

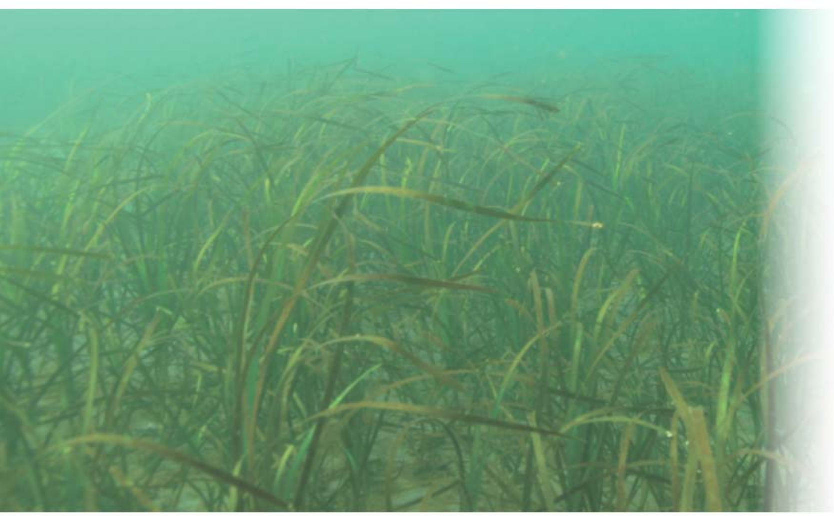
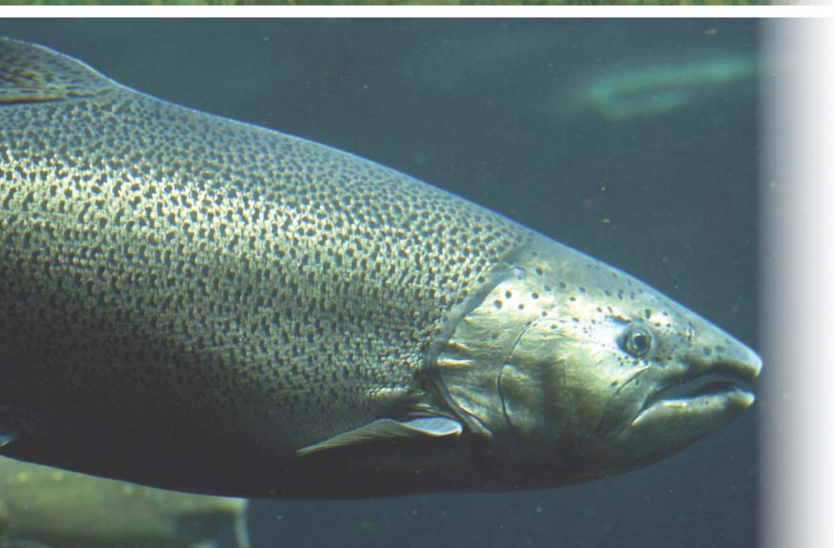

Final Conservation Measures and Monitoring Plan Custom Plywood Interim Action Phase II Anacortes, Washington

Prepared for
Washington State Department of Ecology Toxics Cleanup Program

August 15, 2012
17800-27

HARTCROWSER

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INTRODUCTION

The Washington State Department of Ecology (Ecology) Toxics Cleanup Program (TCP) is proposing to complete an interim remedial action for in-water portions of the Custom Plywood site located on Fidalgo Bay in Anacortes, Washington. The biological evaluation (BE) prepared for the project concluded the following determination of effects for ESA-listed species:

- May affect but is not likely to adversely affect Chinook salmon (*Oncorhynchus tshawytscha*), bull trout (*Salvelinus confluentus*), or their designated critical habitat.
- May affect but is not likely to adversely affect steelhead trout (*O. mykiss*).
- Will not affect Pacific eulachon (*Thaleichthys pacificus*).
- May affect but is not likely to adversely affect marbled murrelet (*Brachyramphus marmoratus*).
- Will not affect bocaccio (*Sebastes paucispinis*), canary rockfish (*Sebastes pinniger*)or yelloweye rockfish (*Sebastes ruberrimus*).
- Will not affect southern resident killer whale (*Orcinus orca*).
- Will not affect humback whale (*Megaptera novaeangliae*).
- Will not affect Steller sea lion (*Eumetopias jubatus*).
- Will not affect sea turtles.

The BE also concluded that the project will have more than minimal but less than substantial effects for short-term construction activities and will have positive long-term effects on essential fish habitat (EFH) (Hart Crowser 2012). These determinations of effects are dependent upon the implementation of several proposed conservation measures designed to offset the unavoidable losses and disturbances to marine habitat function that would result from project completion.

TCP has therefore prepared this Conservation Measures and Monitoring Plan (CMMP) to summarize potential impacts and describe and analyze the proposed conservation measures that will be implemented to offset unavoidable adverse impacts to important marine resources, especially those habitats for salmonids listed under the Endangered Species Act (ESA).

PROJECT DESCRIPTION

Location

The project is located in Anacortes, Washington, in Section 30 of Township 35 North, Range 2 East (Figure 1). The "project area" where proposed activities are planned is approximately 23 acres in size. The project area includes the area between approximately ordinary high water (OHW) and –6 feet mean lower low water (MLLW) and areas north of the site at the existing jetty owned by the City of Anacortes. The "action area," where direct or indirect effects of the proposed action may occur, is defined as a 1-kilometer radius around the project area (Figure 1).

Interim Action Phase II

The TCP proposes to complete an interim remedial action to clean up the in-water portions of the former Custom Plywood site in the City of Anacortes. Phase II of this project includes excavation[1], dredging, and backfilling to remediate contaminated soils/sediments comprised of mainly sawdust, dioxin contamination, and wood debris along the shoreline and within intertidal and subtidal areas of the property. In addition, two protective features, including an extension of the existing jetty and creation of a spit, have been designed to protect site remediation and habitat improvements from wind and wave action. Habitat enhancements have also been incorporated into the remedial design of Phase II and include softening of the existing jetty to create forage fish spawning habitat, creation of forage fish spawning habitat and edge habitat on the protective spit, removal of a bulkhead, in-water structures, and pilings; restoration of the shoreline; and restoration of wetland and buffer functions. These actions will improve habitat for juvenile salmonids, forage fish, shorebirds and waterfowl, benthic organisms, and other marine species on and adjacent to the site.

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[1] Excavation technologies are commonly conducted after water is diverted or drained. Whereas dredging technologies are conducted while it is submerged per US EPA's common term. Refer to Chapter 6, Contaminated Sediment Remediation Guidance for Hazardous Waste Sites, EPA-540-R-05-012, December 2005.

Jetty extension and softening – The jetty extension is a protective feature for remediation activities as an alternative to hard armoring (located on the northern portion of the site) (Figures 2, 3, 6 and 7). The jetty extension allows for placement of a smaller, stable particle size (2 to 3 inches) due to the predominant wind/wave energy from the north. The smaller particle size will support foraging habitat for migrating juvenile salmon. A breach between the existing jetty and jetty extension will maintain the existing salmonid migratory pathway. The shoreward side of the existing jetty and eastern pocket beach located immediately north of the property will be enhanced (softened) with a sandy substrate suitable for forage fish spawning habitat and to support epibenthic crustaceans and other fauna beneficial to foraging juvenile salmonids.

Protective spit – The spit is a protective feature for remediation activities (southern portion of the site) (Figures 2, 4, and 5). The spit will serve as a cap of low-level contaminated intertidal sediment, protect the beach face on the southern portion of the site from erosive wave action, protect the wetland mitigation area, improve aquatic habitat, and increase edge, foraging, and spawning habitat. The top of the spit will feature an 8-foot-wide bench, and the shoreward face of the spit includes a sandy substrate suitable for forage fish spawning habitat at appropriate elevations that will also support juvenile salmonid food sources.

Existing bulkhead replacement protective feature – Creation of a new bulkhead will act as a protective feature at the northern property boundary effectively replacing the existing and degraded bulkhead (Figures 3 and 9). This feature will reduce erosion of the northern shoreline while occupying a smaller footprint than the existing bulkhead, and will transition into the pocket beach softening to the north and shoreline restoration/softshore armoring south of this feature.

Bank stabilization/Softshore armoring – A surface layer of graded sand and rounded gravel habitat material 2 to 3 inches in size and smaller will be placed in the 50-foot shoreline cleanup zone (intertidal and shallow subtidal areas totaling approximately 1.7 acres) to support forage fish spawning habitat along the property shoreline (Figures 2, 3, 4 and 8). A minimum of 6 inches of material will be placed between +5 and +8 MHHW to provide suitable substrate for forage fish spawning. Dunegrass will be planted along the OHW line of the property shoreline to provide erosion control and increase backshore habitat.

Beach restoration and recontouring – Excavation of the beach and upper intertidal areas with dioxin/furan concentrations between 10 and 25 parts per trillion (ppt) within the 50-foot shoreline cleanup zone will remove contaminated sediment and wood waste from the aquatic environment, reducing negative impacts to human health and the environment (Figures 2, 3, 4 and 8). This area covers approximately 1.7 acres. The backfilled and recontoured beach will provide forage fish spawning habitat and improve juvenile salmonid habitat by providing a clean and suitable substrate while attenuating wind and wave action.

Removal of in-water structures and pilings – Concrete structures including the northern bulkhead, L-shaped pier (approximately 13,000 square feet [sf]), and smaller concrete structures along with industrial debris and rubble (bricks, metal, and concrete) will be removed as part of remediation activities and to improve habitat function of the affected project area (Figure 2). Approximately 1,100 derelict wooden piles occupying approximately 1,674 sf will also be removed from the intertidal and subtidal aquatic remediation area.

Wetland mitigation area – This area provides mitigation for impacted freshwater and estuarine wetlands altered as part of Phase I (Wetlands A, B, C and D) and Phase II (Wetland E and shoreline wetlands) site remediation activities (Figures 2, 4, 10, and 11). The mitigation area restores and consolidates smaller individual wetlands, providing higher quality habitat. The wetland buffer, which ranges from 50 to 75 feet, was planted with native trees, shrubs, and backshore vegetation in 2011 during the Phase I cleanup action. The wetland will be planted with salvaged and newly acquired native saltmarsh vegetation during Phase II.

Dredging – Dredging in the project area will remediate high levels (greater than 25 ppt) of dioxin/furan contamination by removal of existing sediment and associated wood waste to a depth that reaches native material (assumed up to about 6 feet below grade). Remaining locations where wood waste is greater than 1 foot thick will be dredged to a maximum depth of 2 feet below grade. All of these areas will be backfilled with clean material optimized for remediation performance and habitat protection (Figures 2 and 12). Dredging will be conducted over an area of approximately 5.3 acres of intertidal/subtidal habitat.

Eelgrass advanced plantings – Approximately 2,000 sf of eelgrass habitat will be transplanted in remediated areas that presently do not support eelgrass (Figures 2 and 12). After remediation, these areas will likely naturally recolonize with eelgrass. This advanced planting will help facilitate and enhance the recolonization of these areas to promote rapid recovery of the biology post-remediation.

Remediation performance monitoring will be conducted for a minimum of 10 years after remediation is completed. The goal of this monitoring is to evaluate the remediation goals of the project for contamination reduction and shoreline protection. This monitoring is separate from mitigation/habitat performance monitoring.

A detailed description of the interim action is provided in the BE.

BASELINE CONDITIONS

The project site is the former location of a plywood mill on the western shoreline of Fidalgo Bay. Past lumber milling and plywood operations took place at the site for over 100 years, which resulted in the placement of copious amounts of wood waste and fill throughout the site. These activities produced wood waste and chemical contaminants affecting site soils, groundwater, and sediments (AMEC 2011).

The shoreline cleanup zone (OHW line at +9.2 feet to approximately +3 to +4 feet MLLW) and intertidal/subtidal zone (+4 feet to –6feet MLLW) of the property contain industrial debris (bricks, concrete), milling by-products (sawdust and wood cuttings), and significant quantities of naturally occurring wood waste. Active erosion is occurring along the southern and central portions of the property where storms and long-period waves have locally destabilized the shoreline. A failing bulkhead is located near the northern property boundary. The southernmost tip of the property is armored with riprap, which extends off site to the south. Unmapped estuarine wetlands are present and were observed among industrial debris along the southern portion of the property near the wetland mitigation area.

The existing marine intertidal and subtidal habitat and associated species are described in detail in the BE.

Structural Modifications

Extensive shoreline modifications have greatly reduced sediment input to the shorelines of the bay, resulting in sediment-starved beaches and inadequate replenishment of depositional landforms (Johannessen 2007). Few natural sediment sources are left along the drift sectors influencing the bay (WDNR 2008).

Riprap, concrete structures, a bulkhead, and debris comprise the northern and central portions of the shoreline at the project site. The northern portion of the site beginning at the existing jetty is heavily armored with riprap and a vertical bulkhead with much of the remaining site armored with cement rubble. Except for the vertical bulkhead which juts into the lower intertidal zone, most of the armoring is limited to the upper intertidal zone above +8 feet MLLW. However, loose rubble, debris, rocks, and wood waste often extend into middle and lower reaches of the intertidal zone. Rubble and debris are also present within the southern portion of the site, but in lesser quantities than in the northern and central portions of the project area.

Approximately 1,100 abandoned creosote-treated piles and several derelict in- and overwater structures are present throughout the site. On the southern end of the site, a small area of unarmored and undercut shoreline is present just below the ordinary high water mark.

Estuarine wetlands—natural (Wetland E and shoreline wetlands) and created (consolidated wetland mitigation area)—are present on the site. Wetland E is a natural saltmarsh of approximately 1,400 sf. Additionally, small patches of estuarine wetland are also present along the shoreline of the site. A wetland mitigation area was created in 2011 by consolidating and restoring former wetlands located in the upland portion of the property. A 50- to 75-foot vegetated buffer surrounds the consolidated wetland mitigation area, which occupies approximately 12,000 sf. A temporary rock berm presently separates the wetland from the nearshore; the berm will be removed once Phase II sediment cleanup activities are completed to provide a hydrologic connection to the intertidal zone.

Water Quality

Fidalgo Bay is well-mixed vertically with temperatures, salinity, and dissolved oxygen measurements similar to regional values (Antrim et al. 2003). The waters of Fidalgo Bay are classified as excellent (Class A; WAC 173-201A-140).

Stormwater runoff is predominantly urban (City of Anacortes) and rural non-point sources, small creeks, and outfalls (WDNR 2008). Aerial photographs of Fidalgo Bay show extensive turbidity throughout the bay; turbidity has been a key indicator parameter for numerous water quality studies in the bay by the Samish Tribe, Washington Department of National Resources (WDNR), Skagit County, and others (Berry et al. 2003, Skagit County MRC 2007). Turbidity is likely a regular, year-round water quality characteristic in the action area based on its shallow depth, warm summer temperatures, exposure to northerly and southerly winds, proximity to upland drainage through urban and agricultural land, and proximity to the depositional area between drift cells that forms the southern half of Fidalgo Bay.

Sediments

Sediment quality in northern Fidalgo Bay demonstrates a range of impairment along the City of Anacortes shoreline. Samples collected in 2010 and 2011 identified dioxins and furans as the primary contaminants of concern in aquatic sediments in the action area; PCBs and wood waste are present in other areas within the cleanup boundary. In general, previous studies have demonstrated elevated dioxin concentrations within the project area. These elevated concentrations are associated with nearshore accumulations of wood waste; concentrations tend to decrease with distance from the shore and historical land use footprints.

Dioxins, furans, and PCBs are persistent and bioaccumulative chemical compounds that appear to transfer easily into Pacific herring, presumably from exposure to contaminated food, sediment, and water. Food (i.e., epibenthic zooplankton and benthic macroinvertebrate ova) is considered the most significant pathway, followed by suspended sediment (Stout et al. 2001, West et al. 2008) and water (Payne et al. 2001, West et al. 2008). ESA-listed marine species that consume herring—as eggs, juveniles, or adults—are Chinook salmon, steelhead, bull trout, marbled murrelet, humpback whale, juvenile rockfish, and Steller sea lion.

Thick deposits of sawdust, mill ends, and other wood waste fill were also found near former overwater structures associated with former site operations, and accumulations exceed 6 feet in places. Wood waste can adversely affect benthic habitat by its presence in the biologically active zone and by potentially lowering sediment redox potential during degradation, which helps facilitate the production of sulfide, ammonia, phenols, and related degradation products. These by-products are harmful to marine biota and have been noted at the site.

Fish and Wildlife

The Fidalgo Bay shoreline is within the migratory corridor of juvenile Chinook, coho (*O. kisutch*), and pink salmon (*O. gorbuscha*). These salmonids have largely unrestricted access to the action area and likely originate from the Skagit River and other river systems in northern Puget Sound. The extensive shallow water habitats in Fidalgo Bay provide a variety of key ecological functions for juvenile salmon, including refuge and foraging (WDFW 2004).

Other fish species likely to occur or known to occur in the project area include Starry flounder (*Platichthys stellatus*), English sole (*Parophrys vetulus*), and Pacific staghorn (*Leptocottus armatus*) in addition to other groundfish and coastal pelagic fish typically found along Puget Sound shorelines.

Forage fish, including Pacific herring, surf smelt, and sand lance, are known to utilize habitats within Fidalgo Bay. According to Salmonscape, the GIS database maintained by WDFW, Pacific herring and surf smelt spawn along beaches and within eelgrass beds in the project area. More specifically, the Fidalgo Bay stock of Pacific herring spawn throughout eelgrass habitat within the project and action areas. Spawn timing is from mid-January through mid-April with peak spawning occurring from late February through early March. Surf smelt also spawn throughout the project area over a wide period extending from June through March. A recent site visit (March 14, 2012) showed that these habitats may be limited within the highly altered upper intertidal zone of the project area. Limited areas of clean sand and gravels suitable for spawning forage fish are present, but the majority of the upper intertidal beach is covered with rubble.

Fidalgo Bay supports a variety of shellfish including Dungeness crab and hardshell clams. Dungeness crab are widely distributed throughout Fidalgo Bay, while hardshell clams such as littleneck clam (*Protothaca staminea*), manila clam (*Tapes japonica*) and cockles (*Clinocardium nuttalli*) are primarily found in intertidal areas.

Fidalgo Bay supports a wide variety of bird species including Pacific brant (*Branta bernicla nigricans*), bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus*), and blue heron (*Ardea Herodias*). Also, many species of shorebirds feed and rest in the exposed tideflats and salt marshes of Fidalgo Bay (WDFW 2004).

Harbor seals are known to frequent Fidalgo Bay, as haulout sites are used year round as resting sites and nursery areas from June through August (WDFW 2004). Other marine mammals, such as sea lions and whales, are not known to frequent the area, likely due to the shallow nature of the bay.

Habitat

The commercial and industrial area to the north of the project site includes marinas and other commercial and industrial uses. South of the project site, the shoreline is armored with riprap and currently supports the Tommy Thompson Trail, a recreational trail on the former railroad grade.

The subtidal and intertidal portions of the project area generally have gentle slopes of natural substrates except for a bulkhead on the northern portion of the site. Sediments in the intertidal areas from about OHW to MHHW are composed of primarily riprap and concrete rubble. Below the toe of armoring, beach substrates are composed of natural coarse gravels and sands, with a substantial amount of cobbles, broken concrete, brick, rubble, and wood waste extending to middle reaches of the intertidal zone. Subtidal substrates are primarily mud and wood waste.

Fidalgo Bay experiences a semi-diurnal tidal cycle, with a mean range of 5 feet (National Ocean Survey Tide Tables), and weak tidal currents. Shallow depths and large tide ranges drive water movement in the bay. Although both flood and ebb tidal currents usually create a weak clockwise eddy in Fidalgo Bay, net shore drift along the Custom Plywood shoreline is southward.

Despite extensive shoreline and substrate alteration throughout much of the proposed cleanup area, the nearshore supports an extensive area of eelgrass. Approximately 21 acres of eelgrass habitat occurs in vicinity of the project area (Figure 2), and the Custom Plywood remediation site is located near and encompasses a portion of the larger Fidalgo Bay eelgrass bed. Eelgrass surveys conducted by Hart Crowser in 2011 show a near continuous band of eelgrass situated between –2 and –5 feet MLLW. These surveys show a break in the near continuous band in the northern portion of the project area (Figures 3 and 4). Eelgrass habitat supports a complex food web that constitutes the majority of the diet of juvenile salmonids, herring, smelts, and flatfishes (Naiman and Sibert 1979; Simenstad et al. 1980, 1988; D'Amours 1987; Thom et al. 1989; Webb 1989; Simenstad and Cordell 1992; and Wyllie-Echeverria et al. 1995). Eelgrass also provides a substrate for growth of epiphytic algae and a closely linked epibenthic invertebrate community, and reduces wave energy, allowing the deposition of fine sediment and detritus, further supporting a complex food web for aquatic species. Other marine plant species observed in the upper intertidal and subtidal habitats include rockweed (*Fucus* spp.), macroalgae (*Ulva* spp.), cyanobacteria, and reducing bacteria (likely *Beggiatoa* spp.).

AVOIDANCE AND MINIMIZATION

The proposed cleanup project represents an optimized design to avoid or minimize the overall impacts to ESA-listed species as well as other important marine resources. Several aspects of the project have been designed to avoid or minimize the potential for impacts from remedial activities.

Habitat gains, losses, and areas of habitat enhancements have been calculated and are presented in Table 1. The only loss of marine waters of the United States will occur with the construction of the jetty extension and filling of estuarine Wetland E. Lost marine waters below OHW will total approximately 5,079 square feet. The consolidation of individual wetlands into a single estuarine wetland during Phase I and connection of this wetland to Fidalgo Bay during Phase II will add approximately 12,000 sf of marine waters below OHW. An additional 1,674 sf of marine waters will be gained by the removal of approximately 1,100 derelict creosote-treated piles for a total gain of 8,595 sf of marine waters of the United States (Table 1). A 50- to 75-foot buffer of indigenous riparian vegetation was also planted around the consolidated wetland mitigation area in 2011 as part of Phase I cleanup activities. This enhanced area will provide highly productive nearshore habitat for juvenile salmonids.

Proposed softening of intertidal portions of the existing jetty and creation of the new spit will enhance over 69,500 sf of intertidal habitat for juvenile salmon and nearly 16,000 sf for spawning forage fish. Recreating the intertidal shore after contaminated sediment and debris removal will enhance an additional 47,500 sf of juvenile salmon habitat and 9,500 sf of forage fish spawning habitat. The removal of approximately 1,100 creosote-treated piles will remove an additional source of contamination and add over 1,600 sf of epibenthic and benthic habitat to the nearshore (Table 1).

All materials placed in contact with water will be non-toxic to fish, aquatic organisms, and the environment.

Work Windows

All proposed activities will occur within prescribed work windows designated by the US Army Corps of Engineers (USACE) to protect ESA-listed fish species present in the project area. The USACE has also designated work windows to protect intertidal spawning areas for three species of forage fish, of which the surf smelt and Pacific herring have been documented to spawn in or adjacent to the project area.

The following work windows apply:

- Salmon: July 2 to March 2;
- Bull trout: July 16 to February 15;
- Surf smelt: Year round; and
- Pacific herring: April 15 to January 31.

This provides an allowable in-water work period of July 16 to January 31.

Prior to the closing of the forage fish work window, a fisheries biologist, certified by WDFW's forage fish program, will conduct forage fish spawning surveys in the project area to define the temporal and areal boundaries of forage fish spawning in or near the project area. These surveys will be used to extend the work window to February 15, as feasible, while minimizing disruption of spawning fish activities during construction periods.

IMPACT ASSESSMENT

Goals and Objectives

The goal of the project is to incorporate sufficient conservation measures to cleanup, protect, restore, and enhance beach, intertidal and subtidal habitats, eelgrass habitat, wetland habitat, and ecological functions to fully restore or offset unavoidable impacts of remedial action construction. Specific objectives of the project to enhance habitat are as follows:

- Expand and restore the shallow water migratory corridor and rearing habitat for juvenile salmonids at all tidal elevations through removal of contaminated sediment as well as in and overwater structures. Excavate/dredge contaminated sediments covering 7.1 acres (1.8 acres in the shoreline cleanup zone/intertidal zone and 5.3 acres of subtidal zone) and backfill with clean sediment. Remove 1,100 creosote-treated piles (1,674 sf), derelict structures (bulkhead, L-shaped pier, and smaller concrete structures), and debris (concrete, metal, and brick) over an area of 14,500 sf.

- Enhance approximately 1,770 linear feet of shoreline habitat between elevations of –5 and +8.5 feet MLLW with suitable substrates and/or grading to allow forage fish spawning. Areas to receive these enhancements range from 29,000 sf (0.7 acres) to 1.7 acres and include the main shoreline of the property, the inner portion of the protective spit, the existing jetty, and a pocket beach located immediately north of the Custom Plywood site.

- Protect eelgrass habitat through advanced plantings (2,000 sf), avoiding eelgrass beds where possible, to achieve no net long-term loss of eelgrass.

- Increase backshore function by planting native vegetation above the upper beach and along the OHW line of the main shoreline. The area to receive these enhancements will be approximately 5,440 sf (0.1 acres).

- Hydrologically connect the consolidated wetland mitigation area to Fidalgo Bay to improve juvenile salmonid habitat and compensate for unavoidable wetland losses as a result of site remediation activities. This area consists of approximately 12,000 sf of wetland habitat and includes a vegetated buffer ranging from 50 to 75 feet.

Impact Summary

A detailed impact assessment is provided in the BE and summarized here. Project construction activities may result in the following alterations/impacts to the nearshore environment:

- Excavation/backfill activities within the shoreline cleanup zone (approximately 50 feet waterward of OHW) are likely to cause in-air and in-water noise (not above ambient background noise), elevated turbidity in the immediate vicinity of construction activities, and temporary displacement of epibenthic/benthic communities.

- Excavation/dredging and associated backfill activities within intertidal and subtidal habitats are likely to cause in-air and in-water noise (not above ambient background noise), elevated turbidity in the immediate vicinity of construction activities, and temporary displacement of epibenthic/benthic communities.

- Structure and piling removal activities along the shoreline and within intertidal and subtidal habitats are likely to cause in-air and in-water noise (not above ambient background noise) and elevated turbidity in the immediate vicinity of construction activities.

- Construction of the in-water protective features (protective spit and jetty extension) will likely cause in-air and in-water noise (not above ambient background noise), elevated turbidity in the immediate vicinity of construction activities, and temporary displacement of epibenthic/benthic communities. Construction of these features may also displace very small areas of eelgrass habitat that were noted in the area in 2011. This will be verified during installation.

The impacts mentioned above will likely cause short-term, temporary, and highly localized disturbances to waterfowl, fish fauna, benthic species, marine mammals, and their associated habitats during construction activities.

Proposed Conservation Measures

To ensure that the project results in a net gain of nearshore habitat function for juvenile salmonids or other important marine species, the TCP proposes to restore and enhance beach and littoral habitats in the project area. These actions are an integral part of the cleanup project and are included to offset unavoidable losses in habitat function associated with the facility. All in-water work will occur during agency-approved work windows for forage fish, juvenile salmonids, and bull trout. This project will be utilizing the most stringent work window available to cover documented forage fish occurrence and spawning within the project site earlier in the year. This window is from July 16 to January 31. If needed, the project may petition WDFW to extend the work window past January 31 based on the results of spawning surveys on the site. The following conservation measures are also proposed to avoid construction impacts or enhance the nearshore habitat:

Wetland Restoration and Shoreline Revegetation

The riparian or buffer zone surrounding the consolidated wetland mitigation area was revegetated with native trees, shrubs, groundcovers, and backshore vegetation in 2011 as part of Phase I cleanup activities. As part of Phase II, the consolidated wetland will be planted with a combination of salvaged vegetation from Wetland E, shoreline wetlands, and newly acquired native saltmarsh vegetation.

During Phase II, the upper beach along the OHW line will be revegetated with dunegrass (*Leymus mollis*), a native backshore plant indigenous to the Puget Sound region. It is expected that other native backshore species will also colonize the area, such as beach pea, gumweed, and other backshore plants. This vegetation will reduce the potential for erosion of the upper beach and provide habitat for wildlife, particularly shorebirds that use the Custom Plywood site on a permanent to seasonal basis.

Forage fish monitoring

The project area is located in or near documented forage fish spawning areas, and thus limited to a January 31 inwater work period closure. Permission to extend in-water work past this date could be granted by WDFW, should no forage fish activity be documented in the area. Therefore, a forage fish monitoring program would be implemented during inwater remediation activities that extend past January 31 to verify that no spawning activity is occurring along shorelines that are being actively remediated.

Eelgrass Advanced Plantings

Advanced Plantings

As previously mentioned, small patches of eelgrass may be impacted during construction of the remediation protective features (jetty extension and spit) which will be verified during construction. To ensure that no temporal loss of eelgrass productivity occurs, advanced eelgrass plantings will be installed adjacent to the larger continuous bed on the Custom Plywood site. This planting will be conducted following the issuance of project permits and remediation of the proposed planting area for wood waste accumulation.

The advanced planting area will be within the appropriate depth range and will have the proper substrate for eelgrass (medium to fine sand), but lack present eelgrass beds due to existing wood waste contamination. The donor sites will also be identified during the pre-construction baseline survey as areas that have healthy and reasonably dense populations of eelgrass, are at a depth similar to that at the respective transplant sites, and are removed from the area of potential project impact. Harvest of donor materials will be limited to a reduction of overall donor bed shoot density of less than 5 percent.

Best Management Practices

In addition to the above conservation measures, a variety of best management practices (BMPs) will be employed to reduce the potential for construction-related impacts on listed species and their habitats. All Ecology-required BMPs and spill controls will be used during construction to minimize the possibility of release of petroleum products and construction debris, and to ensure efficient removal of contaminated sediment.

The following construction-related BMPs will be incorporated into the design of the interim action.

Excavation/Dredging

- Excavation will occur during low tides and will include excavation of only enough volume per tidal cycle to facilitate backfilling before tidal inundation, to the extent practicable. Immediately after excavation, clean backfill material will be placed to prevent remaining contaminants/wood waste from being transported to Fidalgo Bay by the tide.

- Offshore dredging would be limited to periods when water depths are sufficient to accommodate the draft of the barge. No grounding will be allowed at low tide, and spudding will not be allowed in eelgrass habitat.

- Quarry spalls from the access road/working platforms will be reused to fill excavations as initial backfill to the extent practicable.

- Dredge spoils will be dewatered on the construction barge.

  - The bucket shall be paused for several seconds at the water surface during retrieval to release excess water from within the bucket.

  - Construction barge shall be equipped with scuppers and sideboards to prevent bypass of return water or dredge material into the water.

- Scuppers shall be covered with filter fabric or similar material to filter and retain sediment while allowing water to drain. Overtopping of sideboards will not be allowed.

- Excavated sediments will be dewatered in the uplands.

  - Material containing free water shall be placed in a temporary holding or containment cell before loading and transporting off site for disposal.

  - Water from the dewatering process shall be captured for settling and other treatment as necessary for return discharge to Fidalgo Bay.

  - Material not requiring dewatering shall be directly loaded for off-site transport and disposal.

Dewatering procedures will follow Ecology-approved methods and are explained in greater detail in the Engineering Design Report (Hart Crowser 2012b).

- The dispersion of resuspended sediments will be minimized during dredging, including:

  - Taking multiple bites to achieve a full bucket will not be allowed. Bucket descent will be limited to the designated depth of digging penetration.

  - "Sweeping" the bottom to smooth contours will not be allowed.

  - Sloughing of material from adjacent undredged areas into the active dredging area will be limited by limiting the depth of each pass.

  - Limiting sideslopes to a maximum slope of 3–4:1 to limit sloughing.

  - Stockpiling of material on the bottom underwater will not be allowed (each time the bucket is closed it will be brought to the surface).

- BMPs to prevent water quality exceedances include:

  - Debris booms and turbidity curtains will be used during dredging activities to minimize siltation of neighboring beaches and limit turbidity plumes.

  - A water quality monitoring program will be initiated to ensure that turbidity levels in the water (as an indicator of suspended sediment load) do not exceed 3 nephelometric turbidity units (NTU) beyond a 150-foot mixing zone during dredging activities.

- If debris or spill material accidentally enters the waterway, immediate actions will be taken to remove the material. All debris or spill material will be properly disposed of at an approved off-site facility.

Structure Removal

- During in- and overwater structure removal, the distribution of demolition debris during completion of the work will be limited by using debris booms, turbidity curtains, and containment systems to prevent concrete and debris from falling into the water.

- Both land-based and barge-mounted equipment will be used for pile removal. Crane operators will be trained to pull the pile slowly. This will minimize both turbidity in the water column and sediment disturbance.

- Pile removal will be conducted with a vibratory hammer when practicable to ensure the pile is removed in its entirety.

- Pile removal will be conducted during low tides and low tidal currents to avoid excess turbidity.

- Piles will be removed intact whenever possible. For piles that cannot be pulled entirely out of the sediment, they will be cut 2 feet below the mudline and filled with clean sediment to prevent release of any residual contamination to surface waters or to the biologically active surface sediment zone.

- Treated wood piles will be contained during and after removal to preclude sediments and any contaminated materials from re-entering the aquatic environment. Removed creosote-treated pilings will be cut into maximum lengths of 4 feet to preclude reuse of these materials. All contaminated materials will be disposed of at an approved and permitted disposal facility that is in compliance with the ESA.

Shoreline Restoration Rationale and Criteria

Historic filling and expansion of the shoreline along Fidalgo Bay and industrial activities along the waterfront in the early part of the last century significantly degraded the beach and intertidal and subtidal habitats found on and adjacent to the Custom Plywood site. Sawmill and plywood manufacturing operations resulted in releases of woodwaste, petroleum products and waste, PCBs and organics within the upland and marine environments. Deteriorated in-water and overwater structures (northern bulkhead, L-shaped pier, pilings, and other concrete structures) and extensive debris (concrete, metal and brick) on the beach remain from past operations. A combination of deteriorated structures, contamination of beach and marine sediments, and debris have left the site in a significantly degraded condition, limiting natural beach and intertidal function and use by fish.

The site is also located adjacent to a former railroad grade, which currently supports the Tommy Thompson Trail, a non-motorized recreational trail along the southern portion of the property. The former railroad generally was located along the toe of the bluffs, occupying the upper beach and backshore (where one existed). Forage fish (Pacific herring and surf smelt) spawning habitat that may have existed along the shore was directly eliminated in many areas and the erosion of feeder bluffs acting as sources of sediment feeding and maintaining the beaches was greatly reduced. Wave action and sediment transport over the subsequent decades has moved sediment downslope creating areas where the low-gradient, lower beach now intersects the riprap protecting the former rail line at relatively low elevations. This condition means that, at higher tides, once the water reaches and rises up the base of the railroad fill, no shallow water habitat remains.

Shallow water habitat is considered to be an important component of the nearshore migration corridor for juvenile salmonids (Williams et al. 2001). Smaller juvenile salmonids are shoreline-oriented and seek food and refuge from predators in shallow nearshore waters. It is widely assumed (based primarily on Heiser and Finn 1970) that shallow water provides juvenile salmonids a refuge from larger swimming predators (other fish, mergansers, grebes, etc.). However, no data exist regarding the alternative risks to juvenile salmonids from other predators, such as great blue herons and kingfishers that exploit them in shallow water.

The importance of a natural and complete beach profile for forage fish spawning is undisputed. Forage fish spawning habitat has been lost in many areas of Puget Sound where bulkheads either were constructed across the upper beach or have caused the upper beach to degrade as a result of wave energy (Williams et al. 2001). Also undisputed is the fact that where the upper beach and backshore have been lost due to railroad or other fill, adjacent riparian vegetation function often has also been lost. Riparian and backshore vegetation along marine shorelines provides a source of organic matter (leaves and twigs) for nearshore ecosystems and often provides shading of the upper beach. Shading has been shown to be essential for successful summer spawning by surf smelt (Penttila

2001) and also allows certain epibenthos to extend their intertidal ranges higher up the beach than in unshaded areas.

As a result of these known or suspected adverse effects from former industrial activities and railroad fill along the western shoreline of Fidalgo Bay, cleanup, protection, and restoration of the shoreline and lower elevation habitats to improve habitat function in this degraded environment is of particular importance. Because the project is located on a priority cleanup site and is being conducted as an interim action, protection of the remediation features must also be balanced with proposed habitat improvements to protect human health and the environment. Given the need to protect the remediated site, the following criteria were considered for construction of the jetty extension and protective spit, and were used to evaluate shoreline cleanup and habitat improvement activities as the habitat enhancement/restoration portion for the proposed interim remedial action.

Physical Criteria

a. Existing bathymetry provides suitable conditions for successful shoreline restoration. The lower beach at the site is relatively low in slope. A broad mudflat supports the biologically productive eelgrass bed that begins at about –2 feet MLLW.

b. The site has direct exposure from the north or northwest (predominant) and south or southeast wind and wave action that might result in unacceptable rates of movement of placed sediments or require placement of larger material to achieve a stable grain size without additional protection.

c. The site allows for remediation and construction of about 1,088 feet of improved shoreline that is currently contaminated and subject to episodic erosion. By remediating and stabilizing, much of biological function can be restored.

d. The existing uplands on the site support a wetland mitigation area, which will require connection to Fidalgo Bay in order to support long-term wetland habitat.

Biological Process Criteria

a. The site is near a known area for Pacific herring and surf smelt spawning. The project will be designed to expand the spawning area, which is currently very limited.

b. The shoreline is currently in a biologically degraded state, generally lacking a natural beach and intertidal biota, thus minimizing the direct impacts of excavation and backfill activities.

c. Shoreline restoration and enhancement is expected to improve ecological functions supporting juvenile salmonids, including a shallow water migration corridor, food production, and refuge from predation.

d. Wetland restoration activities and dunegrass plantings will create and expand backshore/supralittoral conditions that allow overhanging vegetation and improve overall habitat conditions along the shoreline.

e. Shoreline restoration activities will not negatively affect existing high quality/functioning habitat or resources such as eelgrass beds. Eelgrass at the site will be avoided or mitigated (advanced plantings).

Other Site Considerations

a. The site is accessible by barge, rail, or truck, allowing for efficient construction, monitoring, and, if needed, maintenance.

b. The site is near areas of expected public access to the beach and thus offers an excellent opportunity for public education/outreach regarding the need for this type of project, its goals, and its success at meeting those goals.

MONITORING

This section outlines the approach and criteria by which to evaluate the success of the on-site habitat enhancements for this project to ensure that these features are installed as designed and performing as intended, increasing overall habitat function and production of the nearshore.

Construction Monitoring

Construction Oversight

Inspections and monitoring during construction will be conducted by a qualified biologist, mitigation specialist, and/or engineer. Inspection reports and photo-documentation will be completed throughout the construction period. Construction monitoring data (e.g., species monitoring data, turbidity measurements) will be compiled on a regular basis during excavation/dredging and construction activities. Oversight of work in the shoreline cleanup zone will ensure that the project is constructed in accordance with the design and specifications.

Photo points will be established in the shoreline restoration area and used for the duration of the monitoring period as described below.

Work Window Forage Fish Monitoring

A field biologist will conduct surveys for the presence of forage fish spawning activities along the project area. Surveys will encompass the entire proposed project footprint where potential affects to intertidal habitats may occur. Surveys will be conducted in accordance with WDFW protocols (Moulton and Penttila 2001), by a biologist certified by WDFW for conducting such surveys. Two species of forage fish are potentially present, surf smelt *(Hypomesus pretiosus)* and Pacific sand lance *(Ammodytes hexapterus)*, both of which spawn in the upper intertidal zone on sand-gravel beaches, between +5 feet mean lower low water and mean higher high water. Populations of surf smelt spawn principally from October through March, while sand lance spawn from November through February (Moulton and Penttila 2001).

The forage fish spawning survey will be conducted 5 days before the proposed start of inwater work and weekly during the course of emergency repair activities. Results will be presented to the WDFW Area Habitat Biologist within 2 days of the field survey. If no forage fish eggs are detected after the first survey, inwater work will proceed within the week. If inwater work activities are not completed within 1 week, another survey will be conducted.

If forage fish eggs are detected during the first survey, inwater work will not begin until weekly surveys show the absence of forage fish eggs in the project area. If forage fish eggs are detected after emergency repair work is underway, all inwater work will cease until a subsequent weekly survey shows the absence of forage fish eggs in the project area.

Shoreline Restoration

Shoreline monitoring encompasses a range of information needed for evaluation of shoreline restoration actions, and will be continued for a 10-year period.

Monitoring of the wetland mitigation area is described in detail in the Feasibility Study (Hart Crowser 2011) prepared for the project.

Physical Monitoring

An as-built survey of the restoration site will be completed immediately following completion of site construction to document the as-built topography and surficial substrate types using the following approach. These surveys will be continued at specified intervals throughout the monitoring program to document that both vertical and horizontal migration of beach materials are well managed.

Restored shoreline habitats will be monitored by surveying a minimum of six beach profiles from the edge of adjacent eelgrass beds to the new OHW line along the site shoreline to determine the degree of substrate sorting, recruitment, and migration. Beach features such as changes in slope or substrate will be noted and located on each transect. Hand core samples of substrate will also be collected at four locations on each transect to determine the depth and grain size composition of the surficial substrate.

Photo points will be established to document physical changes in the appearance of the restored beaches (both foreshore and backshore), accumulations of LWD, and development of backshore vegetation. Photo points will also be used to document large shifts in beach coverage.

Monitoring will be conducted at Years 0 (as-built survey at the end of construction), 1 (after first winter and after first summer), 2, 3, 5, 7, and 10 following shoreline improvements. Monitoring reports will be submitted to the USACE, Ecology, and WDFW by December 31 of each monitoring year.

Biological Monitoring

Monitoring for each of the biological components of the shoreline restoration work will be conducted at Years 1, 2, 3, 5, 7, and 10 following implementation. Monitoring reports will be submitted to the USACE, Ecology, and WDFW by December 31 of each monitoring year.

Juvenile Salmonids

Abundance of juvenile salmonids and other fish species on the restored beach and on adjacent unrestored beach will be monitored by beach seining using standard seining techniques. During each monitoring period, three replicate sets will be made on two sites of the restored beach and on the adjacent unrestored beach. Seining will be conducted twice per spring during the period of maximum juvenile salmonid abundance. All fish, including juvenile salmonids, will be counted and a subset of at least 30 individuals will be measured for total length to develop a size frequency distribution.

Epibenthic Zooplankton

Abundance of epibenthic zooplankton—a sediment-associated prey group important to juvenile salmonids—will be measured on the restored beach and on adjacent extant habitats. Monitoring will be accomplished at specified tidal elevations (+6 and +4 feet) on the beach using standard sampling equipment and techniques. During each monitoring period, three replicate samples will be taken at each elevation on the restored beach and on an adjacent unrestored (extant) beach. Sampling will be conducted twice per spring to coincide with the juvenile salmonid sampling.

Forage Fish Spawning

The project area is located in or near documented forage fish spawning areas, and many of the habitat enhancement elements are designed to accommodate forage fish spawning activity. Therefore, a forage fish monitoring program will be implemented to determine efficacy of enhancing forage fish habitat in this area.

As mentioned earlier, two species of forage fish are potentially present, surf smelt *(Hypomesus pretiosus)* and Pacific sand lance *(Ammodytes hexapterus)*, both of which spawn in the upper intertidal zone on sand-gravel beaches between +5 feet mean lower low water and mean higher high water. Populations of surf smelt spawn principally from October through March, while sand lance spawn from November through February (Moulton and Penttila 2001). A sampling program will examine beaches targeted for forage fish enhancement monthly from October through March following WDFW protocols (Moulton and Penttila 2001) in concert with effort to examine the other biological components.

Backshore Vegetation

Backshore plantings of dunegrass and naturally colonizing species will be monitored by simple documentation of the number, apparent health, and approximate size of vegetation, by species, in the planted areas. Non-indigenous/invasive species will be removed during routine site maintenance visits.

Eelgrass Monitoring

The primary goal of the advanced plantings is to facilitate colonization of eelgrass into newly remediated areas that could support eelgrass habitat but currently do not. By transplanting eelgrass into the advanced planting area we expect accelerated recruitment of eelgrass habitat.

The secondary goal of the eelgrass advanced plantings is to mitigate for any eelgrass habitat that may be adversely affected due to construction activities or displaced by permanent structures. We anticipate that there may be approximately 20 sf of eelgrass habitat that may be displaced by the installation of the jetty extension and protective spit. Several small, ill-defined patches were noted within the proposed footprint as documented by the 2011 macrovegetation survey. These patches are adjacent to sediments containing large concentrations of wood waste and may not represent permanent patches. Nonetheless, the proposed advanced plantings should adequately mitigate for their unavoidable loss. Therefore, the success criteria for the advanced plantings will be limited to the eelgrass lost due to project activities and be quantitatively evaluated during the respective monitoring periods.

Advanced Plantings

The overall success criterion for the proposed eelgrass advanced plantings will be no long-term loss of eelgrass productivity. Specifically for this project, the area of eelgrass created by advanced planting must equal or exceed the pre-project calculated area of the impacted portion of the bed by Year 5. In addition, eelgrass shoot density within the two post-construction eelgrass areas must be comparable to that in the pre-project impacted area, as corrected for any changes in a reference area.

Biologists will harvest eelgrass shoots from the donor beds by hand. Care will be taken to avoid damage to surrounding unharvested shoots and rhizomes. To avoid inducing erosion damage, harvest will avoid the edges of existing beds. A maximum of 5 percent of the shoots in a given donor bed will be harvested. Experience has shown that remaining eelgrass quickly fill in the spaces left in the bed by harvesting, such that harvested areas are not identifiable after 1 year (Hart Crowser, field observations at multiple sites).

Harvested shoots and associated rhizomes will be bundled into groups of three shoots and loosely tied with degradable twine. Blades will be clipped to a uniform length of about 9 inches. A U-shaped ungalvanized wire, about 6 inches long, will be slipped inside the twine to serve as an anchor. Each 3-shoot bundle is considered to be a single planting unit (PU). All plant processing will be conducted with minimal exposure time, and plants will be stored in a seawater bath while awaiting processing.

The PUs will be inserted into the sediment with the aid of a trowel. PU survival of 40 to 100 percent has been achieved in two recent transplants using this technique (Hart Crowser, unpublished data); in one of these transplants, expansion and spreading of surviving PUs increased overall shoot density 100 times over the initial planting density within 2 years.

Approximately 500 PU will be placed in the initial transplanting to cover an area of approximately 2,000 sf. Initial planting spacing will be approximately 1 to 1.5 feet.

To address no net loss of eelgrass habitat, the advanced plantings from the impact footprint must equal or surpass the area of disturbance (possibly 20 sf or less) at any time during the 10-year monitoring period. The advanced planting area will be examined by comparison of the total number of shoots (density times area) of eelgrass in each planted area with the number of shoots of eelgrass planted (number per PU times number of PU) to obtain percent survival/expansion of the advanced plantings. Measurements of the spread of eelgrass from the initial PU will be made as the diameter of eelgrass spreads from each identifiable PU. Over time, eelgrass originating from adjacent PUs may begin to overlap and this condition will also be noted. Survey protocols will generally follow WDFW's 2008 Eelgrass/Macroalgae Habitat Interim Survey Guidelines with quantitative counts made on a 20-foot grid spacing within 60 feet of the planting area.

The recovery phase will be defined as the time needed for the advanced transplants to recruit shoots to a sufficient density to emulate the surrounding natural beds. This will be evaluated using the target eelgrass density determined by the 2011 advanced macrovegetation survey ($25.4 \pm 7.8^{n=141}$ shoots per square meter), adjusted for changes in the reference bed. This will allow for stochastic variability in the eelgrass population to be accounted for in the monitoring results. This density, adjusted for changes in the reference bed, coupled with the 20-sf area to be maintained, will be used as the criterion necessary to achieve the interim performance and success by Year 10 to assure no net loss of habitat. Should the area of advanced plantings not equal or exceed the impact area at any point during the recovery phase as determined during post-construction monitoring, additional plantings will be made in either area as part of the adaptive management scheme.

The outer edge of the eelgrass bed along the shoreline affected by the beach restoration and along a nearby reference reach will be mapped using a hand-held GPS during low tide in the late summer of each monitoring year to determine whether project construction has impacted the advanced planting area and adjacent eelgrass beds.

SUCCESS CRITERIA AND CONTINGENCY PLANS

Shoreline Restoration

Success Criteria

The criteria for success of the shoreline enhancements will be:

- Beach profiles will not change by more than +/–1.5 feet by Year 5;
- Substrate composition along the upper beach will be suitable for forage fish spawning over a minimum of 50 percent of the beach area enhanced in any given year;
- The catch per unit effort (CPUE) for juvenile salmonids use on the restored beach will be comparable to or greater than that on the unrestored reference beach in any given year;
- Epibenthic zooplankton densities on the restored beach (CPUE) will be comparable to or greater than that on the unrestored reference beach in any given year; and
- There will be no adverse impacts (i.e burial or displacement) to eelgrass in the adjacent beach areas south of the site.

Contingency Plans

If any success criteria are not met, the USCACE, Ecology, and/or WDFW will be consulted regarding appropriate contingency actions. Contingencies that could be applied include the following:

- Waiting for another monitoring period to see if the change is persistent;
- Nourishing degraded areas with similar-sized material;
- Nourishing degraded areas with a different size range of material; and/or
- Replacing eelgrass negatively affected by shifting beach substrate.

Backshore Vegetation

Success Criteria

The criterion for backshore/riparian vegetation success is based on a combination of criteria for survival and cover.

- 80 percent of the plantings survive after Year 1 and in any year up to Year 3.

- Areal coverage of native vegetation in the planted area will meet the following criteria:

  - Year 1: 20 percent cover or greater;

  - Years 2 and 3: 40 percent cover or greater;

  - Year 5: 60 percent cover or greater; and

  - Years 7 and 10: 80 percent or greater.

- Total cover of invasive plant species including, but not limited to, thistle, blackberry, and nightshade comprise less than 10 percent in any monitoring year.

Contingency Plans

If less than 50 percent survival of backshore vegetation is documented in any year, additional plantings will be made to meet that goal. Replacement plantings may emphasize species shown to have better survival in the local environment. Additional soil amendments or irrigation may be applied to increase survival.

If invasive species are adversely impacting the ecological function of the riparian vegetation, additional removal methods will be applied.

Eelgrass Advanced Plantings

Success Criteria

The success criterion of the proposed eelgrass transplants is that there will be no temporal loss of eelgrass productivity. Specifically, the density multiplied by the area of eelgrass shoots in the transplant areas must equal or exceed any declines in eelgrass in the project vicinity, adjusted for changes in the reference bed.

By Year 1 monitoring, we expect 50 percent or greater colonization (on an areal basis) to have occurred, with total recovery expected by Year 5. Should the Year 5 area and density goals not be met, additional plantings will be mandated to make up for any deficit in ecological performance. These will be carried out using the same procedures detailed above.

Contingency Plans

An eelgrass recovery contingency plan will be triggered by the failure of eelgrass in the transplant area to recover to reference area equivalency for two of the three parameters:

- Areal coverage;
- Shoot density; and
- Epibenthic indicator species diversity or abundance.

If eelgrass transplanting as mitigation for project losses does not meet the performance criterion of no net reduction in eelgrass productivity in any year, additional transplantings will be accomplished in additional areas identified by the applicant and approved by WDFW.

Adaptive Management

The monitoring of physical and biological aspects of this project may be subject to adaptive management approaches based on annual monitoring results. This is especially true for biological components that do not have strict performance criteria. The project team will meet at least annually to review the results of previous monitoring and to determine any adjustments needed in the nature of monitoring to be accomplished in the coming year, as well as any contingency actions needed to achieve project goals. The appropriate regulatory agencies will be contacted to discuss adaptive management and contingency measures should such a need arise.

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TABLES

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Table 1 – ESA-Listed Species Documented or Potentially Present in Fidalgo Bay

Species	Listing Status	ESA Agency	Date of Listing	Critical Habitat in Fidalgo Bay
Puget Sound Chinook (*O. tshawytscha*)	Threatened	NOAA	March 24, 1999	Yes, designated September 2, 2005
Coastal-Puget Sound Bull trout (*Salvelinus confluentus*)	Threatened	USFWS	December 1, 1999	Yes, revised designated October 18, 2010
Puget Sound Steelhead Trout (*O. mykiss*)	Threatened	NOAA	Many 11, 2007	No
Bocaccio (*Sebastes paucispinis*)	Endangered	NOAA	April 23, 2009	No
Canary rockfish (*S. pinniger*)	Threatened	NOAA	April 23, 2009	No
Yelloweye rockfish (*S. ruberrimus*)	Threatened	NOAA	April 23, 2009	No
Pacific eulachon (*Thaleichthys pacificus*)	Threatened	NOAA	March 18, 2010	No
Southern resident killer whale (*Orcinus orca*)	Endangered	NOAA	November 18, 2005	Yes, designated November 29, 2006
Steller sea lion (*Eumetopias jubatus*)	Threatened	NOAA	April 5, 1990	No
Humpback whale (*Megaptera novaeangliae*)	Threatened	NOAA	June 2, 1970	No
Marbled murrelet *(Brachyramphus marmoratus)*	Threatened	USFWS	September 28, 1992	No
Loggerhead Sea Turtle *(Caretta caretta)*	Threatened	NOAA	June 2, 1970	No
Green Sea Turtle *(Chelonia mydas)*	Endangered	NOAA	June 2, 1970	No
Olive Ridley Sea Turtle *(Lepidochelys olivacea)*	Endangered	NOAA	June 2, 1970	No
Leatherback sea turtle *(Dermochelys coriacea)*	Endangered	NOAA	June 2, 1970	No

Table 2 – Summary of Remediation Activities at the Custom Plywood Site

Remedial Activity	Duration of Impact	Amount of Material Placed or Removed	Area of Waterbody Directly Affected
Excavation/Dredge	1-3 months	59,000 cubic yards fill removed	7.1 acres
Backfill	1-3 months	59,000 cubic yards fill placed	7.1 acres
Pile Removal	3 to 6 months	1,110 piles removed	1,674 sf
Overwater and In-water Structure Removal	3 to 6 months	--	14,500sf

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Table 3 – Gains and Losses of Marine Habitat Resulting from Cleanup Actions

Habitat Component	Gain/Loss (+/-) of Marine Waters of the US (square feet)	Salmonid Habitat Enhancement (square feet)*	Forage Fish Spawn Habitat Enhancement (square feet)**
Jetty Extension	- 3,679	6,300	--
Jetty Beach	--	25,311	5,210
Spit Beach	--	37,917	11,924
Wetland Loss (Wetland E)	-1,400	--	--
Wetland Restoration	+12,000	12,000	--
Pile Removal	+1,674	1,674	--
Shoreline/Debris Removal	--	47,500	9,500
TOTALS (square feet)	+8,595	130,702	26,634

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Notes:

***** Salmonid habitat defined as intertidal zone below ordinary high water where contaminated sediment and debris removal, and beach restoration will occur

** Forage fish spawning habitat defined as upper intertidal zone restored with sand/pea-gravel mix between +6 feet MLLW and MHHW.

Table 4 – Species of Fish with Designated Essential Fish Habitat in the Project Area

Groundfish Species
spiny dogfish, *Squalus acanthias*
big skate, *Raja binoculata*
California skate, *R. inornata*
longnose skate, *R. rhina*
spotted ratfish, *Hydrolagus colliei*
Pacific cod, *Gadus macrocephalus*
Pacific hake, *Merluccius productus*
black rockfish, *Sebastes melanops*
bocaccio, *S. paucispinis*
brown rockfish, *S. auriculatus*
canary rockfish, *S. pinniger*
China rockfish, *S. nebulosus*
copper rockfish, *S. caurinus*
darkblotched rockfish, *S. crameri*
greenstriped rockfish, *S. elongatus*
Pacific ocean perch, *S. alutus*
quillback rockfish, *S. maliger*
redbanded rockfish, *S. babcocki*
redstripe rockfish, *S. proriger*
rosethorn rockfish, *S. helvomaculatus*
rosy rockfish, *S. rosaceus*
rougheye rockfish, *S. aleutianus*
sharpchin rockfish, *S. zacentrus*
splitnose rockfish, *S. diploproa*
stripetail rockfish, *S. saxicola*
tiger rockfish, *S. nigrocinctus*
vermilion rockfish, *S. miniatus*
yelloweye rockfish, *S. ruberrimus*
yellowtail rockfish, *S. flavidus*
shortspine thornyhead, *Sebastolobus alascanus*
cabezon, *Scorpaenichthys marmoratus*
lingcod, *Ophiodon elongatus*
kelp greenling, *Hexagrammos decagrammus*
sablefish, *Anoplopoma fimbria*
jack mackerel, *Trachurus symmetricus*
Pacific sanddab, *Citharichthys sordidus*
butter sole, *Pleuronectes isolepis*
curlfin sole, *Pleuronichthys decurrens*
Dover sole, *Microstomus pacificus*
English sole, *Pleuronectes vetulus*
flathead sole, *Hippoglossoides elassodon*
petrale sole, *Eopsetta jordani*
rex sole, *Errex zachirus*
rock sole, *Pleuronectes bilineata*
sand sole, *Psettichthys melanostictus*
starry flounder, *Platichthys stellatus*
arrowtooth flounder, *Atheresthes stomias*
Coastal Pelagic Species
northern anchovy, *Engraulis mordax*
Pacific sardine, *Sardinops sagax*
chub mackerel, *Scomber japonicus*
market squid, *Loligo opalescens*
Salmonid Species
Chinook salmon, *Oncorhynchus tshawytscha*
coho salmon, *O. kisutch*
Puget Sound pink salmon, *O. gorbuscha*

Table 5 – Effects of Project Activities on Habitats used by ESA-Listed Species in the Project and Action Areas

		Effects of Action		
Project Activities	**Habitat Indicator**	**Improve[1]**	**Maintain[2]**	**Degrade[3]**
Construction Disturbances	Noise		X	
	Entrainment		X	
	Stranding		X	
Water Quality Disturbance	Turbidity		X	
	Chemical contamination/nutrients		X	
	Temperature		X	
	Dissolved oxygen		X	
Sediment Disturbance	Sedimentation sources/rates		X	
	Sediment quality	X		
Habitat Disturbance	Fish access/refugia	X		
	Depth		X	
	Substrate	X		
	Slope	X		
	Shoreline	X		
	Riparian conditions	X		
	Flow and hydrology/current patterns/ saltwater–freshwater mixing patterns		X	
	Overwater structures	X		
	Disturbance		X	
Biota Disturbance	Prey—epibenthic and pelagic zooplankton	X		
	Infauna	X		
	Prey—forage fish	X		
	Aquatic/wetland vegetation	X		
	Nonindigenous species		X	
	Ecological diversity	X		

Notes:

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[1] Action will contribute to long-term improvement, over existing conditions, of the habitat indicator.

[2] Action will maintain existing conditions.

[3] Action will contribute to long-term degradation, over existing conditions, of the habitat indicator.

FIGURES

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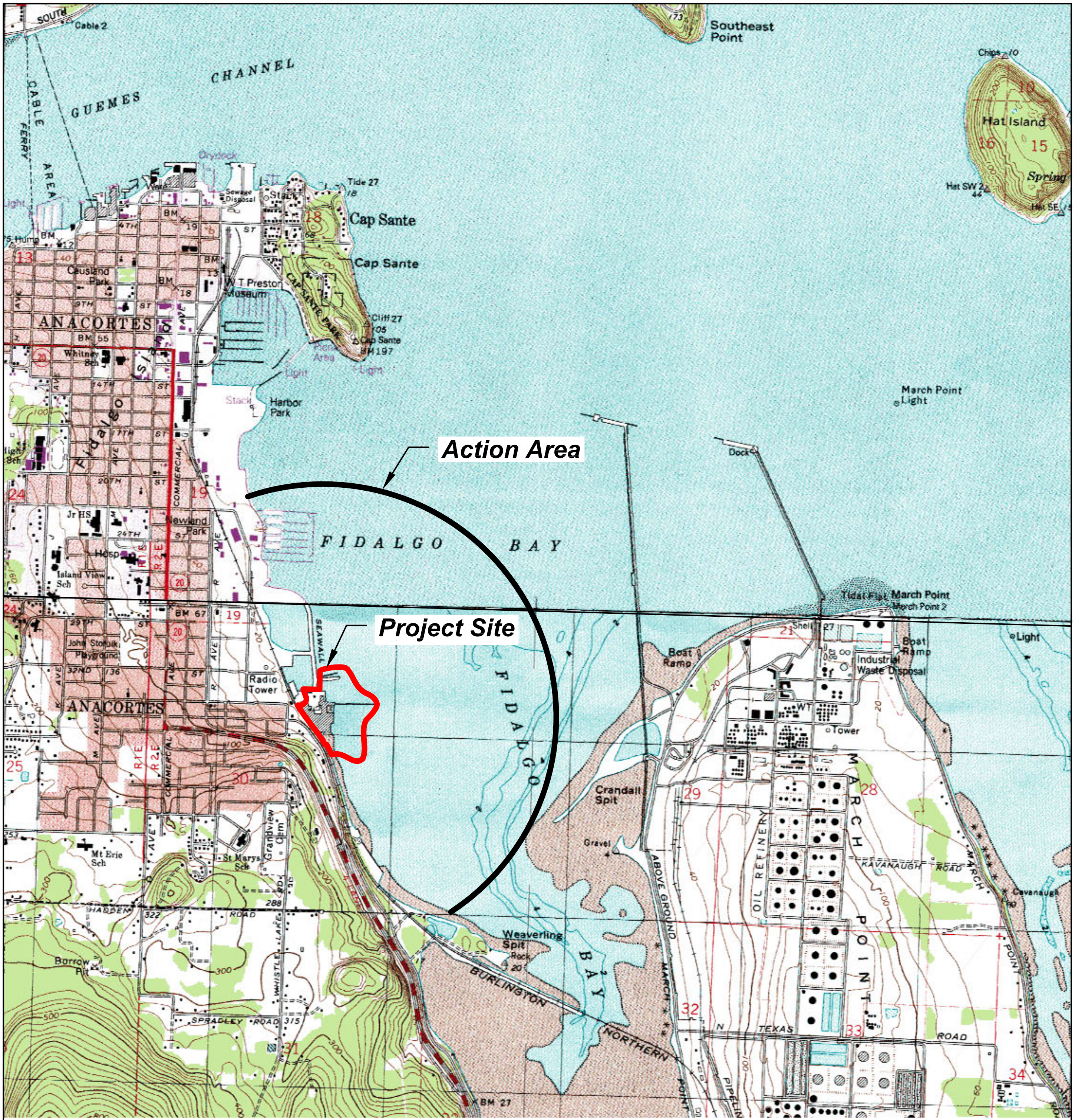
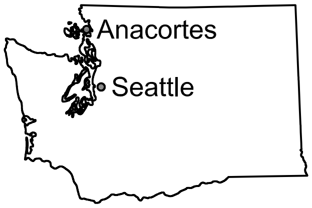
for double-sided printing.



Source: Base map prepared from USGS 7.5-Minute Series Topographic Map, Anacortes North and Anacortes South Quadrangles.



0 0.5 1
Scale in Miles

0 0.5 1
Scale in Kilometers

N

Custom Plywood Site
Anacortes, Washington

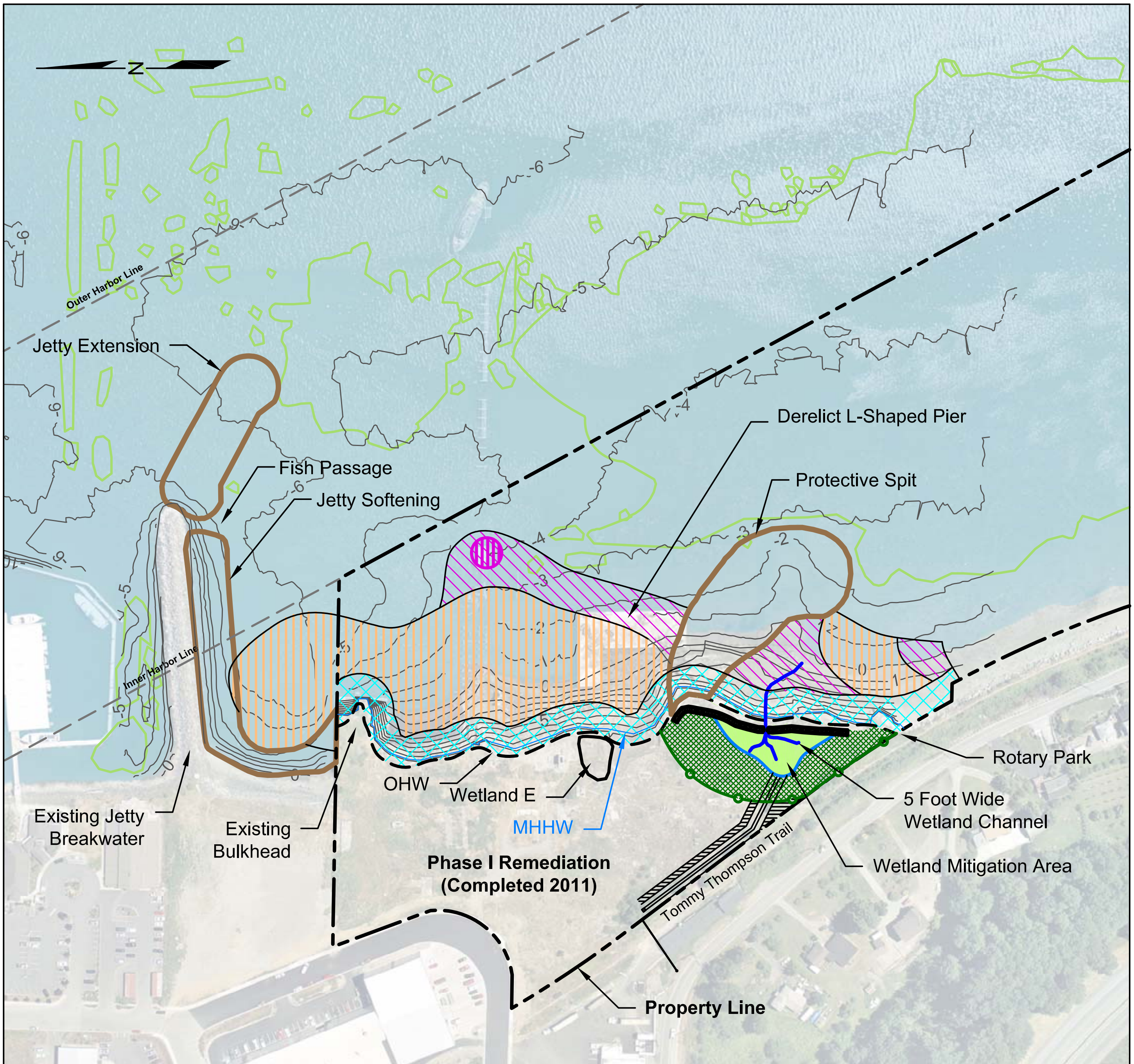
Vicinity Map

17800-27 5/12

HARTCROWSER

Figure
1

EAL 05/2/12 1780027-002.dwg



Excavate/dredge to contact with native sediment where dioxin TEC > 25 ppt

Excavate up to 6 feet below surface grade where dioxin and wood waste are present

Dredge wood waste up to 2 feet below surface grade where wood waste > 1-foot thick

Eelgrass Advanced Mitigation Area

Remediation Protection and Habitat Improvement Features

Approximate Extent of Eelgrass Beds

Note: Seaward of MHHW elevations in feet (MLLW).

Source: Aerial photo courtesy of City of Anacortes, 2003.

0 250 500

Scale in Feet

Custom Plywood Site

Anacortes, Washington

In-Water Pre-Construction Condition and Planned Remedial Actions

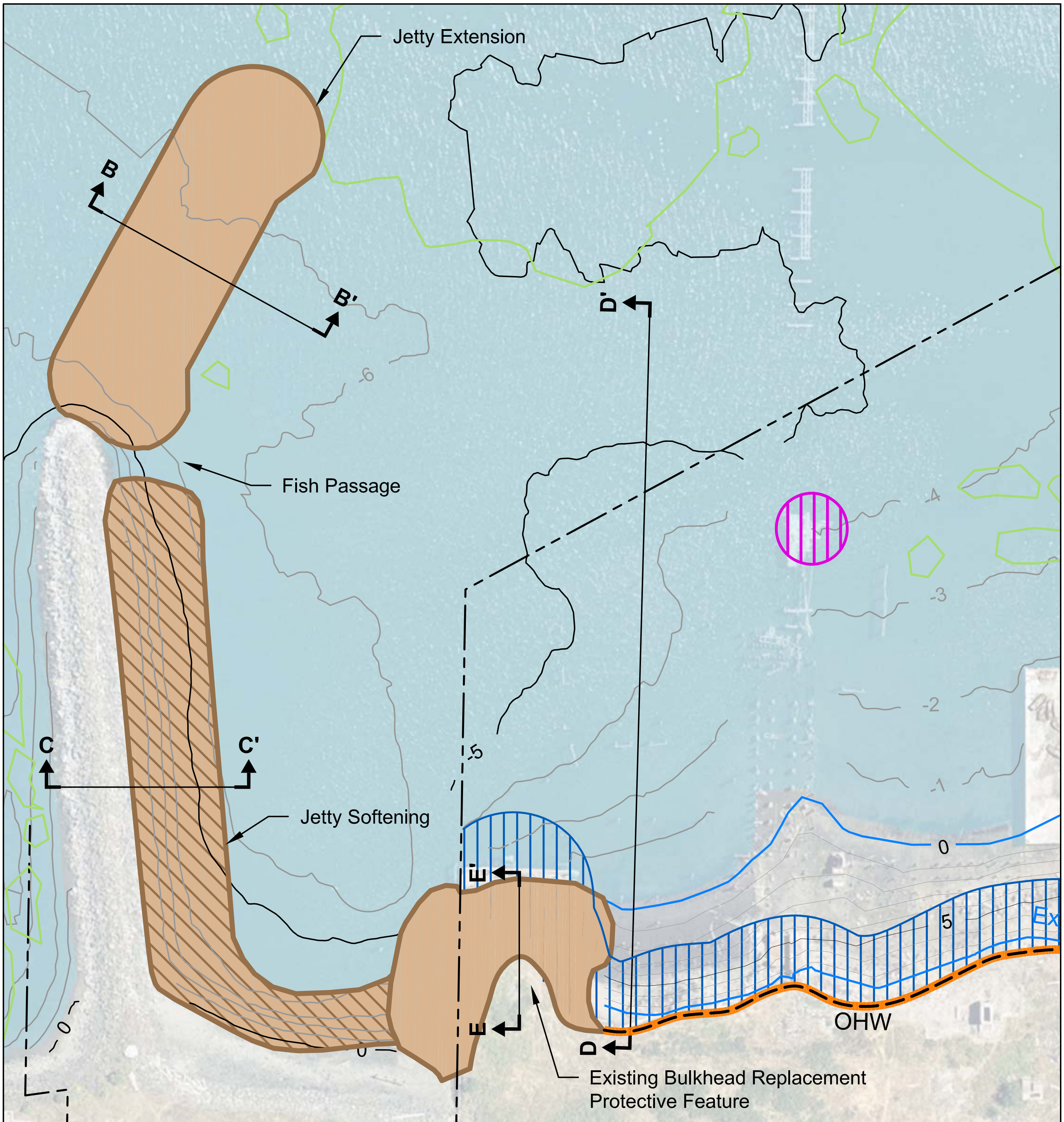
17800-27 8/12

HARTCROWSER

Figure

2

EAL 08/8/12 1780027-016.dwg



Eelgrass Advanced Mitigation Area

Approximate Extent of Eelgrass Beds

Dunegrass Planting Area

Bank Stabilization/Softshore Armoring

N

0 100 200

Scale in Feet

Custom Plywood Site
Anacortes, Washington

Post-Construction Remediation Condition (North)

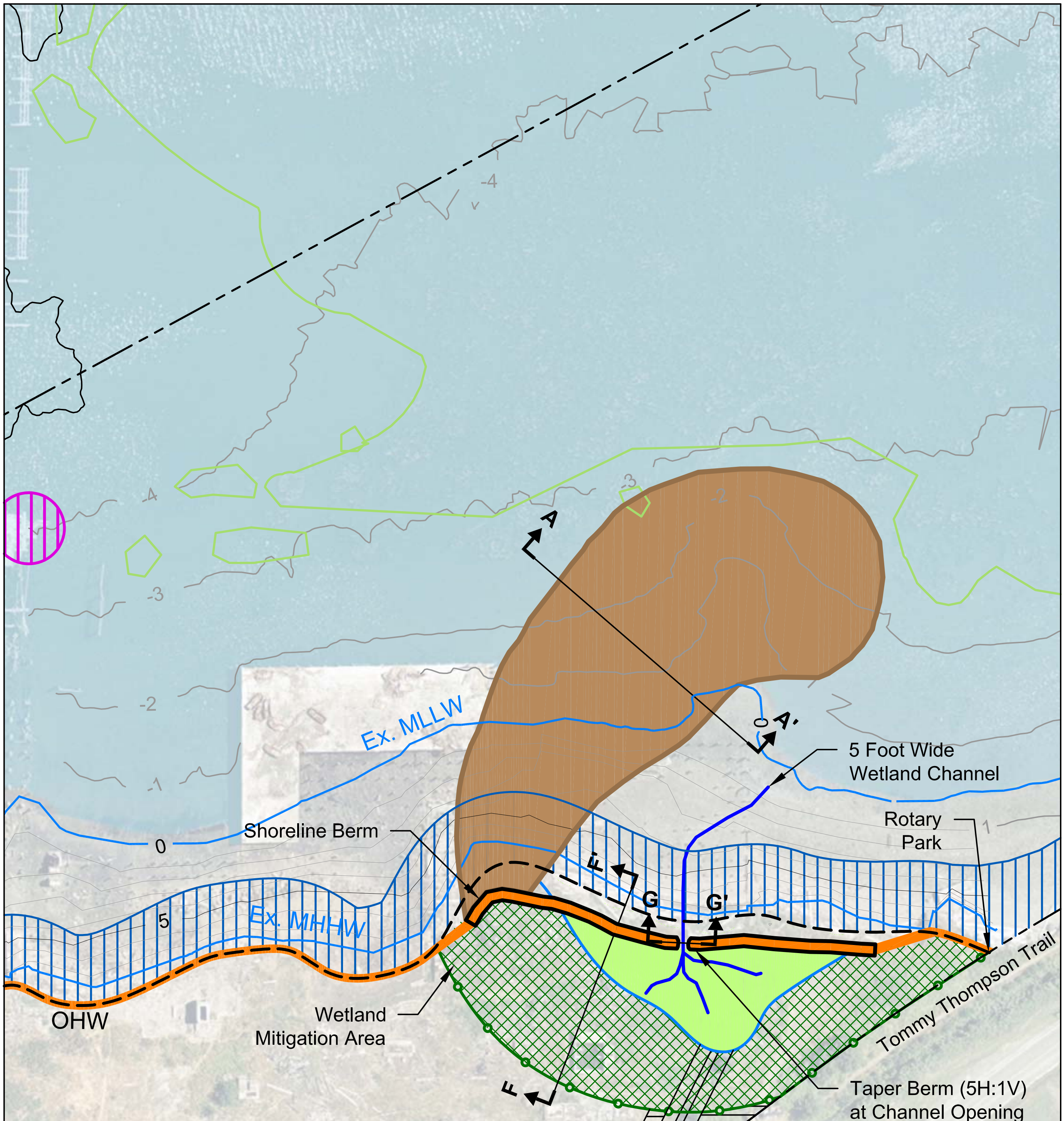
17800-27 7/12

HARTCROWSER

Figure

3

EAL 07/31/12 1780027-006.dwg



Eelgrass Advanced Mitigation Area

Approximate Extent of Eelgrass Beds

Dunegrass Planting Area

Bank Stabilization/Softshore Armoring

N

0 100 200

Scale in Feet

Custom Plywood Site
Anacortes, Washington

Post-Construction Remediation Condition (South)

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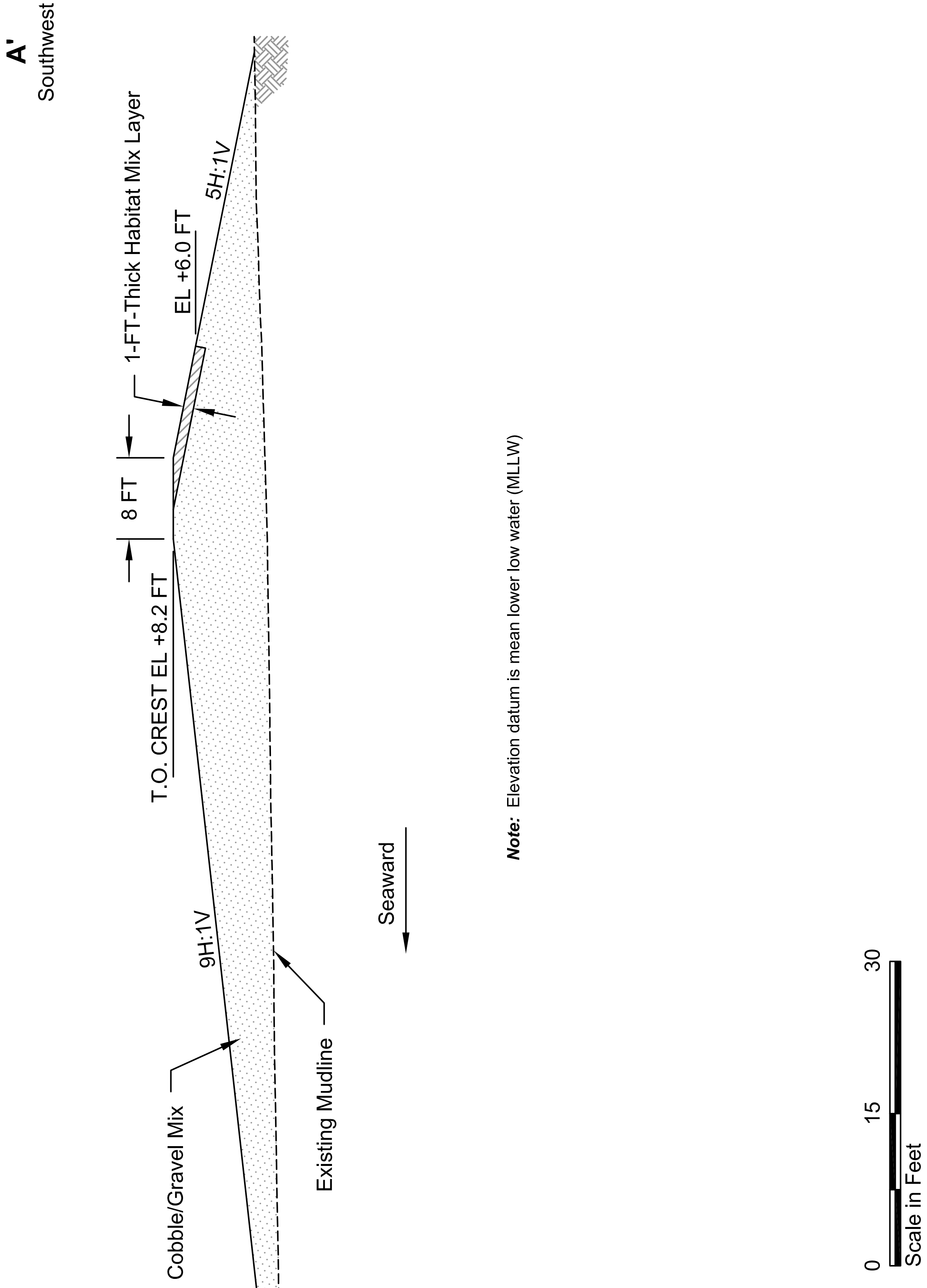
HARTCROWSER

Figure

4

EAL 08/7/12 1780027-006.dwg



Note: Elevation datum is mean lower low water (MLLW)

Custom Plywood Site
Anacortes, Washington

Protective Spit Cross Section A-A'

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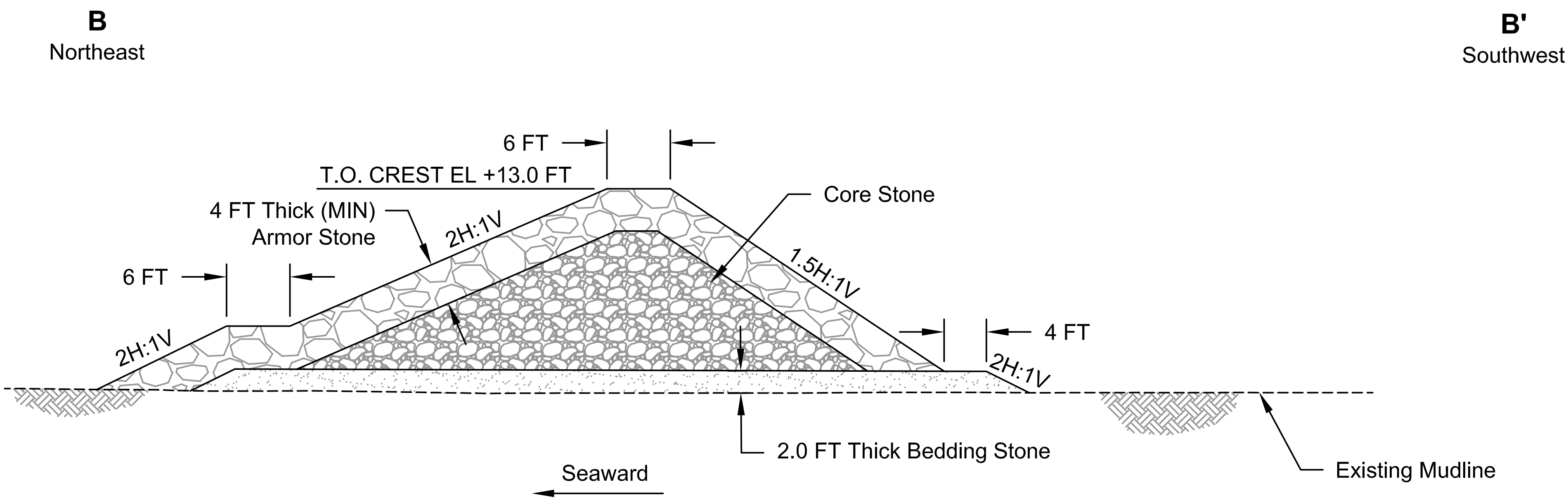
Figure
5

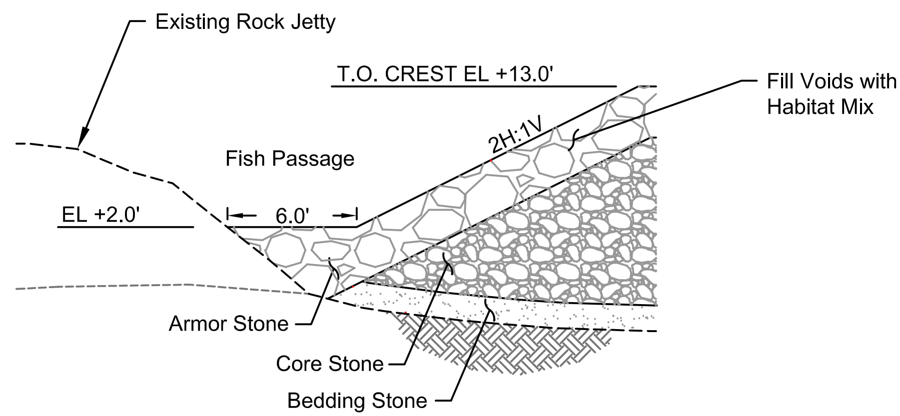
EAL 05/1/12 1780027-004.dwg

EAL 08/3/12 1780027-005.dwg



Note: Elevation datum is mean lower low water (MLLW)

Jetty Extension Section



Fish Passage Section

0 15 30
Scale in Feet

Custom Plywood Site
Anacortes, Washington

Jetty Extension Cross Section B-B'

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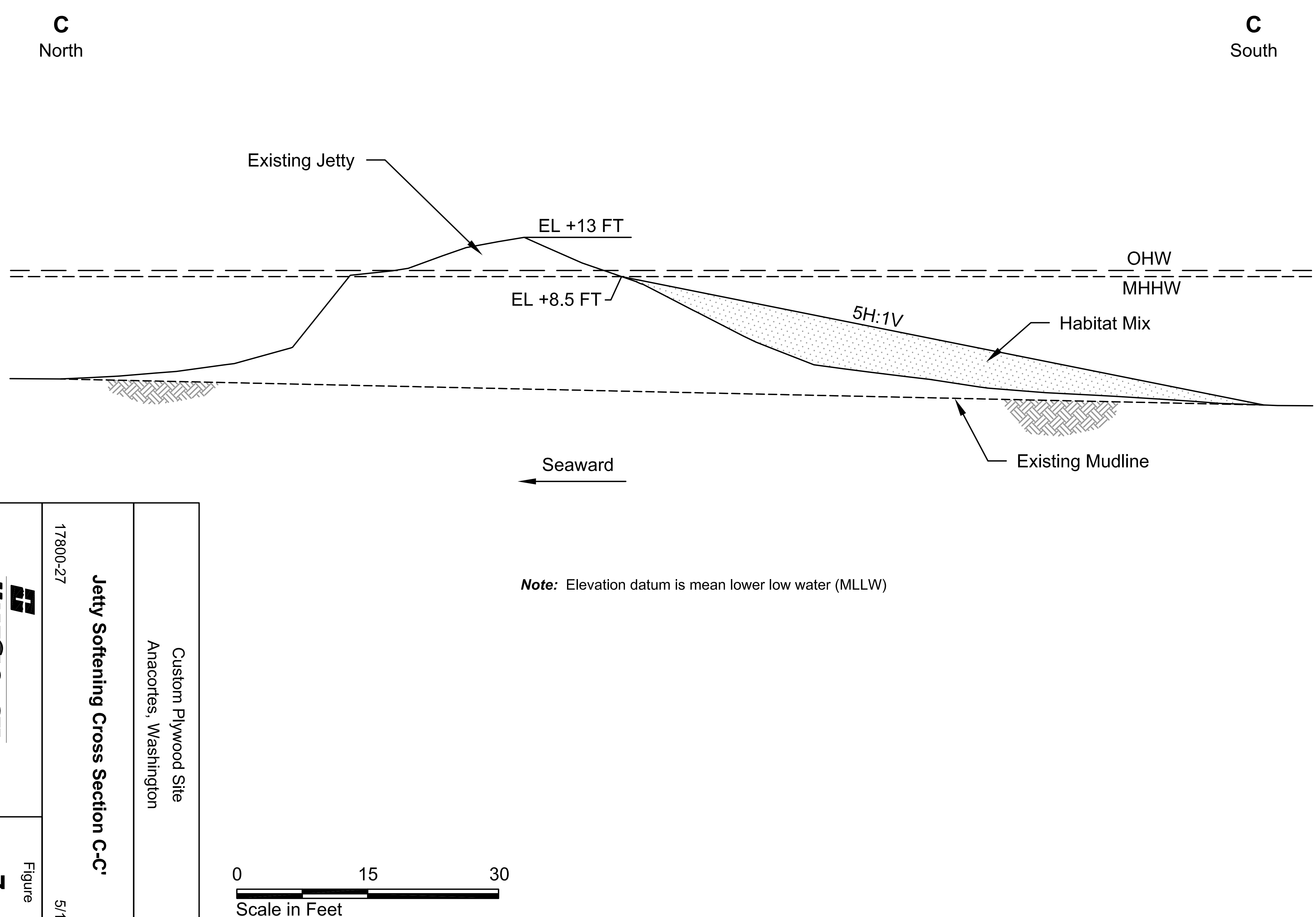
Figure
6

EAL 05/18/12 1780027-011.dwg



Note: Elevation datum is mean lower low water (MLLW)

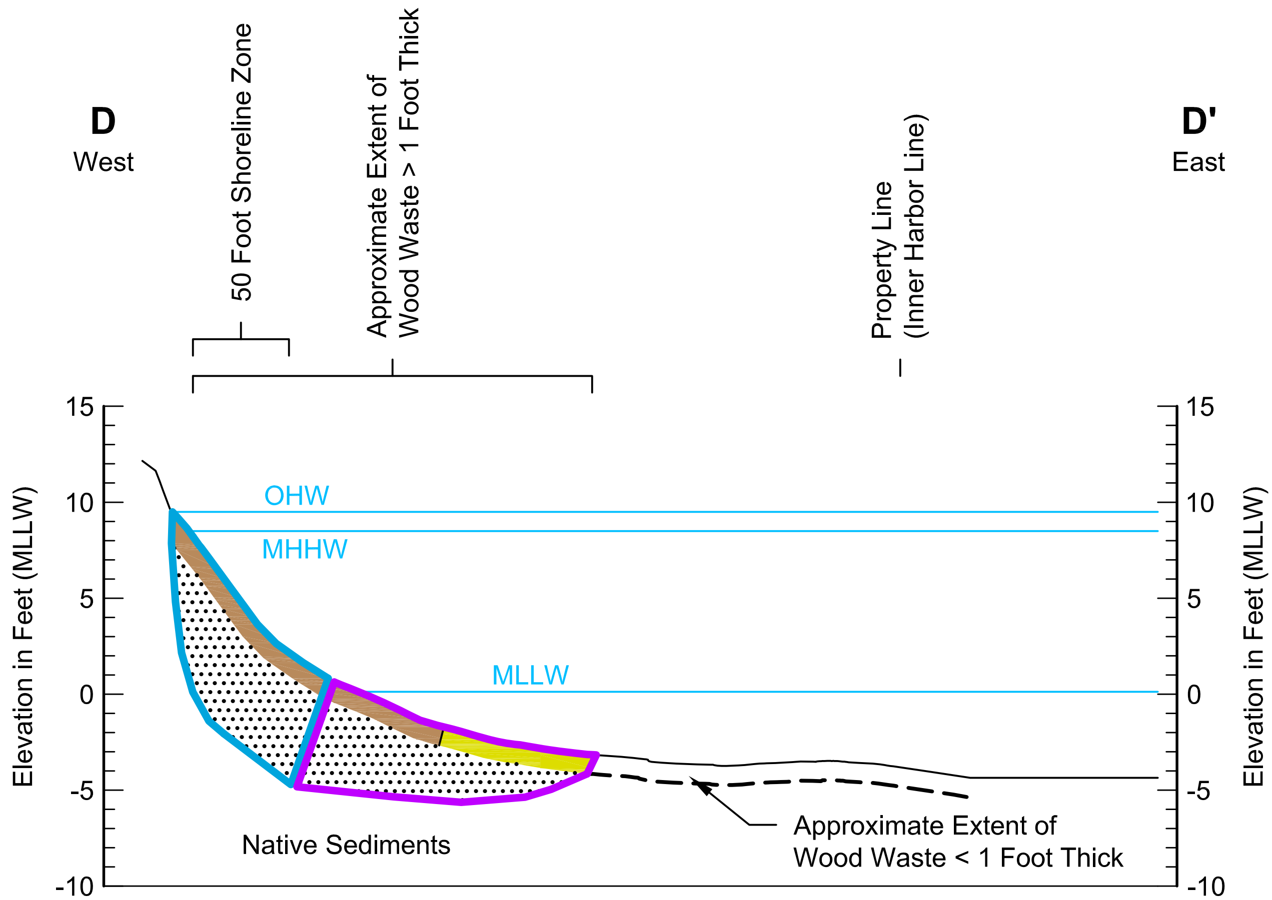
Custom Plywood Site
Anacortes, Washington

Jetty Softening Cross Section C-C'

17800-27 5/12

HARTCROWSER

Figure **7**



Excavate wood waste up to 6 feet below surface grade where dioxin and wood waste are present

Dredge wood waste up to 2 feet below surface grade where wood waste > 1-foot thick

Excavation Backfill/Capping Materials

Gravelly Sand Over Quarry Spalls*

3-Inch Minus Gravel Surface Soft Armor

1-Inch Minus Sandy Gravel Soft Armor

* Reused ballast from temporary roads and crane pads.

Horizontal Scale in Feet
0 100 200

0 10 20
Vertical Scale in Feet
Vertical Exaggeration x 10

MHHW Mean Higher High Water

MLLW Mean Lower Low Water

OHW Ordinary High Water

Custom Plywood Site
Anacortes, Washington

Shoreline Profile Cross Section D-D'

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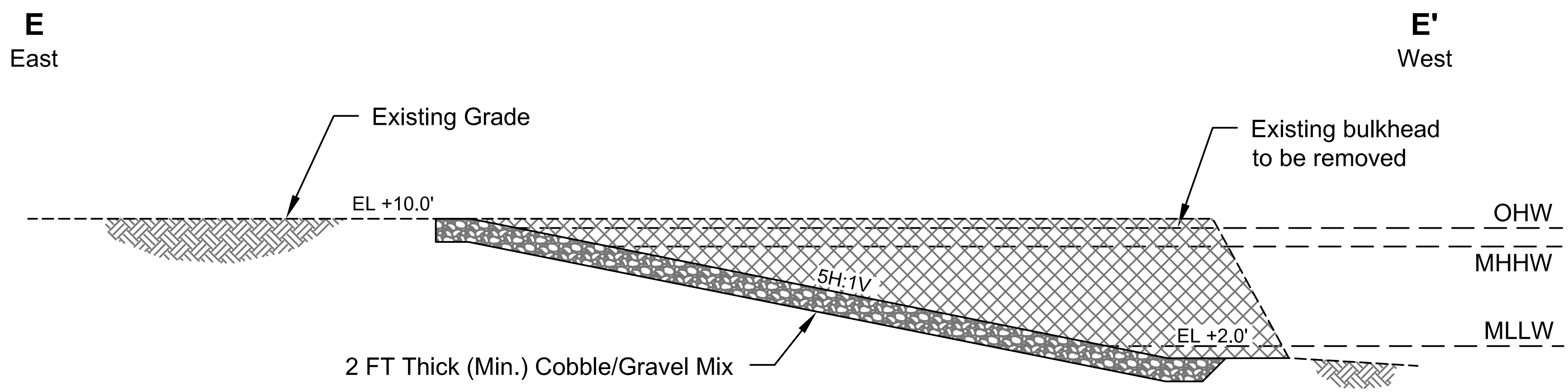
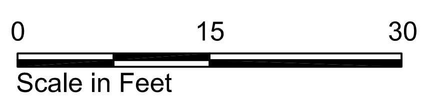
HARTCROWSER

Figure
8

EAL 08/7/12 1780027-009.dwg



Note: Elevation datum is mean lower low water (MLLW)



Custom Plywood Site
Anacortes, Washington

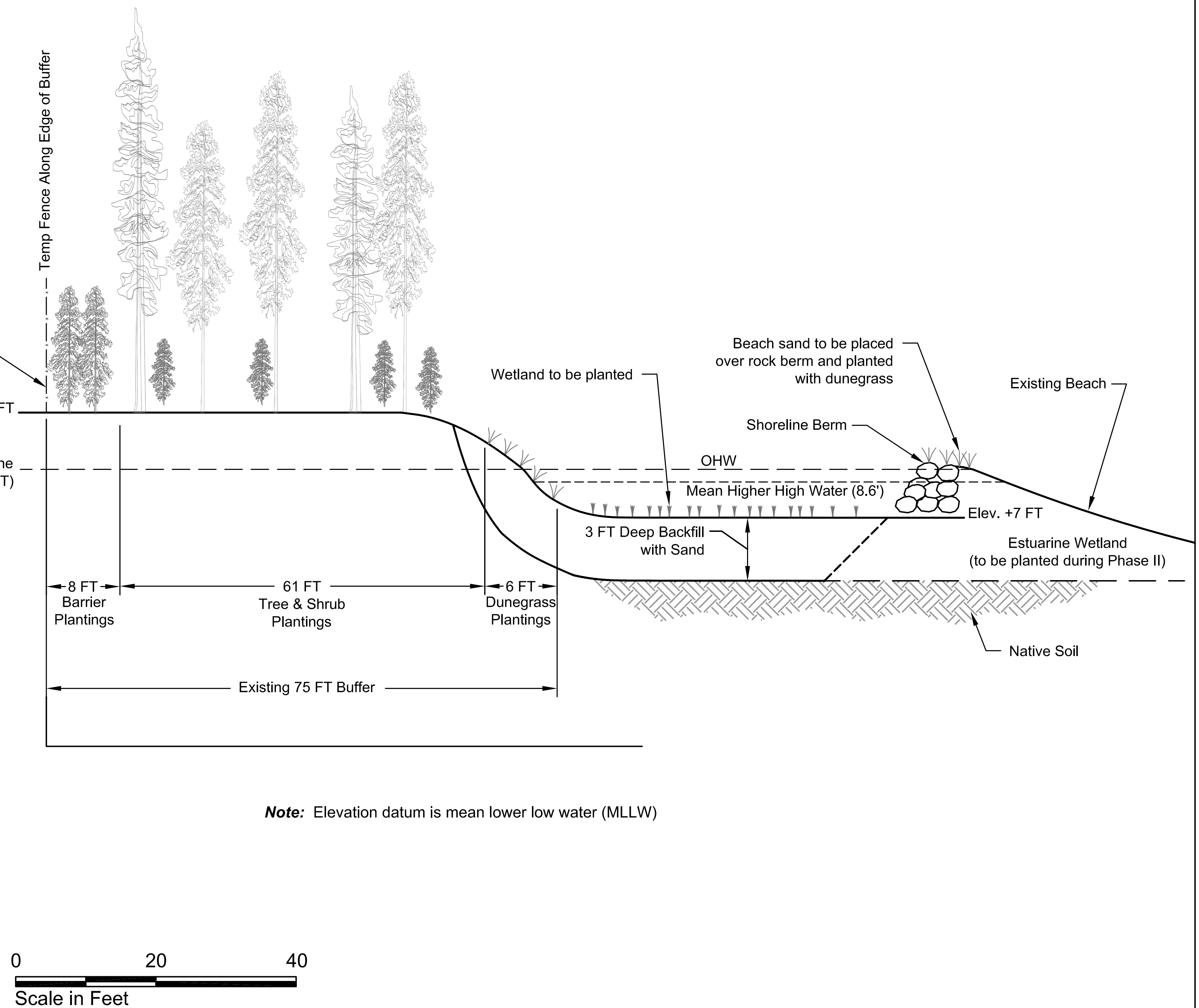
Existing Bulkhead Replacement
Protective Feature Cross Section E-E'

17800-27 5/12

HARTCROWSER

Figure
9

EAL 05/31/12 1780027-010.dwg



Note: Elevation datum is mean lower low water (MLLW)

Custom Plywood Site
Anacortes, Washington

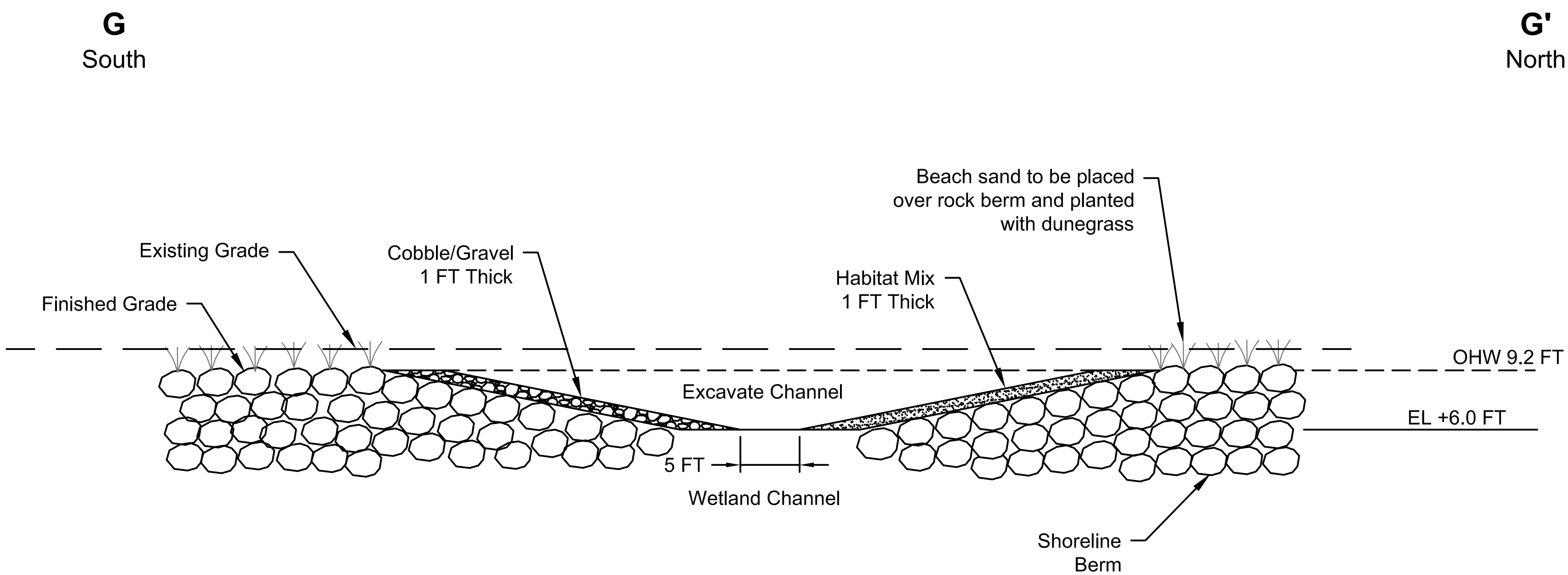
Wetland Mitigation and
Shoreline Cross Section F-F'

17330-27 5/12

HARTCROWSER

Figure
10

EAL 05/30/12 1780027-013.dwg



Note: Elevation datum is mean lower low water (MLLW)

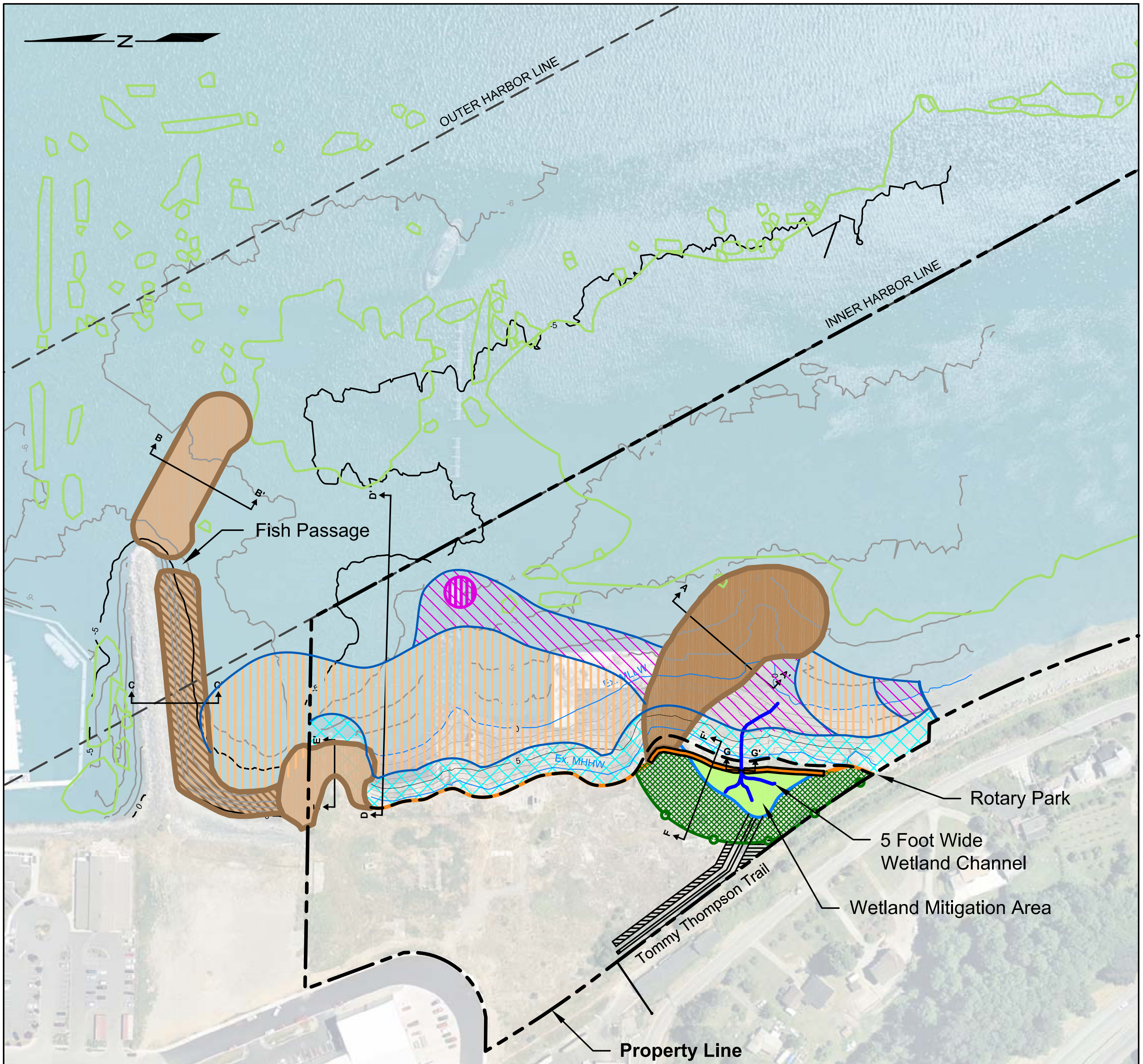
Custom Plywood Site
Anacortes, Washington

Wetland Channel Cross Section G-G'

17800-27 5/12

HARTCROWSER

Figure
11



Excavate/dredge to contact with native sediment where dioxin TEC > 25 ppt

Excavate up to 6 feet below surface grade where dioxin and wood waste are present

Dredge wood waste up to 2 feet below surface grade where wood waste > 1-foot thick

Eelgrass Advanced Mitigation Area

Remediation Protection and Habitat Improvement Features

Approximate Extent of Eelgrass Beds

Note: Seaward of MHHW elevations in feet (MLLW).

Source: Aerial photo courtesy of City of Anacortes, 2003.

0 250 500

Scale in Feet

Custom Plywood Site

Anacortes, Washington

Phase II Post-Remediation Condition

17800-27 8/12

HARTCROWSER

Figure

12

EAL 08/7/12 1780027-017.dwg