DEPARTMENT OF
ECOLOGY
State of Washington

FINAL PHASE III - SUBTIDAL REMEDIAL ACTION:

DRAFT CLEANUP ACTION PLAN AND ENGINEERING DESIGN REPORT

Custom Plywood Mill Site
Anacortes, Washington

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Washington State Department of Ecology

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ACRONYMS AND ABBREVIATIONS

ARAR	applicable or relevant and appropriate requirement
BMP	best management practices
CAP	Cleanup Action Plan
CAP/EDR	Cleanup Action Plan/Engineering Design Report
CCR	Construction Completion Report
CHE	Coast & Harbor Engineering
COC	constituent of concern
COPC	constituent of potential concern
cPAHs	carcinogenic polycyclic aromatic hydrocarbons
CSL	cleanup screening level
CSM	conceptual site model
CY	cubic yards
DAHP	Washington State Department of Archaeology and Historic Preservation
DCA	disproportionate cost analysis
Ecology	Washington State Department of Ecology
EDR	Engineering Design Report
ENR	enhanced natural recovery
EPA	United States Environmental Protection Agency
FS	feasibility study
GBH	GBH Investments, LLC
HASP	health and safety plan
IAWP	Interim Action Work Plan
JARPA	Joint Aquatic Resources Permit Application
MTCA	Model Toxics Control Act
OMMP	Operation, Maintenance and Monitoring Plan
Phase III	Final Phase III – Subtidal Remedial Action
PLP	potentially liable party
POC	point of compliance
ppt	parts per trillion
PQL	practical quantitation limit
PSD	passive sampling device
QA	quality assurance
RCW	Revised Code of Washington
RI	remedial investigation
SCO	sediment cleanup objective
SEPA	State Environmental Policy Act
SMA	sediment management area
SMS	sediment management standards
SF	square feet
SM	square meter
Site	Custom Plywood Site
TCP	Toxics Cleanup Program
TEC	toxic equivalent concentration
TLC	thin layer cap
USACE	United States Army Corps of Engineers
WAC	Washington Administrative Code

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Cleanup Action Plan/Engineering Design Report

Custom Plywood Site
Anacortes, Washington

EXECUTIVE SUMMARY

This Cleanup Action Plan (CAP) and Engineering Design Report (CAP/EDR) has been prepared for the remediation of subtidal portions of the Custom Plywood Site (Site) (Figure 1-1), located in Anacortes, Washington, referred to in this report as the Final Phase III – Subtidal Remedial Action (Phase III). The cleanup is being completed under the direction of the Washington State Department of Ecology (Ecology) Toxics Cleanup Program (TCP). GBH Investments, LLC (GBH), is the current property owner and Potentially Liable Party (PLP) under provisions of the Washington State Model Toxics Control Act (MTCA) – Chapter 173-340 of the Washington Administrative Code [WAC]). This document was initially drafted by Hart Crowser, Inc., as a collaborative effort by Ecology and GBH.

The Custom Plywood Site (Site) is one of several Anacortes area bay-wide priority sites for Fidalgo/Padilla Bays being addressed by the TCP under the Puget Sound Initiative. The Site had lumber and plywood milling operations beginning in about 1900. Milling activities produced wood waste and chemical contaminants affecting Site soil, groundwater, and sediment, as described in more detail in later sections.

To date, two interim remedial actions have been completed at the Site. Phase I (completed in summer 2011) consisted of upland remediation. Phase II (completed in Fall 2013) consisted of intertidal and limited subtidal removal actions, and shoreline restoration. A CAP, EDR, and Construction Completion Report (CCR) was prepared for each of the previous interim actions and will be referred to throughout this document.

This CAP/EDR describes the planned Phase III remedial action at the Site, which generally consists of the placement of a thin layer cap (TLC) over approximately 10 acres of subtidal sediments and dredging/backfill over 0.46 acres of sediment containing greater than 25 parts per trillion (ppt) of dioxins within eelgrass beds.

Summary of Phase I and II Cleanup Activities

Since 1993, previous property owners, the City of Anacortes, Ecology, and the United States Environmental Protection Agency (EPA) have conducted a series of environmental characterization and sampling and analysis investigations near the Site. These investigations were conducted to define the extent of contamination and evaluate the condition of the soil, groundwater, and offshore sediment. Each successive investigation targeted data gaps identified in the previous investigations.

Interim remedial actions were conducted under WAC 173-340-515 (Independent Remedial Actions) on the upland portion of the Site beginning in 1998. In 1998, Woodward-Clyde removed soil impacted by hydraulic oil within the City of Anacortes right-of-way immediately northwest of the GBH property (Woodward-Clyde 1998). Ecology issued a No-Further-Action determination for this specific location following three years of groundwater monitoring. The area in question is not within the project area covered by this CAP/EDR.

Investigations between 1995 and 2003 culminated in the development of an Interim Remedial Action Plan for soil removal within the upland excavation areas 2 through 5, as noted in Figure 5 of the Upland Interim Remedial Action Plan (Geomatrix 2007). The Interim Remedial Action Plan was implemented by Concord, LLC, without Ecology's oversight. It began with excavation and off-site disposal of soil in the northern tracts (Tracts 5 and 6), followed by planned excavation and disposal of the soil in the southern tracts (Tracts 7 and 8) a year later. The first phase of the interim action work on the northern tracts was conducted in July 2007 to remove a limited amount of impacted soil from four areas where petroleum hydrocarbons and other constituents exceeded MTCA Method A cleanup levels. A more complete description of the northern interim cleanup action is provided in the RI. After the interim action in 2007, Ecology required the subsequent work to be conducted within the Puget Sound Initiative program under an Agreed Order to be consistent with the approach at other Puget Sound Initiative-led sites in Fidalgo Bay.

Phase I cleanup activities were completed in the summer and fall 2011. The Phase I cleanup work involved demolishing/disposing of remaining concrete structures in the uplands, removing wooden piles, removing surface debris and contaminated soil and wood waste, backfilling with clean fill material, and constructing a wetland mitigation area with a vegetated buffer zone and a stormwater swale (Figure 1-2). Refer to the Phase I CAP (Hart Crowser 2011c), Phase I EDR (Hart Crowser 2011d), and Phase I CCR (Hart Crowser 2012c) for details on the work planning documentation and completed construction during Phase I implementation.

The in-water contamination and proposed remedy are described in the remedial investigation (RI) and feasibility study (FS), respectively. As described in the FS, the in-water remedy consists of a single, multifaceted cleanup. However, given the nature (i.e., co-located with vital eelgrass habitat) and the extents of the contamination, it was necessary to split the in-water work into two phases. The initial phase of the work, Phase II, was completed in the late fall 2013. The overall scope of work completed for the Phase II remedial action is summarized in Section 2.

Refer to the Phase II CAP/EDR (Hart Crowser 2013b) and the Phase II CCR (Hart Crowser 2014) for details on the work planning documentation and completed construction during Phase II implementation.

Thin Layer Capping Pilot Study

As recommended in the FS, a TLC pilot study was designed to investigate various capping scenarios and approaches to determine the feasibility of implementing a TLC to remediate sediment contaminants while preserving ecological function and biological productivity of eelgrass habitat at the

Site. With a focus on eelgrass habitat function, the pilot study investigated the tolerance of eelgrass beds to the placement of a sediment cap with varying thickness and composition. The pilot study used low-impact techniques to disperse sand over the seabed and gradually build up the cap over time. In some areas, a thin layer of activated carbon pellets was dispersed prior to the application of the sand cap to determine whether additional activated carbon provides enhanced adsorption of dioxin. After cap installation, eelgrass habitat metrics and dioxin concentrations were tracked over time to help inform the larger cleanup design. Field application of the pilot study took place during the summer/fall of 2013 with monitoring, analysis and final conclusions reported in the Thin Layer Cap Pilot Study Report (Hart Crowser 2016a and 2019). In general, the conclusions are as follows:

- Application of 4 inches of sand had little, if any, effect on eelgrass areal aboveground biomass; 8-inch treatments showed significant reduction in eelgrass biomass. This pilot study only illustrates small scale results, because the test plots receiving sand treatments totaled approximately 770 square feet (sf).

- The use of activated carbon as an enhancement showed no additional effectiveness when compared to sand-only applications. At Custom Plywood, it appears that the dioxins are more strongly bound to the organic carbon present in the sediment (potentially wood waste) than to the activated carbon added and presumably not biologically available. As the wood waste degrades over time the dioxins may become biologically available.

Final Phase III – Subtidal Remedial Action

The FS establishes dioxins as the primary aquatic constituents of potential concern (COPC) and wood waste as a secondary COPC. Screening level values and conditions, based on dioxin concentration and the presence of wood waste, were established to evaluate remedial technologies and alternatives. Two action levels were established: (1) areas with wood waste accumulation greater than 1 foot below the mudline and/or areas with dioxin concentrations greater than 25 ppt toxic equivalent concentration (TEC), and; (2) areas with conspicuous surficial wood waste and/or dioxin concentrations greater than 10 ppt TEC.

Phase II essentially addressed aquatic portions of the site that meet the higher concentration screening level criteria by removing intertidal and subtidal sediment with dioxin concentrations greater than 25 ppt TEC and/or wood waste accumulations greater than 1 foot thick. However, Phase II did not address areas of the Site where eelgrass is present. Eelgrass is widely recognized as providing habitat features with significant ecological importance. There are several federal and state regulations protecting seagrass habitat. In Washington State, eelgrass is considered to be a saltwater habitat of special concern and is protected under Saltwater Habitats of Special Concern [WAC 220-110-250 (3)(a, b)]. Traditional methods of dredging and/or placement of thick-layer capping material to address the remaining portions of the site are not feasible in this habitat type. The FS identifies using a TLC to address the remaining aquatic area(s). However, thin-layer capping of eelgrass has not been attempted in Puget Sound, so the design (i.e., cap thickness, application techniques, and potential admixtures for adsorption agents) have not been established.

The Phase III cleanup area is generally defined as the remaining un-remediated aquatic portion of the Site with near-surface sediment dioxin concentrations in excess of 10 ppt. The Phase III area consists of approximately 10.5 acres of aquatic sediments; 4.7 acres of those sediments support eelgrass.

The planned and final cleanup activities for the remainder of the Site will be completed over two or three consecutive construction seasons as follows:

<u>The first construction season</u> (2019/2020) includes:

- **Mobilization** – Prior to beginning work, temporary construction facilities and upland staging areas will be established, in-water water quality best management practices (BMPs) will be implemented, temporary haul roads will be established, and other preparatory activities will occur.

- **Eelgrass Mitigation** - Approximately 0.38 acres of the 0.46-acre dredge footprint supports eelgrass (*Zostera marina*). Prior to dredging, eelgrass within this footprint will be transplanted to the existing 2014 eelgrass mitigation area located within the central portion of the Site. An Eelgrass Mitigation and Monitoring Plan will be developed to support this effort. Divers will be on Site to evaluate eelgrass placement techniques, provide feedback, and necessary field support.

- **Dredging and Backfill (subtidal)** - Dredging of up to 2 feet of sediment covering an area of approximately 0.46 acres will occur. Approximately 1,500 cubic yards (cy) of contaminated sediment will be dredged. All work will occur using barge-based construction equipment. Sediment will be loaded into trucks for off-site disposal or drained prior to disposal using containment cells or other approaches to be further evaluated during project design. The dredged area will be backfilled with a clean material to existing grade.

- **Thin-layer Capping (subtidal, non-eelgrass area)** - Approximately 4.0 acres (not containing eelgrass) will be capped with 8 inches of clean sand. Approximately 1.3 acres (transition zone: located adjacent to the eelgrass bed area) will be capped with 4 to 6 inches of clean sand to minimize slumping and redistribution of the capping layer over the eelgrass area.

- **Thin-layer Capping (subtidal, eelgrass area)** - One-half (0.5) acre of eelgrass will be capped with 2 inches (with a maximum of no more than 4 inches) of clean sand. Material placement methods will be evaluated prior to implementation to identify the least impactful method. The cap will be monitored for one year to determine whether TLC placement on a larger scale negatively affects eelgrass health or performs similarly to the pilot study. Divers will be on Site to evaluate thin layer capping placement techniques, provide feedback, and necessary field support.

<u>The second construction season</u> (2020/2021) includes:

- **Thin-layer Capping (subtidal, eelgrass area)** – Based on monitoring results obtained during the first construction season, 2 inches (with a maximum of no more than 4 inches) of clean sand will be placed over the remaining 4.2-acre area of eelgrass using similar, or modified, placement methods depending on from the results of initial placement efforts.

Following the implementation of the Phase III Final Cleanup action, the cleanup effectiveness will be monitored in accordance with the Operation, Maintenance and Monitoring Plan (OMMP) as discussed in later sections.

1.0 INTRODUCTION

This Cleanup Action Plan/Engineering Design Report (CAP/EDR) has been prepared for the remediation of selected subtidal portions (10.5 acres) of the Custom Plywood Site, located in Anacortes, Washington (Figure 1-1), referred to in this report as the Final Phase III – Subtidal Remedial Action (Phase III). The cleanup is being completed under the direction of the Washington State Department of Ecology (Ecology) Toxics Cleanup Program (TCP). GBH Investments, LLC (GBH), is the current property owner and Potentially Liable Party (PLP) under provisions of the Washington State Model Toxics Control Act (MTCA) Chapter 173-340 of the Washington Administrative Code [WAC]).

CAP and EDR documents are typically prepared sequentially and not simultaneously. The CAP/EDR for Phase III is presented as a single combined document to reduce redundancy and to increase efficiency of public-review document preparation and use. This combined CAP/EDR document satisfies the regulatory requirements specified in WAC 173-340-380 and WAC 173-340-400(4)(a) that apply to individual CAPs and EDRs.

The Site is one of several Anacortes area bay-wide priority sites for Fidalgo/Padilla Bays being addressed by the TCP under the Puget Sound Initiative. The Custom Plywood property, which is currently owned by GBH, includes 6.6 acres of upland and 34 acres of intertidal and subtidal areas (Figure 1-2). The Site held lumber and plywood milling operations beginning in about 1900. Milling activities produced wood waste and chemical contaminants affecting Site soil, groundwater, and sediment, as described in more detail in later sections.

This CAP/EDR describes the planned Phase III remedial action at the Site, which generally consists of the placement of a TLC over approximately 10.0 acres of subtidal sediments and 0.46 acres of dredging/backfill work. To date, two interim remedial actions have been completed at the Site. Phase I (completed in summer/fall 2011) consisted of upland. Phase II (completed in fall 2013) consisted of intertidal and subtidal removal actions and shoreline restoration. A CAP, along with an EDR and CCR, was prepared for each of the previous interim actions and will be referred to throughout this document.

1.1 Regulatory Framework

A CAP/EDR, as described in WAC 173-340-380 and 173-340-400(4), uses information gathered and presented in the remedial investigation (RI) and feasibility study (FS) to describe a remedial action. Interim action implementation, as described in WAC 173-340-430, is necessary to reduce a threat to human health or the environment by eliminating or substantially reducing one or more pathways for exposure to a hazardous substance; corrects a problem that may become substantially worse or cost substantially more to address if the remedial action is delayed; or is needed to provide for completion of a site hazard assessment, RI/FS, or design of a cleanup action. As a result, the effectiveness of a final cleanup action must be combined with the effectiveness of previous interim action(s) to achieve the overall goals of the remedy selected in the FS.

GBH completed the RI in response to Ecology Agreed Order DE 5235, dated March 17, 2008. The RI identified the nature and extent of contaminated soil and groundwater in the upland and sediment in the intertidal and subtidal portions of the Site. The RI further identified cleanup screening levels for affected soil, groundwater, and sediment relative to applicable requirements of MTCA, Sediment Management Standards (SMS), and other regulatory criteria.

The FS further developed a conceptual site model (CSM) describing contaminant sources, pathways, and receptors for the upland and in-water portions of the Site. Remedial action objectives, including applicable cleanup levels, were identified for upland and aquatic areas planned for remediation as part of the Interim Action Work Plan (IAWP) documents. In accordance with WAC 173-340-350(8), the FS screened potential remedial technologies and alternatives in accordance with applicable MTCA and SMS cleanup action requirements. Remedial action alternatives were evaluated by assessing their compliance with the requirements for cleanup actions specified in WAC 173-340-360. The FS then identified preferred remedial alternatives for the upland and in-water areas of the Site.

By reference, this CAP/EDR includes the following documents:

- Fidalgo Bay Sediment Investigation, prepared by SAIC for Ecology, March 2008 (SAIC 2008);
- Supplementary Fidalgo Bay and Custom Plywood Mill Sediment Dioxin Study, prepared by SAIC for Ecology, October 2010 (SAIC 2010);
- RI Report for the Interim Action Work Plan prepared by AMEC Geomatrix for GBH, September 2011 (AMEC 2011);
- FS Report for the Interim Action Work Plan prepared by Hart Crowser for Ecology, September 2011 (Hart Crowser 2011b);
- Phase I CAP prepared by Hart Crowser for Ecology, September 2011 (Hart Crowser 2011c);
- Phase I EDR prepared by Hart Crowser for Ecology, September 2011 (Hart Crowser 2011d);
- Phase I CCR prepared by Hart Crowser for Ecology, October 2012 (Hart Crowser 2012c);
- Phase II CAP and EDR prepared by Hart Crowser for Ecology, August 2012 (Hart Crowser 2013b);
- Phase II CCR prepared by Hart Crowser for Ecology, May 2014 (Hart Crowser 2014); and
- Draft Final Thin Layer Cap Pilot Study Report, prepared by Hart Crowser for Ecology, May 2016 (Hart Crowser 2016a and 2019).

1.2 Summary of Final Phase III Cleanup Activities and Related Elements

The FS establishes dioxins as the primary aquatic COPC, with wood waste a secondary COPC. Screening level values and conditions, based on dioxin concentrations and the presence of wood waste, were established to evaluate remedial technologies and alternatives. In general, two action levels were established: (1) areas with wood waste accumulation greater than 1 foot below the mudline and/or areas with dioxin concentrations greater than 25 parts ppt TEC, and; (2) areas with conspicuous surficial wood waste and/or dioxin concentrations greater than 10 ppt TEC.

Phase II addressed aquatic portions of the site that meet the higher concentration screening level criteria by removing intertidal and subtidal sediment with dioxin concentrations greater than 25 ppt TEC and/or wood waste accumulations greater than 1-foot thick. However, Phase II did not address areas of the site where eelgrass is present. Eelgrass is widely recognized as providing habitat features with significant ecological importance. There are several federal and state regulations protecting seagrass habitat; in Washington State, eelgrass is considered to be a saltwater habitat of special concern and is protected under WAC 220-110-250(3)(a & b). Traditional methods of dredging and/or placement of thick-layer capping material to address the remaining portions of the site are not feasible in this habitat type. The FS identifies using a “Thin Layer Cap” (TLC) to address the remaining aquatic area(s). However, thin-layer capping of eelgrass has not been attempted in Puget Sound, so the design (i.e., appropriate thin-layer cap thickness, application techniques, and potential admixtures for adsorption) have not been established.

1.2.1 Thin Layer Cap Pilot Study

In order to investigate this approach, a TLC pilot study was designed to investigate various capping scenarios and approaches to determine the feasibility of implementing a TLC to remediate sediment contaminants while preserving ecological function and biological productivity of eelgrass habitat at the Site. With a focus on eelgrass habitat function, the pilot study investigated the tolerance of eelgrass beds to the placement of a sediment cap with various thickness and composition. The pilot study used low-impact techniques to disperse sand over the seabed and gradually build up the cap over time. In some areas, a thin layer of activated carbon pellets was dispersed prior to the application of the sand cap to determine whether additional activated carbon provides enhanced adsorption of dioxin. After cap installation, eelgrass habitat metrics and dioxin concentrations were tracked over time to help inform the larger-scale cleanup design. Field application of the pilot study took place during the summer of 2013 with monitoring, analysis and final conclusions reported in the Thin Layer Cap Pilot Study Report (Hart Crowser 2016a and 2019).

1.2.2 Final Phase III Cleanup Description and Schedule

The Phase III cleanup area is generally defined as the remaining un-remediated aquatic portion of the site with near-surface sediment dioxin concentrations in excess of 10 ppt. The Phase III area consists of approximately 10.5 acres of aquatic sediments; 4.7 acres of those sediments support eelgrass.

The planned and final cleanup activities for the remainder of the Site will be completed over two (or three) consecutive construction seasons between 2019 and 2021 (tentative). The first construction season (2019/2020) includes dredging/backfill of subtidal sediment as well as placement of sand caps. Dredging of up to 2 feet of sediment covering an area of approximately 0.46 acres will result in approximately 1,500 cy of contaminated sediment being dredged. The dredged area will be backfilled with a clean material to existing grade. Approximately 0.38 acres of the 0.46-acre dredge footprint supports eelgrass (*Zostera marina*). Prior to dredging, eelgrass within this footprint will be transplanted to the existing 2014 eelgrass mitigation area located within the central portion of the

Site. An Eelgrass Mitigation and Monitoring Plan will be developed to support this effort. Divers will be on Site to evaluate eelgrass placement techniques, provide feedback, and necessary field support.

The first construction season will also include placing thin layer sand caps over roughly 6 acres of impacted subtidal sediments. Approximately 4.0 acres (not located within eelgrass) will be capped with 8 inches of clean sand. Approximately 1.3 acres (transition zones located adjacent to eelgrass beds) will be capped with 4 to 6 inches of clean sand to minimize slumping and redistribution of the capping layer over the eelgrass area. One-half (0.5) acre of eelgrass will be capped with 2 inches (with a maximum of no more than 4 inches) of clean sand. Material placement methods will be evaluated prior to implementation to identify the least impactful method. The one-half (0.5) acre cap will be monitored for one year to confirm that TLC placement on a larger scale does not negatively affect eelgrass health and performs similarly to the pilot study. The second construction season (2020/2021) includes another TLC placement over a dioxin-impacted subtidal eelgrass area. Based on monitoring results during the first construction season, 2 inches (with a maximum of no more than 4 inches) of clean sand will be placed over the remaining 4.7-acre area of eelgrass using similar, or modified, placement methods depending on feedback from initial placement efforts. Following the implementation of the Phase III Final Cleanup action, the cleanup effectiveness in accordance with the Operation, Maintenance and Monitoring Plan (OMMP) will be monitored as discussed in later sections.

1.3 Final Phase III CAP/EDR Approach and Organization

Elements of this CAP/EDR address requirements of WAC 173-340-380 and 173-340-400, including:

- A description of the planned Final Phase III remedial action;
- Rationale for selecting the preferred alternative;
- A summary of other remedial action alternatives evaluated;
- Cleanup standards for hazardous substances and media of concern;
- Institutional controls;
- Applicable state and federal laws;
- Preliminary determination of compliance with MTCA remedy selection criteria;
- Types, levels, and amounts of hazardous substances remaining on site, and measures to prevent migration and contact;
- Definition of the goals of the planned remedial action;
- Design Criteria and assumption for the planned Final Phase III remedial action for development and review of construction plans and specifications; Permitting Process and Construction documents; Expected Cleanup Benefits/impacts and mitigation measures;
- Schedule for the implementation of Phase III; and
- Description of compliance monitoring that will be performed during and after the planned remedial action.

Specific discussion points pertinent to these MTCA criteria are presented in the following sections:

Section 2.0 Summary of Site Conditions

This section summarizes the historical uses of the Site and its current land use. An overview of the results of the RI and other recent investigation work is tabulated in the FS and this CAP/EDR, and prior cleanup actions (by others as well as the completed interim actions) at the Site are summarized. This information is used to develop a CSM for the Site.

Section 3.0 Cleanup Requirements

Remedial action objectives and cleanup standards for Phase III are identified in Section 3.0.

Section 4.0 Remedial Action Alternatives Considered and Basis for Aquatic Remedy Selection

The technology screening process used in the FS to identify candidate remedial technologies for the subtidal areas of the Site, and the assembly of these technologies into remedial alternatives is summarized in Section 4.0. The process used to assess the relative compliance of each alternative with MTCA criteria is also summarized in Section 4.0.

In addition, a description of the completed remedial actions and their impacts on the selected remedy from the FS will be presented in this section.

Section 5.0 Selected Phase III Subtidal Remedial Action

The final cleanup action is detailed in Section 5.0. This includes the thin layer capping of remaining sediments that exceed the cleanup criteria for dioxins.

Section 5.0 also contains information on:

- Planned monitoring during and after implementation of the remedial action;
- Contingency actions that will be implemented if the remedial action objectives for the Site are not achieved;
- Potential future land uses of the Site; and
- Anticipated restrictive covenants to protect human health and the environment once the remedial action has been implemented.

A preliminary implementation schedule is presented in Section 5.0.

Section 6.0 Basis of Final Phase III Design

Section 6.0 describes the design basis for the final Phase III remedial action including critical assumptions, construction sequences along with follow-monitoring schemes, other design considerations, and construction drawings. This section provides a description of how TLC capping can be implemented, and dredged material will be handled, characterized, and disposed.

Section 7.0 Permitting Process and Construction Documents

Section 7.0 summarizes the following efforts to implement the sediment cleanup construction activities including the permitting and construction process.

Section 8.0 Expected Cleanup Benefits/Impact and Mitigation Measures

Section 8.0 describes likely impacts to marine habitat as a result of implementation of the Phase III remedial action and proposed mitigation to address those project impacts. It also describes the expected cleanup benefit to human health risk.

Section 9.0 Compliance Monitoring Plan

Section 9.0 presents planned compliance monitoring activities to be performed during Phase III to confirm that human health and the environment are adequately protected and, following completion of the Phase III action, to confirm that cleanup requirements were satisfied.

Section 10.0 General Approach for the Operation, Maintenance, and Monitoring Plan (OMMP) and Future Sea Level Rise

Section 10.0 introduces the OMMP elements that will be performed following completion of Phase III.

Section 11.0 Ecology Periodic Reviews and Institutional Controls

Phase III as described in this CAP/EDR may leave hazardous or deleterious substances behind at concentrations above cleanup levels and may require restrictive covenants as part of the remedy. Therefore, a periodic review of the implemented remedy will be required. The components of this review are outlined in Section 9.0.

Section 12.0 References

Section 12.0 includes references cited in this CAP/EDR.

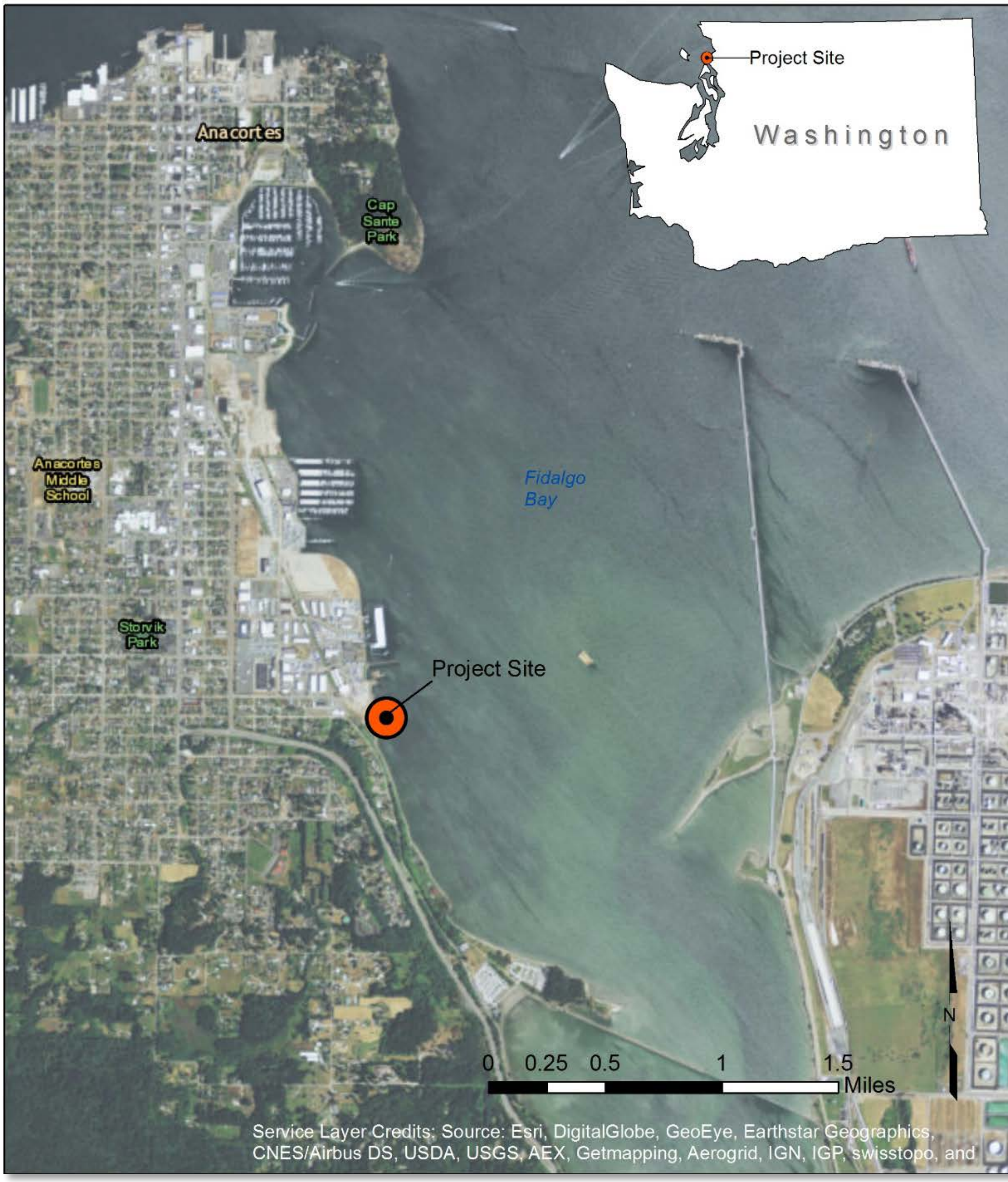


Figure 1-1 Vicinity Map

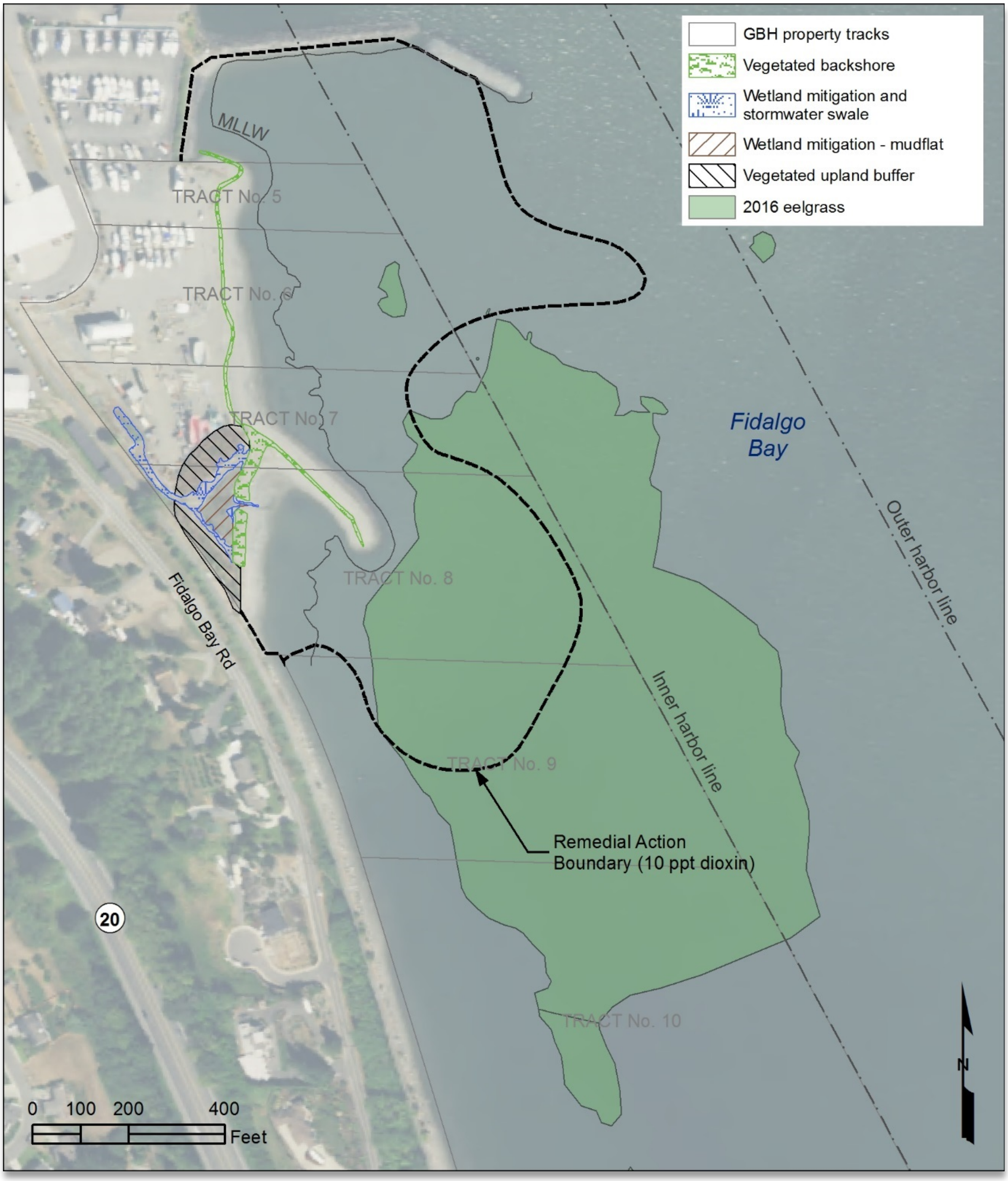


Figure 1-2 Site Map

2.0 SUMMARY OF SITE CONDITIONS

For purposes of this CAP/EDR, the Site is defined by the extent of contamination on or near the Custom Plywood Mill facility. The Site includes the footprint of the former plywood mill at its maximum extent during operation, including upland and offshore property currently owned by GBH, and property owned by other parties. The Site encompasses offshore areas extending to the Inner Harbor Line including GBH-owned aquatic parcels and state-owned aquatic lands located farther offshore and affected by dioxin contamination above the Fidalgo Bay background concentration (Figure 1-2). Ecology determined that the aquatic portion of the Site boundary extends well into Fidalgo Bay following the 2010 sediment quality sampling and testing conducted by SAIC (2010).

The Custom Plywood property is defined as the tracts of land (Tract Nos. 5 through 10) currently owned by GBH, including uplands and tidelands seaward to the inner harbor line (Figure 1-2). The property includes irregularly shaped parcels that cover approximately 6.6 acres of upland and 34 acres of intertidal and subtidal land.

Sections 2.1 and 2.2 summarize the historical and current uses of the Site, respectively. Section 2.2 describes the nearshore, intertidal, and subtidal areas for completeness and to provide context. The investigatory work presented in the RI, in addition to more recent investigations, is summarized in Section 2.3. Limited cleanup actions have been conducted by others at the Site since 1998. These prior cleanup actions are summarized in Section 2.4 for background context and the interim actions. This prior investigatory and cleanup work was used to create a CSM of the Site as presented in the FS.

Since finalizing the FS, Ecology has led the completion of two interim actions (Phase I for upland area and Phase II for intertidal area) at the Site. These two interim actions, as described in Sections 2.4.1 and 2.4.2, respectively, took place after generation of the FS and CSM and are considered integral parts of the final remedy. Section 2.5 presents the current CSM.

2.1 Site History

As summarized in the RI, the property was originally developed as a saw and planing mill around 1900 until it burned down sometime between 1925 and 1937. Through the years, the property changed hands several times, and was rebuilt and added onto until Custom Plywood became the operating entity sometime before 1991. The facility was used as a sawmill and plywood manufacturing plant until most of the wooden structures in the main plant area, many of which were built in the 1940s, were consumed again by fire on November 28, 1992.

Except for the parcels on the periphery that have been sold and redeveloped, the main part of the former mill property has been used sporadically since 1992. In December 2007, the main part of the former mill property was sold to GBH. For further discussion of the history of Site operation and ownership and the history and characteristics of surrounding properties, refer to the RI.

2.2 Current Land and Marine Water Use

The Site has been divided into upland, wetland, intertidal, and subtidal areas, as described in detail in the following sections.

2.2.1 Upland Area

The Phase I interim remedial action was completed in the upland area of the Site in the summer of 2011 (see Section 2.4.1). Before cleanup, the upland was characterized as heavily disturbed and containing abandoned foundations and structures, concrete and wood debris, native and non-native vegetation, and poorly-functioning wetlands.

As part of the upland interim action, approximately 25,000 cy of contaminated material was removed from the Site and disposed of off-site. A wetland mitigation area and vegetated buffer zone were constructed in the southern portion of the Site, and a stormwater conveyance and treatment swale were constructed along the western boundary of the Site (Figure 1-2). The swale receives stormwater from a City of Anacortes outfall that discharges onto the Site and conveys the water into the wetland mitigation area. The remainder of the Site has been graded and hydroseeded or is being used as part of the current owner's operations.

2.2.2 Wetlands

Five poorly-functioning wetland areas, identified as Wetlands A through E, were removed to allow for implementation of the Phase I and II interim actions. An approximately 12,000-square-foot estuarine wetland mitigation area was constructed on the southern portion of the Site as part of the Phase I upland interim action to replace/mitigate the wetland areas removed during Phase I cleanup.

2.2.3 Nearshore and Intertidal Area

Before the Phase II Interim Action, the shoreline of the Site contained industrial debris and significant quantities of naturally occurring woody debris. Woody debris ranged in size from sawdust to large mill end remnants and logs. Active erosion was occurring along the northeast and central portion of the property where storms and long-period waves locally destabilized the shoreline. The southernmost tip of the property was armored with riprap, which still extends to the south.

The intertidal zone had many piles, considerable quantities of wood waste embedded in the substrate, and structural concrete debris from previous buildings on the property. A derelict L-shaped concrete pier (a prominent feature noted in historical aerial photographs) supported by piles was immediately adjacent to the intertidal zone.

Generally, Phase II implementation removed all in-water structures and debris, excavated and/or dredged wood waste and sediment not co-located with eelgrass and constructed shoreline protection and habitat enhancement features. Refer to the Phase II CAP/EDR and CCR (Hart Crowser 2013 and 2014) for details.

2.2.4 Subtidal Area

The immediate subtidal portion of the Site is a gentle-slope mudflat that contained a large amount of wood debris and sawdust and was partially covered by overwater structures.

Deeper in the subtidal zone, extensive eelgrass beds have been documented on and adjacent to the Custom Plywood property. These beds are contiguous with the larger Fidalgo Bay eelgrass population. The eelgrass beds appeared in good condition where present but seem limited in coverage due to previous site use in shallow subtidal areas. The shoreward extent of eelgrass coverage was historically limited by the occurrence of wood waste, debris, and high-organic-content sediments within the project footprint. The Phase II interim action removed all concrete structures, dioxin-containing sediment greater than 25 ppt, and wood waste, not co-located with eelgrass. Additional remedial actions will be performed within the subtidal area as discussed in later sections of this CAP/EDR.

2.3 Summary of Environmental Conditions and Previous Investigations

A brief summary of environmental characterization and sampling and analysis investigations at the Site is presented in Table 2-1 of the Phase II CAP/EDR. Further discussion of the individual investigations and findings between 1993 and 2010 are presented in the RI. Investigations conducted in 2010 are summarized in the FS, and more recent investigations are discussed below.

Former plywood milling operations produced large amounts of wood waste that were placed on upland and aquatic portions of the Site over many years. Fill soil consists of a heterogeneous mixture of silt, sand, and gravel with abundant near-surface debris and intermixed wood waste over native clay deposits. Upland fill materials were more than 15 feet thick in some areas and include the general “upper” and “lower” fill units identified in the RI. Concrete, brick, and other debris were the distinguishing components of the upper unit, while wood waste was more prevalent in the lower unit.

Sediment containing wood waste, prior to interim action implementation, was an ongoing source of contamination in the aquatic environment at the Site. Wood waste accumulation in nearshore areas and near former overwater structures exceeded 6 feet in places. In sufficient quantities, wood waste can represent an environmental pollutant and deleterious substance per SMS criteria (WAC 173-240-200(17)). As part of the sediment profile, wood waste in the biologically active zone can adversely affect benthic habitat by potentially generating sulfide, ammonia, phenols, and related degradation products harmful to marine biota. The seaward extent and magnitude of wood waste in quantities sufficient to promote adverse impacts was further addressed in the May 2011 supplemental sediment field investigation report (see Hart Crowser 2011a Section 2.4 and FS Appendix E). More recently, in January 2012, an investigation was conducted to fill additional data gaps in the aquatic area at the Site (Hart Crowser 2013a).

Dioxins are the primary COPC in the aquatic environment. Near-surface sediment throughout the aquatic portion of the Site is further impacted by dioxin concentrations exceeding Fidalgo Bay background levels. Deeper portions of the sediment profile were also affected as shown in the May

2011 and January 2012 supplemental field investigations. Elevated dioxin concentrations were encountered in deeper sediment associated with relatively thick nearshore accumulations of wood waste. As the thickness and general quantity of wood waste decreases seaward, dioxin is more likely restricted to surface sediment because of secondary redistribution following in-water fill placement or erosion of nearshore deposits.

2.4 Summary of Prior Cleanup Actions: Phase I & Phase II

Since 1993, previous property owners, the City of Anacortes, Ecology, and the United States EPA have conducted a series of environmental characterization and sampling and analysis investigations near the Site. These investigations were conducted to define the extent of contamination and evaluate the condition of the soil, groundwater, and offshore sediment. Each successive investigation targeted data gaps identified in the previous investigations.

Interim remedial actions were conducted under WAC 173-340-515 (Independent Remedial Actions) on the upland portion of the Site beginning in 1998. In 1998, Woodward-Clyde removed a limited amount of soil impacted by hydraulic oil within the City of Anacortes right-of-way immediately northwest of the GBH property (Woodward-Clyde 1998). Ecology issued a No Further Action determination for this location following three years of groundwater monitoring. The area in question is not located within the project area covered by this upland CAP.

Investigations between 1995 and 2003 culminated in the development of an Interim Remedial Action Plan for soil removal within the upland excavation areas 2 through 5. The Interim Remedial Action Plan was implemented by Concord, LLC, without Ecology's oversight. It began with excavation and off-site disposal of soil in the northern tracts (Tracts 5 and 6), followed by planned excavation and disposal of the soil in the southern tracts (Tracts 7 and 8) a year later. The first phase of the interim action work on the northern tracts was conducted in July 2007 to remove a limited amount of impacted soil from four areas where petroleum hydrocarbons and other constituents exceeded MTCA Method A cleanup levels. A more complete description of the northern interim cleanup action is provided in the RI. After the interim action in 2007, Ecology required the subsequent work to be conducted within the Puget Sound Initiative program under an Agreed Order to be consistent with the approach at other Puget Sound Initiative-led sites in Fidalgo Bay.

2.4.1 Phase I Interim Upland Remedial Action

Phase I cleanup activities were completed in the summer of 2011. The Phase I cleanup work involved demolishing remaining concrete structures in the uplands, removing wooden piles, excavating surface debris and contaminated soil and wood waste, backfilling with clean fill material, and constructing a wetland mitigation area with a vegetated buffer zone and a stormwater swale (Figure 1-2). Refer to the Phase I CAP (Hart Crowser 2011c), Phase I EDR (Hart Crowser 2011d), and Phase I CCR (Hart Crowser 2012c) for details on the work planning documentation and completed construction during Phase I implementation.

2.4.2 Phase II Interim Intertidal and Selected Subtidal Remedial Action

The in-water contamination and proposed remedy are described in the RI and FS, respectively. As described in the FS, the in-water remedy consists of a single, multifaceted cleanup. However, given the nature (i.e., co-located with vital eelgrass habitat) and extent of the contamination, it was necessary to split the in-water work into two phases. The initial phase of the work, Phase II, was completed in the late fall 2013. The overall scope of work completed for the Phase II remedial action is summarized below.

- Abandoned in-water concrete structures in the intertidal and subtidal areas were demolished and crushed for use as fill in the upland portions of the Site. Near-surface debris generally consisting of concrete, brick, wood, and other materials was removed as part of the planned excavation and dredging work completed in the intertidal and subtidal areas.
- Wood piling that remained in the intertidal and subtidal areas was removed. Most piles were completely extracted; however, where extraction methods were not successful at extracting a pile, it was broken off below the mudline.
- Nearshore subtidal areas containing wood waste and/or affected by dioxin/furan contamination were dredged to native material or to the prescribed design depth, whichever was reached first (Figure 2-1). The extent of wood waste and historical dioxin/furan TECs measured in this area served as the basis for determining the design excavation and dredging depths.
- Excavated material and dredged sediment were disposed of off-site at the Roosevelt Regional Landfill.
- The excavated and dredged areas were backfilled with clean fill materials that are beneficial to aquatic habitat and provide a cap to isolate any remaining impacted sediment from potential receptors (Figure 2-1).
- Shoreline protection features, including an extension of the jetty at the north end of the Site and a protective spit at the wetland mitigation complex (constructed in Phase I), were constructed as part of Phase II (Figure 2-1). In addition, the cobble berm constructed in Phase I to protect the wetland area was partially breached to connect the wetland area to Fidalgo Bay. At the southern end of the Site, shoreline armoring was constructed to provide protection against erosion.
- The remedial action provided shoreline enhancements intended to improve habitat for juvenile salmonids, forage fish spawning habitat, shorebirds and waterfowl, and other aquatic species on and adjacent to the Site. This included placement of sandy substrate along the shoreline suitable for forage fish spawning habitat, and to support epibenthic crustaceans and other fauna beneficial to foraging juvenile salmonids. Dunegrass was planted along the property shoreline to provide erosion control and backshore habitat. As a result, the amount of habitat-friendly shoreline tripled from 1,450 feet of poorly functioning shore habitat to 4,400 feet of habitat-enhanced beach.

Refer to the Phase II CAP/EDR (Hart Crowser 2013b) and the Phase II CCR (Hart Crowser 2014) for details on the work planning documentation and completed construction during Phase II implementation.

2.5 Conceptual Site Model

The CSM for the Site describes the physical and chemical conditions of the upland portion of the GBH property area and adjacent aquatic area addressed in the FS. The CSM identifies the potential or suspected sources of hazardous substances, the types and concentration of hazardous substances, potentially contaminated media, release/transport mechanism, actual and potential exposure pathways and receptors (WAC 173-340-200) at the Site.

The CSM is a set of hypotheses derived from existing Site data and knowledge gained from environmental evaluations conducted at other similar sites. This model summarizes the environmental processes underway at the Site based on data available as of January 2019. The CSM builds on information presented in the RI, additional site data presented in the FS, and the work completed during Phase I and Phase II interim actions. A generalized CSM for the Site is depicted on Figure 2-3.

2.5.1 Contaminant Sources and Affected Media

Lumber milling and plywood operations took place at the Site for over 100 years. Although operational details are lacking, former plant operations produced large amounts of wood waste fill, which were placed in upland and aquatic portions of the Site over many years. Site operations ceased following the 1992 fire, with no continuing primary sources of contamination.

The primary and secondary sources of contaminants and affected environmental media for the aquatic portion of the Site, identified below, are similar to those identified previously, but are now limited to subtidal areas impacted with dioxins, including the areas where eelgrass is present. Previous remedial actions completed in upland and in-water areas have removed much of the primary and secondary sources of contamination associated with dioxins and wood waste.

Historical sources and processes that released wood waste and hazardous chemical materials to the environment during mill operation are not well documented. The RI identified petroleum hydrocarbons (diesel and heavy oil), carcinogenic polycyclic aromatic hydrocarbons (cPAHs), and metals as COPCs in soil and groundwater, and dioxin/furans as COPCs for sediment. Wood waste was also identified as a potential deleterious substance in aquatic areas of the Site. The process used to further evaluate and identify COPCs is described in Section 4.0 of the FS.

In the aquatic environment, thick sections of sawdust, mill ends, and other wood waste fill were deposited near former overwater structures associated with former site operations. The seaward extent of wood waste as a source of contamination in the aquatic environment has not been established by the RI and related site investigations to date, although additional field sampling was conducted in December 2010 (FS Section 2.0) and January 2012 to address this data gap. In sufficient quantities, wood waste can represent an environmental pollutant and deleterious substance per SMS criteria [WAC 173-240-200(17)]. Potentially deleterious effects of wood waste have been evaluated in biological response studies such as those conducted during the FS for the former Scott Paper site north of Custom Plywood (GeoEngineers, AMEC Geomatrix, and Anchor 2008). Results of these studies with regard to wood waste and associated total volatile solids content are summarized further in Section

4.0 of the FS. These areas have been remediated during Phase II interim actions and no longer serve as a primary or secondary source of contaminants.

Dioxin is the other notable contaminant in the aquatic environment. Dioxin sources associated with Site activities were not documented in the RI. However, surface sediment dioxin concentrations uniformly ranging from about 10 to 20 ppt total TEC occur over much of the shallow aquatic area of the Site based on January 2012 sampling analytical data, in addition to data reported in the RI and by SAIC (2010) (Figure 2-2). The FS previously noted that two “outlier” dioxin concentrations of 81 and 41 ppt were detected (Figure 5-2 of FS). However, more recent sampling conducted in January 2012 to fill data gaps in the aquatic area of the Site found additional surface sediment locations with comparable dioxin concentrations in the nearshore area (Figure 2-2). The results indicated a broader extent of dioxin concentrations exceeding 25 ppt along the northernmost and southernmost portions of the intertidal area, with concentrations in surface sediment ranging as high as 95 ppt at sample location SC-44.

With the exception of these higher concentration samples in the nearshore area, the relatively uniform occurrence of dioxin farther seaward in the subtidal area suggests that dioxins were redistributed in the aquatic environment following release from some combination of local Custom Plywood sources, and (possibly) off-site sources. Dioxin concentrations tend to diminish seaward toward the central part of Fidalgo Bay.

2.5.2 Release Mechanisms and Transport Processes

The primary release mechanisms and transport processes by which contaminants can continue to migrate from sources to receptors are identified in this section. For the aquatic environment, contaminants can migrate from source areas to receptors by the routes described below for affected media.

The release mechanisms and transport processes identified for the aquatic environment include:

- Erosion or exposure of any remaining wood waste through wave and tidal action;
- Migration of sulfide, ammonia, phenols, and any remaining related wood waste constituents to aquatic receptors;
- Transfer of groundwater/surface water chemical contaminants to sediment;
- Direct contact of COPCs with human or ecological receptors; and
- Uptake of COPCs by marine organisms.

2.5.3 Receptors

Several classes of human and ecological receptors have been identified. For the aquatic environment, potential human receptors include current and future site users (the GBH-owned portion of the Site is currently restricted to commercial or industrial uses per City of Anacortes Zoning Map), who may be exposed to sediment via direct contact or through consumption of marine biota. Ecological receptors include organisms in the biologically active zone such as shellfish and other benthic fauna exposed to sediment via direct contact and secondary food chain consumers such as fish and birds.

2.5.4 Summary of Completed Exposure Pathways

For a constituent of concern (COC) to present a risk to human health and/or the environment, the pathway from the COC to the receptor must be completed. The COC to receptor pathways judged to be present at the Site are listed in this section by contaminated medium.

Sediment

The pathways judged to remain that could potentially allow COCs in groundwater and surface water to reach receptors in sediment and marine waters include:

- **Human Receptors.** Direct contact (dermal contact, or incidental ingestion) pathways and consumption of affected marine species and incidental consumption of marine waters and sediment pathways from areas of the site with dioxin-impacted sediment.
- **Ecological Receptors.** Direct contact and/or uptake of contaminants including wood waste and wood waste degradation products pathways and food chain consumption of affected marine species pathways in areas with dioxin-impacted sediment.

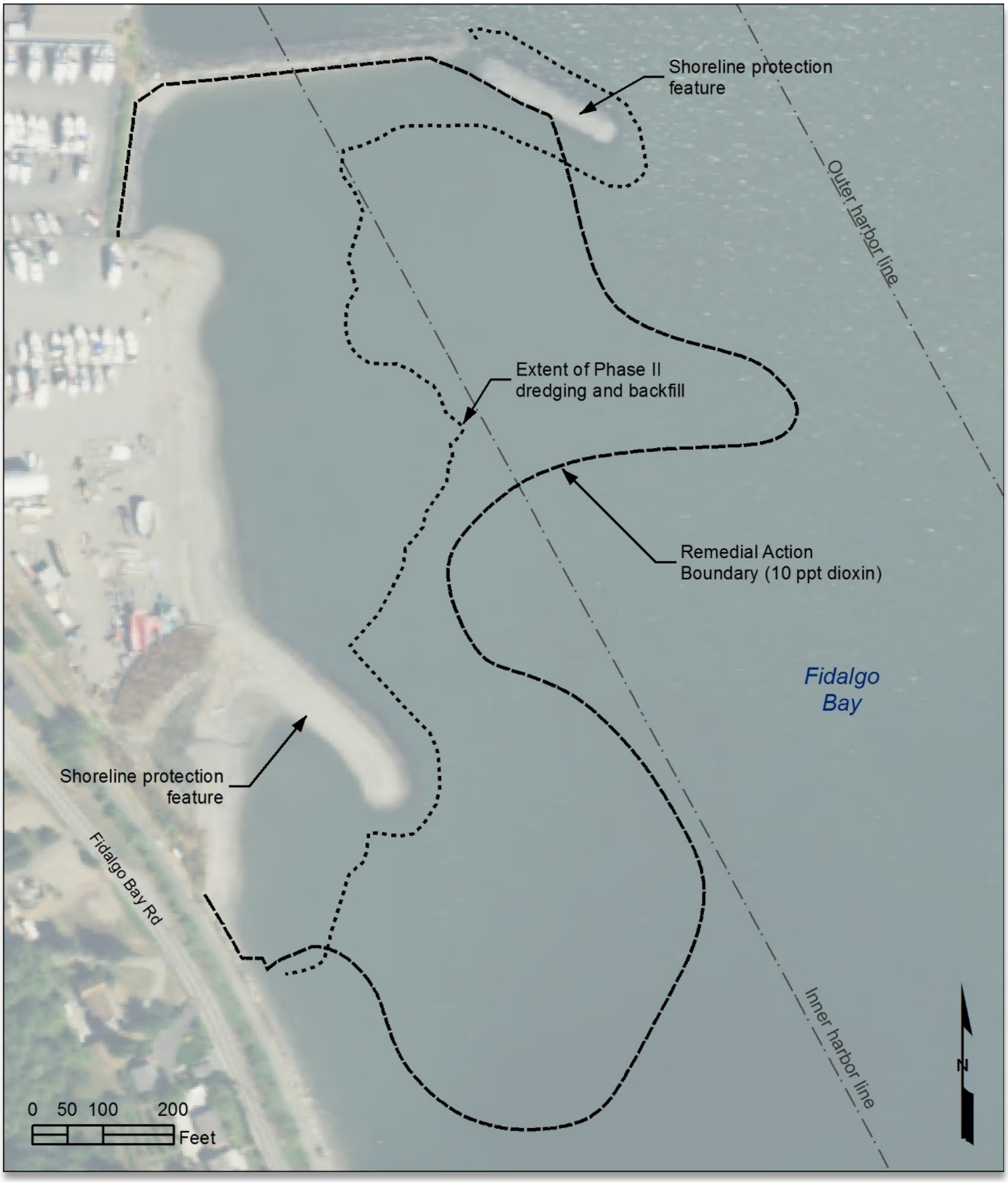


Figure 2-1 Phase II Activities

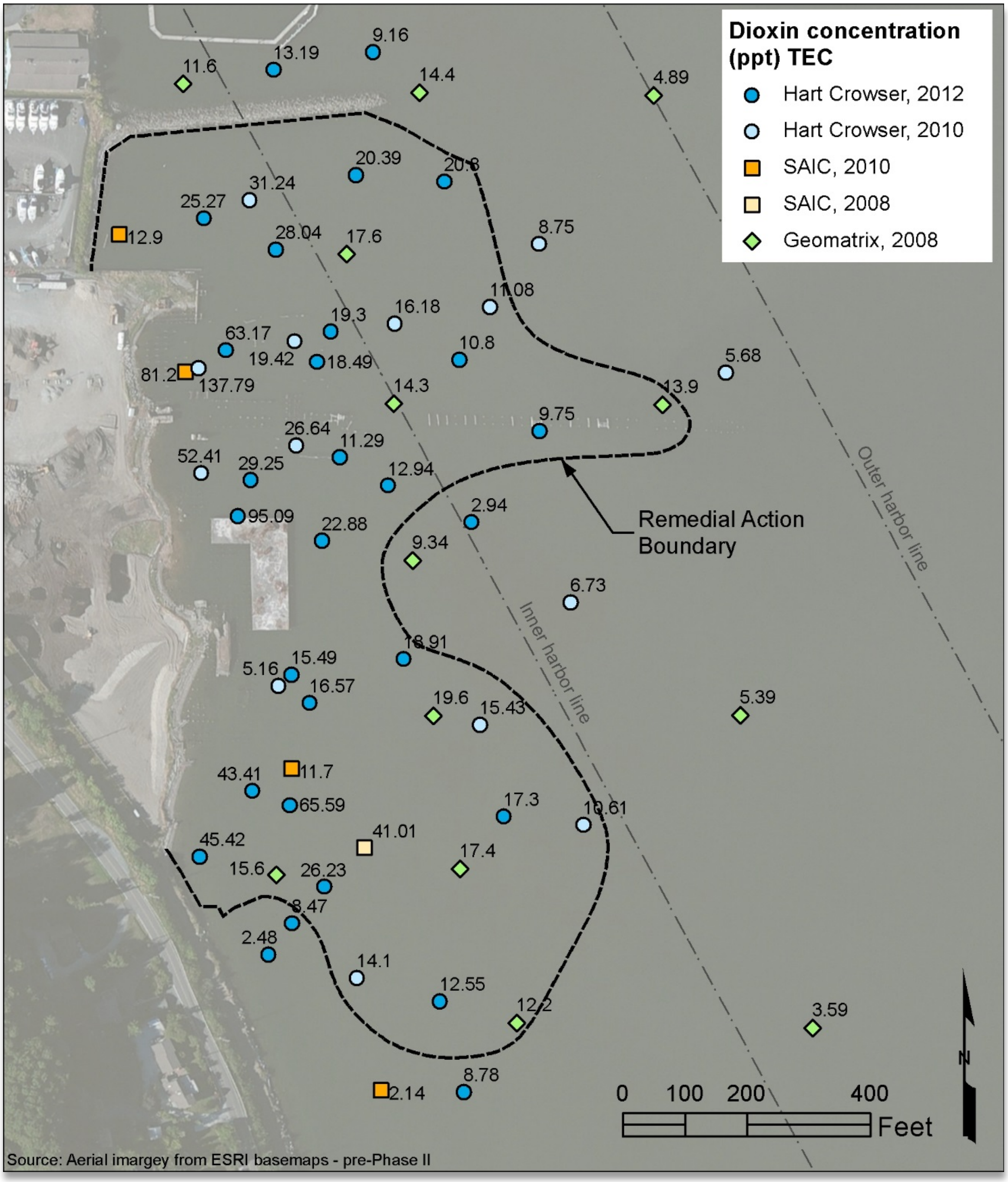


Figure 2-2 Sediment Dioxin Sample TEC Results

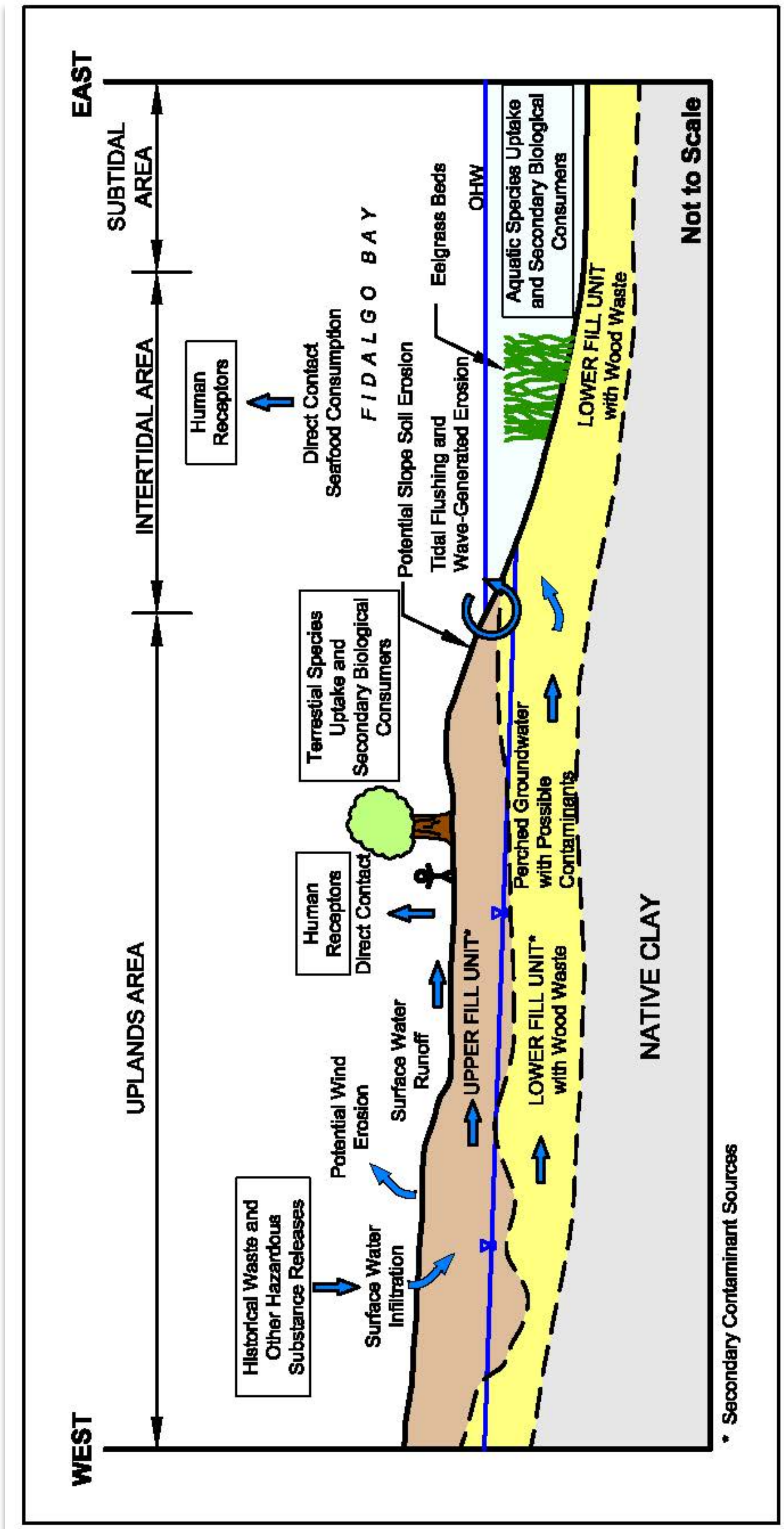


Fig 2-3 Conceptual Site Model (Generalized Cross-section looking North)

3.0 CLEANUP REQUIREMENTS

The following sections identify the remedial action objectives and cleanup standards for the aquatic portions of the Site addressed in this CAP/EDR. Remedial action objectives and cleanup standards were developed to address MTCA, SMS, and other applicable state and federal regulatory requirements for in-water cleanup efforts. These requirements address conditions relative to potential human and ecological receptor impacts. Requirements also consider related habitat, land use, and potential cultural resources issues. Together, project remedial action objectives and cleanup standards provide the framework for selecting a preferred remedial alternative, as well as evaluating other remedial alternatives (Section 4.0).

3.1 Remedial Action Objectives

The primary objective for the Phase III cleanup action at the Site focuses on substantially eliminating, reducing, and/or controlling unacceptable risks to the environment and human health posed by COCs to the extent feasible and practicable. Applicable exposure pathways and receptors of interest for human health include current and future site users, including workers, shellfish consumers, and visitors potentially exposed to sediment via direct contact pathways and consumption of marine biota and marine sediment/waters.

Applicable ecological exposure pathways and receptors include organisms in the biologically active zone exposed to sediment by direct contact and food chain uptake. Related ecologically focused cleanup objectives for bay-wide remediation also include:

- Providing suitable substrate for promoting recovery/recruitment of aquatic organisms in remediated areas; and
- Minimizing habitat (i.e., eelgrass) and water quality impacts during construction.

These remedial action objectives are presented as target goals to be achieved to the extent feasible and practicable. A key additional objective is the preservation and protection of cultural resources, should such objects be encountered during the remedial action. Protective in-water features to prevent further shoreline erosion and migration/dispersion of deleterious sawdust and residual contaminated sediment from the site intertidal area were addressed by the Phase II cleanup action.

3.2 Cleanup Standards: Remedial Action Levels

Under WAC 173-340-700, a cleanup level is the concentration of a hazardous substance in soil, water, air or sediment that is determined to be protective of human health and the environment under specified exposure conditions. Cleanup levels, in combination with points of compliance, typically define the area or volume of soil, water, air or sediment at a site that must be addressed by the cleanup action. However, cleanup criteria established by the MTCA, SMS, or other regulatory criteria would be achieved by this action followed by natural recovery processes. A general discussion of those criteria follows.

Cleanup levels for aquatic cleanup consist of applicable MTCA, SMS, and other protective regulatory concentration criteria for sediment. These cleanup levels are identified as the lowest applicable or relevant and appropriate requirement (ARAR) criteria currently established. Cleanup levels for sediment are established through standard SMS criteria for chemical constituents and bioassay testing.

Key indicator hazardous substances were identified, by medium, after a review of the RI. As noted in Section 7.0 of the RI, indicator hazardous substances were identified based on their frequency of occurrence, mobility and persistence in the environment, and/or their toxicological characteristics (WAC 173-340-703). Points of compliance (POC) are identified in accordance with the SMS for affected sediment. Currently, after implementation of two interim actions, the only affected media are near surface (less than 10 centimeters) of subtidal sediments impacted with dioxins, but not remediated during Phase II.

The SMS establishes applicable benthic cleanup criteria including sediment cleanup objective (SCO) and cleanup screening levels (CSLs). The SCO defines the chemical concentration at or below which there are no adverse effects on the benthic community. The CSL is established at the minor adverse effects level. Concentrations at or below the CSL but greater than the SCO correspond to minor adverse effects to the benthic community. The SMS narrative also establishes the standard that corresponds to no significant health risks to humans and upper trophic level species.

Sediment quality investigations supporting the RI identified SMS CSL bioassay failures. The RI indicated that other contributing factors, such as holding times, may have promoted bioassay failure. The RI also included results of relatively limited dioxin testing in sediment within the former Custom Plywood property area. SAIC conducted additional surface sediment sampling, collection, and testing near the former Custom Plywood facility and elsewhere in Fidalgo/Padilla Bays in 2010. Results from the 2010 sediment investigation verified the presence of near-surface, nearshore dioxin concentrations exceeding the offshore Fidalgo Bay average of 1.4 ppt (FS Appendix A).

The SMS requires that chemicals be screened against criteria protective of human health and upper trophic level species health, in addition to criteria protective of the benthic community. In accordance with WAC 173-204-560 and applicable subsections, the most conservative concentration identified for protection of human, upper trophic level species, and benthic community health (i.e., risk-based criteria) was compared against natural background concentrations as well as the practical quantitation limit (PQL) for dioxins/furans. Per WAC 173-204-560(3), the PQL (i.e. 5.0 ppt TEQ) was selected as the initial cleanup level for dioxins/furans as it was greater than the Puget Sound Natural Background concentration of 4.0 ppt TEQ, as well as the risk-based criteria. As presented in the FS and Phase II CAP, the Remedial Action Levels for final Phase III remain the same:

- Aquatic sediment area where dioxin concentrations exceed 25 ppt TEC and/or greater than a foot of wood waste accumulation is present requires removal (dredging).

- Aquatic area where sediment dioxin concentrations range between 25 and 10 ppt TEC requires either thin layer capping or removal.

As discussed in the later sections, the overall remedy, including previous interim remedial actions, final cleanup actions, and monitored natural recovery will ultimately work together to achieve the final cleanup level for the Site at the POC established within SMS to be the "*biologically active zone*" or uppermost 10 centimeters below the mudline.

3.3 Aquatic Remediation Area

This section describes aquatic areas of concern at the Site where the concentration of COCs exceeds the identified cleanup standard. The areas of concern were identified based on the known or inferred extent of contaminated media following review of historical and analytical data presented in the RI and further summarized in the FS and subsequent investigations.

3.3.1 Marine Sediment Management Areas

Dioxin is the only remaining COC identified for defining sediment management areas (SMAs) for marine sediment cleanup at the Custom Plywood Site. Figure 3-1 identifies an overall cleanup area determined by comparing dioxin concentrations in surface sediment to the remedial action levels described above.

3.3.2 Estimated Sediment Acreage for Remediation

As shown on Figure 3-1, the sediment areas remediated during Phase II and the areas to be remediated during Phase III are calculated as follows:

- Total area with dioxin concentrations above the Fidalgo Bay off-shore average of 1.4 ppt TEC of dioxins/furans (SAIC 2010): 220 acres
- Total area with dioxin concentrations above the PQL of 5 ppt TEC of dioxins/furans (SAIC 2010): 45 acres
- Total area above the remedial action screening level of 10 ppt TEC of dioxins/furans (SAIC 2010): 17 acres
    - Extent of Phase II in-water cleanup conducted: 9.2 acres
        - Phase II mitigation area: 0.10 acre
        - Excavated/dredged/demolished area including dredging prism: 6.5 acres
        - Capped/backfill area (thicker than 6-inch capping): 9.2 acres
    - Extent of Phase III in-water cleanup: 10.5 acres
        - Dredging/backfilling where dioxin is above 25 ppt: 0.46 acres with 2-foot dredging depth
        - Capping (2-inch) within eelgrass beds: 4.7 acres
        - Capping (4 to 6-inch) transition zones: 1.3 acres
        - Capping (8-inch) not within eelgrass beds: 4.0 acres

3.4 Applicable Regulatory Requirements

MTCA and SMS regulatory provisions form the primary basis for evaluating and implementing aquatic cleanup alternatives for remediation at the Site. Following selection of a preferred alternative, MTCA requirements guide the process for preparing this CAP/EDR. Additional MTCA and other regulatory requirements will be further addressed in Section 6 (Engineering Basis of Phase III Design) and in the project design plans and specifications. In-water cleanup components are planned tentatively for the 2019 construction season.

Although exempt from procedural requirements of certain state and local laws and related permitting requirements, pertinent substantive compliance requirements apply. Formal procedural requirements will remain in effect if Ecology determines that an exemption will result in loss of approval by a federal agency. Applicable exempted state laws include:

- Chapter 70.105 RCW – Hazardous Waste Management: These regulations establish a comprehensive statewide framework for the planning, regulation, control, and management of dangerous waste. The regulation designates those solid wastes that are dangerous or extremely hazardous to the public health and environment. The management of excavated contaminated materials from the Site would be conducted in accordance with these regulations to the extent that any dangerous wastes are discovered or generated during the cleanup action;
- Hazardous Waste Operations (WAC 296-843): This regulation establishes safety requirements for workers providing investigation and cleanup operations at sites containing hazardous materials. These requirements will be applicable to onsite cleanup activities and would be addressed in a site-specific health and safety plan (HASP) prepared for the sediment cleanup action construction activities;
- Chapter 70.95 RCW – Solid Waste Management – Reduction and Recycling: Criteria for Municipal Solid Waste Landfills (WAC 173-351). This regulation establishes a comprehensive statewide program for solid waste management, including proper handling and disposal. The management of contaminated sediment, soil, and debris to be removed from the Site would be conducted in accordance with these regulations to the extent that the materials can be managed as solid waste;
- Chapter 90.48 RCW – Water Pollution Control Act: These regulations establish water quality standards for surface waters of the State of Washington consistent with public health and the propagation and protection of fish, shellfish, and wildlife. These standards will be used to develop appropriate BMPs for cleanup action construction activities; and
- Chapter 90.58 RCW – Shoreline Management Act: This regulation establishes permitting and other requirements for substantial development occurring within waters of the United States or within 200 feet of a shoreline, and requires that the activities in coastal zones be consistent with local regulations. MTCA exempts cleanup projects being conducted under an enforceable order or consent decree from the requirement of obtaining the shoreline permit.

The earthwork activities to be performed as part of the sediment cleanup action are not regulated under the Washington Clean Air Act (Chapter 70.94 RCW and WAC 173-400-100), and the cleanup action activities are not expected to create conditions that would significantly affect the ambient air quality or to cause any exceedances of applicable air quality standards.

The exemption also applies to local government permits and approvals associated with the remedial action. Although the in-water remedial actions are expected to be exempt from these procedural requirements, compliance with substantive provisions of these regulatory programs is required. Construction actions associated with cleanup are further subject to requirements of the State Environmental Policy Act (SEPA)– Chapter 43.21C RCW.

MTCA does not provide a procedural exemption from federal permitting. Federal permitting for in-water work could likely be conducted under the Nationwide 38 permit program administered by the United States Army Corps of Engineers (USACE), or, alternatively, under a Clean Water Act Section 404 permit. Additional applicable requirements pertain under Clean Water Act Section 401 (Water Quality Certification), and the Endangered Species Act (agency consultation).

In addition, the Fidalgo Bay region is known to be archaeologically sensitive, and USACE involvement in Clean Water Act permitting triggers provisions of Section 106 of the National Historic Preservation Act of 1966, and the Archeological and Historic Preservation Act (16 U.S.C. 469). The project will be coordinated with state and local agencies regarding substantive compliance issues, and USACE and other federal agencies for federal permitting issues. In addition, the Samish Indian Nation, Swinomish Tribal Community, and other tribes with usual and accustomed treaty rights within Fidalgo and Padilla Bays, and the Washington State Department of Archaeology and Historic Preservation (DAHP) will be consulted on cultural resource and archaeological matters. An Archaeological Monitoring Plan and Inadvertent Discovery prepared for Phase II in-water work will be used for Phase III dredging activities.

A wide range of state, federal, and local compliance requirements may be applicable to the aquatic work that is planned for the Site. These potential compliance requirements and activities that could trigger the requirements are summarized in the FS.

City of Anacortes Permits

Applicable City of Anacortes permitting approvals will be obtained for Phase III. Previous remedial actions have resulted in a Shoreline Master Program exemption and this is assumed for Phase III as well.

Joint Aquatic Resources Permit Application

A Joint Aquatic Resources Permit Application (JARPA) along with the Biological Evaluation Report will be submitted for Phase III after pre-consultation with the resource agencies and Tribes. The JARPA addresses impacts and subsequent mitigation efforts that must be undertaken for water bodies during Phase III activities.

3.5 Thin-Layer Capping Pilot Study Results

As discussed in previous sections, cleanup of sediment is generally limited to dredging and/or capping based alternatives. The presence of eelgrass at Custom Plywood makes either alternative problematic because both options would eliminate that vital habitat. Other sites, particularly fresh water sites, have demonstrated effectiveness using thin layer (less than 12 inches) caps to protect receptors from near surface sediment impacts. This technology has not been used within eelgrass habitats, so a pilot study was designed to test the concept. A full description of the study is contained in the Final Thin Layer Cap Pilot Study Report (Hart Crowser 2016a and 2019). The remainder of the section summarizes the study design and conclusions.

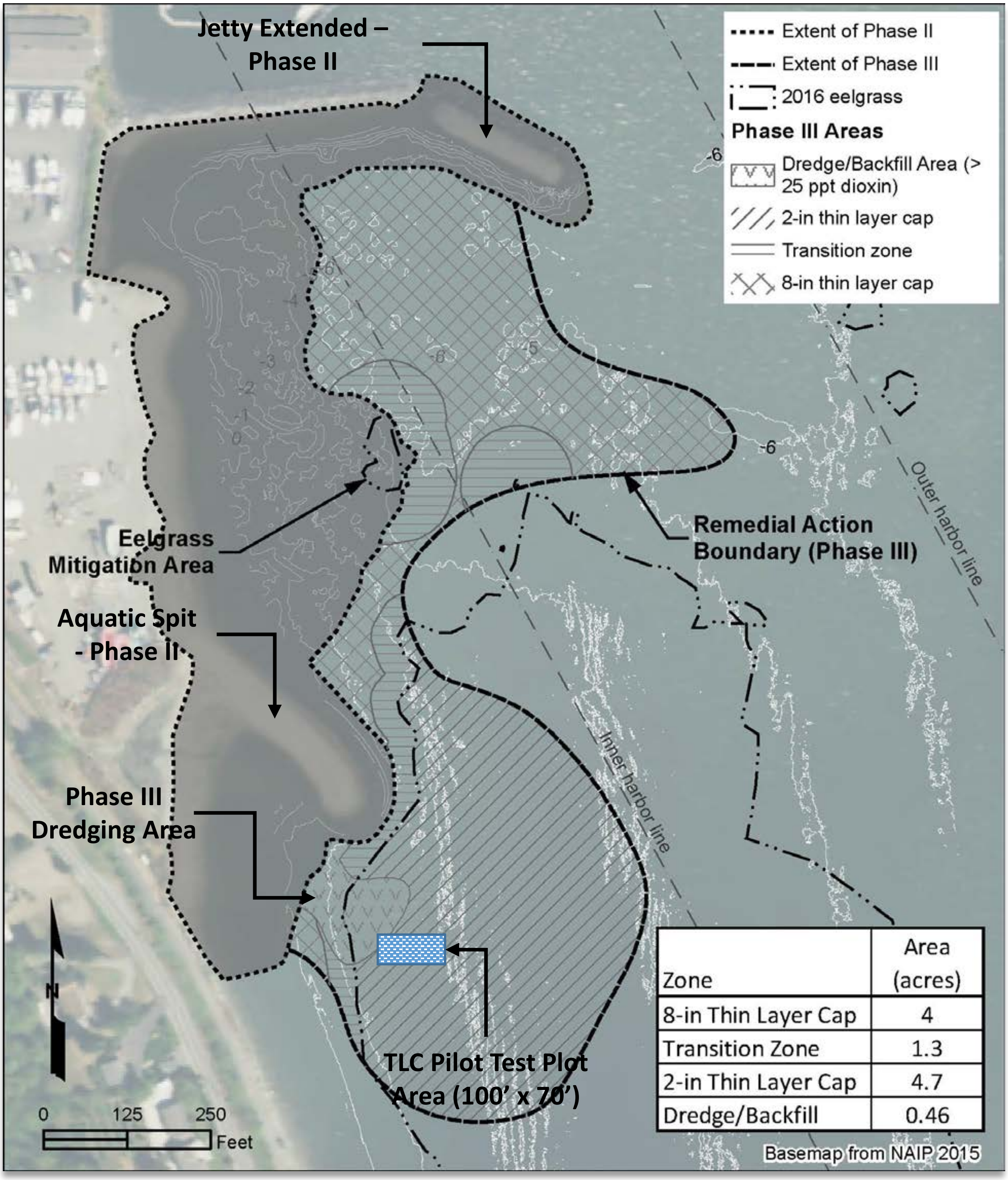
The pilot study was conducted as a limited-scale, semi-factorial exposure experiment using the Nationwide Permit 18, allowing for a maximum placement of 25 cy of capping material. The pilot study began with the application of cap material, conducted July 13 through 23, 2013. The four plots were labeled and constructed as follows: 4-inch sand only; 8-inch sand only; 4-inch sand plus 0.25-inch carbon; and 8-inch sand plus 0.25-inch carbon. Pilot study test plot locations are shown on Figure 3-2.

The goals of the study were to evaluate: (1) the burial tolerance and recovery of eelgrass; (2) effectiveness of the cap at reducing bioavailability; and (3) the effectiveness of a sand cap at remediating dioxin in the native sediment. In order to accomplish this, dioxin concentrations were measured in: the upper 10 centimeters of sediment (including the cap material), bent-nose clam (*Macoma nasuta)* tissue, and passive sampling devices (PSDs) in an effort to determine pore water concentrations. In addition, physical parameters were observed, including above- and belowground eelgrass biomass and individual shoot biomass.

Based on the data, application of a maximum of 4-inch sand-only cap appears to be a most effective remedial alternative at the Custom Plywood Site. However, due to permitting limitations (i.e., the limitation of placing only 25 cubic yards of fill), the scope of the pilot study encompassed a very limited surface area. While the eelgrass biomass data obtained from the pilot study is statistically solid, the results can be considered very specific to the Site and to the eelgrass population that was tested. One should be cautious in scaling up using these results. Despite this study's limitation, a recommended next step would be to implement the remedy in several phases using low-impact placement system of capping materials. The initial phase would apply the preferred thickness (two inches) over a much smaller area (e.g., 0.5 acre) to verify that the results are consistent over different ecological scales. After confirming test results over this 0.5-acre area, the final phase would implement the remaining TLC.

3.6 Consistency Determination of Prior Interim Actions (Phase I and II) with Final Cleanup Action for Phase III

As discussed in WAC 173-340-430, *"an interim action is distinguished from a cleanup action in that an interim action only partially addresses the cleanup of a site… An interim action may constitute the cleanup action for a site if the interim action is subsequently shown to comply with WAC 173-340-350 through 173-340-390."* WAC 173-340-430 goes on to state that if *"the cleanup action is known, the* *interim action shall be consistent with the cleanup action"* and that *"interim actions shall be followed by additional remedial actions unless compliance with cleanup standards has been confirmed at the site."* The Phase I and Phase II actions at Custom Plywood were designed to be consistent with the selected remedy identified within the FS and to meet to site-wide cleanup objectives identified within MTCA & SMS. For these reasons, the Phase III cleanup actions are deemed consistent and an integral part of the Final Cleanup Action.



Zone	Area (acres)
8-in Thin Layer Cap	4
Transition Zone	1.3
2-in Thin Layer Cap	4.7
Dredge/Backfill	0.46

Figure 3-1 Area remediated under Phase II and
Phase III remediation areas along with the location of 2014 Phase II mitigation area

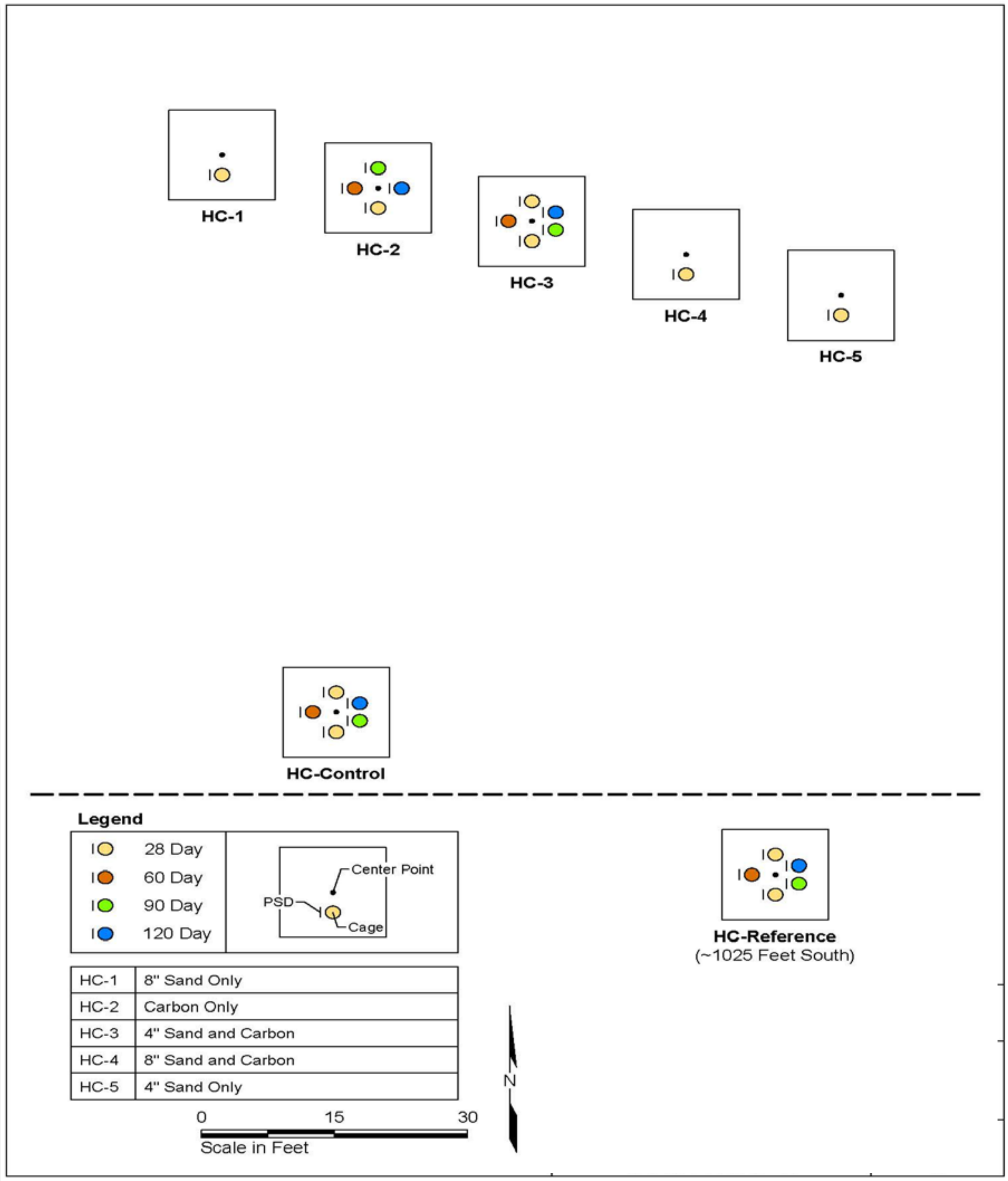


Figure 3-2 Details of thin layer cap pilot study test plot locations

4.0 REMEDIAL ACTION ALTERNATIVES CONSIDERED AND BASIS FOR AQUATIC REMEDY SELECTION

Five aquatic remedial alternatives with different excavation, dredging, and sediment capping options were evaluated in the FS. A range of shoreline protection measures and mitigation alternatives were considered, as described in the supporting FS appendices. This section briefly summarizes the process used to identify candidate remedial technologies, describes the remedial alternatives developed at a generalized level, and identifies the MTCA criteria used to evaluate each potential remedial alternative. Refer to the FS and Phase II CAP/EDR for a more detailed summary.

4.1 Remedial Technology Screening Process

Candidate remedial technologies were identified and screened in Sections 6.1 and 6.4 of the FS to develop potential cleanup alternatives for further evaluation. The remedial technologies considered include methodologies capable of achieving the remedial action objectives, including MTCA and SMS cleanup standards and other regulatory requirements.

Candidate technologies applicable to impacted sediment were identified in many sources, including compilations such as those discussed in the web-based Federal Remediation Technology Roundtable. Applicable technologies were screened based on their expected implementability, reliability, and relative cost. Screening was consistent with MTCA evaluation criteria described further in Section 4.3. The FS provides additional background on these evaluation factors along with the rationale for retaining or discarding particular technologies. Various remediation technologies applicable to marine sediments are listed in Table 6-3 of the FS.

4.2 FS Alternatives Evaluated

Five aquatic remedial alternatives (A-1 through A-5) were developed from the technologies retained in the technology screening. These alternatives included various combinations of intertidal zone excavation and backfilling and subtidal dredging and thin-layer capping to facilitate enhanced natural recovery (ENR). Demolition of remaining concrete structures, surface debris and wooden piling removal, long-term monitoring, and institutional controls were included in each of the aquatic remediation alternatives, in addition to shoreline protection measures.

In marine sediments where dioxin TEC is greater than 25 ppt and wood waste thickness is generally thicker than two feet, Alternatives A-1 through A-3 incorporated variations of excavation and dredging depths in the intertidal and subtidal aquatic areas. Alternative A-1 was the most comprehensive with deep excavation and dredging to 6 feet below the existing surface in both the intertidal and subtidal areas. Alternative A-2 was the least conservative with shallow excavation and dredging to 2 feet below the existing surface in both the intertidal and subtidal areas. Alternative A-3 was a hybrid approach, using deep excavation in the intertidal area and shallow excavation in the subtidal area.

Alternatives A-4 and A-5 were variations of Alternatives A-1 and A-2, respectively, in which implementation of ENR was confined to affected eelgrass bed locations only, and dredging was expanded to include any areas where total dioxin TEC exceeded 10 ppt, excluding eelgrass bed areas. The other remedial elements remained the same as in Alternatives A-1 and A-2.

In areas where dioxin TEC is between 10 and 25 ppt and wood waste thickness is generally less than one foot, Alternatives 1, 2 and 3 incorporated ENR through TLC placement. Phase III consists only of those areas not addressed by Phase II. ENR through TLC placement will include a 2-inch cap in areas with eelgrass, an 8-inch cap in areas not within eelgrass, and a 75-foot wide transition zone (cap transitioning from the 4-inch eelgrass cap to the 6-inch non-eelgrass cap).

4.3 Evaluation Process for Aquatic Remedial Alternatives

The MTCA and SMS criteria used to evaluate the remedial alternative are summarized in this sections.

4.3.1 MTCA Evaluation Criteria

Key guiding requirements for evaluating remedial alternatives and remedial action selection for the Site are listed in the MTCA regulations and detailed in the FS. MTCA criteria consist of threshold requirements and other criteria listed in WAC 173-340-360(2) Minimum Requirements for Cleanup Actions.

MTCA places preference on permanent solutions to the maximum extent practicable based on a disproportionate cost analysis (DCA) as specified in WAC 360-340-360(3) The benefits of the alternatives considered are balanced against relative costs for implementing each alternative. Preference is also placed on remedies that can be implemented in a shorter time, based on potential environmental risks and effects on current site use and associated site and surrounding area resources. The third criterion, public concerns, will be addressed during comment periods for CAP/EDR for remedy implementation.

4.3.2 SMS Evaluation Criteria

SMS requirements are applicable to in-water portions of the Custom Plywood Site cleanup effort. The standards list evaluation requirements for cleanup alternatives comparable to MTCA requirements under SMS section WAC 173-204-570. These requirements closely mirror MTCA in requiring evaluation of cleanup actions that protect human health and the environment by eliminating, reducing, or otherwise controlling risks posed through each exposure pathway and migration route. Additional SMS requirements listed in WAC 173-204-570(3)(e) through (k) include:

- Preferences shall be given to those with a shorter restoration time frame;
- When applicable, remedies with source control shall be given priority;
- Special consideration for sediment recovery zones, where applicable;
- A remedy shall not rely, solely, on monitored natural recovery or institutional controls and monitoring;
- Consideration of public concerns;
- Adequate monitoring; and

- Periodic review to determine the effectiveness and protectiveness of cleanup action.

Requirements for determining whether SMS cleanup action decisions are permanent solutions to the maximum extent practicable are further described in SMS section WAC 173-204-570(4). Like MTCA, SMS cleanup actions require achieving protection of human health and the environment, compliance with cleanup standards and ARARs, source control, consideration of public concerns, and monitoring. SMS cleanup action decisions must also address cleanup time frames, current and future site and vicinity use and impacts, effectiveness and reliability, contamination control, and natural recovery processes. In addition, WAC 173-204-570(5) of SMS allows authorization of cleanup time frames that exceed 10 years where cleanup actions are not practicable in less time. Further net environmental effects of the alternatives, cost effectiveness, public participation, and land access are also to be considered.

4.4 Aquatic Remedial Alternative Selection and Implementation

Following the above MTCA analysis and DCA, Alternative A-3 was identified as the selected alternative for the aquatic remedial action. Consistent with Chapter 70.105D RCW, as implemented following the regulatory requirements of Chapter 173-340 WAC, Ecology has determined that the selected aquatic remedial action is protective of human health and the environment, will attain federal and state requirements that are applicable or relevant and appropriate, complies with cleanup standards, and provides for compliance monitoring.

The Phase II interim action constructed a large portion of Alternative A-3 along with the shoreline protection measures and habitat mitigation components described in the Phase II CAP. The Phase III cleanup action will complete the remaining portions of Alternative A-3. Additionally, it includes appropriate institutional controls as needed and post-construction monitoring to monitor long-term remedy performance.

4.5 DCA Evaluation and Alternatives Ranking

Alternatives that meet threshold requirements for cleanup actions are assessed to determine which use permanent solutions to the maximum extent practicable per WAC 173-340-360(3). This assessment is conducted by performing a DCA. To conduct the DCA, the alternatives are evaluated for degree of permanency and the alternative that provides the greatest degree of permanence shall be the baseline cleanup action alternative (WAC 173-340-360[3][e][ii][B]).

The alternatives are compared by evaluating the following cost/benefit criteria: protectiveness, permanence, cost, effectiveness over the long term, management of short-term risks, and technical and administrative implementability. The regulation gives a general discussion of the types of factors to consider when evaluating each criterion.

When assessing whether a cleanup action uses permanent solutions to the maximum extent practicable, the test used (WAC 173-340-360[3][e][i]) is as follows:

> *"Costs are disproportionate to benefits if the incremental costs of the alternative over that of a lower cost alternative exceed the incremental degree of benefits achieved by the alternative over that of the other lower cost alternative."*

As stated in WAC 173-340-360(3)(3)(ii)(C):

> *"The comparison of benefits and costs may be quantitative, but will often be qualitative and require the use of best professional judgment. In particular, the department has the discretion to favor or disfavor qualitative benefits and use that information in selecting a cleanup action. Where two or more alternatives are equal in benefits, the department shall select the less costly alternative provided the requirements of subsection (2) of this section are met."*

The FS (Hart Crowser 2011), as stated above, evaluated several aquatic alternatives and applied the aforementioned DCA tests. Since completion of the FS, a large portion of the selected alternative, A-3, has been implemented and the extents of the remaining remedy have changed to a certain degree. For example, the area impacted eelgrass to apply TLC, as assumed in the FS, was estimated to be approximately 10 acres initially. Based on current eelgrass extents compared to the remedial action levels, the actual area of eelgrass to be capped is determined to be approximately 4.7 acres. The change in areas will affect the overall costs to be included in the DCA. However, the change in costs would be applied to all alternatives proportionally. Therefore, the DCA (summarized below) from the FS is still qualitatively valid.

Alternative A-1 for the in-water portion ranked highest based protectiveness, permanence, and long-term effectiveness associated with deeper wood waste removal. Alternative A-5, a variant of A-2, ranked as the lowest based on lower scores in these same categories, as well as management of short-term risks. The lower scores for Alternative A-5 (as well as A-4 which is a variant of A-1) reflect concerns over resuspension of dioxin-contaminated material and control of dredging residuals. Alternatives A-2 and A-3 were ranked 3 and 2, respectively, because of the differences in the depth of wood waste removal accomplished by each alternative.

Alternative A-3 for the in-water portion is identified as the preferred aquatic remediation alternative for the portion of the Custom Plywood Site bounded by the 10 ppt total dioxin TEC contour. Implementation of Alternative A-3 has removed near-surface debris and relatively thick accumulations of wood waste in the nearshore zone to depths up to 4 feet below the existing mudline. Seaward accumulations of wood waste have been removed to a depth of up to 2 feet below mudline where wood waste was more than 1 foot thick. Wood waste excavation areas were capped and/or backfilled with sandy material and soft surficial rock armoring as needed in the wave erosion zone. Areas with dioxin concentrations in excess of 25 ppt TEC will be removed to the base of wood waste fill, and other areas with dioxin concentrations between 10 and 25 ppt will be remediated using TLC methods as to achieve ENR.

Although none of the FS aquatic alternatives address other portions of the Custom Plywood Site with dioxin concentrations above the Fidalgo Bay background concentration, Alternative A-3 focuses on excavating, dredging, or capping areas with greatest accumulations of wood waste and the highest concentrations of dioxin. Alternative A-3 provides the most cost-effective remedial action strategy to reduce potential human health and ecological risks in the aquatic environment. Excavation, dredging, and capping measures for Alternative A- 3 achieve MTCA and SMS evaluation criteria for protectiveness, permanence, and long-term effectiveness. Alternative A-3 provides further value by minimizing short-term risks and related disruption to the aquatic environment. This alternative can be readily implemented in a reasonable time frame and should be able to be permitted given similar in-water cleanup projects in Puget Sound.

4.6 Habitat Restoration/Improvement Opportunities

Under the Puget Sound Initiative, MTCA cleanup actions are designed to enhance and/or restore marine habitat. The selected final Phase III cleanup action combined with the Phase II improvements will significantly restore and/or protect habitat and will improve almost 19.7 acres of previously degraded in-water habitat.

Ecology and other agencies established a series of monitoring criteria for the Phase II improvements to compare relative performance of the remedial actions and to evaluate the success of the project from a natural resources perspective. This section provides a summary of the monitoring tasks and indicators for success. The performance categories include:

- Physical monitoring of the restored beach;
- Epibenthic zooplankton sampling;
- Documenting nearshore fish species;
- Monitoring for forage fish spawning activity and egg survival;
- Determining the effectiveness of eelgrass transplants; and
- Monitoring the wetland and backshore vegetation.

All six categories listed above met their Year 2 (2015) success criteria, described in more detail below.

Monitoring of the substrate and profile of the be1ach restoration was conducted on August 28, 2015. The success criterion for the restored beach was for beach elevation profiles to change by no more than ± 1.5 feet by Year 5. This criterion was largely met during Year 2. Monitoring data found only minor changes in beach profiles below +6 feet mean lower low water (MLLW), but some localized changes exceeded this criterion in beach profile elevations above +6 feet MLLW as a result of erosion from the upland site. These changes are likely a result of the constructed beach profiles approaching dynamic equilibrium as anticipated, and no further significant adjustment of the beach profiles is expected.

The success criterion for epibenthic zooplankton was defined as the plankton densities on the restored beach being comparable to or greater than densities at the reference beach. Because densities on the restored beach were comparable to those from the reference beach, this criterion was met during Year 2. In all sites at all depths there was an increase from 2014 in mean density and species richness for both epibenthic fauna and crustaceans. Enhanced densities may have been due to increased colonization of macrovegetation, which provides algae and detritus that support zooplankton production. Decreased presence of juvenile salmonids on the restored beaches may have also contributed to the results by allowing the epibenthic zooplankton populations to thrive.

Nearshore fish surveys focused on juvenile salmonid use of the restored beach compared to that on the reference beach. Similar to the epibenthic zooplankton, the success criterion was that juvenile salmon use of the restored beach would be comparable or greater than the reference beach; this criterion was met in 2015. No salmon were captured at the reference site in 2015. At the restored beach, juvenile salmonid abundance was higher in May than in June, although total abundance was considerably lower during the 2015 monitoring activities relative to 2014 sampling.

Success criterion for forage fish was dependent on at least 50 percent of the substrate composition along the upper beach being suitable for forage fish spawning in any given year. This criterion was met in 2015, with forage fish spawning documented at all survey sites of the enhanced beach area during the Year 2 monitoring period. Increased egg survival was also documented since the replacement of beach substrate in 2013.

Eelgrass transplant success was defined as no temporal loss of eelgrass productivity. This was measured by the density of eelgrass, multiplied by the area of shoots in the transplant areas, and adjusted for changes in the reference bed. After one year, transplants showed signs of recruitment success with planting units exceeding transplant densities and coalescing into larger patches. This prompted a change in the survey methodology to quantify density via quadrat as opposed to counting planting units. Additionally, there was an expectation that 50 percent or greater colonization will have occurred by 2015 with total survival of 2,377 sf at a similar density to a reference bed expected by 2019 (Year 5). Average density within the transplant area was 9.7 shoots per square meter (sm), compared with the original transplant density of 3.7 shoots per sm. Thus the success criteria of greater than 50 percent recruitment of the original plantings has been met in 2015.

Upland buffer, wetland, and backshore vegetation success is based on a combination of plant survival and cover criteria. There were no applicable criteria established to evaluate the upland buffer during this year's monitoring. However, the wetland and backshore criteria in the planted area during Year 2 were: (1) 30 percent or greater areal coverage of native vegetation; (2) 80 percent survival; and (3) less than 10 percent total cover of invasive plant species. Based on the data collected in 2015, all criteria were met for the wetland and backshore areas. Low numbers of non-natives were observed within all areas of the site.

5.0 SELECTED PHASE III SUBTIDAL REMEDIAL ACTION

Final Phase III of the selected remedial alternative for the Site is described in this section. This section describes the details of Final Phase III Cleanup Action and the justification and rationale for the remaining cleanup actions including (1) dredging, and (2) TLC capping in eelgrass, transition zone, and outside eelgrass area. This section also discusses how the remedy conforms to future land use plans, which includes environmental covenants to protect human health and the environment by controlling the use of the Site and managing any contamination that remains.

5.1 Description of the Final Phase III Cleanup Action

The Phase III work consists of remediating the final 10.5 acres of subtidal sediment not addressed during the previous interim actions (Figures 5-1). The work will be completed over two or more construction seasons as described in subsequent sections. Representation of the Site's current setting along with TLC placement Plan for final Phase III remedial work in uplands, nearshore, tideland, subtidal land is shown on Figure 5-1 (remediation areas) and on Figures 5-2 through 5-5 (cross sections A-A', B-B', C-C', and D-D', respectively) show cross-sectional views of upland and in-water areas that were previously remediated as well as TLC areas to be completed as part of Phase III. Figure 5-5 (cross section D-D') also shows previously remediated areas along with the proposed dredging/backfill area.

5.1.1 Subtidal Sediment Dredging and Disposal

Additional dredging work is planned in Phase III for the subtidal areas adjacent to the spit constructed in Phase II. As discussed previously, approximately 0.46 acres of subtidal sediment exceeds the 25 ppt action level. This area, as shown on Figure 5-1, is partially located within eelgrass bed. Partial mitigation was completed in 2014 to compensate for potential losses during Phase II implementation. Additional mitigation will be required to compensate for Phase III activities and will be addressed in the permit, work planning, and/or other engineering documentation.

Approximately 1,500 cy of sediment (wet volume) will be dredged during Phase III using water-based equipment. This is based on the dredge prism area (approximately 20,000 sf) dredged to an average 2-foot depth. The dredging work will be limited to periods when the water depth is sufficient to accommodate the draft of the floating equipment.

Dredged sediment will be loaded directly to barges and allowed to decant/dewater. Solids will be disposed of off-site at an approved upland disposal facility. Water from the barges will be discharged back to Fidalgo Bay after meeting water quality parameters.

Dredged areas will be backfilled following dredging. Backfill material consisting of 1-inch minus, sandy gravel will be placed to existing grade in subtidal dredge prisms. Clean backfill material will be placed using conventional barge-based equipment.

5.1.2 Thin Layer Capping Outside of Eelgrass Area

Approximately 4.0 acres of subtidal sediment will be capped with 8 inches of clean sand. This area, shown on Figure 5-1 constitutes areas of sediment which exceed the 10 ppt TEC dioxin action level. Construction and capping specifications, including means and methods for placement will be presented in the Construction Plans and Specifications for the project. The EDR, a part of this CAP/EDR, will be made available for public review and comment prior to moving forward with final design.

5.1.3 Thin Layer Capping in Transition Zone

Approximately 1.3 acres of transition zone subtidal sediment will be installed to avoid the occurrence of slumping/redistribution of capping layers into the nearby eelgrass area (Figure 5-1). This transition zone will be capped with 4 to 6 inches of clean sand.

5.1.4 Thin Layer Capping within Eelgrass Area

In areas with eelgrass, capping will take place over two (or more) construction seasons. The first season will establish a proof of concept at full scale. As discussed previously, the TLC Pilot Study involved the placement of only 770 sf of 4-inch capping material.

To maximize eelgrass survival under a 2-inch capping scenario as well as develop large scale placement means and methods, one half (0.5)-acre section of the eelgrass remediation area will be set aside and capped with 2 inches of clean sand. After placement, the eelgrass cap will be closely monitored for the remainder of the year. Monitoring will include verification of cap thickness and documentation of aboveground eelgrass biomass. Previous results from the capping study indicated that if deleterious effects on eelgrass were to occur, they would be measurable over the course of the subsequent year.

Assuming eelgrass biomass is retained following cap placement, as predicted by the TLC pilot study, the remainder of the eelgrass remediation will be capped during the subsequent construction season.

5.2 Justification/Rationale for Final Phase III Subtidal Remedial Action

The following section summarizes the justification and rationale for the remaining cleanup action(s) at the Custom Plywood Site.

5.2.1 Dredging

Additional dredging work is planned in Phase III in a subtidal area adjacent to the spit constructed in Phase II. As discussed previously, approximately 0.46 acres of subtidal sediment exceeds the 25 ppt action level for dioxin. This action level is set to eliminate, reduce, and/or control unacceptable risks to the environment posed by constituents of potential concern to the greatest extent feasible and practicable. Although this dredge area is small, its presence potentially provides a remaining exposure pathway to human and ecological health through direct contact and food chain uptake.

Dredge actions will be conducted utilizing best management practices, including working only during appropriate tides and decanting sediment prior to upland disposal. Once the sediment has been dredged, the area will be backfilled to grade with clean sand material.

5.2.2 TLC Cap Outside Eelgrass

Attenuation through natural sedimentation is not a likely option since the most current data available from adjacent Padilla Bay indicates that sedimentation rates are too low for the region to accomplish recovery within a reasonable timeframe. Based on Poppe (2015), bay-wide accretion rates were modeled at -0.26 ± 0.23 centimeters per year (cm/yr; erosional or near-zero accretion). Based on these findings, a sufficient layer of clean sediment may never be achieved if accretion rates are negative (erosional) or near zero (steady state). Natural sedimentation will not provide a remedy that is immediately protective of human health and the environment.

An 8-inch cap was selected as a prescriptive remedy for these areas given the average dioxin contamination concentration. The cap is designed to effectively isolate contamination as well as enhance existing habitat. The cap will consist of clean sand that will be installed using traditional methods and likely in a single layer. The use of clean sand in remediation caps has been implemented at a number of remediation sites in the Puget Sound, including Phase II at Custom Plywood, to enhance benthic habitat. Once the new substrate is colonized, organisms that live in or on the surface of the sediment will increase the migration of cap material downward into the contaminated sediment through bioturbation. The level of bioturbation will vary with depth and the thickness of the cap.

The clean sand cap promotes an oxic environment (stimulating aerobic processes) which has numerous benefits for the long-term success of the remediation of the subtidal area. When the sediment environment is oxic, recruitment of invertebrate fauna, as well as species diversity post-cap application, tends to be enhanced. Currently, subtidal substrate is largely anoxic and lower in species diversity (SAIC 2008), so there is great potential that the 8-inch cap will promote higher species abundance and diversity, and support expansion of eelgrass. It is currently assumed that this area is at the appropriate depth for eelgrass to occur (based on previous macrovegetation surveys) but that existing anoxic conditions associated with the presence of wood waste may be currently preventing colonization within these areas. A recent eelgrass transplant effort in the newly remediated areas has shown promising success with better-than-expected recruitment and lateral spreading of eelgrass shoots after initial performance surveys (Hart Crowser 2016b).

5.2.3 Transition Zone

The transition zone is the area between the eelgrass bed requiring a TLC and the area of thin capping only (no eelgrass). The transition zone (with the thickness between 4- to 6-inches of clean sand) along the southern eelgrass boundary is approximately 40 feet wide (Figure 5-1). Adjacent to the advanced eelgrass transplant area and the northern portion of the main eelgrass bed, the transition zone is 80 feet wide (Figure 5-1). These transition areas will serve as a buffer between the 8-inch cap placement in areas outside eelgrass and the 2-inch cap being placed within the eelgrass bed. The total acreage of the transition zone within these areas is 1.3 acres. In the area outside the eelgrass bed, traditional capping methods will be used. Since methods and cap heights between these two areas differ, we have recommended a transition zone where cap gradation can occur. This will not only protect eelgrass located at the boundary of the bed from being over-capped by traditional methods, but also allows for a transition between the different prescribed cap thicknesses. This strategy also addresses the concerns of a thicker cap migrating after placement between these two areas. Fluid dynamics within the eelgrass bed will be much different than outside of the eelgrass areas and the use of this transition zone will ensure small-scale cap migration will not affect eelgrass function.

This transition zone will be a cap that is protective of human health and the environment. It will provide similar benefits to those of an 8-inch cap by creating oxic conditions which promote epibenthic and infauna diversity. Other capping studies have found macroinvertebrate communities colonize remediated areas similar to areas recovering from environmental stressors which include a process of initial colonization by surface dwelling species and followed by organisms that prefer deeper depths (Becker et al. 2009). This area of the cap would also provide suitable substrate for potential expansion of the adjacent eelgrass bed into the newly remediated areas. Current substrate has a high amount of organic material which leads to development of hydrogen sulfide, an indicator of anoxic conditions. According to Holmer and Bondgaard (2001), sulfides have some toxic effects on species of seagrasses, including *Zostera marina*, and are potentially inhibiting expansion of the adjacent eelgrass bed.

5.2.4 TLC Cap in Eelgrass

As described previously, sediment accretion rates in eelgrass located in the adjacent bay system were positive, but still would require over many decades to naturally accrete a minimum amount of sediment assuming no losses (which is unrealistic). Given this, an enhanced recovery approach is needed to be immediately protective of human health and the environment. The TLC Pilot Study conducted in 2013 was designed to investigate various capping scenarios and approaches to determine the feasibility and practicability of implementing a TLC to remediate sediment contaminants while preserving both the ecological function and biological productivity of eelgrass habitat at the site (Hart Crowser 2016a and 2019). The pilot study focused on the use of low-impact techniques to disperse clean sand over the seabed and gradually build up the cap over time. The key to the approach was to deliver material in such a way as not to cause the eelgrass shoots to lay over and become buried. After cap installation, eelgrass habitat metrics and dioxin concentrations were tracked over time to help inform the design of the larger cleanup.

The data clearly show that the application of 4 inches (total thickness) of cap material had little, if any, effect on eelgrass areal aboveground biomass. Whereas, in the 8-inch test plots, there was a significant reduction in eelgrass biomass. The bulk sediment results were statistically inconclusive, yet there was a trend of reduced dioxin sediment concentrations with the application of 4 or 8 inches of capping material. Average concentrations for the control were at or above the estimated PQL while all other treatments were below it. This infers that the installation of a cap (4 or 8 inches) tended to isolate the existing contamination, though this trend was not statistically significant. Nothing presented in the sediment data collected during this study suggests that a thicker cap would be more effective or necessary to achieve remediation goals.

Based on these data, a 4-inch sand cap appears to be an effective remedial alternative for the eelgrass habitat located on the Custom Plywood Site. However a 2-inch sand cap will be placed over the eelgrass bed during the Final Phase III in order to reduce risk that comes from scaling-up of the TLC pilot study.

Scaling up from these data is a task that will require cautious planning and thorough thought. We recommend implementing this remedy in phases by applying the 2-inch sand cap over one-half acre area during the first construction season. This cap would be applied using similar techniques developed during the pilot study, but with in-depth research, investigation, and practical discussions with contractors on how to implement over a larger area. The application of a sand cap within the eelgrass bed will be done by using low-impact methods, such as sand pluviation techniques or sand raining, in order to distribute small amounts of sand cap material throughout the area. These methods will be designed to reduce any adverse impacts to the eelgrass aboveground habitat by avoiding burying shoots during application.

5.3 Contingency Actions

Post-construction monitoring will evaluate whether contaminated sediment that is left in place after completion of the final Phase III remedial action poses an unacceptable risk. Similar long-term monitoring programs will be established as part of the post-cleanup shoreline protection and improvement components of the OMMP. Contingency actions for impacts to eelgrass, if any, will be developed in consultation with federal and state stakeholders as necessary.

5.4 Future Land/Aquatic Use and Institutional Controls

Alternative A-3, which is the selected aquatic remedial action, addresses MTCA, SMS, and other regulatory requirements to provide a suitable cleanup action that adequately protects human health and the environment as a long-term solution. The remedial action also provides for nearshore habitat restoration and construction of shoreline protection features, which were constructed during the Phase II action.

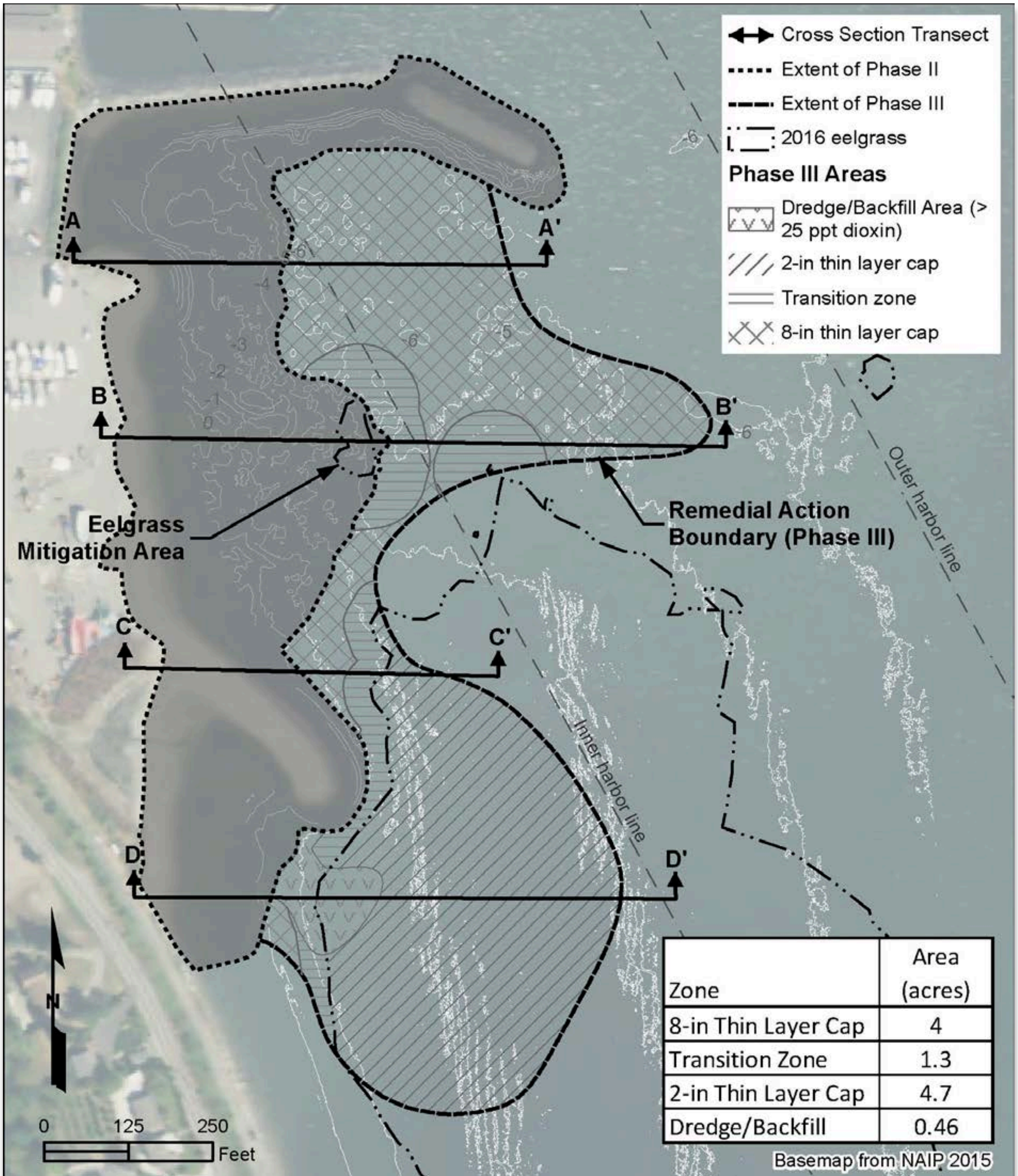
The upland portion of the GBH property is zoned for commercial/industrial development. The excavation and backfilling for Alternative A-3 in the intertidal zone, which abuts the upland area, is compatible with this future land use, including potential development of vessel storage and related boat manufacturing support activities envisioned by the current/future property owner. The selected remedial alternative also could provide for public access near the south end of the GBH property. Considerations for potential future commercial/industrial uses at the upland portion of the Site include the preservation of restored nearshore habitats and the shoreline protection features constructed in Phase II.

One (or more) environmental covenants per WAC 173-340-440(9) for institutional controls will be recorded for upland and nearshore areas where contaminants at concentrations above cleanup levels or wood waste are left behind following completion of Phase III activities described in this CAP/EDR.

Locations and depths of subtidal sediment areas that would require special management if disturbed, will be identified in OMMP. In order to insure the integrity of the cleanup action and continued protection of human health and the environment, sediment management plans will be required that instruct property owners on Ecology's requirements for performing significant invasive construction work in areas of remaining contamination.

5.5 Preliminary Schedule for Phase III

As stated previously, Phase III is tentatively scheduled to span two or more consecutive construction seasons. The first season will include the limited amount of dredging and off-site disposal, capping of the non-eelgrass remediation area, and proof of concept capping of one-half (0.5) acre of eelgrass. The second season will include the remainder of eelgrass capping, pending favorable eelgrass biomass after proof of concept capping.



Zone	Area (acres)
8-in Thin Layer Cap	4
Transition Zone	1.3
2-in Thin Layer Cap	4.7
Dredge/Backfill	0.46

Figure 5-1 Plan-view of Phase III remediation areas (Revised per Phase III CAP/EDR)

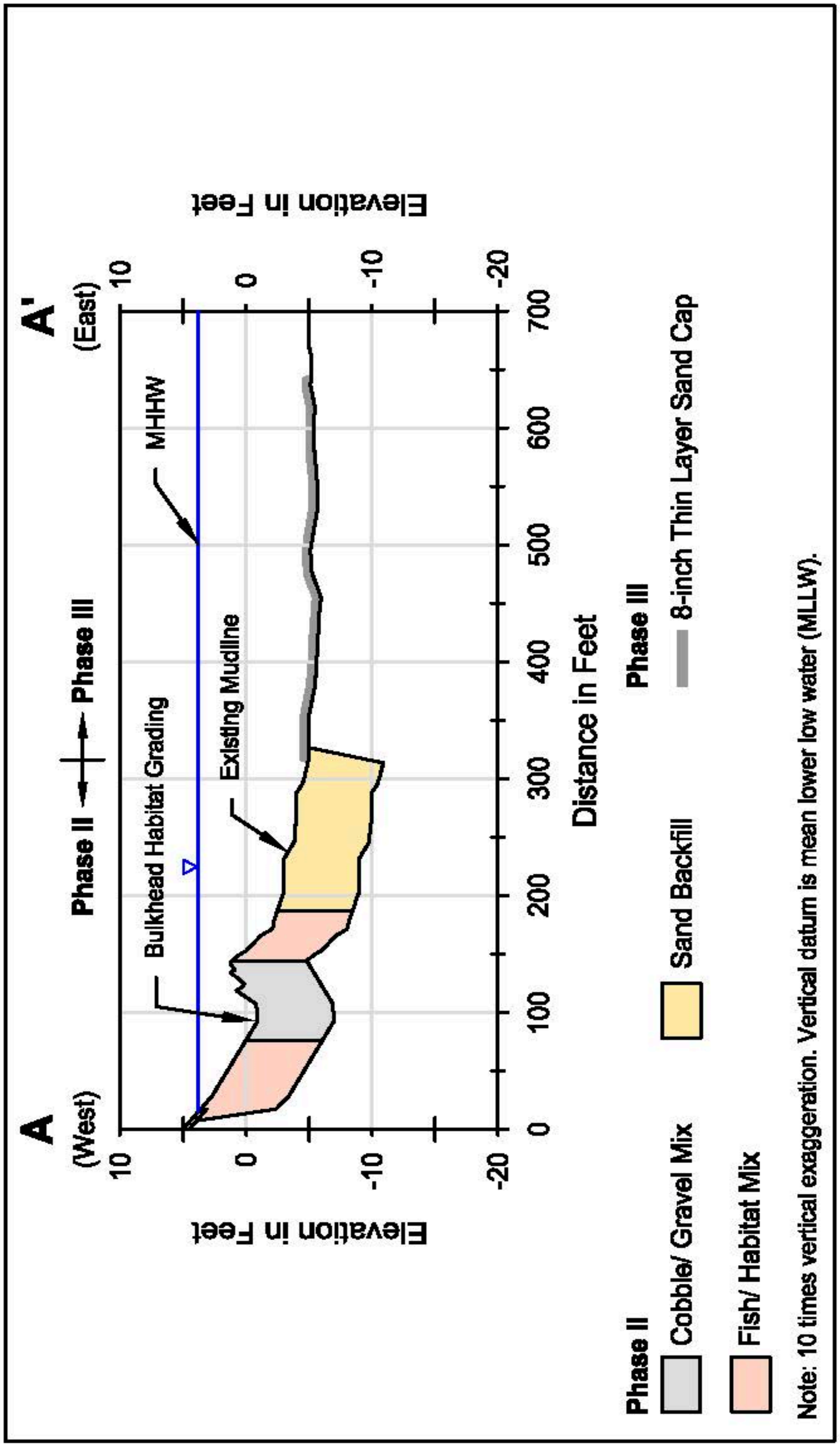


Figure 5-2 Cross-section A-A': existing condition and proposed TLC placement plan

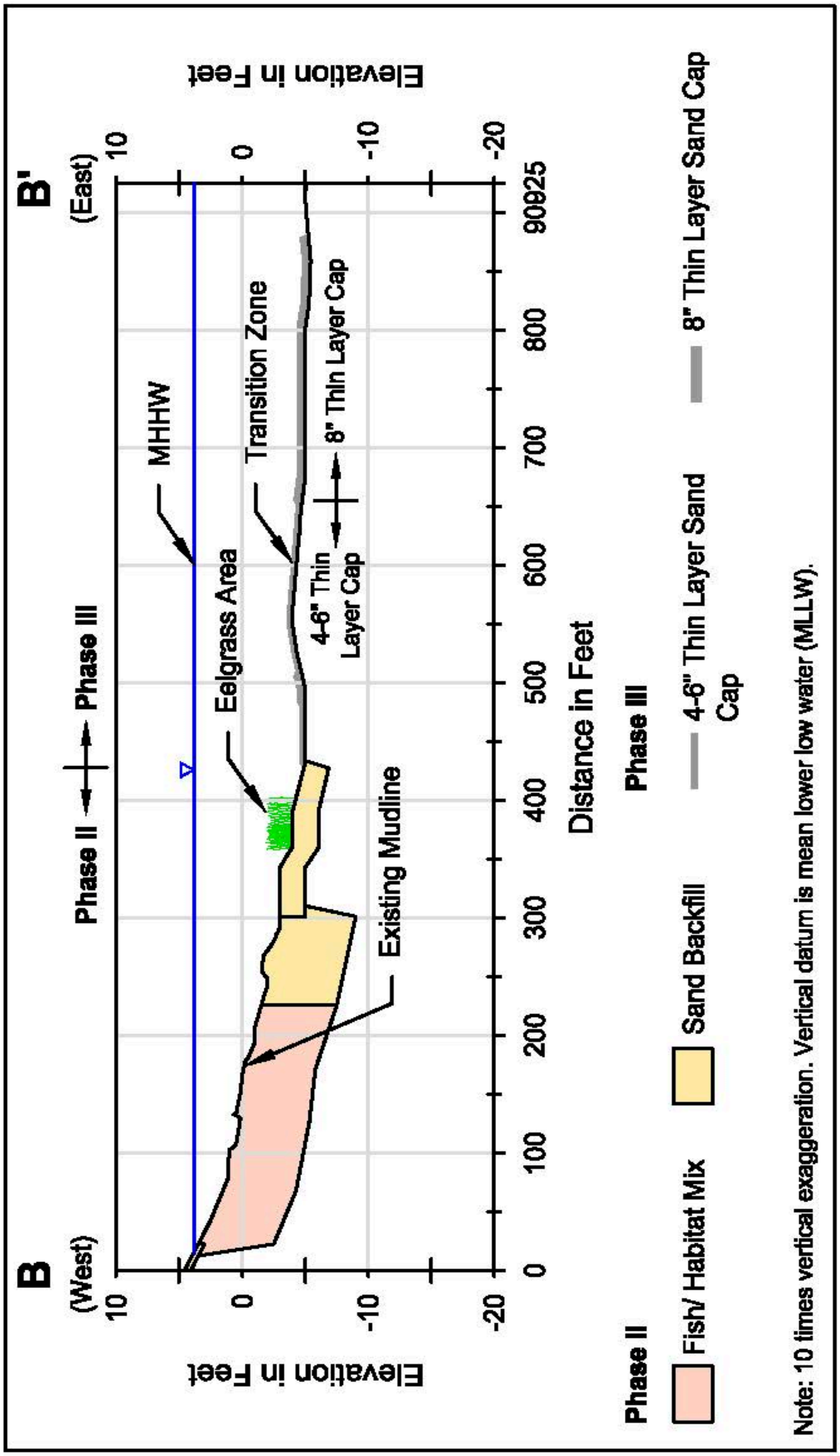


Figure 5-3 Cross-section B-B': existing condition and proposed TLC placement plan

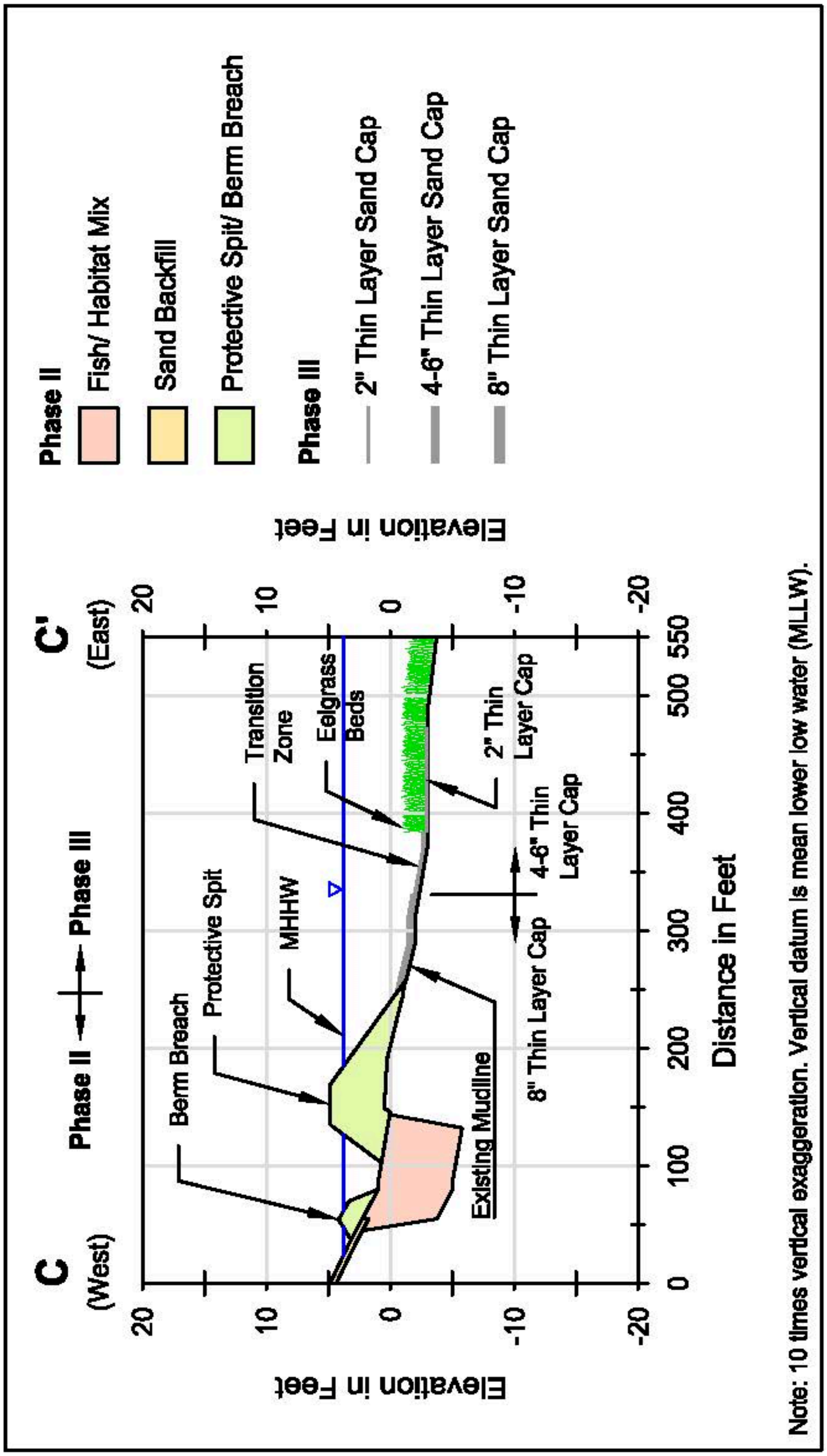


Figure 5-4 Cross-section C-C': existing condition and proposed TLC placement plan

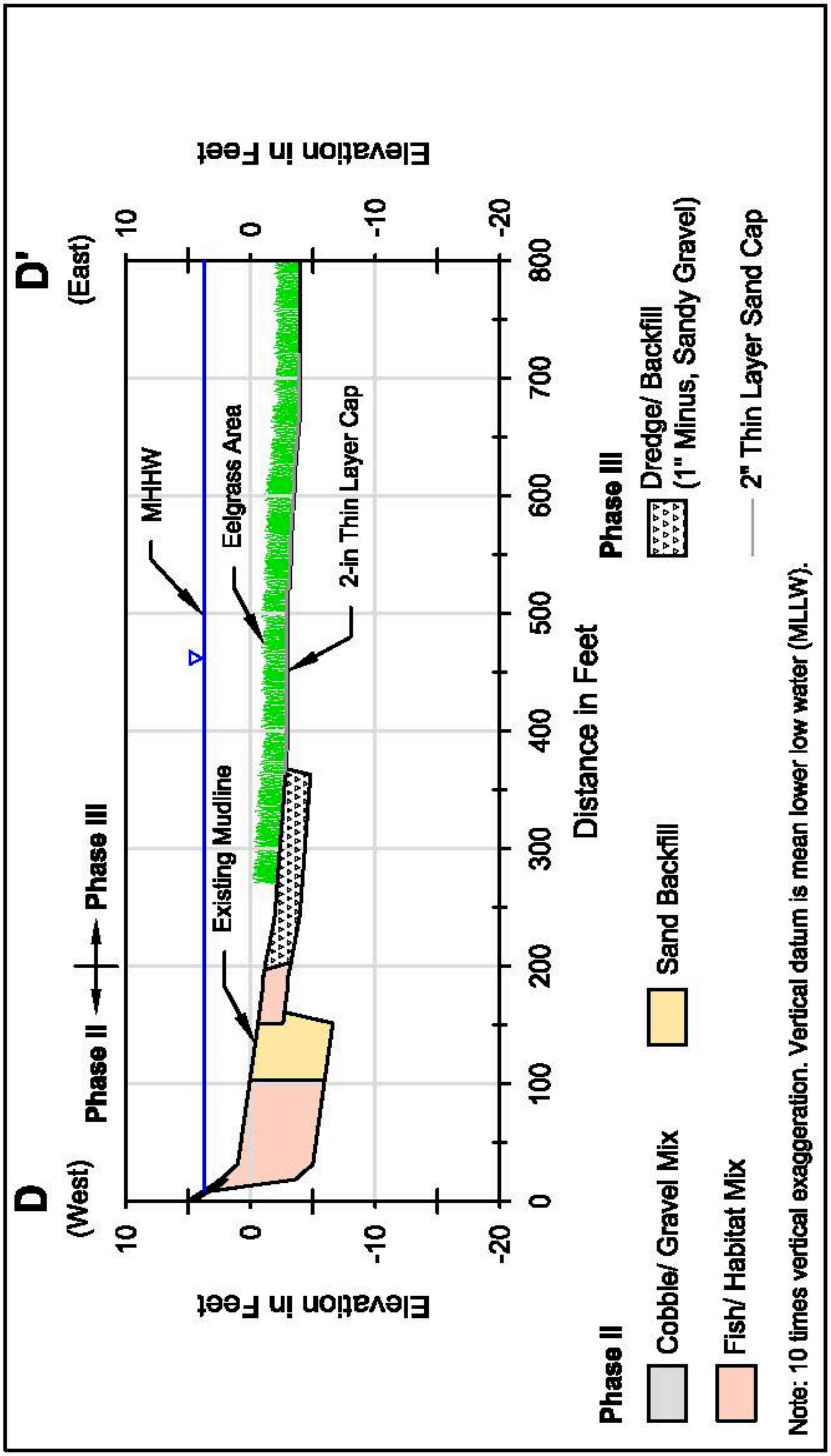


Figure 5-5 Cross-section D-D': existing condition and proposed dredging/backfill and TLC placement plan

6.0 BASIS OF FINAL PHASE III DESIGN

Phase III focuses on the subtidal portions of the Site between -2 and -6 feet (MLLW). The nature and extent of contamination (described in previous sections of this report) provides the primary basis of the design for cleanup of contaminated subtidal sediment.

The primary aquatic COPC are dioxins with wood waste being a secondary COPC. Screening level values and conditions, based on dioxin concentrations and the presence of wood waste were established in the FS to evaluate remedial technologies and alternatives. In general, two action levels were established: (1) areas with wood waste accumulation greater than 1-foot below the mudline and/or areas with dioxin concentrations greater than 25 ppt TEC, and; (2) areas with visible surficial wood waste and/or dioxin concentrations greater than 10 ppt TEC.

Phase II addressed aquatic portions of the Site which meet the higher screening level criteria by removing intertidal and subtidal sediment with dioxin concentrations greater than 25 ppt TEC and/or wood waste accumulations greater than 1-foot thick. However, Phase II did not address areas of the Site where eelgrass was present. Eelgrass is widely recognized as habitat of significant ecological importance (Section 1.2). Traditional methods of dredging and/or placement of thick-layer capping material to address the remaining portions of the site are not feasible in this habitat type. The FS identifies the usage of a “thin layer cap” (TLC) as the best potentially available technology to address the remaining aquatic area(s).

As recommended in the FS, a TLC pilot study was designed to investigate various capping scenarios and approaches to determine the feasibility of implementing a TLC to cap sediment contaminants while preserving ecological function and biological productivity of eelgrass habitat at the Site. The pilot study investigated the tolerance of eelgrass to the placement of a sediment cap at various thicknesses and compositions. The pilot study used low-impact techniques to disperse sand over the seabed (Section 5.2.4) to gradually build up the cap over time. In some areas, a thin layer of activated carbon pellets was dispersed prior to sand cap application to determine whether additional activated carbon provided enhanced adsorption of dioxin. After cap installation, eelgrass habitat metrics and dioxin concentrations were tracked over time to aid in design of the larger-scale cleanup. Field application of the pilot study took place during the summer of 2013 with monitoring, analysis, and final conclusions reported in the Thin Layer Cap Pilot Study Report (Hart Crowser 2016a and 2019). In general, the conclusions are as follows:

- Application of 4 inches of sand cap had little, if any, effect on eelgrass areal aboveground biomass. 8-inch treatments exhibited significant reduction in biomass. This finding can only be inferred on a small scale as the test plots receiving sand treatments totaled approximately 770 sf.
- The activated carbon additive showed no additional protectiveness when compared to sand-only applications. At Custom Plywood, it appears that the dioxins are more strongly bound to the organic carbon present in the sediment (potentially wood waste) and are presumed to not be

biologically available. However, the dioxins may become more biologically available as the wood waste degrades over time.

6.1 Construction Sequencing Considerations

All field construction will comply with Washington State's water quality standards for turbidity. A number of BMPs will be employed during construction activities including, but not limited to debris booms, turbidity curtains, and containment systems.

All in-water work will occur in Fidalgo Bay and contaminated sediments will be disposed of at an approved and appropriate upland disposal facility. The planned and final cleanup activities for the remainder of the Site will be completed over multiple construction seasons. Figures 5-1 through 5-4 show the location and cross-section view of the Phase III cleanup elements.

The contract plans and specifications will be performance-based, allowing the contractor to make specific sequencing decisions and adjustments as the work progresses. The contractor will be required to submit a construction sequencing approach as part of their pre-construction submittals for approval. Key construction sequencing considerations should include:

- Preventing cross-contamination, avoid damaging before remediation/restoration work, controlling turbidity, and optimizing work efficiency for sediment dredging/backfill work.
- Not negatively affecting eelgrass health both during and after TLC construction and optimizing work efficiency for TLC work.

The contractor may work on different construction tasks in different parts of the Site at the same time. The time needed for laboratory testing of sediment samples from the dredging areas will be long, typically 4 to 6 weeks for dioxin/furan analysis. Because of this time constraint, backfilling will not be delayed by waiting for performance sample analytical and will proceed independently of the sample analysis process.

6.1.1 <u>First Construction Season</u> (Tentatively 2019/2020):

- **Mobilization/Site Preparation** – Prior to beginning work, temporary construction facilities, upland staging areas, in-water water quality BMP measures, temporary haul roads, and other preparatory activities will be implemented.
- **Eelgrass Mitigation of 0.38 acre** – Approximately 0.38 acres of the 0.46-acre dredge footprint supports eelgrass (*Zostera marina*). Prior to dredging, eelgrass within and immediate adjacent to this footprint (maximum 0.42 acres including contingency) will be transplanted to the existing 2014 eelgrass mitigation area located within the central portion of the Site. An Eelgrass Mitigation and Monitoring Plan will be developed to support his effort.
- **Dredging and Backfill (subtidal) of 0.46 acres** – Dredging of up to 2 feet of sediment covering an area of approximately 0.46 acres will occur. To limit sloughing, a two (2) horizontal to one (1) vertical (2H:1V) cut slope will be used along the edge of the surrounding Phase II backfill area. Approximately 1,500 cy (maximum 1,900 cy including contingency) of contaminated sediment will

be dredged. All work will occur using barge-based construction equipment. Sediment will be drained using containment cells or other approaches assessed during project design and loaded into trucks for off-site disposal. Transferring material from barge(s) to trucks must be done in a manner that minimizes cross-contamination. The dredged area will be backfilled with clean material to existing grade.

- **Thin-layer Capping (subtidal, non-eelgrass) of 4 acres** - Approximately 4.0 acres (not located within/near eelgrass) will be capped with 8 inches of clean sand.
- **Thin-layer Capping (subtidal, non-eelgrass transition zone) of 1.3 acres -** Approximately 1.3 acres (transition zone: located adjacent to eelgrass) will be capped with 4 to 6 inches of clean sand in a manner that will minimize slumping/redistribution of the capping material onto the eelgrass area.
- **Thin-layer Capping (subtidal, eelgrass) of 0.5 acres** - One-half (0.5) acre of eelgrass (out of 4.7 acres of eelgrass covered area planned for capping) will be capped with 2 inches of clean sand (no more than 4 inches). Material placement methods will be evaluated prior to implementation to identify the method that has the least impact to eelgrass. Divers will be on Site to evaluate eelgrass placement techniques, provide feedback, and provide necessary field support. After capping, the one-half (0.5) acre cap will be monitored for one year to confirm that TLC placement on a larger scale does not negatively affect eelgrass health and performs similarly to the pilot study.

6.1.2 Second Construction Season (Tentatively 2020/2021):

- **Remobilization** – Prior to beginning work, temporary construction facilities, upland staging areas, in-water water quality BMP implementation, temporary haul roads, and other preparatory activities will be re-established.
- **Thin-layer Capping (subtidal, eelgrass) of 4.2 acres** – 4.2 acres of eelgrass (remainder of the 4.7 acres of eelgrass covered area planned for 2-inch capping) will be capped with 2 inches of clean sand (no more than 4 inches) using similar, or modified, placement methods depending on monitoring results and feedback from placement during the first construction season.
- **Construction Monitoring** - Cleanup effectiveness will be monitored in accordance with the OMMP to be developed for the project.
- **Demobilization** - The contractor will remove all temporary facilities and controls and restore the uplands of the Site.

6.2 Site Preparation and Mobilization/Demobilization

Site preparation and mobilization includes the transport of various construction equipment to the Site and construction of temporary staging and access facilities.

Site preparation will consist of, but not limited to, the following activities:

- Complete a site survey to obtain existing bathymetry using standard hydrographic methods;

- Install of temporary offices, lighting and other utilities, sanitary facilities and decontamination stations;
- Install of turbidity control measures and monitoring equipment;
- Create a temporary haul route through the Site and designate staging, lay-down, potential dredge sediment decant, and material stockpile area.

After construction activities are completed the contractor will demobilize, which includes removing temporary facilities and equipment from the Site and cleaning/restoring any areas on or adjacent to the Site that may have been impacted during construction activities.

6.3 Sediment Dredging/Backfilling and Off-site Disposal

Additional dredging work will be completed in Phase III for the subtidal areas adjacent to the spit constructed in Phase II (Figure 5-1). Approximately 0.46 acres of subtidal sediment which exceeds the 25 ppt action level will be dredged between elevations of -2 and -6 feet (MLLW). This area, as shown on Figure 5-1, is partially located within eelgrass. Approximately 1,500 cy of sediment (wet volume) will be mechanically dredged using a crane or hydraulic excavator mounted on a barge. The dredge prism area (approximately 20,000 sf) will be dredged to an average 2-foot depth. The dredging work will be limited to periods when the water depth is sufficient to accommodate the draft of the floating equipment.

Dredge material will be loaded directly onto a flat-deck haul barge for decanting. The contractor will be required to filter the return water to remove suspended solids and meet water quality standards prior to discharge back into Fidalgo Bay. Alternatively, water pumped from the barges may be containerized and treated for POTW discharge and/or disposal off site. Sideboards and scuppers of the barge will be covered with a filter media (e.g., straw bales or geotextile fabric) to filter and retain sediment. No overtopping of sideboards will be allowed, and no free and unfiltered water will be directly discharged back into the water before passing through the filter media.

Dredged sediment and recovered suspended solids will be disposed of off-site at a permitted Subtitle D landfill. Additional sediment characterization beyond that available in the RI may be required to meet specific disposal facility requirements.

Dredged areas will be backfilled following dredging. Clean Backfill material consisting of 1-inch minus, sandy gravel will be placed to existing grade in the subtidal dredge prism using conventional barge-based equipment.

6.4 Placement of Thin Layer Cap over 10 Acres

Approximately 10 acres of subtidal sediment which exceeds the 10 ppt TEC dioxin action level, as shown on Figure 5-1, will be capped with 2 to 8 inches of clean sand.

- **Thin-layer Capping (subtidal, eelgrass)** – Approximately 4.7 acres of eelgrass will be capped with 2 inches of clean sand (obtained from a local quarry) over multiple years. Material placement methods will be evaluated prior to implementation to identify the method least impactful to eelgrass. One potential placement method is to slowly and consistently disperse sand from a vessel in multiple lifts, or layers, over the capping area in a manner that avoids smothering the eelgrass shoots. Divers will be on site during placement activities to evaluate eelgrass placement techniques, provide feedback, and provide necessary field support. Cap thickness will be tracked and verified by installing sediments stakes and traps in between placements. A modified and scaled-up placement method from the Thin-layer Capping Pilot Study will likely be used.

- **Thin-layer Capping outside of eelgrass bed area (subtidal, non-eelgrass)** - Approximately 4.0 acres outside (eelgrass areas) will be capped with 8 inches of clean sand obtained from a local quarry (upland source). Capping materials will be placed using barge-mounted equipment and transported to the project area on a haul barge. The contractor will be responsible for selecting its means and methods for placement of the cap material. One potential placement method is to load a crane- or hydraulic excavator-mounted bucket or skip box with capping material, and then spread the material evenly by opening the bucket or tipping the skip box while the bucket/box is moved over the capping area.
- **Thin-layer Capping in transition zone (subtidal, non-eelgrass transition zone)** - Approximately 1.3 acres (not located within, but near eelgrass bed areas) will be capped with 4 to 6 inches of clean sand obtained from a local quarry (upland source) in a manner that minimizes slumping/ redistribution of the capping layer into the eelgrass area. Capping materials will likely be placed using similar methods that will be employed in the eelgrass bed area. The contractor will be responsible for selecting its means and methods for placement of the cap material.

An Eelgrass Thin-layer Capping Monitoring and Adaptive Management Plan is currently being prepared for areas containing eelgrass that are proposed for thin-layer capping. This Plan will describe placement methods, areas and sequencing, and monitoring to evaluate the health of the capped eelgrass. Plan and section views for dredging and TLC placement design are provided in Figures 5-1 through 5-5.

6.5 Post-Cleanup Site Protection and Habitat Improvement

The combination of Phase II and III remedial actions will fully restore the subtidal, intertidal, and shoreline areas, which will support a healthy beach and subtidal habitat, including the following features:

- Protective aquatic spit that provides habitat for fish and other organisms and developing areas of backshore vegetation dominated by dunegrass;
- Jetty extension/aquatic spit to protect the upland portion of the property from wind and wave action. This included placement of sand for softening and additional habitat for forage fish spawning and supporting foraging juvenile salmonids;
- Deeper in the subtidal zone, extensive eelgrass beds (all Zostera marina) are documented on and adjacent to the project area and are associated with the larger Fidalgo Bay eelgrass population. A small eelgrass mitigation area was planted in 2014 within the central and shallow subtidal portion of the site, and is currently being monitored;

- An open estuarine wetland bench (12,000 sf) was created landward of OHW with an associated upland buffer that was planted with native vegetation; and
- An OMMP will be developed for the project to monitor cleanup effectiveness following the implementation of the Phase III Final action.

7.0 PERMITTING PROCESS AND CONSTRUCTION DOCUMENTS

This section provides a brief summary of the following efforts to implement the sediment cleanup construction activities:

- Agency coordination efforts;
- Types of permits/approvals required;
- Construction documents;
- Quality assurance and control procedures; and
- Procedure to prevent release of hazardous substances during the construction.

7.1 Permitting Process

The sediment cleanup action will require in-water construction activities that are subject to review under state and federal permitting authorities. Permitting will require coordination with USACE and resource services, and preparation of a JARPA and a Biological Evaluation (BE). Early coordination with state and federal resource services is being conducted to discuss the various project elements and the likely impacts of the project on marine habitat, as well as to obtain early input regarding the mitigation proposed to address project impacts. This input will be used to refine the design and address any concerns of the resource services in the design prior to submitting the JARPA. A pre-application meeting was held on March 21, 2018, with the USACE and the resource services; the input of that meeting was used to refine the TLC implementation procedures and other aspects of the design to be presented in the JARPA.

In addition to coordination with the USACE and resource services, coordination with the City of Anacortes will be required regarding obtaining a Shoreline Substantial Development Permit Exemption permit/approval for discharge of construction water to the City of Anacortes sanitary sewer as necessary.

In accordance with MTCA, all cleanup actions conducted under MTCA shall comply with applicable state and federal laws [WAC 173-340-710(1)]. MTCA defines applicable state and federal laws to include legally applicable requirements and those requirements that are relevant and appropriate. Collectively, these requirements are referred to as applicable or relevant and appropriate requirements (ARARs). A discussion and comprehensive list of ARARs for cleanup actions at the Site is presented in Section 3.4. This cleanup action is exempt from the procedural requirements of Chapters 70.94, 70.95, 70.105, 77.55, 90.48, and 90.58 Revised Code of Washington (RCW) and of any laws requiring or authorizing local government permits or approvals, but must still comply with the substantive requirements of such permits or approvals. The primary regulations governing the soil and sediment cleanup actions are the MTCA cleanup regulation (Chapter 173-340 WAC) and the SMS (Chapter 173-204 WAC).

Permits and approvals that will be required for the sediment cleanup action include:

- SEPA determination
- Nationwide 38 or Section 10/404 permit from the USACE (appropriate permit to be determined by the USACE)
- Substantive requirements of the Section 401 Water Quality Certification (WQC) (substantive requirements achieved through coordination with Ecology)
- Hydraulic Project Approval (HPA) from Washington State Department of Fish and Wildlife (WDFW)
- Shoreline Substantial Development Permit Exemption from the City of Anacortes
- Permit to Discharge to the City of Anacortes sanitary sewer if necessary

7.2 Construction Documents

In order to detail the cleanup construction activities to be performed, construction documents and technical specifications/drawings will be prepared later in conformance with currently accepted engineering practices and WAC 173-340-400(4)(b), and will provide the following:

- A general description of the cleanup action, including work to be done, a summary of the Site environmental conditions, a summary of design criteria, an existing Site layout map, Site bathymetric survey information, and a copy of available permits and approvals;
- Detailed plans and specifications necessary for construction, material storage, construction waste storage and management, known utility locations within cleanup areas, surface drainage features, required materials, backfill, and change in grades;
- A description of construction controls (including air emissions, stormwater, traffic, and noise); and
- Construction documentation and reporting requirements.

Construction Quality Control will be conducted by the selected contractor daily, consistent with the requirements of the construction contract specifications for the cleanup action. Construction Quality Control will include the necessary elements to ensure that contaminated materials are properly handled in accordance with WAC 173-340-400(b),(c), and (9).

The plan for Construction Quality Control will be prepared in conjunction with the construction plans and specifications including the following:

- Adequacy of construction submittals;
- General construction methods and equipment;
- Field engineering and survey methods;
- Fill gradation, quality, and consistency;
- Suitability, quality, and installation of structural elements;
- Stormwater run-off and erosion measures;
- Decontamination procedures;

- Traffic controls;
- Contractor quality control methods and documentation; and
- As-built documentation of completed work.

Procedures to control and respond to spills will be incorporated into the construction plans and specifications. Waste materials most likely to be spilled during the Site cleanup action include equipment fuel and oil, or contaminated sediment. A spill prevention and pollution control (SPPC) plan will be prepared by the contractor to address procedures for handling and storage of hazardous materials used for construction purposes (e.g., fuel, oil, etc.), and for prevention and response to any hazardous material spills or accidental discharges.

The contractor's project construction plan will describe the overall sequence and construction methods that will be used to complete the cleanup action. The plan will include detailed procedures for controlling, collecting, handling, and disposal of residual contaminated sediment and debris, and any liquids generated during disposal operations. The equipment decontamination plan will provide design details for the contractor's equipment decontamination pad, including the pad dimensions; construction materials; and water collection, conveyance, and treatment systems. The contractor's stormwater management plan will provide construction details and operation procedures for collection, conveyance, and treatment/disposal of stormwater and construction water, and for installation and maintenance of TESC (Temporary Erosion and Sediment Control) measures during implementation of the cleanup action.

8.0 EXPECTED CLEANUP BENEFITS/IMPACTS AND MITIGATION MEASURES

This section summarizes likely impacts to marine habitat as a result of implementation of the Phase III cleanup construction activities and proposed mitigation to address those project impacts. It also describes the expected cleanup benefit to human health risk.

8.1 Expected Cleanup Benefit: Calculation of Human Health Risk after the Final Phase III Cleanup

As discussed previously, the implementation of Phase III will not achieve the established dioxin cleanup level (see Section 3.2) immediately. The remedy will require ENR processes to complete the restoration. However, based on data obtained from surface sediment two years after Phase II implementation (November 2016), the site-wide sediment dioxin concentrations can be area-weighted and compared to the cleanup levels to gauge the effectiveness in obtaining human health risk reduction.

Figure 8-1 presents dioxin concentration contours generated within GIS based on the data collected to date and discussed previously. Sampling density farther away from the Site decreases rapidly, requiring estimation of the concentration contours north of the jetty. Based on the data, the area-weighted average concentration for the study area at Custom Plywood is 7.89 ppt TEC.

Furthermore, if we were to apply the area-weighted average of the Phase II sediment concentration as measured in November 2016 (< 1 ppt TEC) to the area included in Phase III, the area-weighted dioxin concentration of the entire Custom Plywood Site would fall to 5.95 ppt TEC when final Phase III remedial actions are completed, as shown on Figure 8-2.

8.2 Project Impacts and Mitigation Measures

This section summarizes likely impacts to marine habitat as a result of implementation of the Phase III remedial construction activities and proposed mitigation to address these project impacts. The Phase III project includes the following major in-water construction elements that may cause impacts to aquatic habitat, or provide benefits to aquatic habitat that may help offset impacts:

- Subtidal sediment dredging and disposal to remove about 1,500 cy of contaminated sediment
- Backfilling dredged area with the clean materials (1-inch minus sandy gravel) to pre-dredging grades
- Thin layer capping over 10 acres with clean sand placed in thicknesses ranging from 2 inches to 8 inches
- Eelgrass mitigation

Remediation of additional contaminated sediment and placement of thin layer capping at the Site may have minor, short-term negative effects on subtidal habitat. In general, dredging, backfilling, and placement of thin layer capping activities will likely cause listed species to temporarily avoid the area. Associated construction disturbances created during in-water work by barges, tugs, and dredges will likely disturb any fish in the immediate vicinity and drive them away from the project Site. Resident fish may find refuge nearby, but migratory fish, including juvenile salmonids, will most likely move into other areas beyond the range of construction effects. Injury to fish during dredging, from contact with dredging equipment or entrapment during placement of clean backfill or thin layer material, is unlikely to occur because fish will avoid the project Site due to in-water construction disturbances.

Furthermore, few, if any, listed species are expected to be present during project construction because in-water activities will be scheduled outside the time periods when salmonids and forage fish migrate or spawn. Construction activities will be conducted during applicable in-water work windows for salmonids and forage fish as defined by National Oceanic and Atmospheric Administration (NOAA) Fisheries and U.S. Fish and Wildlife Service (USFWS), and will be specified in conditions of the Section 10/404 federal permit and the State HPA permit issued by the WDFW. Project construction will typically occur during daylight hours within the period established by the regulatory agencies (anticipated to be within a timeframe between July 15 to January 15) to limit disturbance to listed species that could potentially be in the project area during construction. A list of species and potential impacts caused by the proposed Phase III action will be estimated and integrated into the impact assessment for the BE and the JARPA.

Removal and isolation of contaminated sediment from the marine area of the Site is anticipated to have long-term beneficial effects on fish, bird, marine mammal, and aquatic invertebrate habitat and associated prey species. To complete aquatic remediation of this heavily impacted industrial site and access areas with elevated levels of hazardous substances, subtidal habitats will be impacted. The site is a high-priority cleanup site under the Toxics Cleanup Program – Puget Sound Initiative.

A number of best management practices (BMPs) will be employed during construction activities, including, but not limited to:

- Preventing overfilling of dredge bucket;
- Pausing bucket at water surface;
- Controlling rate of vertical lift;
- Not taking multiple bites of bottom sediment to achieve a full bucket;
- Implementing turbidity curtains and containment systems;
- Implementing turbidity controls/monitoring during all in-water activities to prevent particulate materials from the construction from entering the bay or migrating from dredging areas;
- Working during appropriate tides (likely high tides for dredging and low/high tides for capping to accommodate barges and vessels);
- Preventing grounding of any parts (anchoring or spud-down) of the construction barge during low tides in areas of eelgrass to avoid the impact to existing eelgrass;

- Preventing deploying spuds in areas of eelgrass;
- Placement of clean and washed capping material in a manner that minimizes localized turbidity; and
- Implementing appropriate water management practices, such as draining of dredged material either on the barge before loading for off-site transport, or in an on-site upland containment cell (to be further specified during project design).

Measures will be taken to ensure that contaminated material does not return to Fidalgo Bay by employing sideboards and scuppers on the barge. An expanded description of avoidance and minimization measures and BMPs will be provided in the Biological Evaluation (BE) and Conservation Measures and Monitoring Plan (CMMP) for this project.

An Eelgrass Mitigation and Monitoring Plan is being developed for areas where eelgrass is present within the dredging footprint. Eelgrass will be transplanted from the impact footprint to a new mitigation area located adjacent to an existing 2014 eelgrass mitigation area developed during Phase II of the project. A separate Eelgrass Thin-layer Capping Monitoring and Adaptive Management Plan is being prepared for areas containing eelgrass that are proposed for thin-layer capping. This Plan will describe placement methods, areas and sequencing, and monitoring to evaluate the health of the capped eelgrass. A summary of net habitat benefit is presented in the BE. The CMMP includes a description of avoidance and minimization measures and BMPs.

Post remediation, the affected environments are expected to demonstrate a net increase in function by applying a watershed approach and incorporating known habitat restoration/enhancement needs for Fidalgo Bay. In addition to the habitat improvements provided as part of Phase II cleanup activities, 20,000 sf (0.46 acre) of eelgrass will be transplanted to previously remediated areas and adjacent to an existing 2014 eelgrass mitigation area to compensate for eelgrass habitat impacted by Phase III dredging.

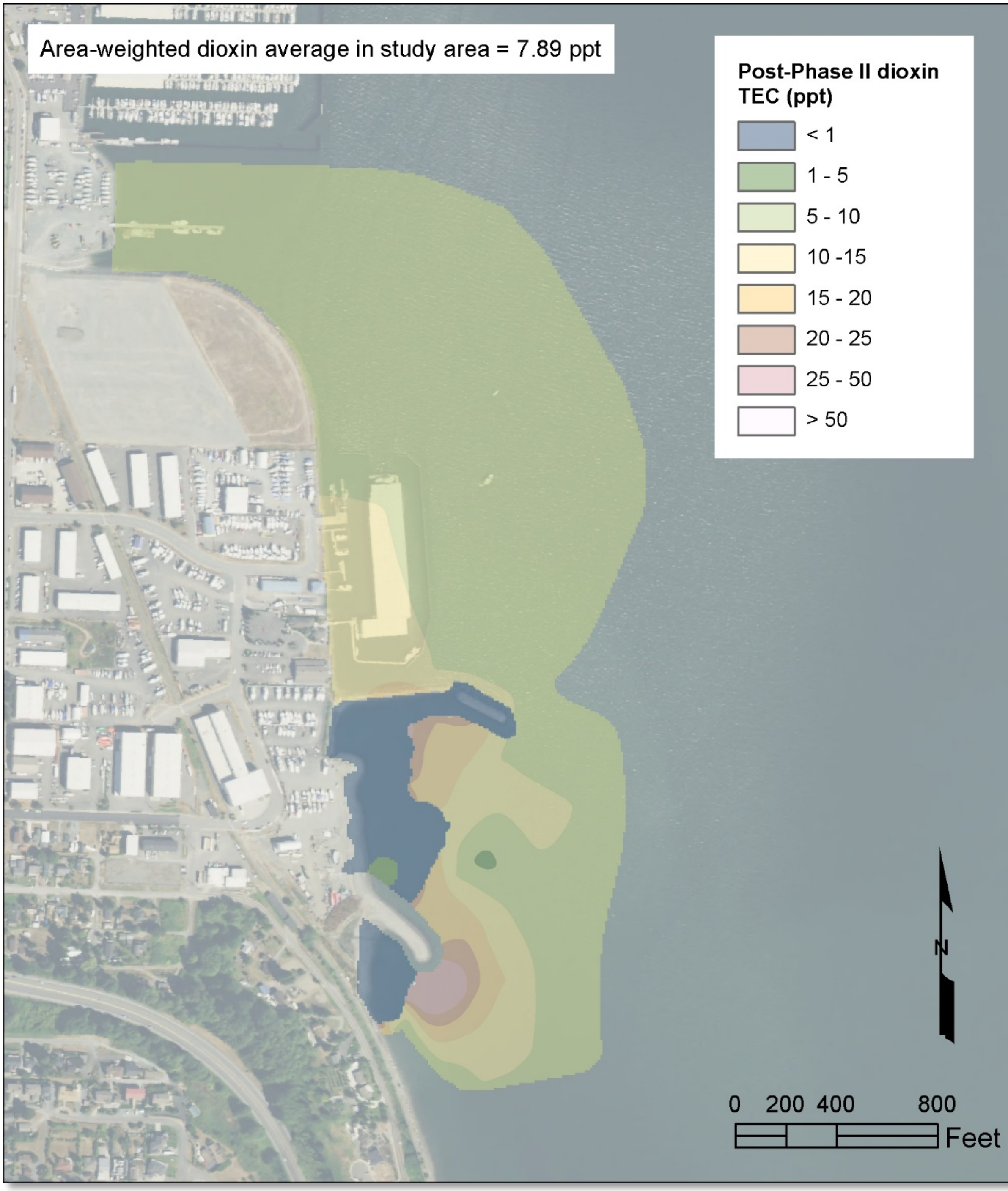


Figure 8-1 Area-weighted dioxin concentration after Phase II Remediation

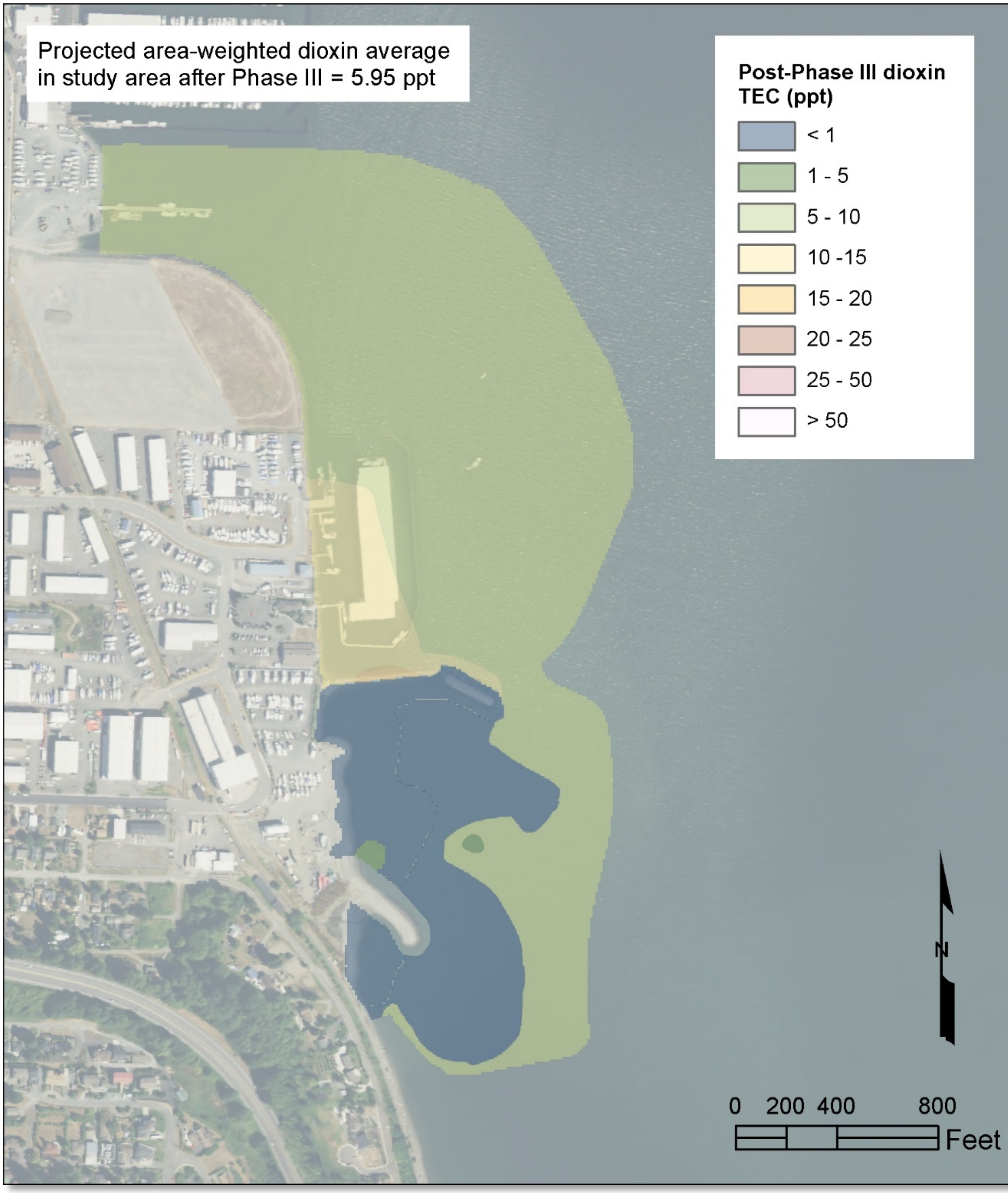


Figure 8-2 Projected area-weighted dioxin concentration after Phase III

9.0 COMPLIANCE MONITORING PLAN

Compliance monitoring will be implemented in accordance with WAC 173-340-410 and will include:

- **Protection Monitoring** to confirm that human health and the environment are adequately protected during construction of the cleanup action;
- **Performance Monitoring** to confirm that the cleanup action has attained cleanup levels and/or other performance standards; and
- **Confirmation Monitoring** to confirm the long-term effectiveness of the cleanup action once performance standards have been obtained.

The objective of compliance monitoring is to confirm that cleanup objectives have been achieved, and to confirm the long-term effectiveness of remedial actions at the Site. A detailed OMMP will be developed to describe planned monitoring and discuss the duration and frequency of monitoring activities, the trigger for contingency response actions, and the rationale for terminating monitoring. Remedy performance criteria, quality assurance (QA) activities, documentation requirements, and potential corrective actions will be developed during the design phase preparation of project plans and specifications.

9.1 Protection Monitoring

Requisite protection monitoring will be performed as a construction health and safety element in accordance with WAC 173-340-410(1)(a). A health and safety plan will also be developed for long-term operation, maintenance, and monitoring of the remedy.

9.2 Performance Monitoring During Field Construction

Performance monitoring (WAC 173-340-410(1)(b)) is intended to assure that a remedial action has attained cleanup standards (including MTCA and SMS criteria) or other performance standards such as construction quality control measurements, permit conditions, or substantive requirements of other laws.

Required contractor performance monitoring will be specified in the construction plans and specifications. Typical contractor requirements will include topographic elevation surveys or similar grade control measures to verify that the design grades and elevations have been achieved.

Performance monitoring following sediment excavation and dredging will begin with topographic elevation surveys or similar grade control measures to verify that the design grades and elevations have been achieved. Sediment samples will be collected and analyzed from the base of the excavation and dredge prism to document the concentration of COCs that remain on the Site, if any. The excavation and dredge prism will be observed to determine the extent of remaining wood waste, if present. Related monitoring and documentation includes verifying the chemical quality of imported backfill material, placing the backfill to match existing grade, and establishing nominal compaction requirements during the design phase. Performance monitoring will be required to document construction of the caps. Monitoring will include demonstrating that the required areal coverage has been met and that appropriate cap thickness has been achieved. Remedy performance criteria, QA activities, documentation requirements, and potential corrective actions will be developed during the preparation of project plans and specifications in the design phase.

9.3 Confirmation Monitoring Post Construction

Confirmation monitoring (WAC 173-340-410(1)(c)) is a component of compliance monitoring intended to demonstrate the long-term effectiveness of the remedial action once cleanup levels or other performance standards have been attained. Specific details for post-construction monitoring will be developed in an OMMP following design phase preparation of project plans and specifications. Anticipated monitoring elements of the OMMP are summarized in Section 8.2.

Related post-construction monitoring activities include annual inspections of the work area to verify that erosion or other potentially adverse conditions are not damaging the remedy. Additionally, it is anticipated that post construction monitoring will be required to verify that eelgrass habitat has not been negatively affected during installation of the cap. This effort will be developed as part of the permitting process and negotiated with various Federal and State stakeholders.

9.4 Contingency Beach and Shellfish Bed Closure

Although this measure is not expected to be needed, the Skagit County Public Health Department/Samish Tribe will be alerted and consulted regarding the potential need for closure of adjacent beach areas and nearby shellfish beds during the intertidal remediation work. Potential beach and shellfish bed closure would be triggered by a release of contaminants during construction that pose potential human exposure risks.

10.0 GENERAL APPROACH FOR THE OPERATION, MAINTENANCE, AND MONITORING PLAN, AND FUTURE SEA LEVEL RISE

The overall OMMP approach is intended to address technical guidance and regulatory requirements to assure effective operations following remedial activities (WAC 173-340-400). Further OMMP details will be developed during the project design phase to describe planned monitoring and discuss the duration and frequency of monitoring activities, the trigger for contingency response actions, and the rationale for terminating monitoring.

Additional OMMP details will establish:

- Monitoring and inspection activities, sampling and testing parameters and protocols, and frequency;
- Appropriate acceptance criteria including MTCA/SMS criteria, physical parameters, and other functional criteria;
- Threshold triggering criteria/levels and early warning levels;
- Potential corrective and contingency response actions; and
- Reporting requirements.

An additional consideration raised during earlier project review is long-term protection of upland areas of the Site from expected sea level rise over the coming decades. Upland surface elevations at the Site are at or just above current sea level and may be susceptible to inundation by a rising sea level. The OMMP will include an adaptive approach to identify and evaluate additional surface protection features that could be needed to prevent wave erosion. Backfilled excavation and dredging areas provide an inherent protective layer to prevent exposure of residual contaminated sediment that might remain at depth; however, supplemental surface vegetation, paving, or other armoring may be needed to provide further protection.

11.0 ECOLOGY PERIODIC REVIEWS AND INSTITUTIONAL CONTROLS

Periodic reviews will be conducted by Ecology to assess post-cleanup site conditions and monitoring data in accordance with requirements of WAC 173-340-420 to assure that human health and the environment are adequately protected. Results of groundwater monitoring and other inspection and monitoring data obtained pursuant to the OMMP and other activities will be reviewed at a minimum of every five years. The overall efficacy and progress of remediation may be assessed at more frequent intervals, such as following annual monitoring. Notice of periodic reviews for public comment will be provided as deemed necessary.

Several review criteria are listed under WAC 173-340-420 to evaluate overall remedy effectiveness including engineered and institutional controls, new scientific information regarding hazardous substances, and new legal and regulatory requirements. These review criteria further consider site and resource use, availability and practicability of more permanent remedies, and new and improved analytical techniques.

These review findings will be used to assess the OMMP strategies, determine whether modifications are appropriate, and/or identify potential corrective actions. The scope and breadth of revisions to the OMMP, and potentially to this CAP/EDR, will be determined based on results of the periodic reviews.

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