material containing contamination and wood waste makes beneficial use approval unlikely.	No

Remedial Technology Identification			Description	Implementability	Effectiveness	Relative Cost		Applicability	Technology Retained (Yes/No)
Category	Type	Option				Capital	O&M		
Ex-Situ Sediment Treatment	Bio-Remediation	Landfarming, Slurry Bioreactor or Biopiles	Biodegradation of contaminants in removed dredged material is enhanced through modification of material conditions and provision of substrate necessary for microbial growth. Treatment is conducted in landfarm arrangement, above ground reactor, or in treatment cells (biopiles).	Difficult to implement. Landfarming option may require use of a large amount of space depending on the quantity of excavated/dredged material. Slurry and biopile treatment require reactor or treatment cell construction. Leachate and off-gassing require collection and treatment. Addition of additives may increase total bulk volume of treated sediment.	Likely ineffective for PCBs and dioxin/furans.	Moderate to High	Moderate to High	Likely not effective and difficult to implement.	No
	Incineration	Rotary Kiln	Material is heated above approximately 1,600 degrees Fahrenheit to volatilize and combust organic contaminants. Incinerator off-gas is treated in an air pollution control system.	Potentially difficult to implement. Limited space for on-site treatment system and staging. Specific feed size and material handling requirements may impact implement ability. Suitable off-site facility not currently identified. Emissions are likely problematic.	Proven effective treatment, although afterburner likely needed to combust dioxins/furans.	High	High	High-cost relative to other ex situ treatment technologies. Even if feasible, may not provide added incremental benefit.	No
	Sediment Washing	Water and Surfactants	Removal of leachable contaminants from sediment using water and surfactants in an aboveground reactor with subsequent treatment of residual fluids.	Difficult to implement. Residuals that are difficult to extract from the sediment matrix may require additional treatment. Could generate state designated Dangerous Waste. Limited space on site for treatment system siting and staging due active terminal operations. Debris screening may be required. Suitable off-site facility has not been identified.	Likely ineffective due to the presence of wood waste and PCBs, and dioxins and furans which have a strong affinity for sorption to solids and organics.	High	High	Difficult to implement. High cost.	No
	Solidification/ Stabilization	Cement or Lime based Processes/ Microencapsula tion	Reagents are introduced to physically bind or enclose contaminants, or to induce chemical reactions between the stabilizing agent and contaminants to reduce their mobility. Resultant materials are typically disposed of.	Difficult to implement. Limited space on site for treatment system siting and staging due active terminal operations. Wood waste and debris screening may be required. Can result in significant increase in volume of reacted material. Post-treatment disposal will be required.	May be ineffective for treatment due to presence to wood waste and organic compounds.	Moderate to High	Low	Likely inadequate effectiveness and reliability for organics. Potentially difficult to implement with high wood waste content.	No
In-Situ Sediment Treatment	Chemical Treatment	Amendment/ Stabilization	This technology involves immobilizing contaminants by physically binding or enclosing the sediment within a stabilized mass, or chemically treating the contaminants. Additives are mixed with the sediment in-situ to encapsulate the sediment and/or reduce the solubility, mobility, and toxicity of the contaminants.	Technically implementable. May be effective for addressing contaminants but may have negative affects to habitat in the marine environment. There are relatively few case studies to establish the potential effectiveness of this technology for treatment of contaminated sediment. Post-treatment disposal may be required.	Effective in sequestering organic contaminants through a combination of adsorption, ion exchange and precipitation. However, this is an emerging technology with limited full-scale applications. Likely not effective to wood debris present on site.	Moderate to High	Moderate	Not effective in treating wood debris. Additionally, this is an emerging technology with only bench- or pilot-scale studies.	No

Table 6

Evaluation of Alternatives, Minimum Requirements for Sediment Cleanup Actions

Weyerhaeuser Mill A Former
Everett, Washington

Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Alternative Summary	• Monitored Natural Recovery (MNR) in SMAs 1 (1a through 1d) and 7 measuring approximately 43 acres. • Removal and replacement of the existing South Terminal pile-supported roll-on/roll-off berth to provide access to dredging areas and installation of South Terminal toe wall and upland retaining wall to support existing structures and achieve complete contaminant removal through dredging. • Full removal of contaminated sediment and wood debris from SMAs 2 (2a and 2b), 3 (3a through 3c), 5 and 6. Dredge stable side slopes at 3H:1V in SMA-1d to allow for full removal to be completed in adjacent SMA-2a. Side slope dredging in SMA-1a, 1b and 1c is not assumed for the purposes of the FS since the full removal depths in the adjacent portions of SMA-2a/2b are shallow. Approximately 424,520 tons of dredged material are estimated to be removed from these SMAs. • Upland transload, transport and disposal of approximately 424,520 tons of dredged material at an off-site permitted landfill. • No further action in SMA 4 due to the completeness of the 2016 interim action. • Institutional controls, as necessary.	• Monitored Natural Recovery (MNR) in SMA 1a measuring approximately 26.8 acres. • Enhanced Natural Recovery (ENR) in SMAs 1b through 1d, and 7 measuring approximately 16.2 acres. Approximately 20,900 tons of sand is estimated to be placed in these SMAs. • Removal and replacement of the existing South Terminal pile-supported roll-on/roll-off berth to provide access to dredging areas and installation of South Terminal toe wall and upland retaining wall to support existing structures and achieve complete contaminant removal through dredging. • Full removal of contaminated sediment and wood debris from SMAs 2 (2a and 2b), 3 (3a through 3c), 5 and 6. Dredge stable side slopes at 3H:1V in SMA-1d to allow for full removal to be completed in adjacent SMA-2a. Side slope dredging in SMA-1a, 1b and 1c is not assumed for the purposes of the FS since the full removal depths in the adjacent portions of SMA-2a/2b are shallow. Approximately 424,520 tons of dredged material are estimated to be removed from these SMAs. • Upland transload, transport and disposal of approximately 424,520 tons of dredged material at an off-site permitted landfill. • No further action in SMA 4 due to the completeness of the 2016 interim action. • Institutional controls, as necessary.	• Monitored Natural Recovery (MNR) in SMA 1a measuring approximately 26.8 acres. • Enhanced Natural Recovery (ENR) in SMAs 1b, 1c and 7 measuring approximately 11.7 acres. Approximately 15,140 tons of sand is estimated to be placed in this SMA. • Placement of dynamic sand cap in SMA 1d measuring approximately 4.5 acres. Approximately 35,720 tons of sand cap material is estimated to be placed in SMA 1d. • Removal and replacement of the existing South Terminal pile-supported roll-on/roll-off berth to provide access to dredging areas and installation of South Terminal toe wall and upland retaining wall to support existing structures and achieve complete contaminant removal through dredging. • Full removal of contaminated sediment and wood debris from SMAs 2 (2a and 2b), 3 (3a through 3c), 5 and 6. Dredge in SMA-1d to provide stable transition slopes to allow full removal in adjacent SMA-2a and to remove contaminated sediment in SMA-1d above elevation -60 feet MLLW which will ensure that the dynamic sand cap placed in SMA-1d is not above the maximum scour elevation (i.e., -55 feet MLLW). Side slope dredging in SMA-1a, 1b and 1c is not assumed for the purposes of the FS since the full removal depths in the adjacent portions of SMA-2a/2b are shallow. Approximately 438,070 tons of dredged material are estimated to be removed from these SMAs. • Upland transload, transport and disposal of approximately 438,070 tons of dredged material at an off-site permitted landfill. • No further action in SMA 4 due to the completeness of the 2016 interim action. • Institutional controls, as necessary.	• Monitored Natural Recovery (MNR) in SMA 1a measuring approximately 26.8 acres. • Enhanced Natural Recovery (ENR) in SMAs 1b, 1c and 7 measuring approximately 11.7 acres. Approximately 15,140 tons of sand are estimated to be placed in these SMAs. • Removal and replacement of the existing South Terminal pile-supported roll-on/roll-off berth to provide access to dredging areas and installation of South Terminal toe wall and upland retaining wall to support existing structures and achieve complete contaminant removal through dredging. • Full removal of contaminated sediment and wood debris from SMAs 1d, 2 (2a and 2b), 3 (3a through 3c), 5 and 6. Dredge stable side slopes at 3H:1V in SMA-1d to allow for full removal to be completed in adjacent SMA-2a. Side slope dredging in SMA-1a, 1b and 1c is not assumed for the purposes of the FS since the full removal depths in the adjacent portions of SMA-2a/2b are shallow. Approximately 484,010 tons of dredged material are estimated to be removed from these SMAs. • Upland transload, transport and disposal of approximately 484,010 tons of dredged material at an off-site permitted landfill. • No further action in SMA 4 due to the completeness of the 2016 interim action. • Institutional controls, as necessary.	• Enhanced Natural Recovery (ENR) in SMAs 1a, 1b, and 1c measuring approximately 35.7 acres. Approximately 46,140 tons of sand is estimated to be placed in these SMAs. • Removal and replacement of the existing South Terminal pile-supported roll-on/roll-off berth to provide access to dredging areas and installation of South Terminal toe wall and upland retaining wall to support existing structures and achieve complete contaminant removal through dredging. • Full removal of contaminated sediment and wood debris from SMAs 1d, 2 (2a and 2b), 3 (3a through 3c), 5, 6 and 7. Dredge stable side slopes at 3H:1V in SMA-1d to allow for full removal to be completed in adjacent SMA-2a. Side slope dredging in SMA-1a, 1b and 1c is not assumed for the purposes of the FS since the full removal depths in the adjacent portions of SMA-2a/2b are shallow. Approximately 519,310 tons of dredged material are estimated to be removed from these SMAs. • Upland transload, transport and disposal of approximately 519,310 tons of dredged material at an off-site permitted landfill. • Backfilling in SMA-7 with sand to restore existing critical habitat elevations. Approximately 43,440 tons of sand backfill is estimated to be placed in this SMA. • No further action in SMA 4 due to the completeness of the 2016 interim action. • Institutional controls, as necessary.

Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Minimum Requirements for Sediment Cleanup Actions (WAC 173-204-570[3])					
Protection of Human Health and the Environment	**Yes**, this alternative protects human health and the environment using a combination of MNR, full removal of contaminated media and institutional controls. • In SMAs where MNR is implemented, protection of human health and environment is achieved over a reasonable restoration timeframe (≤ 10 years). Monitoring will be performed to ensure natural recovery process are effective in protecting human health and the environment. • In SMAs where full removal is implemented, protection of human health and environment is achieved following the completion of cleanup construction.	**Yes**, this alternative protects human health and the environment using a combination of MNR, ENR, sediment capping, full removal of contaminated media and institutional controls. • In SMAs where MNR or ENR are implemented, protection of human health and environment is achieved over a reasonable restoration timeframe (≤ 10 years). ENR will reduce contaminant concentration immediately following the placement of thin-layer sand and will reduce the restoration timeframe as compared to MNR. Monitoring will be performed to ensure natural recovery processes are effective in protecting human health and the environment. • In SMAs where full removal is implemented, protection of human health and environment is achieved following the completion of cleanup construction.	**Yes**, this alternative protects human health and the environment using a combination of MNR, ENR, sediment capping, full removal of contaminated media and institutional controls. • In SMAs where MNR or ENR are implemented, protection of human health and environment is achieved over a reasonable restoration timeframe (≤ 10 years). ENR will reduce contaminant concentration immediately following the placement of thin-layer sand and will reduce the restoration timeframe as compared to MNR. Monitoring will be performed to ensure natural recovery processes are effective in protecting human health and the environment. • In SMAs where dynamic sand capping or full removal are implemented, protection of human health and environment is achieved following the completion of cleanup construction. • The dynamic sand cap will be monitored to ensure that the remedy is effective in protecting human health and the environment.	**Yes**, this alternative protects human health and the environment using a combination of MNR, ENR, full removal of contaminated media and institutional controls. • In SMAs where MNR or ENR are implemented, protection of human health and environment is achieved over a reasonable restoration timeframe (≤ 10 years). ENR will reduce contaminant concentration immediately following the placement of thin-layer sand and will reduce the restoration timeframe as compared to MNR. Monitoring will be performed to ensure natural recovery processes are effective in protecting human health and the environment. • In SMAs where full removal is implemented, protection of human health and environment is achieved following the completion of cleanup construction.	**Yes**, this alternative protects human health and the environment using a combination of ENR, full removal of contaminated media and institutional controls. • In SMAs where ENR is implemented, protection of human health and environment is achieved over a reasonable restoration timeframe (≤ 10 years). ENR will reduce contaminant concentrations immediately following the placement of thin-layer sand and will reduce the restoration timeframe as compared to MNR. Monitoring will be performed to ensure natural recovery processes are effective in protecting human health and the environment. • In SMAs where full removal is implemented, protection of human health and environment is achieved following the completion of cleanup construction.
Compliance with Cleanup Standards	**Yes**, this alternative is expected to comply with cleanup standards within a reasonable restoration timeframe (≤ 10 years). The COCs and SOC exceeding the cleanup standards remaining at the completion of construction will be subject to reduction in concentration over time through natural recovery and include: • cPAHs and dioxin/furans with SWAC ER of 1.51 and 1.32, respectively in SMA-1 (1a through 1d) and 7. • PCB, LPAHs, Phenols and miscellaneous extractables with ER of up to 1.6, 1.7, 1.5, and 1.5, respectively, in SMA-1 (1a, 1b and 1d). • Wood debris in excess of 15% in SMA-1c and 1d.	**Yes**, this alternative is expected to comply with cleanup standards within a reasonable restoration timeframe (≤ 10 years). The COCs exceeding the cleanup standards remaining at the completion of construction will be subject to reduction in concentration over time through natural recovery and include: • cPAHs with SWAC ER of 1.22 in SMA-1 (1a through 1d) and 7. • 4-methylphenol with ER of up to 1.2 in SMA-1a.	**Yes**, this alternative is expected to comply with cleanup standards within a reasonable restoration timeframe (≤ 10 years). The COCs exceeding the cleanup standards remaining at the completion of construction will be subject to reduction in concentration over time through natural recovery and include: • cPAHs with SWAC ER of 1.12 in SMAs-1a through 1c and 7. • 4-methylphenol with ER of up to 1.2 in SMA-1a.	**Yes**, this alternative is expected to comply with cleanup standards within a reasonable restoration timeframe (≤ 10 years). The COCs exceeding the cleanup standards remaining at the completion of construction will be subject to reduction in concentration over time through natural recovery and include: • cPAHs with SWAC ER of 1.13 in SMA-1a through 1c and 7. • 4-methylphenol with ER of up to 1.2 in SMA-1a.	**Yes**, this alternative is expected to comply with cleanup standards following the completion of construction.

Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Compliance with Applicable State and Federal Laws	**Yes**, this alternative will be planned, designed and constructed in a manner that complies with applicable state and federal laws. Applicable permits will be obtained, and the permit/ substantive requirements will be met as part of construction and monitoring.	**Yes**, this alternative will be planned, designed and constructed in a manner that complies with applicable state and federal laws. Applicable permits will be obtained, and the permit/ substantive requirements will be met as part of construction and monitoring.	**Yes**, this alternative will be planned, designed and constructed in a manner that complies with applicable state and federal laws. Applicable permits will be obtained, and the permit/ substantive requirements will be met as part of construction and monitoring.	**Yes**, this alternative will be planned, designed and constructed in a manner that complies with applicable state and federal laws. Applicable permits will be obtained, and the permit/ substantive requirements will be met as part of construction and monitoring.	**Yes**, this alternative will be planned, designed and constructed in a manner that complies with applicable state and federal laws. Applicable permits will be obtained, and the permit/ substantive requirements will be met as part of construction and monitoring.
Use permanent solutions to the maximum extent practicable	**Yes**, these alternative uses permanent solutions to the maximum extent practicable as determined through a Disproportionate Cost Analysis (DCA; WAC 173-340-360(3)(e)). The DCA is presented in Section 10 of the RI/FS Report.				
Provide for a reasonable restoration timeframe	**Yes**, this alternative is expected to attain cleanup standards within a reasonable restoration timeframe (≤ 10 years) based on the sedimentation rate calculated for the Marine Area. Further evaluation will be completed as part of the design phase of the project.	**Yes**, this alternative is expected to attain cleanup standards within a reasonable restoration timeframe (≤ 10 years) based on the sedimentation rate calculated for the Marine Area. Further evaluation will be completed as part of the design phase of the project.	**Yes**, this alternative is expected to attain cleanup standards within a reasonable restoration timeframe (≤ 10 years) based on the sedimentation rate calculated for the Marine Area. Further evaluation will be completed as part of the design phase of the project.	**Yes**, this alternative is expected to attain cleanup standards within a reasonable restoration timeframe (≤ 10 years) based on the sedimentation rate calculated for the Marine Area. Further evaluation will be completed as part of the design phase of the project.	**Yes**, this alternative is expected to achieve cleanup standards immediately following completion of construction.
Source Control Measures	**Yes**, this alternative provides source control measures. The historic processes generating hazardous substances at the Marine Area are no longer in operation. A passive ongoing source of contamination to the surface sediment of Marine Area can be attributed to erosion and dispersal of the historical contamination. This alternative will result in complete removal of contamination from the source areas that are subjected to scour (SMAs-2, 3, 5 and 6) and thus will eliminate this source. Existing stormwater outfalls at the Site are being regulated and managed by the Port under NPDES permit(s) with the applicable regulatory agencies.	**Yes**, this alternative provides source control measures. The historic processes generating hazardous substances at the Marine Area are no longer in operation. A passive ongoing source of contamination to the surface sediment of Marine Area can be attributed to erosion and dispersal of the historical contamination. This alternative will result in complete removal of contamination from the primary source areas that are subjected to scour (SMAs-2, 3, 5 and 6) and thus will eliminate this source. Existing stormwater outfalls at the Site are being regulated and managed by the Port under NPDES permit(s) with the applicable regulatory agencies.	**Yes**, this alternative provides source control measures. The historic processes generating hazardous substances at the Marine Area are no longer in operation. A passive ongoing source of contamination to the surface sediment of Marine Area can be attributed to erosion and dispersal of the historical contamination. This alternative will result in complete removal of contamination from the source areas that are subjected to scour (SMAs-2, 3, 5 and 6) and thus will eliminate this source. Existing stormwater outfalls at the Site are being regulated and managed by the Port under NPDES permit(s) with the applicable regulatory agencies.	**Yes**, this alternative provides source control measures. The historic processes generating hazardous substances at the Marine Area are no longer in operation. A passive ongoing source of contamination to the surface sediment of Marine Area can be attributed to erosion and dispersal of the historical contamination. This alternative will result in complete removal of contamination from the source areas that are subjected to scour (SMAs-2, 3, 5 and 6) and thus will eliminate this source. Existing stormwater outfalls at the Site are being regulated and managed by the Port under NPDES permit(s) with the applicable regulatory agencies.	**Yes**, this alternative provides source control measures. The historic processes generating hazardous substances at the Marine Area are no longer in operation. A passive ongoing source of contamination to the surface sediment of Marine Area can be attributed to erosion and dispersal of the historical contamination. This alternative will result in complete removal of contamination from the source areas that are subjected to scour (SMAs-2, 3, 5 and 6) and thus will eliminate this source. Existing stormwater outfalls at the Site are being regulated and managed by the Port under NPDES permit(s) with the applicable regulatory agencies.
Sediment Recovery Zone	Alternative does not require a sediment recovery zone.	Alternative does not require a sediment recovery zone.	Alternative does not require a sediment recovery zone.	Alternative does not require a sediment recovery zone.	Alternative does not require a sediment recovery zone.
Institutional Controls	**Yes**, this alternative leaves contamination in the Marine Area and therefore, institutional controls may be required. Institutional controls will be defined during future steps in the cleanup process.	**Yes**, this alternative leaves contamination in the Marine Area and therefore, institutional controls may be required. Institutional controls will be defined during future steps in the cleanup process.	**Yes**, this alternative leaves contamination in the Marine Area and therefore, institutional controls may be required. Institutional controls will be defined during future steps in the cleanup process.	**Yes**, this alternative leaves contamination in the Marine Area and therefore, institutional controls may be required. Institutional controls will be defined during future steps in the cleanup process.	**Yes**, this alternative leaves contamination in the Marine Area and therefore, institutional controls may be required. Institutional controls will be defined during future steps in the cleanup process.
Provide for public and affected landowner review and comment	**Yes**, the RI/FS and the alternatives presented in the document are subject to public review as part of the MTCA cleanup process.	**Yes**, the RI/FS and the alternatives presented in the document are subject to public review as part of the MTCA cleanup process.	**Yes**, the RI/FS and the alternatives presented in the document are subject to public review as part of the MTCA cleanup process.	**Yes**, the RI/FS and the alternatives presented in the document are subject to public review as part of the MTCA cleanup process.	**Yes**, the RI/FS and the alternatives presented in the document are subject to public review as part of the MTCA cleanup process.

Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Provision for Compliance Monitoring	**Yes**, this alternative includes provisions for compliance monitoring. Monitoring requirements and contingency plans will be included as administrative controls in the cleanup action to ensure the protectiveness of the MNR areas.	**Yes**, this alternative includes provisions for compliance monitoring. Monitoring requirements and contingency plans will be included as administrative controls in the cleanup action to ensure the protectiveness of the ENR and MNR areas.	**Yes**, this alternative includes provisions for compliance monitoring. Monitoring requirements and contingency plans will be included as administrative controls in the cleanup action to ensure the protectiveness of the capped, ENR and MNR areas.	**Yes**, this alternative includes provisions for compliance monitoring. Monitoring requirements and contingency plans will be included as administrative controls in the cleanup action to ensure the protectiveness of the ENR and MNR areas.	**Yes**, this alternative includes provisions for compliance monitoring. Monitoring requirements and contingency plans will be included as administrative controls in the cleanup action to ensure the protectiveness of the ENR areas.
Provide for Periodic Review	**Yes**, this alternative provides for period review. Ecology is expected to conduct review every five years following the completion of construction to assure that human health and the environment continue to be protected.	**Yes**, this alternative provides for period review. Ecology is expected to conduct review every five years following the completion of construction to assure that human health and the environment continue to be protected.	**Yes**, this alternative provides for period review. Ecology is expected to conduct review every five years following the completion of construction to assure that human health and the environment continue to be protected.	**Yes**, this alternative provides for period review. Ecology is expected to conduct review every five years following the completion of construction to assure that human health and the environment continue to be protected.	**Yes**, this alternative provides for period review. Ecology is expected to conduct review every five years following the completion of construction to assure that human health and the environment continue to be protected.

Notes:

CDF = confined disposal facility

COCs = contaminants of concern

cPAHs = carcinogenic polycyclic aromatic hydrocarbons. Includes benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-c,d)

CY = cubic yard

DCA = Disproportionate Cost Analysis

ENR = enhanced natural recovery

ER = Exceedance Ratio

LPAHs = low molecular weight polycyclic aromatic hydrocarbons. Includes 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene and phenanthrene

Miscellaneous Extractables = Includes dibenzofuran, hexachlorobutadiene, benzoic acid and benzyl alcohol

MNR = monitored natural recovery

MTCA = Model Toxics Control Act

NPDES = National Pollution Discharge Elimination System

PCB = polychlorinated biphenyl

PCUL = proposed cleanup level

SMA = Sediment Management Area

SWAC = surface weighted average concentration

RI/FS = Remedial Investigation/Feasibility Study

Table 6

Evaluation of Alternatives, Minimum Requirements for Sediment Cleanup Actions

Weyerhaeuser Mill A Former

Everett, Washington

Alternative	Alternative 6	Alternative 7	Alternative 8	Alternative 9	Alternative 10
Alternative Summary	• Monitored Natural Recovery (MNR) in SMAs 1 (1a through 1d) and 7 measuring approximately 43 acres. • Removal of the existing South Terminal pile-supported roll-on/roll-off berth to provide access to dredging areas and installation of South Terminal toe wall to support existing structures and achieve complete contaminant removal through dredging. • Full removal of contaminated sediment and wood debris from SMAs 2 (2a and 2b), 3 (3a through 3c) and 6. Dredge stable side slopes at 3H:1V in SMA-1d to allow for full removal to be completed in adjacent SMA-2a. Side slope dredging in SMA-1a, 1b and 1c is not assumed for the purposes of the FS since the full removal depths in the adjacent portions of SMA-2a/2b are shallow. Approximately 227,970 tons of dredged material are estimated to be removed from these SMAs. • Construction of confined disposal facility (CDF) within SMA-5. Approximately 196,550 tons of contaminated sediment and wood debris located in SMA-5 will be contained and covered by the CDF. The CDF will provide space for the disposal of approximately 226,200 tons of dredged material. • Dispose approximately 226,200 tons of dredged material into the on-site CDF. • Upland transload, transport and disposal of approximately 1,770 tons of dredged material that cannot be disposed into the on-site CDF at an off-site permitted landfill. • No further action in SMA-4 due to the completeness of the 2016 interim action. • Institutional controls, as necessary.	• Monitored Natural Recovery (MNR) in SMA 1a measuring approximately 26.8 acres. • Enhanced Natural Recovery (ENR) in SMAs 1b through 1d, and 7 measuring approximately 16.2 acres. Approximately 20,900 tons of sand is estimated to be placed in these SMAs. • Removal of the existing South Terminal pile-supported roll-on/roll-off berth to provide access to dredging areas and installation of South Terminal toe wall to support existing structures and achieve complete contaminant removal through dredging. • Full removal of contaminated sediment and wood debris from SMAs 2 (2a and 2b), 3 (3a through 3c) and 6. Dredge stable side slopes at 3H:1V in SMA-1d to allow for full removal to be completed in adjacent SMA-2a. Side slope dredging in SMA-1a, 1b and 1c is not assumed for the purposes of the FS since the full removal depths in the adjacent portions of SMA-2a/2b are shallow. Approximately 227,970 tons of dredged material are estimated to be removed from these SMAs. • Construction of CDF within SMA-5. Approximately 196,550 tons of contaminated sediment and wood debris located in SMA-5 will be contained and covered by the CDF. The CDF will provide space for the disposal of approximately 226,200 tons of dredged material. • Dispose approximately 226,200 tons of dredged material into the on-site CDF. • Upland transload, transport and disposal of approximately 1,770 tons of dredged material that cannot be disposed into the on-site CDF at an off-site permitted landfill. • No further action in SMA-4 due to the completeness of the 2016 interim action. • Institutional controls, as necessary.	• Monitored Natural Recovery (MNR) in SMA 1a measuring approximately 26.8 acres. • Enhanced Natural Recovery (ENR) in SMAs 1b, 1c and 7 measuring approximately 11.7 acres. Approximately 15,140 tons of sand is estimated to be placed in this SMA. • Removal of the existing South Terminal pile-supported roll-on/roll-off berth to provide access to dredging areas and installation of South Terminal toe wall to support existing structures and achieve complete contaminant removal through dredging. • Placement of dynamic sand cap in SMA 1d measuring approximately 4.5 acres. Approximately 35,720 tons of sand cap material is estimated to be placed in SMA 1d. • Full removal of contaminated sediment and wood debris from SMAs 2 (2a and 2b), 3 (3a through 3c) and 6. Dredge in SMA-1d to provide stable transition slopes to allow full removal in adjacent SMA-2a and to remove contaminated sediment in SMA-1d above elevation -60 feet MLLW which will ensure that the dynamic sand cap placed in SMA-1d is not above the maximum scour elevation (i.e., -55 feet MLLW). Side slope dredging in SMA-1a, 1b and 1c is not assumed for the purposes of the FS since the full removal depths in the adjacent portions of SMA-2a/2b are shallow. Approximately 241,520 tons of dredged material are estimated to be removed from these SMAs. • Construction of CDF within SMA-5. Approximately 196,550 tons of contaminated sediment and wood debris located in SMA-5 will be contained and covered by the CDF. The CDF will provide space for the disposal of approximately 226,200 tons of dredged material. • Dispose approximately 226,200 tons of dredged material into the on-site CDF. • Upland transload, transport and disposal of approximately 15,320 tons of dredged material that cannot be disposed into the on-site CDF at an off-site permitted landfill. • No further action in SMA-4 due to the completeness of the 2016 interim action. • Institutional controls, as necessary.	• Monitored Natural Recovery (MNR) in SMA 1a measuring approximately 26.8 acres. • Enhanced Natural Recovery (ENR) in SMAs 1b, 1c and 7 measuring approximately 11.7 acres. Approximately 15,140 tons of sand is estimated to be placed in these SMAs. • Removal of the existing South Terminal pile-supported roll-on/roll-off berth to provide access to dredging areas and installation of South Terminal toe wall to support existing structures and achieve complete contaminant removal through dredging. • Full removal of contaminated sediment and wood debris from SMAs 1d, 2 (2a and 2b), 3 (3a through 3c) and 6. Dredge stable side slopes at 3H:1V in SMA-1d to allow for full removal to be completed in adjacent SMA-2a. Side slope dredging in SMA-1a, 1b and 1c is not assumed for the purposes of the FS since the full removal depths in the adjacent portions of SMA-2a/2b are shallow. Approximately 287,460 tons of dredged material are estimated to be removed from these SMAs. • Construction of CDF within SMA-5. Approximately 196,550 tons of contaminated sediment and wood debris located in SMA-5 will be contained and covered by the CDF. The CDF will provide space for the disposal of approximately 226,200 tons of dredged material. • Dispose approximately 226,200 tons of dredged material into the on-site CDF. • Upland transload, transport and disposal of approximately 61,260 tons of dredged material that cannot be disposed into the on-site CDF at an off-site permitted landfill. • No further action in SMA-4 due to the completeness of the 2016 interim action. • Institutional controls, as necessary.	• Enhanced Natural Recovery (ENR) in SMAs 1a, 1b, and 1c measuring approximately 35.7 acres. Approximately 46,140 tons of sand is estimated to be placed in these SMAs. • Removal of the existing South Terminal pile-supported roll-on/roll-off berth to provide access to dredging areas and installation of South Terminal toe wall to support existing structures and achieve complete contaminant removal through dredging. • Full removal of contaminated sediment and wood debris from SMAs 1d, 2 (2a and 2b), 3 (3a through 3c) 6 and 7. Dredge stable side slopes at 3H:1V in SMA-1d to allow for full removal to be completed in adjacent SMA-2a. Side slope dredging in SMA-1a, 1b and 1c is not assumed for the purposes of the FS since the full removal depths in the adjacent portions of SMA-2a/2b are shallow. Approximately 322,760 tons of dredged material are estimated to be removed from these SMAs. • Construction of CDF within SMA-5. Approximately 196,550 tons of contaminated sediment and wood debris located in SMA-5 will be contained and covered by the CDF. The CDF will provide space for the disposal of approximately 226,200 tons of dredged material. • Dispose approximately 226,200 tons of dredged material into the on-site CDF. • Upland transload, transport and disposal of approximately 96,560 tons of dredged material that cannot be disposed into the on-site CDF at an off-site permitted landfill. • Backfilling in SMA-7 with sand to restore existing critical habitat elevations. Approximately 43,440 tons of sand backfill is estimated to be placed in this SMA. • No further action in SMA-4 due to the completeness of the 2016 interim action. • Institutional controls, as necessary.

Alternative	Alternative 6	Alternative 7	Alternative 8	Alternative 9	Alternative 10
Minimum Requirements for Sediment Cleanup Actions (WAC 173-204-570[3])					
Protection of Human Health and the Environment	**Yes**, this alternative protects human health and the environment using a combination of MNR, containment/CDF, full removal of contaminated media and institutional controls. • In SMAs where MNR is implemented, protection of human health and environment is achieved over a reasonable restoration timeframe (≤ 10 years). Monitoring will be performed to ensure natural recovery processes are effective in protecting human health and the environment. • In SMAs where containment/CDF and/or full removal are implemented, protection of human health and environment is achieved following the completion of cleanup construction. • The containment/CDF will be monitored to ensure that the contaminants remain confined and that the remedy is effective in protecting human health and the environment.	**Yes**, this alternative protects human health and the environment using a combination of MNR, ENR, containment/CDF, full removal of contaminated media and institutional controls. • In SMAs where MNR or ENR are implemented, protection of human health and environment is achieved over a reasonable restoration timeframe (≤ 10 years). ENR will reduce contaminant concentration immediately following the placement of thin-layer sand and will reduce the restoration timeframe as compared to MNR. Monitoring will be performed to ensure natural recovery processes are effective in protecting human health and the environment. • In SMAs where containment/CDF and/or full removal are implemented, protection of human health and environment is achieved following the completion of cleanup construction. • The containment/CDF will be monitored to ensure that the contaminants remain confined and that the remedy is effective in protecting human health and the environment.	**Yes**, this alternative protects human health and the environment using a combination of MNR, ENR, sediment capping, containment/CDF, full removal of contaminated media and institutional controls. • In SMAs where MNR or ENR are implemented, protection of human health and environment is achieved over a reasonable restoration timeframe (≤ 10 years). ENR will reduce contaminant concentration immediately following the placement of thin-layer sand and will reduce the restoration timeframe as compared to MNR. Monitoring will be performed to ensure natural recovery processes are effective in protecting human health and the environment. • In SMAs where dynamic sand capping, containment/CDF or full removal are implemented, protection of human health and environment is achieved following the completion of cleanup construction. • The dynamic sand cap and containment/CDF will be monitored to ensure that the remedy is effective in protecting human health and the environment.	**Yes**, this alternative protects human health and the environment using a combination of MNR, ENR, containment/CDF, full removal of contaminated media and institutional controls. • In SMAs where MNR or ENR are implemented, protection of human health and environment is achieved over a reasonable restoration timeframe (≤ 10 years). ENR will reduce contaminant concentration immediately following the placement of thin-layer sand and will reduce the restoration timeframe as compared to MNR. Monitoring will be performed to ensure natural recovery processes are effective in protecting human health and the environment. • In SMAs where containment/CDF and/or full removal are implemented, protection of human health and environment is achieved following the completion of cleanup construction. • The containment/CDF will be monitored to ensure that the contaminants remain confined and that the remedy is effective in protecting human health and the environment.	**Yes**, this alternative protects human health and the environment using a combination of ENR, containment/CDF, full removal of contaminated media and institutional controls. • In SMAs where ENR is implemented, protection of human health and environment is achieved over a reasonable restoration timeframe (≤ 10 years). ENR will reduce contaminant concentration immediately following the placement of thin-layer sand and will reduce the restoration timeframe as compared to MNR. Monitoring will be performed to ensure natural recovery processes are effective in protecting human health and the environment. • In SMAs where containment/CDF and/or full removal are implemented, protection of human health and environment is achieved following the completion of cleanup construction. • The containment/CDF will be monitored to ensure that the contaminants remain confined and that the remedy is effective in protecting human health and the environment.
Compliance with Cleanup Standards	**Yes**, this alternative is expected to comply with cleanup standards within a reasonable restoration timeframe (≤ 10 years). The COCs and SOC exceeding the cleanup standards remaining at the completion of construction will be subject to reduction in concentration over time through natural recovery and include: • cPAHs and dioxin/furans with SWAC ER of 1.51 and 1.32, respectively in SMA-1 (1a through 1d) and 7. • PCB, LPAHs, Phenols and miscellaneous extractables with ER of up to 1.6, 1.7, 1.5, and 1.5, respectively, in SMA-1 (1a, 1b and 1d). • Wood debris in excess of 15% in SMA-1c and 1d.	**Yes**, this alternative is expected to comply with cleanup standards within a reasonable restoration timeframe (≤ 10 years). The COCs exceeding the cleanup standards remaining at the completion of construction will be subject to reduction in concentration over time through natural recovery and include: • cPAHs with SWAC ER of 1.22 in SMA-1 (1a through 1d) and 7. • 4-methylphenol with ER of up to 1.2 in SMA-1a.	**Yes**, this alternative is expected to comply with cleanup standards within a reasonable restoration timeframe (≤ 10 years). The COCs exceeding the cleanup standards remaining at the completion of construction will be subject to reduction in concentration over time through natural recovery and include: • cPAHs with SWAC ER of 1.12 in SMAs-1a through 1c and 7. • 4-methylphenol with ER of up to 1.2 in SMA-1a.	**Yes**, this alternative is expected to comply with cleanup standards within a reasonable restoration timeframe (≤ 10 years). The COCs exceeding the cleanup standards remaining at the completion of construction will be subject to reduction in concentration over time through natural recovery and include: • cPAHs with SWAC ER of 1.13 in SMA-1a through 1c and 7. • 4-methylphenol with ER of up to 1.2 in SMA-1a.	**Yes**, this alternative is expected to comply with cleanup standards following the completion of construction.
Compliance with Applicable State and Federal Laws	**Yes**, this alternative will be planned, designed and constructed in a manner that complies with applicable state and federal laws. Applicable permits will be obtained, and the permit/ substantive requirements will be met as part of construction and monitoring.	**Yes**, this alternative will be planned, designed and constructed in a manner that complies with applicable state and federal laws. Applicable permits will be obtained, and the permit/ substantive requirements will be met as part of construction and monitoring.	**Yes**, this alternative will be planned, designed and constructed in a manner that complies with applicable state and federal laws. Applicable permits will be obtained, and the permit/ substantive requirements will be met as part of construction and monitoring.	**Yes**, this alternative will be planned, designed and constructed in a manner that complies with applicable state and federal laws. Applicable permits will be obtained, and the permit/ substantive requirements will be met as part of construction and monitoring.	**Yes**, this alternative will be planned, designed and constructed in a manner that complies with applicable state and federal laws. Applicable permits will be obtained, and the permit/ substantive requirements will be met as part of construction and monitoring.

Alternative	Alternative 6	Alternative 7	Alternative 8	Alternative 9	Alternative 10
Use permanent solutions to the maximum extent practicable	**Yes**, this alternative uses permanent solutions to the maximum extent practicable as determined through a Disproportionate Cost Analysis (DCA; WAC 173-340-360(3)(e)). The DCA is presented in Section 10 of the RI/FS Report.				
Provide for a reasonable restoration timeframe	**Yes**, this alternative is expected to attain cleanup standards within a reasonable restoration timeframe (≤ 10 years) based on the sedimentation rate calculated for the Marine Area. Further evaluation will be completed as part of the design phase of the project.	**Yes**, this alternative is expected to attain cleanup standards within a reasonable restoration timeframe (≤ 10 years) based on the sedimentation rate calculated for the Marine Area. Further evaluation will be completed as part of the design phase of the project.	**Yes**, this alternative is expected to attain cleanup standards within a reasonable restoration timeframe (≤ 10 years) based on the sedimentation rate calculated for the Marine Area. Further evaluation will be completed as part of the design phase of the project.	**Yes**, this alternative is expected to attain cleanup standards within a reasonable restoration timeframe (≤ 10 years) based on the sedimentation rate calculated for the Marine Area. Further evaluation will be completed as part of the design phase of the project.	**Yes**, this alternative will achieve cleanup standards immediately following completion of construction.
Source Control Measures	**Yes**, this alternative provides source control measures. The historic processes generating hazardous substances at the Marine Area are no longer in operation. A passive ongoing source of contamination to the surface sediment of Marine Area can be attributed to erosion and dispersal of the historical contamination. This alternative will result in complete removal or containment of contamination from the source areas that are subjected to scour (SMAs-2, 3, 5 and 6) and thus will eliminate this source. Existing stormwater outfalls at the Site are being regulated and managed by the Port under NPDES permit(s) with the applicable regulatory agencies.	**Yes**, this alternative provides source control measures. The historic processes generating hazardous substances at the Marine Area are no longer in operation. A passive ongoing source of contamination to the surface sediment of Marine Area can be attributed to erosion and dispersal of the historical contamination. This alternative will result in complete removal or containment of contamination from the source areas that are subjected to scour (SMAs-2, 3, 5 and 6) and thus will eliminate this source. Existing stormwater outfalls at the Site are being regulated and managed by the Port under NPDES permit(s) with the applicable regulatory agencies.	**Yes**, this alternative provides source control measures. The historic processes generating hazardous substances at the Marine Area are no longer in operation. A passive ongoing source of contamination to the surface sediment of Marine Area can be attributed to erosion and dispersal of the historical contamination. This alternative will result in complete removal or containment of contamination from the source areas that are subjected to scour (SMAs-2, 3, 5 and 6) and thus will eliminate this source. Existing stormwater outfalls at the Site are being regulated and managed by the Port under NPDES permit(s) with the applicable regulatory agencies.	**Yes**, this alternative provides source control measures. The historic processes generating hazardous substances at the Marine Area are no longer in operation. A passive ongoing source of contamination to the surface sediment of Marine Area can be attributed to erosion and dispersal of the historical contamination. This alternative will result in complete removal or containment of contamination from the source areas that are subjected to scour (SMAs-2, 3, 5 and 6) and thus will eliminate this source. Existing stormwater outfalls at the Site are being regulated and managed by the Port under NPDES permit(s) with the applicable regulatory agencies.	**Yes**, this alternative provides source control measures. The historic processes generating hazardous substances at the Marine Area are no longer in operation. A passive ongoing source of contamination to the surface sediment of Marine Area can be attributed to erosion and dispersal of the historical contamination. This alternative will result in complete removal or containment of contamination from the source areas that are subjected to scour (SMAs-2, 3, 5 and 6) and thus will eliminate this source. Existing stormwater outfalls at the Site are being regulated and managed by the Port under NPDES permit(s) with the applicable regulatory agencies.
Sediment Recovery Zone	Alternative does not include a sediment recovery zone	Alternative does not include a sediment recovery zone	Alternative does not include a sediment recovery zone	Alternative does not include a sediment recovery zone	Alternative does not include a sediment recovery zone
Institutional Controls	**Yes**, this alternative leaves contamination in the Marine Area and therefore, institutional controls may be required. Institutional controls will be defined during future steps in the cleanup process.	**Yes**, this alternative leaves contamination in the Marine Area and therefore, institutional controls may be required. Institutional controls will be defined during future steps in the cleanup process.	**Yes**, this alternative leaves contamination in the Marine Area and therefore, institutional controls may be required. Institutional controls will be defined during future steps in the cleanup process.	**Yes**, this alternative leaves contamination in the Marine Area and therefore, institutional controls may be required. Institutional controls will be defined during future steps in the cleanup process.	**Yes**, this alternative leaves contamination in the Marine Area and therefore, institutional controls may be required. Institutional controls will be defined during future steps in the cleanup process.
Provide for public and affected landowner review and comment	**Yes**, the RI/FS and the alternatives presented in the document are subject to public review as part of the MTCA cleanup process.	**Yes**, the RI/FS and the alternatives presented in the document are subject to public review as part of the MTCA cleanup process.	**Yes**, the RI/FS and the alternatives presented in the document are subject to public review as part of the MTCA cleanup process.	**Yes**, the RI/FS and the alternatives presented in the document are subject to public review as part of the MTCA cleanup process.	**Yes**, the RI/FS and the alternatives presented in the document are subject to public review as part of the MTCA cleanup process.
Provision for Compliance Monitoring	**Yes**, Alternative includes provisions for compliance monitoring. Monitoring requirements and contingency plans will be included as administrative controls in the cleanup action to ensure the protectiveness of the ENR, MNR and containment/CDF areas.	**Yes**, Alternative includes provisions for compliance monitoring. Monitoring requirements and contingency plans will be included as administrative controls in the cleanup action to ensure the protectiveness of the ENR, MNR and containment/CDF areas.	**Yes**, Alternative includes provisions for compliance monitoring. Monitoring requirements and contingency plans will be included as administrative controls in the cleanup action to ensure the protectiveness of the ENR, MNR, capping and containment/CDF areas.	**Yes**, Alternative includes provisions for compliance monitoring. Monitoring requirements and contingency plans will be included as administrative controls in the cleanup action to ensure the protectiveness of the ENR, MNR and containment/CDF areas.	**Yes**, Alternative includes provisions for compliance monitoring. Monitoring requirements and contingency plans will be included as administrative controls in the cleanup action to ensure the protectiveness of the ENR and containment/CDF areas.
Provide for Periodic Review	**Yes**, this alternative provides for period review. Ecology is expected to conduct review every five years following the completion of construction to assure that human health and the environment continue to be protected.	**Yes**, this alternative provides for period review. Ecology is expected to conduct review every five years following the completion of construction to assure that human health and the environment continue to be protected.	**Yes**, this alternative provides for period review. Ecology is expected to conduct review every five years following the completion of construction to assure that human health and the environment continue to be protected.	**Yes**, this alternative provides for period review. Ecology is expected to conduct review every five years following the completion of construction to assure that human health and the environment continue to be protected.	**Yes**, this alternative provides for period review. Ecology is expected to conduct review every five years following the completion of construction to assure that human health and the environment continue to be protected.

Notes:

CDF = confined disposal facility

COCs = contaminants of concern

cPAHs = carcinogenic polycyclic aromatic hydrocarbons. Includes benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-c,d)

CY = cubic yard

DCA = Disproportionate Cost Analysis

ENR = enhanced natural recovery

ER = Exceedance Ratio

LPAHs = low molecular weight polycyclic aromatic hydrocarbons. Includes 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene and phenanthrene

Miscellaneous Extractables = Includes dibenzofuran, hexachlorobutadiene, benzoic acid and benzyl alcohol

MNR = monitored natural recovery

MTCA = Model Toxics Control Act

NPDES = National Pollution Discharge Elimination System

PCB = polychlorinated biphenyl

PCUL = proposed cleanup level

SMA = Sediment Management Area

SWAC = surface weighted average concentration

RI/FS = Remedial Investigation/Feasibility Study

Table 7

Evaluation of Alternatives, MTCA Disproportionate Cost Analysis

Weyerhaeuser Mill A Former
Everett, Washington

Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Alternative Summary	• Monitored Natural Recovery (MNR) in SMAs 1 (1a through 1d) and 7 measuring approximately 43 acres. • Removal and replacement of the existing South Terminal pile-supported roll-on/roll-off berth to provide access to dredging areas and installation of South Terminal toe wall and upland retaining wall to support existing structures and achieve complete contaminant removal through dredging. • Full removal of contaminated sediment and wood debris from SMAs 2 (2a and 2b), 3 (3a through 3c), 5 and 6. Dredge stable side slopes at 3H:1V in SMA-1d to allow for full removal to be completed in adjacent SMA-2a. Side slope dredging in SMA-1a, 1b and 1c is not assumed for the purposes of the FS since the full removal depths in the adjacent portions of SMA-2a/2b are shallow. Approximately 424,520 tons of dredged material are estimated to be removed from these SMAs. • Upland transload, transport and disposal of approximately 424,520 tons of dredged material at an off-site permitted landfill. • No further action in SMA 4 due to the completeness of the 2016 interim action. • Institutional controls, as necessary.	• Monitored Natural Recovery (MNR) in SMA 1a measuring approximately 26.8 acres. • Enhanced Natural Recovery (ENR) in SMAs 1b through 1d, and 7 measuring approximately 16.2 acres. Approximately 20,900 tons of sand is estimated to be placed in these SMAs. • Removal and replacement of the existing South Terminal pile-supported roll-on/roll-off berth to provide access to dredging areas and installation of South Terminal toe wall and upland retaining wall to support existing structures and achieve complete contaminant removal through dredging. • Full removal of contaminated sediment and wood debris from SMAs 2 (2a and 2b), 3 (3a through 3c), 5 and 6. Dredge stable side slopes at 3H:1V in SMA-1d to allow for full removal to be completed in adjacent SMA-2a. Side slope dredging in SMA-1a, 1b and 1c is not assumed for the purposes of the FS since the full removal depths in the adjacent portions of SMA-2a/2b are shallow. Approximately 424,520 tons of dredged material are estimated to be removed from these SMAs. • Upland transload, transport and disposal of approximately 424,520 tons of dredged material at an off-site permitted landfill. • No further action in SMA 4 due to the completeness of the 2016 interim action. • Institutional controls, as necessary.	• Monitored Natural Recovery (MNR) in SMA 1a measuring approximately 26.8 acres. • Enhanced Natural Recovery (ENR) in SMAs 1b, 1c and 7 measuring approximately 11.7 acres. Approximately 15,140 tons of sand is estimated to be placed in this SMA. • Placement of dynamic sand cap in SMA 1d measuring approximately 4.5 acres. Approximately 35,720 tons of sand cap material is estimated to be placed in SMA 1d. • Removal and replacement of the existing South Terminal pile-supported roll-on/roll-off berth to provide access to dredging areas and installation of South Terminal toe wall and upland retaining wall to support existing structures and achieve complete contaminant removal through dredging. • Full removal of contaminated sediment and wood debris from SMAs 2 (2a and 2b), 3 (3a through 3c), 5 and 6. Dredge in SMA-1d to provide stable transition slopes to allow full removal in adjacent SMA-2a and to remove contaminated sediment in SMA-1d above elevation -60 feet MLLW which will ensure that the dynamic sand cap placed in SMA-1d is not above the maximum scour elevation (i.e., -55 feet MLLW). Side slope dredging in SMA-1a, 1b and 1c is not assumed for the purposes of the FS since the full removal depths in the adjacent portions of SMA-2a/2b are shallow. Approximately 438,070 tons of dredged material are estimated to be removed from these SMAs. • Upland transload, transport and disposal of approximately 438,070 tons of dredged material at an off-site permitted landfill. • No further action in SMA 4 due to the completeness of the 2016 interim action. • Institutional controls, as necessary.	• Monitored Natural Recovery (MNR) in SMA 1a measuring approximately 26.8 acres. • Enhanced Natural Recovery (ENR) in SMAs 1b, 1c and 7 measuring approximately 11.7 acres. Approximately 15,140 tons of sand is estimated to be placed in these SMAs. • Removal and replacement of the existing South Terminal pile-supported roll-on/roll-off berth to provide access to dredging areas and installation of South Terminal toe wall and upland retaining wall to support existing structures and achieve complete contaminant removal through dredging. • Full removal of contaminated sediment and wood debris from SMAs 1d, 2 (2a and 2b), 3 (3a through 3c), 5 and 6. Approximately 484,010 tons of dredged material are estimated to be removed from these SMAs. • Upland transload, transport and disposal of approximately 484,010 tons of dredged material at an off-site permitted landfill. • No further action in SMA 4 due to the completeness of the 2016 interim action. • Institutional controls, as necessary.	• Enhanced Natural Recovery (ENR) in SMAs 1a, 1b, and 1c measuring approximately 35.7 acres. Approximately 46,140 tons of sand is estimated to be placed in these SMAs. • Removal and replacement of the existing South Terminal pile-supported roll-on/roll-off berth to provide access to dredging areas and installation of South Terminal toe wall and upland retaining wall to support existing structures and achieve complete contaminant removal through dredging. • Full removal of contaminated sediment and wood debris from SMAs 1d, 2 (2a and 2b), 3 (3a through 3c), 5, 6 and 7. Approximately 519,310 tons of dredged material are estimated to be removed from these SMAs. • Upland transload, transport and disposal of approximately 519,310 tons of dredged material at an off-site permitted landfill. • Backfilling in SMA-7 with sand to restore existing critical habitat elevations. Approximately 43,440 tons of sand backfill is estimated to be placed in this SMA. • No further action in SMA 4 due to the completeness of the 2016 interim action. • Institutional controls, as necessary.

Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Disproportionate Cost Analysis Criteria [173-340-360(3)(f) and SMS 173-204-570(4)] and Ecology Publication No. 17-09-052 – Relative Benefit Evaluation (Scored from 1 = Low to 10 = High)					
Protectiveness	Score = 7	Score = 7.5	Score = 8	Score = 8	Score = 9
"Overall protectiveness of human health and the environment, including the degree to which existing risks are reduced, time required to reduce risk at the facility and attain cleanup standards, on-site and offsite risks resulting from implementing the alternative, and improvement of the overall environmental quality. This also includes evaluating potential risks to the integrity of the remedy from climate change impacts."	• Achieves a moderate-high degree of protectiveness. MNR reduces risk to a lower degree as compared to other remedies as it relies on natural attenuation and a restoration timeframe to meet cleanup standards. Full removal reduces risk to a high degree as contaminants are permanently removed from the Site and cleanup standards are met following implementation of the remedy. • This alternative is expected to attain cleanup standards within a reasonable restoration timeframe (≤ 10 years) as described in Table 10 under the requirement of "Compliance with Cleanup Standards." Areas subject to full removal will meet cleanup standards on completion of the remedy construction. • The primary risk associated with implementing this alternative is the potential for the MNR area to not meet cleanup standards within the reasonable restoration timeframe (≤ 10 years). • Under this alternative, a significant amount (approximately 68% by volume) of the Marine Area contamination is addressed through full removal, which meets cleanup standards and improves environmental quality at the Marine Area immediately following construction. A substantial amount of the remaining contamination (approximately 32% by volume) is addressed using MNR, which relies on a restoration timeframe to improve environmental quality. The offsite transport of dredged material will contribute to significant carbon emissions in addition to the carbon emissions from the onsite construction activities. This alternative will result in an improvement of overall environmental quality at a moderate-high level. • The remedy element of this alternative that could be most impacted by climate change (e.g., sea level rise) is MNR, which is implemented in SMA-1 and 7. SMA-1 is subtidal and therefore, the effects of climate change are not anticipated. Portions of SMA-7 are intertidal and climate change has the potential of impacting MNR in this SMA if conditions for natural sedimentation are diminished. Full removal of contaminated media in SMAs-2, 3, 5 and 6, and no action in SMA-4 are not expected to be impacted by climate change. • This alternative will result in a loss of aquatic habitat at the Site. SMAs 3c, 5, 6 and 7 contain critical aquatic habitat elevations. Full removal of contaminated sediment and wood debris in SMAs 3c, 5 and 6 will result in the loss of critical habitat	• Achieves a moderate-high degree of protectiveness. MNR reduces risk to a lower degree as compared to other remedies as it relies on natural attenuation and a restoration timeframe to meet cleanup standards. ENR reduces risks to a moderate degree due to the placement of sand to reduce contaminant concentrations and the time frame for meeting cleanup standards. Full removal reduces risk to a high degree as contaminants are permanently removed from the Site and cleanup standards are met following implementation of the remedy. • This alternative is expected to attain cleanup standards within a reasonable restoration timeframe (≤ 10 years) as described in Table 10 under the requirement of "Compliance with Cleanup Standards." Areas subject to full removal will meet cleanup standards on completion of the remedy construction. • The primary risks associated with implementing this alternative is the potential for the MNR and ENR areas to not meet cleanup standards within the reasonable restoration timeframe (≤ 10 years). • Under this alternative, a significant amount (approximately 68% by volume) of the Marine Area contamination is addressed through full removal, which meets cleanup standards and improves environmental quality at the Marine Area immediately following construction. A substantial amount of contamination (approximately 32% by volume) is addressed using MNR and ENR, both of which rely on restoration timeframe to improve environmental quality. ENR reduces restoration timeframe through placement of a thin layer of sand and thus provides for a better environmental quality as compared to MNR. The offsite transport of dredged material will contribute to significant carbon emissions in addition to the carbon emissions from the onsite construction activities. This alternative will result in an improvement of overall environmental quality at a moderate-high level. • The remedy element of this alternative that could be most impacted by climate change (e.g., sea level rise) include MNR and ENR, which are implemented in SMA-1 and/or 7. SMA-1 is subtidal and therefore effects of climate change are not anticipated. Portions of SMA-7 are intertidal and climate change has a potential of impacting ENR in this SMA if conditions for natural sedimentation are diminished. Full removal of	• Achieves a high degree of protectiveness. MNR reduces risk to a lower degree as compared to other remedies as it relies on natural attenuation and a restoration timeframe to meet cleanup standards. ENR reduces risks to a moderate degree due to the placement of sand to reduce contaminant concentrations and the time frame for meeting cleanup standards. Dynamic sand cap reduces risk to a moderate-high degree by isolating the contaminated media from surrounding aquatic environment. Full removal reduces risk to a high degree as contaminants are permanently removed from the Site and cleanup standards are met following implementation of the remedy. • This alternative is expected to attain cleanup standards within a reasonable restoration timeframe (≤ 10 years) as described in Table 10 under the requirement of "Compliance with Cleanup Standards." Areas subject to full removal will meet cleanup standards on completion of the remedy construction. • The primary risks with implementing this alternative include the potential for the MNR and ENR areas to not meet the cleanup standards within the reasonable restoration timeframe (≤ 10 years). • Under this alternative, a significant amount (approximately 78% by volume) of the Marine Area contamination is addressed through full removal and dynamic sand capping, all of which meet cleanup standards and improves environmental quality at the Marine Area immediately following construction. A considerable amount (approximately 22% by volume) of contamination is addressed using MNR and ENR, which relies on restoration timeframe to improve environmental quality. The offsite transport of dredged material will contribute to significant carbon emissions in addition to the carbon emissions from the onsite construction activities. This alternative will result in an improvement of overall environmental quality at a high level. • The remedy element of this alternative that could be most impacted by climate change (e.g., sea level rise) rise include MNR, ENR and dynamic sand capping, which are implemented in SMA-1 and/or 7. SMA-1 is subtidal and therefore effects of climate change is not anticipated. Portions of SMA-7 are intertidal and climate change has a potential of impacting ENR in this SMA if conditions for natural sedimentation are	• Achieves a high degree of protectiveness. MNR reduces risk to a lower degree as compared to other remedies as it relies on natural attenuation and a restoration timeframe to meet cleanup standards. ENR reduces risks to a moderate degree due to the placement of sand to reduce contaminant concentrations and the time frame for meeting cleanup standards. Full removal reduces risk to a high degree as contaminants are permanently removed from the Site and cleanup standards are met following implementation of the remedy. • This alternative is expected to attain cleanup standards within a reasonable restoration timeframe (≤ 10 years) as described in Table 10 under the requirement of "Compliance with Cleanup Standards." Areas subject to full removal will meet cleanup standards on completion of the remedy construction. • The primary risks with implementing this alternative include ineffective removal in the deeper water areas and the potential for the MNR and ENR areas to not meet cleanup standards within the reasonable restoration timeframe (≤ 10 years). Dredging in the deeper areas of the Site presents significant challenges to place dredge buckets accurately and precisely, potentially resulting in incomplete dredging and contaminated dredging residuals. Deeper water increases the potential for contaminant losses to the water column as the dredged material is raised to the surface. • Under this alternative, a significant amount (approximately 78% by volume) of the Marine Area contamination is addressed through full removal, which meet cleanup standards and improves environmental quality at the Marine Area immediately following construction. A considerable amount (approximately 22% by volume) of contamination is addressed using MNR and ENR, which relies on restoration timeframe to improve environmental quality. The offsite transport of dredged material will contribute to significant carbon emissions in addition to the carbon emissions from the onsite construction activities. This alternative will result in an improvement of overall environmental quality at a high level. • The remedy element of this alternative that could be most impacted by climate change (e.g., sea level rise) include MNR and ENR, which are implemented in SMA-1a, 1b, 1c and/or 7. SMAs-1a, 1b and 1c are subtidal and therefore effects of climate	• Achieves a high degree of protectiveness. ENR reduces risks to a moderate degree due to the placement of sand to reduce contaminant concentrations and the timeframe for meeting cleanup standards. Full removal reduces risk to a high degree as contaminants are permanently removed from the Site and cleanup standards are met following implementation of the remedy. • This alternative is expected to attain cleanup standards following the completion of construction as described in Table 10 under the requirement of "Compliance with Cleanup Standards." • Cleanup standards are expected to be met at the completion of construction; however, the primary risks with implementing this alternative include ineffective removal in the deeper water areas and the potential for the ENR area to not maintain the cleanup standards. Dredging in the deeper areas of the Site presents significant challenges to place dredge buckets accurately and precisely, potentially resulting in incomplete dredging and contaminated dredging residuals. Deeper water increases the potential for contaminant losses to the water column as the dredged material is raised to the surface. • Under this alternative, a significant amount (approximately 83% by volume) of the Marine Area contamination is addressed through full removal, which meets cleanup standards and improves environmental quality at the Marine Area immediately following construction. A considerable amount (approximately 17% by volume) is addressed using ENR, which relies on restoration timeframe to improve environmental quality. The offsite transport of dredged material will contribute to significant carbon emissions in addition to the carbon emissions from the onsite construction activities. This alternative will result in an improvement of overall environmental quality at a high level. The remedy element of this alternative that could be most impacted by climate change (e.g., sea level rise) is ENR, which is implemented in SMAs-1a, 1b and 1c, which are subtidal. Full removal of contaminated media in SMAs-1d, 2, 3, 5 and 6, full removal and backfill in SMA-7, and no action in SMA-4 are not expected to be impacted by climate change. Therefore, remedies implemented as part of this alternative are not expected to be impacted by climate change. • This alternative will result in a loss of aquatic

Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
(Protectiveness Continued)	elevations. MNR in SMA-7 does not affect habitat elevations and therefore, will not result in the loss of critical aquatic habitat. A habitat mitigation plan will be developed as part of the project permitting process in consultation with regulatory agencies and will be implemented to offset the loss of aquatic habitat resulting from this alternative. The Port anticipates use of the advanced habitat mitigation at the Blue Heron Slough Conservation and Mitigation Bank as part of the offset to habitat impacts resulting from the remedial action.	contaminated media in SMAs-2, 3, 5 and 6, and no action in SMA-4 are not expected to be impacted by climate change. • This alternative will result in a loss of aquatic habitat at the Site. SMAs 3c, 5, 6 and 7 contain critical aquatic habitat elevations. Full removal of contaminated sediment and wood debris in SMAs 3c, 5 and 6 will result in the loss of critical habitat elevations. ENR in SMA-7 does not affect habitat elevations and therefore, will not result in the loss of critical aquatic habitat. A habitat mitigation plan will be developed as part of the project permitting process in consultation with regulatory agencies and will be implemented to offset the loss of aquatic habitat resulting from this alternative. The Port anticipates use of the advanced habitat mitigation at the Blue Heron Slough Conservation and Mitigation Bank as part of the offset to habitat impacts resulting from the remedial action.	diminished. Full removal of contaminated media in SMAs-2, 3, 5 and 6, and no action in SMA-4 are not expected to be impacted by climate change. • This alternative will result in a loss of aquatic habitat at the Site. SMAs 3c, 5, 6 and 7 contain critical aquatic habitat elevations. Full removal of contaminated sediment and wood debris in SMAs 3c, 5 and 6 will result in the loss of critical habitat elevations. ENR in SMA-7 does not affect habitat elevations and therefore, will not result in the loss of critical aquatic habitat. A habitat mitigation plan will be developed as part of the project permitting process in consultation with regulatory agencies and will be implemented to offset the loss of aquatic habitat resulting from this alternative. The Port anticipates use of the advanced habitat mitigation at the Blue Heron Slough Conservation and Mitigation Bank as part of the offset to habitat impacts resulting from the remedial action.	change are not anticipated. Portions of SMA-7 are intertidal and climate change has a potential of impacting ENR in this SMA if conditions for natural sedimentation are diminished. Full removal of contaminated media in SMAs-1d, 2, 3, 5 and 6, and no action in SMA-4 are not expected to be impacted by climate change. • This alternative will result in a loss of aquatic habitat at the Site. SMAs 3c, 5, 6 and 7 contain critical aquatic habitat elevations. Full removal of contaminated sediment and wood debris in SMAs 3c, 5 and 6 will result in the loss of critical habitat elevations. ENR in SMA-7 does not affect habitat elevations and therefore, will not result in the loss of critical aquatic habitat. A habitat mitigation plan will be developed as part of the project permitting process in consultation with regulatory agencies and will be implemented to offset the loss of aquatic habitat resulting from this alternative. The Port anticipates use of the advanced habitat mitigation at the Blue Heron Slough Conservation and Mitigation Bank as part of the offset to habitat impacts resulting from the remedial action.	habitat at the Site. SMAs 3c, 5, 6 and 7 contain critical aquatic habitat elevations. Full removal of contaminated sediment and wood debris in SMAs 3c, 5 and 6 will result in the loss of critical habitat elevations. Full removal and backfill to restore existing elevations in SMA-7 does not affect habitat elevations and therefore, will not result in the loss of critical aquatic habitat. A habitat mitigation plan will be developed as part of the project permitting process in consultation with regulatory agencies and will be implemented to offset the loss of aquatic habitat resulting from this alternative. The Port anticipates use of the advanced habitat mitigation at the Blue Heron Slough Conservation and Mitigation Bank as part of the offset to habitat impacts resulting from the remedial action.

Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Permanence	**Score = 6.5**	**Score = 7**	**Score = 7.5**	**Score = 8**	**Score = 8.5**
"The degree to which the alternative permanently reduces the toxicity, mobility or volume of hazardous substances, including the adequacy of the alternative in destroying the hazardous substances, the reduction or elimination of hazardous substance releases and sources of releases, the degree of irreversibility of waste treatment process, and the characteristics and quantity of treatment residuals generated."	• Achieves a moderate degree of permanence because approximately 32% by volume of contaminated media is addressed using MNR and approximately 68% is addressed using full removal. MNR relies on natural attenuation processes to reduce toxicity, mobility and volume over time. Full removal immediately reduces toxicity, mobility and volume of hazardous substance from the Marine Area following construction. • Contamination addressed using MNR will naturally degrade and attenuate over time. Contamination addressed by full removal is not destroyed but will be disposed of at an off-site permitted landfill where it will be permanently isolated and contained from the environment. • The historic processes generating hazardous substances at the Marine Area are no longer in operation. A passive ongoing source of contamination to the surface sediment of Marine Area can be attributed to erosion and dispersal of the historical contamination. This alternative will result in complete removal of contamination from the source areas that are subjected to scour (SMAs-2, 3, 5 and 6) and thus will eliminate this source. • Treatment proposed under this alternative is through natural degradation and attenuation processes, which are irreversible and will not generate treatment residuals.	• Achieves a moderate-high degree of permanence because approximately 32% by volume of contaminated media is addressed using MNR and ENR and approximately 68% is addressed using full removal. MNR relies on natural attenuation processes to reduce toxicity, mobility, and volume over time. ENR involves placement of a thin layer of sand to reduce contaminant concentrations and the timeframe in which natural attenuation processes work to reduce toxicity, mobility, and volume. Full removal immediately reduces toxicity, mobility, and volume of hazardous substances from the Marine Area following construction. • Contamination addressed using MNR and ENR will naturally degrade and attenuate over time. Contamination addressed by full removal is not destroyed but will be disposed of at an off-site permitted landfill where it will be permanently isolated and contained from the environment. • The historic processes generating hazardous substances at the Marine Area are no longer in operation. A passive ongoing source of contamination to the surface sediment of Marine Area can be attributed to erosion and dispersal of the historical contamination. This alternative will result in complete removal of contamination from the source areas that are subjected to scour (SMAs-2, 3, 5 and 6) and thus will eliminate this source. • Treatment proposed under this alternative is through natural degradation and attenuation processes, which are irreversible and will not generate treatment residuals.	• Achieves a moderate-high degree of permanence because approximately 22% by volume of contaminated media is addressed using MNR and ENR, 10% is addressed using dynamic sand capping and 68% is addressed using full removal. MNR relies on natural attenuation processes to reduce toxicity, mobility, and volume. ENR involves placement of a thin layer of sand to reduce contaminant concentrations and the timeframe in which natural attenuation processes work to reduce toxicity, mobility, and volume. Dynamic sand capping reduces the mobility of hazardous substances through placement and distribution of 3-feet equivalent mass of sand to isolate the underlying contamination. Dynamic sand capping does not immediately reduce toxicity and volume of hazardous substances but prevents exposure through isolation. Full removal immediately reduces toxicity, mobility and volume of hazardous substance from the Marine Area following construction. • Contamination addressed using MNR, ENR and dynamic sand cap will naturally degrade and attenuate over time. Contamination addressed using capping is not destroyed but isolated from the aquatic environment to prevent exposure. Contamination addressed using full removal is not destroyed but disposed at an off-site permitted landfill where it will be permanently isolated and contained from the environment. • The historic processes generating hazardous substances at the Marine Area are no longer in operation. A passive ongoing source of contamination to the surface sediment of Marine Area can be attributed to erosion and dispersal of the historical contamination. This alternative will result in complete removal of contamination from the source areas that are subjected to scour (SMAs-2, 3, 5 and 6) and thus will eliminate this source. • Treatment proposed under this alternative is through natural degradation and attenuation processes, which are irreversible and will not generate treatment residuals.	• Achieves a high degree of permanence because approximately 22% by volume of contaminated media is addressed using MNR and ENR and approximately 78% is addressed using full removal. MNR relies on natural attenuation processes to reduce toxicity, mobility, and volume. ENR involves placement of a thin layer of sand to reduce contaminant concentrations and the timeframe in which natural attenuation processes work to reduce toxicity, mobility, and volume. Full removal immediately reduces toxicity, mobility, and volume of hazardous substances from the Marine Area following construction. Dredging in deeper water areas poses a risk for incomplete removal or residuals which would act to lower the degree of permanence. • Contamination addressed using MNR and ENR will naturally degrade and attenuate over time. Contamination addressed by full removal is not destroyed but will be disposed of at an off-site permitted landfill where it will be permanently isolated and contained from the environment. • The historic processes generating hazardous substances at the Marine Area are no longer in operation. A passive ongoing source of contamination to the surface sediment of Marine Area can be attributed to erosion and dispersal of the historical contamination. This alternative will result in complete removal of contamination from the source areas that are subjected to scour (SMAs-2, 3, 5 and 6) and thus will eliminate this source. • Treatment proposed under this alternative is through natural degradation and attenuation processes, which are irreversible and will not generate treatment residuals.	• Achieves a high degree of permanence because approximately 17% by volume of contaminated media is addressed using ENR and approximately 83% is addressed using full removal. ENR involves placement of a thin layer of sand to reduce contaminant concentrations and the timeframe in which natural attenuation processes work to reduce toxicity, mobility, and volume. Full removal immediately reduces toxicity, mobility, and volume of hazardous substances from the Marine Area following construction. Dredging in deeper water areas poses a risk for incomplete removal or residuals which would act to lower the degree of permanence. • Contamination addressed using ENR will naturally degrade and attenuate over time. Contamination addressed by full removal is not destroyed but will be disposed of at an off-site permitted landfill where it will be permanently isolated and contained from the environment. • The historic processes generating hazardous substances at the Marine Area are no longer in operation. A passive ongoing source of contamination to the surface sediment of Marine Area can be attributed to erosion and dispersal of the historical contamination. This alternative will result in complete removal of contamination from the source areas that are subjected to scour (SMAs-2, 3, 5 and 6) and thus will eliminate this source. • Treatment proposed under this alternative is through natural degradation and attenuation processes, which are irreversible and will not generate treatment residuals.

Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Long-Term Effectiveness	**Score = 7**	**Score = 7**	**Score = 7.5**	**Score = 8**	**Score = 8.5**
"Long-term effectiveness includes the degree of certainty that the alternative will be successful, the reliability of the alternative during the period of time hazardous substances are expected to remain on-site at concentrations that exceed cleanup levels, the magnitude of residual risk with the alternative in place, and the effectiveness of controls required to manage treatment residues or remaining wastes."	• Achieves a moderate degree of long-term effectiveness due to its reliance on MNR to address contaminated media (approximately 32% by volume) located outside of the full removal areas at the Site. • Given that the technologies used in this alternative are well established and proven, this alternative is considered reliable. • Risks are immediately reduced through the full removal element of this alternative. Until the cleanup standards are achieved through MNR in the remaining parts of the Site, risks of exposure to hazardous substances will remain, although reduced through time, until recovery is achieved over the restoration timeframe. • Under this alternative, subsurface contamination below the point of compliance will remain in the SMAs where MNR is implemented. This contamination may be disturbed due to unanticipated natural or man-made forces and potentially pose a risk if exposed to receptors. • Institutional controls may be required to ensure the long-term effectiveness of the alternative. Institutional controls are effective if followed.	• Achieves a moderate degree of long-term effectiveness due to its reliance on MNR and ENR to address contaminated media (approximately 32% by volume) located outside of the full removal areas at the Site. MNR and ENR are expected to achieve a similar degree of long-term effectiveness since both technologies rely on natural attenuation processes and both are expected to achieve cleanup standards within a reasonable restoration timeframe. • Given that the technologies used in this alternative are well established and proven, this alternative is considered reliable. • Risks are immediately reduced through the full removal element of this alternative. Until the cleanup standards are achieved through MNR and ENR in the remaining parts of the Site, risks of exposure to hazardous substances will remain, although reduced over time, until recovery is achieved over the restoration timeframe. • Under this alternative, subsurface contamination below the point of compliance will remain in the SMAs where MNR and ENR are implemented. This contamination may be disturbed due to unanticipated natural or man-made forces and potentially pose a risk if exposed to receptors. • Institutional controls may be required to ensure the long-term effectiveness of the alternative. Institutional controls are effective if followed.	• Achieves a moderate-high degree of long-term effectiveness due to its reliance on MNR, ENR and dynamic sand capping to address contaminated media (approximately 32% by volume) located outside of the full removal areas at the Site. Dynamic sand capping is expected to achieve a higher degree to long-term effectiveness as compared to MNR and ENR since capping will result in isolation of contaminated media while MNR and ENR rely on natural attenuation processes to reduce contaminant concentrations. • Given that the technologies used in this alternative are well established and proven, this alternative is considered reliable. • Risks are immediately reduced through the full removal and dynamic sand capping elements of this alternative. Until the cleanup standards are achieved through MNR and ENR in the remaining parts of the Site, risks of exposure to hazardous substances will remain, although reduced through time, until recovery is achieved/cleanup standards are met over the restoration timeframe. • Under this alternative, subsurface contamination below the point of compliance will remain in the SMAs where MNR, ENR and dynamic sand capping are implemented. This contamination may be disturbed due to unanticipated natural or man-made forces and potentially pose a risk if exposed to receptors. • Institutional controls may be required to ensure the long-term effectiveness of the alternative. Institutional controls are effective if followed.	• Achieves a high degree of long-term effectiveness due to its reliance on both MNR and ENR to address contaminated media (approximately 22% by volume) located outside of the full removal areas of the Site. • Given that the technologies used in this alternative are well established and proven, this alternative is considered reliable. • Risks are immediately reduced through the full removal element of this alternative. Long-term risks associated with dredging the deeper areas at the Site include potential for incomplete removal and contaminated dredging residuals due to increased implementation challenges. Until the cleanup standards are achieved through MNR and ENR in the remaining parts of the Site, risks of exposure to hazardous substances will remain, although reduced over time, until recovery is achieved over the restoration timeframe. • Under this alternative, subsurface contamination below the point of compliance will remain in the SMAs where MNR and ENR are implemented. This contamination may be disturbed due to unanticipated natural or man-made forces and potentially pose a risk if exposed to receptors. • Institutional controls may be required to ensure the long-term effectiveness of the alternative. Institutional controls are effective if followed.	• Achieves a high degree of long-term effectiveness due to reliance on ENR to address contaminated media (approximately 17% by volume) located outside of the full removal areas of the Site. • Given that the technologies used in this alternative are well established and proven, this alternative is considered reliable. • Risks are immediately reduced through the full removal element of this alternative. Long-term risks associated with dredging the deeper areas at the Site include potential for incomplete removal and contaminated dredging residuals due to increased implementation challenges. Cleanup standards are expected to be met at the completion of construction; however, long-term risks with implementing this alternative include a potential for the ENR area to not maintain the cleanup standards. • Under this alternative, subsurface contamination below the point of compliance will remain in the SMAs where ENR is implemented. This contamination may be disturbed due to unanticipated natural or man-made forces and potentially pose a risk if exposed to receptors. • Institutional controls may be required to ensure the long-term effectiveness of the alternative. Institutional controls are effective if followed.

Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Management of Short-Term Risks	**Score = 7.5**	**Score = 7**	**Score = 6.5**	**Score = 6**	**Score = 5.5**
"The risk to human health and the environment associated with the alternative during construction and implementation, and the effectiveness of measures that will be taken to manage such risks."	• Manages short-term risks to a moderate-high degree through use of common construction methods for sediment remediation. • Marine construction activities pose potential health and safety risks to construction workers and temporary impacts to water quality and marine life during construction. Moderate risks can be mitigated by isolating the work zone, notifying the public including commercial and recreational boat traffic, water quality management, street route planning for transportation of materials, and spill response preparedness. These measures are typical for marine remediation projects and are proven effective in minimizing the risks. • There is a potential for dredging residual, but it will be managed during construction by implementing necessary best management practices (BMPs) and compliance monitoring. • Dredging to achieve full removal in the vicinity of existing structures present significant risk to the integrity of the structures. This risk will be mitigated by installation of structural elements to protect the existing infrastructure during construction. The structural elements will be designed to meet the requirements of the construction conditions. • The dredged material removed from the Site will be disposed at an off-site landfill, posing potential risk of accidental spills/releases during transportation. This risk will be managed through rapid response to address potential spills. • Capacity limitations on transportation and landfill disposal may limit throughput for the large volume of dredged material. Capacity limitations would prolong the construction schedule and exposure period of contaminated media to human health and the environment. Multiple offsite disposal options may be required to meet the project throughput requirements.	• Manages short-term risks to a moderate degree through use of common construction methods for sediment remediation. • Marine construction activities pose potential health and safety risks to construction workers and temporary impacts to water quality and marine life during construction. Moderate risks can be mitigated by isolating the work zone, notifying the public including commercial and recreational boat traffic, water quality management, street route planning for transportation of materials, and spill response preparedness. These measures are typical for marine remediation projects and are proven effective in minimizing the risks. • There is a potential for dredging residual, but it will be managed during construction by implementing necessary BMPs and compliance monitoring. • Dredging to achieve full removal in the vicinity of existing structures present significant risk to the integrity of the structures. This risk will be mitigated by installation of structural elements to protect the existing infrastructure during construction. The structural elements will be designed to meet the requirements of the construction conditions. • The dredged material removed from the Site will be disposed at an off-site landfill, posing potential risk of accidental spills/releases during transportation. This risk will be managed through rapid response to address potential spills. • Capacity limitations on transportation and landfill disposal may limit throughput for the large volume of dredged material. Capacity limitations would prolong the construction schedule and exposure period of contaminated media to human health and the environment. Multiple offsite disposal options may be required to meet the project throughput requirements. • The import of sand/fill material for ENR may result in short-term risks related to both the transport and placement of material.	• Manages short-term risks to a moderate degree through use of common construction methods for sediment remediation. • Marine construction activities pose potential health and safety risks to construction workers and temporary impacts to water quality and marine life during construction. Moderate risks can be mitigated by isolating the work zone, notifying the public including commercial and recreational boat traffic, water quality management, street route planning for transportation of materials, and spill response preparedness. These measures are typical for marine remediation projects and are proven effective in minimizing the risks. • There is a potential for dredging residual, but it will be managed during construction by implementing necessary BMPs and compliance monitoring. • Short-term risks associated with dynamic sand cap placement include disturbance and resuspension of contaminated sediment or porewater on impact with the bottom and smothering of benthic communities and aquatic vegetation. • Dredging to achieve full removal in the vicinity of existing structures present significant risk to the integrity of the structures. This risk will be mitigated by installation of structural elements to protect the existing infrastructure during construction. The structural elements will be designed to meet the requirements of the construction conditions. • The dredged material removed from the Site will be disposed at an off-site landfill, posing potential risk of accidental spills/releases during transportation. This risk will be managed through rapid response to address potential spills. • Capacity limitations on transportation and landfill disposal may limit throughput for the large volume of dredged material. Capacity limitations would prolong the construction schedule and exposure period of contaminated media to human health and the environment. Multiple offsite disposal options may be required to meet the project throughput requirements. • The import of sand/fill material for capping and ENR may result in short-term risks related to both the transport and placement of material.	• Manages short-term risks to a moderate degree through use of common construction methods for sediment remediation. • Marine construction activities pose potential health and safety risks to construction workers and temporary impacts to water quality and marine life during construction. Moderate risks can be mitigated by isolating the work zone, notifying the public including commercial and recreational boat traffic, water quality management, street route planning for transportation of materials, and spill response preparedness. These measures are typical for marine remediation projects and are proven effective in minimizing the risks. • There is a potential for dredging residual, but it will be managed during construction by implementing necessary BMPs and compliance monitoring. This alternative involves dredging in one of the deep SMAs at the Site which has an increased risk for incomplete removal and residuals due to lower precision performance of the dredging equipment. • Dredging to achieve full removal in the vicinity of existing structures present significant risk to the integrity of the structures. This risk will be mitigated by installation of structural elements to protect the existing infrastructure during construction. The structural elements will be designed to meet the requirements of the construction conditions. • The dredged material removed from the Site will be disposed at an off-site landfill, posing potential risk of accidental spills/releases during transportation. This risk will be managed through rapid response to address potential spills. • Capacity limitations on transportation and landfill disposal may limit throughput for the large volume of dredged material. Capacity limitations would prolong the construction schedule and exposure period of contaminated media to human health and the environment. Multiple offsite disposal options may be required to meet the project throughput requirements. • The import of sand/fill material for ENR may result in short-term risks related to both the transport and placement of material.	• Manages short-term risks to a moderate degree through use of common construction methods for sediment remediation. • Marine construction activities pose potential health and safety risks to construction workers and temporary impacts to water quality and marine life during construction. Moderate risks can be mitigated by isolating the work zone, notifying the public including commercial and recreational boat traffic, water quality management, street route planning for transportation of materials, and spill response preparedness. These measures are typical for marine remediation projects and are proven effective in minimizing the risks. • There is a potential for dredging residual, but it will be managed during construction by implementing necessary BMPs and compliance monitoring. This alternative involves dredging in one of the deep SMAs at the Site which has an increased risk for incomplete removal and residuals due to lower precision performance of the dredging equipment. • Dredging to achieve full removal in the vicinity of existing structures present significant risk to the integrity of the structures. This risk will be mitigated by installation of structural elements to protect the existing infrastructure during construction. The structural elements will be designed to meet the requirements of the construction conditions. • The dredged material removed from the Site will be disposed at an off-site landfill, posing potential risk of accidental spills/releases during transportation. This risk will be managed through rapid response to address potential spills. • Capacity limitations on transportation and landfill disposal may limit throughput for the large volume of dredged material. Capacity limitations would prolong the construction schedule and exposure period of contaminated media to human health and the environment. Multiple offsite disposal options may be required to meet the project throughput requirements. • The import of sand/fill material for ENR may result in short-term risks related to both the transport and placement of material.

Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Technical and Administrative Implementability	Score = 8.5	Score = 8	Score = 7.5	Score = 6.5	Score = 6
"Ability to be implemented including consideration of whether the alternative is technically possible, availability of necessary offsite facilities, services and materials, administrative and regulatory requirements, scheduling, size, complexity, monitoring requirements, access for construction operations and monitoring, and integration with existing facility operations and other current or potential remedial actions."	• Achieves a high level of technical implementability through the use of common marine construction methods to complete the remedial action including the construction of the South Terminal toe wall and upland retaining wall. A significant area of the Site requires only monitoring under this alternative. • Administrative implementability will be addressed by meeting the cleanup objectives and other regulatory and permitting requirements for the project. This alternative will not prohibit the identified current or future Site uses. • Due to the magnitude and complexity, multiple in-water work seasons will be required to complete construction on this alternative. • Dredging activities, including construction of the South Terminal toe wall and upland retaining wall will require coordination with Port's operations to minimize impact on vessel operations at Port's terminals. Outside of the Port's navigational areas access for construction activities, and future maintenance/monitoring will not be limited by site operations. • Offsite landfill facilities will be required for the disposal of 424,520 tons of contaminated material. Capacity limitations on transportation and landfill disposal may require the construction to be phased over multiple years. Depending on the rate of dredging, use of multiple transportation and landfill alternatives may be necessary. • The use of MNR reduces the overall dredged material volume and need for precision materials placement or dredging in the deeper areas of the Site. • Monitoring will be required to confirm the effectiveness of MNR to achieve the cleanup standards within the restoration timeframe.	• Achieves a high level of technical implementability through the use of common marine construction methods to complete the remedial action including the construction of the South Terminal toe wall and upland retaining wall. • Administrative implementability will be addressed by meeting the cleanup objectives and other regulatory and permitting requirements for the project. This alternative will not prohibit the identified current or future Site uses. • Due to the magnitude and complexity, multiple in-water work seasons will be required to complete construction on this alternative. • Dredging activities, including construction of the South Terminal toe wall and upland retaining wall will require coordination with Port's operations to minimize impact on vessel operations at Port's terminals. Outside of the Port's navigational areas access for construction activities, and future maintenance/monitoring will not be limited by site operations. • Offsite landfill facilities will be required for the disposal of 424,520 tons of contaminated material. Capacity limitations on transportation and landfill disposal may require the construction to be phased over multiple years. Depending on the rate of dredging, use of multiple transportation and landfill alternatives may be necessary. • The use of MNR and ENR reduces the overall dredged material volume and the need for precision materials placement or dredging in the deeper areas of the Site. • Placing ENR sand in deep water column is not expected to pose significant technical challenges since sand placed for ENR purposes does not require the precision that is necessary for capping and can effectively be implemented in deeper water areas. • Monitoring will be required to confirm the effectiveness of MNR and ENR to achieve the cleanup standards within the restoration timeframe.	• Achieves a moderate level of technical implementability through the use of common marine construction methods to complete the remedial action including the construction of the South Terminal toe wall and upland retaining wall. • Administrative implementability will be addressed by meeting the cleanup objectives and other regulatory and permitting requirements for the project. This alternative will not prohibit the identified current or future Site uses. • Due to the magnitude and complexity, multiple in-water work seasons will be required to complete construction on this alternative. • Dredging activities, including construction of the South Terminal toe wall and upland retaining wall will require coordination with Port's operations to minimize impact on vessel operations at Port's terminals. Outside of the Port's navigational areas access for construction activities, and future maintenance/monitoring will not be limited by site operations. • Offsite landfill facilities will be required for the disposal of 438,070 tons of contaminated material. Capacity limitations on transportation and landfill disposal may require the construction to be phased over multiple years. Depending on the rate of dredging, use of multiple transportation and landfill alternatives may be necessary. • The use of MNR, ENR and dynamic sand cap reduces the overall dredged material volume and need for precision materials placement or dredging in the deeper areas of the Site. • Placing ENR sand in deep water and dynamic sand cap material in moderately deep water is not expected to pose significant technical challenges since the sand placement techniques to implement these technologies do not require the precision that is necessary for conventional or amended/reactive capping. • Monitoring will be required to confirm the effectiveness of MNR and ENR to achieve the cleanup standards within the restoration timeframe and to confirm the effectiveness of the dynamic sand caps.	• Achieves a moderate level of technical implementability through the use of common marine construction methods to complete the remedial action including the construction of the South Terminal toe wall and upland retaining wall. • Administrative implementability will be addressed by meeting the cleanup objectives and other regulatory and permitting requirements for the project. This alternative will not prohibit the identified current or future Site uses. • Due to the magnitude and complexity, multiple in-water work seasons will be required to complete construction on this alternative. • Dredging activities, including construction of the South Terminal toe wall and upland retaining wall will require coordination with Port's operations to minimize impact on vessel operations at Port's terminals. Outside of the Port's navigational areas access for construction activities, and future maintenance /monitoring will not be limited by site operations. • Offsite landfill facilities will be required for the disposal of 484,010 tons of contaminated material. Capacity limitations on transportation and landfill disposal may require the construction to be phased over multiple years. Depending on the rate of dredging, use of multiple transportation and landfill alternatives may be necessary. • The use of MNR and ENR reduces the overall dredged material volume and the need for precision materials placement or dredging in the deeper areas of the Site. • Placing ENR sand in deep water column is not expected to pose significant technical challenges since sand placed for ENR purposes does not require the precision that is necessary for capping and can effectively be implemented in deeper water areas. • Dredging is proposed in SMA-1d with mudline up to -75 feet MLLW. Significant inherent technical challenges are associated with the precision dredging in deep water and risk potential schedule delays, incomplete dredging, residuals, releases to the water column and increased cost due to over-dredging. • Monitoring will be required to confirm the effectiveness of MNR and ENR to achieve the cleanup standards within the restoration timeframe.	• Achieves a moderate level of technical implementability through the use of common marine construction methods to complete the remedial action including the construction of the South Terminal toe wall and upland retaining wall. • Administrative implementability will be addressed by meeting the cleanup objectives and other regulatory and permitting requirements for the project. This alternative will not prohibit the identified current or future Site uses. • Due to the magnitude and complexity, multiple in-water work seasons will be required to complete construction on this alternative. • Dredging activities, including construction of the South Terminal toe wall and upland retaining wall will require coordination with Port's operations to minimize impact on vessel operations at Port's terminals. Outside of the Port's navigational areas access for construction activities, and future maintenance /monitoring will not be limited by site operations. • Offsite landfill facilities will be required for the disposal of 519,310 tons of contaminated material. Capacity limitations on transportation and landfill disposal may require the construction to be phased over multiple years. Depending on the rate of dredging, use of multiple transportation and landfill alternatives may be necessary. • The use of ENR reduces the overall dredged material volume and need for precision materials placement or dredging in the deeper areas of the Site. • Placing ENR sand in deep water column is not expected to pose significant technical challenges since sand placed for ENR purposes does not require the precision that is necessary for capping and can effectively be implemented in deeper water areas. • Dredging is proposed in SMA-1d with mudline up to -75 feet MLLW. Significant inherent technical challenges are associated with the precision dredging in deep water and risk potential schedule delays, incomplete dredging, residuals, releases to the water column and increased cost due to over-dredging. • Monitoring will be required to confirm the effectiveness of ENR to achieve the cleanup standards within the restoration timeframe.

Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Consideration of Public Concerns	**Score = 6.5**	**Score = 7**	**Score = 7.5**	**Score = 7.5**	**Score = 8.5**
"Whether the community has concerns regarding the alternative and, if so, the extent to which the alternative addresses those concerns. This process includes concerns from individuals, community groups, local governments, tribes, federal and state agencies, or any other organization that may have an interest in or knowledge of the site."	• Public concerns are not yet known. • It is assumed that protectiveness is the greatest public concern and therefore, the score for this criterion considers the relative benefit score protectiveness as modified by the considerations described below. • It is also anticipated that the public will be concerned about traffic and noise disturbances and potential exposure to contaminated material resulting from accidental release during transportation of contaminated dredged material on public streets and/or highway. • All of the contaminated dredged material generated from this alternative will be transported off-site by trucks on public streets and/or highways since this alternative solely relies on the use of off-site landfill facilities for the disposal of contaminated dredged material. • The relative benefit score for this criterion will be reviewed and revised as necessary after receiving public comments on the RI/FS.	• Public concerns are not yet known. • It is assumed that protectiveness is the greatest public concern and therefore, the score for this criterion considers the relative benefit score protectiveness as modified by the considerations described below. • It is also anticipated that the public will be concerned about traffic and noise disturbances and potential exposure to contaminated material resulting from accidental release during transportation of contaminated dredged material on public streets and/or highway. • All of the contaminated dredged material generated from this alternative will be transported off-site by trucks on public streets and/or highways since this alternative solely relies on the use of off-site landfill facilities for the disposal of contaminated dredged material. • The relative benefit score for this criterion will be reviewed and revised as necessary after receiving public comments on the RI/FS.	• Public concerns are not yet known. • It is assumed that protectiveness is the greatest public concern and therefore, the score for this criterion considers the relative benefit score protectiveness as modified by the considerations described below. • It is also anticipated that the public will be concerned about traffic and noise disturbances and potential exposure to contaminated material resulting from accidental release during transportation of contaminated dredged material on public streets and/or highway. • All of the contaminated dredged material generated from this alternative will be transported off-site by trucks on public streets and/or highways since this alternative solely relies on the use of off-site landfill facilities for the disposal of contaminated dredged material. • The relative benefit score for this criterion will be reviewed and revised as necessary after receiving public comments on the RI/FS.	• Public concerns are not yet known. • It is assumed that protectiveness is the greatest public concern and therefore, the score for this criterion considers the relative benefit score protectiveness as modified by the considerations described below. • It is also anticipated that the public will be concerned about traffic and noise disturbances and potential exposure to contaminated material resulting from accidental release during transportation of contaminated dredged material on public streets and/or highway. • All of the contaminated dredged material generated from this alternative will be transported off-site by trucks on public streets and/or highways since this alternative solely relies on the use of off-site landfill facilities for the disposal of contaminated dredged material. • The relative benefit score for this criterion will be reviewed and revised as necessary after receiving public comments on the RI/FS.	• Public concerns are not yet known. • It is assumed that protectiveness is the greatest public concern and therefore, the score for this criterion considers the relative benefit score protectiveness as modified by the considerations described below. • It is also anticipated that the public will be concerned about traffic and noise disturbances and potential exposure to contaminated material resulting from accidental release during transportation of contaminated dredged material on public streets and/or highway. • All of the contaminated dredged material generated from this alternative will be transported off-site by trucks on public streets and/or highways since this alternative solely relies on the use of off-site landfill facilities for the disposal of contaminated dredged material. • The relative benefit score for this criterion will be reviewed and revised as necessary after receiving public comments on the RI/FS.

Notes:

BMPs = best management practices
CDF = confined disposal facility
COCs = contaminants of concern
DCA = Disproportionate Cost Analysis
Ecology = Washington State Department of Ecology
ENR = enhanced natural recovery
MNR = monitored natural recovery
MTCA = Model Toxics Control Act
RI/FS = Remedial Investigation/Feasibility Study
SMA = sediment management area

Table 7

Evaluation of Alternatives, MTCA Disproportionate Cost Analysis

Weyerhaeuser Mill A Former
Everett, Washington

Alternative	Alternative 6	Alternative 7	Alternative 8	Alternative 9	Alternative 10
Alternative Summary	• Monitored Natural Recovery (MNR) in SMAs 1 (1a through 1d) and 7 measuring approximately 43 acres. • Removal of the existing South Terminal pile-supported roll-on/roll-off berth to provide access to dredging areas and installation of South Terminal toe wall to support existing structures and achieve complete contaminant removal through dredging. • Full removal of contaminated sediment and wood debris from SMAs 2 (2a and 2b), 3 (3a through 3c) and 6. Dredge stable side slopes at 3H:1V in SMA-1d to allow for full removal to be completed in adjacent SMA-2a. Side slope dredging in SMA-1a, 1b and 1c is not assumed for the purposes of the FS since the full removal depths in the adjacent portions of SMA-2a/2b are shallow. Approximately 227,970 tons of dredged material are estimated to be removed from these SMAs. • Construction of confined disposal facility (CDF) within SMA-5. Approximately 196,550 tons of contaminated sediment and wood debris located in SMA-5 will be contained and covered by the CDF. The CDF will provide space for the disposal of approximately 226,200 tons of dredged material. • Dispose approximately 226,200 tons of dredged material into the on-site CDF. • Upland transload, transport and disposal of approximately 1,770 tons of dredged material that cannot be disposed into the on-site CDF at an off-site permitted landfill. • No further action in SMA-4 due to the completeness of the 2016 interim action. • Institutional controls, as necessary.	• Monitored Natural Recovery (MNR) in SMA 1a measuring approximately 26.8 acres. • Enhanced Natural Recovery (ENR) in SMAs 1b through 1d, and 7 measuring approximately 16.2 acres. Approximately 20,900 tons of sand is estimated to be placed in these SMAs. • Removal of the existing South Terminal pile-supported roll-on/roll-off berth to provide access to dredging areas and installation of South Terminal toe wall to support existing structures and achieve complete contaminant removal through dredging. • Full removal of contaminated sediment and wood debris from SMAs 2 (2a and 2b), 3 (3a through 3c) and 6. Dredge stable side slopes at 3H:1V in SMA-1d to allow for full removal to be completed in adjacent SMA-2a. Side slope dredging in SMA-1a, 1b and 1c is not assumed for the purposes of the FS since the full removal depths in the adjacent portions of SMA-2a/2b are shallow. Approximately 227,970 tons of dredged material are estimated to be removed from these SMAs. • Construction of CDF within SMA-5. Approximately 196,550 tons of contaminated sediment and wood debris located in SMA-5 will be contained and covered by the CDF. The CDF will provide space for the disposal of approximately 226,200 tons of dredged material. • Dispose approximately 226,200 tons of dredged material into the on-site CDF. • Upland transload, transport and disposal of approximately 1,770 tons of dredged material that cannot be disposed into the on-site CDF at an off-site permitted landfill. • No further action in SMA-4 due to the completeness of the 2016 interim action. • Institutional controls, as necessary.	• Monitored Natural Recovery (MNR) in SMA 1a measuring approximately 26.8 acres. • Enhanced Natural Recovery (ENR) in SMAs 1b, 1c and 7 measuring approximately 11.7 acres. Approximately 15,140 tons of sand is estimated to be placed in this SMA. • Removal of the existing South Terminal pile-supported roll-on/roll-off berth to provide access to dredging areas and installation of South Terminal toe wall to support existing structures and achieve complete contaminant removal through dredging. • Placement of dynamic sand cap in SMA 1d measuring approximately 4.5 acres. Approximately 35,720 tons of sand cap material is estimated to be placed in SMA 1d. • Full removal of contaminated sediment and wood debris from SMAs 2 (2a and 2b), 3 (3a through 3c) and 6. Dredge in SMA-1d to provide stable transition slopes to allow full removal in adjacent SMA-2a and to remove contaminated sediment in SMA-1d above elevation -60 feet MLLW which will ensure that the dynamic sand cap placed in SMA-1d is not above the maximum scour elevation (i.e., -55 feet MLLW). Side slope dredging in SMA-1a, 1b and 1c is not assumed for the purposes of the FS since the full removal depths in the adjacent portions of SMA-2a/2b are shallow. Approximately 241,520 tons of dredged material are estimated to be removed from these SMAs. • Construction of CDF within SMA-5. Approximately 196,550 tons of contaminated sediment and wood debris located in SMA-5 will be contained and covered by the CDF. The CDF will provide space for the disposal of approximately 226,200 tons of dredged material. • Dispose approximately 226,200 tons of dredged material into the on-site CDF. • Upland transload, transport and disposal of approximately 15,320 tons of dredged material that cannot be disposed into the on-site CDF at an off-site permitted landfill. • No further action in SMA-4 due to the completeness of the 2016 interim action. • Institutional controls, as necessary.	• Monitored Natural Recovery (MNR) in SMA 1a measuring approximately 26.8 acres. • Enhanced Natural Recovery (ENR) in SMAs 1b, 1c and 7 measuring approximately 11.7 acres. Approximately 15,140 tons of sand is estimated to be placed in these SMAs. • Removal of the existing South Terminal pile-supported roll-on/roll-off berth to provide access to dredging areas and installation of South Terminal toe wall to support existing structures and achieve complete contaminant removal through dredging. • Full removal of contaminated sediment and wood debris from SMAs 1d, 2 (2a and 2b), 3 (3a through 3c) and 6. Approximately 287,460 tons of dredged material are estimated to be removed from these SMAs. • Construction of CDF within SMA-5. Approximately 196,550 tons of contaminated sediment and wood debris located in SMA-5 will be contained and covered by the CDF. The CDF will provide space for the disposal of approximately 226,200 tons of dredged material. • Dispose approximately 226,200 tons of dredged material into the on-site CDF. • Upland transload, transport and disposal of approximately 61,260 tons of dredged material that cannot be disposed into the on-site CDF at an off-site permitted landfill. • No further action in SMA-4 due to the completeness of the 2016 interim action. • Institutional controls, as necessary.	• Enhanced Natural Recovery (ENR) in SMAs 1a, 1b, and 1c measuring approximately 35.7 acres. Approximately 46,140 tons of sand is estimated to be placed in these SMAs. • Removal of the existing South Terminal pile-supported roll-on/roll-off berth to provide access to dredging areas and installation of South Terminal toe wall to support existing structures and achieve complete contaminant removal through dredging. • Full removal of contaminated sediment and wood debris from SMAs 1d, 2 (2a and 2b), 3 (3a through 3c) 6 and 7. Approximately 322,760 tons of dredged material are estimated to be removed from these SMAs. • Construction of CDF within SMA-5. Approximately 196,550 tons of contaminated sediment and wood debris located in SMA-5 will be contained and covered by the CDF. The CDF will provide space for the disposal of approximately 226,200 tons of dredged material. • Dispose approximately 226,200 tons of dredged material into the on-site CDF. • Upland transload, transport and disposal of approximately 96,560 tons of dredged material that cannot be disposed into the on-site CDF at an off-site permitted landfill. • Backfilling in SMA-7 with sand to restore existing critical habitat elevations. Approximately 43,440 tons of sand backfill is estimated to be placed in this SMA. • No further action in SMA-4 due to the completeness of the 2016 interim action. • Institutional controls, as necessary.

Alternative	Alternative 6	Alternative 7	Alternative 8	Alternative 9	Alternative 10
Disproportionate Cost Analysis Criteria [173-340-360(3)(f) and SMS 173-204-570(4)] and Ecology Publication No. 17-09-052 – Relative Benefit Evaluation (Scored from 1 = Low to 10 = High)					
Protectiveness	Score = 7.5	Score = 8	Score = 8.5	Score = 8.5	Score = 9.5
"Overall protectiveness of human health and the environment, including the degree to which existing risks are reduced, time required to reduce risk at the facility and attain cleanup standards, on-site and offsite risks resulting from implementing the alternative, and improvement of the overall environmental quality. This also includes evaluating potential risks to the integrity of the remedy from climate change impacts."	• Achieves a moderate-high degree of protectiveness. MNR reduces risk to a lower degree as compared to other remedies as it relies on natural attenuation and a restoration timeframe to meet cleanup standards. Containment/CDF reduces risk to a high degree as it contains and isolates contaminated media in an engineered structure and eliminates the need to perform remedial action such as removal to address the in-place contamination located within the CDF footprint. Full removal reduces risk to a high degree as contaminants are permanently removed from exposure pathways and cleanup standards are met following implementation of the remedy. • This alternative is expected to attain cleanup standards within a reasonable restoration timeframe (≤ 10 years) as described in Table 10-1 under the requirement of "Compliance with Cleanup Standards." Areas subject to containment/CDF and full removal will meet cleanup standards on completion of the remedy construction. • The primary risk associated with implementing this alternative is the potential for the MNR area to not meet cleanup standards within the reasonable restoration timeframe (≤ 10 years). • Under this alternative, a significant amount (approximately 68% by volume) of the Marine Area contamination is addressed through containment/CDF and full removal, which meet cleanup standards and improves environmental quality at the Marine Area immediately following construction. A substantial amount of the remaining contamination (approximately 32% by volume) is addressed using MNR, which relies on restoration timeframe to improve environmental quality. Under this alternative, approximately 99% of the dredged material are estimated to be disposed of in the on-site CDF while the remaining approximately 1% will require off-site transport and landfill disposal. As a result, carbon emissions resulting from this alternative are reduced significantly relative to offsite disposal due to the reduced off-site transportation activities. This alternative will result in an improvement of overall environmental quality at a moderate-high level. • The remedy element of this alternative that could be most impacted by climate change (e.g., sea level rise) is MNR, which is implemented in SMA-1 and 7. SMA-1 is subtidal and therefore, the effects of climate change is not anticipated. Portions of SMA-7 are intertidal and climate change has the potential of impacting MNR in this SMA if conditions for natural sedimentation are diminished. Full removal of contaminated media	• Achieves a high degree of protectiveness. MNR reduces risk to a lower degree as compared to other remedies as it relies on natural attenuation and a restoration timeframe to meet cleanup standards. ENR reduces risks to a moderate degree due to the placement of sand to reduce contaminant concentrations and the time frame for meeting cleanup standards. Containment/CDF reduces risk to a high degree as it contains and isolates contaminated media in an engineered structure and eliminates the need to perform remedial action such as removal to address the in-place contamination located within the CDF footprint. Full removal reduces risk to a high degree as contaminants are permanently removed from exposure pathways and cleanup standards are met following implementation of the remedy. • This alternative is expected to attain cleanup standards within a reasonable restoration timeframe (≤ 10 years) as described in Table 10 under the requirement of "Compliance with Cleanup Standards." Areas subject to containment/CDF and full removal will meet cleanup standards on completion of the remedy construction. • The primary risks associated with implementing this alternative is the potential for the MNR and ENR areas to not meet cleanup standards within the reasonable restoration timeframe (≤ 10 years). Under this alternative, a significant amount (approximately 68% by volume) of the Marine Area contamination is addressed through containment/CDF and full removal, which meet cleanup standards and improves environmental quality at the Marine Area immediately following construction. A substantial amount of contamination (approximately 32% by volume) is addressed using MNR and ENR, both of which rely on restoration timeframe to improve environmental quality. ENR reduces restoration timeframe through placement of a thin layer of sand and thus provides for a better environmental quality as compared to MNR. Under this alternative, approximately 99% of the dredged material are estimated to be disposed of in the on-site CDF while the remaining approximately 1% will require off-site transport and landfill disposal. As a result, carbon emissions resulting from this alternative are reduced significantly relative to offsite disposal due to the reduced off-site transportation activities. This alternative will result in an improvement of overall environmental quality at a high level. • The remedy element of this alternative that could be most impacted by climate change (e.g., sea	• Achieves a high degree of protectiveness. MNR reduces risk to a lower degree as compared to other remedies as it relies on natural attenuation and a restoration timeframe to meet cleanup standards. ENR reduces risks to a moderate degree due to the placement of sand to reduce contaminant concentrations and the time frame for meeting cleanup standards. Dynamic sand cap reduces risk to a moderate-high degree by isolating the contaminated media from surrounding aquatic environment. Containment/CDF reduces risk to a high degree as it contains and isolates contaminated media in an engineered structure and eliminates the need to perform remedial action such as removal to address the in-place contamination located within the CDF footprint. Full removal reduces risk to a high degree as contaminants are permanently removed from exposure pathways and cleanup standards are met following implementation of the remedy. • This alternative is expected to attain cleanup standards within a reasonable restoration timeframe (≤ 10 years) as described in Table 10 under the requirement of "Compliance with Cleanup Standards." Areas subject to containment/CDF and full removal will meet cleanup standards on completion of the remedy construction. • The primary risks with implementing this alternative include the potential for the MNR and ENR areas to not meet cleanup standards within a reasonable restoration timeframe (≤ 10 years). • Under this alternative, a significant amount (approximately 78% by volume) of the Marine Area contamination is addressed through containment/CDF, full removal and dynamic sand capping, which meet cleanup standards and improves environmental quality at the Marine Area immediately following construction. A considerable amount (approximately 22% by volume) of contamination is addressed using MNR and ENR, which relies on restoration timeframe to improve environmental quality. Under this alternative, approximately 99% of the dredged material are estimated to be disposed in the on-site CDF while the remaining approximately 1% will require off-site transport and landfill disposal. As a result, carbon emissions resulting from this alternative are reduced significantly relative to offsite disposal due to the reduced off-site transportation activities. This alternative will result in an improvement of overall environmental quality at a high level. The remedy element of this alternative that could be most impacted by climate change (e.g., sea level rise) include MNR, ENR and dynamic sand capping, which are	• Achieves a high degree of protectiveness. MNR reduces risk to a lower degree as compared to other remedies as it relies on natural attenuation and a restoration timeframe to meet cleanup standards. ENR reduces risks to a moderate degree due to the placement of sand to reduce contaminant concentrations and the time frame for meeting cleanup standards. Containment/CDF reduces risk to a high degree as it contains and isolates contaminated media in an engineered structure and eliminates the need to perform remedial action such as removal to address the in-place contamination located within the CDF footprint. Full removal reduces risk to a high degree as contaminants are permanently removed from exposure pathways and cleanup standards are met following implementation of the remedy. • This alternative is expected to attain cleanup standards within a reasonable restoration timeframe (≤ 10 years) as described in Table 10 under the requirement of "Compliance with Cleanup Standards." Areas subject to containment/CDF and full removal will meet cleanup standards on completion of the remedy construction. • The primary risks with implementing this alternative include ineffective removal in the deeper water areas and the potential for the MNR and ENR areas to not meet cleanup standards within the reasonable restoration timeframe (≤ 10 years). Dredging in deeper areas of the Site presents significant challenges to place dredge bucket accurately and precisely, potentially resulting in incomplete dredging and contaminated dredging residuals. Deeper water increases the potential for contaminant losses to the water column as the dredged material is raised to the surface. Under this alternative, a significant amount (approximately 78% by volume) of the Marine Area contamination is addressed through containment/CDF and full removal, which meet cleanup standards and improves environmental quality at the Marine Area immediately following construction. A considerable amount (approximately 22% by volume) of contamination is addressed using MNR and ENR, which relies on restoration timeframe to improve environmental quality. Under this alternative, approximately 79% of the dredged material are estimated to be disposed of in the on-site CDF while the remaining approximately 21% will require off-site transport and landfill disposal. As a result, carbon emissions resulting from this alternative are reduced relative to offsite disposal due to the partially reduced off-	• Achieves a high degree of protectiveness. ENR reduces risks to a moderate degree due to the placement of sand to reduce contaminant concentrations and the time frame for meeting cleanup standards. Containment/CDF reduces risk to a high degree as it contains and isolates contaminated media in an engineered structure and eliminates the need to perform remedial action such as removal to address the in-place contamination located within the CDF footprint. Full removal reduces risk to a high degree as contaminants are permanently removed from exposure pathways and cleanup standards are met following implementation of the remedy. • This alternative is expected to attain cleanup standards following the completion of construction as described in Table 10 under the requirement of "Compliance with Cleanup Standards." • Cleanup standards are expected to be met at the completion of construction; however, the primary risks with implementing this alternative include ineffective removal in the deeper water areas and the potential of not maintaining cleanup standards in the ENR area. Dredging in deeper areas of the Site presents significant challenges to place dredge bucket accurately and precisely, potentially resulting in incomplete dredging and contaminated dredging residuals. Deeper water increases the potential for contaminant losses to the water column as the dredged material is raised to the surface. • Under this alternative, a significant amount (approximately 83% by volume) of the Marine Area contamination is addressed through containment/CDF and full removal, which meets cleanup standards and improves environmental quality at the Marine Area immediately following construction. A considerable amount (approximately 17% by volume) is addressed using ENR, which relies on restoration timeframe to improve environmental quality. Under this alternative, approximately 570% of the dredged material are estimated to be disposed in the on-site CDF while the remaining approximately 30% will require off-site transport and landfill disposal. As a result, carbon emissions resulting from this alternative are reduced relative to offsite disposal due to the partially reduced off-site transportation activities. This alternative will result in an improvement of overall environmental quality at a high level. • The remedy element of this alternative that could be most impacted by climate change (e.g., sea level rise) is ENR, which is implemented in SMA-1a, 1b and 1c, which are subtidal. Full removal of contaminated media in SMAs-1d, 2, 3 and 6,

Alternative	Alternative 6	Alternative 7	Alternative 8	Alternative 9	Alternative 10
(Protectiveness Continued)	in SMAs-2, 3 and 6, containment/CDF in SMA-5 and no action in SMA-4 are not expected to be impacted by climate change. The top of CDF wall will be constructed at an elevation that is at or above the adjacent upland areas where Port terminal facilities are located, and therefore, climate change such as sea level rise is not expected to impact CDF. Port terminal facilities are well above sea level and are not expected to be impacted by sea level rise in the foreseeable future. This alternative will result in a loss of aquatic habitat and waters of the State at the Site. SMAs 3c, 5, 6 and 7 contain critical aquatic habitat elevations. Construction of CDF in SMA-5 will result in loss of aquatic habitat and waters of the State. Full removal of contaminated sediment and wood debris in 3c and 6 will result in the loss of critical habitat elevations. MNR in SMA-7 does not affect habitat elevations and therefore, will not result in the loss of critical aquatic habitat. A habitat mitigation plan will be developed as part of the project permitting process in consultation with regulatory agencies and will be implemented to offset the loss of aquatic habitat and waters of the State resulting from this alternative. The Port anticipates use of the advanced habitat mitigation at the Blue Heron Slough Conservation and Mitigation Bank as part of the offset to habitat impacts resulting from the remedial action.	level rise) include MNR and ENR, which are implemented in SMA-1 and/or 7. SMA-1 is subtidal and therefore effects of climate change are not anticipated. Portions of SMA-7 are intertidal and climate change has a potential of impacting ENR in this SMA if conditions for natural sedimentation are diminished. Full removal of contaminated media in SMAs-2, 3 and 6, containment/CDF in SMA-5 and no action in SMA-4 are not expected to be impacted by climate change. The top of CDF wall will be constructed at an elevation that is at or above the adjacent upland areas where Port terminal facilities are located, and therefore, climate change such as sea level rise is not expected to impact CDF. Port terminal facilities are well above sea level and are not expected to be impacted by sea level rise in the foreseeable future. • This alternative will result in a loss of aquatic habitat and waters of the State at the Site. SMAs 3c, 5, 6 and 7 contain critical aquatic habitat elevations. Construction of CDF in SMA-5 will result in loss of aquatic habitat and waters of the State. Full removal of contaminated sediment and wood debris in 3c and 6 will result in the loss of critical habitat elevations. ENR in SMA-7 does not affect habitat elevations and therefore, will not result in the loss of critical aquatic habitat. A habitat mitigation plan will be developed as part of the project permitting process in consultation with regulatory agencies and will be implemented to offset the loss of aquatic habitat and waters of the State resulting from this alternative. The Port anticipates use of the advanced habitat mitigation at the Blue Heron Slough Conservation and Mitigation Bank as part of the offset to habitat impacts resulting from the remedial action.	implemented in SMA-1 and/or 7. SMA-1 is subtidal and therefore effects of climate change are not anticipated. Portions of SMA-7 are intertidal and climate change has a potential of impacting ENR in this SMA if conditions for natural sedimentation are diminished. Full removal of contaminated media in SMAs-2, 3 and 6, containment/CDF in SMA-5 and no action in SMA-4 are not expected to be impacted by climate change. The top of CDF wall will be constructed at an elevation that is at or above the adjacent upland areas where Port terminal facilities are located, and therefore, climate change such as sea level rise is not expected to impact CDF. Port terminal facilities are well above sea level and are not expected to be impacted by sea level rise in the foreseeable future. • This alternative will result in a loss of aquatic habitat and waters of the State at the Site. SMAs 3c, 5, 6 and 7 contain critical aquatic habitat elevations. Construction of CDF in SMA-5 will result in loss of aquatic habitat and waters of the State. Full removal of contaminated sediment and wood debris in 3c and 6 will result in the loss of critical habitat elevations. ENR in SMA-7 does not affect habitat elevations and therefore, will not result in the loss of critical aquatic habitat. A habitat mitigation plan will be developed as part of the project permitting process in consultation with regulatory agencies and will be implemented to offset the loss of aquatic habitat and waters of the State resulting from this alternative. The Port anticipates use of the advanced habitat mitigation at the Blue Heron Slough Conservation and Mitigation Bank as part of the offset to habitat impacts resulting from the remedial action.	site transportation activities. This alternative will result in an improvement of overall environmental quality at a high level. • The remedy element of this alternative that could be most impacted by climate change (e.g., sea level rise) include MNR and ENR, which are implemented in SMA-1a, 1b, 1c and/or 7. SMAs-1a, 1b and 1c are subtidal and therefore effects of climate change are not anticipated. Portions of SMA-7 are intertidal and climate change has a potential of impacting ENR in this SMA if conditions for natural sedimentation are diminished. Full removal of contaminated media in SMAs-1d, 2, 3 and 6, containment/CDF in SMA-5 and no action in SMA-4 are not expected to be impacted by climate change. The top of CDF wall will be constructed at an elevation that is at or above the adjacent upland areas where Port terminal facilities are located, and therefore, climate change such as sea level rise is not expected to impact CDF. Port terminal facilities are well above sea level and are not expected to be impacted by sea level rise in the foreseeable future. • This alternative will result in a loss of aquatic habitat and waters of the State at the Site. SMAs 3c, 5, 6 and 7 contain critical aquatic habitat elevations. Construction of CDF in SMA-5 will result in loss of aquatic habitat and waters of the State. Full removal of contaminated sediment and wood debris in 3c and 6 will result in the loss of critical habitat elevations. ENR in SMA-7 does not affect habitat elevations and therefore, will not result in the loss of critical aquatic habitat. A habitat mitigation plan will be developed as part of the project permitting process in consultation with regulatory agencies and will be implemented to offset the loss of aquatic habitat and waters of the State resulting from this alternative. The Port anticipates use of the advanced habitat mitigation at the Blue Heron Slough Conservation and Mitigation Bank as part of the offset to habitat impacts resulting from the remedial action.	containment/CDF in SMA-5, full removal and backfill in SMA-7, and no action in SMA-4 are not expected to be impacted by climate change. The top of CDF wall will be constructed at an elevation that is at or above the adjacent upland areas where Port terminal facilities are located, and therefore, climate change such as sea level rise is not expected to impact CDF. Port terminal facilities are well above sea level and are not expected to be impacted by sea level rise in the foreseeable future. Therefore, remedies implemented as part of this alternative are not expected to be impacted by climate change. • This alternative will result in a loss of aquatic habitat and waters of the State at the Site. SMAs 3c, 5, 6 and 7 contain critical aquatic habitat elevations. Construction of CDF in SMA-5 will result in loss of aquatic habitat and waters of the State. Full removal of contaminated sediment and wood debris in 3c and 6 will result in the loss of critical habitat elevations. Full removal and backfill to restore existing elevations in SMA-7 does not affect habitat elevations and therefore, will not result in the loss of critical aquatic habitat. A habitat mitigation plan will be developed as part of the project permitting process in consultation with regulatory agencies and will be implemented to offset the loss of aquatic habitat and waters of the State resulting from this alternative. The Port anticipates use of the advanced habitat mitigation at the Blue Heron Slough Conservation and Mitigation Bank as part of the offset to habitat impacts resulting from the remedial action.

Alternative	Alternative 6	Alternative 7	Alternative 8	Alternative 9	Alternative 10
Permanence	Score = 6	Score = 6.5	Score = 7	Score = 7.5	Score = 8
"The degree to which the alternative permanently reduces the toxicity, mobility or volume of hazardous substances, including the adequacy of the alternative in destroying the hazardous substances, the reduction or elimination of hazardous substance releases and sources of releases, the degree of irreversibility of waste treatment process, and the characteristics and quantity of treatment residuals generated."	• Achieves a moderate degree of permanence because approximately 32% by volume of contaminated media is addressed using MNR, approximately 37% is addressed using containment/CDF and approximately 31% is addressed using full removal. MNR relies on natural attenuation processes to reduce toxicity, mobility, and volume. Containment/CDF reduces the mobility of hazardous substances following implementation. Containment/CDF does not immediately reduce toxicity and volume of hazardous substances but prevents exposure through isolation. Full removal immediately reduces toxicity, mobility, and volume of hazardous substance from the Marine Area following construction. • Contamination addressed using MNR will naturally degrade and attenuate over time. • Contamination addressed by full removal is not destroyed but will be contained/disposed in an on-site CDF or at off-site permitted landfill where it will be permanently isolated from the environment. The containment of contaminated media in the CDF is permanent, however, due to the location, does not result in reduction of volume at the Site. • The historic processes generating hazardous substances at the Marine Area are no longer in operation. A passive ongoing source of contamination to the surface sediment of Marine Area can be attributed to erosion and dispersal of the historical contamination. This alternative will result in complete removal or containment of contamination from the source areas that are subjected to scour (SMAs-2, 3, 5 and 6) and thus will eliminate this source. • Treatment proposed under this alternative is through natural degradation and attenuation processes, which are irreversible and will not generate treatment residuals.	• Achieves a moderate degree of permanence because approximately 32% by volume of contaminated media is addressed using MNR and ENR, approximately 37% is addressed using containment/CDF and approximately 31% is addressed using full removal. MNR relies on natural attenuation processes to reduce toxicity, mobility, and volume. ENR involves placement of a thin layer of sand to reduce contaminant concentrations and the timeframe in which natural attenuation processes work to reduce toxicity, mobility, and volume. Containment/CDF reduces the mobility of hazardous substances following implementation. Containment/CDF does not immediately reduce toxicity and volume of hazardous substances but prevents exposure through isolation. Full removal immediately reduces toxicity, mobility, and volume of hazardous substances from the Marine Area following construction. • Contamination addressed using MNR and ENR will naturally degrade and attenuate over time. • Contamination addressed by full removal is not destroyed but will be contained/disposed in an on-site CDF or at off-site permitted landfill where it will be permanently isolated from the environment. The containment of contaminated media in the CDF is permanent, however, due to the location, does not result in reduction of volume at the Site. • The historic processes generating hazardous substances at the Marine Area are no longer in operation. A passive ongoing source of contamination to the surface sediment of Marine Area can be attributed to erosion and dispersal of the historical contamination. This alternative will result in complete removal or containment of contamination from the source areas that are subjected to scour (SMAs-2, 3, 5 and 6) and thus will eliminate this source. • Treatment proposed under this alternative is through natural degradation and attenuation processes, which are irreversible and will not generate treatment residuals.	• Achieves a moderate degree of permanence because approximately 22% by volume of contaminated media is addressed using MNR and ENR, approximately 10% is addressed using dynamic sand capping, approximately 37% is addressed using containment/CDF and approximately 31% is addressed using full removal. MNR relies on natural attenuation processes to reduce toxicity, mobility, and volume. ENR involves placement of a thin layer of sand to reduce contaminant concentrations and the timeframe in which natural attenuation processes work to reduce toxicity, mobility, and volume. Dynamic sand capping reduces the mobility of hazardous substances through placement and distribution of 3-feet equivalent mass of sand to isolate the underlying contamination. The CDF reduces the mobility of hazardous substances following completion of construction. Dynamic sand capping and containment/CDF do not immediately reduce toxicity and volume of hazardous substances but prevents exposure through isolation. Full removal immediately reduces toxicity, mobility, and volume of hazardous substances from the Marine Area following construction. • Contamination addressed using MNR, ENR and dynamic sand cap will naturally degrade and attenuate over time. • Contamination addressed using dynamic sand capping is not destroyed but isolated from the aquatic environment to prevent exposure. Contamination addressed by full removal is not destroyed but will be contained/disposed in an on-site CDF or at off-site permitted landfill where it will be permanently isolated from the environment. The containment of contaminated media in the CDF is permanent, however, due to the location, does not result in reduction of volume at the Site. • The historic processes generating hazardous substances at the Marine Area are no longer in operation. A passive ongoing source of contamination to the surface sediment of Marine Area can be attributed to erosion and dispersal of the historical contamination. This alternative will result in complete removal or containment of contamination from the source areas that are subjected to scour (SMAs-2, 3, 5 and 6) and thus will eliminate this source. • Treatment proposed under this alternative is through natural degradation and attenuation processes, which are irreversible and will not generate treatment residuals.	• Achieves a moderate-high degree of permanence because approximately 22% by volume of contaminated media is addressed using MNR and ENR, approximately 37% is addressed using containment/CDF and approximately 41% is addressed using full removal. MNR relies on natural attenuation processes to reduce toxicity, mobility, and volume. ENR involves placement of a thin layer of sand to reduce contaminant concentrations and the timeframe in which natural attenuation processes work to reduce toxicity, mobility, and volume. Containment/CDF reduces the mobility of hazardous substances following implementation. Containment/CDF does not immediately reduce toxicity and volume of hazardous substances but prevents exposure through isolation. Full removal immediately reduces toxicity, mobility, and volume of hazardous substances from the Marine Area following construction. Dredging in deeper water areas poses a risk for incomplete removal or residuals which would act to lower the degree of permanence. • Contamination addressed using MNR and ENR will naturally degrade and attenuate over time. • Contamination addressed by full removal is not destroyed but will be contained/disposed in an on-site CDF or at off-site permitted landfill where it will be permanently isolated from the environment. The containment of contaminated media in the CDF is permanent, however, due to the location, does not result in reduction of volume at the Site. • The historic processes generating hazardous substances at the Marine Area are no longer in operation. A passive ongoing source of contamination to the surface sediment of Marine Area can be attributed to erosion and dispersal of the historical contamination. This alternative will result in complete removal or containment of contamination from the source areas that are subjected to scour (SMAs-2, 3, 5 and 6) and thus will eliminate this source. • Treatment proposed under this alternative is through natural degradation and attenuation processes, which are irreversible and will not generate treatment residuals.	• Achieves a high degree of permanence because approximately 17% by volume of contaminated media is addressed using ENR, approximately 37% is addressed using containment/CDF and approximately 46% is addressed using full removal. ENR involves placement of a thin layer of sand to reduce contaminant concentrations and the timeframe in which natural attenuation processes work to reduce toxicity, mobility, and volume. Containment/CDF reduces the mobility of hazardous substances following implementation. Containment/CDF does not immediately reduce toxicity and volume of hazardous substances but prevents exposure through isolation. Full removal immediately reduces toxicity, mobility, and volume of hazardous substances from the Marine Area following construction. Dredging in deeper water areas poses a risk for incomplete removal or residuals which would act to lower the degree of permanence. • Contamination addressed using ENR will naturally degrade and attenuate over time. • Contamination addressed by full removal is not destroyed but will be contained/disposed in an on-site CDF or at off-site permitted landfill where it will be permanently isolated from the environment. The containment of contaminated media in the CDF is permanent, however, due to the location, does not result in reduction of volume at the Site. • The historic processes generating hazardous substances at the Marine Area are no longer in operation. A passive ongoing source of contamination to the surface sediment of Marine Area can be attributed to erosion and dispersal of the historical contamination. This alternative will result in complete removal or containment of contamination from the source areas that are subjected to scour (SMAs-2, 3, 5 and 6) and thus will eliminate this source. • Treatment proposed under this alternative is through natural degradation and attenuation processes, which are irreversible and will not generate treatment residuals.

Alternative	Alternative 6	Alternative 7	Alternative 8	Alternative 9	Alternative 10
Long-Term Effectiveness	**Score = 6.5**	**Score = 6.5**	**Score = 7**	**Score = 7.5**	**Score = 8.0**
"Long-term effectiveness includes the degree of certainty that the alternative will be successful, the reliability of the alternative during the period of time hazardous substances are expected to remain on-site at concentrations that exceed cleanup levels, the magnitude of residual risk with the alternative in place, and the effectiveness of controls required to manage treatment residues or remaining wastes."	• Achieves a moderate degree of long-term effectiveness due to its reliance on MNR to address contaminated media (approximately 32% by volume) located outside of the containment/CDF and full removal areas at the Site. • Given that the technologies used in this alternative are well established and proven, this alternative is considered reliable. • Risks are immediately reduced through the full removal and containment/CDF elements of this alternative. Until the cleanup standards are achieved through MNR in the remaining parts of the Site, risks of exposure to hazardous substances will remain, although reduced through time, until recovery is achieved over the restoration timeframe. • Under this alternative, subsurface contamination below the point of compliance will remain in the SMAs where MNR is implemented and within the containment/CDF. The contamination within SMAs with MNR may be disturbed due to unanticipated natural or man-made forces and potentially pose a risk if exposed to receptors. Potential for failure of containment/CDF structure will be managed by engineering the structure to perform its function, long-term monitoring, and performing maintenance on the structure over-time. • Institutional controls may be required to ensure the long-term effectiveness of the alternative. Institutional controls are effective if followed.	• Achieves a moderate degree of long-term effectiveness due to its reliance on MNR and ENR to address contaminated media (approximately 32% by volume) located outside of the containment/CDF and full removal areas at the Site. MNR and ENR are expected to achieve a similar degree of long-term effectiveness since both technologies rely on natural attenuation processes and both are expected to achieve cleanup standards within a reasonable restoration timeframe. • Given that the technologies used in this alternative are well established and proven, this alternative is considered reliable. • Risks are immediately reduced through the full removal and containment/CDF elements of this alternative. Until the cleanup standards are achieved through MNR and ENR in the remaining parts of the Site, risks of exposure to hazardous substances will remain, although reduced over time, until recovery is achieved over the restoration timeframe. • Under this alternative, subsurface contamination below the point of compliance will remain in the SMAs where MNR and ENR is implemented and within the containment/CDF. The contamination within SMAs with MNR and ENR may be disturbed due to unanticipated natural or man-made forces and potentially pose a risk if exposed to receptors. Potential for failure of containment/CDF structure will be managed by engineering the structure to perform its function, long-term monitoring, and performing maintenance on the structure over-time. • Institutional controls may be required to ensure the long-term effectiveness of the alternative. Institutional controls are effective if followed.	• Achieves a moderate degree of long-term effectiveness due to its reliance on MNR, ENR and dynamic sand capping to address contaminated media (approximately 32% by volume) located outside of the containment/CDF and full removal areas at the Site. Dynamic sand capping is expected to achieve a higher degree to long-term effectiveness as compared to MNR and ENR since capping will result in isolation of contaminated media while MNR and ENR rely on natural attenuation processes to reduce contaminant concentrations. • Given that the technologies used in this alternative are well established and proven, this alternative is considered reliable. • Risks are immediately reduced through the full removal, containment/CDF and dynamic sand capping elements of this alternative. Until the cleanup standards are achieved through MNR and ENR in the remaining parts of the Site, risks of exposure to hazardous substances will remain, although reduced through time, until recovery is achieved/cleanup standards are met over the restoration timeframe. • Under this alternative, subsurface contamination below the point of compliance will remain in the SMAs where MNR, ENR and dynamic sand capping are implemented and within the containment/CDF. The contamination within SMAs with MNR, ENR and dynamic sand capping may be disturbed due to unanticipated natural or man-made forces and potentially pose a risk if exposed to receptors. Potential for failure of containment/CDF structure will be managed by engineering the structure to perform its function, long-term monitoring, and performing maintenance on the structure over-time. • Institutional controls may be required to ensure the long-term effectiveness of the alternative. Institutional controls are effective if followed.	• Achieves a moderate-high degree of long-term effectiveness due to its reliance on both MNR and ENR to address contaminated media (approximately 22% by volume) located outside of the containment/CDF and full removal areas of the Site. • Given that the technologies used in this alternative are well established and proven, this alternative is considered reliable. • Risks are immediately reduced through the full removal and containment/CDF elements of this alternative. Long-term risks associated with dredging the deeper areas at the Site include potential for incomplete removal and contaminated dredging residuals due to increased implementation challenges. Until the cleanup standards are achieved through MNR and ENR in the remaining parts of the Site, risks of exposure to hazardous substances will remain, although reduced over time, until recovery is achieved over the restoration timeframe. • Under this alternative, subsurface contamination below the point of compliance will remain in the SMAs where MNR and ENR are implemented and within the containment/CDF. The contamination in SMAs with MNR and ENR may be disturbed due to unanticipated natural or man-made forces and potentially pose a risk if exposed to receptors Potential for failure of containment/CDF structure will be managed by engineering the structure to perform its function, long-term monitoring, and performing maintenance on the structure over-time. • Institutional controls may be required to ensure the long-term effectiveness of the alternative. Institutional controls are effective if followed.	• Achieves a moderate-high degree of long-term effectiveness due to reliance on ENR to address contaminated media (approximately 17% by volume) located outside of the containment/CDF and full removal areas of the Site. • Given that the technologies used in this alternative are well established and proven, this alternative is considered reliable. • Risks are immediately reduced through the full removal and containment/CDF elements of this alternative. Long-term risks associated with dredging the deep areas at the Site include potential for incomplete removal and presence of contaminated dredging residuals due to increased implementation challenges. Cleanup standards are expected to be met at the completion of construction; however, long-term risks with implementing this alternative include a potential for the ENR area to not maintain the cleanup standards. • Under this alternative, subsurface contamination below the point of compliance will remain in the SMAs where ENR is implemented and within the containment/CDF. The contamination within SMAs with ENR may be disturbed due to unanticipated natural or man-made forces and potentially pose a risk if exposed to receptors. Potential for failure of containment/CDF structure will be managed by engineering the structure to perform its function, long-term monitoring, and performing maintenance on the structure over-time. • Institutional controls may be required to ensure the long-term effectiveness of the alternative. Institutional controls are effective if followed.

Alternative	Alternative 6	Alternative 7	Alternative 8	Alternative 9	Alternative 10
Management of Short-Term Risks	**Score = 9.5**	**Score = 9**	**Score = 8.5**	**Score = 8**	**Score = 7.5**
"The risk to human health and the environment associated with the alternative during construction and implementation, and the effectiveness of measures that will be taken to manage such risks."	• Manages short-term risks to a high degree through use of common construction methods for sediment remediation. • Marine construction activities pose potential health and safety risks to construction workers and temporary impacts to water quality and marine life during construction. Moderate risks can be mitigated by isolating the work zone, notifying the public including commercial and recreational boat traffic, water quality management, street route planning for transportation of materials, and spill response preparedness. These measures are typical for marine remediation projects and are proven effective in minimizing the risks. • There is a potential for dredging residual, but it will be managed during construction by implementing necessary BMPs and compliance monitoring. • Dredging to achieve full removal in the vicinity of existing structures present significant risk to the integrity of the structures. This risk will be mitigated by installation of structural elements to protect the existing infrastructure during construction. The structural elements will be designed to meet the requirements of the construction conditions. • Approximately 99% of the dredged material are estimated to be disposed of in the on-site CDF while the remaining approximately 1% will require off-site transport and landfill disposal. As a result, the potential risk of accidental spills/releases during transportation is significantly reduced. This risk will be managed through rapid response to address potential spills. Due to the negligible quantity of dredged material requiring landfill disposal, the potential for short-term risks associated with production delays due to offsite disposal are significantly reduced. The import of sand/fill material to cover contamination in the CDF may result in short-term risks related to both the transport and placement of material.	• Manages short-term risks to a high degree through use of common construction methods for sediment remediation. • Marine construction activities pose potential health and safety risks to construction workers and temporary impacts to water quality and marine life during construction. Moderate risks can be mitigated by isolating the work zone, notifying the public including commercial and recreational boat traffic, water quality management, street route planning for transportation of materials, and spill response preparedness. These measures are typical for marine remediation projects and are proven effective in minimizing the risks. • There is a potential for dredging residual, but it will be managed during construction by implementing necessary BMPs and compliance monitoring. • Dredging to achieve full removal in the vicinity of existing structures present significant risk to the integrity of the structures. This risk will be mitigated by installation of structural elements to protect the existing infrastructure during construction. The structural elements will be designed to meet the requirements of the construction conditions. • Approximately 99% of the dredged material are estimated to be disposed of in the on-site CDF while the remaining approximately 1% will require off-site transport and landfill disposal. As a result, the potential risk of accidental spills/releases during transportation is significantly reduced. This risk will be managed through rapid response to address potential spills. Due to the negligible quantity of dredged material requiring landfill disposal, the potential for short-term risks associated with production delays due to offsite disposal are significantly reduced. • The import of sand/fill material for ENR and to cover contamination in the CDF may result in short-term risks related to both the transport and placement of material.	• Manages short-term risks to a high degree through use of common construction methods for sediment remediation. • Marine construction activities pose potential health and safety risks to construction workers and temporary impacts to water quality and marine life during construction. Moderate risks can be mitigated by isolating the work zone, notifying the public including commercial and recreational boat traffic, water quality management, street route planning for transportation of materials, and spill response preparedness. These measures are typical for marine remediation projects and are proven effective in minimizing the risks. • There is a potential for dredging residual, but it will be managed during construction by implementing necessary BMPs and compliance monitoring. • Short-term risks associated with dynamic sand cap placement include disturbance and resuspension of contaminated sediment or porewater on impact with the bottom and smothering of benthic communities and aquatic vegetation. • Dredging to achieve full removal in the vicinity of existing structures present significant risk to the integrity of the structures. This risk will be mitigated by installation of structural elements to protect the existing infrastructure during construction. The structural elements will be designed to meet the requirements of the construction conditions. • Approximately 94% of the dredged material are estimated to be disposed of in the on-site CDF while the remaining approximately 6% will require off-site transport and landfill disposal. As a result, the potential risk of accidental spills/releases during transportation is significantly reduced. This risk will be managed through rapid response to address potential spills. Due to the negligible quantity of dredged material requiring landfill disposal, the potential for short-term risks associated with production delays due to offsite disposal are significantly reduced. • The import of sand/fill material for dynamic sand capping, ENR and to cover contamination in the CDF may result in short-term risks related to both the transport and placement of material.	• Manages short-term risks to a high degree through use of common construction methods for sediment remediation. • Marine construction activities pose potential health and safety risks to construction workers and temporary impacts to water quality and marine life during construction. Moderate risks can be mitigated by isolating the work zone, notifying the public including commercial and recreational boat traffic, water quality management, street route planning for transportation of materials, and spill response preparedness. These measures are typical for marine remediation projects and are proven effective in minimizing the risks. • There is a potential for dredging residual, but it will be managed during construction by implementing necessary BMPs and compliance monitoring. This alternative involves dredging in one of the deep SMAs at the Site which has an increased risk for incomplete removal and residuals due to lower precision performance of the dredging equipment. • Dredging to achieve full removal in the vicinity of existing structures present significant risk to the integrity of the structures. This risk will be mitigated by installation of structural elements to protect the existing infrastructure during construction. The structural elements will be designed to meet the requirements of the construction conditions. • Approximately 79% of the dredged material is estimated to be disposed in the on-site CDF while the remaining approximately 21% will require off-site transport and landfill disposal. As a result, the potential risk of accidental spills/releases during transportation is reduced to a certain degree. This risk will be managed through rapid response to address potential spills. Due to the relatively low quantity of dredged material requiring landfill disposal, potential for short-term risks associated with production delays due to offsite disposal are significantly reduced. • The import of sand/fill material for ENR and to cover contamination in the CDF may result in short-term risks related to both the transport and placement of material. •	• Manages short-term risks to a moderate-high degree through use of common construction methods for sediment remediation. • Marine construction activities pose potential health and safety risks to construction workers and temporary impacts to water quality and marine life during construction. Moderate risks can be mitigated by isolating the work zone, notifying the public including commercial and recreational boat traffic, water quality management, street route planning for transportation of materials, and spill response preparedness. These measures are typical for marine remediation projects and are proven effective in minimizing the risks. • There is a potential for dredging residual, but it will be managed during construction by implementing necessary BMPs and compliance monitoring. This alternative involves dredging in one of the deep SMAs at the Site which has an increased risk for incomplete removal and residuals due to lower precision performance of the dredging equipment. • Dredging to achieve full removal in the vicinity of existing structures present significant risk to the integrity of the structures. This risk will be mitigated by installation of structural elements to protect the existing infrastructure during construction. The structural elements will be designed to meet the requirements of the construction conditions. • Approximately 70% of the dredged material are estimated to be disposed of in the on-site CDF while the remaining approximately 30% will require off-site transport and landfill disposal. As a result, the potential risk of accidental spills/releases during transportation is reduced to a certain degree. This risk will be managed through rapid response to address potential spills. Due to the relatively low quantity of dredged material requiring landfill disposal, potential for short-term risks associated with production delays due to offsite disposal are significantly reduced. • The import of sand/fill material for ENR and to cover contamination in the CDF may result in short-term risks related to both the transport and placement of material.

Alternative	Alternative 6	Alternative 7	Alternative 8	Alternative 9	Alternative 10
Technical and Administrative Implementability	Score = 9.5	Score = 9	Score = 8.5	Score = 7.5	Score = 7
"Ability to be implemented including consideration of whether the alternative is technically possible, availability of necessary offsite facilities, services and materials, administrative and regulatory requirements, scheduling, size, complexity, monitoring requirements, access for construction operations and monitoring, and integration with existing facility operations and other current or potential remedial actions."	• Achieves a high level of technical implementability through the use of common marine construction methods to complete the remedial action including the construction of the South Terminal toe wall and Containment/CDF. A significant area of the Site requires only monitoring under this alternative. • Administrative implementability will be addressed by meeting the cleanup objectives and other regulatory and permitting requirements for the project. • This alternative requires the Containment/CDF to be located within SMA-5 to not limit the identified current or future Site uses. Other elements of this alternative do not limit the identified current or future Site uses. • Due to the magnitude and complexity, multiple in-water work seasons will be required to complete construction on this alternative. • Dredging activities, and construction of the South Terminal toe wall and containment/CDF wall will require coordination with Port's operations to minimize impact on vessel operations at Port's terminals. Outside of the Port's navigational areas access for construction activities, and future maintenance/monitoring will not be limited by site operations. • Offsite landfill facilities will be required for the disposal of 1,770 tons of contaminated material. Capacity limitations on transportation and landfill disposal are not expected to pose management and schedule challenges for this alternative. • The use of MNR reduces the overall dredged material volume and need for precision materials placement or dredging in the deeper areas of the Site. • Monitoring will be required to confirm the effectiveness of MNR to achieve the cleanup standards within the restoration timeframe.	• Achieves a high level of technical implementability through the use of common marine construction methods to complete the remedial action including the construction of the South Terminal toe wall and Containment/CDF. • Administrative implementability will be addressed by meeting the cleanup objectives and other regulatory and permitting requirements for the project. • This alternative requires the Containment/CDF to be located within SMA-5 to not limit the identified current or future Site uses. Other elements of this alternative do not limit the identified current or future Site uses. • Due to the magnitude and complexity, multiple in-water work seasons will be required to complete construction on this alternative. • Dredging activities and construction of the South Terminal toe wall and containment/CDF wall will require coordination with Port's operations to minimize impact on vessel operations at Port's terminals. Outside of the Port's navigational areas access for construction activities, and future maintenance/monitoring will not be limited by site operations. • Offsite landfill facilities will be required for the disposal of 1,770 tons of contaminated material. Capacity limitations on transportation and landfill disposal are not expected to pose management and schedule challenges for this alternative. • The use of MNR and ENR reduces the overall dredged material volume and the need for precision materials placement or dredging in the deeper areas of the Site. • Placing ENR sand in deep water column is not expected to pose significant technical challenges since sand placed for ENR purposes does not require the precision that is necessary for capping and can effectively be implemented in deeper water areas. • Monitoring will be required to confirm the effectiveness of MNR and ENR to achieve the cleanup standards within the restoration timeframe.	• Achieves a moderate-high level of technical implementability through the use of common marine construction methods to complete the remedial action including the construction of the South Terminal toe wall and Containment/CDF. • Administrative implementability will be addressed by meeting the cleanup objectives and other regulatory and permitting requirements for the project. • This alternative requires the Containment/CDF to be located within SMA-5 to not limit the identified current or future Site uses. Other elements of this alternative do not limit the identified current or future Site uses. • Due to the magnitude and complexity, multiple in-water work seasons will be required to complete construction on this alternative. • Dredging activities and construction of the South Terminal toe wall and containment/CDF wall will require coordination with Port's operations to minimize impact on vessel operations at Port's terminals. Outside of the Port's navigational areas access for construction activities, and future maintenance/monitoring will not be limited by site operations. • Offsite landfill facilities will be required for the disposal of 15.320 tons of contaminated material. Capacity limitations on transportation and landfill disposal are not expected to pose management and schedule challenges for this alternative. • The use of MNR, ENR and dynamic sand capping reduces the overall dredged material volume and need for precision materials placement or dredging in the deeper areas of the Site. • Placing ENR sand in deep water and dynamic sand cap material in moderately deep water is not expected to pose significant technical challenges since the sand placement techniques to implement these technologies do not require the precision that is necessary for conventional or amended/reactive capping. • Monitoring will be required to confirm the effectiveness of MNR and ENR to achieve the cleanup standards within the restoration timeframe and to confirm the effectiveness of the dynamic sand caps.	• Achieves a moderate-high level of technical implementability through the use of common marine construction methods to complete the remedial action including the construction of the South Terminal toe wall and Containment/CDF. • Administrative implementability will be addressed by meeting the cleanup objectives and other regulatory and permitting requirements for the project. • This alternative requires the Containment/CDF to be located within SMA-5 to not limit the identified current or future Site uses. Other elements of this alternative do not limit the identified current or future Site uses. • Due to the magnitude and complexity, multiple in-water work seasons will be required to complete construction on this alternative. • Dredging activities and construction of the South Terminal toe wall and containment/CDF wall will require coordination with Port's operations to minimize impact on vessel operations at Port's terminals. Outside of the Port's navigational areas access for construction activities, and future maintenance/monitoring will not be limited by site operations. • Offsite landfill facilities will be required for the disposal of 61,260 tons of contaminated material. Capacity limitations on transportation and landfill disposal are not expected to pose significant management and schedule challenges for this alternative. • The use of MNR and ENR reduces the overall dredged material volume and the need for precision materials placement or dredging in the deeper areas of the Site. • Placing ENR sand in deep water column is not expected to pose significant technical challenges since sand placed for ENR purposes does not require the precision that is necessary for capping and can effectively be implemented in deeper water areas. • Dredging is proposed in SMA-1d with mudline up to -75 feet MLLW. Significant inherent technical challenges are associated with the precision dredging in deep water and risk potential schedule delays, incomplete dredging, residuals, releases to the water column and increased cost due to over-dredging. • Monitoring will be required to confirm the effectiveness of MNR and ENR to achieve the cleanup standards within the restoration timeframe.	• Achieves a moderate-high level of technical implementability through the use of common marine construction methods to complete the remedial action including the construction of the toe South Terminal wall and Containment/CDF. • Administrative implementability will be addressed by meeting the cleanup objectives and other regulatory and permitting requirements for the project. • This alternative requires the Containment/CDF to be located within SMA-5 to not limit the identified current or future Site uses. Other elements of this alternative do not limit the identified current or future Site uses. • Due to the magnitude and complexity, multiple in-water work seasons will be required to complete construction on this alternative. • Dredging activities and construction of the South Terminal toe wall and containment/CDF wall will require coordination with Port's operations to minimize impact on vessel operations at Port's terminals. Outside of the Port's navigational areas access for construction activities, and future maintenance/monitoring will not be limited by site operations. • Offsite landfill facilities will be required for the disposal of 96,560 tons of contaminated material. Capacity limitations on transportation and landfill disposal are not expected to pose significant management and schedule challenges for this alternative. • The use ENR reduces the overall dredged material volume and need for precision materials placement or dredging in the deeper areas of the Site. • Placing ENR sand in deep water column is not expected to pose significant technical challenges since sand placed for ENR purposes does not require the precision that is necessary for capping and can effectively be implemented in deeper water areas. • Dredging is proposed in SMA-1d with mudline up to -75 feet MLLW. Significant inherent technical challenges are associated with the precision dredging in deep water and risk potential schedule delays, incomplete dredging, residuals, releases to the water column and increased cost due to over-dredging. • Monitoring will be required to confirm the effectiveness of ENR to achieve the cleanup standards within the restoration timeframe.

Alternative	Alternative 6	Alternative 7	Alternative 8	Alternative 9	Alternative 10
Consideration of Public Concerns	**Score = 7.5**	**Score = 8**	**Score = 8.5**	**Score = 8.5**	**Score = 9.5**
"Whether the community has concerns regarding the alternative and, if so, the extent to which the alternative addresses those concerns. This process includes concerns from individuals, community groups, local governments, tribes, federal and state agencies, or any other organization that may have an interest in or knowledge of the site."	• Public concerns are not yet known. • It is assumed that protectiveness is the greatest public concern and therefore, the score for this criterion considers the relative benefit score for protectiveness. • It is also anticipated that the public will be concerned about traffic and noise disturbances and potential exposure to contaminated material resulting from accidental release during transportation of contaminated dredged material on public streets and/or highway. This alternative has reduced traffic, noise, and potential contaminant exposure as a result of the use of CDF technology and therefore, the relative benefit score based on protectiveness is not modified. • The relative benefit score for this criterion will be reviewed and revised as necessary after receiving public comments on the RI/FS.	• Public concerns are not yet known. • It is assumed that protectiveness is the greatest public concern and therefore, the score for this criterion considers the relative benefit score for protectiveness as modified by the considerations described below. • It is also anticipated that the public will be concerned about traffic and noise disturbances and potential exposure to contaminated material resulting from accidental release during transportation of contaminated dredged material on public streets and/or highway. This alternative has reduced traffic, noise, and potential contaminant exposure as a result of the use of CDF technology and therefore, the relative benefit score based on protectiveness is not modified. • The relative benefit score for this criterion will be reviewed and revised as necessary after receiving public comments on the RI/FS.	• Public concerns are not yet known. • It is assumed that protectiveness is the greatest public concern and therefore, the score for this criterion considers the relative benefit score for protectiveness as modified by the considerations described below. • It is also anticipated that the public will be concerned about traffic and noise disturbances and potential exposure to contaminated material resulting from accidental release during transportation of contaminated dredged material on public streets and/or highway. This alternative has reduced traffic, noise, and potential contaminant exposure as a result of the use of CDF technology and therefore, the relative benefit score based on protectiveness is not modified. • The relative benefit score for this criterion will be reviewed and revised as necessary after receiving public comments on the RI/FS.	• Public concerns are not yet known. • It is assumed that protectiveness is the greatest public concern and therefore, the score for this criterion considers the relative benefit score for protectiveness as modified by the considerations described below. • It is also anticipated that the public will be concerned about traffic and noise disturbances and potential exposure to contaminated material resulting from accidental release during transportation of contaminated dredged material on public streets and/or highway. This alternative has reduced traffic, noise, and potential contaminant exposure as a result of the use of CDF technology and therefore, the relative benefit score based on protectiveness is not modified. • The relative benefit score for this criterion will be reviewed and revised as necessary after receiving public comments on the RI/FS.	• Public concerns are not yet known. • It is assumed that protectiveness is the greatest public concern and therefore, the score for this criterion considers the relative benefit score for protectiveness as modified by the considerations described below. • It is also anticipated that the public will be concerned about traffic and noise disturbances and potential exposure to contaminated material resulting from accidental release during transportation of contaminated dredged material on public streets and/or highway. This alternative has reduced traffic, noise, and potential contaminant exposure as a result of the use of CDF technology and therefore, the relative benefit score based on protectiveness is not modified. • The relative benefit score for this criterion will be reviewed and revised as necessary after receiving public comments on the RI/FS.

Notes:

BMPs = best management practices
CDF = confined disposal facility
COCs = contaminants of concern
DCA = Disproportionate Cost Analysis
Ecology = Washington State Department of Ecology
ENR = enhanced natural recovery
MNR = monitored natural recovery
MTCA = Model Toxics Control Act
RI/FS = Remedial Investigation/Feasibility Study
SMA = sediment management area

Table 8

Summary of Relative Benefits Ranking, Cost and Relative Benefit/Cost Ratios for Alternatives

Weyerhaeuser Mill A Former

Everett, Washington

Remedial Alternatives	1	2	3	4	5	6	7	8	9	10
Relative Benefits Ranking for DCA Criteria[1]										
Protectiveness	7.00	7.50	8.00	8.00	9.00	7.50	8.00	8.50	8.50	9.50
Permanence	6.50	7.00	7.50	8.00	8.50	6.00	6.50	7.00	7.50	8.00
Long-Term Effectiveness	7.00	7.00	7.50	8.00	8.50	6.50	6.50	7.00	7.50	8.00
Management of Short-Term Risk	7.50	7.00	6.50	6.00	5.50	9.50	9.00	8.50	8.00	7.50
Technical and Administrative Implementability	8.50	8.00	7.50	6.50	6.00	9.50	9.00	8.50	7.50	7.00
Consideration of Public Concerns	6.50	7.00	7.50	7.50	8.50	7.50	8.00	8.50	8.50	9.50
Weighted[2] Relative Benefits Ranking for DCA Criteria[1]										
Protectiveness (weighted as 30%)	2.10	2.25	2.40	2.40	2.70	2.25	2.40	2.55	2.55	2.85
Permanence (weighted as 20%)	1.30	1.40	1.50	1.60	1.70	1.20	1.30	1.40	1.50	1.60
Long-Term Effectiveness (weighted as 20%)	1.40	1.40	1.50	1.60	1.70	1.30	1.30	1.40	1.50	1.60
Management of Short-Term Risks (weighted as 10%)	0.75	0.70	0.65	0.60	0.55	0.95	0.90	0.85	0.80	0.75
Technical and Administrative Implementability (weighted as 10%)	0.85	0.80	0.75	0.65	0.60	0.95	0.90	0.85	0.75	0.70
Consideration of Public Concerns (weighted as 10%)	0.65	0.70	0.75	0.75	0.85	0.75	0.80	0.85	0.85	0.95
Total Weighted Relative Benefit Score	**7.1**	**7.3**	**7.6**	**7.6**	**8.1**	**7.4**	**7.6**	**7.9**	**8.0**	**8.5**
Cost										
Total Estimated Cleanup Cost (Accuracy +50%/-30%)[3]	**$ 230.9 M**	**$ 233.1 M**	**$ 238.8 M**	**$ 243.7 M**	**$ 258.0 M**	**$ 201.9 M**	**$ 204.0 M**	**$ 209.8 M**	**$ 214.7 M**	**$ 229.0 M**
Disproportionate Cost Analysis										
Relative Benefit to Cost Ratio[4]	**6.16**	**6.28**	**6.38**	**6.30**	**6.34**	**7.40**	**7.52**	**7.60**	**7.48**	**7.45**
Overall Alternative Ranking										
Overall Alternative Ranking	**10**	**9**	**6**	**8**	**7**	**5**	**2**	**1**	**3**	**4**

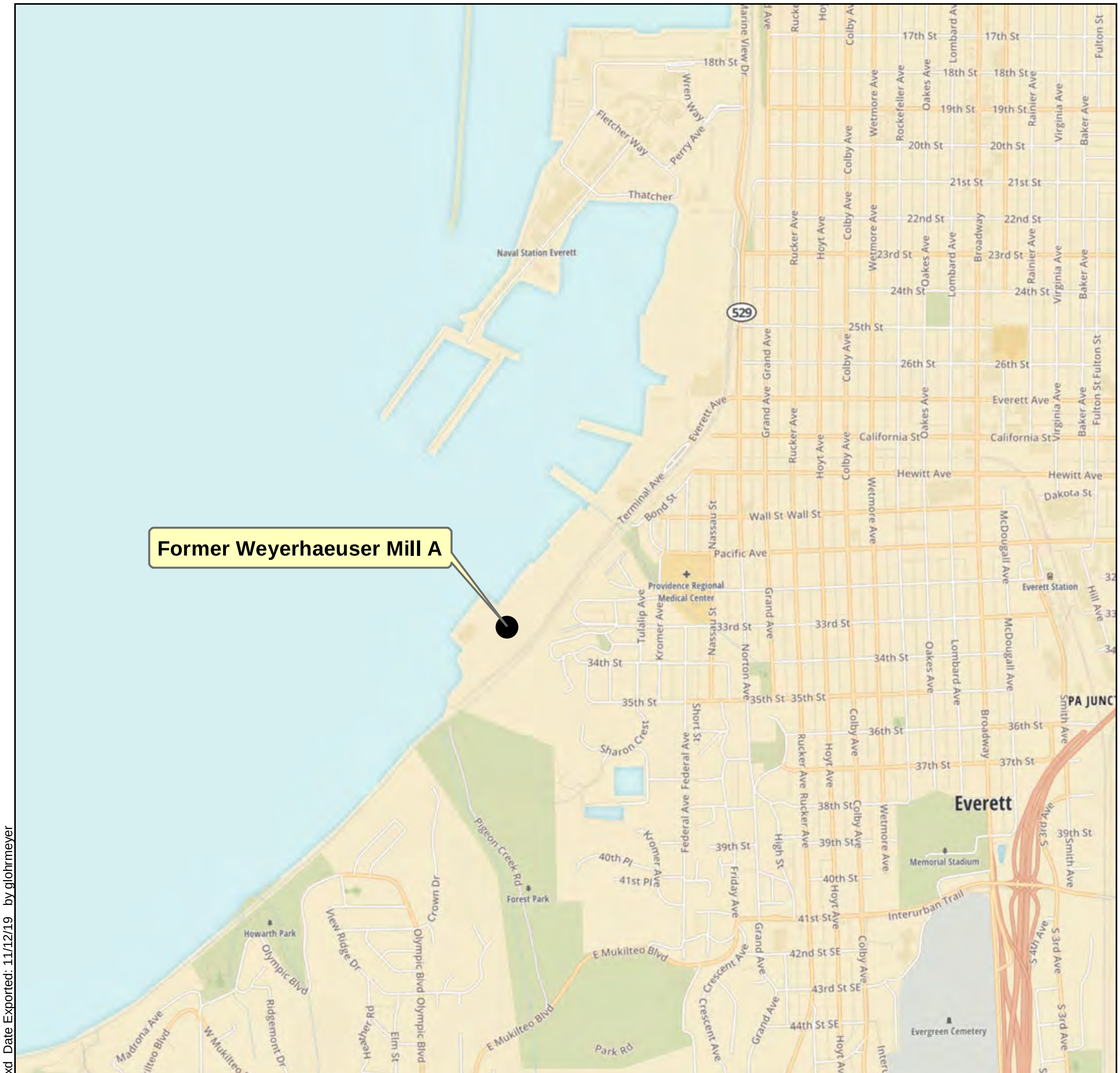
Notes:

[1] Refer to Table 7 for detailed evaluation of Disproportionate Cost Analysis criteria.

[2] Weightings were established by Ecology as referenced in Opinion Letter dated December 28, 2009.

[3] Cost details are presented in Marine Area RI/FS (GeoEngineers 2023).

[4] The relative benefit to cost ratio is calculated by dividing total weighted relative benefit ranking by total cleanup cost. Total cleanup cost for each alternative is normalized by the cost of the alternative with lowest cost, which is Alternative 6, to avoid relative benefit to cost ratios with millionth decimal place. For example, relative benefit to cost ratio of Alternative 1 is calculated as follows: Total Weighted Relative Benefit Score of Alternative 1/(Cost of Alternative 1/Cost of Alternative 6) = 7.1 / (230.9 M/201.9M) = 6.16.



N
W E
S

2,000 0 2,000

Feet

Vicinity Map

Weyerhaeuser Mill A Former Site
Everett, Washington

GEOENGINEERS

Figure 1

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Mapbox Open Street Map, 2016

Projection: NAD 1983 UTM Zone 10N

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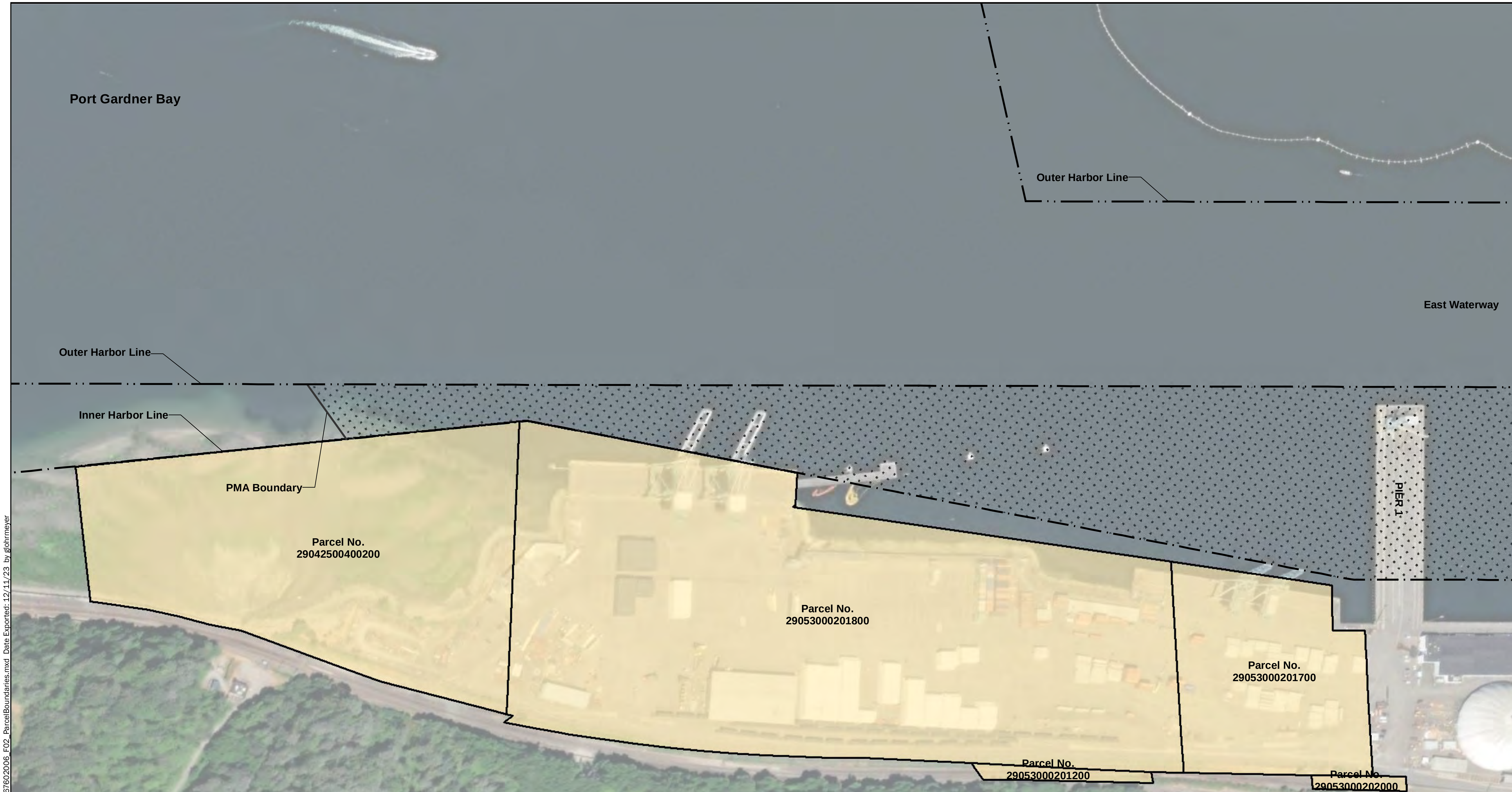

Notes:
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Data Source: Base aerial from ESRI, 2022

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Legend

Parcel Boundary

Area Managed By the Port of Everett Under PMA No. 20-08-0027 With the DNR

PMA Port Management Agreement
DNR Department of Natural Resources

300 0 300
Feet

Property Boundaries

Weyerhaeuser Mill A Former
Everett, Washington

GEOENGINEERS

Figure 2

P:\0\0676020\GIS\MXD\MarineArea_RI_Report\067602006_F02_ParcelBoundaries.mxd Date Exported: 12/11/23 by gtohrmeyer

Notes:
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Data Source: Aerial photo from Port of Everett, 2009.

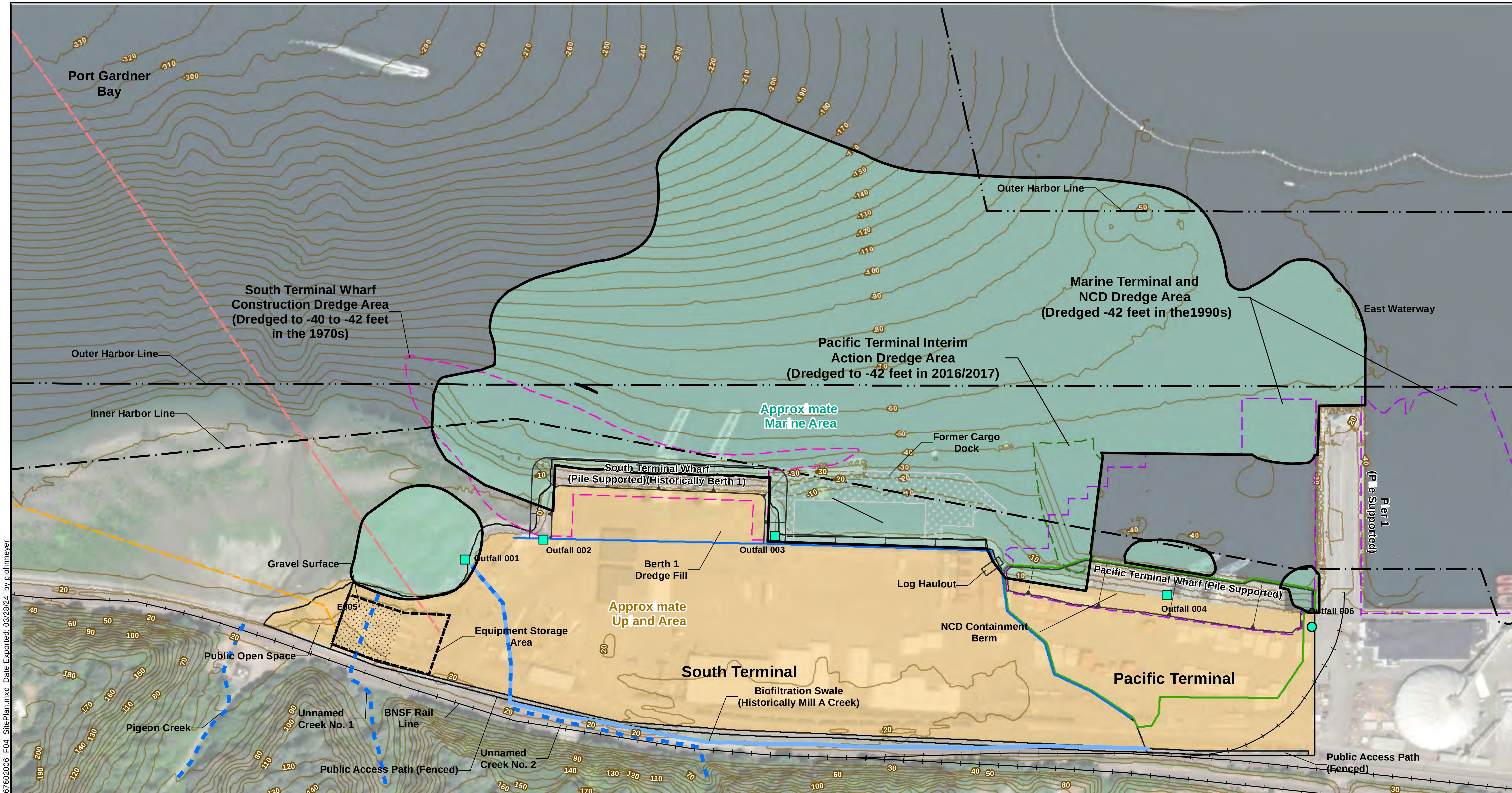
Overview

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure 3

Path: P:\0\0676020\GIS\MXD\MarineArea_RI_Report\067602006_F02_Overview.mxd Map Revised: 13 January 2020 glohrmeyer



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Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Base aerial from ESRI, 2022

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Legend

- Construction Berm
- Historical Piling Area
- Nearshore Confined Disposal (NCD) Facility (Former Log Pond)
- Sediment Management Area Boundary
- Approximate Marine Area
- Approximate Upland Area
- Current Kimberly-Clark/City of Everett/ City of Marysville Outfall 100 (approximate)
- Historical Kimberly-Clark/Weyerhaeuser Outfall SW001 (approximate)
- Bulkhead
- Topography/Bathymetry Contour (Feet Mean Lower Low Water [MLLW])
- Current CSO
- Current Stormwater Outfall

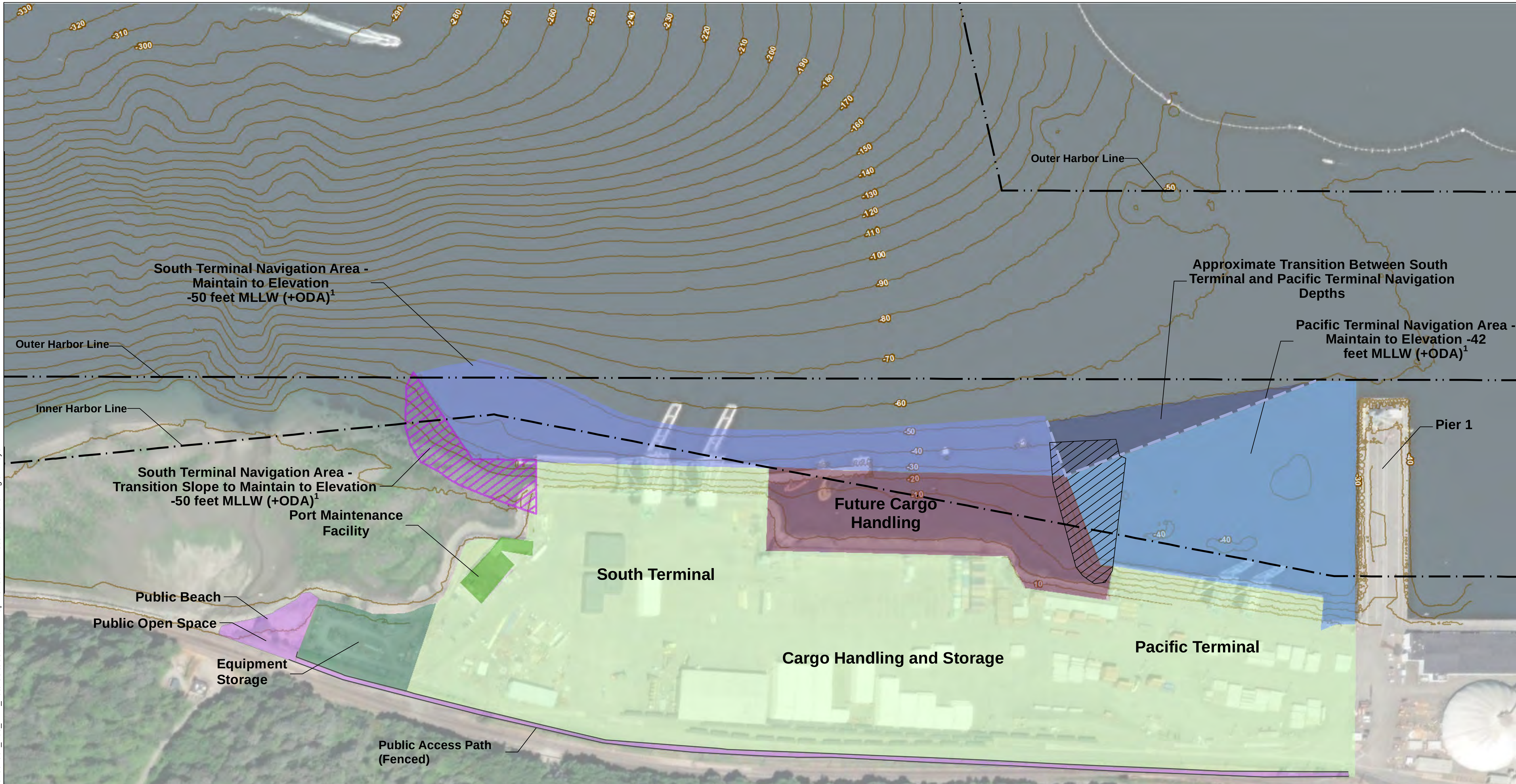
300 0 300
Feet

Site Plan

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure 4



Path: P:\0\0676020\GIS\MXD\MarineArea_RI_Report\0676020007_F05_DNR_FutureSiteUse.mxd Map Revised: 11 December 2023 glohrmeyer

Notes:
1. Navigation Area does not include transition slopes for maintained berth depth.
3. The locations of all features shown are approximate.
4. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Base aerial from ESRI, 2022.

Legend

Bathymetry Contour (Feet MLLW)

Pacific Terminal Interim Action Dredge Area (Dredged to -42 feet MLLW in 2016/2017)

MLLW - Mean Lower Low Water
ODA - Over-Dredge Allowance

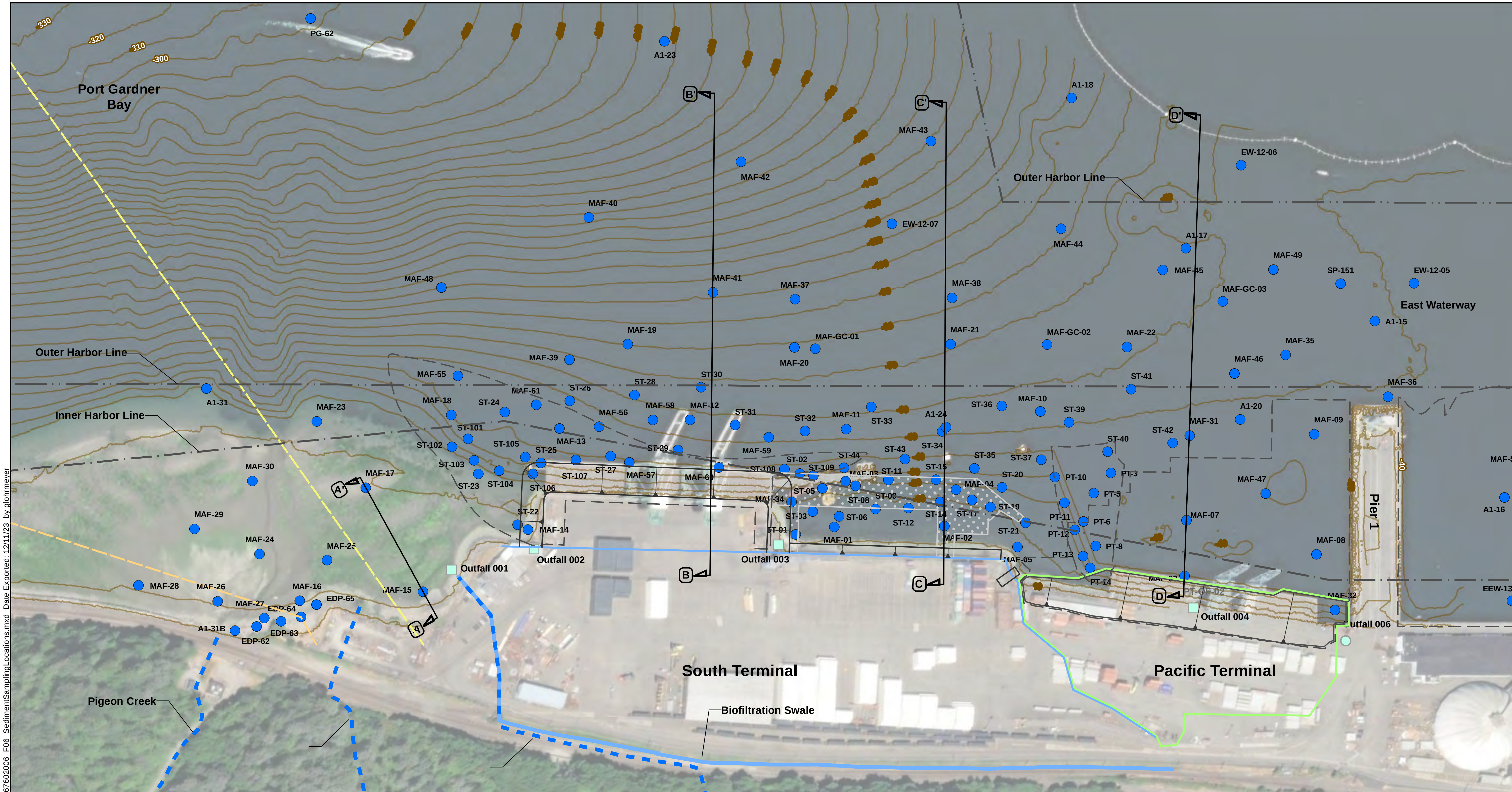
300 0 300
Feet

Current and Future Property Use Assumptions

Weyerhaeuser Mill A Former Site
Everett, Washington

GeoEngineers

Figure 5



300 0 300
Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
Data Source: Base aerial from ESRI, 2022
Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Legend

- Sediment Sampling Location
- Cross Section Location (A – A')
- Construction Berm
- Historical Piling Area
- Dredged Area
- Nearshore Confined Disposal (NCD) Facility (Former Log Pond)
- Current Kimberly-Clark/City of Everett/City of Marysville Outfall 100 (approximate)
- Historical Kimberly-Clark/Weyerhaeuser Outfall SW001 (approximate)
- Bulkhead
- Topography/Bathymetry Contour
- Current CSO
- Current Stormwater Outfall

Sediment Sampling Locations

Weyerhaeuser Mill A Former
Everett, Washington

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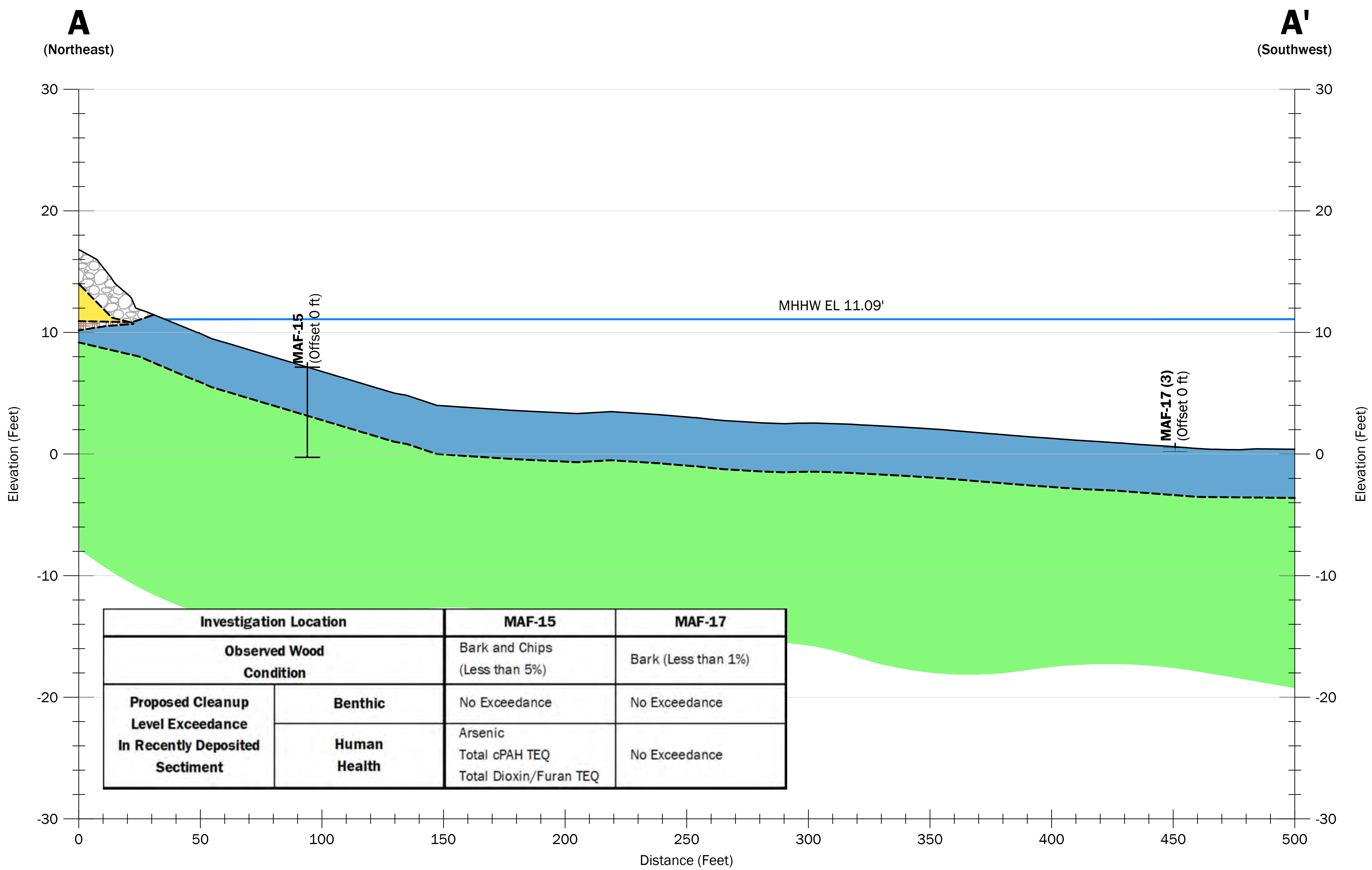
Figure 6

P:\0\0676020\GIS\MXD\MarineArea_RI_Report\0676020006_F06_SedimentSamplingLocations.mxd Date Exported: 12/11/23 by glohmeyer



Investigation Location		MAF-15	MAF-17
Observed Wood Condition		Bark and Chips (Less than 5%)	Bark (Less than 1%)
Proposed Cleanup Level Exceedance In Recently Deposited Sectiment	Benthic	No Exceedance	No Exceedance
	Human Health	Arsenic Total cPAH TEQ Total Dioxin/Furan TEQ	No Exceedance

Legend

- Existing Mudline
- Inferred Sediment Contact
- Sediment Core

Recently Deposited Sediment

- Wood Debris (>50% Wood Debris)
- Pigeon Creek Sediment

Native Sediment

- Snohomish Basin Alluvium

Other Materials

- Approximate Shoreline Slope Armor (Rip-Rap)
- Upland Fill Soil

EL Elevation
MLLW Mean Lower Low Water
cPAH Carseniginic Polycyclic Aromatic Hydrocarbon
TEQ Toxic Equivalent Quotient

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

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50 0 50
Horizontal Scale in Feet
10 0 10
Vertical Scale in Feet
Vertical Exaggeration = 5X

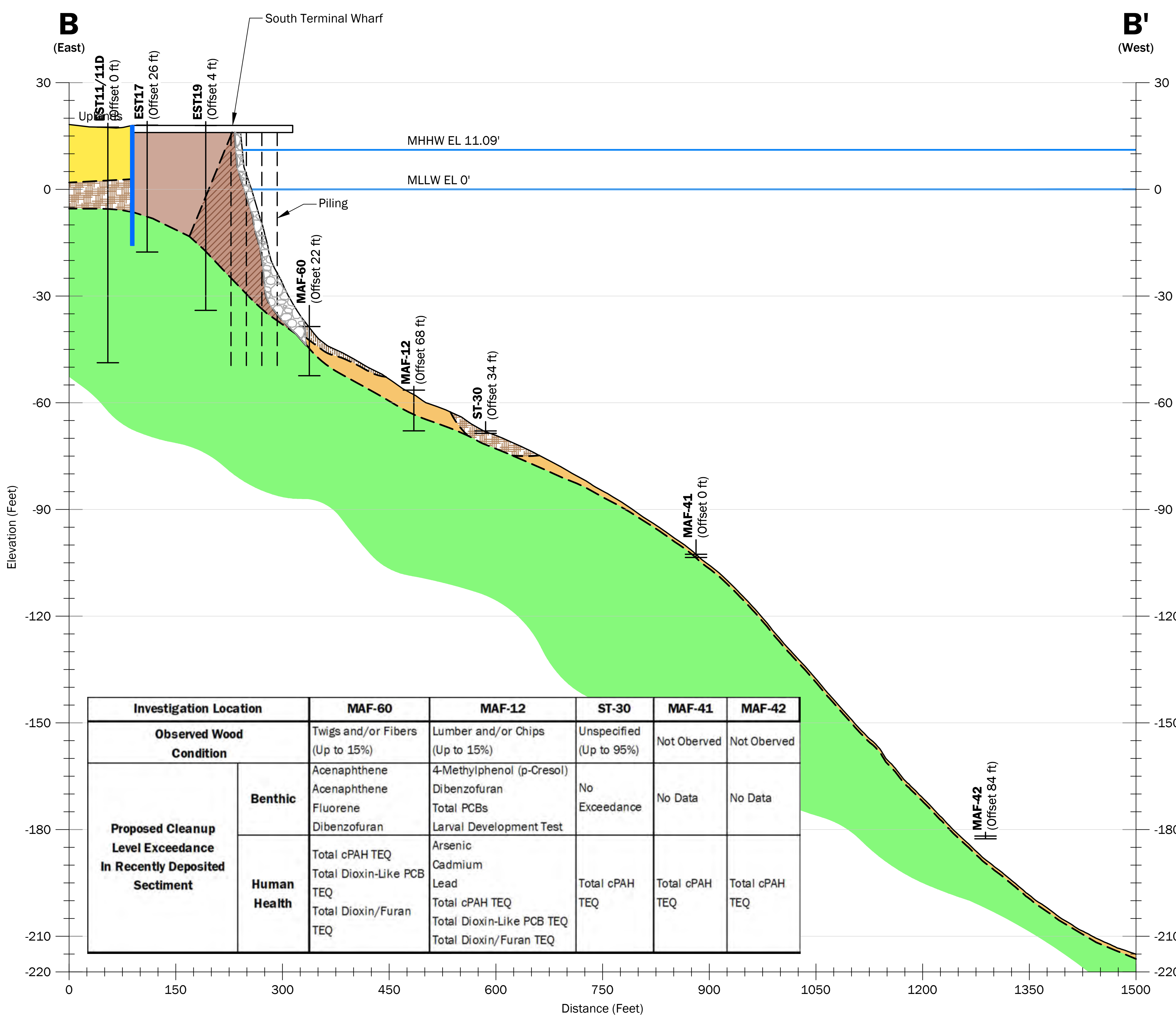
Cross Section A - A'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure 7

p:\0\0676020\CAD\07\task 1700 (cap)\0676020007_F07_Cross Section A - A'.dwg F07 Date Exported:2/16/2024 9:15 AM - by Jackson N. Fellows



Investigation Location		MAF-60	MAF-12	ST-30	MAF-41	MAF-42
Observed Wood Condition		Twigs and/or Fibers (Up to 15%)	Lumber and/or Chips (Up to 15%)	Unspecified (Up to 95%)	Not Obeved	Not Obeved
Proposed Cleanup Level Exceedance In Recently Deposited Sectiment	Benthic	Acenaphthene Acenaphthene Fluorene Dibenzofuran	4-Methylphenol (p-Cresol) Dibenzofuran Total PCBs Larval Development Test	No Exceedance	No Data	No Data
	Human Health	Total cPAH TEQ Total Dioxin-Like PCB TEQ Total Dioxin/Furan TEQ	Arsenic Cadmium Lead Total cPAH TEQ Total Dioxin-Like PCB TEQ Total Dioxin/Furan TEQ	Total cPAH TEQ	Total cPAH TEQ	Total cPAH TEQ

Legend

Existing Mudline

Inferred Sediment Contact

Sediment Core

Bulkhead (Depth Unknown)

Recently Deposited Sediment

- Wood Debris (>50% Wood Debris)
- Mixed Sand and Silt (10% - 50% Wood Debris)
- Unconsolidated Sand and Silt (<10% Wood Debris)

Native Sediment

- Snohomish Basin Alluvium

Other Materials

- Approximate Shoreline Slope Armor (Rip-Rap)
- Upland Fill Soil
- South Terminal Wharf (Berth 1) Dredged Fill
- South Terminal Wharf (Berth 1) Fill Berm

EL Elevation
MHHW Mean Higher High Water
MLLW Mean Lower Low Water
cPAH Carseniginic Polycyclic Aromatic Hydrocarbon
PCB Polychlorinated Biphenyl
TEQ Toxic Equivalent Quotient

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

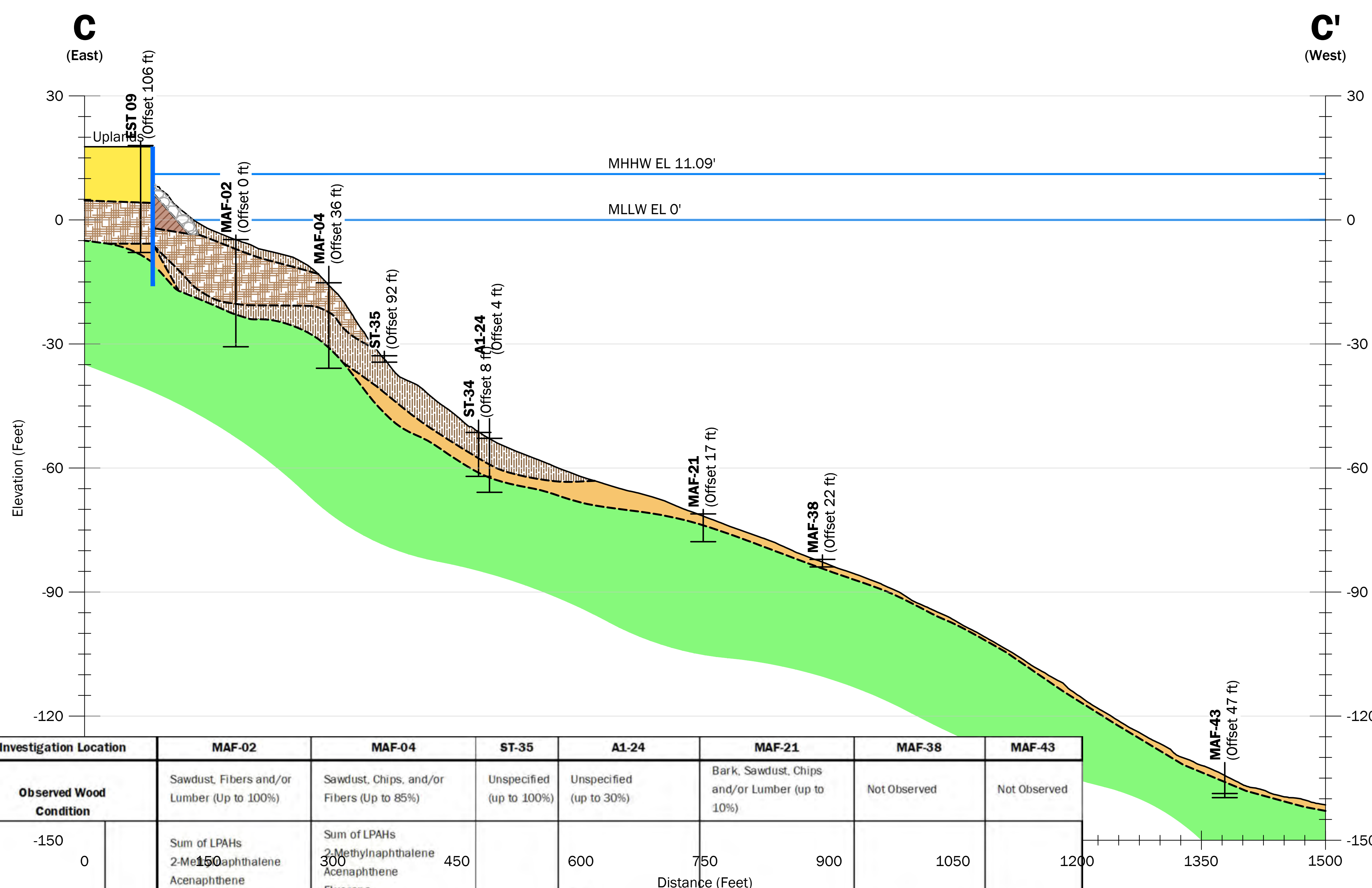
150 0 150
Horizontal Scale in Feet
30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

Cross Section B - B'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure 8



Investigation Location		MAF-02	MAF-04	ST-35	A1-24	MAF-21	MAF-38	MAF-43
Observed Wood Condition		Sawdust, Fibers and/or Lumber (Up to 100%)	Sawdust, Chips, and/or Fibers (Up to 85%)	Unspecified (up to 100%)	Unspecified (up to 30%)	Bark, Sawdust, Chips and/or Lumber (up to 10%)	Not Observed	Not Observed
Proposed Cleanup Level Exceedance In Recently Deposited Sectiment	Benthic	Sum of LPAHs 2-Methylnaphthalene Acenaphthene Naphthalene Hexachlorobenzene 2,4-Dimethylphenol 2-Methylphenol (o-Cresol) 4-Methylphenol (p-Cresol) Hexachlorobutadiene Dibenzofuran	Sum of LPAHs 2-Methylnaphthalene Acenaphthene Fluorene Naphthalene Phenanthrene 2,4-Dimethylphenol 2-Methylphenol (o-Cresol) 4-Methylphenol (p-Cresol) Phenol Dibenzofuran Benzyl Alcohol	No Data	Zinc 4-Methylphenol (p-Cresol) 2,4-Dimethylphenol	Fluorene 4-Methylphenol (p-Cresol)	No Exceedance	No Data
	Human Health	Arsenic Cadmium Lead Mercury Total cPAH TEQ Total Dioxin/Furan TEQ	Arsenic Cadmium, Lead Mercury Total cPAH TEQ Total Dioxin-Like PCB TEQ	No Data	Arsenic Cadmium Lead Mercury Total cPAH TEQ Total Dioxin/Furan TEQ	Arsenic Cadmium Lead Mercury Total cPAH TEQ Total Dioxin-Like PCB TEQ Total Dioxin/Furan TEQ	Total cPAH TEQ Total Dioxin/Furan TEQ	No Exceedance

Legend

- Existing Mudline
- Inferred Sediment Contact
- Sediment Core
- Bulkhead (Depth Unknown)

Recently Deposited Sediment

- Wood Debris (>50% Wood Debris)
- Mixed Sand and Silt (10% - 50% Wood Debris)
- Unconsolidated Sand and Silt (<10% Wood Debris)

Native Sediment

- Snohomish Basin Alluvium

Other Materials

- Approximate Shoreline Slope Armor (Rip-Rap)
- Upland Fill Soil
- South Terminal Wharf (Berth 1) Dredged Fill
- South Terminal Wharf (Berth 1) Fill Berm

EL	Elevation
MHHW	Mean Higher High Water
MLLW	Mean Lower Low Water
cPAH	Carseniginic Polycyclic Aromatic Hydrocarbon
HPAH	High Molecular Weight Polycyclic Aromatic Hydrocarbon
LPAH	Low Molecular Weight Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
TEQ	Toxic Equivalent Quotient
N/A	Not Available

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

150 0 150
Horizontal Scale in Feet

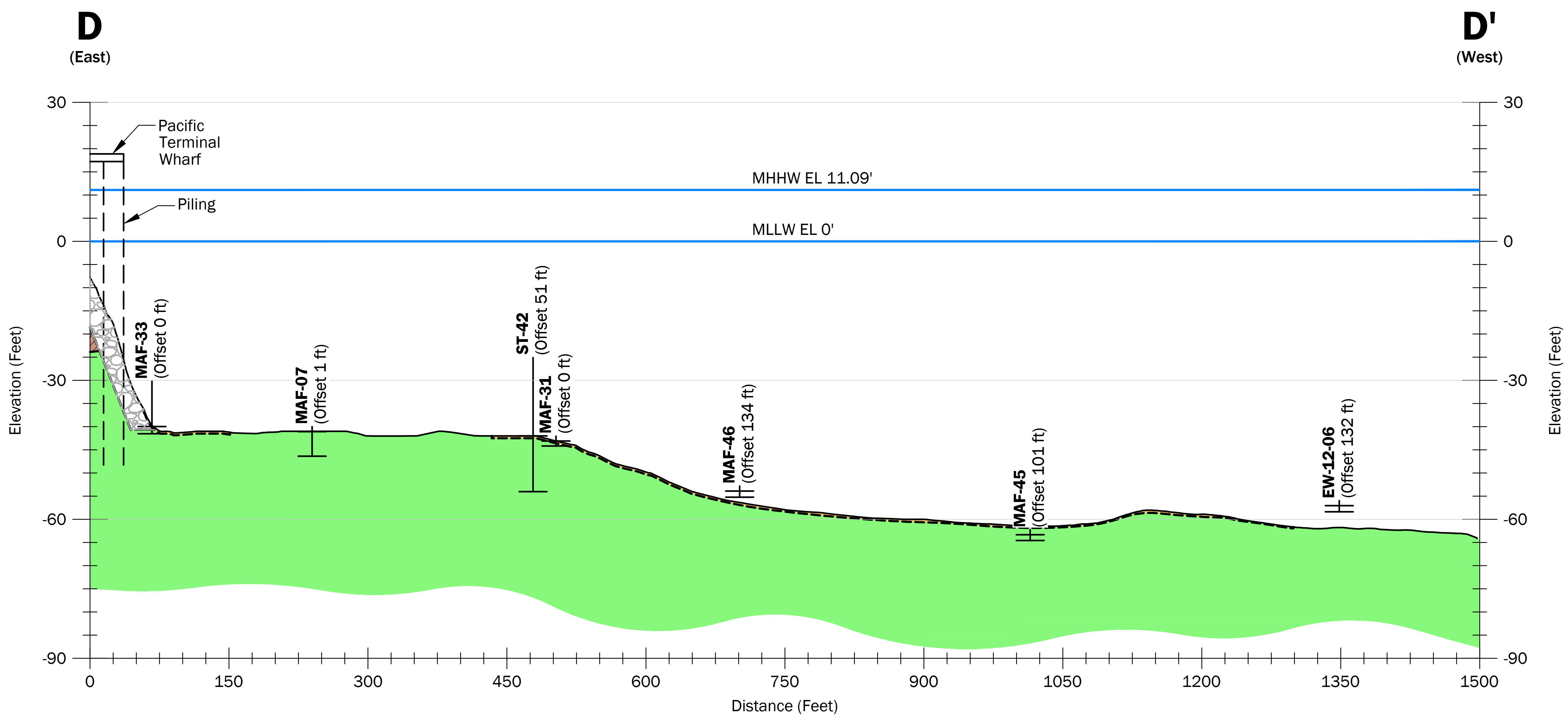
30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

Cross Section C - C'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure 9



Investigation Location		MAF-33	MAF-07	ST-42	MAF-31	MAF-46	MAF-45	EW-12-06
Observed Wood Condition		Bark (Less than 1%)	Chips (Up to 10%)	Chips and/or Cunks (Up to 5%)	Bark (Up to 10%)	No Observed	No Observed	N/A
Proposed Cleanup Level Exceedance In Recently Deposited Sectiment	Benthic	Acenaphthene Dibenzofuran	No Exceedance	No Data	2,4-Dimethylphenol 4-Methylphenol (p-Cresol), Benzoic Acid	No Data	No Data	No Exceedance
	Human Health	Arsenic Total cPAH TEQ	No Exceedance	No Data	Cadmium, Lead Total cPAH TEQ Total Dioxin/Furan TEQ	Total cPAH TEQ	Total cPAH TEQ	No Exceedance

Legend

- Existing Mudline
- Inferred Sediment Contact
- Sediment Core

Recently Deposited Sediment

- Unconsolidated Sand and Silt (<10% Wood Debris)

Native Sediment

- Snohomish Basin Alluvium

Other Materials

- Approximate Shoreline Slope Armor (Rip-Rap)
- South Terminal Wharf (Berth 1) Fill Berm

EL Elevation
MHHW Mean Higher High Water
MLLW Mean Lower Low Water
cPAH Carseniginic Polycyclic Aromatic Hydrocarbon
PCB Polychlorinated Biphenyl
TEQ Toxic Equivalent Quotient
N/A Not Available

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

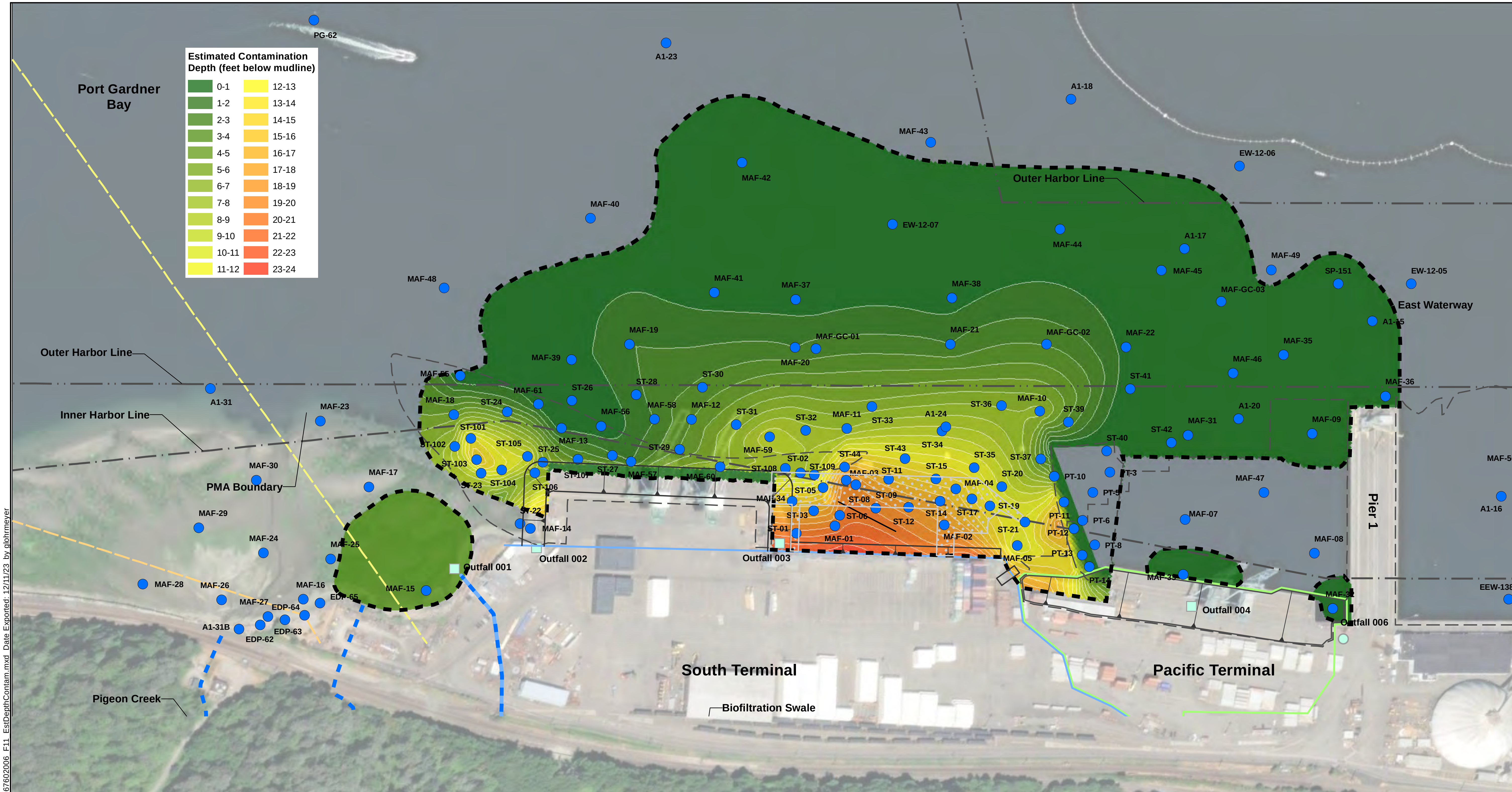
150 0 150
Horizontal Scale in Feet
30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

Cross Section D - D'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure 10



Legend

- Sediment Sampling Location
- Extent Requiring Cleanup Action
- Construction Berm
- Historical Piling Area
- Dredged Area
- Nearshore Confined Disposal (NCD) Facility (Former Log Pond)
- Current Kimberly-Clark/City of Everett/ City of Marysville Outfall 100 (approximate)
- Historical Kimberly-Clark/Weyerhaeuser Outfall SW001 (approximate)
- Bulkhead
- Current CSO
- Current Stormwater Outfall

300 0 300

Feet

Notes:
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Data Source: Base aerial from ESRI, 2022

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

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Estimated Extent and Depth of Contamination

Weyerhaeuser Mill A Former
Everett, Washington

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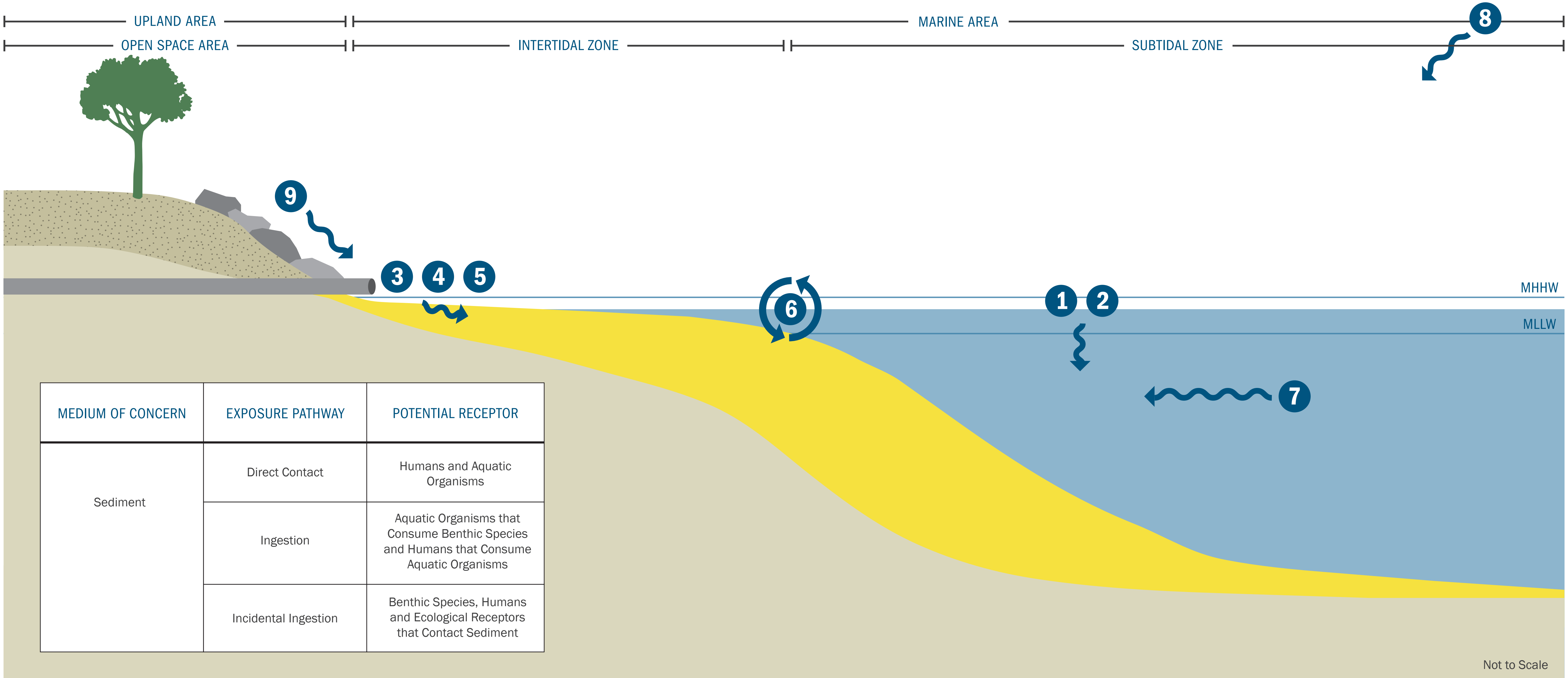
Figure 11



MEDIUM OF CONCERN	EXPOSURE PATHWAY	POTENTIAL RECEPTOR
Sediment	Direct Contact	Humans and Aquatic Organisms
	Ingestion	Aquatic Organisms that Consume Benthic Species and Humans that Consume Aquatic Organisms
	Incidental Ingestion	Benthic Species, Humans and Ecological Receptors that Contact Sediment

Legend

Potential Contaminant Transport Pathway

MHHW Mean Higher High Water

MLLW Mean Lower Low Water

Stratigraphy

Upland Fill Soil

Pigeon Creek/Mixed/Unconsolidated Sand and Silt

Snohomish Basin Alluvium

Release And Transport Pathway

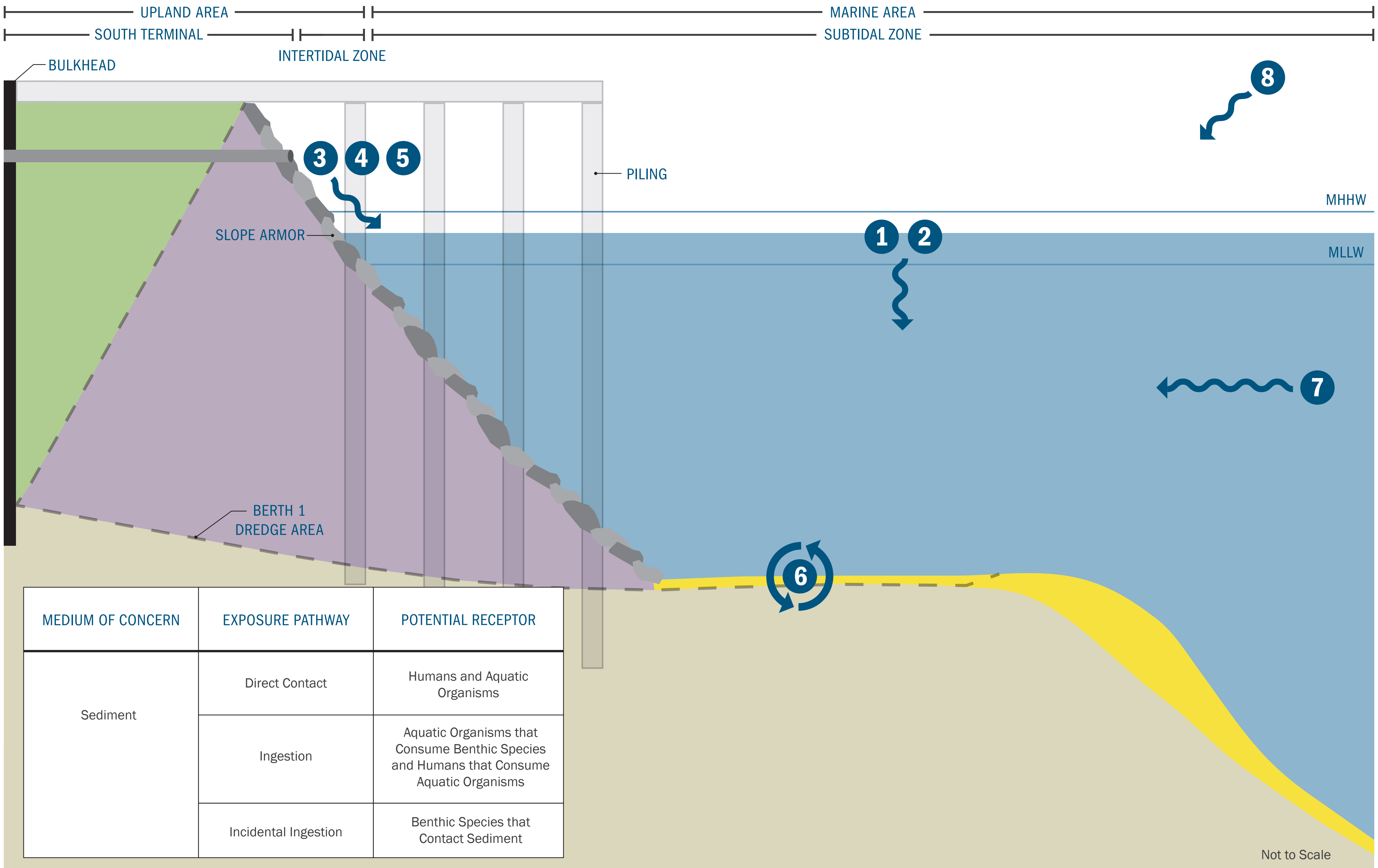
1. Direct deposition of wood debris to the sediment from historical wood milling operations and pulp production from the late 1800s to 1980 and rafted logs, prior to being pulled ashore, sorted and stacked in the Upland Area pending transport by vessels between 1983 and the mid-2000s.
2. Direct deposition from current and historical vessel traffic and berthing in the Marine Area through drips, spills and incidental releases.
3. Direct deposition from industrial wastewater discharges from washing, bleaching, and drying processes, and stormwater generated during Mill A operations into the Marine Area through historical shoreline outfalls.
4. Direct deposition from combined sewer overflow discharges by the City of Everett onto the Marine Area through historical shoreline outfalls.
5. Direct deposition from stormwater discharges by the Port into the Marine Area through current shoreline outfalls.
6. Resuspension of sediment and wood debris through bioturbation or disturbance (i.e., wave and current action, propeller scour and vessel anchors, maintenance dredging, etc.).
7. Transport of hazardous substances sorbed to particulates entrained in the water column from off-site sources.
8. Atmospheric deposition of particulates from current and historical combustion (vehicle and marine vessel emissions, hog fuel burner, etc.) and/or industrial operations.
9. Direct deposition of upland contamination to sediments from shoreline bank erosion.

Marine Area Conceptual Site Model
South Terminal Open Space/Pigeon Creek Area

Weyerhaeuser Mill A Former Site
Everett, Washington

GEOENGINEERS

Figure 12



MEDIUM OF CONCERN	EXPOSURE PATHWAY	POTENTIAL RECEPTOR
Sediment	Direct Contact	Humans and Aquatic Organisms
	Ingestion	Aquatic Organisms that Consume Benthic Species and Humans that Consume Aquatic Organisms
	Incidental Ingestion	Benthic Species that Contact Sediment

Legend

➡ Potential Contaminant Transport Pathway

MHHW Mean Higher High Water

MLLW Mean Lower Low Water

Stratigraphy

- South Terminal Wharf (Berth 1) Fill Berm
- South Terminal Wharf (Berth 1) Dredge Fill
- Mixed/Unconsolidated Sand and Silt
- Snohomish Basin Alluvium

Release And Transport Pathway

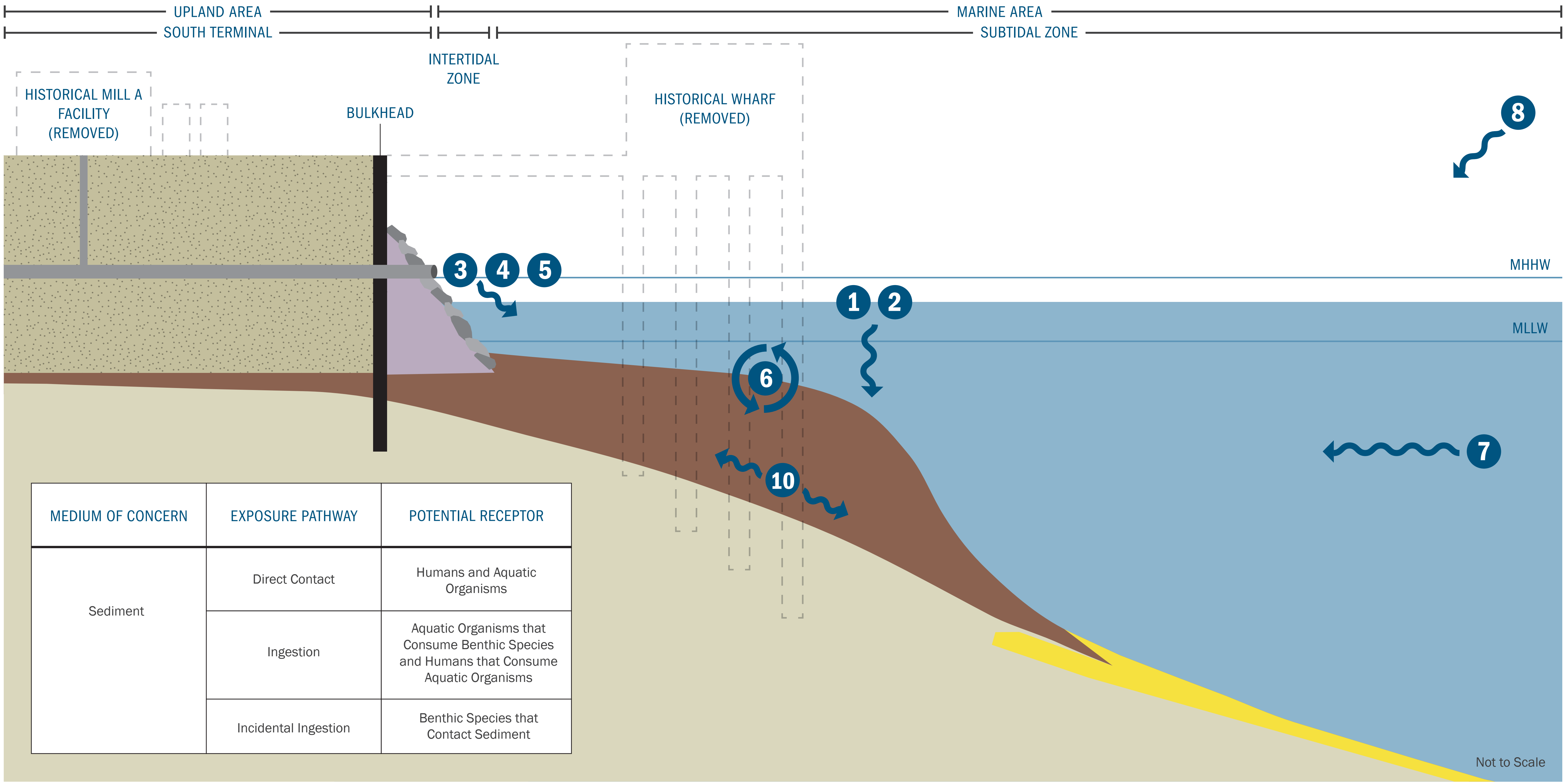
1. Direct deposition of wood debris to the sediment from historical wood milling operations and pulp production from the late 1800s to 1980 and rafted logs, prior to being pulled ashore, sorted and stacked in the Upland Area pending transport by vessels between 1983 and the mid-2000s.
2. Direct deposition from current and historical vessel traffic and berthing in the Marine Area through drips, spills and incidental releases.
3. Direct deposition from industrial wastewater discharges from washing, bleaching, and drying processes, and stormwater generated during Mill A operations into the Marine Area through historical shoreline outfalls.
4. Direct deposition from combined sewer overflow discharges by the City of Everett onto the Marine Area through historical shoreline outfalls.
5. Direct deposition from stormwater discharges by the Port into the Marine Area through current shoreline outfalls.
6. Resuspension of sediment and wood debris through bioturbation or disturbance (i.e., wave and current action, propeller scour and vessel anchors, maintenance dredging, etc.).
7. Transport of hazardous substances sorbed to particulates entrained in the water column from off-site sources.
8. Atmospheric deposition of particulates from current and historical combustion (vehicle and marine vessel emissions, hog fuel burner, etc.) and/or industrial operations.

Marine Area Conceptual Site Model
South Terminal Wharf Area

Weyerhaeuser Mill A Former Site
Everett, Washington

GeoEngineers

Figure 13



MEDIUM OF CONCERN	EXPOSURE PATHWAY	POTENTIAL RECEPTOR
Sediment	Direct Contact	Humans and Aquatic Organisms
	Ingestion	Aquatic Organisms that Consume Benthic Species and Humans that Consume Aquatic Organisms
	Incidental Ingestion	Benthic Species that Contact Sediment

Legend

Potential Contaminant Transport Pathway

MHHW Mean Higher High Water

MLLW Mean Lower Low Water

Stratigraphy

- Upland Fill Soil
- South Terminal Wharf Fill Berm
- Wood Debris/Mixed Sand and Silt
- Mixed/Unconsolidated Sand and Silt
- Snohomish Basin Alluvium

Release And Transport Pathway

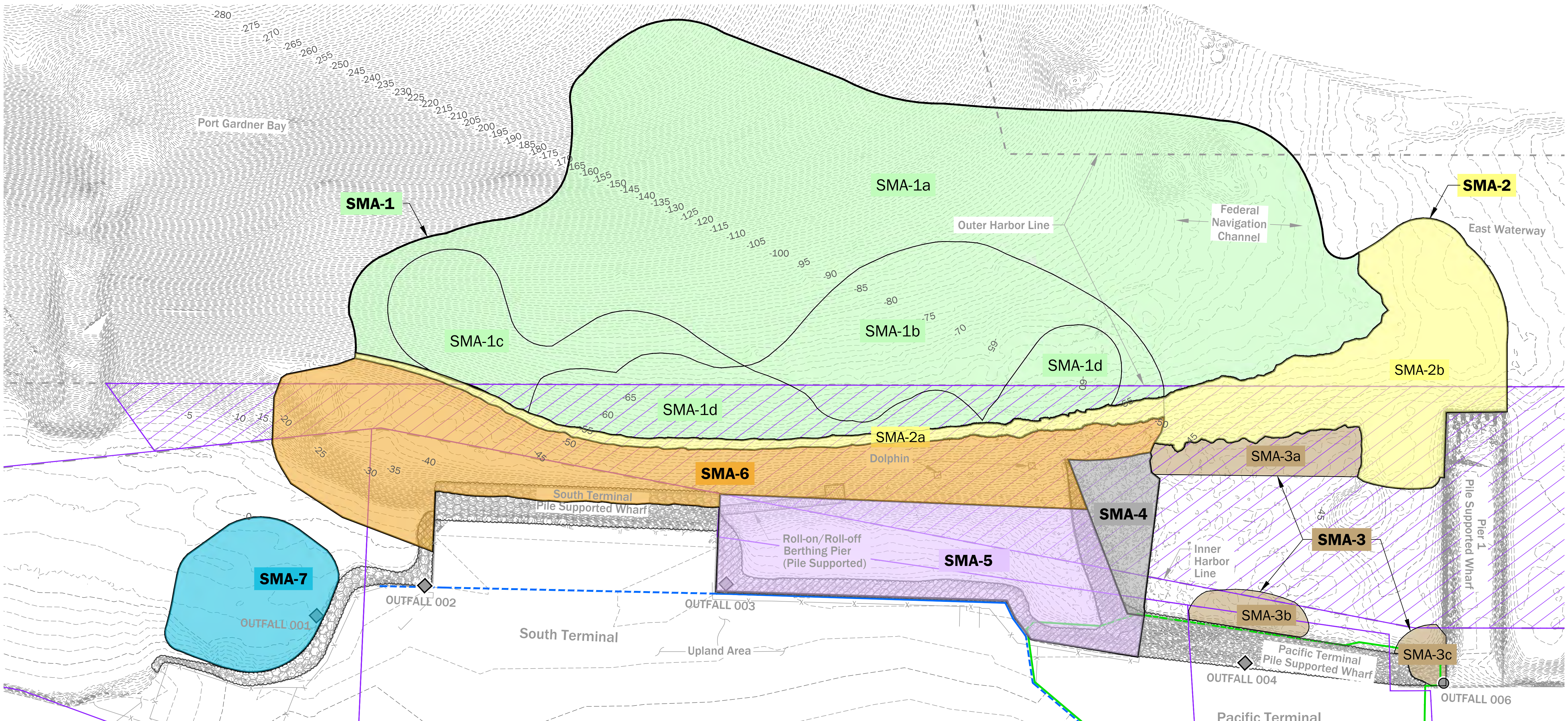
1. Direct deposition of wood debris to the sediment from historical wood milling operations and pulp production from the late 1800s to 1980 and rafted logs, prior to being pulled ashore, sorted and stacked in the Upland Area pending transport by vessels between 1983 and the mid-2000s.
2. Direct deposition from current and historical vessel traffic and berthing in the Marine Area through drips, spills and incidental releases.
3. Direct deposition from industrial wastewater discharges from washing, bleaching, and drying processes, and stormwater generated during Mill A operations into the Marine Area through historical shoreline outfalls.
4. Direct deposition from combined sewer overflow discharges by the City of Everett onto the Marine Area through historical shoreline outfalls.
5. Direct deposition from stormwater discharges by the Port into the Marine Area through current shoreline outfalls.
6. Resuspension of sediment and wood debris through bioturbation or disturbance (i.e., wave and current action, propeller scour and vessel anchors, maintenance dredging, etc.).
7. Transport of hazardous substances sorbed to particulates entrained in the water column from off-site sources.
8. Atmospheric deposition of particulates from current and historical combustion (vehicle and marine vessel emissions, hog fuel burner, etc.) and/or industrial operations.
10. Degradation of wood debris

Marine Area Conceptual Site Model Northeast of South Terminal Wharf

Weyerhaeuser Mill A Former Site
Everett, Washington

GeoEngineers

Figure 14



Notes:
1. The overall extent of sediment management areas is based on the limits of contamination shown on Figures 69 and 70 of the Remedial Investigation (RI) report.
2. Bathymetric Contours are based on merged survey data provided by Tetra Tech on 12/12/2017. Three surveys were merged by Tetra Tech - 1) Tetra Tech survey dated February 2017 presenting bathymetry of the marine areas adjacent to the South Terminal, 2) Tetra Tech survey dated December 2015 presenting bathymetry of areas underneath the Pacific/South Terminal Wharfs, and 3) Pacific Geomatic Services, Inc. survey dated October 2014 presenting the bathymetry of the rest of the marine areas of the site except for Pacific Terminal Interim Action Dredge Area. The bathymetry for the Pacific Terminal Interim Action Dredge Area is based on Tetra Tech survey dated February 2017 and was merged by GeoEngineers.
3. Upland contours are based on surface elevations obtained at the upland boring locations as part of the RI.
4. The locations of all features shown are approximate.
5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: See Notes 2 and 3.

Horizontal Datum: North American Datum (NAD) 1983/1991, WA State Plane, N Zone, US Foot
Vertical Datum: Mean Lower Low Water (MLLW)
Vertical Datum Conversion (based on NOAA's Publication Sheet (944-7659), dated 09/29/1988):
MHHW = +11.11 feet MLLW
NGVD 1929 = +5.93 MLLW
NAVD 1988 = +2.25 MLLW

Legend

- Sediment Management Area[1]
- -45 Existing Contours[2,3] (feet MLLW)
- MLLW Mean Lower Low Water
- MHHW Mean Higher High Water
- Outer Harbor Line
- Inner Harbor Line
- Areas of Known Armoring
- Bulkhead (Dashed where Buried)
- Nearshore Confined Disposal (NCD) Facility (Former Log Pond)
- Fence
- Current Combined Sewer Outfall (SCO)
- Current Stormwater Outfall
- Parcel Boundary
- Area Managed By the Port of Everett Under Port Management Agreement No. 20-08-0027 with the DNR

250 0 250
Feet

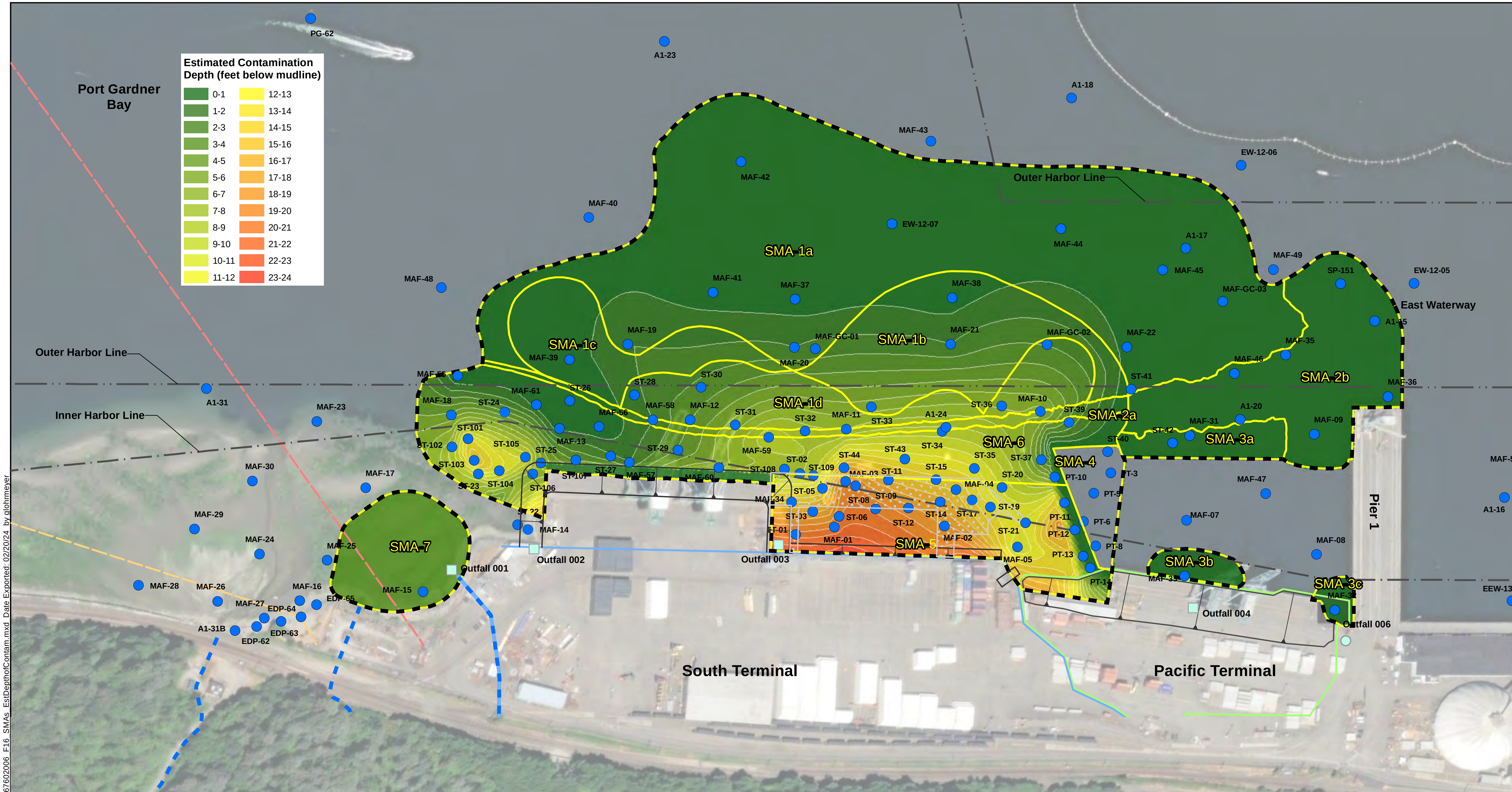
Sediment Management Areas

Weyerhaeuser Mill A Former
Everett, Washington

GEOENGINEERS

Figure 15

p:\0\0676020\CAD\07\task 1700 (cap)\0676020007_F015_Sediment Management Areas.dwg 15 Sediment Management Areas Date Exported:2/20/2024 11:45 AM - by Jackson N. Fellows



P:\0\0676020\GIS\MXD\MarineArea_RI_Report\0676020006_F16_SMAs_EstDepthofContam.mxd Date Exported: 02/20/24 by glohrmeyer

300 0 300
Feet

Legend

- Sediment Sample Location
- Extent Requiring Cleanup Action
- Sediment Management Area Boundary
- Construction Berm
- Historical Piling Area
- Nearshore Confined Disposal (NCD) Facility (Former Log Pond)
- Current Kimberly-Clark/City of Everett/ City of Marysville Outfall 100 (approximate)
- Historical Kimberly-Clark/Weyerhaeuser Outfall SW001 (approximate)
- Bulkhead
- Current CSO
- Current Stormwater Outfall

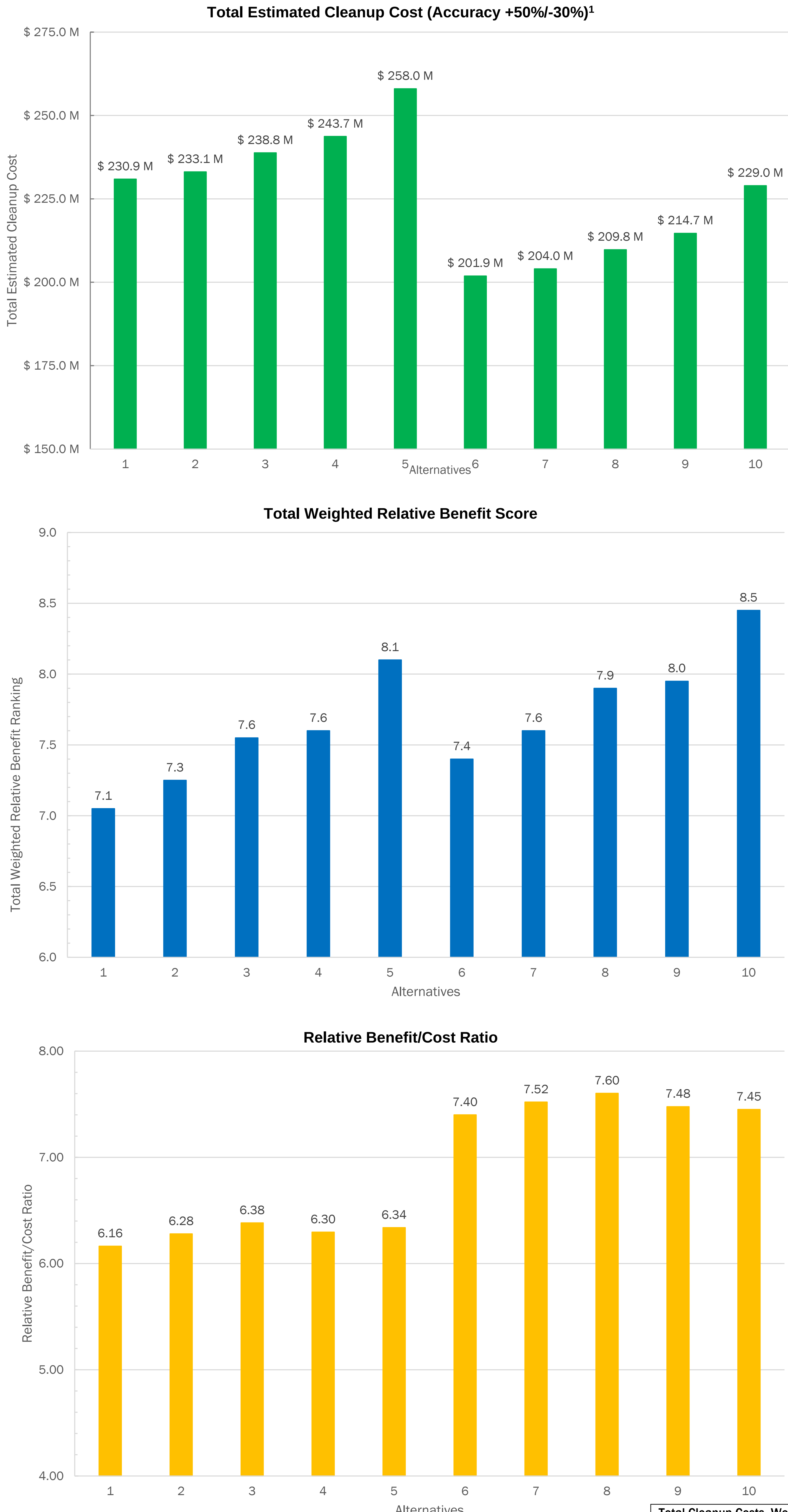
Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
Data Source: Base aerial from ESRI, 2022
Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Sediment Management Areas and Estimated Depth of Contamination

Weyerhaeuser Mill A Former
Everett, Washington

GEOENGINEERS

Figure 16



Note:
[1] Cost detail for each alternative is presented in the Marine Area RI/FS (GeoEngineers 2023).

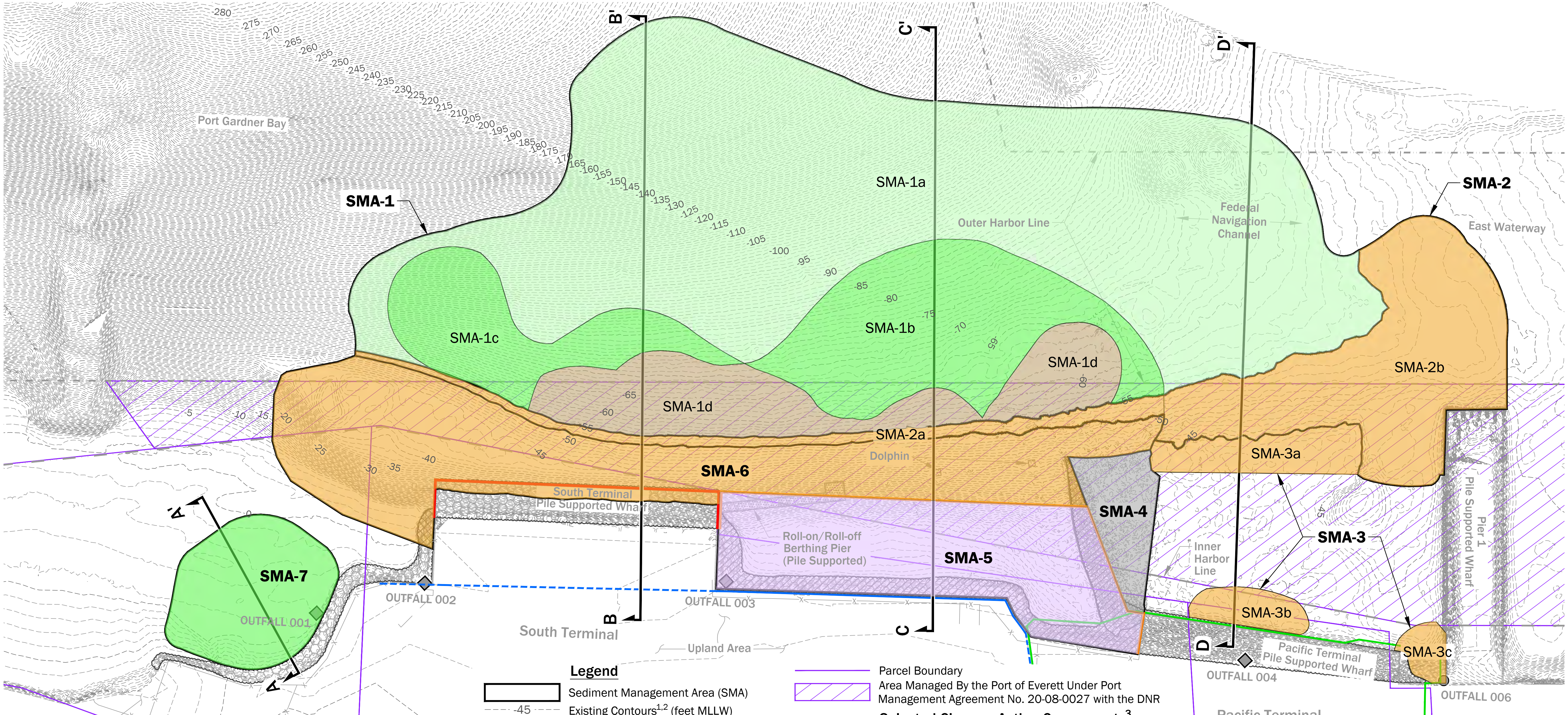
Total Cleanup Costs, Weighted Relative Benefit Rankings and Benefit/Cost Ratio

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure 17

0676-020-07 Date Exported: 1/16/2023



Notes:

1. Bathymetric Contours are based on merged survey data provided by Tetra Tech on 12/12/2017. Three surveys were merged by Tetra Tech - 1) Tetra Tech survey dated February 2017 presenting bathymetry of the marine areas adjacent to the South Terminal, 2) Tetra Tech survey dated December 2015 presenting bathymetry of areas underneath the Pacific/South Terminal Wharfs, and 3) Pacific Geomatic Services, Inc. survey dated October 2014 presenting the bathymetry of the rest of the marine areas of the site except for Pacific Terminal Interim Action Dredge Area. The bathymetry for the Pacific Terminal Interim Action Dredge Area is based on Tetra Tech survey dated February 2017 and was merged by GeoEngineers.
2. Upland contours are based on surface elevations obtained at the upland boring locations as part of the RI.
3. A summary of remedial action components is presented in the figure. A detailed description of the remedial action components are presented in the Cleanup Action Plan.
4. The locations of all features shown are approximate.
5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: See Notes 1 and 2.

Horizontal Datum: North American Datum (NAD) 1983/1991, WA State Plane, N Zone, US Foot
Vertical Datum: Mean Lower Low Water (MLLW)
Vertical Datum Conversion (based on NOAA's Publication Sheet (944-7659), dated 09/29/1988):
MHHW = +11.11 feet MLLW
NGVD 1929 = +5.93 MLLW
NAVD 1988 = +2.25 MLLW

Legend

Sediment Management Area (SMA)
-45 Existing Contours[1,2] (feet MLLW)
MLLW Mean Lower Low Water
MHHW Mean Higher High Water
Outer Harbor Line
Inner Harbor Line
Bulkhead (Dashed where Buried)
Nearshore Confined Disposal (NCD) Facility (Former Log Pond)
Fence
Areas of Known Armoring
Current Combined Sewer Outfall (SCO)
Current Stormwater Outfall
A A' Cross Section Location

Parcel Boundary
Area Managed By the Port of Everett Under Port Management Agreement No. 20-08-0027 with the DNR

Selected Cleanup Action Components[3]

Full Removal of Contaminated Sediment and/or Wood Debris
Dynamic Sand Cap
Enhanced Natural Recovery (ENR)
Monitored Natural Recovery (MNR) Temp
Containment/Confined Disposal Facility (CDF)
Remove Existing Pile-Supported Roll-on/Roll-off Berthing Pier and Dolphins
Remove Existing Armor
Remove and Replace Existing Armor
No Action
South Terminal Toe Wall
Containment/CDF Wall

250 0 250
Feet

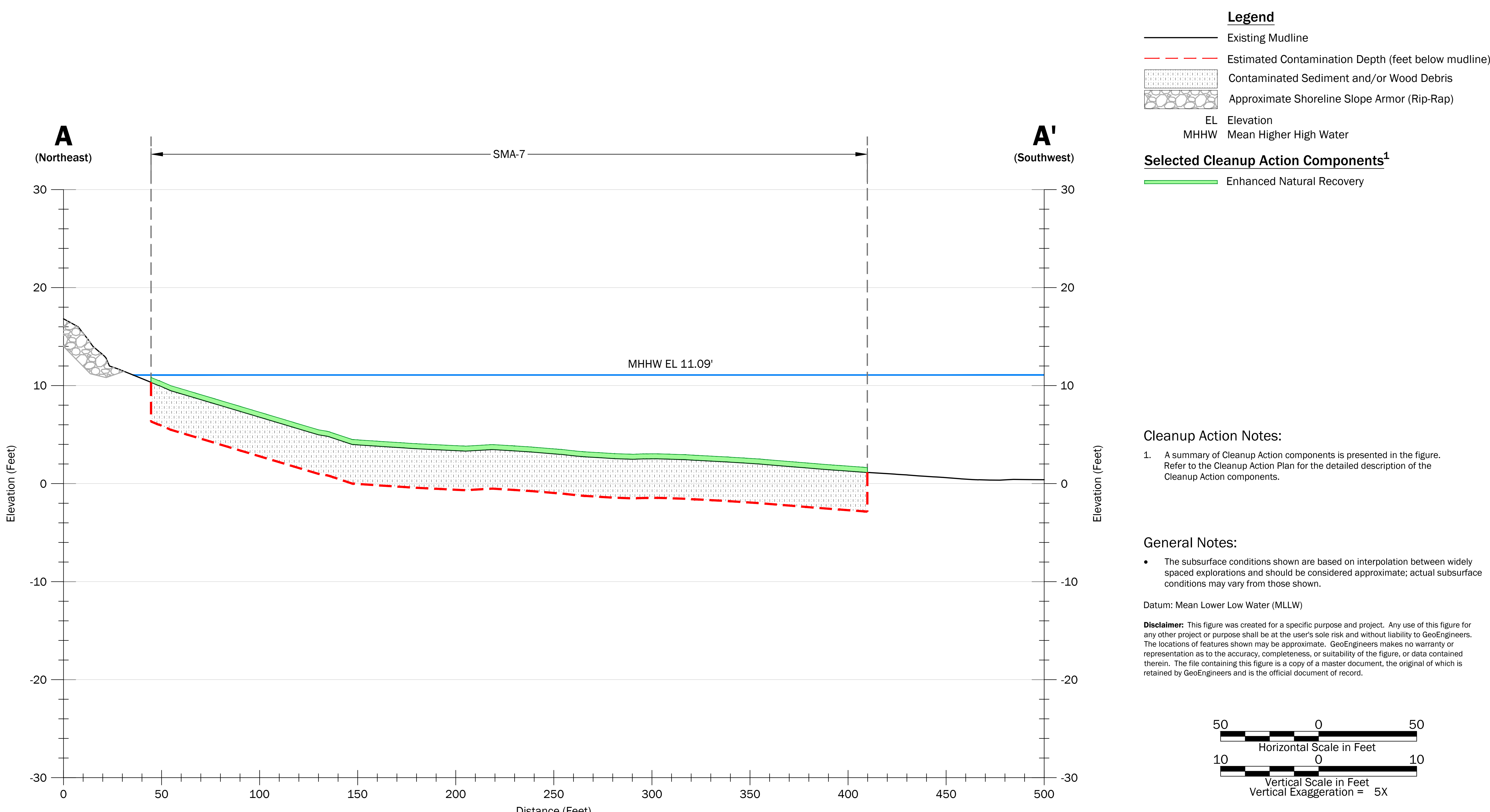
Selected Cleanup Action Plan

Weyerhaeuser Mill A Former
Everett, Washington

GEOENGINEERS

Figure 18

p:\0\0676020\CAD\07\task 1700 (cap)\067602007_F018_Proposed Cleanup Action Plan.dwg 18 Selected Cleanup Action Plan Date Exported:2/27/2024 10:46 AM - by Jackson N. Fellows



Cleanup Action Notes:

1. A summary of Cleanup Action components is presented in the figure. Refer to the Cleanup Action Plan for the detailed description of the Cleanup Action components.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

50 0 50
Horizontal Scale in Feet
10 0 10
Vertical Scale in Feet
Vertical Exaggeration = 5X

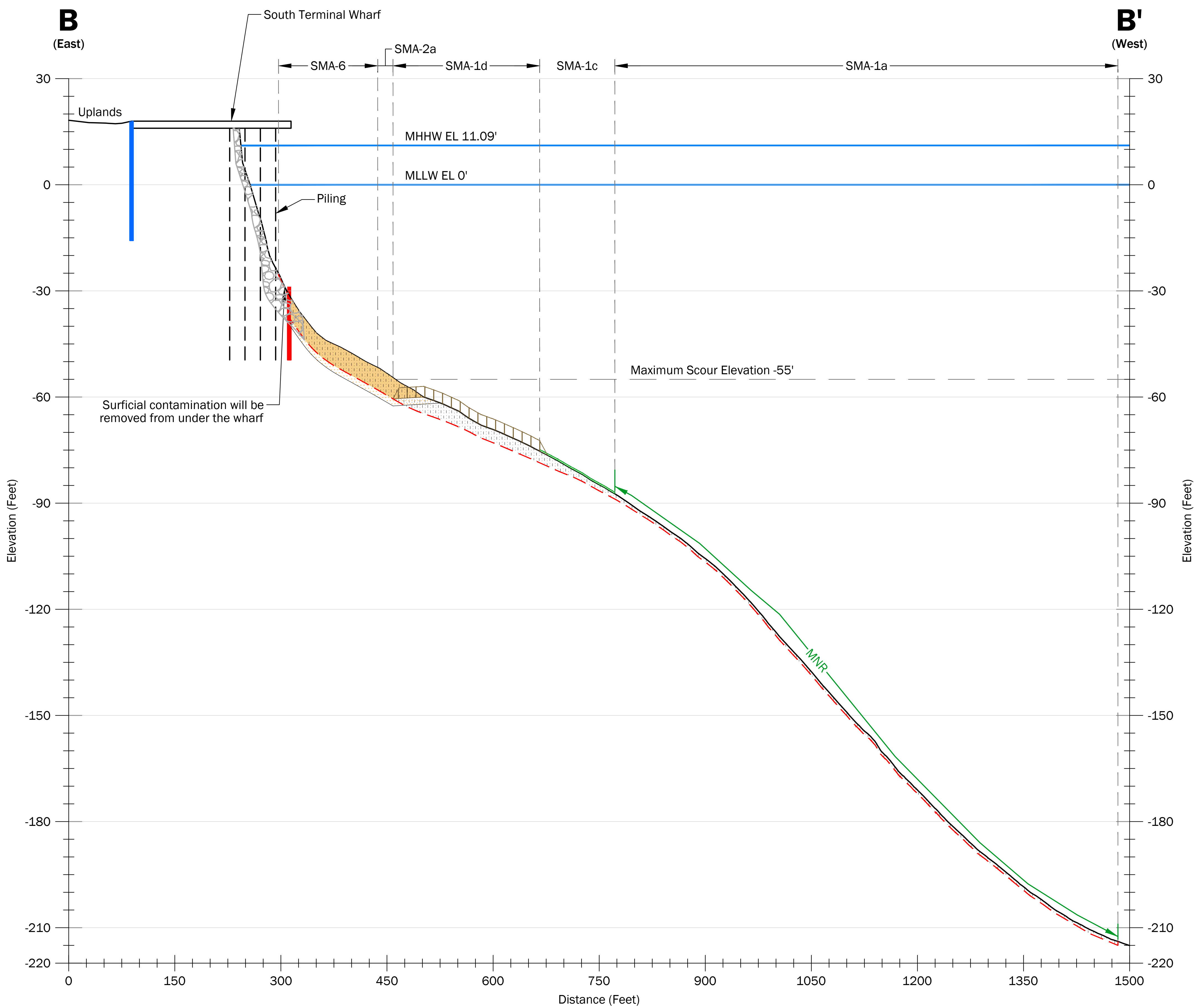
Selected Cleanup Action
Cross Section A - A'

Weyerhaeuser Mill A Former
Everett, Washington

GEOENGINEERS

Figure 19

p:\0\0676020\CAD\07\task 1700 (cap)\067602007_F019_Cross Section A - A' (Alt 8).dwg 19 Cross Section A - A' Date Exported:2/16/2024 9:41 AM - by Jackson N. Fellows



Legend

- Existing Mudline
- Estimated Contamination Depth (feet below mudline)
- Contaminated Sediment and/or Wood Debris
- Approximate Shoreline Slope Armor (Rip-Rap)
- Bulkhead (Depth Unknown)

EL Elevation
MHHW Mean Higher High Water
MLLW Mean Lower Low Water

Selected Cleanup Action Components[1]

- MNR — Monitored Natural Recovery
- Enhanced Natural Recovery
- Full Removal of Contaminated Sediment and Wood Debris
- 2-Foot Overdredge Allowance
- Dynamic Sand Cap
- South Terminal Toe Wall[2]

Cleanup Action Notes:

1. A summary of Cleanup Action components is presented in the figure. Refer to the Cleanup Action Plan for the detailed description of the Cleanup Action components.
2. The height and depth of the wall will be determined during remedial design. In general, the wall will be keyed into the native soil and will vertically extend upwards such that the top of the wall is at or above the surface elevations of the adjacent armored slopes.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

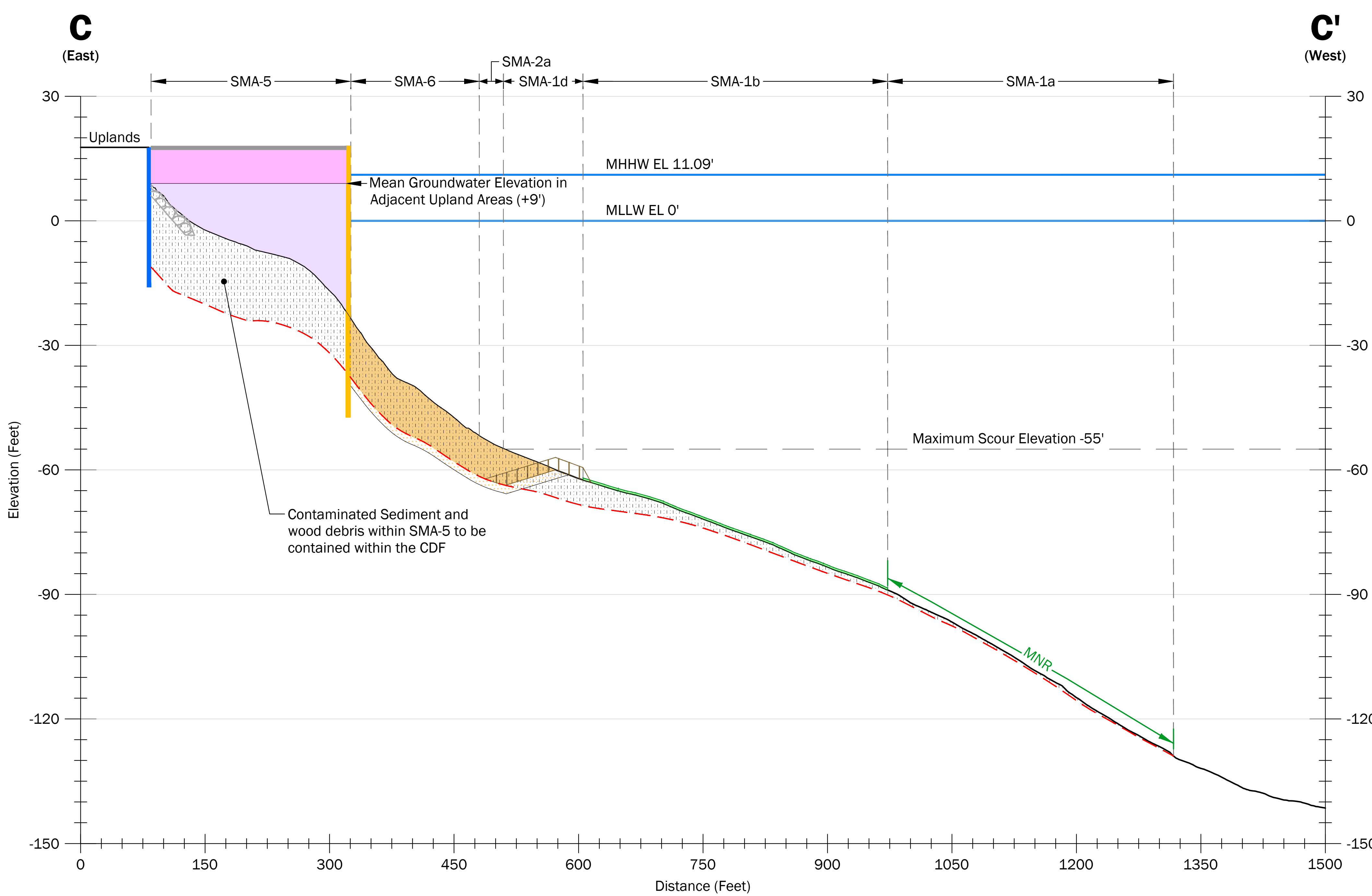
150 0 150
Horizontal Scale in Feet
30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

Selected Cleanup Action
Cross Section B - B'

Weyerhaeuser Mill A Former
Everett, Washington

GEOENGINEERS

Figure 20



Legend

- Existing Mudline
- Estimated Contamination Depth (feet below mudline)
- Contaminated Sediment and/or Wood Debris
- Approximate Shoreline Slope Armor (Rip-Rap)
- Bulkhead (Depth Unknown)
- EL Elevation
- MHHW Mean Higher High Water
- MLLW Mean Lower Low Water

Selected Cleanup Action Components[1]

- MNR Monitored Natural Recovery
- Enhanced Natural Recovery
- Full Removal of Contaminated Sediment and Wood Debris
- 2-Foot Overdredge Allowance
- Dynamic Sand Cap
- Containment/CDF Wall[2]
- Contaminated Dredged Material Fill
- Imported Fill Material
- Asphalt Surface with Stormwater Management System

Cleanup Action Notes:

1. A summary of Cleanup Action components is presented in the figure. Refer to the Cleanup Action Plan for the detailed description of the Cleanup Action components.
2. The height and depth of the wall will be determined during remedial design. In general, the wall will be keyed into the native soil and will vertically extend upwards such that the top of the wall is at or above the surface elevations of the adjacent Upland area.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

150 0 150
Horizontal Scale in Feet
30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

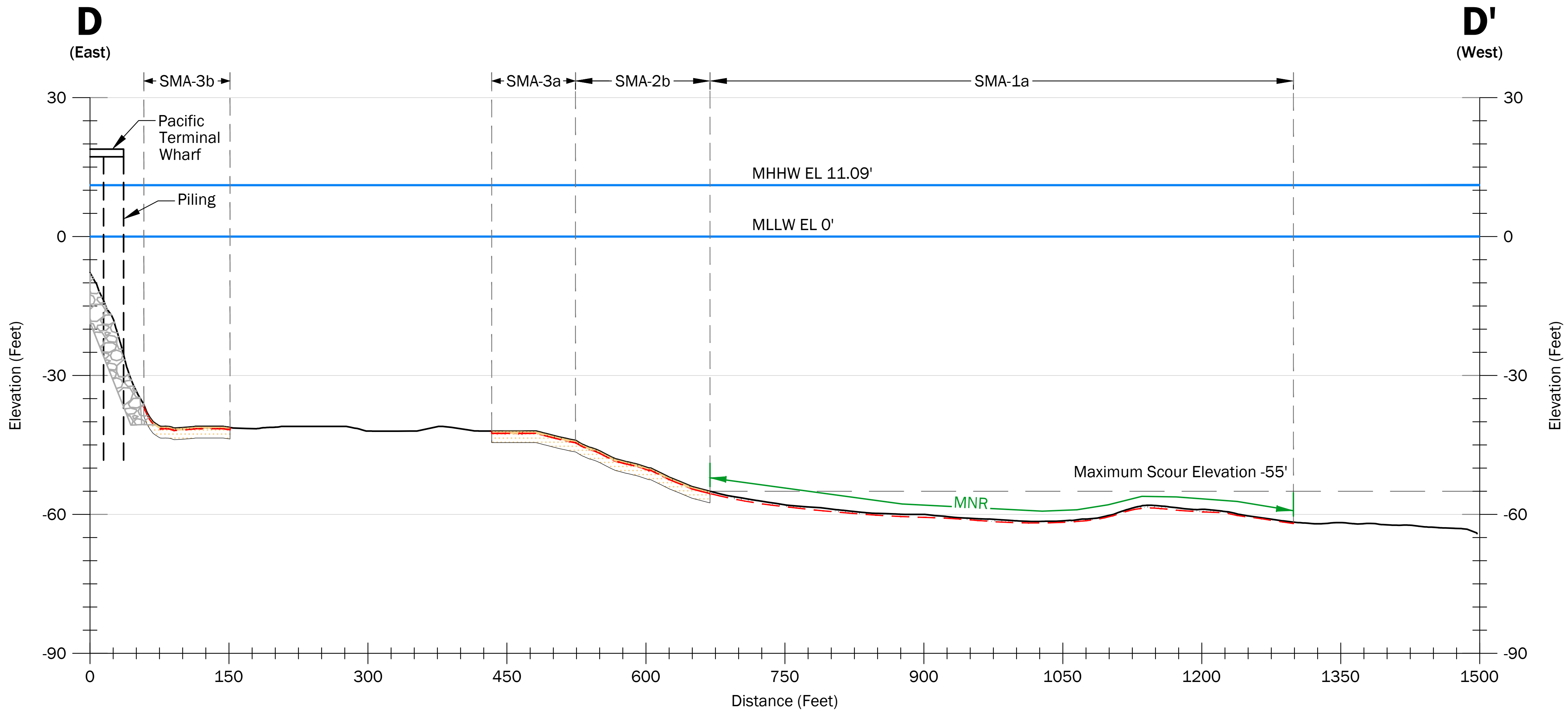
Selected Cleanup Action
Cross Section C - C'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure 21

p:\0\0676020\CAD\07\task 1700 (cap)\067602007_F021_Cross Section C - C' [Alt 8].dwg 21 Cross Section C - C' Date Exported:2/16/2024 9:41 AM - by Jackson N. Fellows



Legend

- Existing Mudline
- Estimated Contamination Depth (feet below mudline)
- Contaminated Sediment and/or Wood Debris
- Approximate Shoreline Slope Armor (Rip-Rap)

EL Elevation
MHHW Mean Higher High Water
MLLW Mean Lower Low Water

Selected Cleanup Action Components[1]

- MNR — Monitored Natural Recovery
- Full Removal of Contaminated Sediment and Wood Debris
- 2-Foot Overdredge Allowance

Cleanup Action Notes:

1. A summary of Cleanup Action components is presented in the figure. Refer to the Cleanup Action Plan for the detailed description of the Cleanup Action components.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

150 0 150
Horizontal Scale in Feet
30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

Selected Cleanup Action
Cross Section D - D'

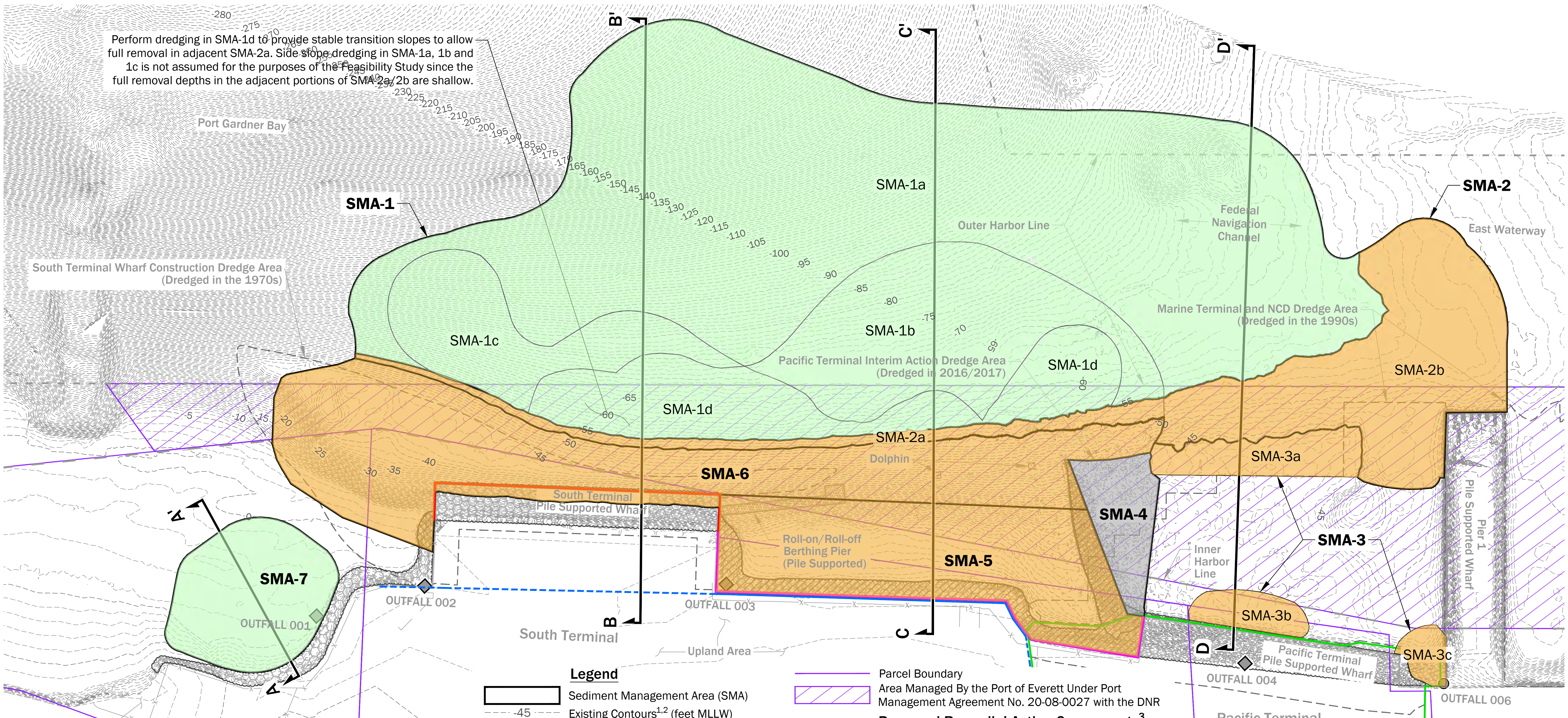
Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure 22

p:\0\0676020\CAD\07\task 1700 (cap)\067602007_F022_Cross Section D - D' [Alt 8].dwg 22 Cross Section D - D' Date Exported:2/16/2024 9:41 AM - by Jackson N. Fellows

Appendix A. Marine Area Remedial Alternatives



Legend

- Sediment Management Area (SMA)
- -45 Existing Contours[1,2] (feet MLLW)
- MLLW Mean Lower Low Water
- MHHW Mean Higher High Water
- Outer Harbor Line
- Inner Harbor Line
- Bulkhead (Dashed where Buried)
- Nearshore Confined Disposal (NCD) Facility (Former Log Pond)
- Fence
- Previously Dredged Areas
- Areas of Known Armoring
- Current Combined Sewer Outfall (SCO)
- Current Stormwater Outfall
- A A' Cross Section Location
- Parcel Boundary
- Area Managed By the Port of Everett Under Port Management Agreement No. 20-08-0027 with the DNR

Proposed Remedial Action Components[3]

- Full Removal of Contaminated Sediment and/or Wood Debris
- Monitored Natural Recovery (MNR)
- Remove Existing Pile-Supported Roll-on/Roll-off Berthing Pier and Dolphins
- Remove Existing Armor
- Remove and Replace Existing Armor
- No Action
- South Terminal Toe Wall
- Upland Retaining Wall

Notes:

1. Bathymetric Contours are based on merged survey data provided by Tetra Tech on 12/12/2017. Three surveys were merged by Tetra Tech - 1) Tetra Tech survey dated February 2017 presenting bathymetry of the marine areas adjacent to the South Terminal, 2) Tetra Tech survey dated December 2015 presenting bathymetry of areas underneath the Pacific/South Terminal Wharfs, and 3) Pacific Geomatic Services, Inc. survey dated October 2014 presenting the bathymetry of the rest of the marine areas of the site except for Pacific Terminal Interim Action Dredge Area. The bathymetry for the Pacific Terminal Interim Action Dredge Area is based on Tetra Tech survey dated February 2017 and was merged by GeoEngineers.
2. Upland contours are based on surface elevations obtained at the upland boring locations as part of the RI.
3. A summary of remedial action components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.
4. The locations of all features shown are approximate.
5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: See Notes 1 and 2.

Horizontal Datum: North American Datum (NAD) 1983/1991, WA State Plane, N Zone, US Foot
Vertical Datum: Mean Lower Low Water (MLLW)
Vertical Datum Conversion (based on NOAA's Publication Sheet (944-7659), dated 09/29/1988):
MHHW = +11.11 feet MLLW
NGVD 1929 = +5.93 MLLW
NAVD 1988 = +2.25 MLLW

250 0 250
Feet

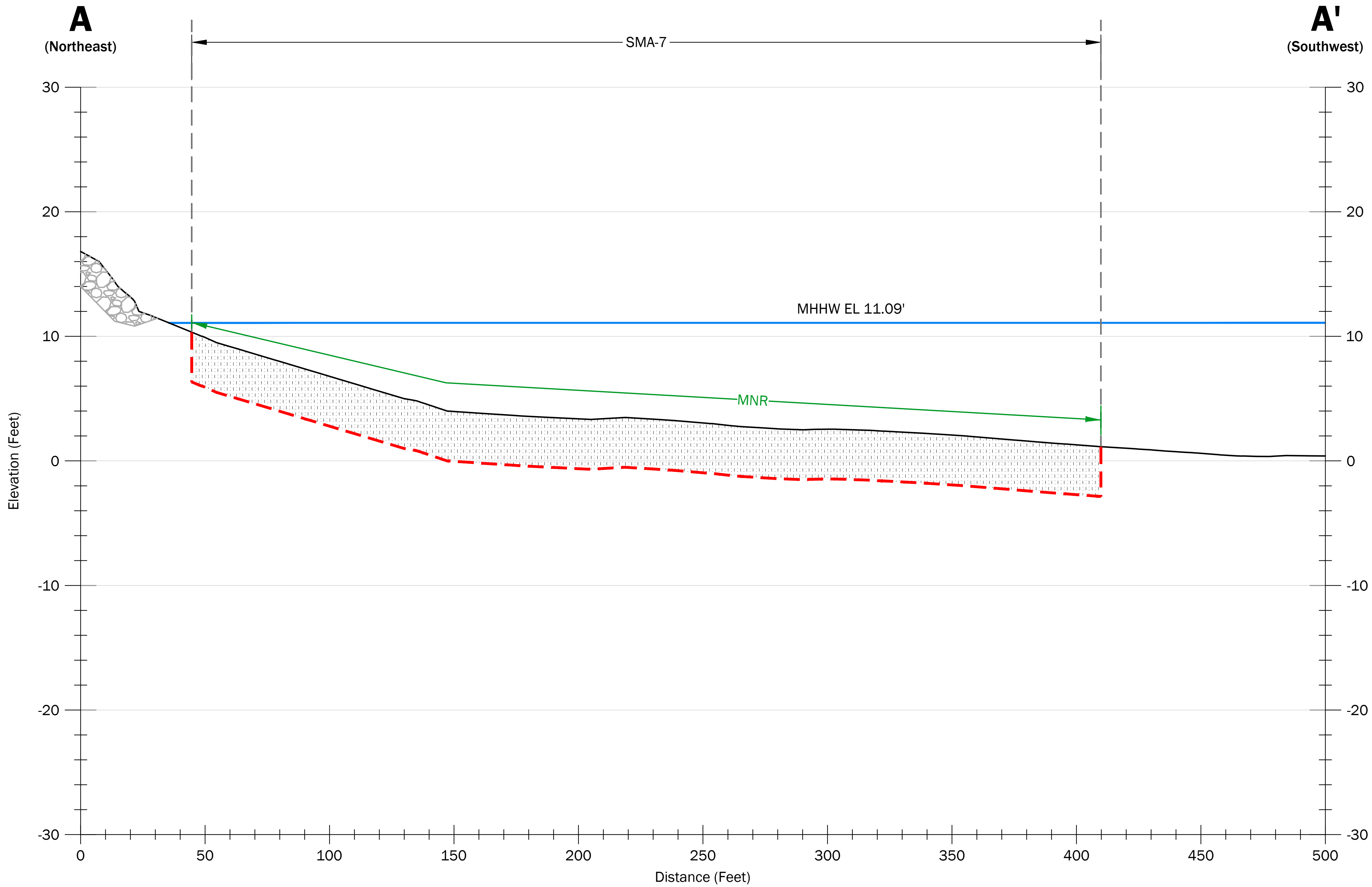
Alternative 1

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-1

p:\0\0676020\CAD\07\task 1700 (cap)\067602007_F077_Alternative 1.dwg F77 Date Exported:12/12/2023 3:04 PM - by Chad Stickel



Legend

- Existing Mudline
- Estimated Contamination Depth (feet below mudline)
- Contaminated Sediment and/or Wood Debris
- Approximate Shoreline Slope Armor (Rip-Rap)
- EL Elevation
- MHHW Mean Higher High Water

Proposed Remedial Alternative Components[1]

- MNR Monitored Natural Recovery

Alternative 1 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

50 0 50
Horizontal Scale in Feet
10 0 10
Vertical Scale in Feet
Vertical Exaggeration = 5X

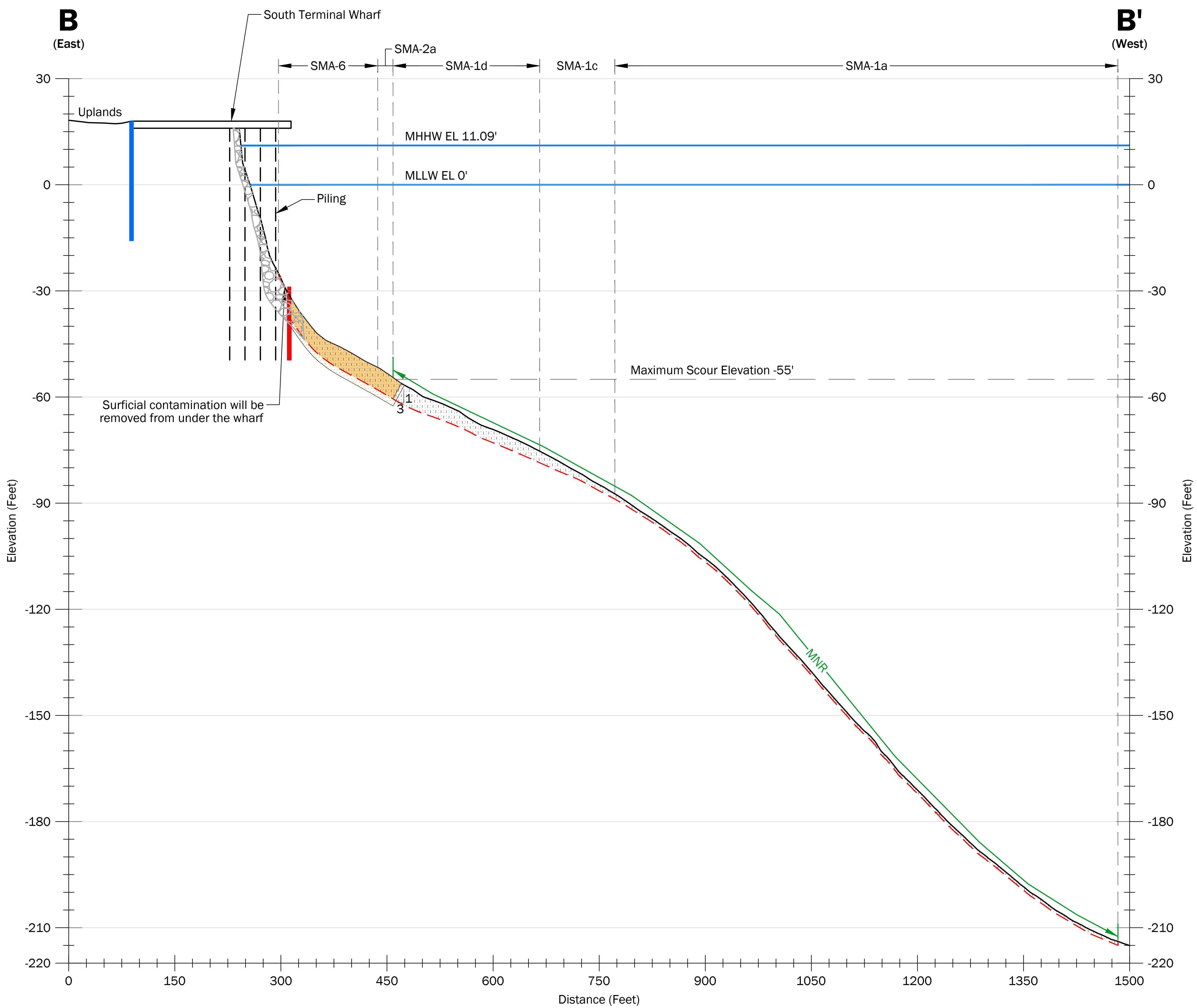
Alternative 1
Cross Section A - A'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-1A

p:\0\0676020\CAD\07\task 1700 (cap)\067602007_F078_Cross Section A - A' (Alt 1).dwg A-1A Section A (Alternative 1) Date Exported:12/12/2023 4:41 PM - by Chad Stickel



Legend

- Existing Mudline
- Estimated Contamination Depth (feet below mudline)
- Contaminated Sediment and/or Wood Debris
- Approximate Shoreline Slope Armor (Rip-Rap)
- Bulkhead (Depth Unknown)

EL	Elevation
MHHW	Mean Higher High Water
MLLW	Mean Lower Low Water

Proposed Remedial Alternative Components[1]

- MNR — Monitored Natural Recovery
- Full Removal of Contaminated Sediment and Wood Debris
- 2-Foot Overdredge Allowance
- South Terminal Toe Wall[2]

Alternative 1 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.
2. The height and depth of the wall will be determined during remedial design. In general, the wall will be keyed into the native soil and will vertically extend upwards such that the top of the wall is at or above the surface elevations of the adjacent armored slopes.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

150 0 150
Horizontal Scale in Feet
30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

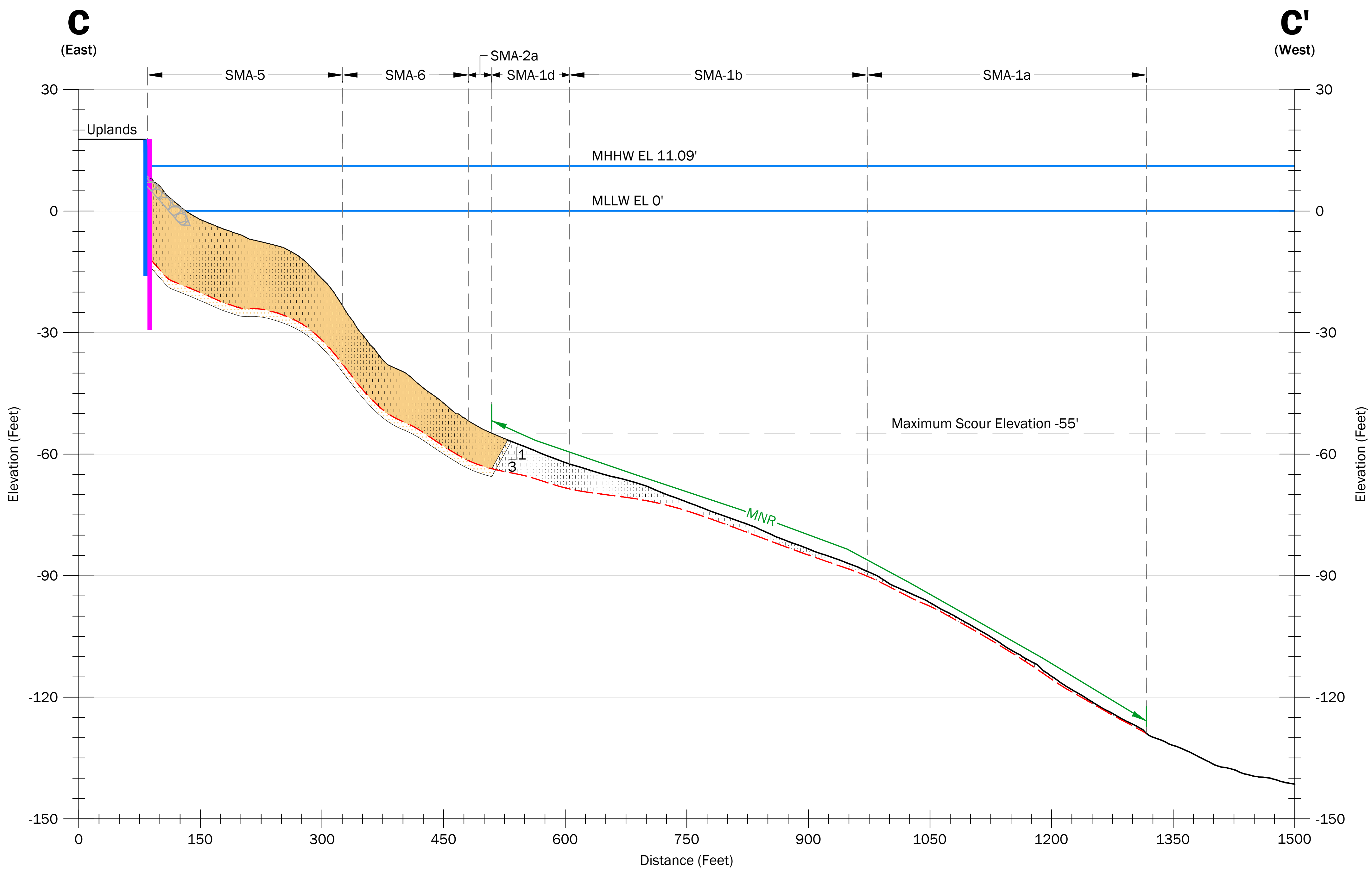
Alternative 1
Cross Section B - B'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-1B

p:\0\0676020\CAD\07\task 1700 (cap)\0676020007_F079_Cross Section B - B' [Alt 1].dwg A-1B Section B [Alternative 1] Date Exported:12/12/2023 4:41 PM - by Chad Stickel



Legend

- Existing Mudline
- Estimated Contamination Depth (feet below mudline)
- Contaminated Sediment and/or Wood Debris
- Approximate Shoreline Slope Armor (Rip-Rap)
- Bulkhead (Depth Unknown)

EL Elevation
MHHW Mean Higher High Water
MLLW Mean Lower Low Water

Proposed Remedial Alternative Components[1]

- MNR — Monitored Natural Recovery
- Full Removal of Contaminated Sediment and Wood Debris
- 2-Foot Overdredge Allowance
- Upland Retaining Wall[2]

Alternative 1 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.
2. The height and depth of the wall will be determined during remedial design. In general, the wall will be keyed into the native soil and will vertically extend upwards such that the top of the wall is at or above the surface elevations of the adjacent Upland area.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

150 0 150
Horizontal Scale in Feet
30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

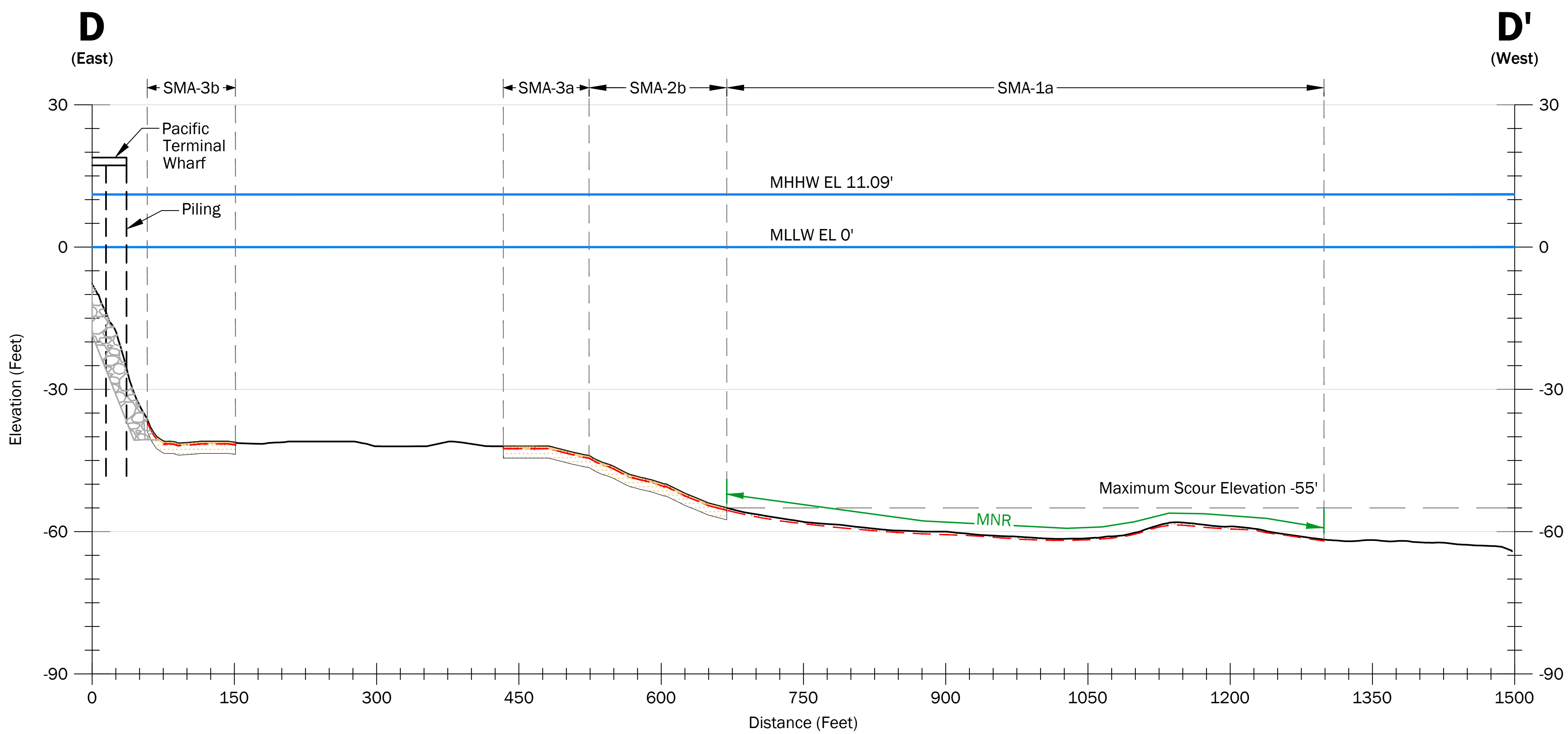
Alternative 1
Cross Section C - C'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-1C

p:\0\0676020\CAD\07\task 1700 (cap)\067602007_F080_Cross Section C - C' [Alt 1].dwg A-1C Section C [Alternative 1] Date Exported:12/12/2023 4:41 PM - by Chad Stickel



Legend

Existing Mudline
Estimated Contamination Depth (feet below mudline)
Contaminated Sediment and/or Wood Debris
Approximate Shoreline Slope Armor (Rip-Rap)
EL Elevation
MHHW Mean Higher High Water
MLLW Mean Lower Low Water

Proposed Remedial Alternative Components[1]

MNR Monitored Natural Recovery
Full Removal of Contaminated Sediment and Wood Debris
2-Foot Overdredge Allowance

Alternative 1 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

150 0 150
Horizontal Scale in Feet
30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

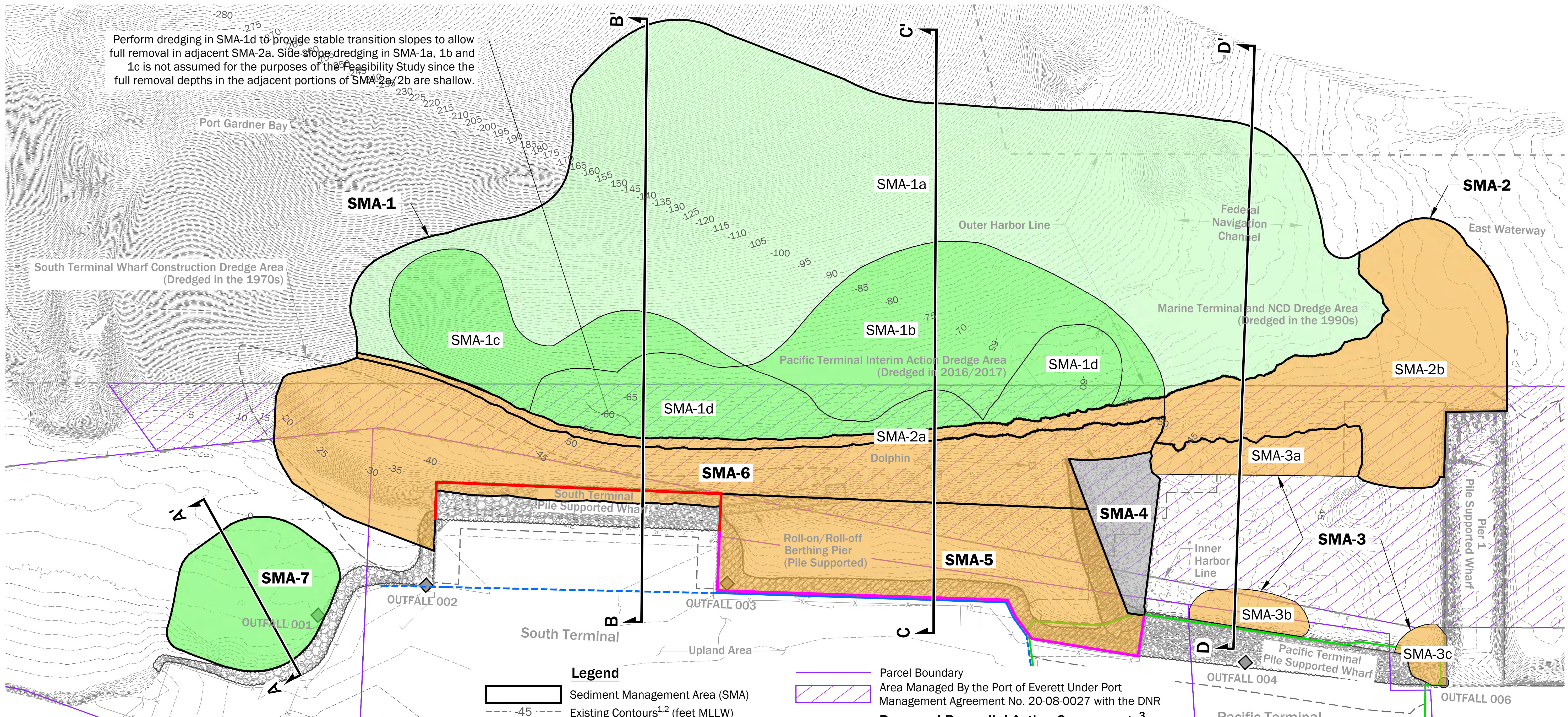
Alternative 1
Cross Section D - D'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-1D

p:\0\0676020\CAD\07\task 1700 (cap)\067602007_F081_Cross Section D - D' (Alt 1).dwg A-1D Section D (Alternative 1) Date Exported:12/12/2023 4:41 PM - by Chad Stickel



Legend

- Sediment Management Area (SMA)
- Existing Contours[1,2] (feet MLLW)
- Mean Lower Low Water
- Mean Higher High Water
- Outer Harbor Line
- Inner Harbor Line
- Bulkhead (Dashed where Buried)
- Nearshore Confined Disposal (NCD) Facility (Former Log Pond)
- Fence
- Previously Dredged Areas
- Areas of Known Armoring
- Current Combined Sewer Outfall (SCO)
- Current Stormwater Outfall
- Cross Section Location
- Parcel Boundary
- Area Managed By the Port of Everett Under Port Management Agreement No. 20-08-0027 with the DNR

Proposed Remedial Action Components[3]

- Full Removal of Contaminated Sediment and/or Wood Debris
- Enhanced Natural Recovery (ENR)
- Monitored Natural Recovery (MNR)
- Remove Existing Pile-Supported Roll-on/Roll-off Berthing Pier and Dolphins
- Remove Existing Armor
- Remove and Replace Existing Armor
- No Action
- South Terminal Toe Wall
- Upland Retaining Wall

Notes:

1. Bathymetric Contours are based on merged survey data provided by Tetra Tech on 12/12/2017. Three surveys were merged by Tetra Tech - 1) Tetra Tech survey dated February 2017 presenting bathymetry of the marine areas adjacent to the South Terminal, 2) Tetra Tech survey dated December 2015 presenting bathymetry of areas underneath the Pacific/South Terminal Wharfs, and 3) Pacific Geomatic Services, Inc. survey dated October 2014 presenting the bathymetry of the rest of the marine areas of the site except for Pacific Terminal Interim Action Dredge Area. The bathymetry for the Pacific Terminal Interim Action Dredge Area is based on Tetra Tech survey dated February 2017 and was merged by GeoEngineers.
2. Upland contours are based on surface elevations obtained at the upland boring locations as part of the RI.
3. A summary of remedial action components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.
4. The locations of all features shown are approximate.
5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: See Notes 1 and 2.

Horizontal Datum: North American Datum (NAD) 1983/1991, WA State Plane, N Zone, US Foot
Vertical Datum: Mean Lower Low Water (MLLW)
Vertical Datum Conversion (based on NOAA's Publication Sheet (944-7659), dated 09/29/1988):
MHHW = +11.11 feet MLLW
NGVD 1929 = +5.93 MLLW
NAVD 1988 = +2.25 MLLW

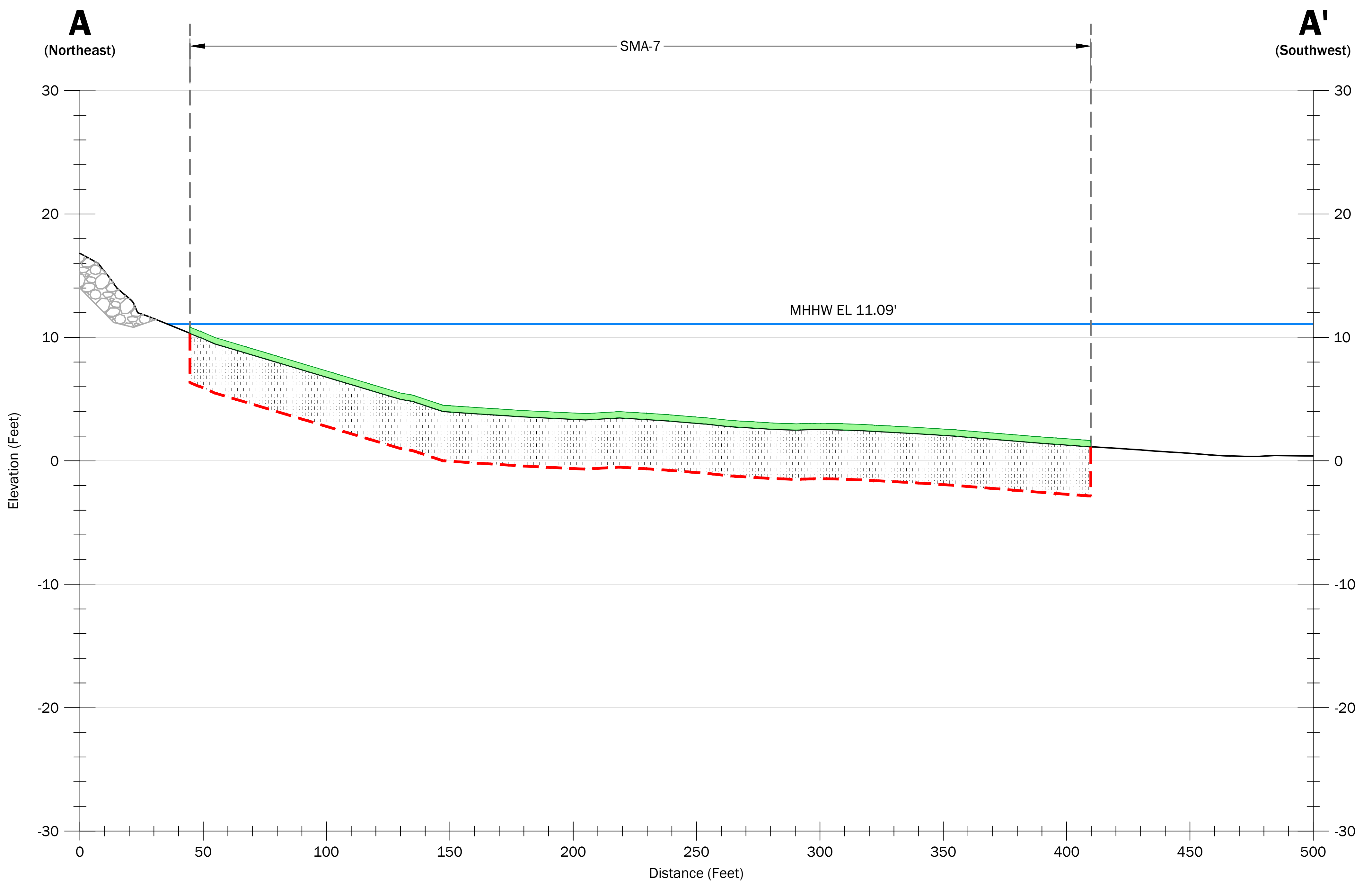
Alternative 2

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-2

P:\0\0676020\CAD\07\task 1700 (cap)\067602007_F082_Alternative 2.dwg F77 Date Exported:12/12/2023 3:16 PM - by Chad Stickel



Legend

Existing Mudline

Estimated Contamination Depth (feet below mudline)

Contaminated Sediment and/or Wood Debris

Approximate Shoreline Slope Armor (Rip-Rap)

EL Elevation

MHHW Mean Higher High Water

Proposed Remedial Alternative Components[1]

Enhanced Natural Recovery

Alternative 2 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

50 0 50
Horizontal Scale in Feet
10 0 10
Vertical Scale in Feet
Vertical Exaggeration = 5X

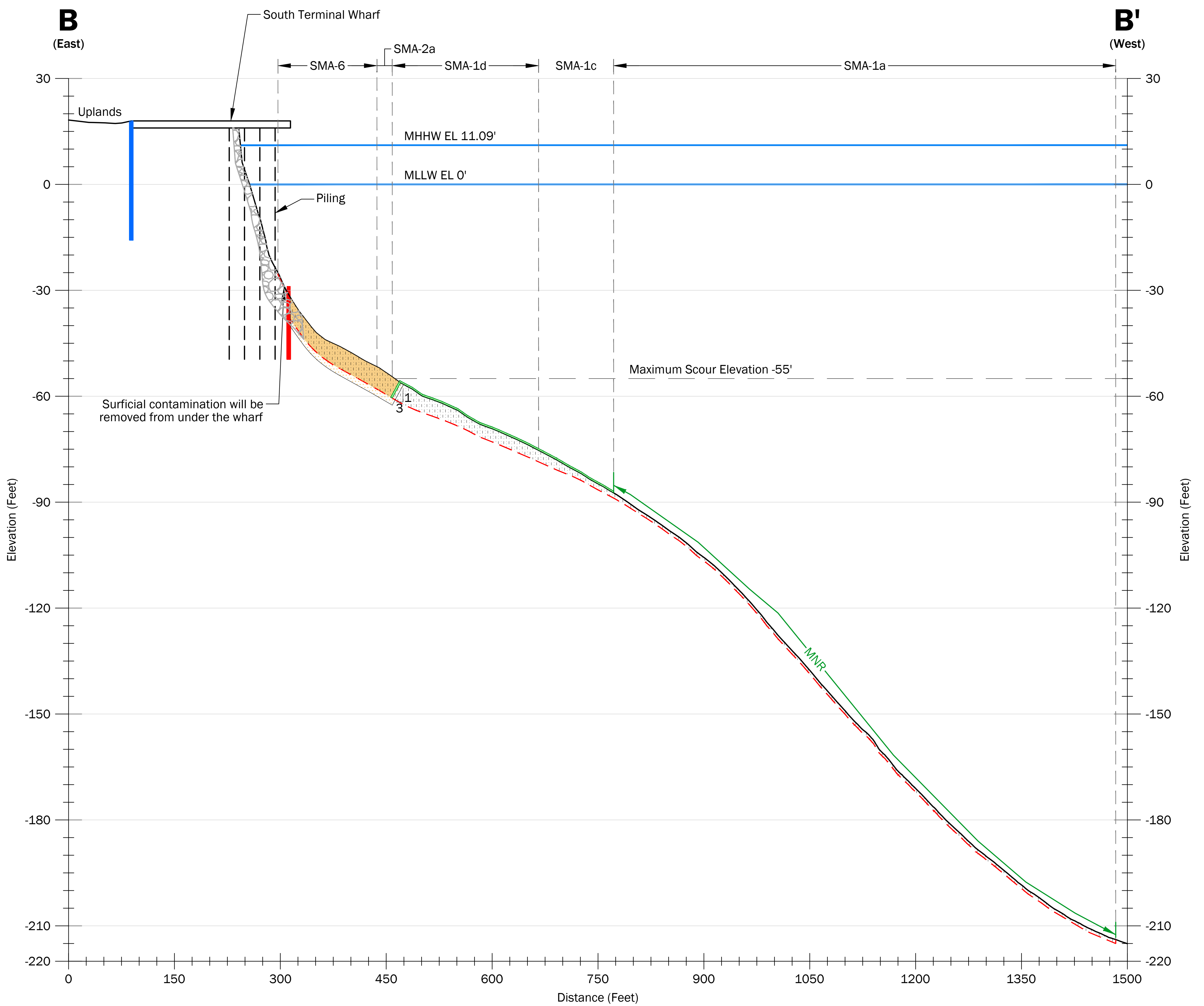
Alternative 2
Cross Section A - A'

Weyerhaeuser Mill A Former
Everett, Washington

GEOENGINEERS

Figure A-2A

p:\0\0676020\CAD\07\task 1700 (cap)\067602007_F083_Cross Section A - A' (Alt 2).dwg A-2A Section A (Alternative 2) Date Exported:12/12/2023 4:42 PM - by Chad Stickel



Legend

- Existing Mudline
- Estimated Contamination Depth (feet below mudline)
- Contaminated Sediment and/or Wood Debris
- Approximate Shoreline Slope Armor (Rip-Rap)
- Bulkhead (Depth Unknown)

EL Elevation
MHHW Mean Higher High Water
MLLW Mean Lower Low Water

Proposed Remedial Alternative Components[1]

- MNR — Monitored Natural Recovery
- Enhanced Natural Recovery
- Full Removal of Contaminated Sediment and Wood Debris
- 2-Foot Overdredge Allowance
- South Terminal Toe Wall[2]

Alternative 2 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.
2. The height and depth of the wall will be determined during remedial design. In general, the wall will be keyed into the native soil and will vertically extend upwards such that the top of the wall is at or above the surface elevations of the adjacent armored slopes.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

150 0 150
Horizontal Scale in Feet
30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

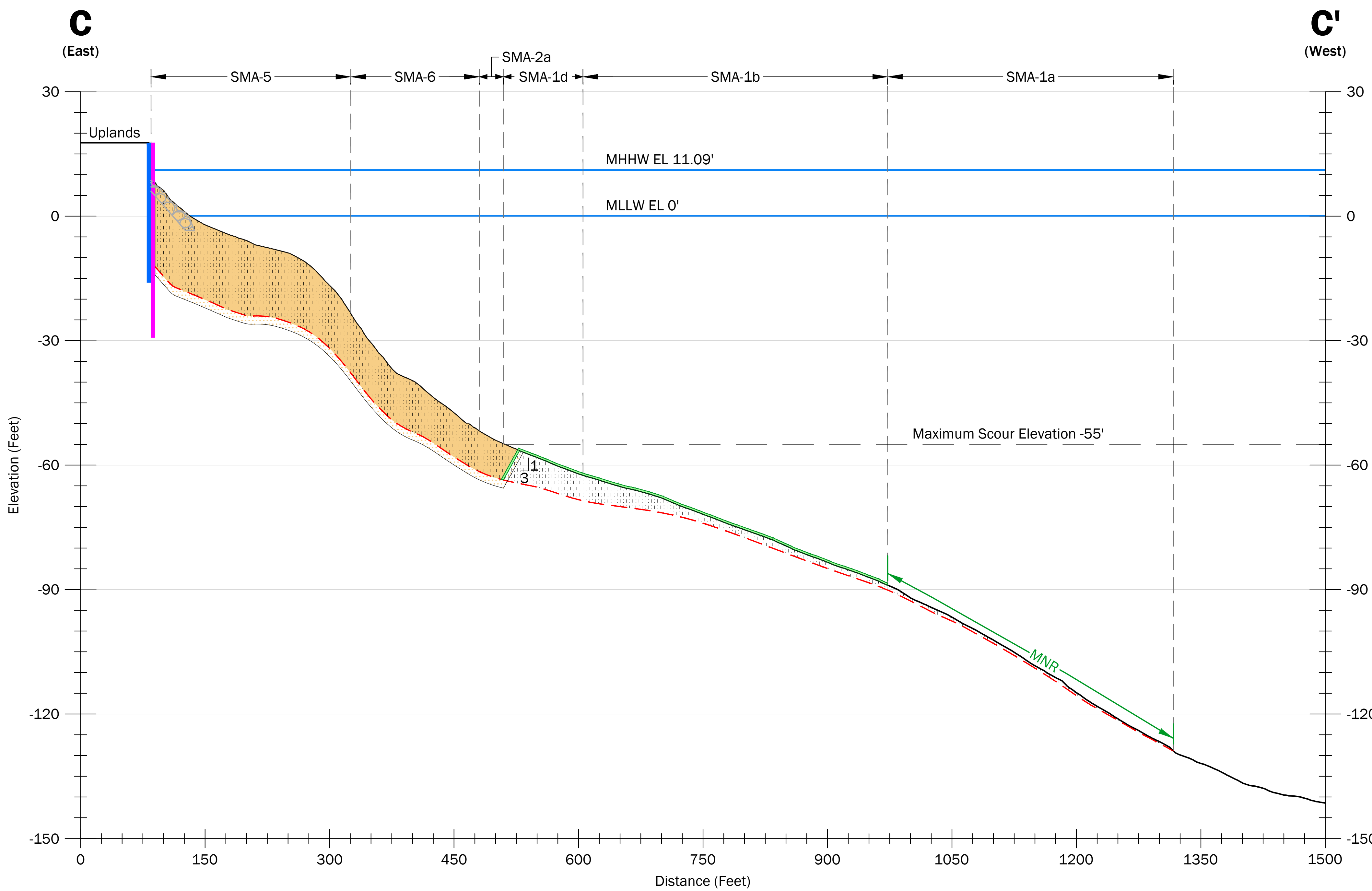
Alternative 2
Cross Section B - B'

Weyerhaeuser Mill A Former
Everett, Washington

GEOENGINEERS

Figure A-2B

p:\0\0676020\CAD\07\task 1700 (cap)\067602007_F084_Cross Section B - B' (Alt 2).dwg A-2B Section B (Alternative 2) Date Exported:12/12/2023 4:42 PM - by Chad Stickel



Legend

- Existing Mudline
- Estimated Contamination Depth (feet below mudline)
- Contaminated Sediment and/or Wood Debris
- Approximate Shoreline Slope Armor (Rip-Rap)
- Bulkhead (Depth Unknown)
- EL Elevation
- MHHW Mean Higher High Water
- MLLW Mean Lower Low Water

Proposed Remedial Alternative Components[1]

- MNR Monitored Natural Recovery
- Enhanced Natural Recovery
- Full Removal of Contaminated Sediment and Wood Debris
- 2-Foot Overdredge Allowance
- Upland Retaining Wall[2]

Alternative 2 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.
2. The height and depth of the wall will be determined during remedial design. In general, the wall will be keyed into the native soil and will vertically extend upwards such that the top of the wall is at or above the surface elevations of the adjacent Upland area.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

150 0 150
Horizontal Scale in Feet

30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

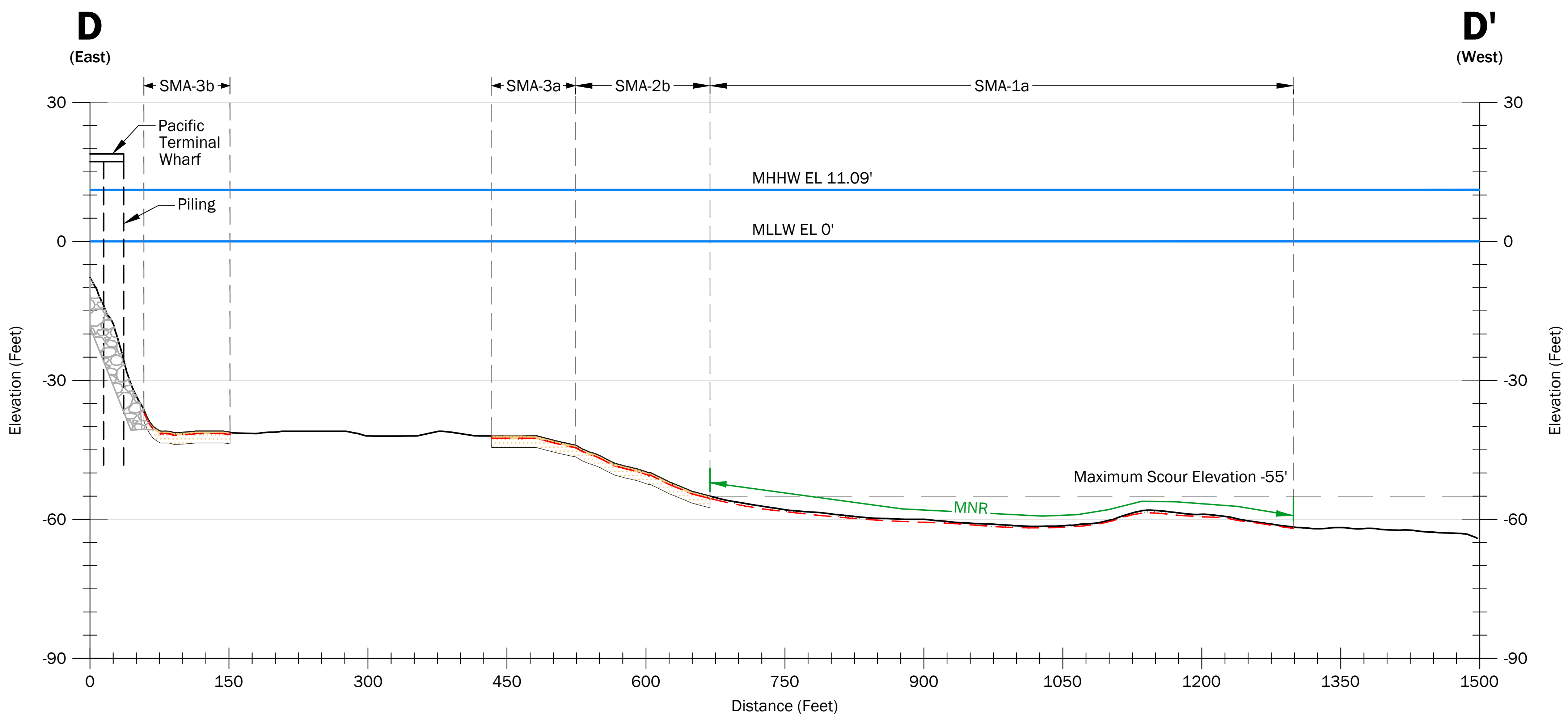
Alternative 2
Cross Section C - C'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-2C

p:\0\0676020\CAD\07\task 1700 (cap)\067602007_F085_Cross Section C - C' (Alt 2).dwg A-2C Section C (Alternative 2) Date Exported:12/12/2023 4:42 PM - by Chad Stickel



Legend

- Existing Mudline
- Estimated Contamination Depth (feet below mudline)
- Contaminated Sediment and/or Wood Debris
- Approximate Shoreline Slope Armor (Rip-Rap)

EL Elevation
MHHW Mean Higher High Water
MLLW Mean Lower Low Water

Proposed Remedial Alternative Components[1]

- MNR Monitored Natural Recovery
- Full Removal of Contaminated Sediment and Wood Debris
- 2-Foot Overdredge Allowance

Alternative 2 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

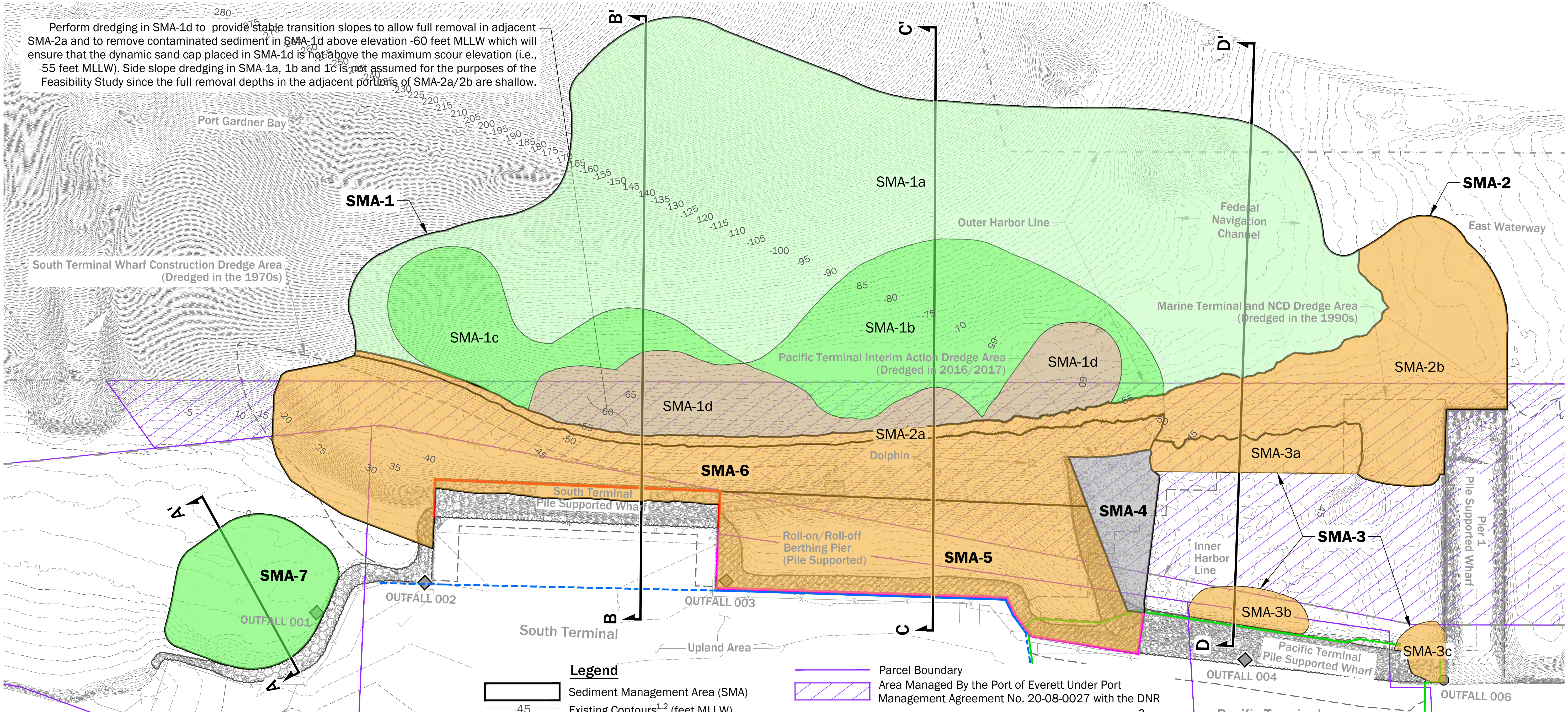
150 0 150
Horizontal Scale in Feet
30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

Alternative 2
Cross Section D - D'

Weyerhaeuser Mill A Former
Everett, Washington

GEOENGINEERS

Figure A-2D



Legend

- Sediment Management Area (SMA)
- Existing Contours[1,2] (feet MLLW) (-45)
- Mean Lower Low Water (MLLW)
- Mean Higher High Water (MHHW)
- Outer Harbor Line
- Inner Harbor Line
- Bulkhead (Dashed where Buried)
- Nearshore Confined Disposal (NCD) Facility (Former Log Pond)
- Fence
- Previously Dredged Areas
- Areas of Known Armoring
- Current Combined Sewer Outfall (SCO)
- Current Stormwater Outfall
- Cross Section Location (A, A')
- Parcel Boundary
- Area Managed By the Port of Everett Under Port Management Agreement No. 20-08-0027 with the DNR

Proposed Remedial Action Components[3]

- Full Removal of Contaminated Sediment and/or Wood Debris
- Dynamic Sand Cap
- Enhanced Natural Recovery (ENR)
- Monitored Natural Recovery (MNR)
- Remove Existing Pile-Supported Roll-on/Roll-off Berthing Pier and Dolphins
- Remove Existing Armor
- Remove and Replace Existing Armor
- No Action
- South Terminal Toe Wall
- Upland Retaining Wall

250 0 250
Feet

W N S E

Notes:

1. Bathymetric Contours are based on merged survey data provided by Tetra Tech on 12/12/2017. Three surveys were merged by Tetra Tech - 1) Tetra Tech survey dated February 2017 presenting bathymetry of the marine areas adjacent to the South Terminal, 2) Tetra Tech survey dated December 2015 presenting bathymetry of areas underneath the Pacific/South Terminal Wharfs, and 3) Pacific Geomatic Services, Inc. survey dated October 2014 presenting the bathymetry of the rest of the marine areas of the site except for Pacific Terminal Interim Action Dredge Area. The bathymetry for the Pacific Terminal Interim Action Dredge Area is based on Tetra Tech survey dated February 2017 and was merged by GeoEngineers.
2. Upland contours are based on surface elevations obtained at the upland boring locations as part of the RI.
3. A summary of remedial action components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.
4. The locations of all features shown are approximate.
5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: See Notes 1 and 2.

Horizontal Datum: North American Datum (NAD) 1983/1991, WA State Plane, N Zone, US Foot
Vertical Datum: Mean Lower Low Water (MLLW)
Vertical Datum Conversion (based on NOAA's Publication Sheet (944-7659), dated 09/29/1988):
MHHW = +11.11 feet MLLW
NGVD 1929 = +5.93 MLLW
NAVD 1988 = +2.25 MLLW

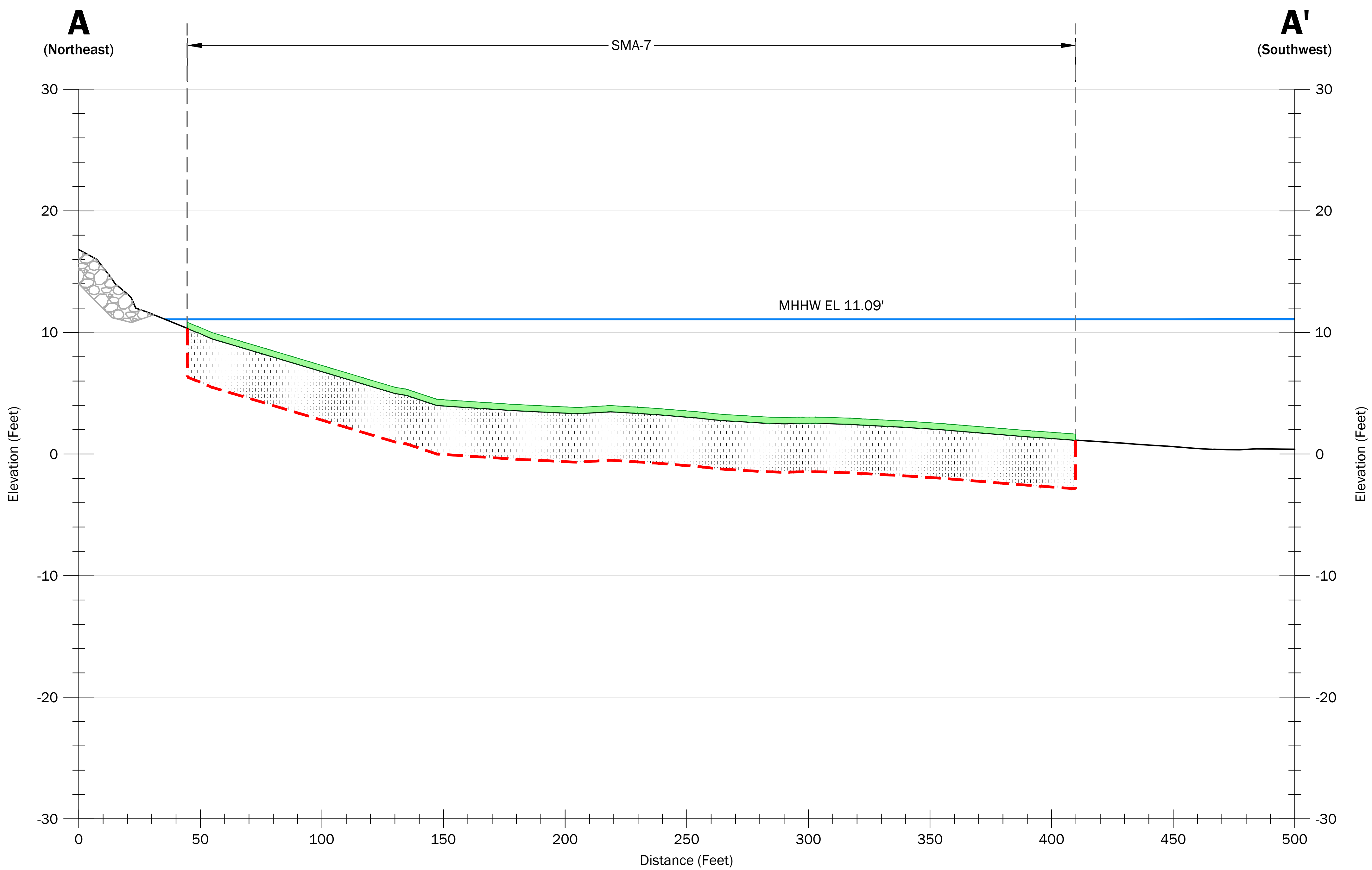
Alternative 3

Weyerhaeuser Mill A Former
Everett, Washington

GEOENGINEERS

Figure A-3

p:\0\0676020\CAD\07\task 1700 [cap]\067602007_F087_Alternative 3.dwg A-3 Alternative 3 Date Exported:12/12/2023 9:17 PM - by Chad Stickel



Legend

- Existing Mudline
- Estimated Contamination Depth (feet below mudline)
- Contaminated Sediment and/or Wood Debris
- Approximate Shoreline Slope Armor (Rip-Rap)
- EL Elevation
- MHHW Mean Higher High Water

Proposed Remedial Alternative Components[1]

- Enhanced Natural Recovery

Alternative 3 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

Disclaimer: This figure was created for a specific purpose and project. Any use of this figure for any other project or purpose shall be at the user's sole risk and without liability to GeoEngineers. The locations of features shown may be approximate. GeoEngineers makes no warranty or representation as to the accuracy, completeness, or suitability of the figure, or data contained therein. The file containing this figure is a copy of a master document, the original of which is retained by GeoEngineers and is the official document of record.

50 0 50
Horizontal Scale in Feet
10 0 10
Vertical Scale in Feet
Vertical Exaggeration = 5X

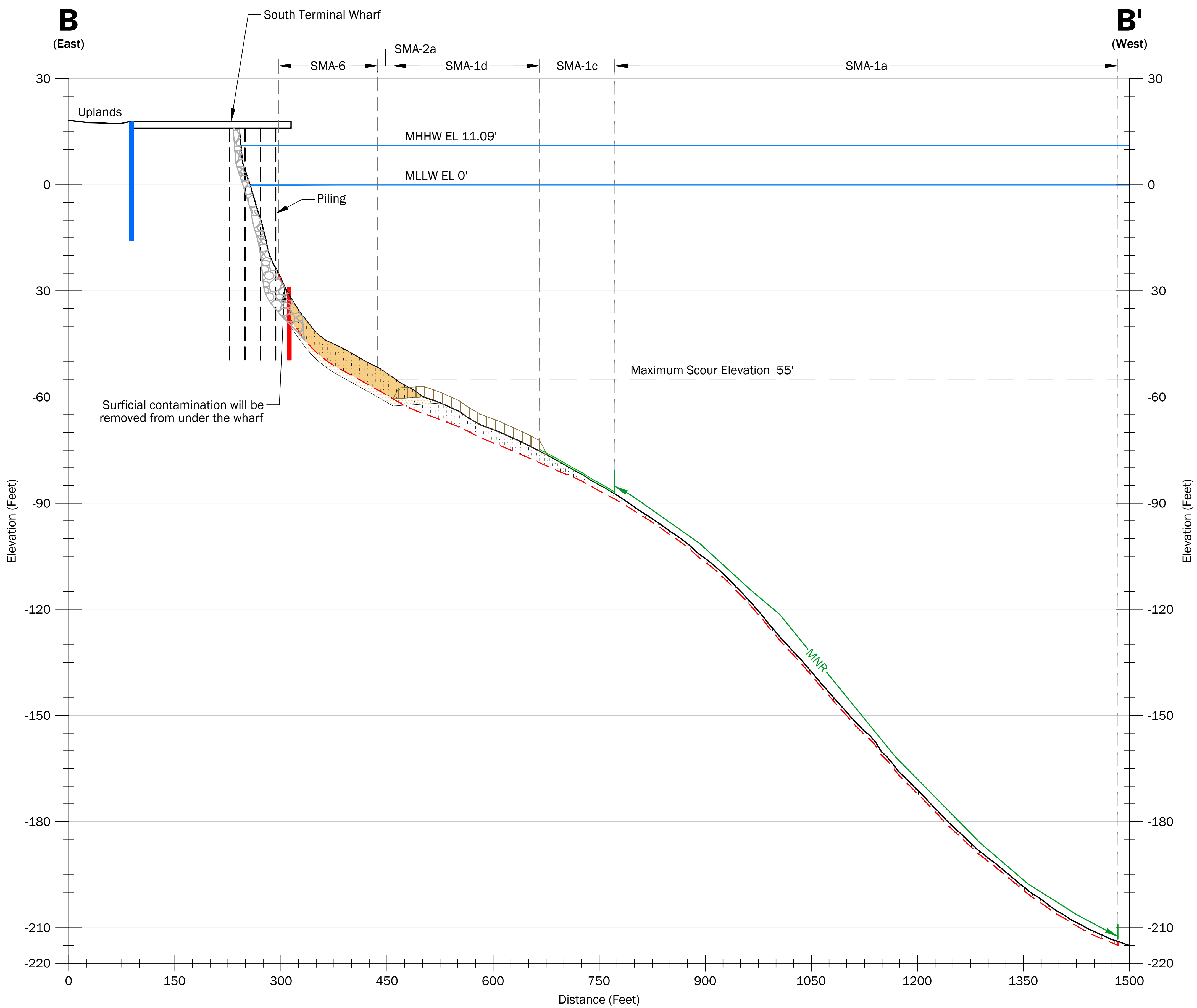
Alternative 3
Cross Section A - A'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-3A

p:\0\0676020\CAD\07\task 1700 (cap)\067602007_F088_Cross Section A - A' (Alt 3).dwg A-3A Section A (Alternative 3) Date Exported:12/12/2023 4:47 PM - by Chad Stickel



Legend

- Existing Mudline
- Estimated Contamination Depth (feet below mudline)
- Contaminated Sediment and/or Wood Debris
- Approximate Shoreline Slope Armor (Rip-Rap)
- Bulkhead (Depth Unknown)
- EL Elevation
- MHHW Mean Higher High Water
- MLLW Mean Lower Low Water

Proposed Remedial Alternative Components[1]

- MNR Monitored Natural Recovery
- Enhanced Natural Recovery
- Full Removal of Contaminated Sediment and Wood Debris
- 2-Foot Overdredge Allowance
- Dynamic Sand Cap
- South Terminal Toe Wall[2]

Alternative 3 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.
2. The height and depth of the wall will be determined during remedial design. In general, the wall will be keyed into the native soil and will vertically extend upwards such that the top of the wall is at or above the surface elevations of the adjacent armored slopes.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

150 0 150
Horizontal Scale in Feet
30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

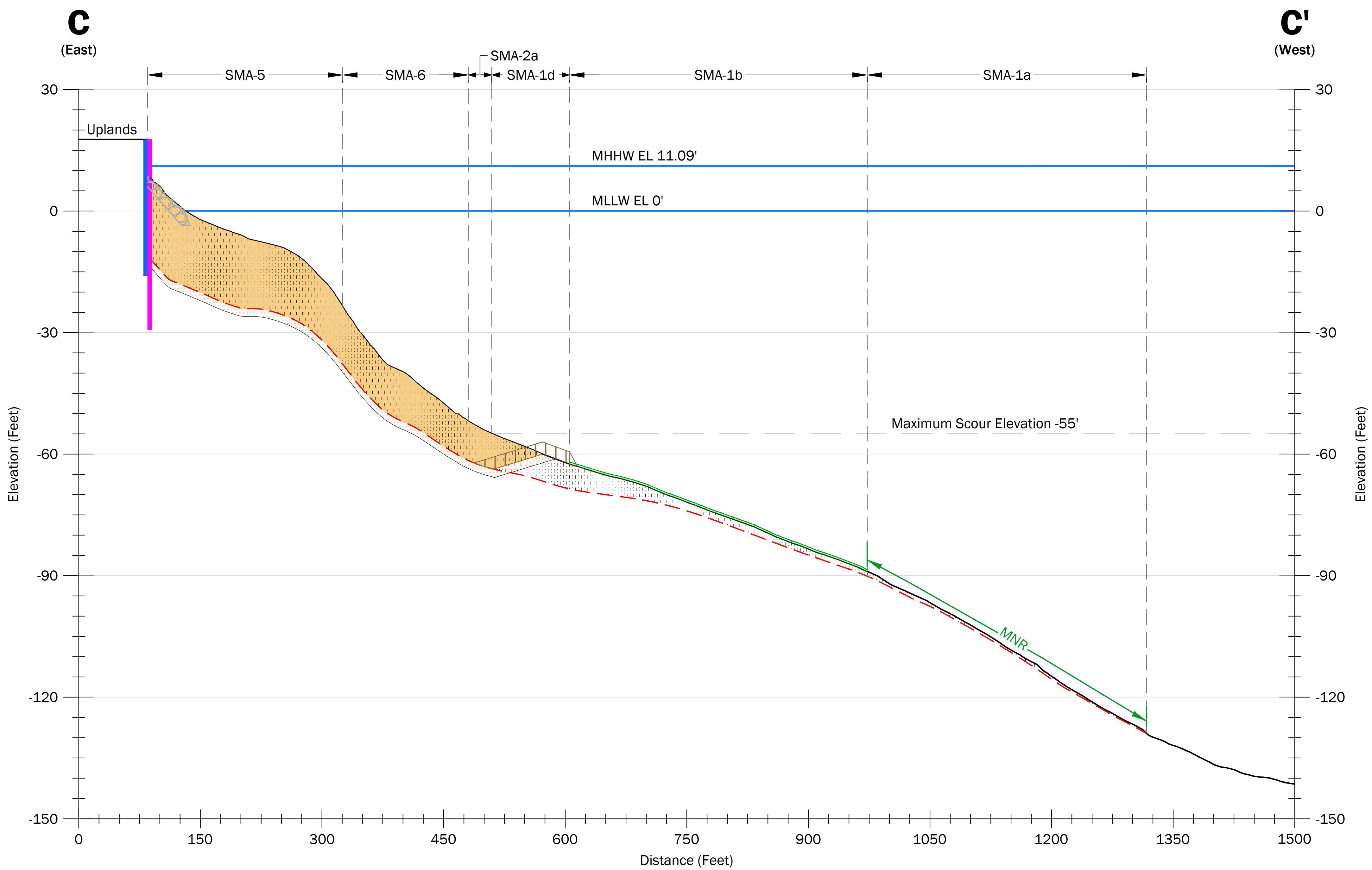
Alternative 3
Cross Section B - B'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-3B

p:\0\0676020\CAD\07\task 1700 (cap)\067602007_F089_Cross Section B - B' (Alt 3).dwg A-3B Section B (Alternative 3) Date Exported:12/12/2023 4:47 PM - by Chad Stickel



Legend

- Existing Mudline
- Estimated Contamination Depth (feet below mudline)
- Contaminated Sediment and/or Wood Debris
- Approximate Shoreline Slope Armor (Rip-Rap)
- Bulkhead (Depth Unknown)

EL Elevation
MHHW Mean Higher High Water
MLLW Mean Lower Low Water

Proposed Remedial Alternative Components[1]

- MNR Monitored Natural Recovery
- Enhanced Natural Recovery
- Full Removal of Contaminated Sediment and Wood Debris
- 2-Foot Overdredge Allowance
- Dynamic Sand Cap
- Upland Retaining Wall[2]

Alternative 3 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.
2. The height and depth of the wall will be determined during remedial design. In general, the wall will be keyed into the native soil and will vertically extend upwards such that the top of the wall is at or above the surface elevations of the adjacent Upland area.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

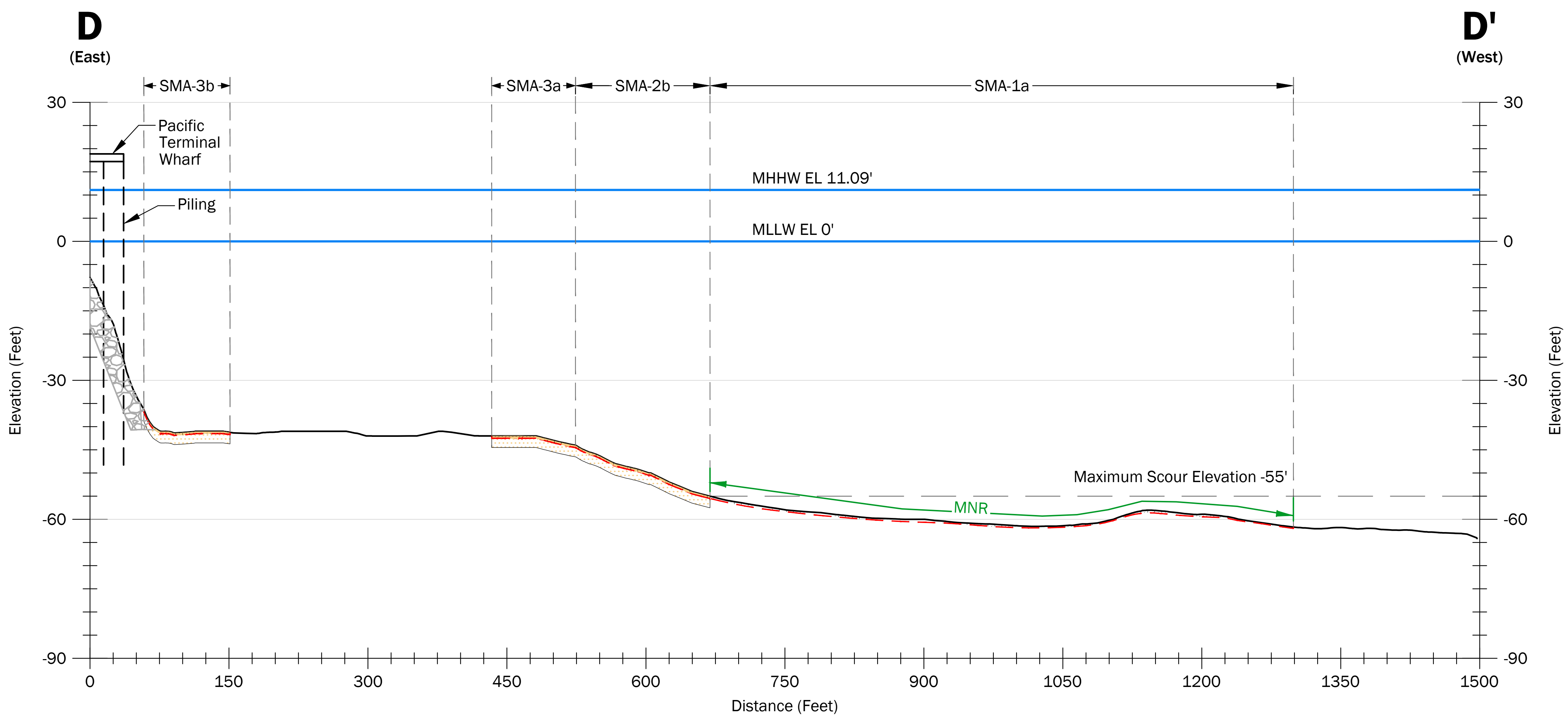
150 0 150
Horizontal Scale in Feet
30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

Alternative 3
Cross Section C - C'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-3C



Legend

- Existing Mudline
- Estimated Contamination Depth (feet below mudline)
- Contaminated Sediment and/or Wood Debris
- Approximate Shoreline Slope Armor (Rip-Rap)

EL Elevation
MHHW Mean Higher High Water
MLLW Mean Lower Low Water

Proposed Remedial Alternative Components[1]

- MNR: Monitored Natural Recovery
- Full Removal of Contaminated Sediment and Wood Debris
- 2-Foot Overdredge Allowance

Alternative 3 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

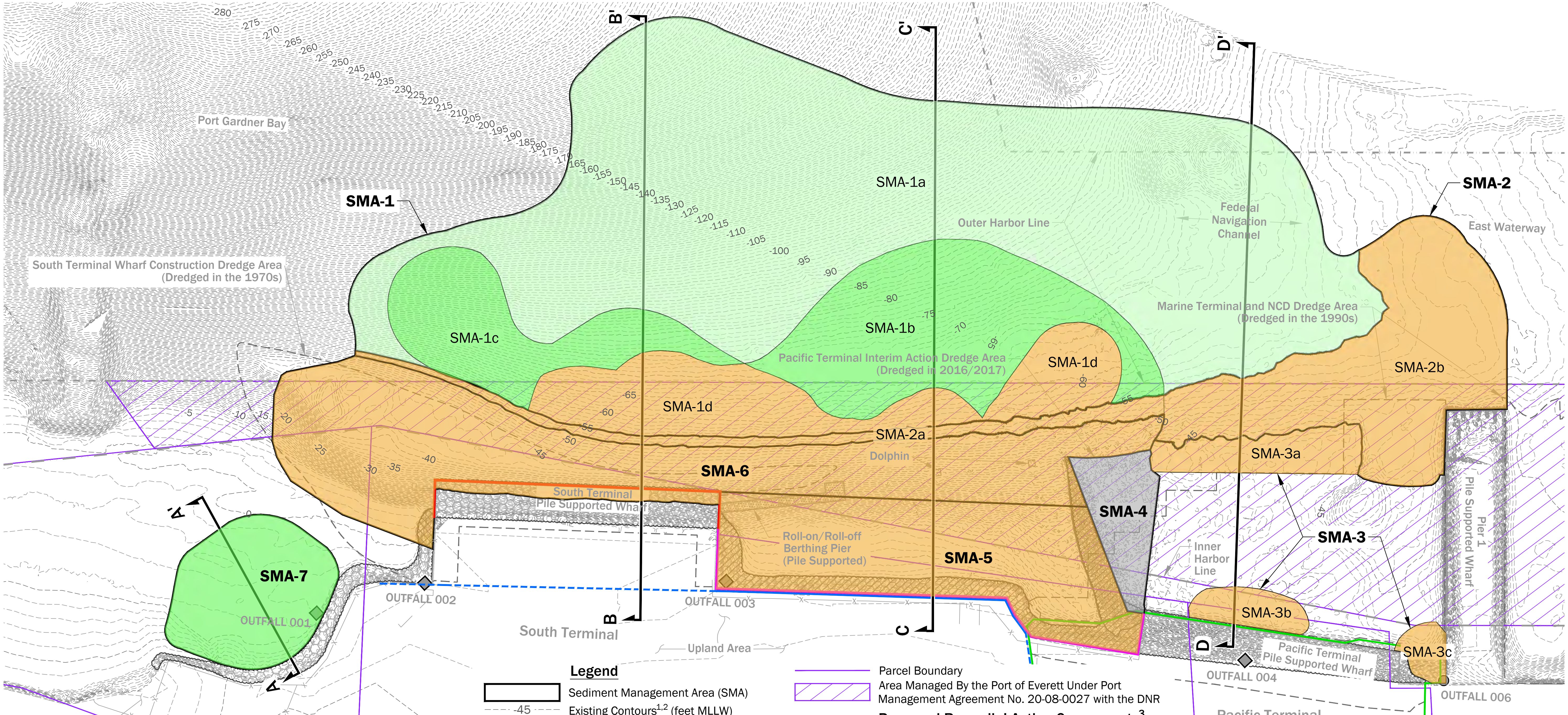
150 0 150
Horizontal Scale in Feet
30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

Alternative 3
Cross Section D - D'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-3D



Notes:

1. Bathymetric Contours are based on merged survey data provided by Tetra Tech on 12/12/2017. Three surveys were merged by Tetra Tech - 1) Tetra Tech survey dated February 2017 presenting bathymetry of the marine areas adjacent to the South Terminal, 2) Tetra Tech survey dated December 2015 presenting bathymetry of areas underneath the Pacific/South Terminal Wharfs, and 3) Pacific Geomatic Services, Inc. survey dated October 2014 presenting the bathymetry of the rest of the marine areas of the site except for Pacific Terminal Interim Action Dredge Area. The bathymetry for the Pacific Terminal Interim Action Dredge Area is based on Tetra Tech survey dated February 2017 and was merged by GeoEngineers.
2. Upland contours are based on surface elevations obtained at the upland boring locations as part of the RI.
3. A summary of remedial action components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.
4. The locations of all features shown are approximate.
5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: See Notes 1 and 2.

Horizontal Datum: North American Datum (NAD) 1983/1991, WA State Plane, N Zone, US Foot
Vertical Datum: Mean Lower Low Water (MLLW)
Vertical Datum Conversion (based on NOAA's Publication Sheet (944-7659), dated 09/29/1988):
MHHW = +11.11 feet MLLW
NGVD 1929 = +5.93 MLLW
NAVD 1988 = +2.25 MLLW

Legend

- Sediment Management Area (SMA)
- -45 Existing Contours[1,2] (feet MLLW)
- MLLW Mean Lower Low Water
- MHHW Mean Higher High Water
- Outer Harbor Line
- Inner Harbor Line
- Bulkhead (Dashed where Buried)
- Nearshore Confined Disposal (NCD) Facility (Former Log Pond)
- Fence
- Previously Dredged Areas
- Areas of Known Armoring
- Current Combined Sewer Outfall (SCO)
- Current Stormwater Outfall
- A A' Cross Section Location
- Parcel Boundary
- Area Managed By the Port of Everett Under Port Management Agreement No. 20-08-0027 with the DNR

Proposed Remedial Action Components[3]

- Full Removal of Contaminated Sediment and/or Wood Debris
- Enhanced Natural Recovery (ENR)
- Monitored Natural Recovery (MNR)
- Remove Existing Pile-Supported Roll-on/Roll-off Berthing Pier and Dolphins
- Remove Existing Armor
- Remove and Replace Existing Armor
- No Action
- South Terminal Toe Wall
- Upland Retaining Wall

250 0 250
Feet

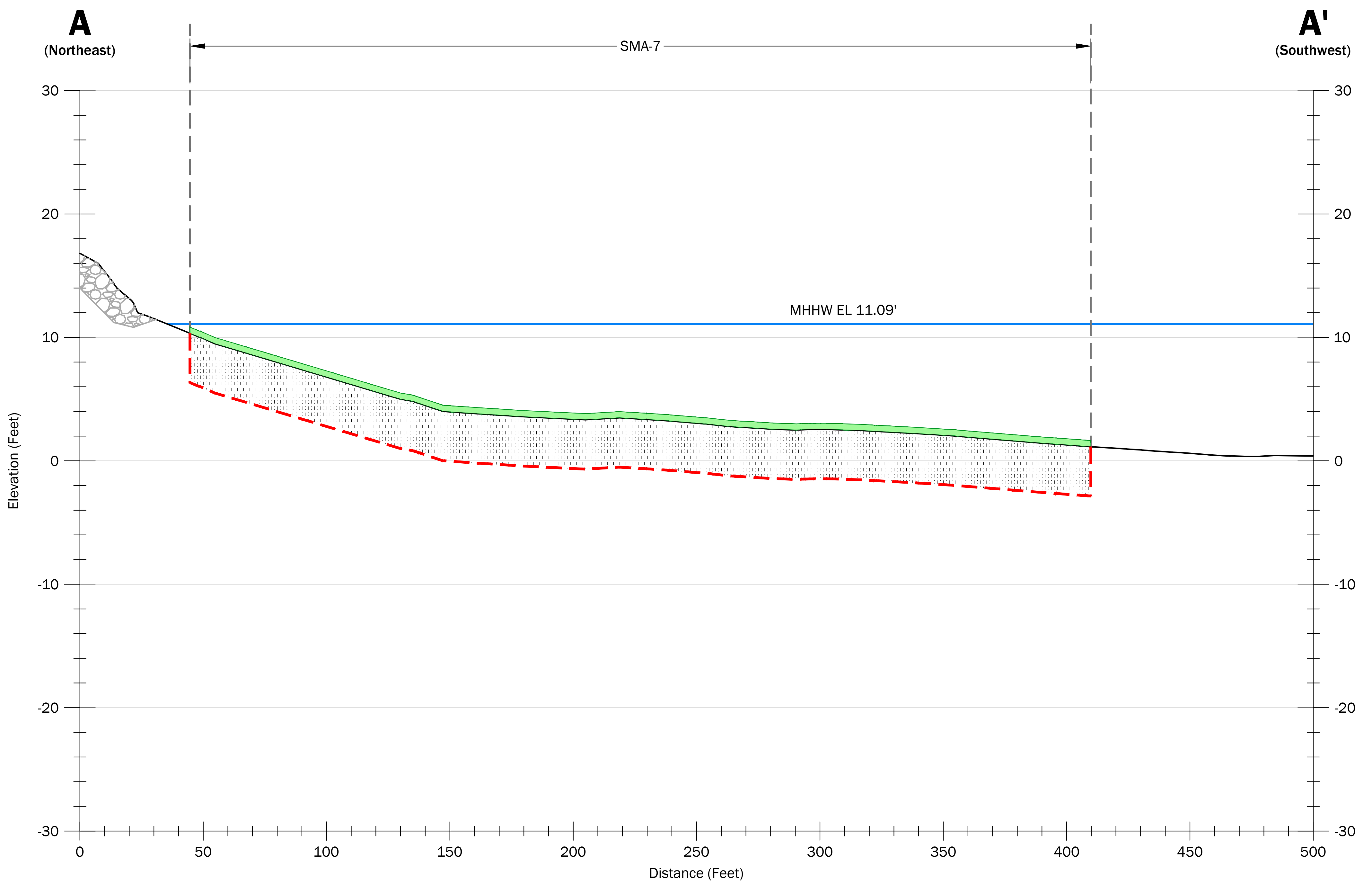
Alternative 4

Weyerhaeuser Mill A Former
Everett, Washington

GEOENGINEERS

Figure A-4

p:\0\0676020\CAD\07\task 1700 [cap]\067602007_F092_Alternative 4.dwg A-4 Alternative 4 Date Exported:12/12/2023 9:20 PM - by Chad Stickel



Legend

- Existing Mudline
- Estimated Contamination Depth (feet below mudline)
- Contaminated Sediment and/or Wood Debris
- Approximate Shoreline Slope Armor (Rip-Rap)
- EL Elevation
- MHHW Mean Higher High Water

Proposed Remedial Alternative Components[1]

- Enhanced Natural Recovery

Alternative 4 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

50 0 50
Horizontal Scale in Feet

10 0 10
Vertical Scale in Feet
Vertical Exaggeration = 5X

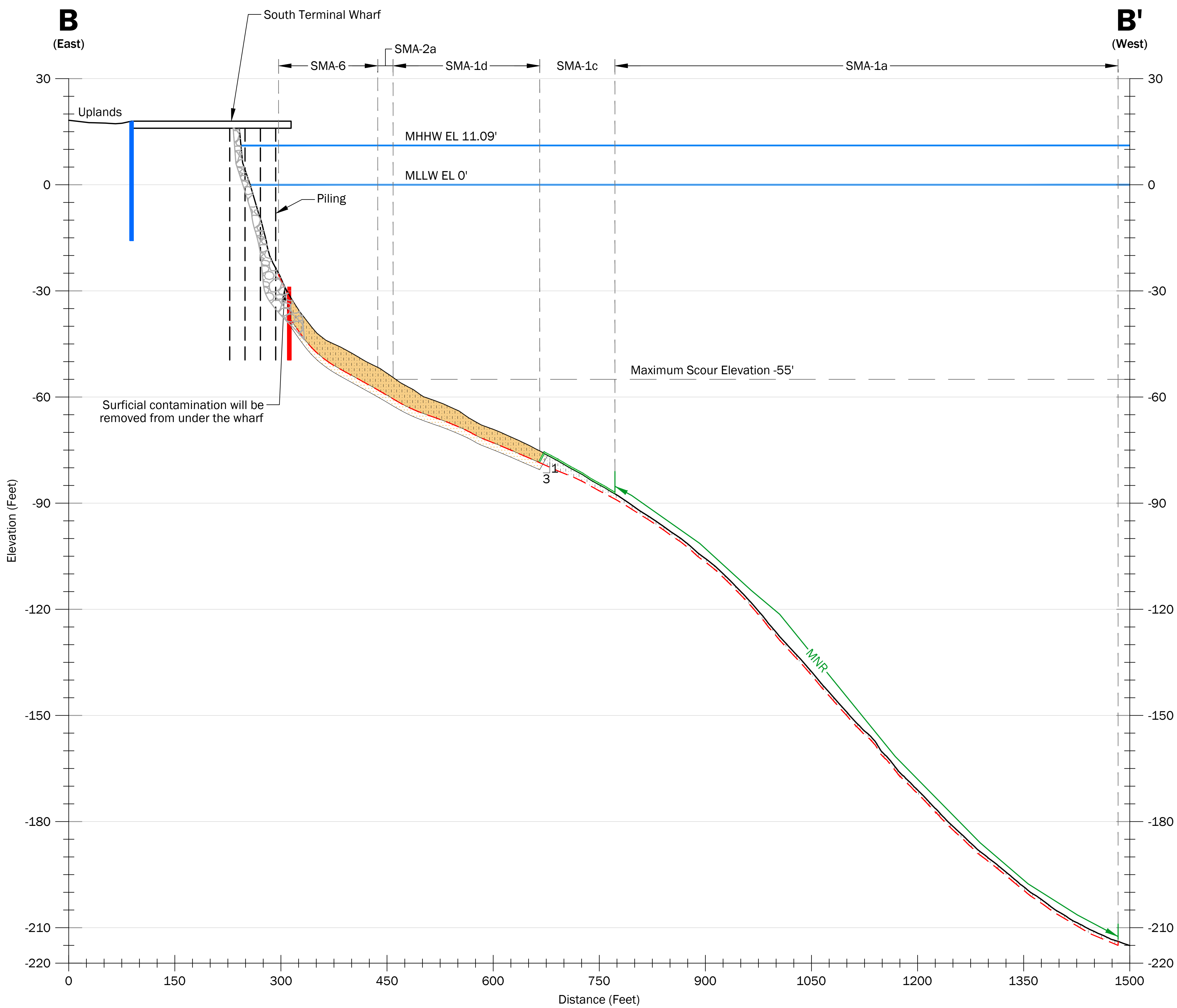
Alternative 4
Cross Section A - A'

Weyerhaeuser Mill A Former
Everett, Washington

GEOENGINEERS

Figure A-4A

p:\0\0676020\CAD\07\task 1700 [cap]\067602007_F093_Cross Section A - A' [Alt 4].dwg A-4A Section A [Alternative 4] Date Exported:12/12/2023 4:44 PM - by Chad Stickel



Legend

- Existing Mudline
- Estimated Contamination Depth (feet below mudline)
- Contaminated Sediment and/or Wood Debris
- Approximate Shoreline Slope Armor (Rip-Rap)
- Bulkhead (Depth Unknown)
- EL Elevation
- MHHW Mean Higher High Water
- MLLW Mean Lower Low Water

Proposed Remedial Alternative Components[1]

- MNR Monitored Natural Recovery
- Enhanced Natural Recovery
- Full Removal of Contaminated Sediment and Wood Debris
- 2-Foot Overdredge Allowance
- South Terminal Toe Wall[2]

Alternative 4 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.
2. The height and depth of the wall will be determined during remedial design. In general, the wall will be keyed into the native soil and will vertically extend upwards such that the top of the wall is at or above the surface elevations of the adjacent armored slopes.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

150 0 150
Horizontal Scale in Feet
30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

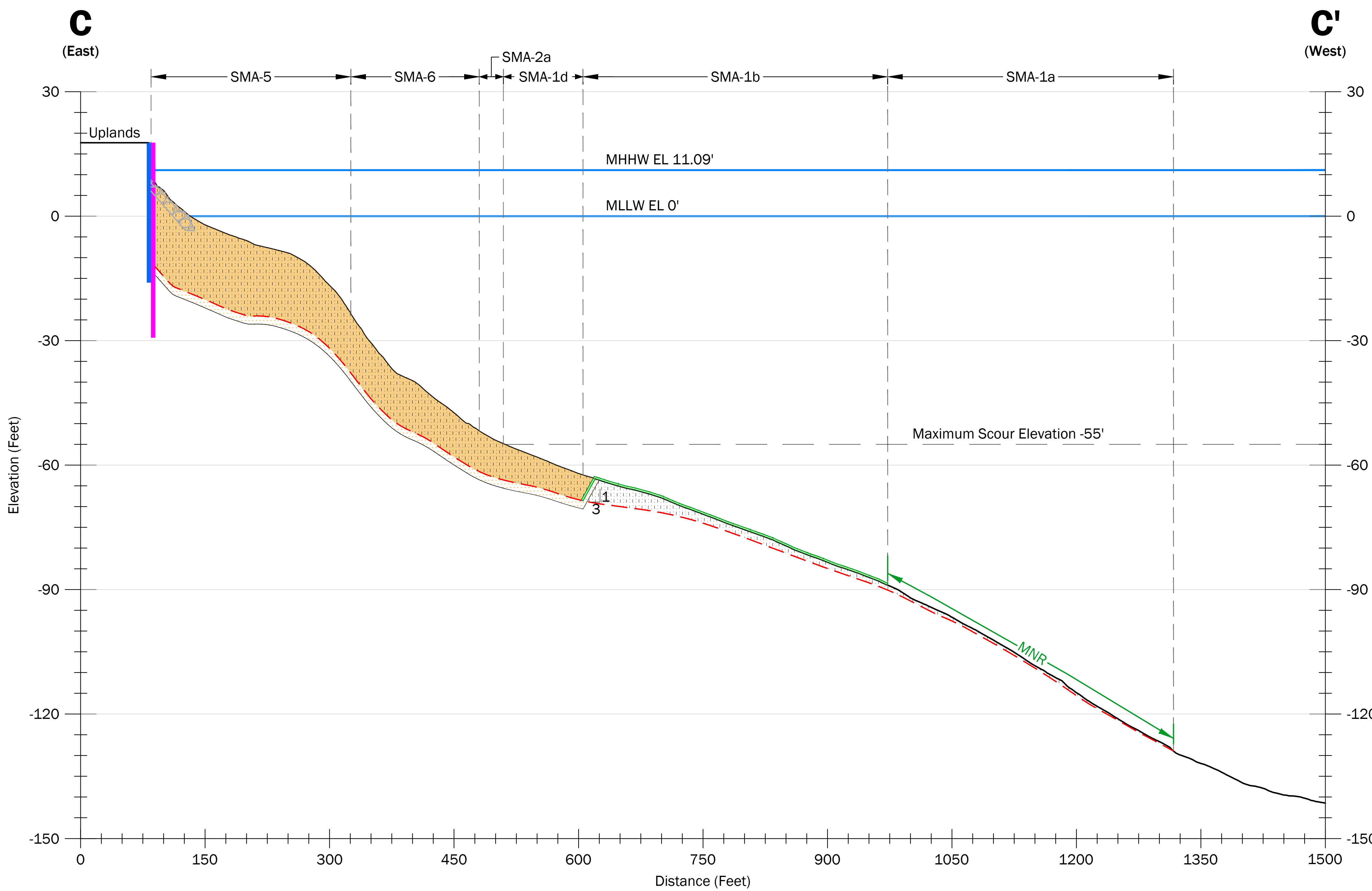
Alternative 4
Cross Section B - B'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-4B

p:\0\0676020\CAD\07\task 1700 (cap)\067602007_F094_Cross Section B - B' (Alt 4).dwg A-4B Section B (Alternative 4) Date Exported:12/12/2023 4:44 PM - by Chad Stickel



Legend

- Existing Mudline
- Estimated Contamination Depth (feet below mudline)
- Contaminated Sediment and/or Wood Debris
- Approximate Shoreline Slope Armor (Rip-Rap)
- Bulkhead (Depth Unknown)

EL Elevation
MHHW Mean Higher High Water
MLLW Mean Lower Low Water

Proposed Remedial Alternative Components[1]

- MNR Monitored Natural Recovery
- Enhanced Natural Recovery
- Full Removal of Contaminated Sediment and Wood Debris
- 2-Foot Overdredge Allowance
- Upland Retaining Wall[2]

Alternative 4 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.
2. The height and depth of the wall will be determined during remedial design. In general, the wall will be keyed into the native soil and will vertically extend upwards such that the top of the wall is at or above the surface elevations of the adjacent Upland area.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

150 0 150
Horizontal Scale in Feet

30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

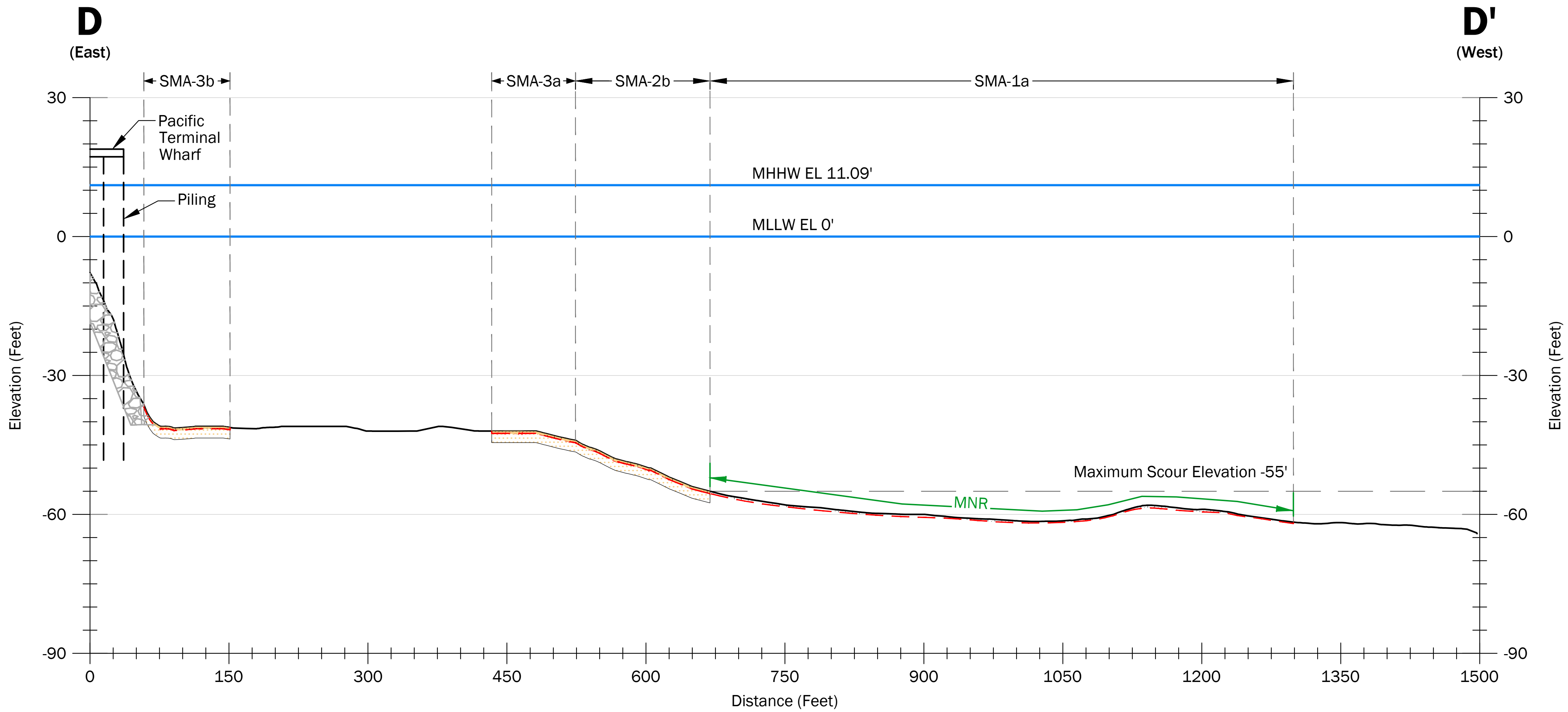
Alternative 4
Cross Section C - C'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-4C

p:\0\0676020\CAD\07\task 1700 (cap)\0676020007_F095_Cross Section C - C' (Alt 4).dwg A-4C Section C (Alternative 4) Date Exported:12/12/2023 4:44 PM - by Chad Stickel



Legend

- Existing Mudline
- Estimated Contamination Depth (feet below mudline)
- Contaminated Sediment and/or Wood Debris
- Approximate Shoreline Slope Armor (Rip-Rap)

EL Elevation
MHHW Mean Higher High Water
MLLW Mean Lower Low Water

Proposed Remedial Alternative Components[1]

- MNR Monitored Natural Recovery
- Full Removal of Contaminated Sediment and Wood Debris
- 2-Foot Overdredge Allowance

Alternative 4 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

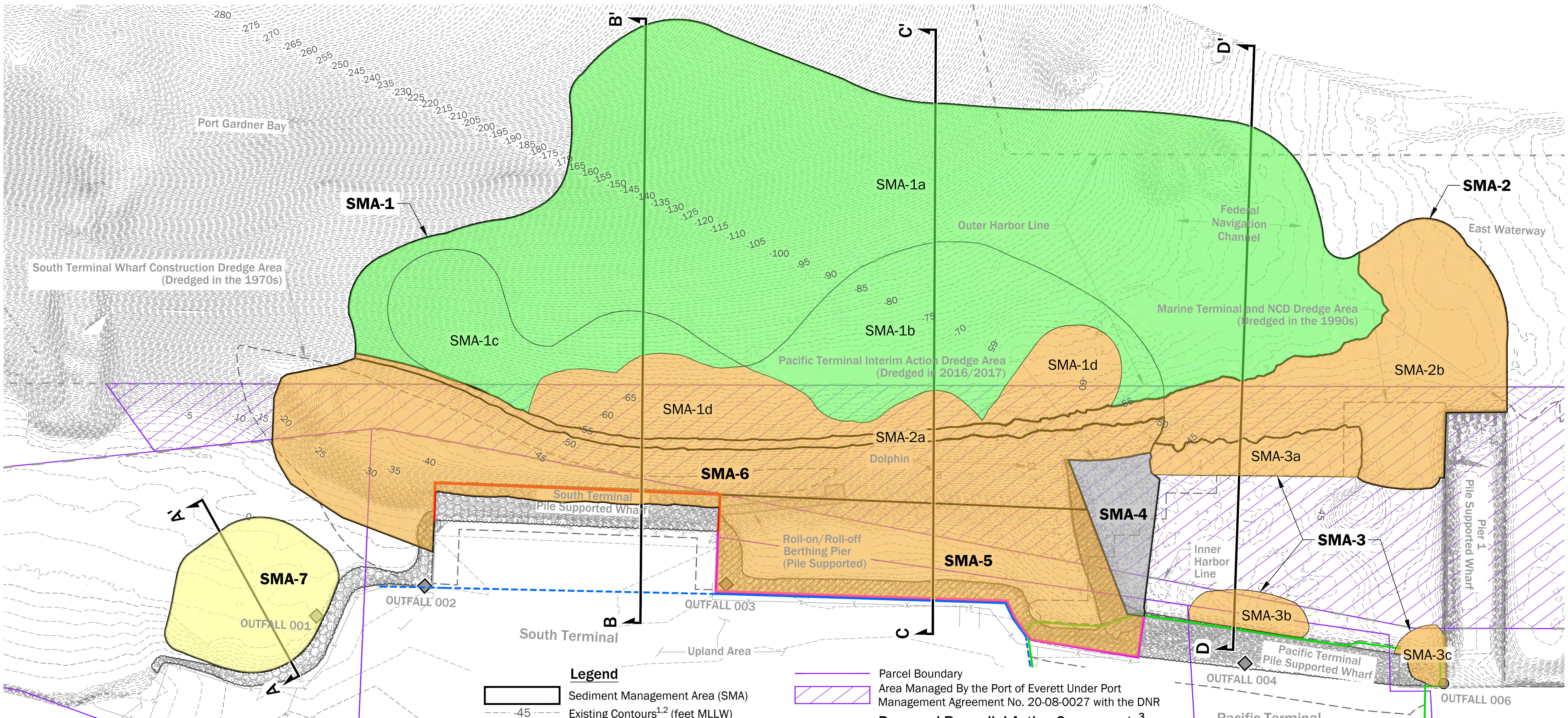
150 0 150
Horizontal Scale in Feet
30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

Alternative 4
Cross Section D - D'

Weyerhaeuser Mill A Former
Everett, Washington

GEOENGINEERS

Figure A-4D



Legend

- Sediment Management Area (SMA)
- -45 Existing Contours[1,2] (feet MLLW)
- MLLW Mean Lower Low Water
- MHHW Mean Higher High Water
- Outer Harbor Line
- Inner Harbor Line
- Bulkhead (Dashed where Buried)
- Nearshore Confined Disposal (NCD) Facility (Former Log Pond)
- Fence
- Previously Dredged Areas
- Areas of Known Armoring
- Current Combined Sewer Outfall (SCO)
- Current Stormwater Outfall
- A A' Cross Section Location
- Parcel Boundary
- Area Managed By the Port of Everett Under Port Management Agreement No. 20-08-0027 with the DNR

Proposed Remedial Action Components[3]

- Full Removal of Contaminated Sediment and/or Wood Debris
- Full Removal and Backfill
- Enhanced Natural Recovery (ENR)
- Remove Existing Pile-Supported Roll-on/Roll-off Berthing Pier and Dolphins
- Remove Existing Armor
- Remove and Replace Existing Armor
- No Action
- South Terminal Toe Wall
- Upland Retaining Wall

250 0 250
Feet

Notes:

1. Bathymetric Contours are based on merged survey data provided by Tetra Tech on 12/12/2017. Three surveys were merged by Tetra Tech - 1) Tetra Tech survey dated February 2017 presenting bathymetry of the marine areas adjacent to the South Terminal, 2) Tetra Tech survey dated December 2015 presenting bathymetry of areas underneath the Pacific/South Terminal Wharfs, and 3) Pacific Geomatic Services, Inc. survey dated October 2014 presenting the bathymetry of the rest of the marine areas of the site except for Pacific Terminal Interim Action Dredge Area. The bathymetry for the Pacific Terminal Interim Action Dredge Area is based on Tetra Tech survey dated February 2017 and was merged by GeoEngineers.
2. Upland contours are based on surface elevations obtained at the upland boring locations as part of the RI.
3. A summary of remedial action components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.
4. The locations of all features shown are approximate.
5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: See Notes 1 and 2.

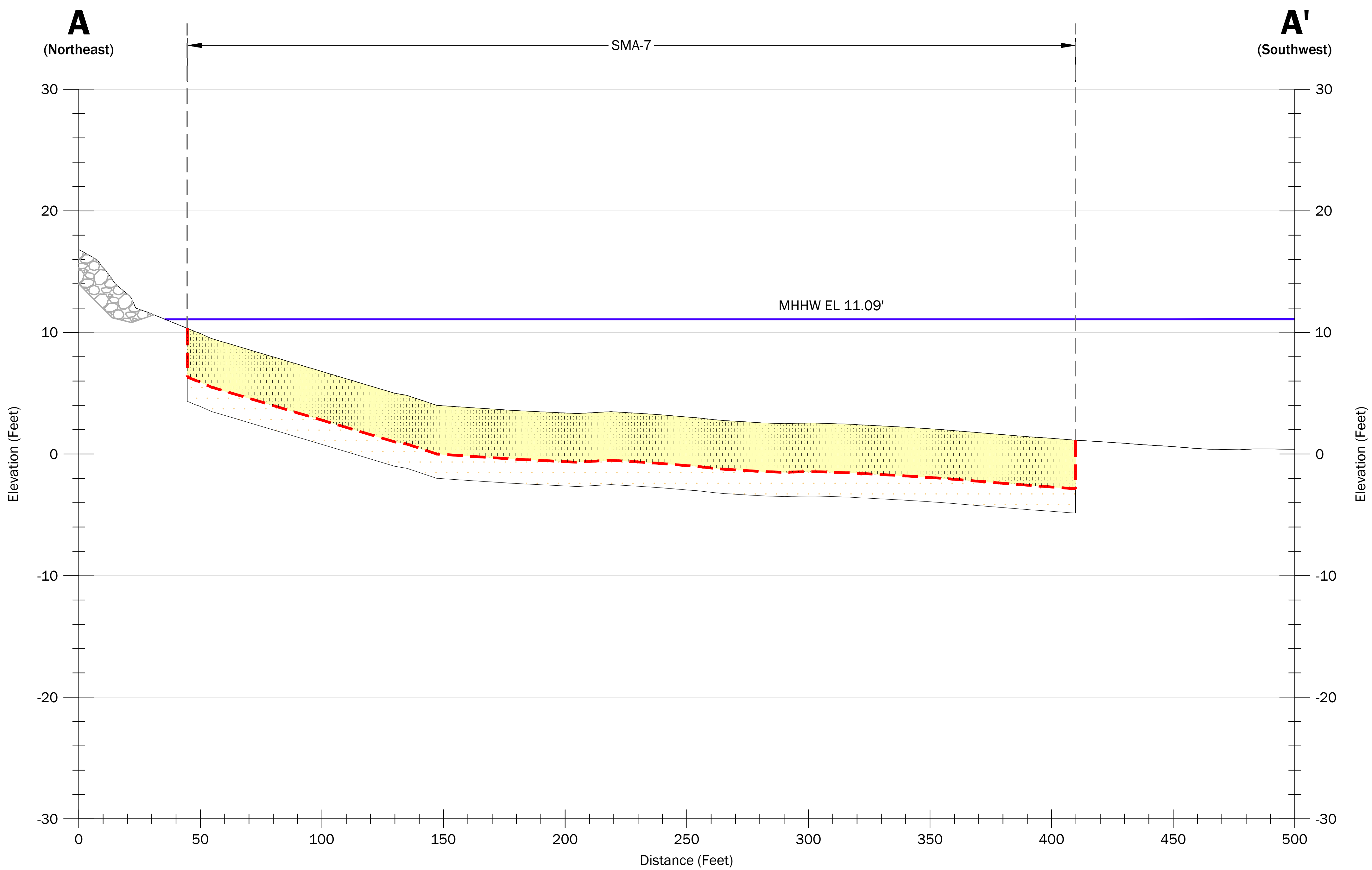
Horizontal Datum: North American Datum (NAD) 1983/1991, WA State Plane, N Zone, US Foot
Vertical Datum: Mean Lower Low Water (MLLW)
Vertical Datum Conversion (based on NOAA's Publication Sheet (944-7659), dated 09/29/1988):
MHHW = +11.11 feet MLLW
NGVD 1929 = +5.93 MLLW
NAVD 1988 = +2.25 MLLW

Alternative 5

Weyerhaeuser Mill A Former
Everett, Washington

GEOENGINEERS

Figure A-5



Legend

Existing Mudline

Estimated Contamination Depth (feet below mudline)

Contaminated Sediment and/or Wood Debris

Approximate Shoreline Slope Armor (Rip-Rap)

EL Elevation

MHHW Mean Higher High Water

Proposed Remedial Alternative Components[1]

Full Removal and Backfill

2-Foot Overdredge Allowance

Alternative 5 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

50 0 50
Horizontal Scale in Feet

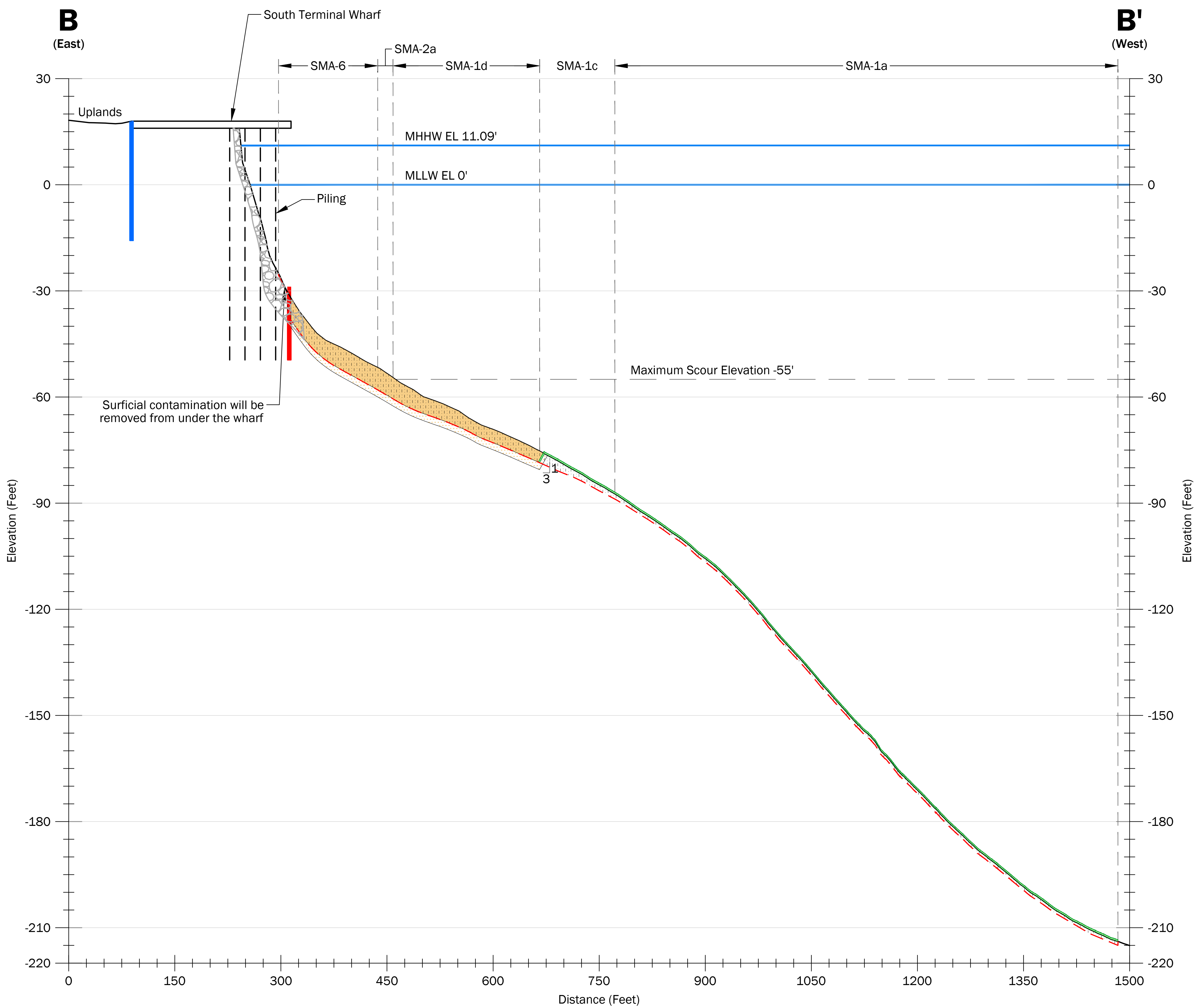
10 0 10
Vertical Scale in Feet
Vertical Exaggeration = 5X

Alternative 5
Cross Section A - A'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-5A



Legend

- Existing Mudline
- Estimated Contamination Depth (feet below mudline)
- Contaminated Sediment and/or Wood Debris
- Approximate Shoreline Slope Armor (Rip-Rap)
- Bulkhead (Depth Unknown)

EL Elevation
MHHW Mean Higher High Water
MLLW Mean Lower Low Water

Proposed Remedial Alternative Components[1]

- Enhanced Natural Recovery
- Full Removal of Contaminated Sediment and Wood Debris
- 2-Foot Overdredge Allowance
- South Terminal Toe Wall[2]

Alternative 5 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.
2. The height and depth of the wall will be determined during remedial design. In general, the wall will be keyed into the native soil and will vertically extend upwards such that the top of the wall is at or above the surface elevations of the adjacent armored slopes.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

150 0 150
Horizontal Scale in Feet
30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

Alternative 5
Cross Section B - B'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-5B

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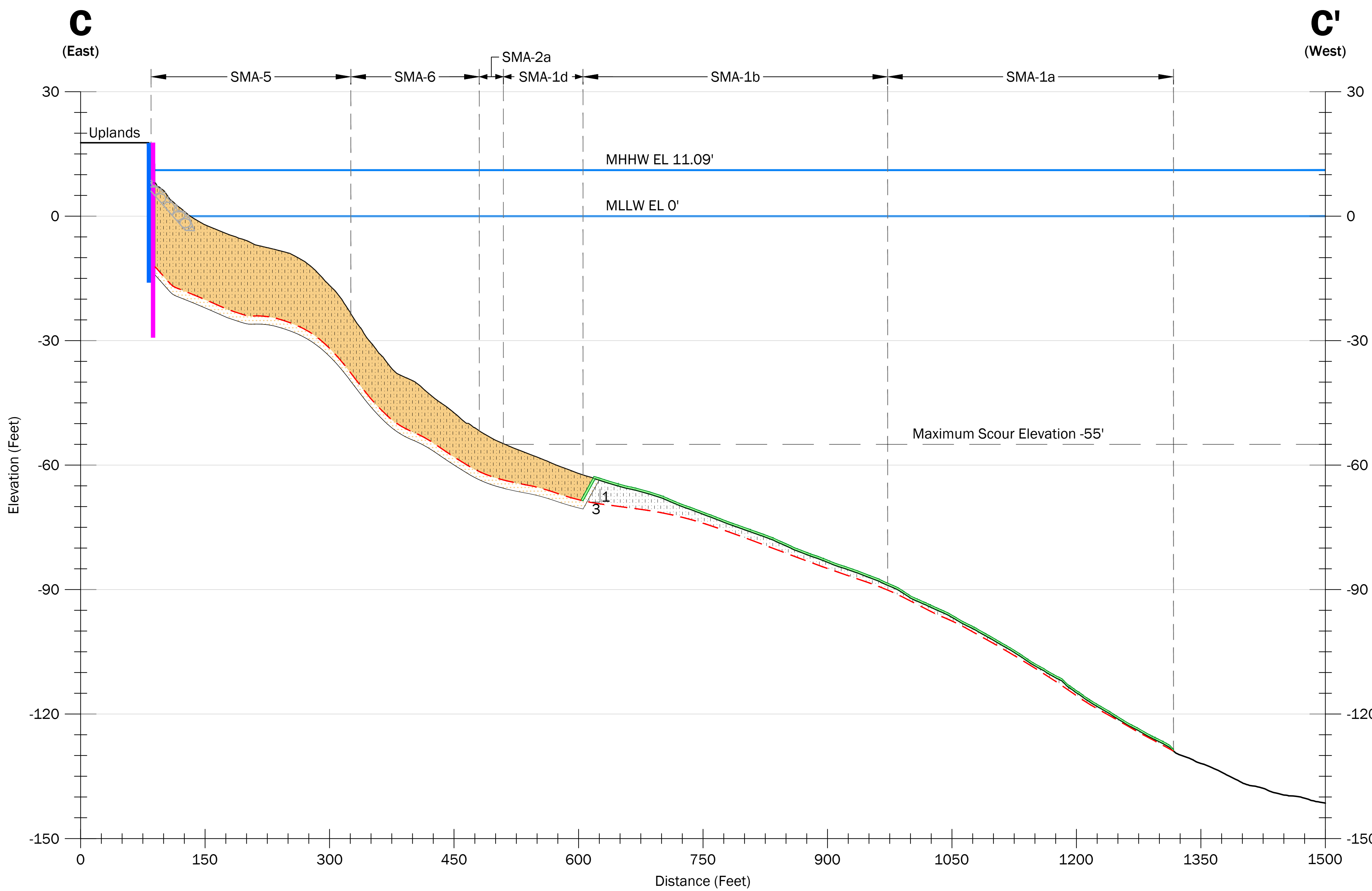

Legend

- Existing Mudline
- Estimated Contamination Depth (feet below mudline)
- Contaminated Sediment and/or Wood Debris
- Approximate Shoreline Slope Armor (Rip-Rap)
- Bulkhead (Depth Unknown)

EL Elevation
MHHW Mean Higher High Water
MLLW Mean Lower Low Water

Proposed Remedial Alternative Components[1]

- Enhanced Natural Recovery
- Full Removal of Contaminated Sediment and Wood Debris
- 2-Foot Overdredge Allowance
- Upland Retaining Wall[2]

Alternative 5 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.
2. The height and depth of the wall will be determined during remedial design. In general, the wall will be keyed into the native soil and will vertically extend upwards such that the top of the wall is at or above the surface elevations of the adjacent Upland area..

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

150 0 150
Horizontal Scale in Feet
30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

Alternative 5
Cross Section C - C'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-5C

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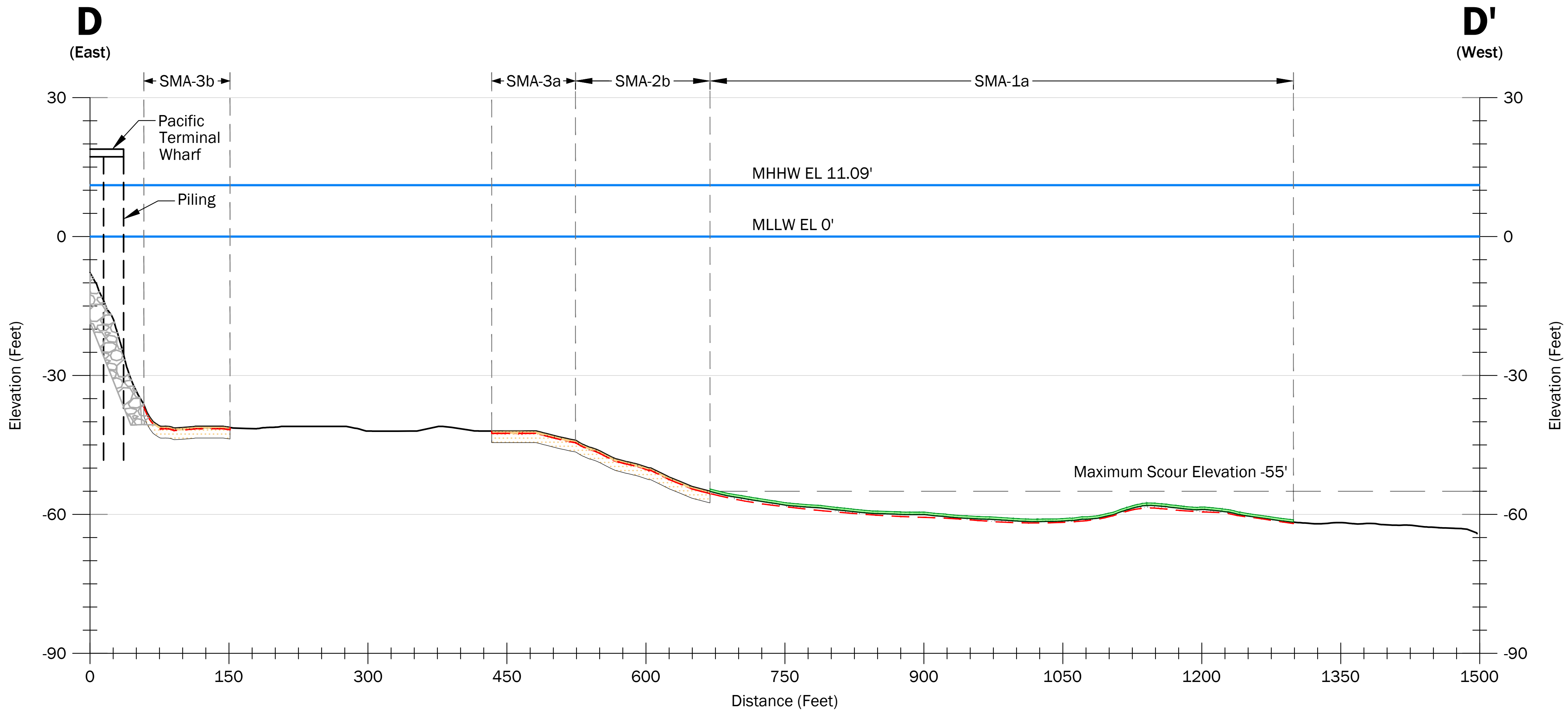


Legend

- Existing Mudline
- Estimated Contamination Depth (feet below mudline)
- Contaminated Sediment and/or Wood Debris
- Approximate Shoreline Slope Armor (Rip-Rap)

EL Elevation
MHHW Mean Higher High Water
MLLW Mean Lower Low Water

Proposed Remedial Alternative Components[1]

- Enhanced Natural Recovery
- Full Removal of Contaminated Sediment and Wood Debris
- 2-Foot Overdredge Allowance

Alternative 5 Notes:

1. A summary of remedial alternative components is presented in the figure. Refer to the FS report for the detailed description of remedial alternative components.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

Disclaimer: This figure was created for a specific purpose and project. Any use of this figure for any other project or purpose shall be at the user's sole risk and without liability to GeoEngineers. The locations of features shown may be approximate. GeoEngineers makes no warranty or representation as to the accuracy, completeness, or suitability of the figure, or data contained therein. The file containing this figure is a copy of a master document, the original of which is retained by GeoEngineers and is the official document of record.

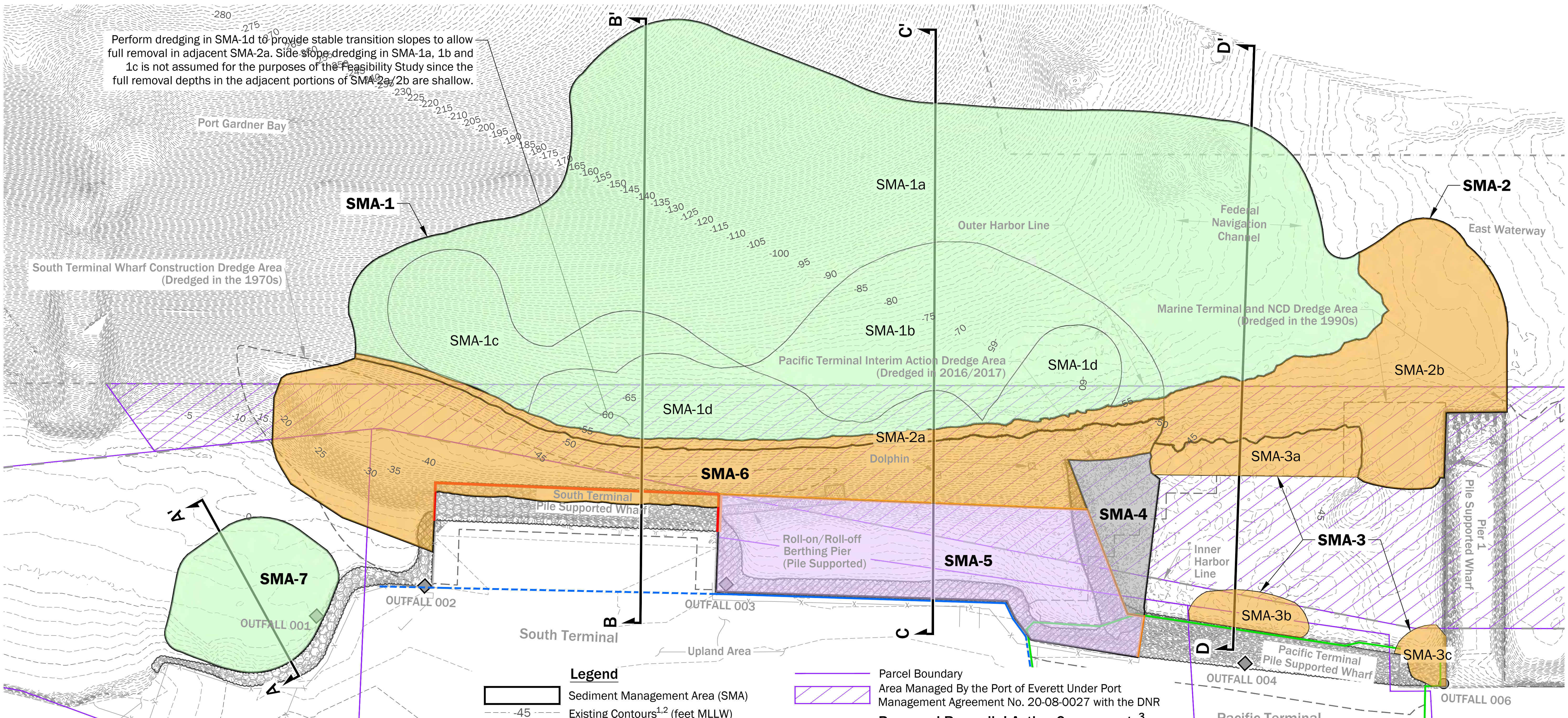
150 0 150
Horizontal Scale in Feet
30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

Alternative 5
Cross Section D - D'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-5D



Legend

- Sediment Management Area (SMA)
- -45 Existing Contours[1,2] (feet MLLW)
- MLLW Mean Lower Low Water
- MHHW Mean Higher High Water
- Outer Harbor Line
- Inner Harbor Line
- Bulkhead (Dashed where Buried)
- Nearshore Confined Disposal (NCD) Facility (Former Log Pond)
- Fence
- Previously Dredged Areas
- Areas of Known Armoring
- Current Combined Sewer Outfall (SCO)
- Current Stormwater Outfall
- A A' Cross Section Location
- Parcel Boundary
- Area Managed By the Port of Everett Under Port Management Agreement No. 20-08-0027 with the DNR

Proposed Remedial Action Components[3]

- Full Removal of Contaminated Sediment and/or Wood Debris
- Monitored Natural Recovery (MNR)
- Containment/Confined Disposal Facility (CDF)
- Remove Existing Pile-Supported Roll-on/Roll-off Berthing Pier and Dolphins
- Remove Existing Armor
- Remove and Replace Existing Armor
- No Action
- South Terminal Toe Wall
- Containment/CDF Wall

250 0 250
Feet

Notes:

1. Bathymetric Contours are based on merged survey data provided by Tetra Tech on 12/12/2017. Three surveys were merged by Tetra Tech - 1) Tetra Tech survey dated February 2017 presenting bathymetry of the marine areas adjacent to the South Terminal, 2) Tetra Tech survey dated December 2015 presenting bathymetry of areas underneath the Pacific/South Terminal Wharfs, and 3) Pacific Geomatic Services, Inc. survey dated October 2014 presenting the bathymetry of the rest of the marine areas of the site except for Pacific Terminal Interim Action Dredge Area. The bathymetry for the Pacific Terminal Interim Action Dredge Area is based on Tetra Tech survey dated February 2017 and was merged by GeoEngineers.
2. Upland contours are based on surface elevations obtained at the upland boring locations as part of the RI.
3. A summary of remedial action components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.
4. The locations of all features shown are approximate.
5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: See Notes 1 and 2.

Horizontal Datum: North American Datum (NAD) 1983/1991, WA State Plane, N Zone, US Foot
Vertical Datum: Mean Lower Low Water (MLLW)
Vertical Datum Conversion (based on NOAA's Publication Sheet (944-7659), dated 09/29/1988):
MHHW = +11.11 feet MLLW
NGVD 1929 = +5.93 MLLW
NAVD 1988 = +2.25 MLLW

Alternative 6

Weyerhaeuser Mill A Former
Everett, Washington

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Figure A-6

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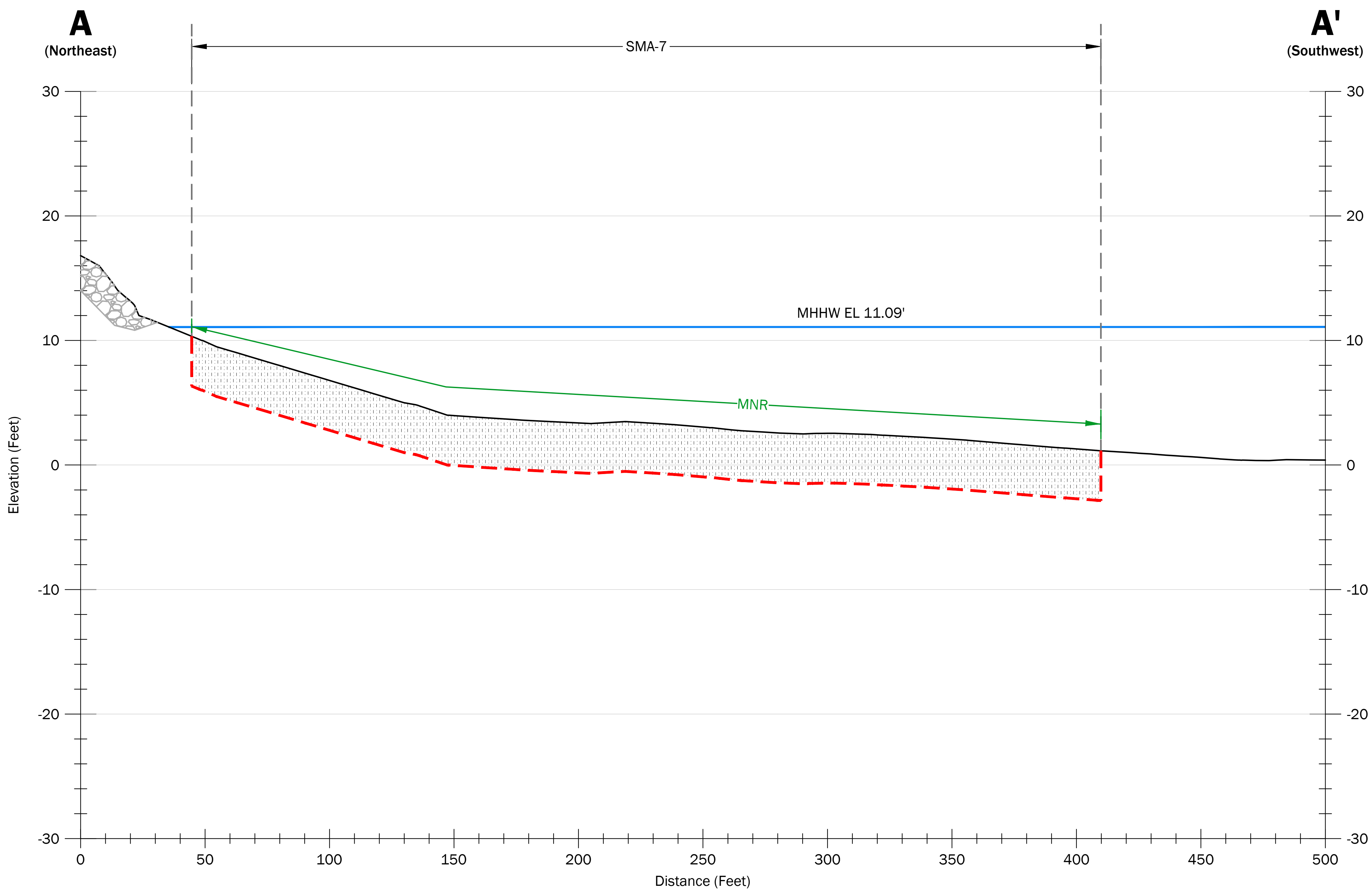


Legend

Existing Mudline

Estimated Contamination Depth (feet below mudline)

Contaminated Sediment and/or Wood Debris

Approximate Shoreline Slope Armor (Rip-Rap)

EL Elevation

MHHW Mean Higher High Water

Proposed Remedial Alternative Components[1]

MNR Monitored Natural Recovery

Alternative 6 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

50 0 50
Horizontal Scale in Feet

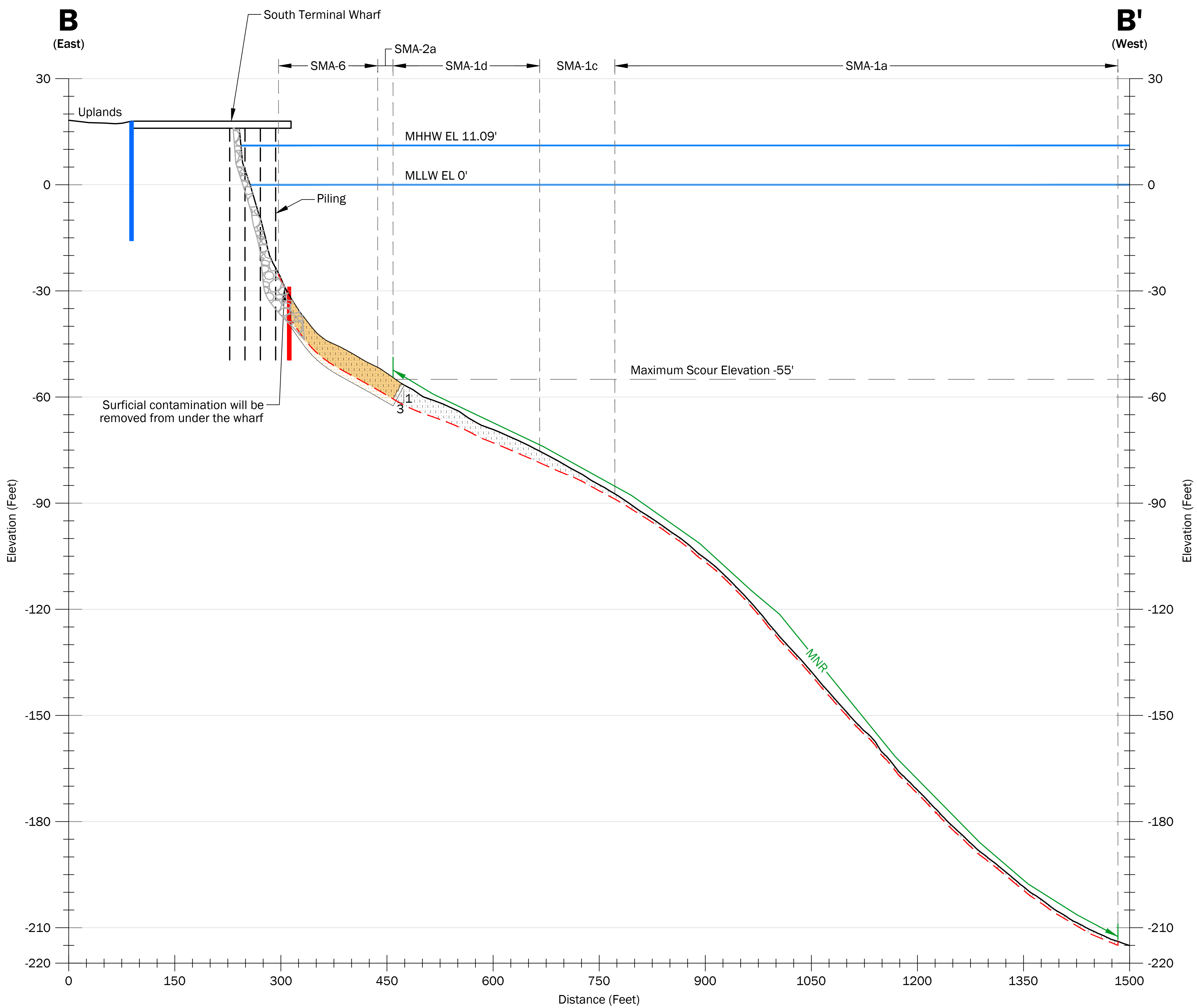
10 0 10
Vertical Scale in Feet
Vertical Exaggeration = 5X

Alternative 6
Cross Section A - A'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-6A



Legend

Existing Mudline
Estimated Contamination Depth (feet below mudline)
Contaminated Sediment and/or Wood Debris
Approximate Shoreline Slope Armor (Rip-Rap)
Bulkhead (Depth Unknown)
EL Elevation
MHHW Mean Higher High Water
MLLW Mean Lower Low Water

Proposed Remedial Alternative Components[1]

MNR Monitored Natural Recovery
Full Removal of Contaminated Sediment and Wood Debris
2-Foot Overdredge Allowance
South Terminal Toe Wall[2]

Alternative 6 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.
2. The height and depth of the wall will be determined during remedial design. In general, the wall will be keyed into the native soil and will vertically extend upwards such that the top of the wall is at or above the surface elevations of the adjacent armored slopes.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

150 0 150
Horizontal Scale in Feet
30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

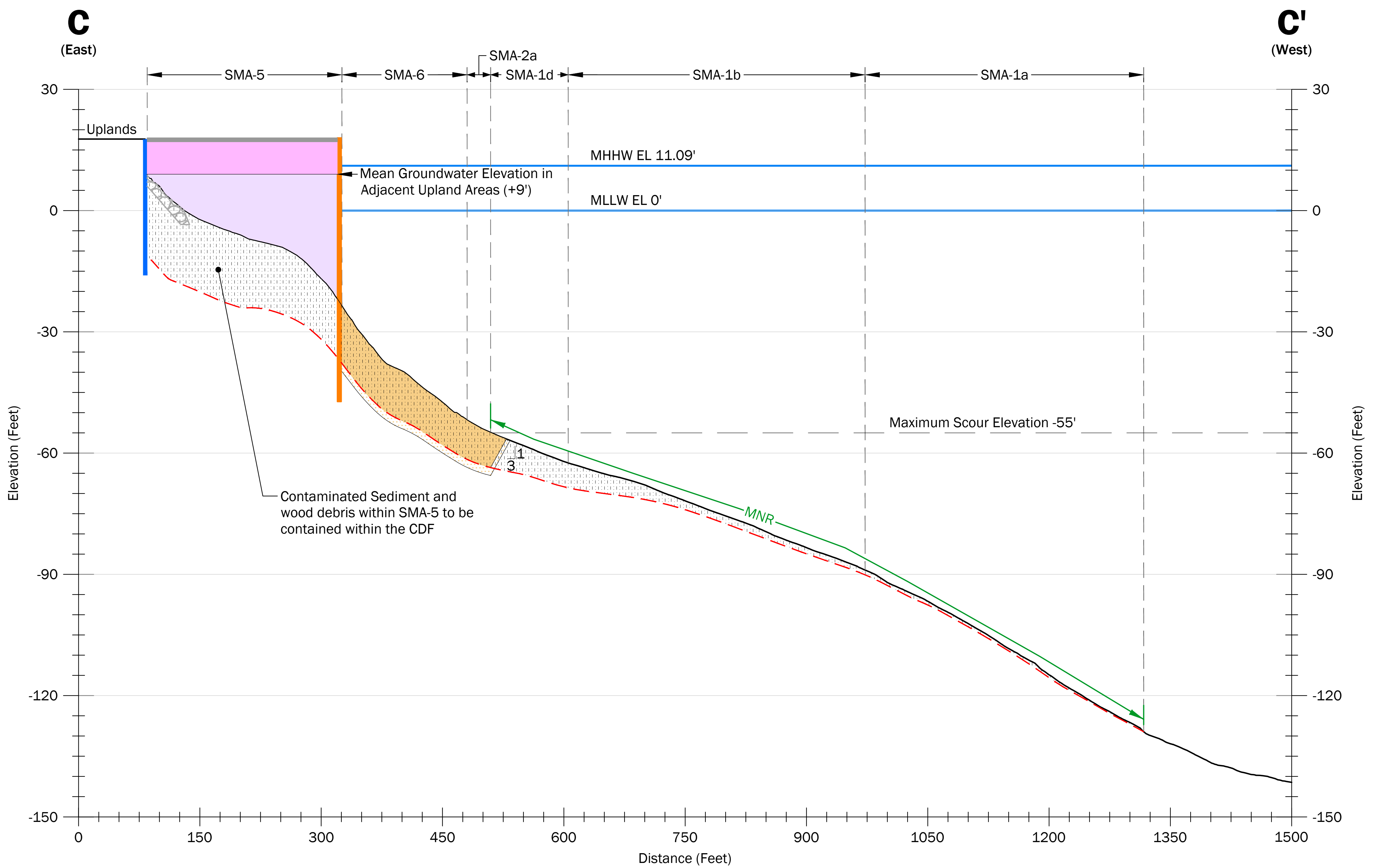
Alternative 6
Cross Section B - B'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-6B

p:\0\0676020\CAD\07\task 1700 (cap)\067602007_F104_Cross Section B - B' (Alt 6).dwg A-6B Section B (Alternative 6) Date Exported:12/12/2023 4:49 PM - by Chad Stickel



Legend

Existing Mudline

Estimated Contamination Depth (feet below mudline)

Contaminated Sediment and/or Wood Debris

Approximate Shoreline Slope Armor (Rip-Rap)

Bulkhead (Depth Unknown)

EL Elevation

MHHW Mean Higher High Water

MLLW Mean Lower Low Water

Proposed Remedial Alternative Components[1]

MNR Monitored Natural Recovery

Full Removal of Contaminated Sediment and Wood Debris

2-Foot Overdredge Allowance

Containment/CDF Wall[2]

Contaminated Dredged Material Fill

Imported Fill Material

Asphalt Surface with Stormwater Management System

Alternative 6 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.
2. The height and depth of the wall will be determined during remedial design. In general, the wall will be keyed into the native soil and will vertically extend upwards such that the top of the wall is at or above the surface elevations of the adjacent Upland area.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

150 0 150

Horizontal Scale in Feet

30 0 30

Vertical Scale in Feet

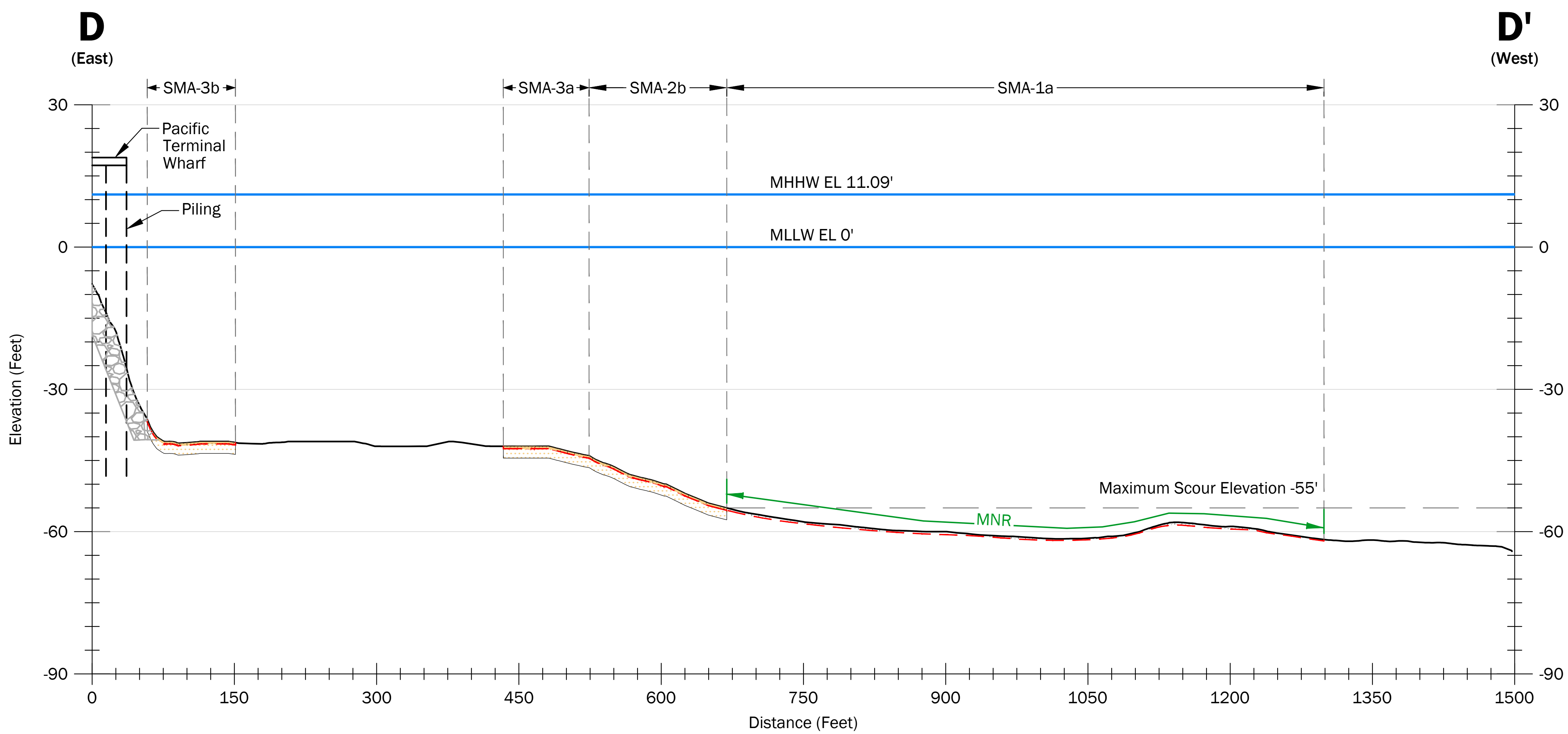
Vertical Exaggeration = 5X

Alternative 6
Cross Section C - C'

Weyerhaeuser Mill A Former
Everett, Washington

GEOENGINEERS

Figure A-6C



Legend

Existing Mudline
Estimated Contamination Depth (feet below mudline)
Contaminated Sediment and/or Wood Debris
Approximate Shoreline Slope Armor (Rip-Rap)
EL Elevation
MHHW Mean Higher High Water
MLLW Mean Lower Low Water

Proposed Remedial Alternative Components[1]

MNR Monitored Natural Recovery
Full Removal of Contaminated Sediment and Wood Debris
2-Foot Overdredge Allowance

Alternative 6 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

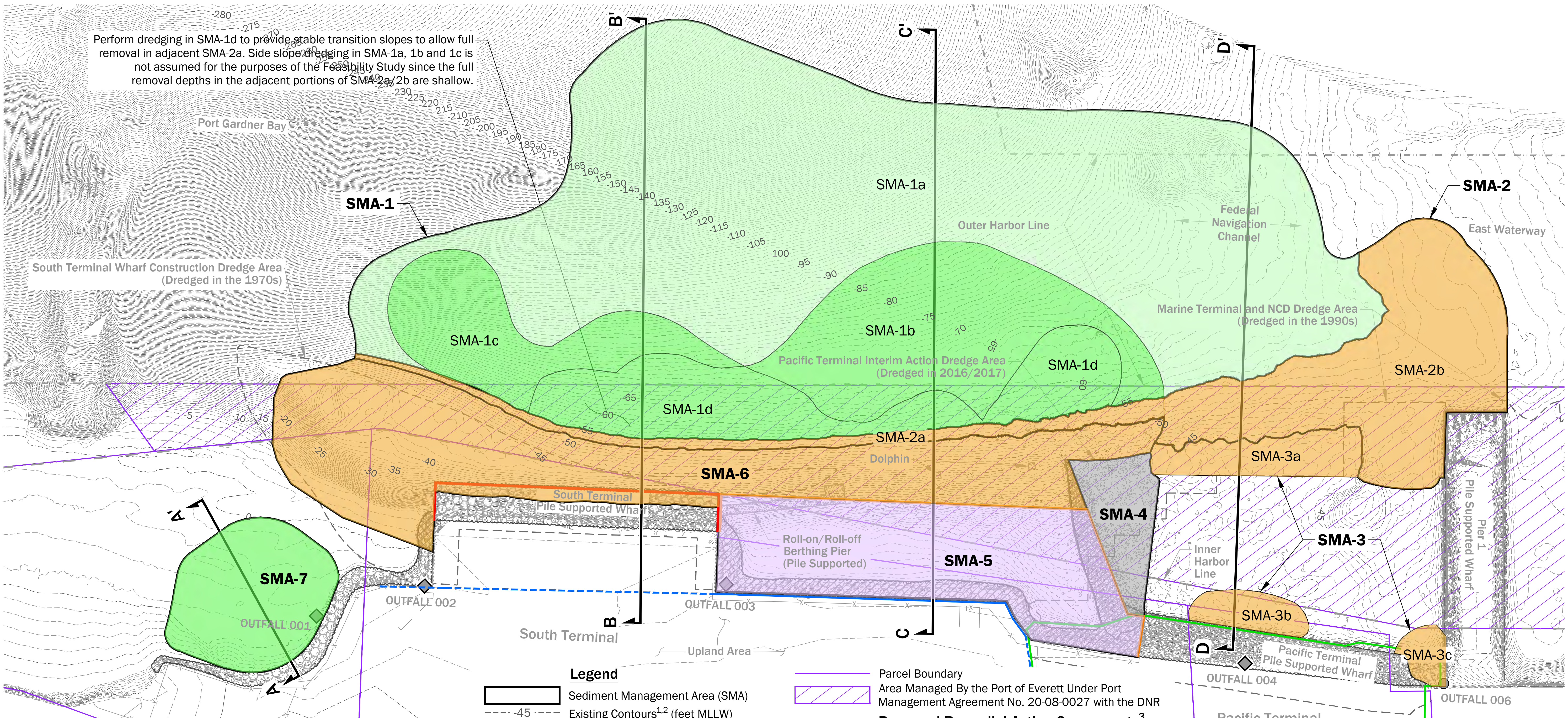
150 0 150
Horizontal Scale in Feet
30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

Alternative 6
Cross Section D - D'

Weyerhaeuser Mill A Former
Everett, Washington

GEOENGINEERS

Figure A-6D



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Legend

- Sediment Management Area (SMA)
- -45 Existing Contours[1,2] (feet MLLW)
- MLLW Mean Lower Low Water
- MHHW Mean Higher High Water
- Outer Harbor Line
- Inner Harbor Line
- Bulkhead (Dashed where Buried)
- Nearshore Confined Disposal (NCD) Facility (Former Log Pond)
- Fence
- Previously Dredged Areas
- Areas of Known Armoring
- Current Combined Sewer Outfall (SCO)
- Current Stormwater Outfall
- A A' Cross Section Location
- Parcel Boundary
- Area Managed By the Port of Everett Under Port Management Agreement No. 20-08-0027 with the DNR

Proposed Remedial Action Components[3]

- Full Removal of Contaminated Sediment and/or Wood Debris
- Enhanced Natural Recovery (ENR)
- Monitored Natural Recovery (MNR)
- Containment/Confined Disposal Facility (CDF)
- Remove Existing Pile-Supported Roll-on/Roll-off Berthing Pier and Dolphins
- Remove Existing Armor
- Remove and Replace Existing Armor
- No Action
- South Terminal Toe Wall
- Containment/CDF Wall

Notes:

1. Bathymetric Contours are based on merged survey data provided by Tetra Tech on 12/12/2017. Three surveys were merged by Tetra Tech - 1) Tetra Tech survey dated February 2017 presenting bathymetry of the marine areas adjacent to the South Terminal, 2) Tetra Tech survey dated December 2015 presenting bathymetry of areas underneath the Pacific/South Terminal Wharfs, and 3) Pacific Geomatic Services, Inc. survey dated October 2014 presenting the bathymetry of the rest of the marine areas of the site except for Pacific Terminal Interim Action Dredge Area. The bathymetry for the Pacific Terminal Interim Action Dredge Area is based on Tetra Tech survey dated February 2017 and was merged by GeoEngineers.
2. Upland contours are based on surface elevations obtained at the upland boring locations as part of the RI.
3. A summary of remedial action components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.
4. The locations of all features shown are approximate.
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Data Source: See Notes 1 and 2.

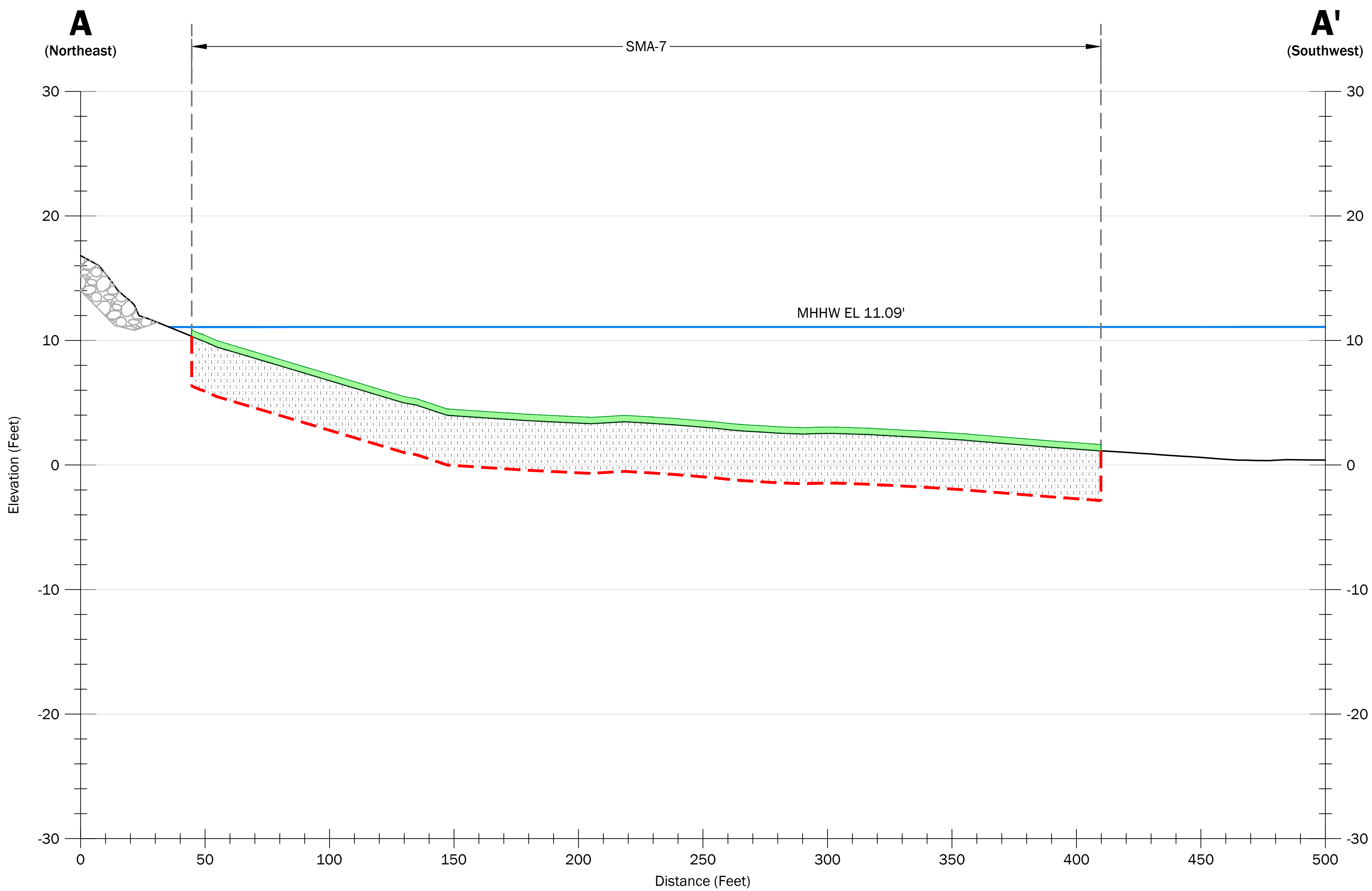
Horizontal Datum: North American Datum (NAD) 1983/1991, WA State Plane, N Zone, US Foot
Vertical Datum: Mean Lower Low Water (MLLW)
Vertical Datum Conversion (based on NOAA's Publication Sheet (944-7659), dated 09/29/1988):
MHHW = +11.11 feet MLLW
NGVD 1929 = +5.93 MLLW
NAVD 1988 = +2.25 MLLW

Alternative 7

Weyerhaeuser Mill A Former
Everett, Washington

GEOENGINEERS

Figure A-7



Legend

Existing Mudline

Estimated Contamination Depth (feet below mudline)

Contaminated Sediment and/or Wood Debris

Approximate Shoreline Slope Armor (Rip-Rap)

EL Elevation

MHHW Mean Higher High Water

Proposed Remedial Alternative Components[1]

Enhanced Natural Recovery

Alternative 7 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

50 0 50
Horizontal Scale in Feet

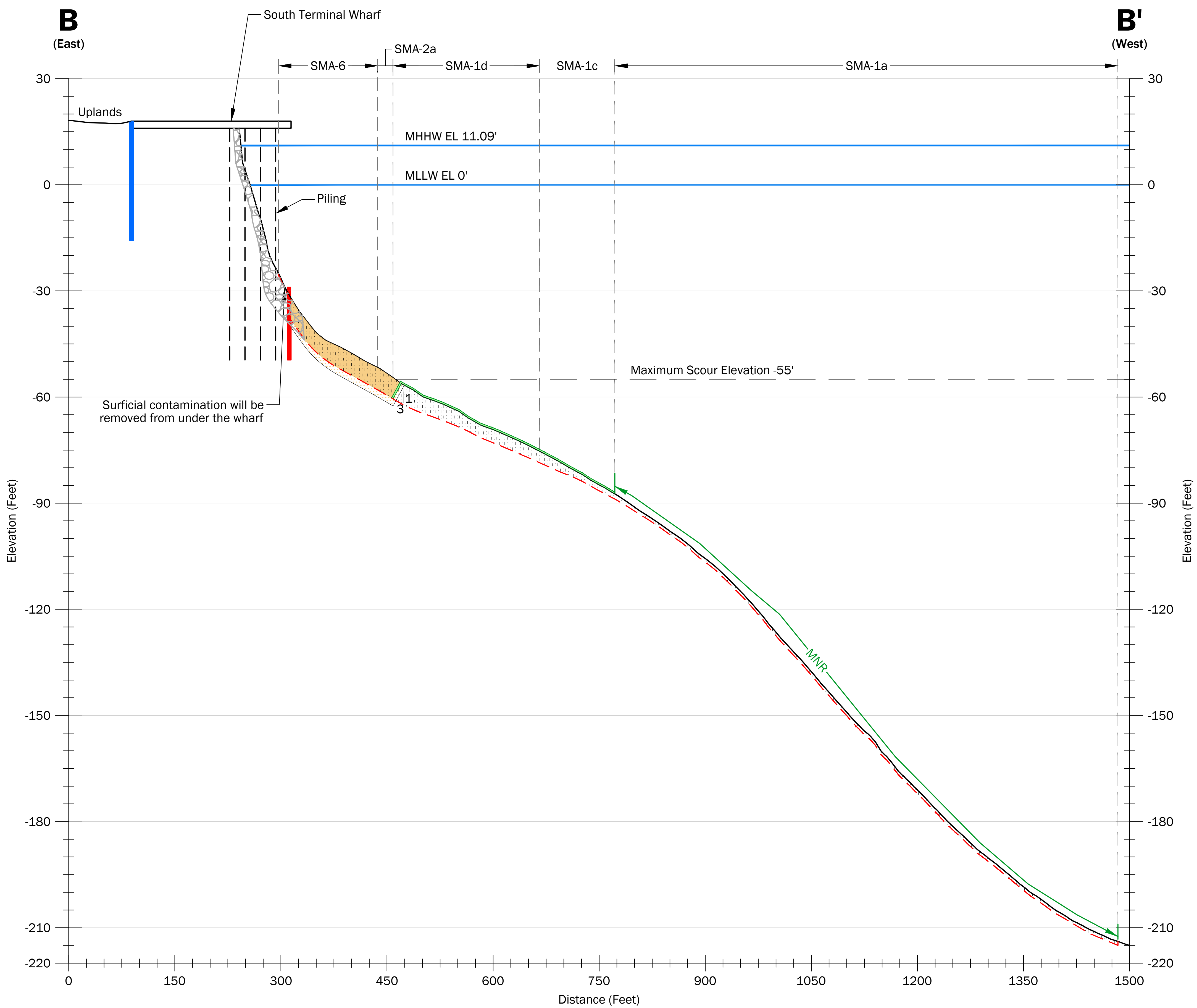
10 0 10
Vertical Scale in Feet
Vertical Exaggeration = 5X

Alternative 7
Cross Section A - A'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-7A



Legend

- Existing Mudline
- Estimated Contamination Depth (feet below mudline)
- Contaminated Sediment and/or Wood Debris
- Approximate Shoreline Slope Armor (Rip-Rap)
- Bulkhead (Depth Unknown)
- EL Elevation
- MHHW Mean Higher High Water
- MLLW Mean Lower Low Water

Proposed Remedial Alternative Components[1]

- MNR Monitored Natural Recovery
- Enhanced Natural Recovery
- Full Removal of Contaminated Sediment and Wood Debris
- 2-Foot Overdredge Allowance
- South Terminal Toe Wall[2]

Alternative 7 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.
2. The height and depth of the wall will be determined during remedial design. In general, the wall will be keyed into the native soil and will vertically extend upwards such that the top of the wall is at or above the surface elevations of the adjacent armored slopes.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

150 0 150
Horizontal Scale in Feet
30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

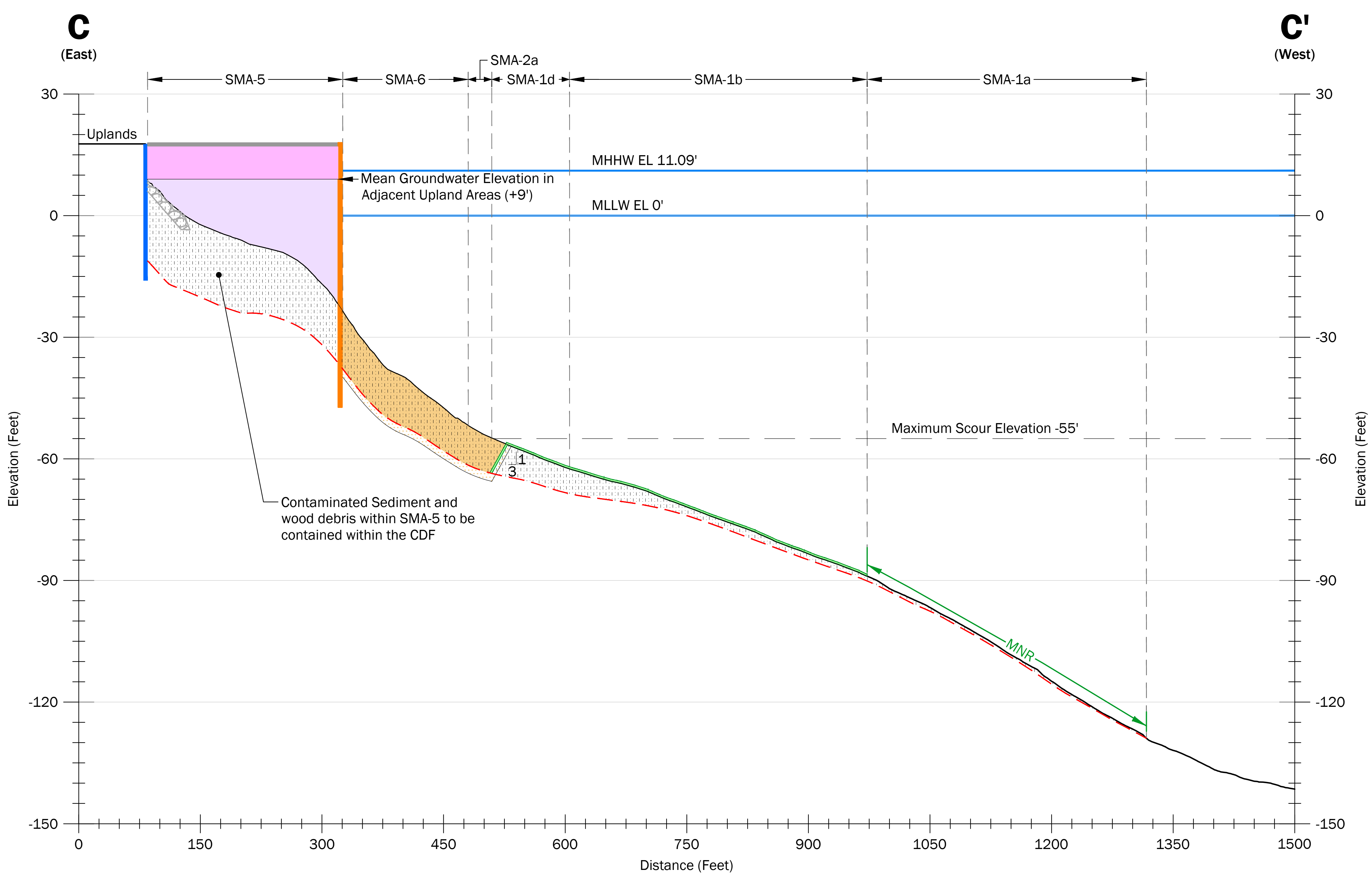
Alternative 7
Cross Section B - B'

Weyerhaeuser Mill A Former
Everett, Washington

GEOENGINEERS

Figure A-7B

p:\0\0676020\CAD\07\task 1700 (cap)\0676020007_F0109_Cross Section B - B' [Alt 7].dwg A-7B Section B [Alternative 7] Date Exported:12/12/2023 4:53 PM - by Chad Stickel



Legend

Existing Mudline

Estimated Contamination Depth (feet below mudline)

Contaminated Sediment and/or Wood Debris

Approximate Shoreline Slope Armor (Rip-Rap)

Bulkhead (Depth Unknown)

EL Elevation

MHHW Mean Higher High Water

MLLW Mean Lower Low Water

Proposed Remedial Alternative Components[1]

MNR Monitored Natural Recovery

Enhanced Natural Recovery

Full Removal of Contaminated Sediment and Wood Debris

2-Foot Overdredge Allowance

Containment/CDF Wall[2]

Contaminated Dredged Material Fill

Imported Fill Material

Asphalt Surface with Stormwater Management System

Alternative 7 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.
2. The height and depth of the wall will be determined during remedial design. In general, the wall will be keyed into the native soil and will vertically extend upwards such that the top of the wall is at or above the surface elevations of the adjacent Upland area.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

150 0 150
Horizontal Scale in Feet

30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

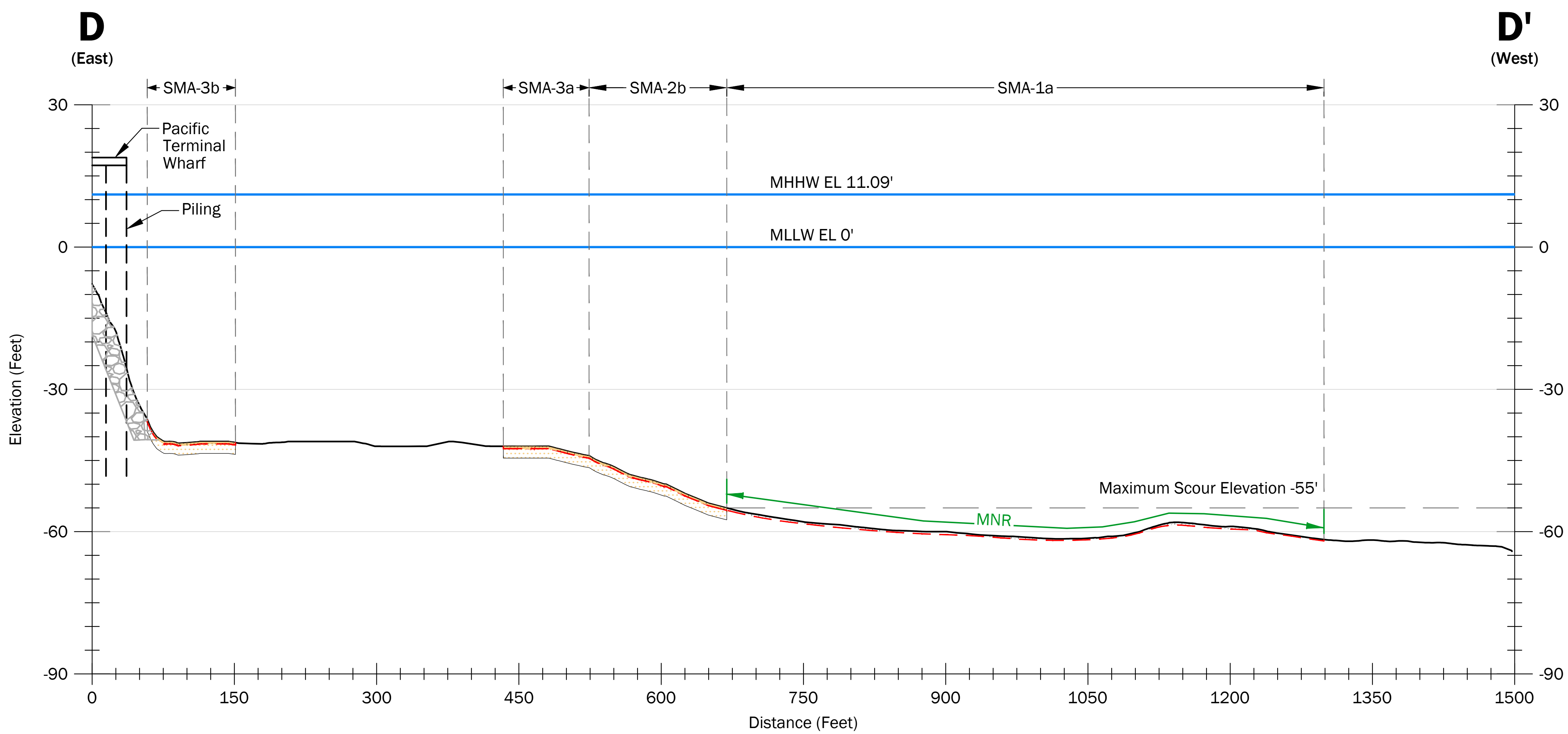
Alternative 7
Cross Section C - C'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-7C

p:\0\0676020\CAD\07\task 1700 (cap)\067602007_F110_Cross Section C - C' [Alt 7].dwg A-7C Section C [Alternative 7] Date Exported:12/12/2023 4:53 PM - by Chad Stickel



Legend

- Existing Mudline
- Estimated Contamination Depth (feet below mudline)
- Contaminated Sediment and/or Wood Debris
- Approximate Shoreline Slope Armor (Rip-Rap)

EL Elevation
MHHW Mean Higher High Water
MLLW Mean Lower Low Water

Proposed Remedial Alternative Components[1]

- MNR — Monitored Natural Recovery
- Full Removal of Contaminated Sediment and Wood Debris
- 2-Foot Overdredge Allowance

Alternative 7 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

150 0 150
Horizontal Scale in Feet
30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

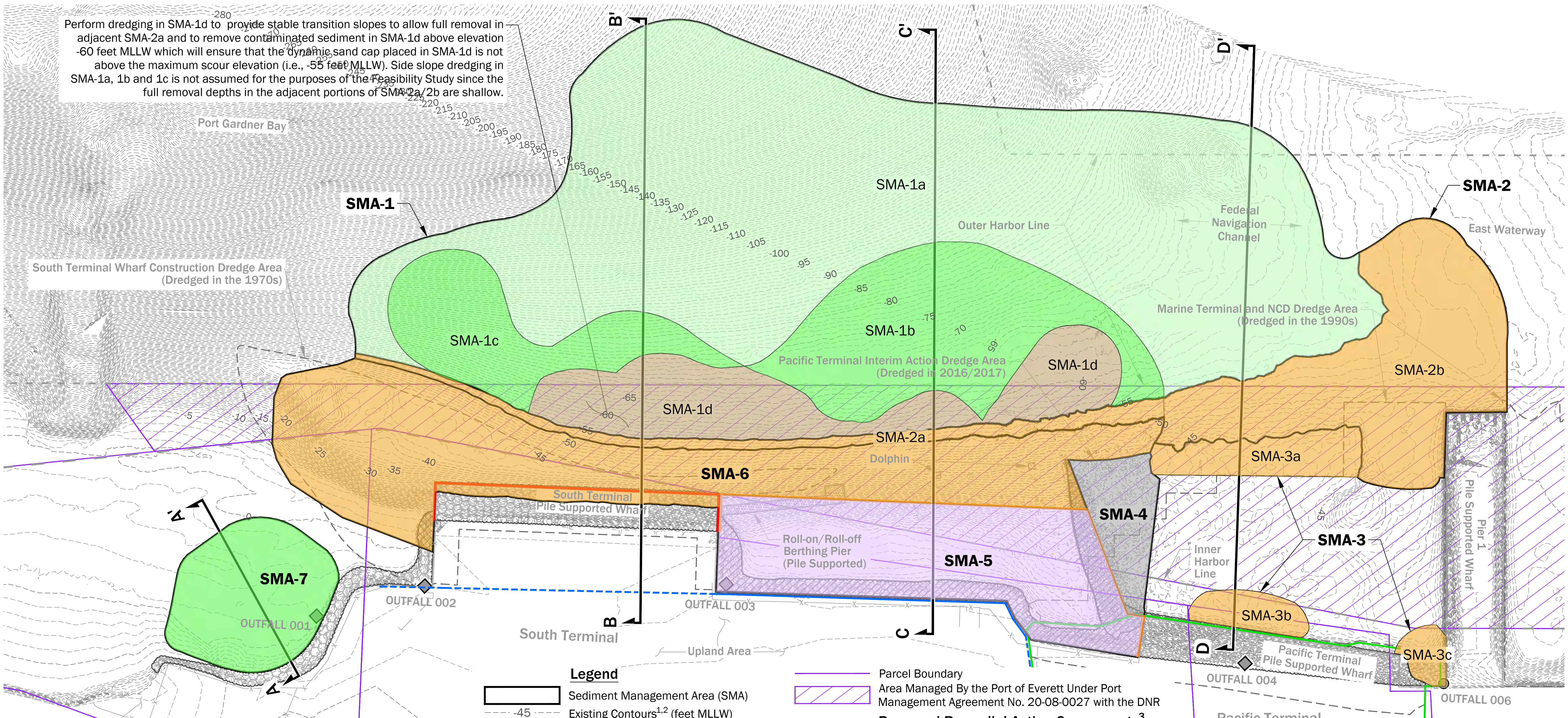
Alternative 7
Cross Section D - D'

Weyerhaeuser Mill A Former
Everett, Washington

GEOENGINEERS

Figure A-7D

p:\0\0676020\CAD\07\task 1700 (cap)\067602007_F111_Cross Section D - D' (Alt 7).dwg A-7D Section D (Alternative 7) Date Exported:12/12/2023 4:53 PM - by Chad Stickel



Legend

- Sediment Management Area (SMA)
- -45 Existing Contours[1,2] (feet MLLW)
- MLLW Mean Lower Low Water
- MHHW Mean Higher High Water
- Outer Harbor Line
- Inner Harbor Line
- Bulkhead (Dashed where Buried)
- Nearshore Confined Disposal (NCD) Facility (Former Log Pond)
- Fence
- Previously Dredged Areas
- Areas of Known Armoring
- Current Combined Sewer Outfall (SCO)
- Current Stormwater Outfall
- A A' Cross Section Location
- Parcel Boundary
- Area Managed By the Port of Everett Under Port Management Agreement No. 20-08-0027 with the DNR

Proposed Remedial Action Components[3]

- Full Removal of Contaminated Sediment and/or Wood Debris
- Dynamic Sand Cap
- Enhanced Natural Recovery (ENR)
- Monitored Natural Recovery (MNR)
- Containment/Confined Disposal Facility (CDF)
- Remove Existing Pile-Supported Roll-on/Roll-off Berthing Pier and Dolphins
- Remove Existing Armor
- Remove and Replace Existing Armor
- No Action
- South Terminal Toe Wall
- Containment/CDF Wall

Notes:
1. Bathymetric Contours are based on merged survey data provided by Tetra Tech on 12/12/2017. Three surveys were merged by Tetra Tech - 1) Tetra Tech survey dated February 2017 presenting bathymetry of the marine areas adjacent to the South Terminal, 2) Tetra Tech survey dated December 2015 presenting bathymetry of areas underneath the Pacific/South Terminal Wharfs, and 3) Pacific Geomatic Services, Inc. survey dated October 2014 presenting the bathymetry of the rest of the marine areas of the site except for Pacific Terminal Interim Action Dredge Area. The bathymetry for the Pacific Terminal Interim Action Dredge Area is based on Tetra Tech survey dated February 2017 and was merged by GeoEngineers.
2. Upland contours are based on surface elevations obtained at the upland boring locations as part of the RI.
3. A summary of remedial action components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.
4. The locations of all features shown are approximate.
5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: See Notes 1 and 2.

Horizontal Datum: North American Datum (NAD) 1983/1991, WA State Plane, N Zone, US Foot
Vertical Datum: Mean Lower Low Water (MLLW)
Vertical Datum Conversion (based on NOAA's Publication Sheet (944-7659), dated 09/29/1988):
MHHW = +11.11 feet MLLW
NGVD 1929 = +5.93 MLLW
NAVD 1988 = +2.25 MLLW

250 0 250
Feet

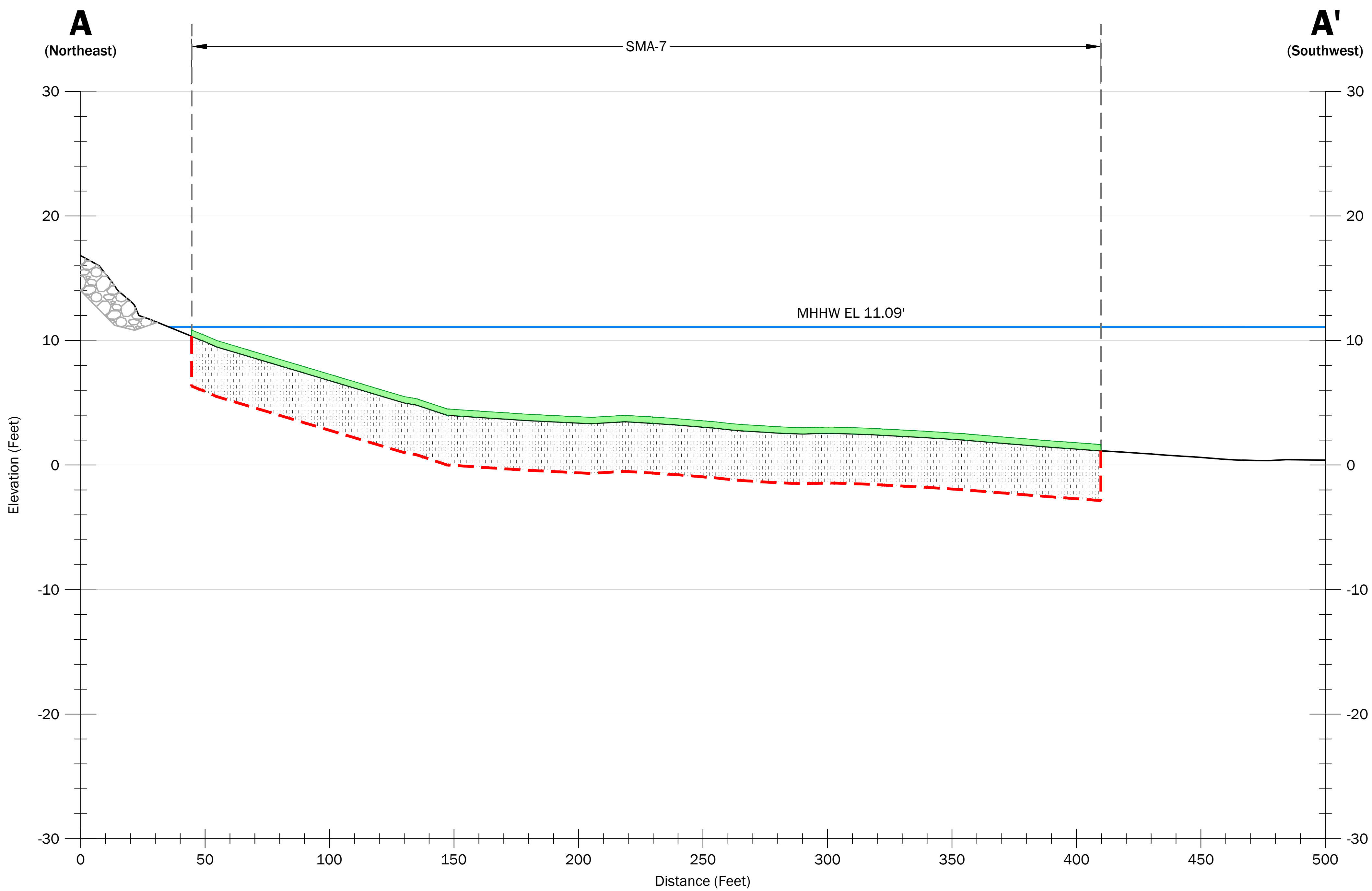
Alternative 8

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-8

p:\0\0676020\CAD\07\task 1700 (cap)\067602007_F112_Alternative 8.dwg A-8 Alternative 8 Date Exported:12/12/2023 9:31 PM - by Chad Stickel



Legend

- Existing Mudline
- Estimated Contamination Depth (feet below mudline)
- Contaminated Sediment and/or Wood Debris
- Approximate Shoreline Slope Armor (Rip-Rap)

EL Elevation
MHHW Mean Higher High Water

Proposed Remedial Alternative Components[1]

- Enhanced Natural Recovery

Alternative 8 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

50 0 50
Horizontal Scale in Feet
10 0 10
Vertical Scale in Feet
Vertical Exaggeration = 5X

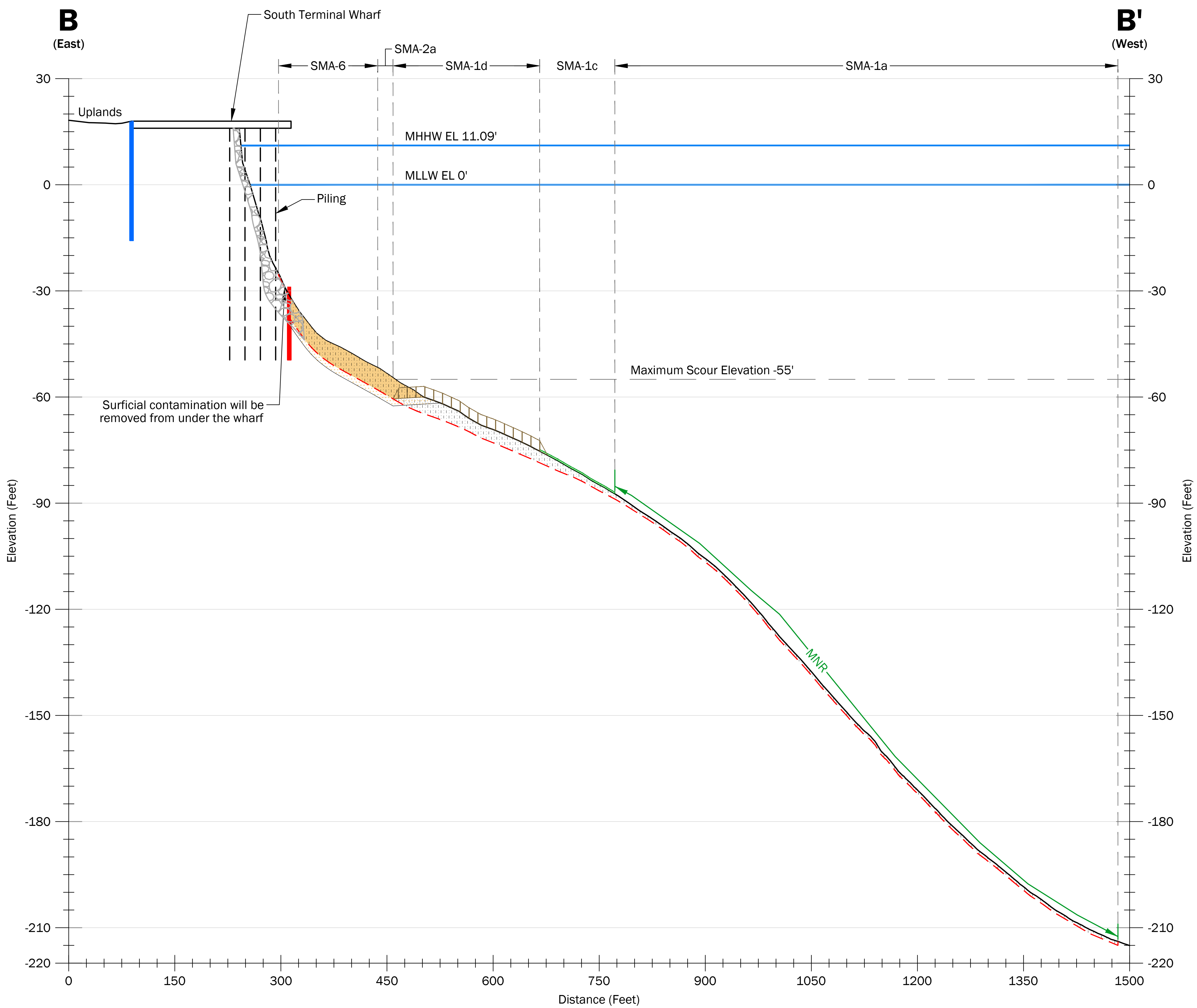
Alternative 8
Cross Section A - A'

Weyerhaeuser Mill A Former
Everett, Washington

GEOENGINEERS

Figure A-8A

p:\0\0676020\CAD\07\task 1700 (cap)\067602007_F113_Cross Section A - A' (Alt 8).dwg A-8A Section A (Alternative 8) Date Exported:12/12/2023 4:53 PM - by Chad Stickel



Legend

- Existing Mudline
- Estimated Contamination Depth (feet below mudline)
- Contaminated Sediment and/or Wood Debris
- Approximate Shoreline Slope Armor (Rip-Rap)
- Bulkhead (Depth Unknown)

EL Elevation
MHHW Mean Higher High Water
MLLW Mean Lower Low Water

Proposed Remedial Alternative Components[1]

- MNR Monitored Natural Recovery
- Enhanced Natural Recovery
- Full Removal of Contaminated Sediment and Wood Debris
- 2-Foot Overdredge Allowance
- Dynamic Sand Cap
- South Terminal Toe Wall[2]

Alternative 8 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.
2. The height and depth of the wall will be determined during remedial design. In general, the wall will be keyed into the native soil and will vertically extend upwards such that the top of the wall is at or above the surface elevations of the adjacent armored slopes.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

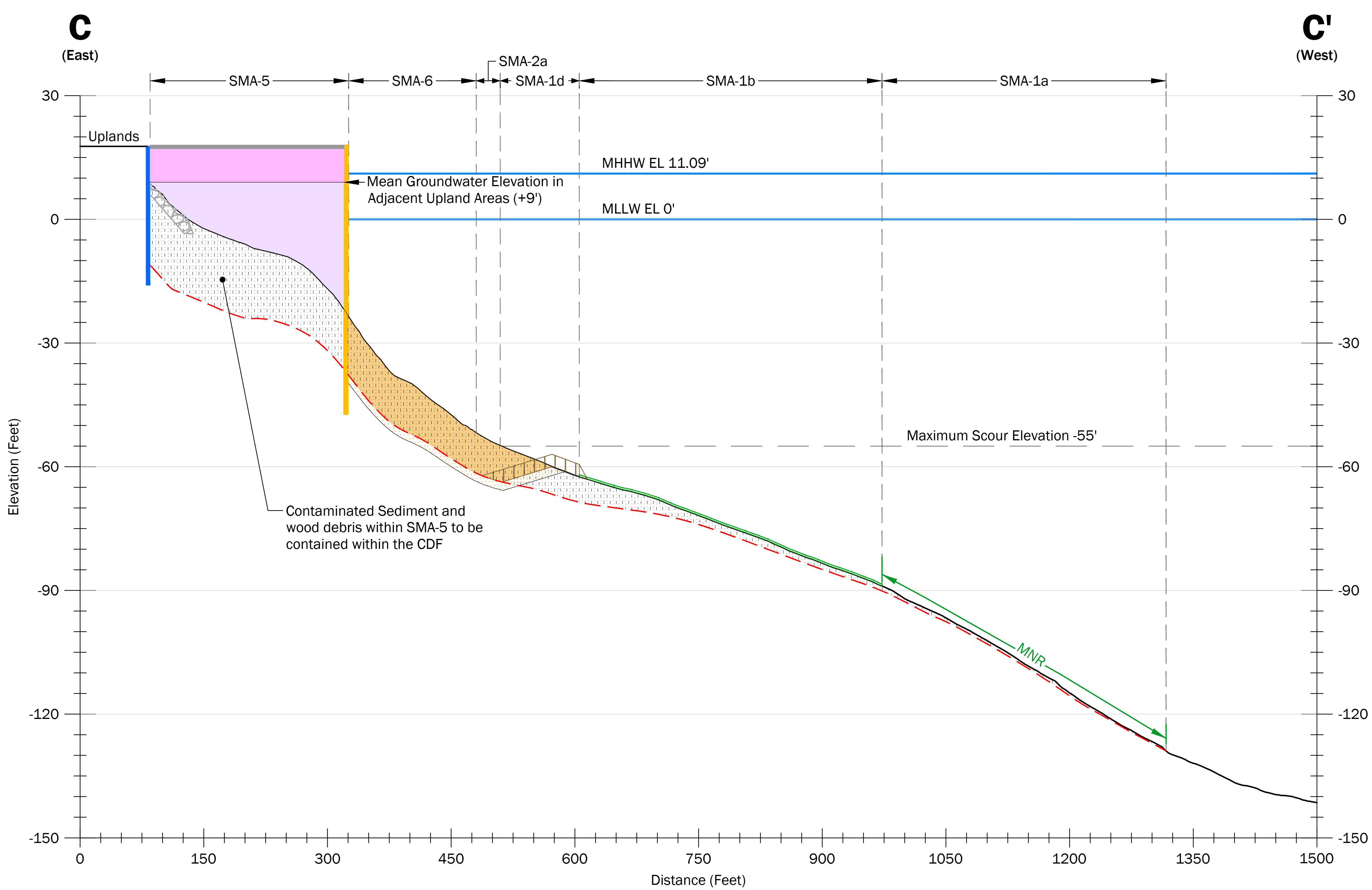
150 0 150
Horizontal Scale in Feet
30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

Alternative 8
Cross Section B - B'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-8B



Legend

- Existing Mudline
- Estimated Contamination Depth (feet below mudline)
- Contaminated Sediment and/or Wood Debris
- Approximate Shoreline Slope Armor (Rip-Rap)
- Bulkhead (Depth Unknown)
- EL Elevation
- MHHW Mean Higher High Water
- MLLW Mean Lower Low Water

Proposed Remedial Alternative Components[1]

- MNR Monitored Natural Recovery
- Enhanced Natural Recovery
- Full Removal of Contaminated Sediment and Wood Debris
- 2-Foot Overdredge Allowance
- Dynamic Sand Cap
- Containment/CDF Wall[2]
- Contaminated Dredged Material Fill
- Imported Fill Material
- Asphalt Surface with Stormwater Management System

Alternative 8 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.
2. The height and depth of the wall will be determined during remedial design. In general, the wall will be keyed into the native soil and will vertically extend upwards such that the top of the wall is at or above the surface elevations of the adjacent Upland area.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

150 0 150
Horizontal Scale in Feet

30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

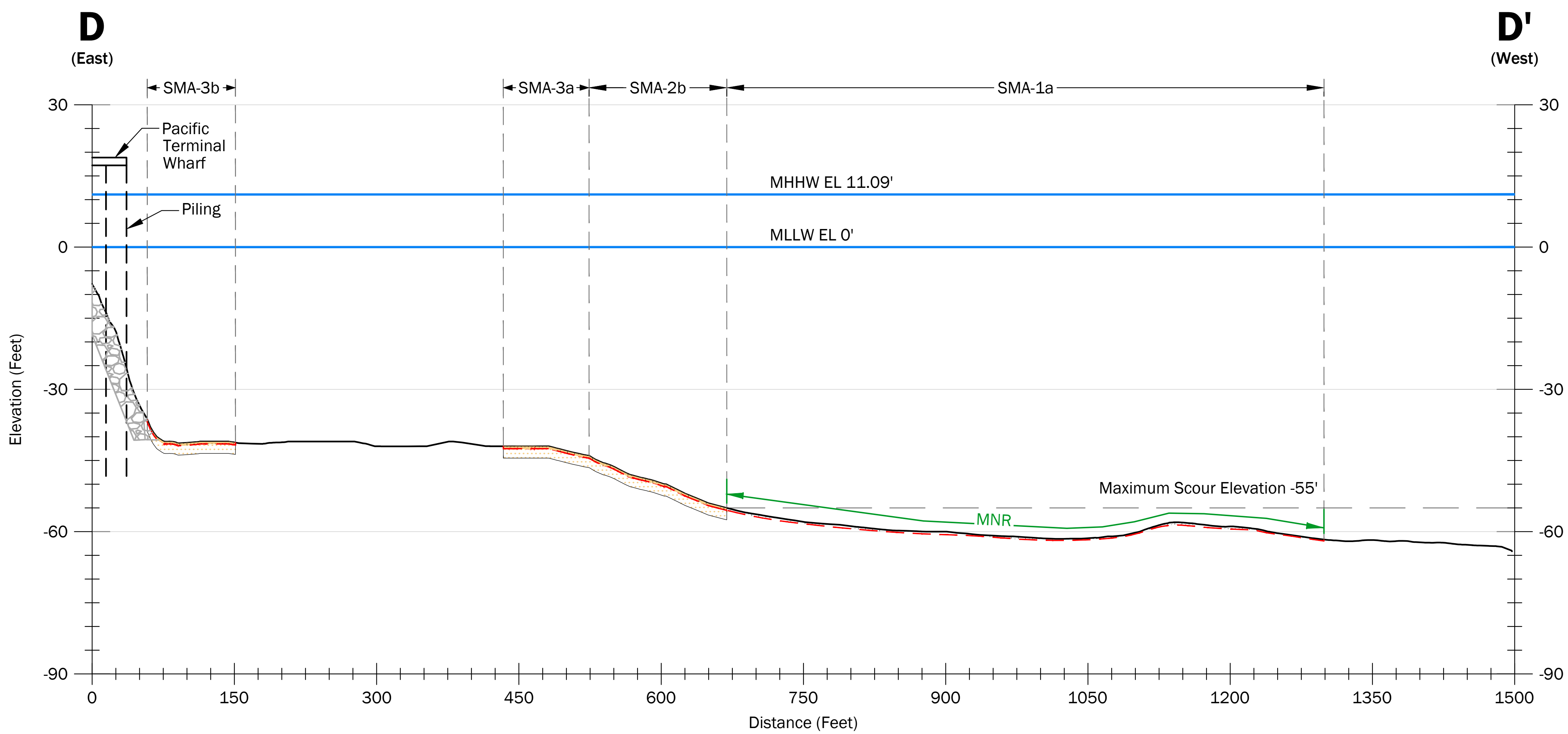
Alternative 8
Cross Section C - C'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-8C

p:\0\0676020\CAD\07\task 1700 (cap)\067602007_F115_Cross Section C - C' (Alt 8).dwg A-8C Section C (Alternative 8) Date Exported:12/12/2023 4:54 PM - by Chad Stickel



Legend

- Existing Mudline
- Estimated Contamination Depth (feet below mudline)
- Contaminated Sediment and/or Wood Debris
- Approximate Shoreline Slope Armor (Rip-Rap)

EL Elevation
MHHW Mean Higher High Water
MLLW Mean Lower Low Water

Proposed Remedial Alternative Components[1]

- MNR — Monitored Natural Recovery
- Full Removal of Contaminated Sediment and Wood Debris
- 2-Foot Overdredge Allowance

Alternative 8 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

150 0 150
Horizontal Scale in Feet
30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

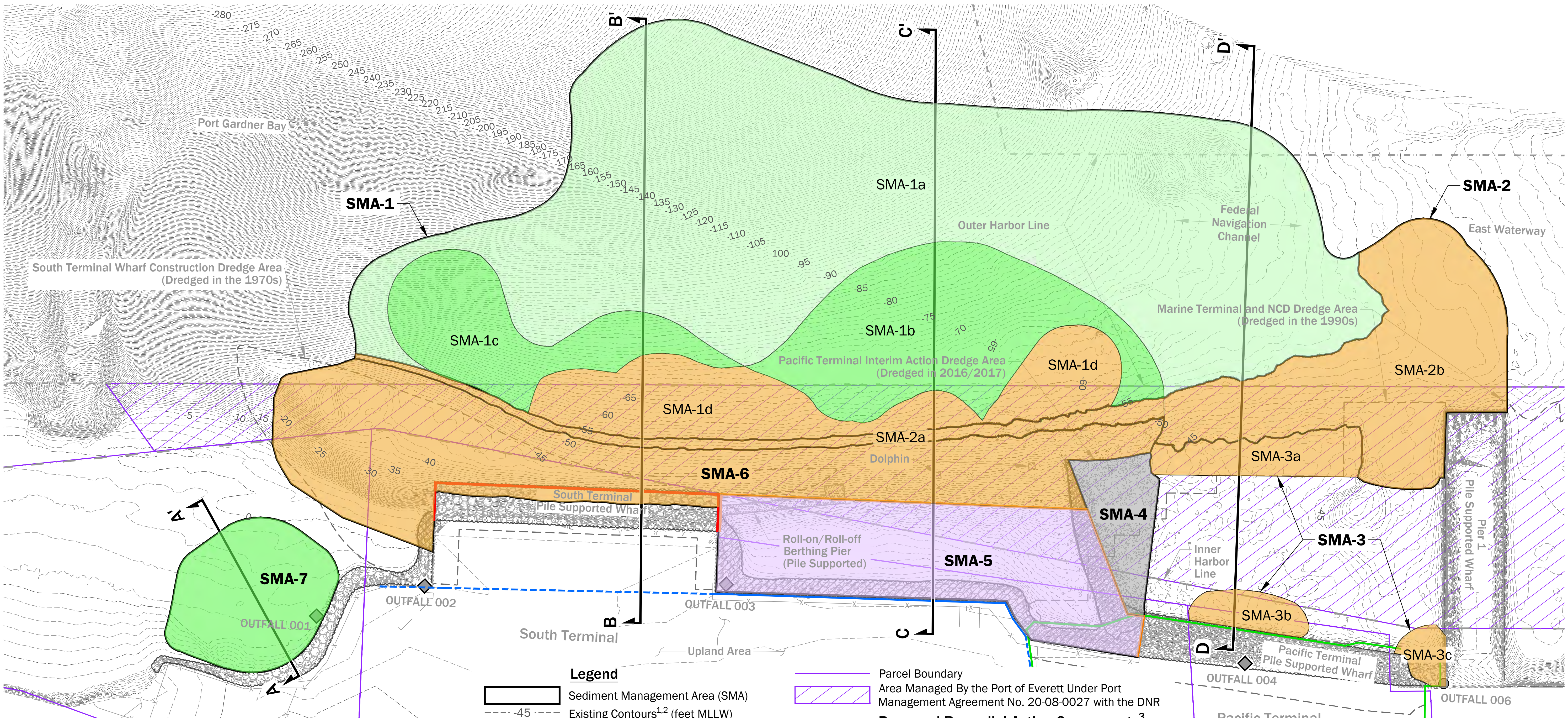
Alternative 8
Cross Section D - D'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-8D

p:\0\0676020\CAD\07\task 1700 (cap)\067602007_F116_Cross Section D - D' (Alt 8).dwg A-8D Section D (Alternative 8) Date Exported:12/12/2023 4:54 PM - by Chad Stickel



p:\0\0676020\CAD\07\task 1700 (cap)\067602007_F117_Alternative 9.dwg A-9 Alternative 9 Date Exported:12/12/2023 9:33 PM - by Chad Stickel

Legend

- Sediment Management Area (SMA)
- -45 Existing Contours[1,2] (feet MLLW)
- MLLW Mean Lower Low Water
- MHHW Mean Higher High Water
- Outer Harbor Line
- Inner Harbor Line
- Bulkhead (Dashed where Buried)
- Nearshore Confined Disposal (NCD) Facility (Former Log Pond)
- Fence
- Previously Dredged Areas
- Areas of Known Armoring
- Current Combined Sewer Outfall (SCO)
- Current Stormwater Outfall
- A A' Cross Section Location
- Parcel Boundary
- Area Managed By the Port of Everett Under Port Management Agreement No. 20-08-0027 with the DNR

Proposed Remedial Action Components[3]

- Full Removal of Contaminated Sediment and/or Wood Debris
- Enhanced Natural Recovery (ENR)
- Monitored Natural Recovery (MNR)
- Containment/Confined Disposal Facility (CDF)
- Remove Existing Pile-Supported Roll-on/Roll-off Berthing Pier and Dolphins
- Remove Existing Armor
- Remove and Replace Existing Armor
- No Action
- South Terminal Toe Wall
- Containment/CDF Wall

250 0 250
Feet

Notes:

1. Bathymetric Contours are based on merged survey data provided by Tetra Tech on 12/12/2017. Three surveys were merged by Tetra Tech - 1) Tetra Tech survey dated February 2017 presenting bathymetry of the marine areas adjacent to the South Terminal, 2) Tetra Tech survey dated December 2015 presenting bathymetry of areas underneath the Pacific/South Terminal Wharfs, and 3) Pacific Geomatic Services, Inc. survey dated October 2014 presenting the bathymetry of the rest of the marine areas of the site except for Pacific Terminal Interim Action Dredge Area. The bathymetry for the Pacific Terminal Interim Action Dredge Area is based on Tetra Tech survey dated February 2017 and was merged by GeoEngineers.
2. Upland contours are based on surface elevations obtained at the upland boring locations as part of the RI.
3. A summary of remedial action components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.
4. The locations of all features shown are approximate.
5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: See Notes 1 and 2.

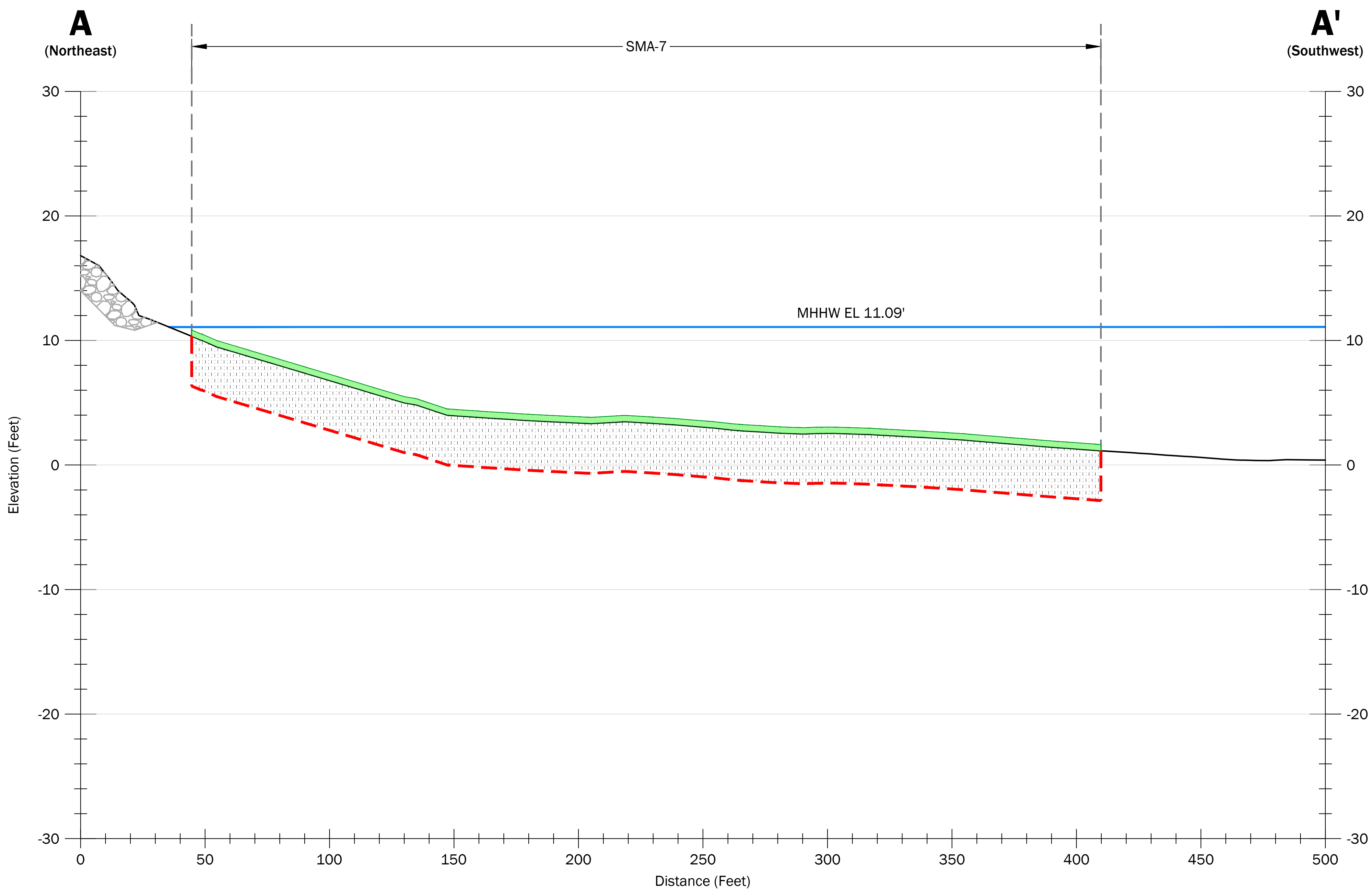
Horizontal Datum: North American Datum (NAD) 1983/1991, WA State Plane, N Zone, US Foot
Vertical Datum: Mean Lower Low Water (MLLW)
Vertical Datum Conversion (based on NOAA's Publication Sheet (944-7659), dated 09/29/1988):
MHHW = +11.11 feet MLLW
NGVD 1929 = +5.93 MLLW
NAVD 1988 = +2.25 MLLW

Alternative 9

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-9



Legend

- Existing Mudline
- Estimated Contamination Depth (feet below mudline)
- Contaminated Sediment and/or Wood Debris
- Approximate Shoreline Slope Armor (Rip-Rap)

EL Elevation
MHHW Mean Higher High Water

Proposed Remedial Alternative Components[1]

- Enhanced Natural Recovery

Alternative 9 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

50 0 50
Horizontal Scale in Feet
10 0 10
Vertical Scale in Feet
Vertical Exaggeration = 5X

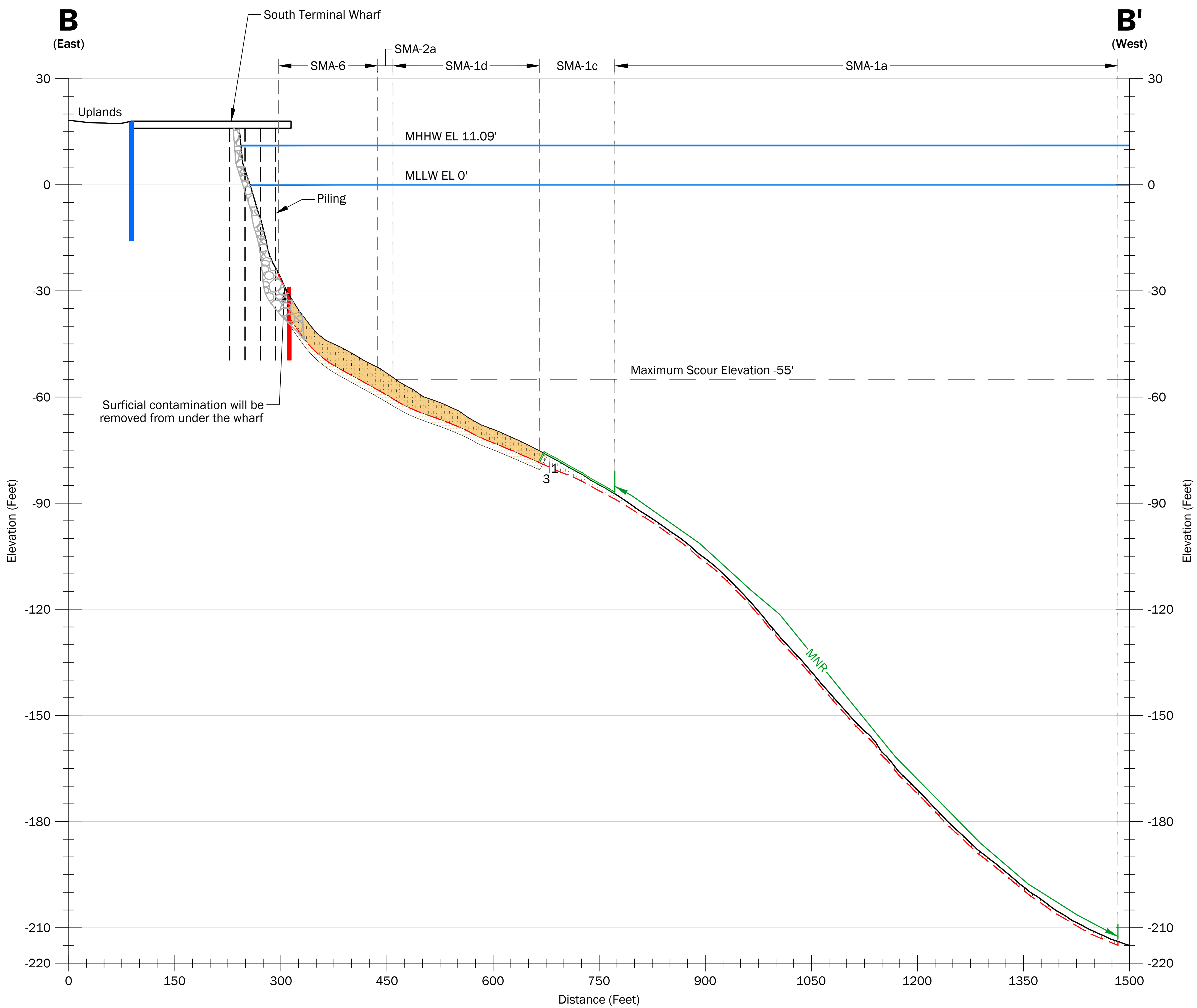
Alternative 9
Cross Section A - A'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-9A

p:\0\0676020\CAD\07\task 1700 (cap)\067602007_F118_Cross Section A - A' (Alt 9).dwg A-9A Section A (Alternative 9) Date Exported:12/12/2023 9:09 PM - by Chad Stickel



Legend

Existing Mudline
Estimated Contamination Depth (feet below mudline)
Contaminated Sediment and/or Wood Debris
Approximate Shoreline Slope Armor (Rip-Rap)
Bulkhead (Depth Unknown)
EL Elevation
MHHW Mean Higher High Water
MLLW Mean Lower Low Water

Proposed Remedial Alternative Components[1]

MNR Monitored Natural Recovery
Enhanced Natural Recovery
Full Removal of Contaminated Sediment and Wood Debris
2-Foot Overdredge Allowance
South Terminal Toe Wall[2]

Alternative 9 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.
2. The height and depth of the wall will be determined during remedial design. In general, the wall will be keyed into the native soil and will vertically extend upwards such that the top of the wall is at or above the surface elevations of the adjacent armored slopes.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

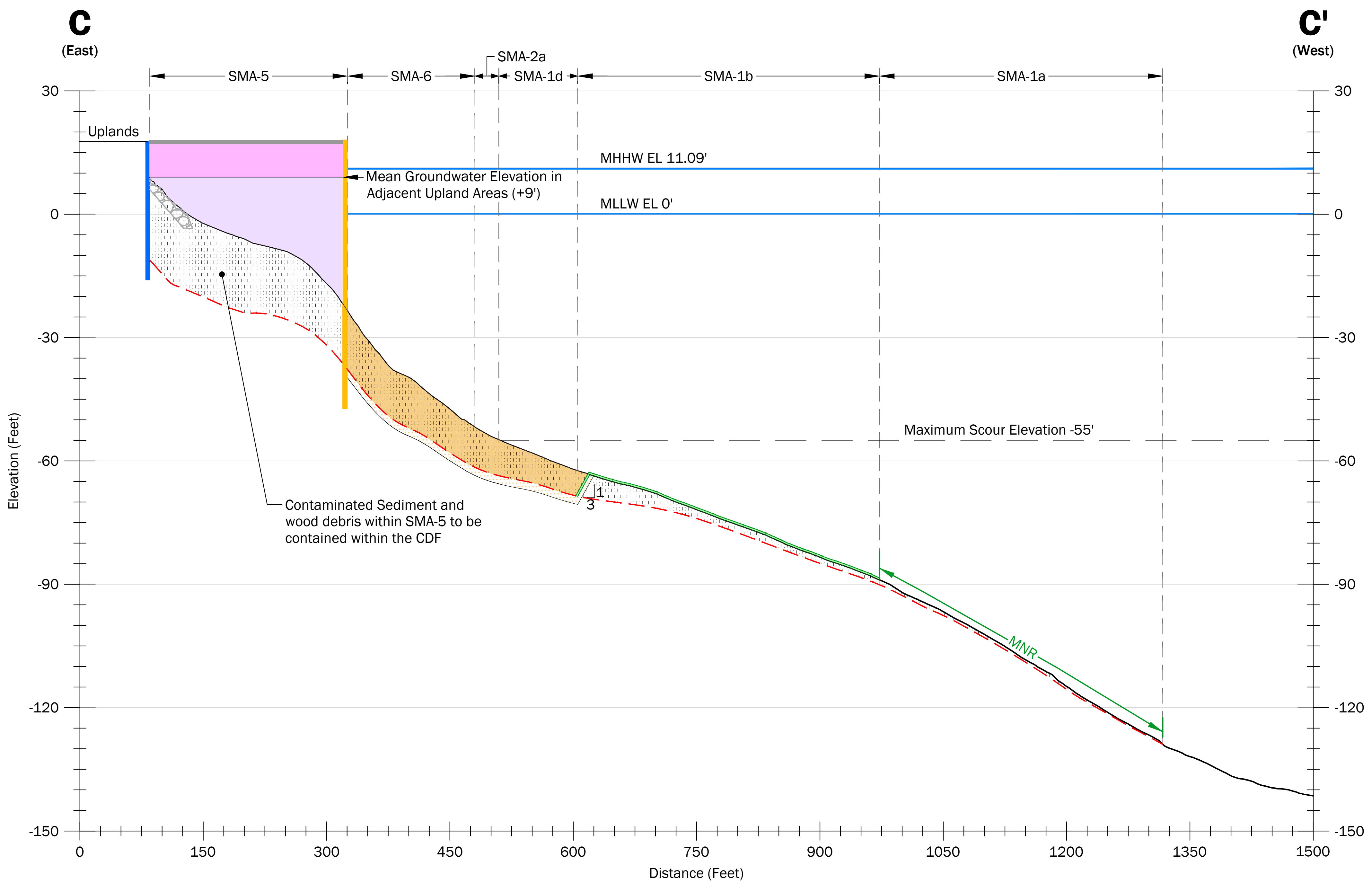
150 0 150
Horizontal Scale in Feet
30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

Alternative 9
Cross Section B - B'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-9B



Legend

- Existing Mudline
- Estimated Contamination Depth (feet below mudline)
- Contaminated Sediment and/or Wood Debris
- Approximate Shoreline Slope Armor (Rip-Rap)
- Bulkhead (Depth Unknown)

EL Elevation
MHHW Mean Higher High Water
MLLW Mean Lower Low Water

Proposed Remedial Alternative Components[1]

- MNR Monitored Natural Recovery
- Enhanced Natural Recovery
- Full Removal of Contaminated Sediment and Wood Debris
- 2-Foot Overdredge Allowance
- Containment/CDF Wall[2]
- Contaminated Dredged Material Fill
- Imported Fill Material
- Asphalt Surface with Stormwater Management System

Alternative 9 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.
2. The height and depth of the wall will be determined during remedial design. In general, the wall will be keyed into the native soil and will vertically extend upwards such that the top of the wall is at or above the surface elevations of the adjacent Upland area.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

150 0 150
Horizontal Scale in Feet
30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

Alternative 9
Cross Section C - C'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-9C

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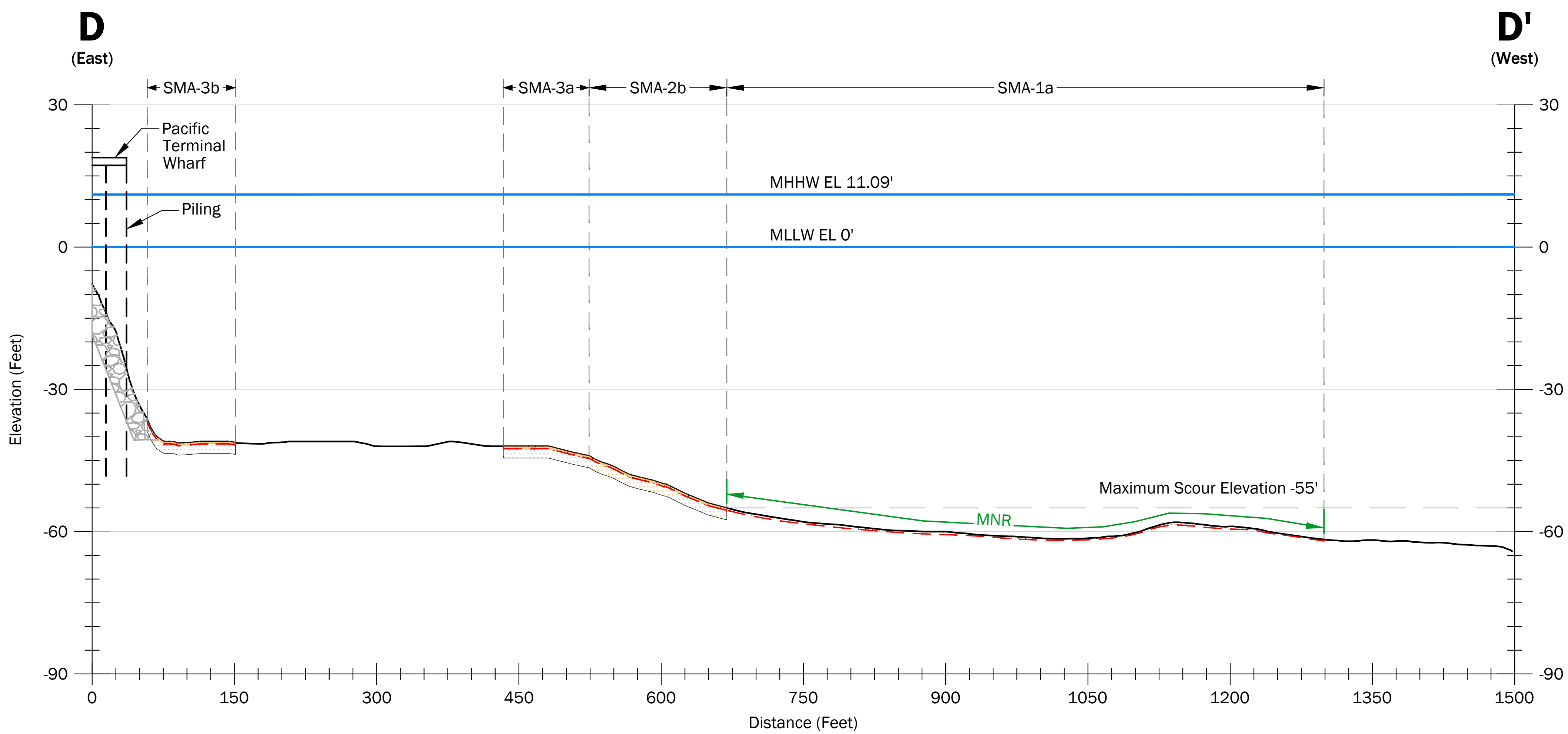


Legend

Existing Mudline

Estimated Contamination Depth (feet below mudline)

Contaminated Sediment and/or Wood Debris

Approximate Shoreline Slope Armor (Rip-Rap)

EL Elevation
MHHW Mean Higher High Water
MLLW Mean Lower Low Water

Proposed Remedial Alternative Components[1]

MNR Monitored Natural Recovery

Full Removal of Contaminated Sediment and Wood Debris

2-Foot Overdredge Allowance

Alternative 9 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

150 0 150
Horizontal Scale in Feet
30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

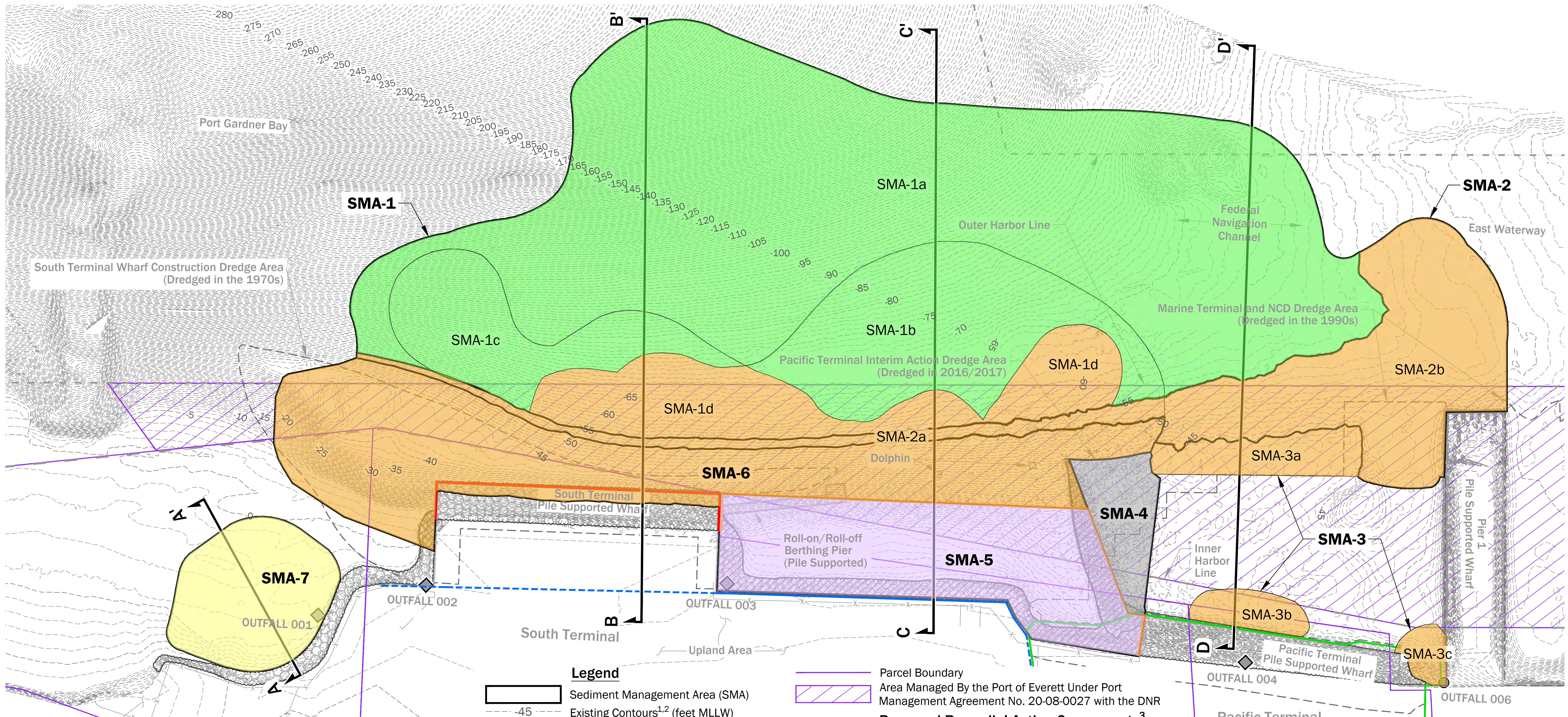
Alternative 9
Cross Section D - D'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-9D

p:\0\0676020\CAD\07\task 1700 (cap)\067602007_F121_Cross Section D - D' [Alt 9].dwg A-9D Section D [Alternative 9] Date Exported:12/12/2023 9:09 PM - by Chad Stickel



Legend

- Sediment Management Area (SMA)
- -45 Existing Contours[1,2] (feet MLLW)
- MLLW Mean Lower Low Water
- MHHW Mean Higher High Water
- Outer Harbor Line
- Inner Harbor Line
- Bulkhead (Dashed where Buried)
- Nearshore Confined Disposal (NCD) Facility (Former Log Pond)
- Fence
- Previously Dredged Areas
- Areas of Known Armoring
- Current Combined Sewer Outfall (SCO)
- Current Stormwater Outfall
- A A' Cross Section Location
- Parcel Boundary
- Area Managed By the Port of Everett Under Port Management Agreement No. 20-08-0027 with the DNR

Proposed Remedial Action Components[3]

- Full Removal of Contaminated Sediment and/or Wood Debris
- Full Removal and Backfill
- Enhanced Natural Recovery (ENR)
- Containment/Confined Disposal Facility (CDF)
- Remove Existing Pile-Supported Roll-on/Roll-off Berthing Pier and Dolphins
- Remove Existing Armor
- Remove and Replace Existing Armor
- No Action
- South Terminal Toe Wall
- Containment/CDF Wall

250 0 250
Feet

Notes:

1. Bathymetric Contours are based on merged survey data provided by Tetra Tech on 12/12/2017. Three surveys were merged by Tetra Tech - 1) Tetra Tech survey dated February 2017 presenting bathymetry of the marine areas adjacent to the South Terminal, 2) Tetra Tech survey dated December 2015 presenting bathymetry of areas underneath the Pacific/South Terminal Wharfs, and 3) Pacific Geomatic Services, Inc. survey dated October 2014 presenting the bathymetry of the rest of the marine areas of the site except for Pacific Terminal Interim Action Dredge Area. The bathymetry for the Pacific Terminal Interim Action Dredge Area is based on Tetra Tech survey dated February 2017 and was merged by GeoEngineers.
2. Upland contours are based on surface elevations obtained at the upland boring locations as part of the RI.
3. A summary of remedial action components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.
4. The locations of all features shown are approximate.
5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: See Notes 1 and 2.

Horizontal Datum: North American Datum (NAD) 1983/1991, WA State Plane, N Zone, US Foot
Vertical Datum: Mean Lower Low Water (MLLW)
Vertical Datum Conversion (based on NOAA's Publication Sheet (944-7659), dated 09/29/1988):
MHHW = +11.11 feet MLLW
NGVD 1929 = +5.93 MLLW
NAVD 1988 = +2.25 MLLW

Alternative 10

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-10

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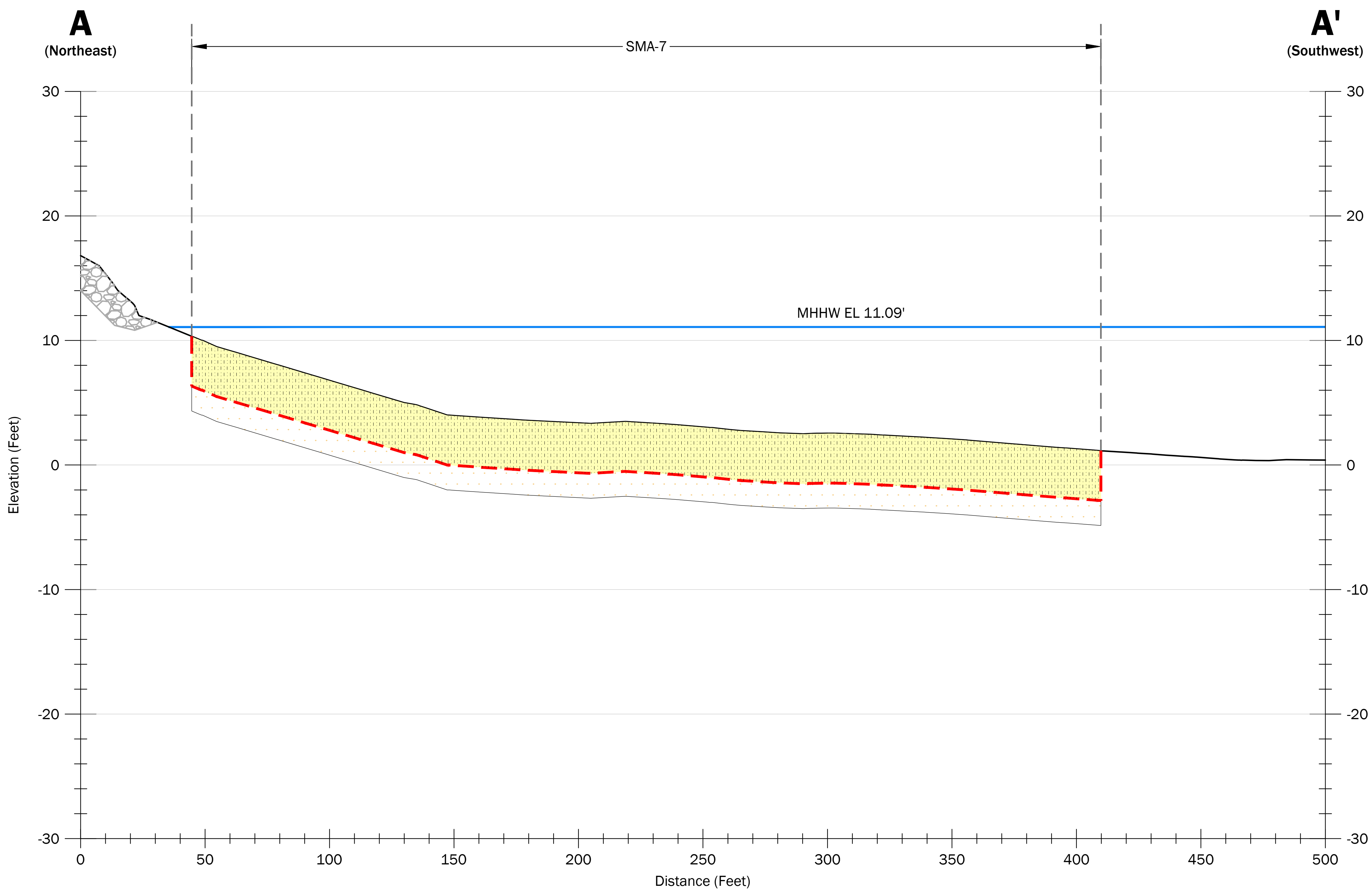


Legend

Existing Mudline
Estimated Contamination Depth (feet below mudline)
Contaminated Sediment and/or Wood Debris
Approximate Shoreline Slope Armor (Rip-Rap)
EL Elevation
MHHW Mean Higher High Water

Proposed Remedial Alternative Components[1]

Full Removal and Backfill
2-Foot Overdredge Allowance

Alternative 10 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

50 0 50
Horizontal Scale in Feet
10 0 10
Vertical Scale in Feet
Vertical Exaggeration = 5X

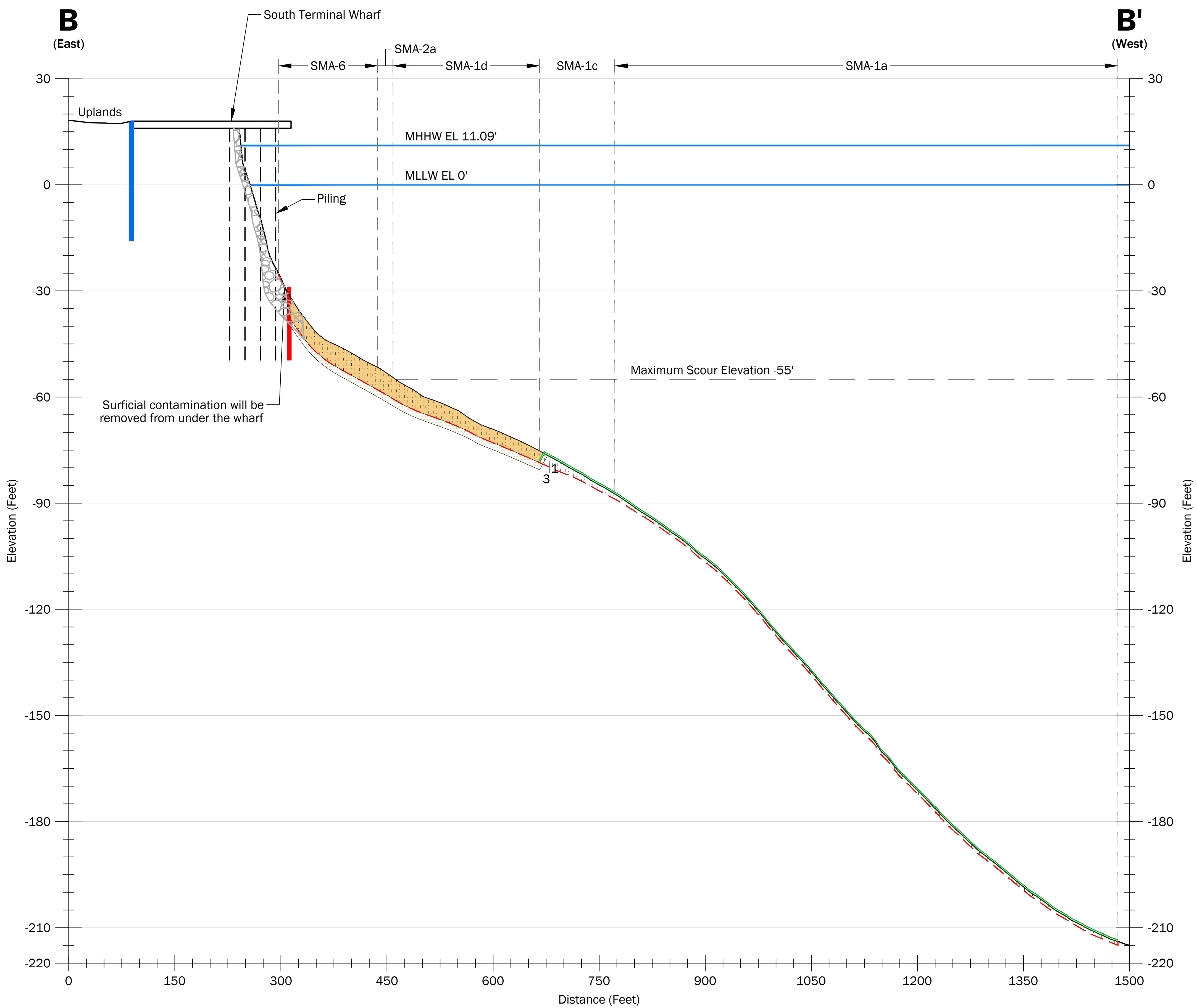
Alternative 10
Cross Section A - A'

Weyerhaeuser Mill A Former
Everett, Washington

GEOENGINEERS

Figure A-10A

p:\0\0676020\CAD\07\task 1700 (cap)\067602007_F123_Cross Section A - A' [Alt 10].dwg A-10A Section A [Alternative 10] Date Exported:12/12/2023 9:10 PM - by Chad Stickel



Legend

- Existing Mudline
- Estimated Contamination Depth (feet below mudline)
- Contaminated Sediment and/or Wood Debris
- Approximate Shoreline Slope Armor (Rip-Rap)
- Bulkhead (Depth Unknown)

EL Elevation
MHHW Mean Higher High Water
MLLW Mean Lower Low Water

Proposed Remedial Alternative Components[1]

- Enhanced Natural Recovery
- Full Removal of Contaminated Sediment and Wood Debris
- 2-Foot Overdredge Allowance
- South Terminal Toe Wall[2]

Alternative 10 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.
2. The height and depth of the wall will be determined during remedial design. In general, the wall will be keyed into the native soil and will vertically extend upwards such that the top of the wall is at or above the surface elevations of the adjacent armored slopes.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

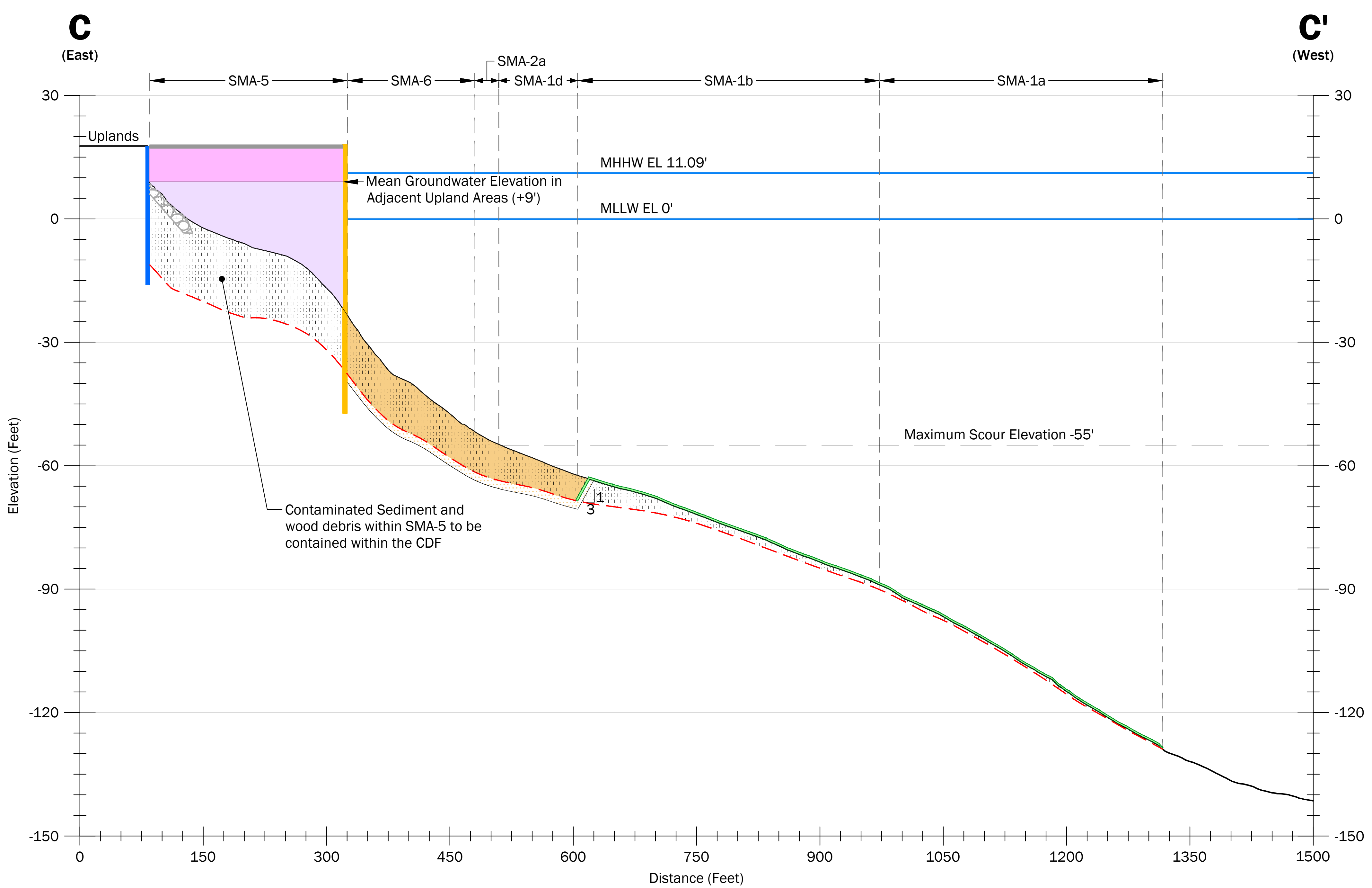
150 0 150
Horizontal Scale in Feet
30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

Alternative 10
Cross Section B - B'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-10B



Legend

- Existing Mudline
- Estimated Contamination Depth (feet below mudline)
- Contaminated Sediment and/or Wood Debris
- Approximate Shoreline Slope Armor (Rip-Rap)
- Bulkhead (Depth Unknown)

EL Elevation
MHHW Mean Higher High Water
MLLW Mean Lower Low Water

Proposed Remedial Alternative Components[1]

- Enhanced Natural Recovery
- Full Removal of Contaminated Sediment and Wood Debris
- 2-Foot Overdredge Allowance
- Containment/CDF Wall[2]
- Contaminated Dredged Material Fill
- Imported Fill Material
- Asphalt Surface with Stormwater Management System

Alternative 10 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.
2. The height and depth of the wall will be determined during remedial design. In general, the wall will be keyed into the native soil and will vertically extend upwards such that the top of the wall is at or above the surface elevations of the adjacent Upland area..

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

150 0 150
Horizontal Scale in Feet
30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

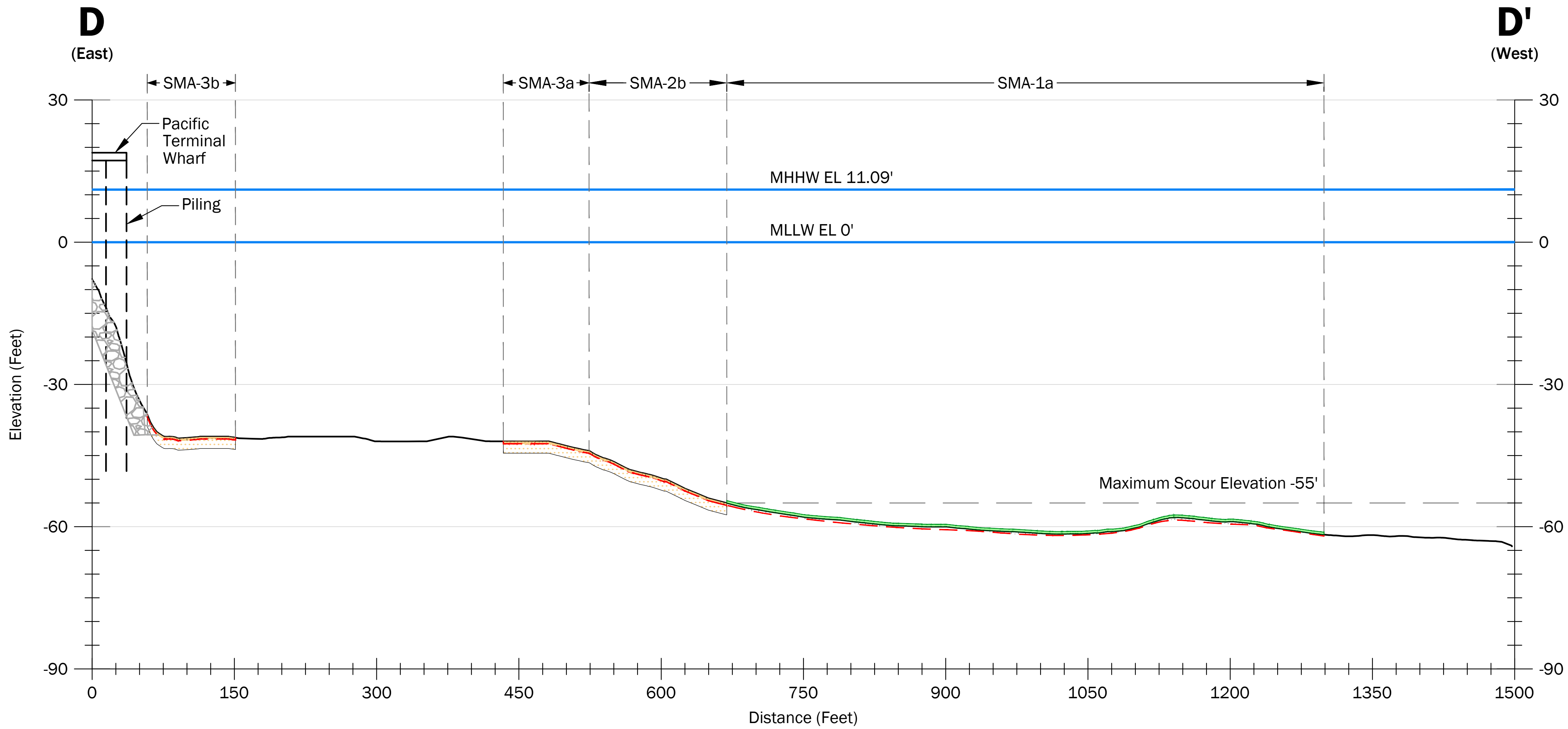
Alternative 10
Cross Section C - C'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-10C

p:\0\0676020\CAD\07\task 1700 (cap)\0676020007_F125_Cross Section C - C' [Alt 10].dwg A-10C Section C [Alternative 10] Date Exported:12/12/2023 9:10 PM - by Chad Stickel



Legend

- Existing Mudline
- Estimated Contamination Depth (feet below mudline)
- Contaminated Sediment and/or Wood Debris
- Approximate Shoreline Slope Armor (Rip-Rap)

EL Elevation
MHHW Mean Higher High Water
MLLW Mean Lower Low Water

Proposed Remedial Alternative Components[1]

- Enhanced Natural Recovery
- Full Removal of Contaminated Sediment and Wood Debris
- 2-Foot Overdredge Allowance

Alternative 10 Notes:

1. A summary of remedial alternative components is presented in the figure. A detailed description of the remedial action components are presented in the Remedial Investigation/Feasibility Study (RI/FS) Report.

General Notes:

- The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

150 0 150
Horizontal Scale in Feet
30 0 30
Vertical Scale in Feet
Vertical Exaggeration = 5X

Alternative 10
Cross Section D - D'

Weyerhaeuser Mill A Former
Everett, Washington

GeoEngineers

Figure A-10D

Appendix B. Selected Cleanup Action Cost Estimate

Table B-1

Selected Cleanup Action Cost Estimate

Weyerhaeuser Mill A Former

Everett, Washington

Item No.	Item Identification	Unit	Unit Cost[1]	Quantity[2]	Cost[3]	Item Description
CONSTRUCTION						
1	Mobilization/Demobilization	Percent	5%	--	$ 5,331,035	A percentage of other construction items.
2	Removal, Upland Offload and Temporary Stockpiling of Existing Armor	Cubic Yard	$ 44	1,750	$ 77,000	Includes removal of existing armor to allow for dredging of the underlying contaminated sediment and wood debris, and temporary stockpiling of removed armor in the upland portions of the Site.
3	Procurement and Installation of South Terminal Toe Wall	Lump Sum	$ 5,700,000	1	$ 5,700,000	The toe wall is intended to protect the existing South Terminal wharf and armored slope to allow the full depth of contamination to be removed by dredging. The proposed toe wall will be designed to allow for removal to the maximum estimated depth of contamination along the South Terminal pier face of the wall and will not support dredging to the Port's future navigational elevations. Additional details and assumptions for CDF wall are presented in the Marine Area CAP. Cost details are presented in the Marine Area RI/FS.
4	Removal of Existing Ro-Ro Berthing Pier, Installation of CDF Wall, and Surface Confinement of CDF	Lump Sum	$ 66,300,000	1	$ 66,300,000	Includes removal and off-site disposal of existing pile-supported roll-on/roll-off berthing pier located north of the South Terminal to allow for cleanup dredging, procurement and installation of CDF wall, and covering the CDF area (following the placement of dredged material) with a layer of clean imported fill material overlain by the asphalt surface and stormwater management infrastructure for the asphalt surface to meet dredged material protection and permitting requirements. Purpose of the CDF is to create a confined disposal space for disposal of dredged material on Site. Additionally, the CDF provides containment for the in-place contaminated sediment and wood debris present within the footprint of the CDF. The proposed wall will be designed to allow for removal to the maximum estimated depth of contamination along the proposed CDF face and will not support dredging to the Port's future navigational elevations. Additional details and assumptions for CDF wall are presented in the Marine Area CAP. Cost details are presented in the Marine Area RI/FS.
5	Ground Improvements for CDF Wall	Lump Sum	$ 22,000,000	1	$ 22,000,000	The purpose of ground improvement is to provide seismic stability to the CDF wall and comply with the applicable building codes. Additional details and assumptions for CDF wall are presented in the Marine Area CAP. Cost details are presented in the Marine Area RI/FS.
6	Dredging of Contaminated Material	Cubic Yard	$ 24	185,796	$ 4,459,107	Includes removal of contaminated sediment and wood debris and includes a 2-foot allowable overdredging allowance to ensure that removal is achieved. Dredging for berth deepening beyond the estimated depth of contamination is not included.
7	Post-Dredge Surface Sediment Sample Collection	Per Day	$ 3,230	5	$ 16,150	Includes collection of sediment samples from post-dredge sediment surface to meet the compliance monitoring requirements of MTCA and SMS. Post-dredge surface sediment samples will be collected to confirm that cleanup levels are met. Assumes 2 samples will be collected per acre and up to 10 samples can be collected in a day.
8	Post-Dredge Surface Sediment Sample Analysis	Per Sample	$ 5,000	42	$ 210,000	Includes analysis of Site contaminants of concern (COCs) on a standard turn-around time.
9	Upland Offload and Management of Dredged Contaminated Material	Cubic Yard	$ 15	11,796	$ 176,942	Includes offload of dredged contaminated material from material barges directly into trucks and trailers (or containers) at the South Terminal. It is assumed that the necessary dewatering of dredged material will be accomplished on the material barges and the water will be released back to the marine waters in accordance with the requirements of the permits.
10	Transportation and Disposal of Dredged Contaminated Material at an Upland Landfill	Ton	$ 72	15,335	$ 1,104,116	Includes disposal of dredged contaminated material at a permitted upland landfill (e.g., RCRA Subtitle D landfill). Assumes a conversion rate of 1.3 tons/CY for contaminated sediment and wood debris.
11	Disposal and Management of Dredged Contaminated Material inside CDF	Cubic Yard	$ 20	174,000	$ 3,480,000	Includes disposal of dredged contaminated material inside the on Site CDF. Also includes management of material inside the CDF.
12	Replacement/Reuse of Existing Armor	Cubic Yard	$ 44	1,200	$ 52,800	Includes reusing stockpiled armor to restore the armored slopes in the southern portion of the South Terminal that are not protected by the toe wall.
13	Import and Place Sand for Enhanced Natural Recovery (ENR)	Ton	$ 53	15,140	$ 802,420	Includes placement of a 6-inch equivalent mass of clean imported sand (mass per area basis) on top of the sediment surfaces within the ENR remedy areas. Assumes a conversion rate of 1.6 tons/CY for imported sand.
14	Import and Place Sand Cap	Ton	$ 53	35,720	$ 1,893,160	Includes placement of a 3-foot equivalent mass of clean imported sand (mass per area basis) on top of the sediment surfaces within the dynamic sand cap remedy area. Assumes a conversion rate of 1.6 tons/CY for imported sand.
15	Progress Bathymetric Surveys	Per Survey	$ 10,500	28	$ 294,000	Includes 2 progress survey per month of in-water dredging or material placement activities. Assumes that the entire Marine Area can be surveyed in a day. For the purposes of estimating total duration of in-water activities and total number of surveys required, a production rate of 800 CY/day and 20 work days in a month are assumed.
16	Post-Construction Bathymetric Survey	Per Survey	$ 15,000	3	$ 45,000	Includes 3 post-construction bathymetric surveys.
17	Warning Signage	Lump Sum	$ 10,000	1	$ 10,000	Includes installation of up to 10 warning signage within the upland portions of the Site.
				Construction Subtotal	**$ 111,951,729**	A sum of individual Construction items.
				Contractor Overhead	$ 11,195,173	A percentage (10%) of Construction Subtotal.
				Everett Sales Tax	$ 10,635,414	A percentage (9.5%) of Construction Subtotal.
				Contingency	$ 40,134,695	A percentage (30%) of Construction Subtotal, Contractor Overhead, Everett Sales Tax.
				Construction Total	**$ 173,917,011**	A sum of Construction Subtotal, Contractor Overhead, Everett Sales Tax and Contingency.

Item No.	Item Identification	Unit	Unit Cost[1]	Quantity[2]	Cost[3]	Item Description
PROFESSIONAL/TECHNICAL SERVICES						
1	Remedial Design	Percent	6%	--	$ 10,435,021	A percentage of Construction Total. Remedial Design includes pre-design collection and analysis of field data, engineering survey for design, and the various design components such as design analysis, plans, specifications, cost estimate, and schedule at the preliminary, intermediate, and final design phases.
2	Construction Management	Percent	6%	--	$ 10,435,021	A percentage of Construction Total. Construction Management includes review of submittals, design modifications, construction observation or oversight, documentation of quality control/quality assurance, and record drawings.
3	Project Management	Percent	5%	--	$ 8,695,851	A percentage of Construction Total. Project Management includes planning, community relations support during construction, bid and contract administration, permitting and legal services outside of institutional controls.
4	Institutional Controls	Lump Sum	20,000	1	$ 20,000	Includes administrative cost and legal fees associated with Institutional Controls.
				Professional/Technical Services Total	**$ 29,585,892**	A sum of individual Professional/Technical Services items.
MONITORING						
1	Marine Area Monitoring Plan	Lump Sum	$ 50,000	1	$ 50,000	A requirement of Ecology prior to performing monitoring.
2	Periodic Bathymetric Survey	Per Survey	$ 15,000	8	$ 120,000	Includes performing periodic surveys within areas with dynamic sand cap to evaluate distribution of cap over time. It is assumed that surveys will be completed in years 1, 3, 5, 10, 15, 20, 25, 30 following the completion of cleanup action construction. It is assumed that post-construction bathymetric survey completed as part of the construction will be used as baseline survey.
3	Baseline Surface Sediment Sample Collection	Per Day	$ 3,230	9	$ 29,070	Includes collection of samples from existing sediment surface in areas with natural recovery (MNR and ENR) and dynamic sand cap remedies to establish baseline for periodic sampling. Samples will be collected prior to the placement of natural recovery or capping materials. Assumes 2 samples will be collected per acre and up to 10 samples can be collected in a day.
4	Periodic Surface Sediment Sample Collection[4]	Per Event	$ 29,070	8	$ 232,560	Includes periodic collection of surface sediment samples from areas with natural recovery (MNR and ENR) and dynamic sand cap remedies to meet the compliance monitoring requirements of MTCA and SMS. For MNR and ENR remedies, surface sediment samples will be collected to evaluate the attenuation of contaminant concentrations over a period of time. For dynamic sand cap remedies, surface sediment samples will be collected to evaluate continued compliance with cleanup standards. The assumptions for the number of samples to be collected and number of days required to complete a sampling event is same as Item No. 3 (Baseline Surface Sediment Sample Collection). Periodic sampling events will be completed in years 1, 3, 5, 10, 15, 20, 25, 30 following the completion of cleanup action construction.
5	Baseline Surface Sediment Sample Analysis	Per Sample	$ 5,000	88	$ 440,000	Includes analysis of Site contaminants of concern (COCs) on a standard turn-around time for samples collected during baseline sampling event.
6	Periodic Surface Sediment Sample Analysis[5]	Per Event	$ 440,000	8	$ 3,520,000	Includes analysis of Site contaminants of concern (COCs) on a standard turn-around time for samples collected during periodic sampling event. Includes same assumptions as Item No. 5 (Baseline Surface Sediment Sample Analysis) for a sampling event. Periodic sampling events will be completed in years 1, 3, 5, 10, 15, 20, 25, 30 following the completion of cleanup action construction.
7	Monitoring of the CDF	Per Event	$ 25,000	10	$ 250,000	Includes cost to perform site visit, inspect conditions and evaluate structural integrity of the CDF. For the purposes of the FS, yearly monitoring events are assumed to be performed for a period of 10 years.
8	Reporting	Per Event	$ 20,000	9	$ 180,000	Includes preparation of a monitoring report to document results of baseline and each periodic event.
				Monitoring Subtotal	**$ 4,821,630**	A sum of individual Monitoring items.
				Contingency	$ 1,446,489.0	A percentage (30%) of Monitoring Subtotal.
				Monitoring Total	**$ 6,268,119**	A sum of Monitoring Subtotal and Contingency.
TOTAL						
				Construction, Professional/Technical Services and Monitoring Total	**$ 209,771,022**	A sum of Construction, Professional/Technical Services and Monitoring Totals.

Notes:

[1] Refer to Table B-2 for the basis for unit cost.

[2] Refer to Marine Area RI/FS for quantity estimate details.

[3] The cost estimate is presented in 2022 dollars and is an opinion of construction cost made by Port's consultant. In providing opinions of construction cost, it is recognized that neither the Port nor Port's consultant has control over the costs of labor, equipment, materials or over contractors' methods of determining prices and bids. This opinion of construction cost is based on the Port consultant's reasonable professional judgment and experience. This estimate does not constitute a warranty, expressed or implied, that contractors' bids or negotiated prices of work will correspond with Port's budget or the opinion of construction cost prepared by Port's consultant. The accuracy of FS-level cost estimate is assumed to be -30% to +50% as per EPA's FS cost estimate guidance (EPA 2000).

[4] The per event cost for Item 4 - Periodic Surface Sediment Sample Collection is assumed to be the total cost of Item 3 - Baseline Surface Sediment Sample Collection for each alternative.

[5] The per event cost for Item 6 - Periodic Surface Sediment Sample Analysis is assumed to be the total cost of Item 5 - Baseline Surface Sediment Sample Analysis for each alternative.

MTCA = Model Toxics Control Act

CDF = Confined Disposal Facility

Ro-Ro = roll-on/roll-off

SMS = Sediment Management Standards

MNR = Monitored Natural Recovery

ENR = Enhanced Natural Recovery

Table B-2

Basis for Unit Cost Used in the Development of Cost Estimates

Weyerhaeuser Mill A Former

Everett, Washington

Item	Item Description	Unit	Unit Cost	Basis for Unit Cost
CONSTRUCTION				
1	Mobilization/Demobilization	Percent	5%	Based on experience on other similar projects.
2	Removal, Upland Offload and Temporary Stockpiling of Existing Armor	Cubic Yard	$ 44	Unit cost to remove is assumed to be same as unit cost to dredge in Item No. 6 (Dredging of Contaminated Material), unit cost to offload is assumed to be same as unit cost offload in Item No. 9 (Upland Offload and Management of Dredged Contaminated Material) and unit cost to stockpile is assumed to be $5/cubic yard.
3	Procurement and Installation of South Terminal Toe Wall	Lump Sum	$ 5,700,000	Refer to Marine Area RI/FS for cost details.
4	Removal of Existing Ro-Ro Berthing Pier, Installation of CDF Wall, and Surface Confinement of CDF	Lump Sum	$ 66,300,000	Refer to Marine Area RI/FS for cost details.
5	Ground Improvements for CDF Wall	Lump Sum	$ 22,000,000	Refer to Marine Area RI/FS for cost details.
6	Dredging of Contaminated Material	Cubic Yard	$ 24	Based on selected contractor bid price for 2016 Mill A Pacific Terminal Interim Action adjusted to 2022 dollars[1].
7	Post-Dredge Surface Sediment Sample Collection	Per Day	$ 3,230	Based on a quote received from a vendor (Gravity Consulting, LLC) in 2021 and is inclusive of 12 hours of boat captain, 12 hours of deckhand/scientist, and cost of vessel, power grab sampler, and RTK GPS navigation system. It is assumed that the cost for Port's representative are included in the Construction Management item. Unit cost is adjusted to 2022 dollars[1].
8	Post-Dredge Surface Sediment Sample Analysis	Per Sample	$ 5,000	Based on an estimate provided by a vendor (Analytical Resources, LLC of Tukwila, Washington).
9	Upland Offload and Management of Dredged Contaminated Material	Cubic Yard	$ 15	Based on selected contractor bid price for 2016 Mill A Pacific Terminal Interim Action adjusted to 2022 dollars[1].
10	Transportation and Disposal of Dredged Contaminated Material at an Upland Landfill	Ton	$ 72	Based on a quote received from Republic Services in 2022.
11	Disposal and Management of Dredged Contaminated Material inside CDF	Cubic Yard	$ 20	Unit cost to dispose dredge material from barges directly into CDF is assumed to be same as the unit cost to offload in Item No. 9 (Upland Offload and Management of Dredged Contaminated Material) plus an additional unit cost of $5/cubic yard is included to manage sediment inside CDF.
12	Replacement/Reuse of Existing Armor	Cubic Yard	$ 44	Unit cost is assumed to same as the unit cost for Item No. 2 (Removal, Upland Offload and Temporary Stockpiling of Existing Armor).
13	Import and Place Sand for Enhanced Natural Recovery (ENR)	Ton	$ 53	Based on average bid price dated 2009 for a similar project (Scott Paper Mill Site in Anacortes, Washington). Unit cost is adjusted to 2022 dollars[1].
14	Import and Place Sand Cap	Ton	$ 53	Unit cost to is assumed to be the same as the unit cost for Item No. 13 (Import and Place Sand for Enhanced Natural Recovery [ENR]).
15	Progress Bathymetric Surveys	Per Survey	$ 10,500	Based on an estimate provided by a vendor (Tetra Tech) to complete the survey and prepare a working survey deliverables (no surveyor stamp).
16	Post-Construction Bathymetric Survey	Per Survey	$ 15,000	Based on an estimate provided by a vendor (Tetra Tech) to complete the survey and prepare a final stamped survey deliverables.
17	Warning Signage	Lump Sum	$ 10,000	Assumes $10,000 to install 10 warning signs.
PROFESSIONAL/TECHNICAL SERVICES				
1	Remedial Design	Percent	6%	Based on recommendations provided in Environmental Protection Agency's (EPA's) guide on feasibility study cost estimate - A Guide to Developing and Documenting Cost Estimates During the Feasibility Study dated July 2000.
2	Construction Management	Percent	6%	Based on recommendations provided in Environmental Protection Agency's (EPA's) guide on feasibility study cost estimate - A Guide to Developing and Documenting Cost Estimates During the Feasibility Study dated July 2000.
3	Project Management	Percent	5%	Based on recommendations provided in Environmental Protection Agency's (EPA's) guide on feasibility study cost estimate - A Guide to Developing and Documenting Cost Estimates During the Feasibility Study dated July 2000.
4	Institutional Controls	Lump Sum	20,000	Based on experience on other similar projects.

Item	Item Description	Unit	Unit Cost	Basis for Unit Cost
MONITORING				
1	Marine Area Monitoring Plan	Lump Sum	$ 50,000	Based on experience on other similar projects.
2	Periodic Bathymetric Survey	Per Survey	$ 15,000	Unit cost to is assumed to be the same as the unit cost for Item No. 16 (Post-Construction Bathymetric Survey).
3	Baseline Surface Sediment Sample Collection	Per Day	$ 3,230	Unit cost to complete sample collection is assumed to be the same as the unit cost for Item No. 7 (Post-Dredge Surface Sediment Sample Collection).
4	Periodic Surface Sediment Sample Collection	Per Event	Varies	Per event cost to complete periodic sediment sample collection is assumed to be same as the total cost to complete the baseline surface sediment sample collection event. See Table B-1 for the unit cost.
5	Baseline Surface Sediment Sample Analysis	Per Sample	$ 5,000	Unit cost to complete sample analysis is assumed to be the same as the unit cost for Item No. 8 (Post-Dredge Surface Sediment Sample Analysis).
6	Periodic Surface Sediment Sample Analysis	Per Event	Varies	Per event cost to complete periodic sediment sample analysis is assumed to be same as the total cost to complete the baseline surface sediment sample analysis event. See Table B-1 for the unit cost.
7	Monitoring of the CDF	Per Event	$ 25,000	A rough order of magnitude estimate to perform site visit, inspect conditions and evaluate structural integrity of the CDF.
8	Reporting	Per Event	$ 20,000	Based on experience on other similar projects.

Notes:

[1] Unit cost is adjusted to 2022 dollars using the following formula: FV = PV (1+r)n, where FV = 2022 Unit Cost, PV = Past Unit Cost, r = annual inflation rate, n = number of periods inflation held. Annual inflation rate is assumed to be 3 percent.

MTCA = Model Toxics Control Act

CDF = Confined Disposal Facility

Ro-Ro = roll-on/roll-off

SMS = Sediment Management Standards

MNR = Monitored Natural Recovery

ENR = Enhanced Natural Recovery