Upland Remediation (Phase I) Engineering Design Report for Interim Action Work Plan Custom Plywood Site Anacortes, Washington

Prepared by Hart Crowser under Direction and Contract with Washington State Department of Ecology under Agreement with GBH Investments, LLC

September 2011
17330-27

WASHINGTON STATE DEPARTMENT OF ECOLOGY

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FOR THE CUSTOM PLYWOOD INTERIM REMEDIAL ACTION

ACRONYMS AND ABBREVIATIONS

ARAR	applicable or relevant and appropriate requirement
bgs	below ground surface
BMPs	best management practices
CAP	Cleanup Action Plan
COC	constituent of concern
COPC	constituent of potential concern
cPAHs	carcinogenic polycyclic aromatic hydrocarbons
cy	cubic yard
DAHP	Department of Archaeology and Historic Preservation
Ecology	Washington State Department of Ecology
EDR	Engineering Design Report
EPA	US Environmental Protection Agency
FS	Feasibility Study
GBH	GBH Investments, LLC
IAWP	Interim Action Work Plan
mg/kg	milligrams per kilogram
MHHW	Mean Higher High Water
MTCA	Model Toxics Control Act
NAVD88	North American Vertical Datum of 1988
OHW	Ordinary High Water
OMMP	Operations, Maintenance, and Monitoring Plan
PCBs	polychlorinated biphenyls
PCP	pentachlorophenol
PLP	Potentially Liable Person
POC	point of compliance
PSI	Puget Sound Initiative
RI	Remedial Investigation
SVOCs	semivolatile organic compounds
SEA	Shorelands and Environmental Assistance
SEPA	State Environmental Policy Act
sf	square feet
SMP	Shoreline Master Program
TCP	Ecology's Toxics Cleanup Program
TPH	total petroleum hydrocarbons
ug/L	micrograms per liter
USACE	US Army Corps of Engineers
VOCs	volatile organic compounds

EXECUTIVE SUMMARY

In accordance with an agreement with GBH Investments, LLC (GBH), this Engineering Design Report (EDR) has been prepared under the provisions of the Washington State Model Toxics Control Act (MTCA – Chapter 173-340 WAC) for the Custom Plywood Site (Site) in Anacortes, Washington. The EDR was prepared under the direction of the Washington State Department of Ecology (Ecology) Toxics Cleanup Program (TCP), for selected upland portions of the Site, of which GBH is the current property owner and represents a Potential Liable Person (PLP) per Chapter 173-340-200 WAC.

This EDR is part of the MTCA Interim Action Work Plan (IAWP) for the Site. The IAWP consists of the September 2011 Remedial Investigation (RI) Report for Interim Action Work Plan prepared by AMEC Geomatrix (AMEC 2011) for GBH, the September 2011 Feasibility Study (FS) Report for Interim Action Work Plan and the September 2011 Upland Remediation (Phase I) Cleanup Action Plan (CAP) for Interim Action Work Plan prepared by Hart Crowser for Ecology, and this EDR for Phase I remediation. (Note that herein these reports are referred to as the RI, FS, CAP, and EDR hereafter.) GBH completed the RI in response to Ecology Agreed Order DE 5235, dated March 17, 2008.

As summarized in the RI, the property was originally developed as a saw and planing mill in the early 1900s. Through the years, the property ownership has changed several times and was rebuilt and added onto until Custom Plywood became an 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 in a 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.

The upland area of the Custom Plywood property is characterized as heavily disturbed, containing relict foundations and structures, concrete and wood debris, native and non-native vegetation, and wetlands. The remnants of former structures, including concrete foundations and pilings and abandoned tanks from previous industrial activities, are scattered across the property. More than 1,500 wooden pilings associated with the former Custom Plywood mill structures remain on the property.

The shoreline of the Site contains industrial debris and significant quantities of naturally occurring woody debris. Woody debris ranges in size from sawdust to large mill end remnants and logs. Active erosion is occurring along the northeast

and central portion of the property where storm events and long-period waves have locally destabilized the shoreline. Temporary measures have been completed with the intent to stabilize the shoreline to prevent or slow further erosion.

Results of the RI identified constituents of potential concern (COPCs) and key indicator hazardous substances in soil and groundwater at the Custom Plywood Site. The COPCs and key indicator hazardous substances that were identified in Site soil include diesel- and oil-range total petroleum hydrocarbons (TPH), inorganic constituents (arsenic, cadmium, copper, chromium, lead, mercury, nickel, selenium, silver, and zinc), and select SVOCs, which primarily include carcinogenic polycyclic aromatic hydrocarbons (cPAHs). Of these, oil-range TPH had the most significant relative exceedance of preliminary MTCA screening levels, identified near the former press pits located in the central upland portion of the property. Polychlorinated biphenyls (PCBs), dioxins/furans, and other compounds were identified infrequently and generally at concentrations below screening levels. As such, these compounds were not considered to be key indicator hazardous substances in the RI or FS.

The RI reported limited groundwater data for establishing indicator hazardous substances. Several constituents were detected during sampling and testing of Site groundwater monitoring wells and seeps that were considered indicator hazardous substances, which include diesel- and oil-range TPH, cPAHs, and metals (arsenic, copper, nickel, and zinc).

Previous independent and limited interim remedial actions have been conducted in the upland portion of the Custom Plywood Site. These actions include removal of soil impacted by hydraulic oil within the City of Anacortes right-of-way located immediately northwest of the GBH property in 1998 and removal of impacted soils from four areas where petroleum hydrocarbons and other constituents exceeded MTCA Method A cleanup levels in 2007.

The FS that was prepared for the Site assessed several upland cleanup alternatives applicable to remediation of impacted Site soil and groundwater, which were developed based on the findings of the RI and evaluated in accordance with MTCA criteria (WAC 173-340-360). The selected remedy for the uplands is identified in the FS as Alternative U-3. As described in the FS and CAP, this remedy combines removal of near-surface debris, concrete foundations, and pilings (where necessary to access contaminated soil), with soil excavation as a source control measure and backfilling to existing contours.

The remedy involves excavation up to a depth of 15 feet in the shoreline protection zone (defined as the area that lies between the Mean Higher High

Water (MHHW) line to a distance 75 feet landward of MHHW) and up to 6 feet elsewhere on the property. Portions of the excavation areas that lie seaward of Ordinary High Water (OHW) will be excavated in the later aquatic phase of work (Phase II). Excavation up to a depth of 6 feet represents source removal to the terrestrial ecological point of compliance (POC), and excavation to 15 feet represents source removal to the human health POC. The final extent of excavation will be determined during construction through field screening and soil sample testing as part of performance monitoring. During construction, excavation will proceed as practicable to inhibit potential sidewall failure; however, additional shoring or other stabilization measures are not planned.

A target volume of approximately 26,000 cubic yards (cy) of debris and contaminated soil material is estimated to be excavated and disposed of off site at a permitted Subtitle D landfill facility. The excavation areas will be backfilled to grade using clean imported fill and crushed concrete debris generated from on-site above-ground structure and foundation demolition. Post-construction site stabilization measures (hydroseeding and other erosion protection technologies) will be implemented in the last phase of construction that occurs outside of the new stormwater management and wetland mitigation and buffer areas that are created.

The selected upland cleanup alternative includes mitigation for nearly 12,000 square feet (sf) of wetlands impacted by the planned soil excavation activities. A consolidated wetland concept in the southern portion of the property is included as part of the overall cleanup action for the Site, which includes an estuarine wetland created landward of Ordinary High Water (OHW) with an associated upland buffer approximately 50 to 75 feet in width that will be planted with native vegetation. Public access elements are also planned to be implemented, that include beach access at the southern landward tip of the Site.

Installation of a stormwater swale is planned for management and treatment of stormwater currently routed onto the Custom Plywood property through a City of Anacortes conveyance. The swale will provide basic stormwater treatment before it enters a vegetated conveyance corridor that will route the treated stormwater from the swale into the restored wetland area. The conveyance corridor will be designed to meander through the restored buffer area to provide additional treatment and infiltration as well as a more natural channel configuration.

Post-construction stormwater and confirmational monitoring would be conducted to verify the long-term efficacy of the upland interim action after performance standards have been reached. In addition, one or more

environmental covenants are planned to be established for the Custom Plywood property.

The Draft Interim Action Work Plan documents, which included the Draft Engineering Design Report, were issued in mid-February 2011 for combined MTCA/SEPA public review. Briefing meetings with Site stakeholders and the general public were held in late February and the final IAWP documents released in September 2011 following August 2011 completion of the Summary Response to Comments from the stakeholders and pubic. The detailed design phase began in early February to develop the necessary project plans, specifications, and related quality assurance planning and compliance monitoring documents.

The construction bid solicitation was advertised in May 2011and the construction contract awarded in June 2011 Phase I upland construction began at the middle of July and is currently scheduled to be completed by the end of October 2011. Field construction for aquatic remediation (Phase II) is scheduled to begin in 2013 and extend through 2015 as the follow-on action to Phase I upland remediation.

UPLAND REMEDIATION (PHASE I)
ENGINEERING DESIGN REPORT
FOR INTERIM ACTION WORK PLAN
CUSTOM PLYWOOD SITE
ANACORTES, WASHINGTON

1.0 INTRODUCTION

This Phase I upland remediation Engineering Design Report (EDR) is prepared under the direction of the Washington State Department of Ecology (Ecology) Toxics Cleanup Program (TCP) in accordance with an agreement with GBH Investments, LLC (GBH), for selected upland portions of the Custom Plywood Site (Site) located in Anacortes, Washington (Figure 1-1). 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 WAC).

Elements of this EDR address the requirements of WAC 173-340-400, including:

- A description and conceptual plan of the planned cleanup action;
- Definition of the goals of the planned cleanup action;
- Design criteria and assumptions for the planned cleanup action;
- Schedule for implementation of the cleanup action plan;
- Cleanup standards for hazardous substances and media of concern; and
- Description of compliance monitoring that will be performed during and after the planned remedial action.

This EDR documents the engineering concepts and criteria used for design of the planned interim cleanup action in the upland portion of the Site and provides information necessary for the development and review of construction plans and specifications, as part of a MTCA Interim Action Work Plan (IAWP). In addition to this EDR for Phase I upland remediation, the IAWP documents include the September 2011 Remedial Investigation (RI) Report for Interim Action Work Plan prepared by AMEC Geomatrix (AMEC 2011) for GBH and the September 2011 Feasibility Study (FS) Report for Interim Action Work Plan, the September 2011 Upland Remediation (Phase I) Cleanup Action Plan (CAP) for Interim Action Work Plan, both prepared by Hart Crowser for Ecology. (Note that herein these reports are referred to as the RI, FS, CAP, and EDR, hereafter.)

GBH completed the RI in response to Ecology Agreed Order DE 5235, dated March 17, 2008.

The overall interim cleanup action at the Site consists of both upland and aquatic work. The cleanup work would be phased with upland remediation (Phase I) planned to be completed by the end of October 2011. Cleanup of in-water areas (Phase II) is planned to begin in 2013 and to be completed in 2015. A separate CAP and EDR are planned to be developed for the in-water remediation component, with permitting and construction completed as separate, follow-on efforts to upland remediation. The upland interim cleanup action described in this EDR involves demolition of existing upland structures, excavation and off-site disposal of near-surface debris and impacted soil, backfilling of excavated areas, construction of a wetland mitigation area and buffer zone, and provision of post-construction stormwater management and public access at the Site. In addition, ongoing monitoring of the interim cleanup action and establishment of the wetland buffer during and after construction is planned.

1.1 Interim Action Contact Information

Questions regarding the upland remediation and mitigation activities should be directed to the Washington State Department of Ecology's site manager, Hun Seak Park, (360) 407-7189, hpar461@ecy.wa.gov.

1.2 Summary of Planned Upland Phase I Cleanup Activities and Related Elements

The planned cleanup activities for the upland portion of the Custom Plywood Site are summarized as follows.

- Above-ground concrete structures will be demolished, crushed, and retained on site as excavation backfill material. Near-surface debris generally consisting concrete, brick, wood, and other materials would be removed from the planned excavation areas, where needed to access contaminated soils. Existing available Site information indicates that the near-surface debris would not be practical or cost-effective to screen for on-site or off-site recycling. Debris are planned to be shipped for off-site landfill disposal with contaminated soils.

- Wooden pilings that remain in the upland excavation areas would be either extracted in their entirety or sawed off at the excavation bottom, depending on projected piling lengths and target soil excavation depths. The pilings would be disposed of off site at a permitted landfill.

- Areas of contaminated soil identified on the Site would be removed to the approximate extent shown, or until analytical results for performance samples show that cleanup levels are achieved at the excavation limits.

- Performance monitoring would be conducted during the excavation work. Where field screening or performance sample analytical results show residual contamination remains above cleanup levels, additional lateral excavation is planned to be performed as necessary to achieve compliance with cleanup levels.

- Target excavation depths range from 4 to 8 feet in the shoreline protection zone, and from 4 to 6 feet elsewhere. If necessary, the depth of excavation in the shoreline protection zone may extend to a maximum of 15 feet (human health point of compliance [POC]) or to a maximum of 6 feet elsewhere in the uplands (ecological POC), as described in the FS and CAP.

- As practical, excavated soil would be directly loaded into trucks and disposed of off site at a permitted Subtitle D (lined) landfill facility. Alternatively, the contractor may elect to stage excavation materials in temporary on-site stockpiles, if desirable for dewatering or to manage off-site shipment.

- As the remedial excavation work proceeds, a wetland mitigation complex would be constructed in the southern portion of the uplands. The wetland mitigation complex would consist of estuarine wetland and a surrounding buffer area planted with local flora. A public beach access facility addressing City of Anacortes Shoreline Master Program requirements is proposed for construction at the southernmost point of the mitigation area as part of Phase II in-water remediation.

- Within the buffer area adjacent to the wetland mitigation complex, clean imported fill would be placed to raise local grades and protect the revegetated buffer area from wave inundation. Hydroseeding would be performed over other areas of the Site to stabilize topsoil following excavation backfilling following placement, as part of the Site restoration program.

- A stormwater swale and conveyance system would be constructed near the western property boundary adjacent to the Tommy Thompson Trail for post-construction stormwater management of stormwater that enters the Site from a City of Anacortes outfall pipe.

- Existing groundwater monitoring wells that are located in the planned excavation areas would be decommissioned in accordance with Chapter 173-160 WAC, Minimum Standards for Construction and Maintenance of Wells.

- New groundwater monitoring wells would be installed after completion of Phase II in-water construction activities. Phase II construction would otherwise damage wells if already installed in the nearshore areas. Confirmation monitoring consisting of groundwater sampling and analysis would be conducted to assess the long-term effectiveness of the interim cleanup action.

1.3 Custom Plywood Site Upland Phase I EDR Organization

Specific discussion points pertinent to these MTCA criteria are presented in subsequent EDR sections organized as follows:

Section 2.0 Summary of Site History and Current Conditions

Section 2.0 provides a summary overview of Site history, previous remedial actions, and Site conditions and contamination. Summary information is compiled from the RI, FS, and CAP documents.

Section 3.0 Cleanup Requirements

Remedial action objectives and cleanup levels for soil and groundwater in the upland area of the Custom Plywood Site are identified in Section 3.0. The criteria used to establish upland wetland mitigation are also defined in this section.

Section 4.0 Basis of Design

Section 4.0 presents the basis of design for the upland interim cleanup action, including key assumptions, construction sequencing approach, groundwater and stormwater management, wetland mitigation, and other design considerations. This section also includes a description of how excavated material is planned to be handled, characterized, and disposed of.

Section 5.0 Estimated Costs

Estimated costs for construction – including direct and indirect capital costs, long-term monitoring and maintenance costs, and 30 percent contingency – are

presented in Table 5-1, without modification of the total cost or subtotals presented in the FS.

Section 6.0 Compliance Monitoring Plan

Section 6.0 presents planned compliance monitoring activities to be performed during the upland interim cleanup action to confirm that human health and the environment are adequately protected, and following cleanup action to confirm that cleanup requirements were satisfied.

Section 7.0 Operation, Maintenance, and Monitoring Plan

Section 7.0 introduces the Operation, Maintenance, and Monitoring Plan (OMMP) elements that are planned to be performed following completion of the upland interim action.

Section 8.0 Project Schedule and Construction Sequencing Considerations

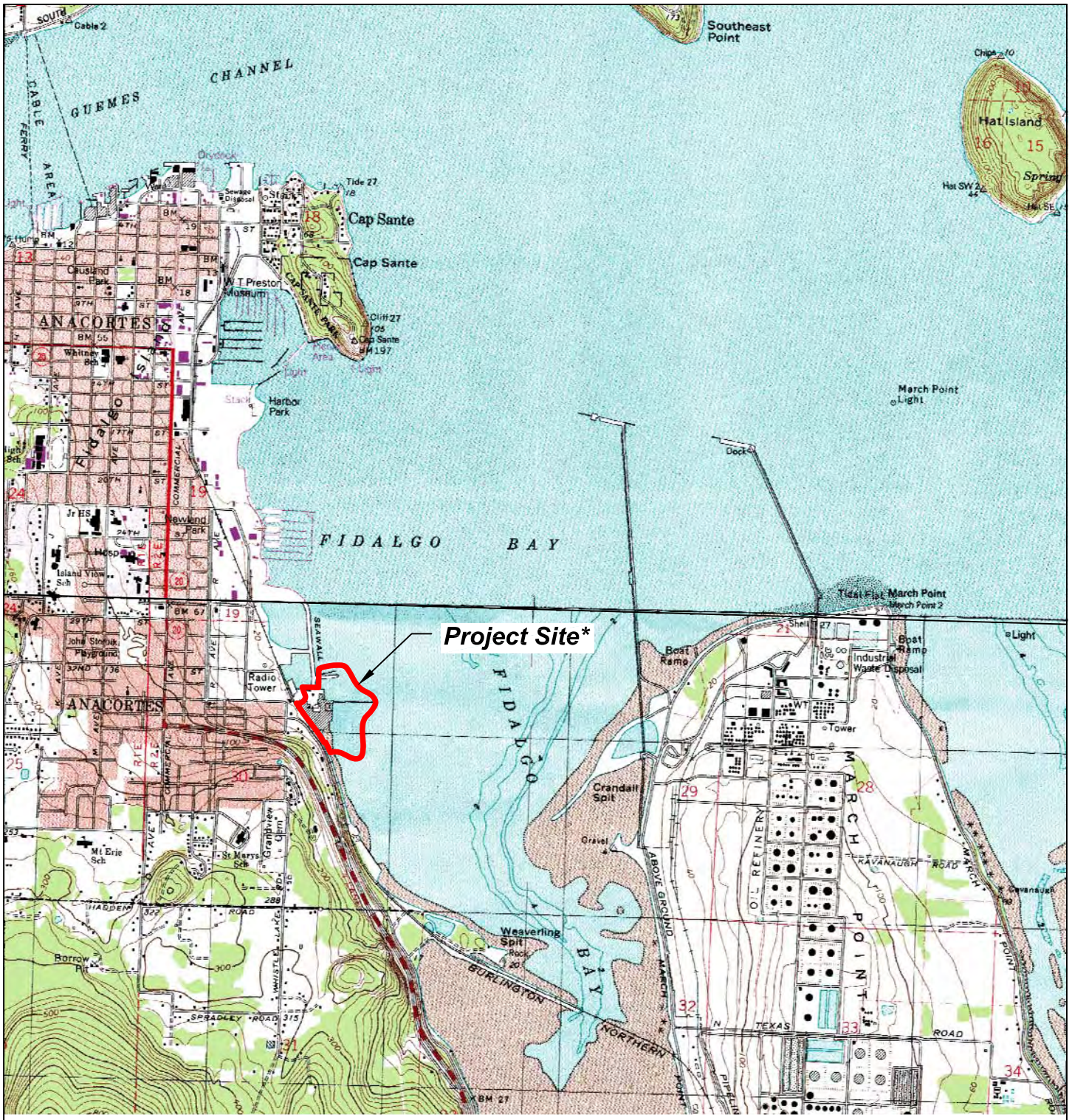
Section 8.0 presents the schedule for Site upland cleanup activities to be completed within a reasonable time frame in accordance with WAC 173-340-360(6). Factors that affecting the construction work sequence are discussed in this section.

Section 9.0 References

Section 9.0 Includes references cited in the EDR.

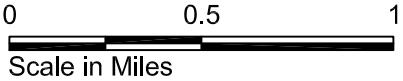
Appendix A – Conceptual Wetland Mitigation Plan

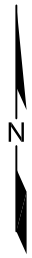
This EDR also includes the Conceptual Wetland Mitigation Plan (Appendix A), which identified measures in detail to mitigate impacts to the existing wetlands on the Site that would be affected by the planned remedial alternative. Additionally, the plan identified how stormwater entering the Site via an existing City of Anacortes conveyance would be managed, and how stormwater management would be integrated with the wetland mitigation area.



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

* Represents upland and aquatic portions of the site included with current EDR.





Custom Plywood Site
Anacortes, Washington

Vicinity Map

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Figure
1-1

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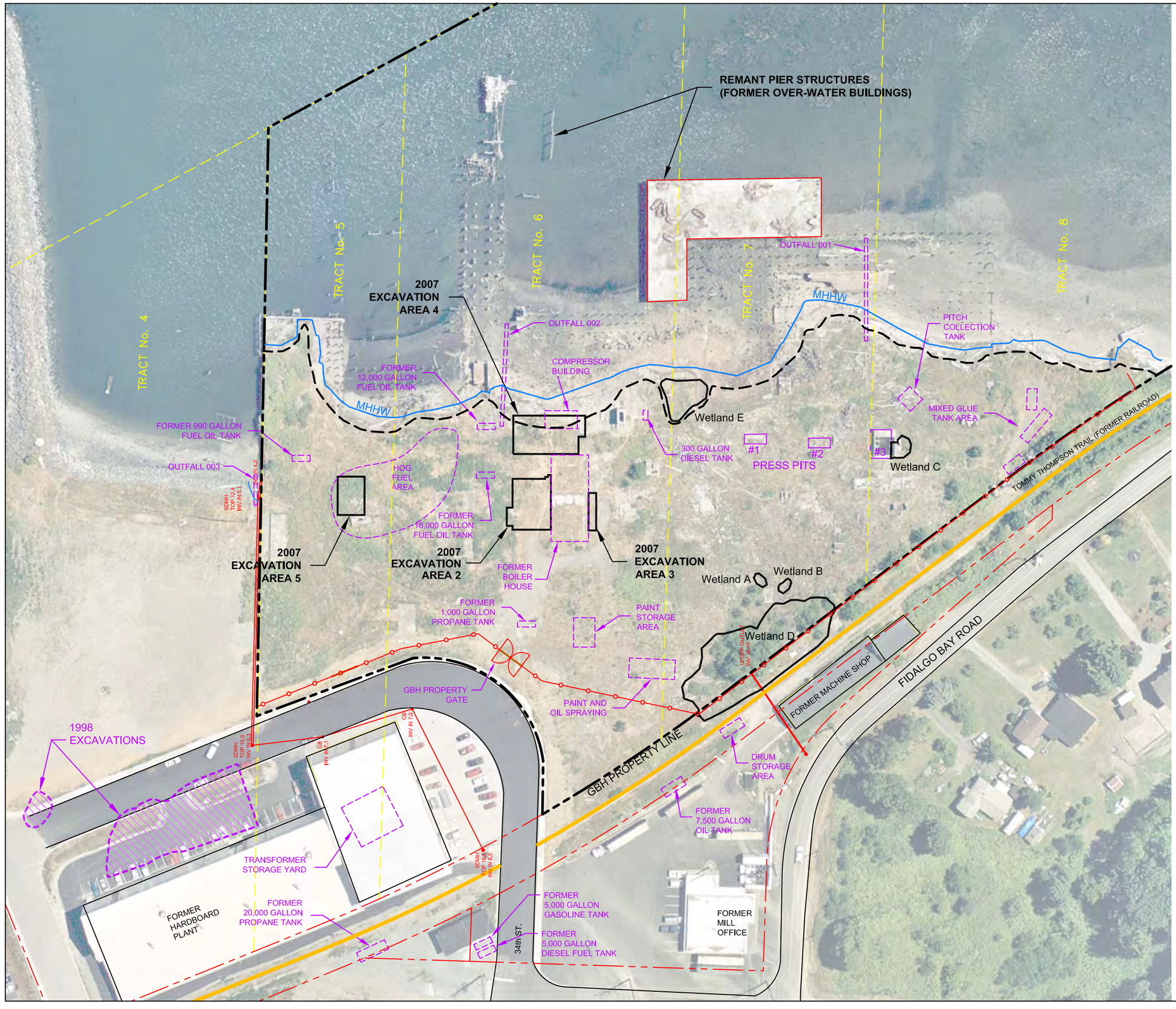

Ordinary High Water

MHHW Mean Higher High Water

Fence

Storm Drain Line

Historical Feature

Note:
Adapted from AMEC Geomatrix (2010) First Draft Remedial Investigation (RI) Report Figure 3.

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

N

0 100 200

Scale in Feet

Custom Plywood Site
Anacortes, Washington

Site Features Map

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Figure
1-2

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2.0 SUMMARY OF SITE HISTORY AND CURRENT CONDITIONS

The Custom Plywood 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 (PSI). The Site includes property owned by GBH covering approximately 6.6 acres of upland and 34 acres of intertidal and subtidal areas.

As described in the RI and CAP, the Custom Plywood Site was the location of lumber and plywood milling operations beginning in about 1900. Through the years, the property changed hands several times, and was rebuilt and added onto until Custom Plywood became an 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 in a fire on November 28, 1992. The current Site layout is shown on Figure 1-2. Milling activities produced wood waste and chemical contaminants affecting Site soils and groundwater that are the focus of this EDR.

Interim remedial actions were conducted under WAC 173-340-515 (Independent Remedial Actions) on the upland portion of the Custom Plywood Site beginning in 1998. These interim actions included removal of soil impacted by hydraulic oil within the City of Anacortes right-of-way located immediately northwest of the GBH property in 1998 and removal of impacted soils from four areas where petroleum hydrocarbons and other constituents exceeded MTCA Method A cleanup levels in 2007. Additional information on previous Site remedial actions is presented in the RI.

2.1 Site Environmental Conditions

The upland area of the Custom Plywood property is currently undeveloped with remnant concrete building foundations and structures, pilings, concrete and wood debris, and native and non-native grass and shrub vegetation, and wetlands (Figure 1-2). Former plywood milling operations produced copious amounts of wood waste fill placed in upland and aquatic portions of the Site over many years. Site fill soils consist 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 exceed 15 feet in thickness in some areas and include general "upper" and "lower" fill units identified in the RI. Concrete, brick, and other debris are the distinguishing components of the upper unit, while wood waste is more prevalent in the lower unit.

Shallow, perched groundwater is present at the Site and is tidally affected in nearshore areas. As reported in the RI, groundwater has been encountered at

depths ranging from approximately 5 to 6 feet below ground surface (bgs) during low tide, and within 2 feet of ground surface at high tide in some nearshore locations. Further monitoring of the variability of groundwater level elevations has reportedly not been conducted.

The northwestern portion of the property is being used as a temporary boat storage yard. The remnants of former structures, including concrete foundations and pilings and abandoned tanks from previous industrial activities, are scattered across the property. Portions of some of the above-ground concrete foundations have been removed from the property. Several debris piles containing wood, metal, and other material are located throughout the property. Approximately 970 wooden pilings are currently estimated to be present in the upland portion of the GBH property. The condition and number of creosote-treated pilings is uncertain.

Five wetland areas (Wetlands A through E) are located within the southern portion of the property (Figure 1-2). These wetlands were delineated and their boundaries accepted by the US Army Corps of Engineers (USACE) and Ecology's Shorelands and Environmental Assistance (SEA) Program. Wetlands A (120 square feet [sf] in area), B (124 sf in area), and D (9,910 sf in area) are freshwater wetlands, and Wetlands C (367 sf in area) and E (1,389 sf in area) are estuarine wetlands.

The shoreline of the Site contains industrial debris and significant quantities of naturally occurring woody debris. Woody debris ranges in size from sawdust to larger mill end remnants and logs. Active erosion is occurring along the northeast and central portion of the property where storm events and long-period waves have locally destabilized the shoreline (refer to Appendix B-2 of the FS). Site conditions show an actively eroding shoreline upon which ecology blocks and rubble were placed to help stabilize the shoreline following inundation during a high wave storm event in the winter of 2010.

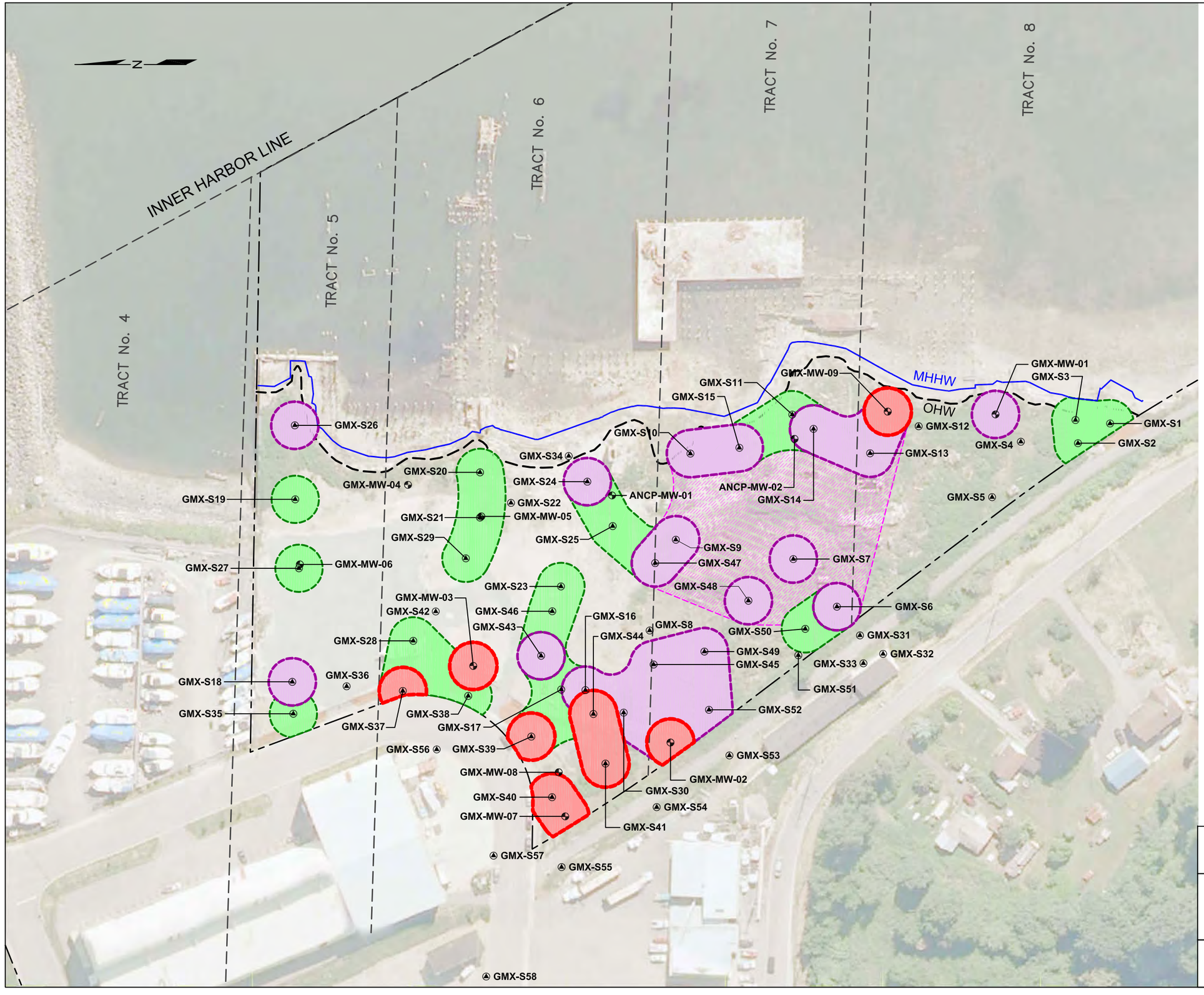
2.2 Site Soil and Groundwater Contaminants

The primary constituents of potential concern (COPCs) and key indicator hazardous substances in soil identified by the RI are diesel- and oil-range total petroleum hydrocarbons (TPH), inorganic constituents (arsenic, cadmium, copper, chromium, lead, mercury, nickel, selenium, silver, and zinc), and select semivolatile organic compounds (SVOCs) — primarily carcinogenic polycyclic aromatic hydrocarbons (cPAHs). Of these, oil-range TPH had the most significant relative exceedance of preliminary MTCA screening levels with concentrations up to 164,000 milligrams per kilogram (mg/kg) identified near

the press pits identified on Figure 1-2. Figure 2-1 identifies the inferred extent of contaminant screening level exceedances for upland soils at the Site.

To date, soil samples have identified polychlorinated biphenyls (PCBs) and dioxins/furans each exceeding their respective screening levels at only one location on the Site. Where the concentrations of petroleum hydrocarbons are highest, some SVOCs (e.g., phenanthrene, fluoranthene, and pyrene) were detected. Creosote-treated pilings are an additional potential source of cPAHs in the upland (and aquatic) environments. PCBs, dioxin/furans, and other compounds were identified infrequently and generally at concentrations below screening levels. These compounds were not considered to be key indicator hazardous substances in the RI or FS. The RI provides additional detail regarding the extent of MTCA screening level exceedances, and further information on the primary and secondary sources of upland contaminants is presented in the CAP.

Limited groundwater data were reported in the RI for establishing indicator hazardous substances. Several constituents were detected during 2008 and 2009 sampling and testing of Site groundwater monitoring wells and seeps that were considered indicator hazardous substances. These included diesel- and oil-range TPH, cPAHs, and arsenic, copper, nickel, and zinc. The RI report provides further information on the frequency and locations of MTCA screening level exceedances for these groundwater constituents, although monitoring data are somewhat limited. Cadmium, lead, and mercury were COPCs identified for soil, and are included as additional COPCs for groundwater based on potential exposure pathways associated with Site construction activities.



Inferred Areal and Depth Extent of COC Screening Level Exceedances in Soil
Depth Extent in Feet Below Ground Surface

- 0-4 Feet
- 0-6 Feet
- 0-8 Feet
- Potential Exceedance to 6 Feet

Exploration Location and Number

- GMX-MW-02 — 2008 and 2009 Monitoring Well (AMEC 2009)
- GMX-S6 — 2008 and 2009 Soil Sample (AMEC 2009)

Notes:

1. Adapted from AMEC Geomatrix (2010) First Draft Remedial Investigation (RI) Report Figures 5 and 32.
2. Includes exceedance of screening levels for TPH, cPAHs, and metals in soil.
3. Boundary locations estimated based on nominal 25-ft minimum horizontal distance from point of detection. Assumed working scenario for FS evaluation.

0 100 200
Scale in Feet

Custom Plywood Site
Anacortes, Washington

Inferred Extent of COC Screening Level Exceedances in Soil

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Figure **2-1**

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3.0 CLEANUP REQUIREMENTS

This section summarizes the remedial action objectives and cleanup levels for the upland portions of the Custom Plywood Site addressed in the CAP. Remedial action objectives and cleanup levels were developed to address MTCA and other applicable state and federal regulatory requirements for upland cleanup.

3.1 Remedial Action Objectives

The primary objective for the planned upland interim cleanup actions at the Custom Plywood Site focuses on substantially eliminating, reducing, and/or controlling unacceptable risks to the environment posed by COPCs to the extent feasible and practicable. Applicable exposure pathways and receptors of interest for human health include current and future Site users, including workers and visitors potentially exposed to soil and groundwater associated with direct contact pathways, and consumption of marine biota exposed to upland groundwater or eroded soils. Applicable ecological exposure pathways and receptors include biota potentially exposed to soil and groundwater associated with direct contact pathways and food chain uptake including marine biota exposed to eroding upland soils.

Remedial action objectives for Phase I upland cleanup are presented as target goals to be achieved to the extent feasible and practicable. A key related objective is the preservation and protection of cultural resources, should such objects be encountered during the upland remedial action.

3.1.1 Shoreline Stability Considerations

As discussed in the FS and CAP, wave and current action have resulted in significant erosion of the filled shoreline zone and is expected to continue to do so in the future. Results of coastal engineering modeling completed to date are consistent with observed shoreline erosion scarps and high-energy events such as occurred during the winter of 2010. Protective in-water features to prevent further shoreline erosion and migration/dispersion of deleterious sawdust and residual contaminated soil from the Site upland areas will be further addressed in separate CAP and EDR documents for Phase II aquatic cleanup.

3.2 Cleanup Standards

Cleanup standards include cleanup levels and POCs as described in WAC 173-340-700 through WAC 173-340-760, which were addressed in the CAP and are summarized in the following sections.

Cleanup levels for upland cleanup consist of applicable MTCA and other protective regulatory criteria for soil and groundwater. Criteria applicable to the former Custom Plywood Site are summarized in Tables 3-1 and 3-2 for soil and groundwater, respectively. In each case, cleanup levels are identified as the lowest applicable MTCA or applicable or relevant and appropriate requirements (ARARs) currently established. Key indicator hazardous substances and COCs were identified by media, based on their frequency of occurrence, as required by MTCA (WAC 173-340-703). The proposed POCs were identified in accordance with standard MTCA protocols for soil and groundwater.

3.2.1 Soil

Target soil cleanup levels for soil are determined using MTCA Method B criteria for direct contact and terrestrial ecological and groundwater protection (see Table 3-1). Groundwater is not currently envisioned as a future drinking water source at the former Custom Plywood Site, and soil cleanup levels for groundwater protection, therefore, are established for the soil to groundwater to surface water pathway. Site-specific cleanup levels for diesel-range TPH are defined based on the results of terrestrial ecological evaluations and soil bioassay (refer to Appendix D of the RI). Cleanup levels for some metals including arsenic, chromium, copper, mercury, and nickel are adjusted for regional background concentrations as provided in WAC 173-340-740(5)(c) and WAC 173-340-709.

Key Indicator Hazardous Substances. Key indicator hazardous substances in soil identified in the RI and further evaluated in FS include:

- Diesel- and oil-range TPH;
- cPAHs; and
- Total metals including arsenic, cadmium, copper, lead, mercury, nickel, and zinc.

Other compounds, including PCBs, pentachlorophenol (PCP), dioxins/furans, chromium, silver, and selenium, were identified in Site soils but had a limited number of detections or exceedances of screening levels. These compounds

would be appropriately addressed through remedial actions focused on indicator hazardous substances. Other compounds, including antimony, barium, beryllium, gasoline-range TPH, and volatile organic compounds (VOCs), were excluded as indicator hazardous substances because the concentration of these substances seldom, if ever, exceeded cleanup criteria.

Points of Compliance. The POC for human exposure to soil via direct contact pathway is 15 feet bgs for soil throughout the GBH property (WAC 173-340-740[6][d]). The conditional POC for the biologically active soil zone is 6 feet bgs, assuming that an institutional control is established to limit exposure from excavation below this depth (WAC 173-340-7490[4]).

3.2.2 Groundwater

Target groundwater cleanup levels are established based on protection of the groundwater to surface water pathway (Table 2-2). Cleanup levels are derived from the lowest concentration protective of human or ecological health from MTCA Method B, state surface water quality criteria (Chapter 173-201A), Clean Water Act Section 304, or the National Toxics Rule (40 CFR 131) criteria.

Key Indicator Hazardous Substances. Limited groundwater data were reported in the RI for establishing indicator hazardous substances in groundwater. Several constituents were detected during 2008 and 2009 sampling and testing of Site groundwater monitoring wells and seeps and are considered indicator hazardous substances. These substances included:

- Diesel- and oil-range TPH;
- cPAHs; and
- Metals including arsenic, copper, nickel, and zinc.

Additional COPC metals including cadmium, lead, and mercury are also included as key indicator hazardous substances based on potential exposure pathways associated with Site construction activities. Accordingly, groundwater compliance monitoring following completion of the upland interim action will include this combined suite of metals as indicator hazardous substances.

Point of Compliance. Although planned soil remediation is expected to remove soil contaminants from the soil to groundwater to surface water pathway, a POC for groundwater throughout the GBH property may not be practicable. A conditional POC, therefore, is identified at the groundwater/surface water interface per provisions of WAC 173-340-720(8)(d)(i), Properties Abutting

Surface Water. This conditional POC is located within surface water as close as technically feasible to the point where groundwater flows into surface water. Identification of this conditional POC is subject to further conditions of WAC 173-340-720(8)(d)(i), including notice to the Natural Resource Trustees and the USACE, and is also subject to long-term monitoring.

3.2.3 Potentially Applicable Regulatory Requirements

The RI, FS, and CAP describe MTCA regulatory provisions forming the primary basis for evaluating and implementing upland cleanup alternatives for remediation at the Site. A wide range of state, federal, and local compliance requirements may be applicable to the upland work that is planned for the Site. Potential compliance requirements, activities, and triggering actions for state and federal regulations are summarized in Table 3-3.

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

Applicable exempted state laws include:

- Chapter 70.94 RCW – Washington Clean Air Act;
- Chapter 70.95 RCW – Solid Waste Management – Reduction and Recycling;
- Chapter 70.105 RCW – Hazardous Waste Management;
- Chapter 90.48 RCW – Water Pollution Control Act; and
- Chapter 90.58 RCW – Shoreline Management Act.

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, including applicable requirements that 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 Historical Preservation Act

(16 USCA 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 for upland construction activities is presented in Appendix A of the FS.

City of Anacortes Permits

Applicable City of Anacortes permitting approvals will be obtained for the Phase I upland cleanup component. Permitting actions will consist of submitting an application for a standard City of Anacortes Grading Permit. Guidance from the City to streamline the permit process will result in inclusion of applicable elements for site clearing, demolition, and a Shorelines Master Program exemption. A related element of the Grading Permit application is analysis of stormwater drainage elements associated with the planned stormwater swale and conveyance structure for long-term management of City stormwater flows entering the Site. Drainage analysis will be conducted in accordance with requirements of Ecology's Stormwater Management Manual for Western Washington (Ecology 2005).

Table 3-1 - Soil Cleanup Levels

Concentrations in mg/kg

Soil Constituent Key Indicator Hazardous Substances Identified in Bold	Cleanup Level	Regulatory Criteria				Area Background[c]
		MTCA Method B Soil-Direct Contact Unrestricted Land Use Carcinogen	MTCA Method B Soil-Direct Contact Unrestricted Land Use Noncarcinogen	MTCA Method B Protective of Groundwater as Marine Surface Water[a]	MTCA Method B Protective of Terrestrial Ecological Receptors [b]	
Total Metals						
Arsenic	**8.47**	0.67	24	0.08	20	**8.47**
Cadmium	**1.21**	2[d]	80	1.21	25	1.2
Chromium (total)	117	2,000[d]	NE	NE	42	117
Copper	**52.9**	NE	3,000	1.07	100	**52.9**
Lead	**220**	250[d]	NE	1,620	**220**	NE
Mercury	**0.13**	2[d]	24	0.03	9	**0.13**
Nickel	**54.2**	NE	1,600	10.7	100	**54.2**
Zinc	**101**	NE	24,000	**101**	270	85.6
PCBs						
Total PCBs	0.5	NE	0.5	**NE**	2	NE
Dioxins and Furans						
Total ecological TEC dioxin	0.000005	NE	NE	NE	0.000005	
Total ecological TEC furan	0.000003	NE	NE	NE	0.000003	
TPH						
Diesel-range hydrocarbons	**1,700**	2,000[d]	NE	NE	**1,700**	
Oil-range hydrocarbons	**2,000**	**2,000[d]**	NE	NE	**8,500**	
Gasoline-range hydrocarbons (no benzene)	100	100[d]	NE	NE	200	
Gasoline-range hydrocarbons (with benzene)	30	30[d]	NE	NE	200	
SVOCs						
2-Chloronaphthalene	42.56	NE	6,400	42.56	NE	
2-Chlorophenol	1.15	NE	400	1.15	NE	
2-Methyl-4,6-dinitrophenol	NE	NE	NE	NE	NE	
2-Methylnaphthalene	320	NE	320	NE	NE	
2-Methylphenol	4,000	NE	4,000	NE	NE	
2-Nitroaniline	NE	NE	NE	NE	NE	
2-Nitrophenol	NE	NE	NE	NE	NE	
3-Methylphenol	4,000	NE	4,000	NE	NE	
4-Methylphenol	400	NE	400	NE	NE	
3,3'-Dichlorobenzidine	0.001	2.2	NE	0.001	NE	
3-Nitroaniline	NE	NE	NE	NE	NE	
4-Bromophenyl phenyl ether	NE	NE	NE	NE	NE	
4-Chloro-3-methyl phenol	NE	NE	NE	NE	NE	
4-Chloroaniline	320	NE	320	NE	NE	
4-Chlorophenyl phenyl ether	NE	NE	NE	NE	NE	
4-Nitroaniline	NE	NE	NE	NE	NE	
4-Nitrophenol	NE	NE	NE	NE	NE	
Acenaphthene	100.99	NE	4,800	100.99	NE	
Acenaphthylene	NE	NE	NE	NE	NE	
Aniline	180	180	NE	NE	NE	
Anthracene	18,560	NE	24,000	18,560	NE	
Benzidine	0.0007	0.0043	240	0.0007	NE	
Benzo[a]anthracene	**0.13**	NE	NE	**0.13**	NE	
Benzo[a]pyrene	**0.14**	**0.14**	NE	0.35	30	
Benzo[b]fluoranthene	**0.43**	NE	NE	**0.43**	NE	
Benzo(g,h,i)perylene	NE	NE	NE	NE	NE	
Benzo[k]fluoranthene	**0.43**	NE	NE	**0.43**	NE	
Benzyl alcohol	24,000	NE	**24,000**	NE	NE	
bis(2-Chloroethoxy) methane	NE	NE	NE	NE	NE	
bis(2-Chloroethyl) ether	0.003	0.91	NE	**0.003**	NE	
bis(2-Chloroisopropyl) ether	3200	NE	3,200	--	NE	
bis(2-Ethylhexyl) phthalate	4.85	71	1,600	4.85	NE	
bis(2-Ethylhexyl adipate	830	830	48,000	--	NE	
Butyl benzyl phthalate	539.6	NE	16,000	539.6	NE	
Carbazole	50	50	NE	--	NE	
Chrysene	**0.14**	NE	NE	**0.14**	NE	
Dibenzo[a,h]anthracene	**0.65**	NE	NE	**0.65**	NE	
Dibenzofuran	160	NE	160	--	NE	
Diethyl phthalate	248	NE	64,000	248	NE	

Table 3-1 - Soil Cleanup Levels

Soil Constituent Key Indicator Hazardous Substances Identified in Bold	Cleanup Level	Regulatory Criteria				Area Background[c]
		MTCA Method B Soil-Direct Contact Unrestricted Land Use Carcinogen	MTCA Method B Soil-Direct Contact Unrestricted Land Use Noncarcinogen	MTCA Method B Protective of Groundwater as Marine Surface Water[a]	MTCA Method B Protective of Terrestrial Ecological Receptors [b]	
SVOCs (Continued)						
Dimethyl phthalate	5,280	NE	80,000	5,280	NE	
Dibutyl phthalate	162	NE	8,000	162	200	
Di-n-octyl phthalate	1600	NE	1,600	NE	NE	
Fluoranthene	137.8	NE	3,200	137.8	NE	
Fluorene	837.4	NE	3,200	837.4	NE	
Hexachlorobenzene	0.0005	0.63	64	0.0005	31	
Hexachlorobutadiene	13	13	16	19.52	NE	
Hexachlorocyclopentadiene	480	NE	480	4,407	NE	
Hexachloroethane	0.13	71	80	0.13	NE	
Indeno[1,2,3-cd]pyrene	**1.26**	NE	NE	**1.26**	NE	
Isophorone	2.96	1,100	16,000	2.96	NE	
Naphthalene	137.4	NE	1,600	137.4	NE	
Nitrobenzene	4.42	NE	40	4.42	NE	
N-Nitrosodimethylamine	0.02	0.02	NE	NE	NE	
N-Nitroso-di-n-propylamine	0.002	0.14	NE	0.002	NE	
N-Nitrosodiphenylamine	0.48	200	NE	0.48	NE	
Pentachlorophenol	0.05	8.3	2,400	0.05	11	
Phenanthrene	NE	NE	NE	NE	NE	
Phenol	7,786	NE	48,000	7,786	NE	
Pyrene	2,400	NE	2,400	5,456	NE	
Pyridine	80	NE	80	NE	NE	
Total cPAHs - benzo(a)pyrene TEQ	**0.14**	**0.14**	NE	0.35	30	

Notes

[a] Calculated using fixed-parameter three-phase partitioning model WAC 173-340-747(4).
[b.] Based on simplified terrestrial evaluation in WAC 173-340-7492, criteria listed in Table 749-2 for all constituents except TPH. TPH criteria based on bioassay data reported by AMEC (2010).
[c] The screening level adjusted for regional background concentrations within Skagit/Whatcom counties or Western Washington as reported by Ecology (1994).
[d] MTCA Method A value.

mg/kg = milligrams per kilogram
NE = Not established
PCBs = polychlorinated biphenyls
SVOC = semivolatile organic compounds
TEQ = toxicity equivalent concentration
TPH = total petroleum hydrocarbons

Table 3-2 - Groundwater Cleanup Levels

Concentrations in ug/L

Groundwater Constituent Key Indicator Hazardous Substances Identified in Bold	Cleanup Level[a]	Regulatory Criteria: Surface Water ARAR - Aquatic Life - Marine/Acute - Ch. 173-201A WAC	Surface Water ARAR - Aquatic Life - Marine/Acute - Clean Water Act §304	Surface Water ARAR - Aquatic Life - Marine/Acute - National Toxics Rule, 40 CFR 131	Surface Water ARAR - Aquatic Life - Marine/Chronic - Ch. 173-201A WAC	Surface Water ARAR - Aquatic Life - Marine/Chronic - Clean Water Act §304	Surface Water ARAR - Aquatic Life - Marine/Chronic - National Toxics Rule, 40 CFR 131	Surface Water ARAR - Human Health – Marine – Clean Water Act §304	Surface Water ARAR - Human Health – Marine – National Toxics Rule, 40 CFR 131	Surface Water, Method B, Carcinogen, Standard Formula Value	Surface Water, Method B, Non-Carcinogen, Standard Formula Value
Dissolved Metals											
Arsenic, inorganic	**0.14**	69	69	69	36	36	36	**0.14**	**0.14**	0.098	18
Cadmium	8.8	42	40	42	9.3	**8.8**	9.3	NE	NE	NE	20
Chromium (total)	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Copper	**2.4**	4.8	4.8	**2.4**	3.1	3.1	**2.4**	NE	NE	NE	2,700
Lead	8.1	210	210	210	8.1	8.1	8.1	NE	NE	NE	NE
Mercury (Total)	0.025	1.8	1.8	2.1	0.025	0.94	**0.025**	0.3	0.15	NE	NE
Nickel (as soluble salts)	**8.2**	74	74	74	**8.2**	**8.2**	**8.2**	4,600	4,600	NE	1,100
Zinc	**81**	90	90	90	**81**	**81**	**81**	26,000	NE	NE	NE
PCBs											
Total PCBs	**0.000064**	10	NE	NE	0.03	0.03	0.03	**0.000064**	0.00017	0.00011	NE
TPH											
TPH, diesel-range organics	**500**[b]	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
TPH, heavy oil-range organics	**500**[b]	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
TPH, mineral oil-range organics	500[b]	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
SVOCs											
2,3,3,6-Tetrachlorophenol	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
2-Chloronaphthalene (beta-chloronaphthalene)	1,600	NE	NE	NE	NE	NE	NE	1,600	NE	NE	1,000
2-Chlorophenol	97	NE	NE	NE	NE	NE	NE	NE	NE	NE	97
2-Methyl-4,6-dinitrophenol	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
2-methylnaphthalene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
2-Methylphenol	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
2-Nitroaniline	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
2-Nitrophenol	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
3,3'-Dichlorobenzidine	0.028	NE	NE	NE	NE	NE	NE	0.028	0.077	0.046	NE
3-Methylphenol	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
3-Nitroaniline	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
4-Bromophenyl phenyl ether	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
4-Chloro-3-methylphenol	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
4-chloroaniline	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
4-Chlorophenyl phenyl ether	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
4-Methylphenol	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
4-Nitroaniline	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
4-Nitrophenol	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Acenaphthene	990	NE	NE	NE	NE	NE	NE	990	NE	NE	640

Table 3-2 - Groundwater Cleanup Levels

Groundwater Constituent Key Indicator Hazardous Substances Identified in Bold	Cleanup Level[a]	Surface Water ARAR - Aquatic Life - Marine/Acute - Ch. 173-201A WAC	Surface Water ARAR - Aquatic Life - Marine/Acute - Clean Water Act §304	Surface Water ARAR - Aquatic Life - Marine/Acute - National Toxics Rule, 40 CFR 131	Surface Water ARAR - Aquatic Life - Marine/Chronic - Ch. 173-201A WAC	Surface Water ARAR - Aquatic Life - Marine/Chronic - Clean Water Act §304	Surface Water ARAR - Aquatic Life - Marine/Chronic - National Toxics Rule, 40 CFR 131	Surface Water ARAR - Human Health – Marine – Clean Water Act §304	Surface Water ARAR - Human Health – Marine – National Toxics Rule, 40 CFR 131	Surface Water, Method B, Carcinogen, Standard Formula Value	Surface Water, Method B, Non-Carcinogen, Standard Formula Value
SVOCs (Continued)											
Acenaphthylene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Aniline	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Anthracene	40,000	NE	NE	NE	NE	NE	NE	40,000	110,000	NE	26,000
Benzidine	0.0002	NE	NE	NE	NE	NE	NE	0.0002	0.00054	0.00032	89
Benzo(g,h,i)perylene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Benzo[a]anthracene	**0.018**	NE	NE	NE	NE	NE	NE	0.018	0.031	NE	NE
Benzo[a]pyrene	**0.018**	NE	NE	NE	NE	NE	NE	0.018	0.031	0.03	NE
Benzo[b]fluoranthene	**0.018**	NE	NE	NE	NE	NE	NE	0.018	0.031	NE	NE
Benzo[k]fluoranthene	**0.018**	NE	NE	NE	NE	NE	NE	0.018	0.031	NE	NE
Benzyl alcohol	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
bis(2-Chloroethoxy) methane	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
bis(2-Chloroethyl) ether	0.53	NE	NE	NE	NE	NE	NE	0.53	1.4	0.85	NE
bis(2-Chloroisopropyl) ether	65,000	NE	NE	NE	NE	NE	NE	65,000	170,000	NE	42,000
bis(2-Ethylhexyl) adipate	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
bis(2-Ethylhexyl) phthalate	2.2	NE	NE	NE	NE	NE	NE	2.2	5.9	3.6	400
Butyl benzyl phthalate	1,900	NE	NE	NE	NE	NE	NE	1,900	NE	NE	1,300
Carbazole	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Chrysene	**0.018**	NE	NE	NE	NE	NE	NE	0.018	0.031	NE	NE
Dibenzo[a,h]anthracene	**0.018**	NE	NE	NE	NE	NE	NE	0.018	0.031	NE	NE
Dibenzofuran	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Dibutyl phthalate	4,500	NE	NE	NE	NE	NE	NE	4,500	12,000	NE	2,900
Diethyl phthalate	44,000	NE	NE	NE	NE	NE	NE	44,000	120,000	NE	28,000
Dimethyl phthalate	1,100,000	NE	NE	NE	NE	NE	NE	1,100,000	2,900,000	NE	72,000
Di-n-octyl phthalate	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Fluoranthene	140	NE	NE	NE	NE	NE	NE	140	370	NE	90
Fluorene	5,300	NE	NE	NE	NE	NE	NE	5,300	14,000	NE	3,500
Hexachlorobenzene	0.00029	NE	NE	NE	NE	NE	NE	0.00029	0.00077	0.00047	0.24
Hexachlorobutadiene	18	NE	NE	NE	NE	NE	NE	18	50	30	190
Hexachlorocyclopentadiene	1,100	NE	NE	NE	NE	NE	NE	1,100	17,000	NE	3,600
Hexachloroethane	3.3	NE	NE	NE	NE	NE	NE	3.3	8.9	5.3	30
Indeno[1,2,3-cd]pyrene	**0.018**	NE	NE	NE	NE	NE	NE	0.018	0.031	NE	NE
Isophorone	600	NE	NE	NE	NE	NE	NE	960	600	1,600	120,000
Nitrobenzene	450	NE	NE	NE	NE	NE	NE	690	1,900	NE	450
N-Nitrosodimethylamine	3	NE	NE	NE	NE	NE	NE	3	8.1	4.9	NE
N-Nitroso-di-n-propylamine	0.51	NE	NE	NE	NE	NE	NE	0.51	NE	0.82	NE
N-Nitrosodiphenylamine	16	NE	NE	NE	NE	NE	NE	NE	16	NE	9.7
Pentachlorophenol	3	13	13	13	7.9	7.9	7.9	3	8.2	4.9	7,100
Phenanthrene	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Phenol	1,700,000	NE	NE	NE	NE	NE	NE	1,700,000	4,600,000	NE	1,100,000
Pyrene	2,600	NE	NE	NE	NE	NE	NE	4,000	11,000	NE	2,600
Pyridine	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE

Notes

[a] Cleanup level may be adjusted based on laboratory practical quantitation limit (PQL)
[b] MTCA Method A value.

NE = Not established.
PCBs = polychlorinated biphenyls
SVOC = semivolatile organic compounds
TPH = total petroleum hydrocarbons

Table 3-3 - Potentially Applicable Federal and State Regulatory Requirements

Federal Regulations	Regulatory Citation	Triggering Activity
Clean Water Act	Sections 303, 311, 312, 401, and 404 US Code (USC) 1252 et seq.	Dredging and placement of sediment capping materials within navigable waters of the United States, protection of surface water quality, and filling or removal of wetlands.
Coastal Zone Management Act	16 USC 1455	Construction activities requiring federal approval must be consistent with the State's Coastal Zone Management Program.
Rivers and Harbors Act	33 USC 403 and CFR Parts 320 and 32	Alteration of waters of Fidalgo Bay as a navigable waterway.
Endangered Species Act	16 USC 1531 et seq.	Presence or suspected presence of threatened or endangered species or critical habitat at or near the site at the time of anticipated work.
National Historic Preservation Act of 1966	Section 106 – 16 USC 470 and 36 CFR Part 800	SEPA regulatory compliance, and federal permitting, assistance, and related involvement.
Archeological and Historical Preservation Act	16 USCA 469	Discovery of archaeological or historical objects during remediation activities.
State Regulations		
Solid and Hazardous Waste Management and Related Federal Resource Conservation and Recovery Act	Chapter 70.105 and 70.105D (MTCA) and Chapter 173-303; and 42 USC 6921-6949a and 40 CFR Part 268, Subtitle D	Potential for generating, handling, and disposing of dredged material containing designated hazardous wastes.
Sediment Management Standards	Chapter 173-204 WAC	Actions which expose or resuspend surface sediments which exceed, or otherwise cause or potentially cause surface sediments to exceed applicable standards of the WAC 173-204-320 through 340.
Water Quality Standards for Surface Waters of the State of Washington	Chapter 90.48 RCW and Chapter 173-201A WAC	Potential for construction activities for the upland and in-water remedial action to adversely affect surface waters of the State.
State Environmental Policy Act	Chapter 43.21C RCW, Chapter 197-11 WAC, and Chapter WAC 173-802	Permit application or proposed regulatory cleanup action under MTCA or SMS, and impacts to critical areas.
Shoreline Management Act	Chapter 90-58 RCW and Chapter 173-27 WAC	Construction work within the shoreline zone.
Wetlands – Water Pollution Control Act	90-48 RCW, WAC 365-190-090, and Chapter 173-201A WAC	Construction work affecting wetlands.
Fish and Wildlife Habitat Conservation	Chapter 77-85 RCW and WAC 365-190-130	Construction work within fish and wildlife habitat conservation areas and within the shoreline zone.
Saltwater Habitats of Special Concern	WAC 220-110-250	Construction work within the shoreline and intertidal zones.
Washington Hydraulics Code	Chapter 70-95 RCW and Chapter 173-304 WAC	Use, diversion, obstruction, or change in the natural flow or bed of Fidalgo Bay from the in-water component of the remedial action.
Indian Graves and Records and Archaeological Sites and Resources	RCW Chapter 27.44 and RCW Chapter 27.53	Construction project involving state funding.

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4.0 BASIS OF DESIGN

The design basis of the interim cleanup action selected for the upland area of the Site is described in this section. The interim cleanup action is planned to include demolition of existing above-ground structures, debris and piling removal, soil excavation and disposal, backfilling, associated wetland mitigation, buffer establishment, stormwater management, public access, and Site restoration. Target soil removal areas for the upland interim cleanup action are depicted on Figure 4-1 and in cross sections on Figures 4-2 and 4-3.

4.1 Upland Remediation Areas

This section describes upland areas of concern at the Site (Figure 2-1) where the concentrations of COCs exceed the cleanup levels identified in Section 3.0. 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 CAP. Uncertainty remains regarding the overall depth and areal extents of contamination in the upland area. This uncertainty is a result of spatial data gaps in soil sampling to identify the lateral extent and depth of contamination in upland areas. Additional historical information that could help further delineate contaminant sources and migration mechanisms is not available.

For these reasons, a number of working assumptions were used to provide a practical way of delineating remediation areas for the purposes of evaluating cleanup alternatives and selecting a preferred alternative for the upland interim action.

4.1.1 Criteria for Defining Soil Remediation Areas

Figure 2-1 identifies the areas of concern for upland soils at the Site. The concentrations of diesel- and oil-range TPH, cPAHs, and metals present in upland soils were compared to the most stringent regulatory screening level available for the protection of human health, ecological receptors, and of marine surface water (via the groundwater migration pathway) to establish these areas of concern.

Uncertainty exists as to the extents of soil contamination. This is particularly true in the case of shallow areas within about 2 feet of ground surface, and deeper areas below about 8 feet bgs. Much of the existing soil sampling and analysis focused on the zone between about 2 and 6 feet below grade that was believed to be the most heavily contaminated based on historical information and

previous field observations. The COCs are not equally represented in the samples or at various locations and depths. For this reason, the areal extent, depth, and estimated volume of contaminated soil requiring remediation are detailed in the FS. The FS considers nominal ranges of impact between "clean" and "dirty" samples, sampling locations and relative density, sample depth distribution, and proximity to known or potential historical contaminant sources.

Using these FS assumptions and qualifications, estimated soil volumes for remediation throughout the upland area are as follows:

- 0 to 4 feet depth (including debris): 13,000 cubic yards (cy)
- 4 to 6 feet depth: 4,200 cy
- 6 to 8 feet depth: 1,200 cy
- Potential additional areas at 0 to 6 feet depth: 6,100 cy

These estimates represent in-place volumes for reference purposes. Note that the combined volume for 0 to 6 feet depth, 23,300 cy, represents the soil volume above the ecological POC, which is 6 feet bgs. The combined volume for 0 to 8 feet depth, 24,500 cy, represents the currently estimated remediation volume for contaminated soil requiring removal. Note this is a target depth and depending on findings during excavation, additional soil may need to be excavated to satisfy the POC for the protection of human health, which is 15 feet bgs. Also, the additional potential areas of soil contamination between 0 and 6 feet depth include locations near the former press pit areas and to the west, as shown on Figure 2-1. These areas were identified on Figure 32 of the RI, but limited sample testing data apparently exist to verify the actual nature and extent of soil contamination in this area.

The actual soil remediation volumes at the time of the work will potentially vary from the estimated volumes (given current uncertainties on the nature and extent of contamination). Using more conservative assumptions for areal and depth extent of contamination increases the affected volume to well over 40,000 cy, but does not currently appear to be warranted given the available information. Conversely, using less conservative assumptions might significantly underestimate affected volumes given the current sampling density. An adaptive approach to verify the extent of contamination during construction excavation is planned. This adaptive approach would be guided by the use of routine field screening indicators and soil samples to remove and dispose of additional contaminated soil during excavation to the extent practicable.

4.1.2 Groundwater

As discussed above, limited groundwater data are available establishing TPH, cPAHs, and arsenic, copper, nickel, and zinc as indicator hazardous constituents. However, for the purpose of this EDR, these groundwater constituents are retained as COCs, along with lead, mercury, and zinc as additional COPCs. Remediation of contaminated soils is expected to significantly reduce the soil to groundwater pathway and allow the concentration of these constituents in groundwater to remain and/or return to below cleanup levels within a reasonable restoration time frame, to be further determined during post-construction monitoring.

4.2 Upland Interim Cleanup Action Description

Elements of the upland interim cleanup action are discussed in the following sections, which include site mobilization and site preparation, debris and piling removal, excavation and backfilling, wetland mitigation, and post-construction stormwater management.

4.2.1 Mobilization and Site Preparation

Mobilization and site preparation include transport of construction equipment to the site and construction of temporary upland staging and access facilities. Site preparation activities would begin concurrently with equipment mobilization. Site preparation for soil excavation and removal would consist of the following:

- Performing a pre-removal Site survey to obtain existing grade elevations;
- Performing an underground utilities survey as necessary;
- Establishing necessary traffic control, security fencing, and construction entrance/exit points;
- Installing temporary offices, lighting and other utilities, sanitary facilities, and decontamination stations;
- Installing erosion control measures;
- Establishing a temporary haul route through the Site and designate staging and laydown areas for potential excavated soil dewatering, extracted pilings, and temporary construction stormwater management;

- Establishing drainage control for construction stormwater, and temporarily rerouting the City of Anacortes stormwater outfall that currently discharges on the Site at Wetland D;

- Clearing and grubbing of the wetland areas that reside in the planned excavation areas;

- Removing any potentially impacted standing water from the remaining press pit area structures and appropriate disposal; and

- Abandoning monitoring wells that will not be used for future monitoring in accordance to Chapter 173-160 WAC, Minimum Standards for Construction and Maintenance of Wells.

Demobilization after construction is completed includes removing temporary facilities and equipment from the Site and cleaning any adjacent areas of the Site that may have been impacted during construction.

4.2.2 Above-Ground Demolition, Debris, and Piling Removal

Existing above-ground concrete structures and foundations are planned to be demolished, crushed, and recycled on site as excavation backfill material. This would contribute approximately 1,750 cy of crushed concrete material to the backfill volume, resulting in a reduction of the quantity of clean backfill material that will need to be imported to the Site from off-site sources.

Wood pilings and near-surface debris and rubble also require removal during excavation of contaminated soil. Near-surface debris generally consist of concrete, brick, wood, and other materials that will most likely be removed concurrently with contaminated soils. Existing available site information indicates that the near-surface debris is heterogeneous and would be difficult to screen or separate for on-site or off-site recycling. Regional recycling facilities would not likely accept such material, and significant additional characterization sampling and analysis would be needed if on-site reuse were considered. For these reasons, near-surface debris materials are currently planned to be shipped for off-site landfill disposal with contaminated soils. Additional test pit explorations are planned to further evaluate assumptions for debris removal and disposal.

Wooden pilings will obstruct planned excavations in some areas of the Site, and additional hidden pilings may also be present. It may be most feasible for the contractor to remove or alternatively cut off pilings as excavation proceeds. Relatively short pilings less than about 20 feet long may be most easily managed

by removal using a variety of potential extraction methods to be determined by the contractor. As one example, piling removal could be facilitated using a vibratory hammer with a crane or long-reach equipment. The top of each piling would need to be exposed sufficiently to attach the pulling equipment. Piling conditions are uncertain, and pilings may be susceptible to breaking.

Alternatively, the contractor may elect to cut pilings off at the bottom of the excavations particularly in areas where shallower excavation cuts of 4 to 6 feet bgs are anticipated, or for degraded pilings that would not be able to withstand removal by pulling. An estimated 970 pilings are present in the upland area, many of which are located in planned soil excavation areas. Removed pilings would be temporarily stored on site or off site for shipment to a permitted off-site landfill for disposal. Recycling appears too problematic and potentially costly because of hauling and management costs. Pilings would be left in place where removal is not needed to allow excavation.

Creosote-treated pilings will require secondary containment to prevent cross contamination during handling and temporary storage of the extracted pilings. The contractor will therefore have to establish contained staging and stockpile areas if the pilings are not direct loaded for off-site disposal.

4.2.3 Excavation, Backfilling, and Soil Management

The planned upland interim cleanup action Alternative U-3 involves soil excavation up to 15 feet bgs in the shoreline protection zone and up to 6 feet bgs elsewhere on the property. The shoreline protection zone is defined as the area that lies between Mean Higher High Water (MHHW) to a distance 75 feet landward of MHHW. Portions of the excavation areas that lie seaward of the OHW will be excavated in the later aquatic phase of work (Phase II). Excavation up to 6 feet bgs represents source removal to the ecological POC, and excavation to 15 bgs represents source removal to the human health POC. The extent of contamination during construction and potential need for overexcavation would be determined through field screening and performance monitoring.

General Excavation Sequencing

As described in the previous section, the selected U-3 upland remedy combines above-ground concrete structure removal, with near-surface debris, foundation removal, and piling extraction and/or cutting where necessary to access contaminated soil areas. The general sequencing of excavation and performance monitoring is envisioned as follows:

- Excavate in targeted areas to depth and lateral extent as shown on Figure 4-1, based on spatial sequencing and scheduling to be determined by the contractor (Stage 1 excavation).

- Collect and analyze soil samples from excavation sidewalls and bottom to determine the effectiveness of soil removal and post-excavation conditions on the leave surface.

- If analytical results indicate exceedances of cleanup levels, continue excavation in areas of detected contamination, if the POC has not already been reached (Stage 2 excavation).

- Collect and analyze soil samples from sidewalls and bottom of the overexcavated areas.

- Complete additional excavation, sampling, and testing, as needed, to the extent practicable, or as otherwise determined at the time of the work (additional excavation stages). Successive excavation and sampling stages would continue until soils meeting cleanup criteria are reached; until the vertical POC is attained; or if the contractor is otherwise directed to discontinue excavation.

- Excavation areas where the targeted depth does not extend to the POC would be left open pending laboratory testing results of post-excavation soil samples. To minimize the duration that excavations would remain open and to maintain cleanup work continuity, excavation areas that have reached the POC may be backfilled before laboratory analytical results for the excavation sidewalls are received. If results indicate exceedances of cleanup levels, excavation may continue outward laterally from the previously backfilled area.

- Overexcavation to remove additional contaminated soil would be prioritized first in the shoreline protection area, wetland mitigation and buffer areas, and stormwater swale/drainage conveyance areas. The remaining Site areas would have lower priority for overexcavation.

Excavation areas will be backfilled to existing grade using clean imported fill and crushed concrete debris generated from on-site above-ground structure and concrete foundation demolition. Recycling the concrete debris material on site in this manner would reduce the quantity of imported fill required and the amount of material sent off site for disposal, thus providing a reduction in cost. Backfilling for upland excavations does not anticipate more than nominal, machine-compaction during fill placement.

As excavation areas are completed, surveys would be completed to document the final extent of excavation. A final grading survey would be conducted after backfilling of the excavation areas is completed. These surveys would be used to determine compliance with the specifications and as a potential basis for payment in the event overexcavation is implemented.

Additional Sequencing Considerations

The contractor could elect to sequence the upland remediation work in several ways: Work could generally proceed from south to north across the Site, shoreward to landward, or by some other sequence etc. The contract plans and specifications will be performance based, allowing the selected contractor to make specific sequencing decisions and adaptive adjustments as the work progresses. Key considerations for construction sequencing include the following:

- Sequencing must prevent cross contamination of clean, backfilled areas as a key construction performance criterion. This could be accomplished in several ways such as by generally moving from south to north, shoreward to landward, etc. Alternatively, the sequencing could be more elaborate, provided that clean access and haul routes across the Site are maintained.

- The contactor may elect to proceed with different construction tasks in different parts of the Site at the same time. For example, demolition of above-ground concrete structures and foundations in one part of the Site may occur at the same time that excavation is occurring in another portion of the Site.

- The time needed for laboratory testing of soil confirmation samples from the construction excavations will likely result in multiple, concurrent excavation areas.

- Sequencing must accommodate construction of the wetland mitigation area, buffer, and stormwater swale and conveyance features. Critical sequencing items for these features are described in Section 4.6.

- Final site restoration will involve planting in wetland mitigation area, buffer, and stormwater swale as noted in Section 4.6. The remainder of the Site will be seeded with native grasses and/or other vegetation to be determined to stabilize the post-construction surface.

4.3 Soil and Near-Surface Debris Management and Off-Site Disposal

A target volume of approximately 26,000 cy of excavated surface debris and soil would be sent off site for disposal at a permitted Subtitle D landfill facility. Additional soil may also be generated for disposal if excavation proceeds beyond the target depths (to the POC) or laterally. Conversely, a lower volume of contaminated soils could be generated if sample testing from the excavation surfaces indicates that the target excavation areas are smaller than projected. Soil could either be direct loaded into trucks for off-site disposal (if water drainage not required), or temporarily managed in on-site stockpiles at the discretion of the contractor. Additional soil characterization beyond that available in the RI may be required to meet specific disposal facility requirements.

4.4 Wet Soil Handling and Contingency Construction Dewatering

Because soil excavations will encounter wet conditions and groundwater, provisions for excavating and handling wet material and a contingency for excavation dewatering must be considered. Excavated soil not passing the standard paint filter test typically required for Subtitle D (lined) landfill disposal will require draining, either directly to the ground before loading and transporting off site, or possibly in an on-site upland containment cell (to be further specified during project design).

A general assumption is that excavation will proceed in wet conditions (no dewatering) if groundwater is encountered, unless sheen or other indications of free product are observed. As a contingency, water with free product would be removed using a standard vacuum suction removal methods for temporary on-site storage in portable above-ground tanks for testing and disposition. Unless acceptable for City of Anacortes sanitary sewer disposal, which is expected to be problematic, excavation dewatering water will be shipped for off-site reprocessing at a suitable permitting facility.

The contractor will be required to provide the necessary means to protect the excavation area, particularly the shoreline protection zone, from tidal and sediment intrusion and/or resulting cave-in. Temporary retaining techniques will be allowed as long as all field construction work is conducted above the MHHW line. However, additional measures beyond the planned berms are not included in the estimated project costs.

4.5 Stormwater Runoff Controls during Construction

Contract plans and specifications will require the selected contractor to control and manage Site stormwater during construction. This will consist of establishing temporary routing for City of Anacortes stormwater entering the Site from the existing outfall pipe to Wetland D, and managing stormwater originating on the Site. It is likely that a substantial portion of the City of Anacortes stormwater flow can continue to be infiltrated. Alternatively, excess flows may require routing for surface water discharge until the permanent bioswale and stormwater conveyance system are operational.

Stormwater originating on the Site during construction may be manageable through infiltration and not require discharge to surface water (i.e., zero discharge condition). Regardless, plans and specifications will require the contractor to develop a Stormwater Pollution Prevention Plan in accordance with substantive requirements of the current Washington State Construction Stormwater General Permit. Contractor requirements will include providing a contingency for discharge to surface water, if such action became necessary.

Typical best management practices (BMPs) expected to be used would include flow control measures to control runoff during excavation and other site work, silt fencing surrounding excavation areas, covering of stockpiles as practicable, and site stabilization following completion of construction. A Certified Erosion and Sediment Control Lead would conduct monitoring and inspection, as needed based on substantive requirements of the permit. If stormwater treatment became necessary, the contractor would be required to develop appropriate management and disposal measures. Such measures would likely include typical treatment processes such as solid particle settling and filtration.

4.6 Upland Wetland Mitigation

The selected upland cleanup alternative includes mitigation for nearly 12,000 sf of wetlands impacted by planned soil excavation activities (excluding Wetland E). These areas are identified on Figure 1-2. Wetland E is more directly connected to the surface waters of Fidalgo Bay, and is to be addressed during the subsequent aquatic-phase cleanup (Phase II).

To mitigate for the loss of wetland areas, a consolidated wetland concept to be constructed in the southern portion of the GBH property is included as part of the overall cleanup action for the Site. This area and associated buffer are identified on Figure 4-1. The consolidated wetland mitigation area includes a 12,000-square-foot estuarine wetland bench created landward of OHW with an associated upland buffer that would be planted with native vegetation. The

planned buffer ranges from 50 to 75 feet in width and would be fenced to limit access until vegetation can fully mature and establish. Additional detail on the planned wetland mitigation work is provided in the Conceptual Wetland Mitigation Plan memorandum (refer to Appendix A). Mitigation details and related permitting issues are being discussed with the SEA program, resource agencies, City of Anacortes, the Tribes, and other stakeholders.

4.6.1 Critical Construction Sequencing

The overall sequencing of the construction work for the upland cleanup effort would be determined by the construction contractor to meet the performance requirements as defined in the forthcoming plans and specifications. However, work sequencing in relation to construction of the wetland mitigation, buffer, and stormwater swale areas are envisioned as being constrained by the following sequence of construction activities.

- Excavate contaminated soil from the future mitigation, buffer, and swale areas.
- Remove an additional 3-foot thickness of fill soil in the wetland mitigation area, and backfill with clean import sandy fill to provide further separation of the wetland with underlying fill soils.
- Excavate wetland, stormwater swale, and final stormwater conveyance features to design grades and configuration.
- Maintain a protective shoreline berm of existing fill material between the wetland and surface waters of Fidalgo Bay until Phase II aquatic work. The berm must remain in place to allow shoreline access for Phase II construction equipment. The wetland cannot be merged with surface waters of Fidalgo Bay until Phase II aquatic permits have been obtained.
- Place wetland buffer and swale fill as needed to final grades.
- Place topsoil, dress, and plant to complete restoration.

4.7 Bioswale Construction and Post-Construction Stormwater Management

Installation of a stormwater swale is planned for management and treatment of stormwater currently routed onto the Custom Plywood property through an 18-inch-diameter City of Anacortes conveyance to Wetland D (Figure 1-2). The swale is to be designed and sized per Ecology's 2005 Stormwater Management Manual for Western Washington (Ecology 2005) to provide permanent water

quality treatment. No infiltration is assumed as a conservative assumption based on subsurface soil and groundwater conditions. Infiltration that does occur would provide additional stormwater management control.

Figure 4-1 identifies the general swale location. Stormwater from the existing City conveyance area be routed to the swale through a control box structure, catch basin, and inlet pipe. These structures will be established at appropriate elevations and gradients to manage flows through the swale.

The swale and conveyance corridor would be vegetated with a standard grass seed mix to filter and remove sediment and particulates from the stormwater. The swale would provide basic stormwater treatment before it enters a vegetated conveyance corridor that would route the treated stormwater from the swale into the restored wetland area. The conveyance corridor would be designed to meander through the restored buffer area to provide additional treatment and infiltration as well as a more natural channel configuration. The swale also would be protected with a low berm and backflow preventer at the outlet because inundation during high tide will damage or destroy vegetation.

The remainder of the site would be graded to route sheet-flow runoff toward Fidalgo Bay.

4.8 City of Anacortes Public Access to Shoreline Areas

Public shoreline access requirements pursuant to the City of Anacortes Shoreline Master Program (SMP) will be addressed by making provisions for beach access at the southern landward tip of the Site. The general location of the beach access is identified on Figure 2 in Appendix A. The configuration of these features has not yet been determined and is ultimately subject to an agreement between the City of Anacortes and the property owner. A conceptual design is planned concurrently with the design for the Phase II in-water remediation. Aquatic permitting required for the beach access will also be included with Phase II. Final design and field construction are currently planned to be completed in coordination with the City of Anacortes and the property owner. Access to the public beach area will require, at a minimum, completion of the Phase II aquatic cleanup.

4.9 Contingency Beach and Shellfish Bed Closure

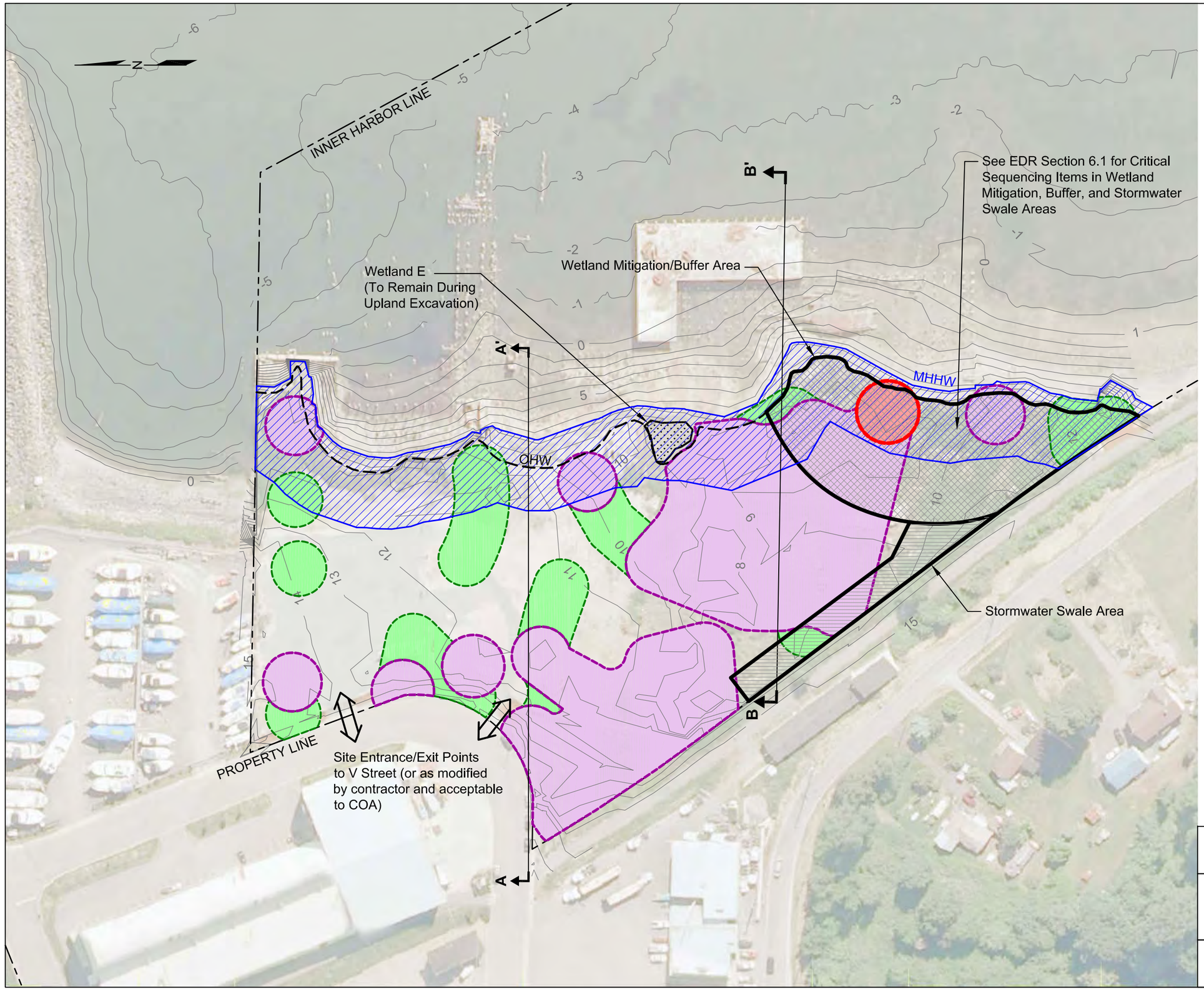
Although not expected to be needed, the Skagit County Public Health Department would be alerted and consulted relative to the potential need for closure of adjacent beach areas and nearby shellfish beds during the upland remediation. Potential beach and shellfish bed closure would be triggered by

conditions noted during construction posing potential human exposure risks from release of contaminants. The likelihood of such closures being required is low for several reasons:

- Excavation would not proceed seaward of OHW. The unexcavated land seaward of OHW provides a physical berm to protect in-water areas throughout the duration of upland construction.

- Groundwater encountered during construction is planned to be contained within the excavations, reinfiltrated on site, or otherwise treated prior to other discharge in accordance with applicable regulatory requirements.

- As practicable, site stormwater would be managed as a zero discharge conditions. Should discharge to surface water become necessary, the contractor will be required to complete monitoring and sample testing in accordance with requirements of Ecology's Construction Stormwater General Permit.



Target Excavation Area and Depth in Feet Below Grade

- 4 Feet
- 6 Feet
- 8 Feet

- Shoreline Protection Zone (75 Feet Landward of MHHW)
- MHHW — Mean Higher High Water
- OHW — Ordinary High Water
- 5 — Ground Surface Elevation Contour in Feet (NAVD 88)
- B B' — Cross Section Location and Designation

Notes:

1. Excavate up to 15 feet depth (Human Health Point of Compliance) in shoreline protection zone and up to 6 feet depth (Ecological POC) elsewhere.
2. Excavations include nominal 1H:1V side walls from base of contaminated area and property boundaries.
3. Target excavation areas located seaward of OHW to be excavated as part of aquatic remediation alternatives (Phase II).
4. See Figure 2-1 for exploration locations and inferred extent of contamination.
5. Extent of contamination below 8 feet depth is uncertain.
6. Stormwater swale and wetland mitigation/buffer element details presented in the FS.
7. Cross sections shown on Figures 4-2 and 4-3.
8. See EDR Section 3.0 for soil excavation, confirmation soil sampling, and backfilling sequencing discussion.
9. Contractor to determine material laydown and stockpiling areas.
10. Contractor to determine overall work sequencing and schedule to meet construction performance criteria.

0 100 200
Scale in Feet

Custom Plywood Site
Anacortes, Washington

Site Access and General Construction Plan

17330-27 (EDR) 2/11

HARTCROWSER

Figure
4-1

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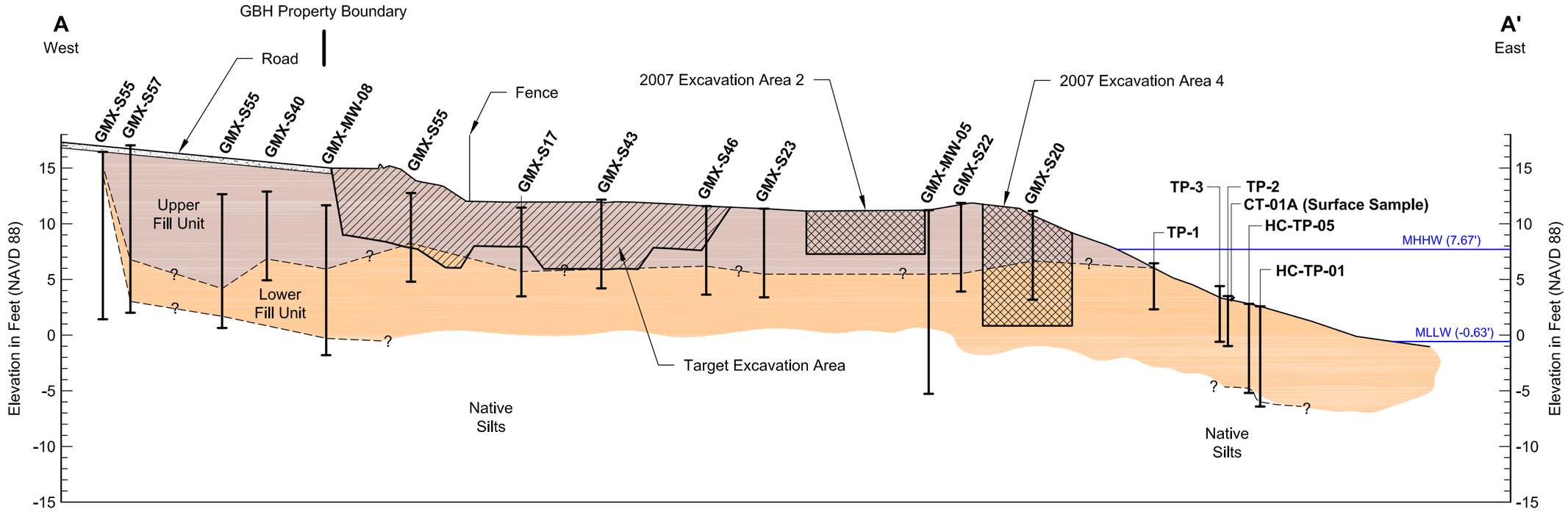

Horizontal Scale in Feet
0 50 100
0 10 20
Vertical Scale in Feet
Vertical Exaggeration x 5

Notes:

1. Adapted from AMEC Geomatrix (2010) First Draft Remedial Investigation (RI) Report Figure 30.

Upper Fill Unit	Silty Sand with Gravel, Brick Fragments, and Buried Building Debris
Lower Fill Unit	Fine-Grained Wood (Sawdust to Bark Chip Sized) with Scattered Logs

GMX-S43 Exploration Name

I Exploration Location

MHHW Mean Higher High Water

MLLW Mean Lower Low Water

Custom Plywood Site
Anacortes, Washington

Cross Section A-A'
(Upland Interim Cleanup Action)

17330-27 (EDR) 2/11

HARTCROWSER

Figure
4-2

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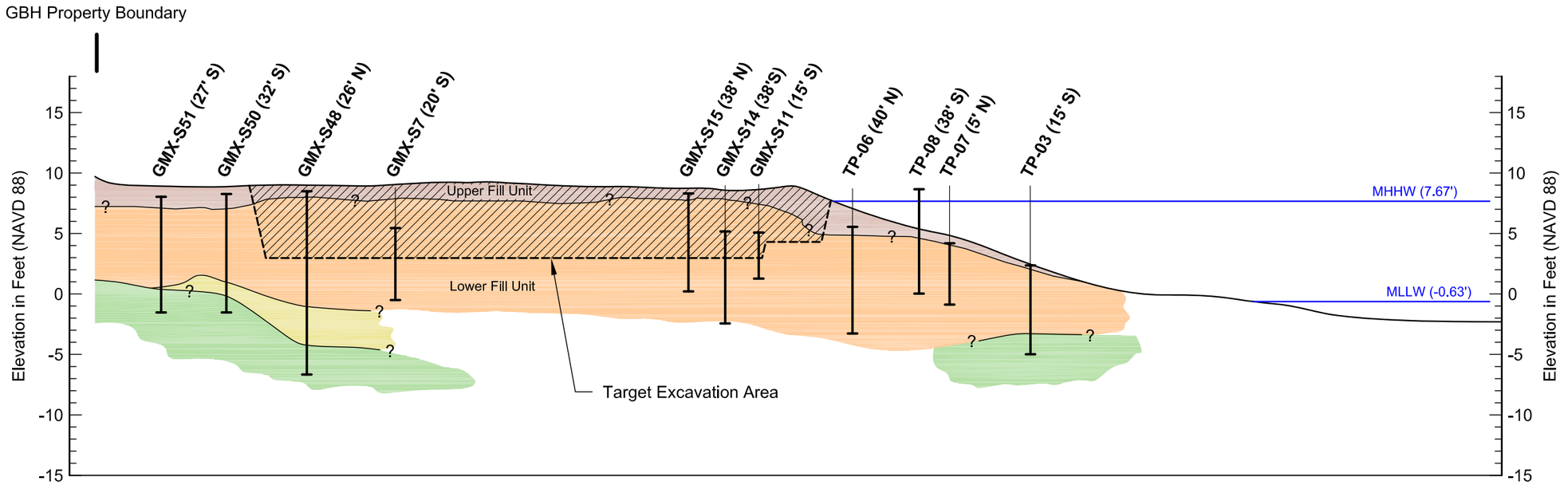
B
West

B'
East



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

Upper Fill Unit	Sandy and Gravelly Fill
Lower Fill Unit	Fine-Grained Wood (Sawdust to Bark Chip Sized) with Scattered Logs
	Sandy Silt and Silty Sand
	Native Clay

GMX-S51 (27' S) Exploration Name and Offset Distance and Direction

Exploration Location

MHHW Mean Higher High Water

MLLW Mean Lower Low Water

Note: Subsurface units modified slightly from Figures presented in AMEC Geomatrix 2010.

Custom Plywood Site
Anacortes, Washington

Cross Section B-B'
(Upland Interim Cleanup Action)

17330-27 (EDR) 2/11

HARTCROWSER

Figure
4-3

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5.0 ESTIMATED COSTS

Table 5-1 presents estimated costs of the upland interim cleanup action, including costs associated with soil excavation and disposal, backfilling, wetland mitigation and stormwater swale area construction, project management, and related tasks. Direct and indirect capital costs, long-term monitoring and maintenance costs, and 30 percent contingency presented in the table are based on current assumptions and subject to further refinement as the design process and bid phase progress. Note that actual costs for bidding purposes will differ. The estimated volume of impacted soil to be removed was based on the site characterization performed as part of the RI and further evaluation in the FS, CAP, and this EDR. The projected areal extent and depths of excavation are shown on Figure 4-1.

Table 5-1 - Estimated Costs of the Upland Remediation Alternative

Description	Upland Remediation Alternative
	Excavate Soil to Human Health POC in Shoreline Protection Zone and to Ecological POC Elsewhere on Property Long-Term Monitoring and Institutional Controls
FS Appendix C Cost Table Reference	C-U3
Construction Subtotal (Including 30% Contingency)	$4,794,000
Non-Construction Costs	$1,012,000
Mitigation	$704,000
Long-Term Monitoring and Maintenance (Annual and Periodic Costs)	$261,000
Estimated Total	**$6,771,000**

Notes:
Estimated cost assumes an accuracy range of -30 to +50 percent.
See Feasibility Study for additional cost discussion and breakdown.

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6.0 COMPLIANCE MONITORING PLAN

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

- **Protection Monitoring** to confirm that human health and the environment are adequately protected during the construction period of the interim cleanup action;

- **Performance Monitoring** to confirm that the interim cleanup action has attained cleanup levels and other performance standards; and

- **Confirmational Monitoring** to confirm the long-term effectiveness of the interim cleanup action once performance standards have been obtained.

The objective of compliance monitoring is to confirm that cleanup levels have been achieved, and to confirm the long-term effectiveness of interim cleanup 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 are planned to be developed during the design phase preparation of project plans and specifications.

6.1 Protection Monitoring

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

6.2 Construction Performance Monitoring

Performance monitoring (WAC 173-340-410[1][b]) is intended to assure that a remedial action has attained cleanup standards (including MTCA 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 would

include topographic surveys or similar grade control measures to verify that the excavation has achieved the desired areal extent and cut elevation. Performance monitoring is also required to document construction of the wetlands mitigation complex, associated buffer area, and stormwater swale and conveyance features. Monitoring includes demonstrating that appropriate excavation and materials placement have occurred to the planned lines and grades, and that required revegetation and habitat functions have been established. The construction of the stormwater conveyance system must also be monitored to verify that state and city design requirements have been achieved.

An additional aspect of performance is collection and analytical laboratory testing of soil samples from the sidewalls and bottom of excavations to confirm that target cleanup levels have been achieved, or to document the concentration of COCs that remain on the Site. Related monitoring and documentation would include verifying the chemical quality of imported soils used for backfilling, placement to match pre-existing grade, and nominal compaction requirements to be established during the design phase.

6.3 Confirmational Monitoring

Confirmation monitoring (WAC 173-340-410[1][c]) is a component of compliance monitoring intended to demonstrate the long-term effectiveness of the cleanup action once cleanup levels or other performance standards have been attained. Specific details for post-construction monitoring will be further developed in a detailed Operations, Maintenance, and Monitoring Plan (OMMP) prepared during or following the design phase or construction management phases of the project.

The OMMP will further describe details of this well network; nominally one existing and nine new wells are expected to be monitored within the shallow, unconfined groundwater system. The existing and proposed well locations are shown on Figure 6-1. This shallow system is tidally affected toward the shoreline. At a minimum, groundwater would be monitored quarterly for at least 2 years following construction, and annually for 5 years following construction. Monitoring results and frequency would be closely evaluated to determine the adequacy of this approach. Longer term monitoring requirements would be evaluated as part of planned 5-year reviews. Although exceedances of groundwater cleanup levels are not anticipated after construction on a persistent or long-term basis, other actions as necessary would be considered, including potential Site capping as described in the FS for Alternative U-4, should monitoring identify such exceedances.

Related post-construction monitoring activities would include annual visual inspections of the upland areas to verify that erosion, rutting, or other potentially adverse conditions are not detrimentally affecting the remedy. Inspection and monitoring also would be required for the wetland mitigation area for a period of 10 years. Routine inspection and maintenance of the stormwater swale and conveyance system is a further component of the long-term maintenance and monitoring program.

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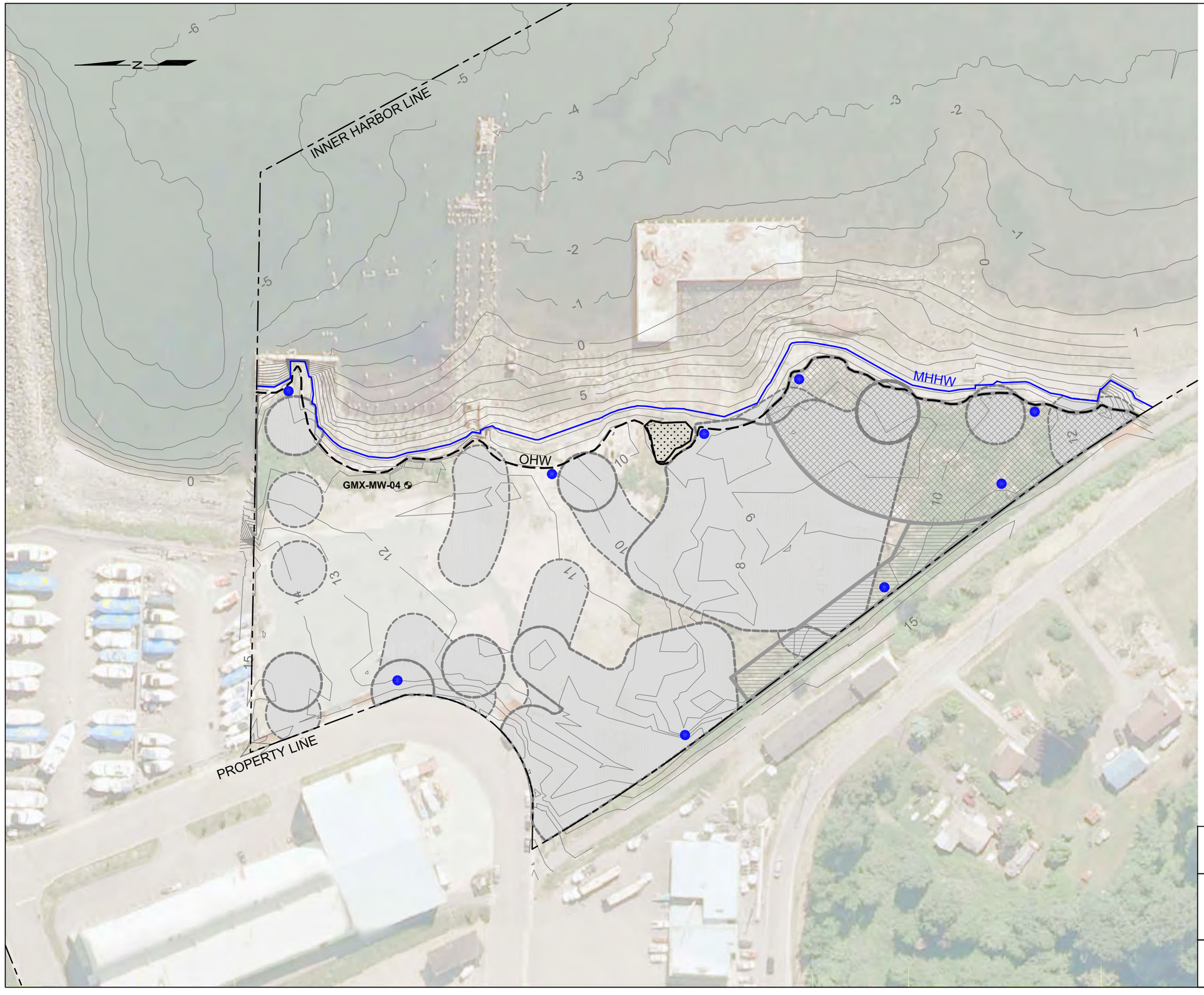

Monitoring Well Location

GMX-MW-04 Existing

Proposed

MHHW Mean Higher High Water

OHW Ordinary High Water

5 Ground Surface Elevation Contour in Feet (NAVD 88)

Notes:

1. New monitoring wells to be installed following completion of Phase II of interum cleanup action.
2. New monitoring well lcations are tenative as shown, Final locations to be determined in OMMP to be completed in remedial design.

0 100 200

Scale in Feet

Custom Plywood Site
Anacortes, Washington

Groundwater Monitoring Well Location Plan

17330-27 (EDR) 2/11

HARTCROWSER

Figure **6-1**

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7.0 GENERAL APPROACH FOR OPERATION, MAINTENANCE, AND MONITORING PLAN (OMMP)

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 the following:

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

7.1 Future Sea Level Rise Considerations

An additional consideration raised during earlier project review is long-term protection of upland areas of the Site from expected sea level rise over a time scale of decades. Upland surface elevations at the Site range down to about 8 feet elevation NAVD 88, and portions of the Site may be susceptible to inundation from progressive sea level rise. The OMMP will include an adaptive approach to identify and evaluate potential additional surface protection features that could be needed to prevent wave erosion. Backfilled excavation areas provide an inherent protective layer to prevent exposure of residual contaminated soil that might remain at depth; however, supplemental surface vegetation, paving, or other armoring may be needed to provide further protection.

8.0 PROJECT SCHEDULE

This section summarizes the anticipated schedule and factors critical in the sequencing of planned construction activities for the interim cleanup action. Technical briefing meetings with the resource agencies, Tribes, and the public were conducted in late February 2011. These briefing meeting provided further information during the combined MTCA/SEPA public review period for the IAWP including the CAP and this EDR for Phase I Upland Remediation. Following conclusion of the public review and comment period in mid-March 2011, the IAWP documents were issued as final in September 2011. The grading permit package was submitted to the City of Anacortes in late March, using 80 percent design drawings to describe the project, mitigation, and stormwater swale elements. To support the contract bid and permitting process, the project design was completed by mid-April, including finalized project plans and specifications. Related construction management planning documents were also be completed during this time frame.

Bid solicitation and contracting for Phase I interim action (upland remediation work) were conducted between mid-April and late May 2011. The notice to proceed to the selected contractor was issued in June. The field upland Phase I construction activities started in early July 2011. Phase I upland construction duration is currently scheduled at approximately 16 weeks, ending in the late fall of 2011.

Post-construction sampling and analysis would commence and continue in accordance with the OMMP schedule to be developed. Elements of the post-construction monitoring are expected to commence in late 2011 or early 2012 to assess the efficacy of remediation. The full groundwater monitoring would likely commence in late 2013 or early 2014 following completion of the nearshore component of Phase II in-water remediation. Field construction for the aquatic remediation (Phase II) is scheduled to begin in 2013 and to be completed by 2015.

9.0 REFERENCES

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Geomatrix, 2007. Upland Area 1 Interim Remedial Action Plan, Former Custom Plywood Site, Anacortes, Washington. Prepared by Geomatrix, Inc., for Concorde, Inc., September 2007.

Hart Crowser, 2011a. Feasibility Study Report for Interim Action Work Plan, Custom Plywood Site, Anacortes, Washington. Prepared by Hart Crowser, Inc., for the Washington State Department of Ecology, September 2011.

Hart Crowser, 2011b. Upland Remediation (Phase I) Cleanup Action Plan for Interim Action Work Plan, Custom Plywood Site, Anacortes, Washington. Prepared by Hart Crowser, Inc., for the Washington State Department of Ecology, September 2011.

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APPENDIX A
CONCEPTUAL WETLAND MITIGATION PLAN
FOR THE CUSTOM PLYWOOD INTERIM REMEDIAL ACTION

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MEMORANDUM

DATE: September 9, 2011

TO: Hun Seak Park, PE

FROM: Celina Abercrombie
Jason Stutes, PhD
Rick Moore, LHG

RE: **Appendix A - Conceptual Wetland Mitigation Plan for the Custom Plywood Interim Remedial Action**
17330-27

The Custom Plywood Site (Figure 1) contains five freshwater and estuarine wetlands totaling 11,910 square feet (sf) that would be impacted by proposed remediation activities on the property. Wetlands A, B, C, and D are isolated wetlands that will be impacted during the Phase I upland remediation. Wetland E is connected to state and navigable waters, and the U.S. Army Corps of Engineers (USACE) has determined that Wetland E is federally regulated. Wetland E will be impacted during the Phase II in-water remediation. These five wetlands will be consolidated into one large estuarine wetland and restored on site as agreed upon by applicable regulatory agencies. The restored wetland will: (1) replace the impacted wetland areas; and (2) improve the functions provided by the existing wetlands.

Off-site mitigation options, such as the Ship Harbor site in Anacortes, were given consideration as compensatory mitigation for on-site wetland impacts resulting from the cleanup. Based on the timing and feasibility of an off-site mitigation option, on-site wetland mitigation was determined to be to a preferable alternative that provides adequate compensation for impacts to existing wetlands and serves as an integrated habitat improvement piece within the larger project.

A summary of the key elements associated with proposed on-site mitigation activities for the Custom Plywood Site is provided below.

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Seattle, Washington 98109-3056
Fax 206.328.5581
Tel 206.324.9530

WETLAND MITIGATION AREA

The restored estuarine wetland would be a minimum of 12,000 sf in area (Figure 2). The wetland mitigation area would be constructed landward of the Ordinary High Water (OHW) line. During Phase I upland remediation activities, a bench would be excavated and graded at suitable elevations for the establishment of estuarine wetland vegetation. The wetland edge would be constructed to provide sinuosity between the wetland and the transition to the upland buffer. A protective berm would be created at and landward of the OHW line to prevent contaminant migration into the restored wetland during in-water construction as part of Phase II. The width of the berm would be approximately 10 feet, and the height of the berm would be approximately 10.5 feet Mean Lower Low Water (MLLW) or at the height of the existing shoreline berm. Near the completion of the in-water work, the protective berm would be removed and the area covered by the berm would be graded to appropriate elevations that allow for tidal connection of the wetland to Fidalgo Bay and for installation of native plantings.

Colonization of wetland vegetation would occur between elevations of 7 feet MLLW and Mean Higher High Water (MHHW), which is 8.6 feet for the Custom Plywood Site. It is anticipated that a larger area between MHHW and OHW (about 9.2 feet MLLW) would colonize with a variety of saltmarsh vegetation. The wetland would be planted and naturally colonize with native saltmarsh vegetation, including, but not limited to pickleweed (*Salicornia virginica*), saltgrass (*Distichlis spicata*), and seacoast bulrush (*Scirpus maritimus*). The restored wetland area would provide a moderate to high level of function, and support other aquatic habitats and species such as juvenile salmon rearing and migration.

A vegetated buffer would be provided around the restored wetland totaling approximately 26,000 sf. The buffer along the Tommy Thompson Trail would measure 50 feet in width and the remainder of the buffer would measure 75 feet in width as agreed upon by applicable regulatory agencies. Installation of a variety of native tree and shrub plantings may include, but is not limited to big-leaf maple (*Acer macrophyllum*), shore pine (*Pinus contorta*), black cottonwood (*Populus balsamifera*), Sitka spruce (*Picea sitchensis*), Douglas fir (*Pseudotsuga menziesii*), paper birch (*Betula paperifera*), Pacific crabapple (*Malus fusca*), salmonberry (*Rubus spectabilis*), salal (*Gaultheria shallon*), oceanspray (*Holodiscus discolor*), snowberry (*Symphoricarpos albus*), red elderberry (*Sambucus racemosa*), Indian plum (*Oemleria cerasiformis*), serviceberry (*Amelanchier alnifolia*), Nootka rose (*Rosa nutkana*), thimbleberry (*Rubus parviflorus*), red-flowering currant (*Ribes sanguineum*), dunegrass (*Leymus mollis*), coastal strawberry (*Fragaria chiloensis*), and kinnikinnick (*Arctostaphylos uva-ursi*). Following removal of the protective shoreline berm, dunegrass would be planted within the buffer along the shoreline and as a transition species between the wetland and the upland buffer. Trees would be planted 10 to 12 feet on center and shrubs would be planted 5 to 7 feet on center throughout the upland buffer. Emergent and groundcover vegetation would be planted 1 to

3 feet and 3 to 5 feet on center throughout the wetland and buffer, depending on the species designated for installation in each area. Tables 1 and 2 show the plant schedule for the wetland and buffer planting areas. In addition to native plantings, large woody debris and other habitat structures would be installed in the dunegrass and upland buffer planting areas.

A temporary fence fitted with light reduction slats would be installed along the upland extent of the wetland buffer to deter human access and protect against light and noise pollution. In addition, barrier plantings of rose (*Rosa* sp.) and Douglas hawthorne (*Crataegus douglasii*) would be densely planted along the outer perimeter of the wetland buffer and would develop into a thicket replacing the function of the temporary fence over time. The barrier planting area would measure approximately 6 to 8 feet in width. The temporary fence would be removed once the barrier plantings become established. Critical/sensitive area signs may also be installed along the edge of the buffer.

Additionally, a public access easement would be provided along the beach as well as a beach access area at the southern landward tip of the site. The general location for future beach access is shown on Figure 2. The final configuration of these features has not yet been determined and is ultimately subject to an agreement between the City of Anacortes and the property owner. A conceptual design is planned concurrent with the design for the Phase II in-water remediation. The final aquatic permitting required for the beach access component will also be included with Phase II. Final design and field construction are currently planned to be completed in coordination with the City of Anacortes and the property owner. Access to the public beach area may require, at a minimum, completion of the Phase II aquatic cleanup.

A plan view of the wetland mitigation area is provided on Figure 2 and a cross section is provided on Figure 3.

SITE GRADING AND CONSTRUCTION

Current site elevations over much of the area of the planned wetland mitigation area vary from about 10 to 11 feet MLLW. Although these elevations are slightly above the estuarine wetlands zone, it is desirable to further elevate the adjacent buffer area to protect buffer vegetation from damage during high tides. Typical high tides near Anacortes range between about elevation 9.2 to 10 feet MLLW. Therefore, it is desirable to raise site grades in the mitigation buffer area to about 12 feet to provide a suitable level of protection and a factor of safety. This bench would also provide sufficient elevation for constructing a stormwater conveyance system and treatment swale, as described in the Stormwater section below.

Construction of the mitigation area is planned for the southern property corner landward of the OHW line and extending to the north and west. Following excavation related to site cleanup in the wetland and buffer areas, the buffer adjacent to the southern property line along the Tommy Thompson Trail would be backfilled and the grade raised to an appropriate elevation for the establishment of the buffer plantings. Construction would then extend north into the restored wetland area.

The wetland area would be excavated an additional 3 feet beyond the proposed bottom elevation of approximately 7 feet MLLW and a layer of sand would be placed within this additional excavation area to serve as a planting medium for emergent wetland plantings (to be installed during Phase II following tidal connection to Fidalgo Bay) and to prevent vertical migration of remaining clean wood waste located on the Site. This sand layer would cover the 12,000 sf wetland mitigation area and extend landward into the buffer where dunegrass plantings are proposed. A low-gradient transition between the wetland and tree and shrub planting area would be provided. Large woody debris and dunegrass would be installed throughout this zone to mimic a more natural shoreline. Woody debris placement and dunegrass plantings would coincide with planting activities in the tree and shrub planting area.

During excavation and grading activities in the restored wetland, a temporary berm would be placed along the opening of the wetland at and landward of the OHW line. This berm is intended to protect the mitigation area from migrating contaminated sediment until in-water construction is underway and the area waterward of the mitigation area is remediated. The berm would be constructed from a combination of quarry spalls and sand. A geotextile fabric may be placed between the existing substrate along the OHW line and the quarry spalls to provide additional stability and filtration of sediments that may be present in the water column. Additional design details would be developed during the construction design process. This feature is intended to be temporary and would be removed from the existing beach during Phase II to protect the previously installed wetland area. Potential damage to this temporary berm may occur from winter storm surges but are not anticipated given the existing in-water structures will remain in-place until Phase II construction. In the event of a large storm event, a site visit would be conducted to evaluate potential damage and develop a remedy for re-stabilizing this feature. Possible remedies include, but are not limited to, repositioning of the geotextile fabric and installation of additional quarry spalls or similar material. During or following removal of the temporary berm, the wetland area would be planted as described in the Wetland Mitigation Area section.

Following excavation and backfilling of sand in the wetland area, the remaining upland buffer to the west and north of the wetland would be backfilled with a clean fill material. The upland planting area would be graded and lightly compacted for structural stability. In addition, the buffer would be graded to provide microtopography and a somewhat undulating surface. Compost would be

applied and tilled into the soil throughout the tree and shrub planting area. Then a layer of mulch would be placed throughout this area for weed control and water retention. Following mulch placement, large woody debris would also be placed throughout the buffer for habitat value. Trees, shrubs, and groundcover species would be installed per the planting details previously described. A fence would be constructed around the mitigation area during or immediately following plant installation to prevent human access during the plant establishment and monitoring period. Care would have to be taken to avoid disturbing the new wetlands during installation of any future public access features.

STORMWATER

Swale Concept

A stormwater swale located outside of the wetland buffer has been designed to treat stormwater currently routed onto the property through a City of Anacortes conveyance (Figure 2). The swale is designed and sized per the Washington State Department of Ecology's 2005 Stormwater Management Manual (SWMM) for Western Washington to provide water quality treatment. No infiltration is assumed as a conservative assumption based on subsurface soil and groundwater conditions. Infiltration that does occur provides additional stormwater management control.

The swale includes the following elements and target design dimensions:

- Size: Approximately 788 sf at the base
- Flow path length: Minimum 175 linear feet
- Side slopes: 5H:1V
- Depth: Minimum of 10 inches
- Slope: Approximately 2 percent

A combination of native trees, shrubs, and groundcover species would be planted around the perimeter of the swale.

Stormwater Routing

Stormwater from the existing 18-inch City of Anacortes conveyance pipe to Wetland D would be routed through a control box structure to control flow and provide settling in a 48-inch catch basin (Figure 4). Flow from the control box would discharge through a higher elevation outlet in the box to provide necessary elevation and gradient for downstream flow management. Specific components of the routing system downstream of the control box include:

- An approximately 50-foot-long, 18-inch-diameter conveyance pipe sloped at 2 percent grade between the control box outlet and the swale inlet;
- An in-line settling/treatment structure between the control box and the swale;
- A possible gravel pad or other energy dissipation feature at the swale inlet to accommodate a 0.5-foot drop from the upstream conveyance pipe as a required design feature;
- An approximately 175-foot-long, vegetation-lined treatment swale to manage SWMM design flow as described above;
- An approximately 45-foot swale discharge conveyance channel sloped at 0.5 percent grade between the swale outlet and the estuarine wetland complex; and
- A level spreader or energy dissipater, such as quarry spalls or a similar material, to connect the swale discharge channel to the estuarine wetland complex.

The swale and conveyance corridor would be vegetated with a standard grass seed mix to filter and remove sediment and particulates from the stormwater. The swale would provide basic treatment prior to entering a vegetated conveyance corridor that would route the treated stormwater from the swale into the restored wetland area. The conveyance corridor would be designed to meander through the restored buffer area to provide additional treatment and infiltration as well as a more natural channel configuration. The swale would also be protected with a low berm and backflow preventer at the outlet to avoid inundation during high tides.

Target design elevations at various points in the stormwater routing system are as follows, subject to continuing design analysis.

- Discharge Elevation at Estuarine Wetland: 8.6 feet
- Swale Outlet Elevation: 9.5 feet
- Swale Inlet Elevation: 13.0 feet

- Control Box Outlet Elevation: 14.5 feet
- Control Box Inlet Elevation: 10.7 feet (surveyed elevation)

To optimize the grades and locations of the stormwater and bioswale features, several factors were considered to balance the elevation of the control box outlet with the discharge point at the edge of the estuarine wetland. The discharge point at the wetland edge was set at 8.6 feet (approximately MHHW) as an optimal design target. A lower elevation for discharge to the wetland would require deeper incising of the conveyance channel from the swale outlet (approximately 9.5 feet) into the new topographic bench to be established at approximately 12 feet. A higher discharge elevation would result in progressively higher upstream elevations for the swale and control box outlet, which would be undesirable.

MONITORING ACTIVITIES

Monitoring Schedule

Monitoring of the mitigation areas would be conducted for 10 years following construction. Following upland remediation and debris removal (summer 2012), a report would be prepared to summarize the constructed conditions of the restored wetland and buffer, including, but not limited to site grading, and berm location, prior to tidal connection. Formal monitoring of the wetland and buffer areas would not begin until the completion of the Phase II in-water work and connection of the wetland to Fidalgo Bay. At this time, a formal as-built report would be prepared and monitoring would begin.

Site inspections and reporting would occur on an annual basis. The following schedule would be used for project monitoring reports:

- At time of construction/As-built (Year 0);
- Year 1: detailed annual report;
- Year 2: detailed annual report;
- Year 3: detailed annual report;
- Year 4: reconnaissance level report;
- Year 5: detailed annual report;
- Year 6: reconnaissance level report;
- Year 7: detailed annual report;
- Year 8: reconnaissance level report;
- Year 9: reconnaissance level report; and
- Year 10/Final: detailed annual report

Following construction, an as-built report would be submitted by the project applicant to the applicable federal, state, and local government agencies within approximately 30 days after completion of plant installation in both the wetland and buffer areas. The report would document mitigation site conditions at completion of plant installation and would be used as a baseline for future monitoring events. Annual detailed monitoring reports would be submitted to the appropriate regulatory agencies by December 31 of each calendar year.

GOALS AND PERFORMANCE STANDARDS

Project goals include restoring wetland areas through the creation of appropriate elevations and installation of native vegetation, restoring buffer areas through the installation of native vegetation, and maintaining invasive vegetation at low levels within the wetland and buffer areas. Performance requirements for the mitigation area would include:

Goal 1: Restore Wetland Areas through Installation of Native Vegetation

Performance Standards:

a) Survival of planted native vegetation would be monitored for two years.

- Year 1: 90 percent survival of installed plants visually estimated
- Year 2: 80 percent survival of installed plants visually estimated

b) Areal coverage of native shrubs and emergent vegetation would be a minimum of 80 percent after 10 years.

- Year 1: 20 percent cover
- Year 2: 30 percent cover
- Year 3: 40 percent cover
- Year 5: 50 percent cover
- Year 7: 60 percent cover
- Year 10: 80 percent cover

Goal 2: Restore Buffer Areas through Installation of Native Vegetation

Performance Standards:

a) Survival of planted native vegetation would be monitored for two years.

- Year 1: 90 percent survival of installed plants

- Year 2: 80 percent survival of installed plants

b) Areal coverage of native tree, shrub, and groundcover species would be a minimum of 80 percent after 10 years.

- Year 1: 20 percent cover
- Year 2: 30 percent cover
- Year 3: 40 percent cover
- Year 5: 50 percent cover
- Year 7: 60 percent cover
- Year 10: 80 percent cover

Goal 3: Control Invasive Plant Species within the Wetland and Buffer Areas

a) Invasive plant areal coverage would be less than 10 percent after 10 years.

- Years 1 through 10: 10 percent or less coverage of invasive plants

Goal 4: Provide Adequate Hydrologic Connection for Restored Wetland

a) Visual observation of tidal inundation during a normal tidal cycle each year.

- Years 1 through 10: 100 percent coverage of marsh mitigation area by tidal waters at tidal elevation of approximately MHHW

b) Documented coverage (in square feet) of emergent estuarine plant species using a global positioning system during Years 1, 5, and 10.

- Years 1, 5, and 10: 12,000 sf or greater cover of native estuarine plant species

A total of 12,000 sf or more of wetland would be maintained throughout the 10-year monitoring period. Monitoring would include qualitative observations on vegetation (cover, density, survival, and natural colonization) and wildlife, and quantitative data collection (species composition and percentage cover, total percentage plant cover, percentage cover of volunteer plants, and percentage cover of invasive species) using a sample plot method. In addition, permanent photo points would be established within the wetland and buffer mitigation areas to supplement the qualitative data.

Vegetation

The project biologist or mitigation specialist conducting monitoring activities would make a number of qualitative observations on vegetation and wildlife during quantitative data collection. Qualitative data on plant cover, density, survival and naturally colonizing plants would be collected. In addition, observations of wildlife use, including birds, amphibians, reptiles, and small mammals would be recorded during each monitoring visit.

Wetland and buffer plant communities would be sampled along permanent vegetation transects using a circular quadrat (1-meter radius). A minimum of two transects would be established in the wetland and buffer restoration areas for minimum total of four transects throughout the mitigation area. Transect lengths would range between 100 and 200 feet, depending on the as-built conditions at the site. A minimum of five permanent quadrats would be established along each transect. To ensure the same locations are monitored each year, permanent markers would be established at the ends of each transect and at each quadrat sampling point (either PVC, wood lathe, or a combination of PVC and rebar). A map of the transect and sample plot locations would be created for use during monitoring events.

Wetland and buffer plantings would be visually evaluated along each transect to determine the rate of survival, health, and vigor. Plants would be recorded as live, stressed, or dead/dying. For the first year of monitoring, plant survival would be calculated by dividing the number of installed plants still living by the number of initially installed plants.

The percent cover of individual plant species present within each quadrat would be visually estimated. Data collection would consist of species composition and percent cover, total percent plant cover, percent cover of volunteer plants, and percent cover of invasive species, including, but not limited to, Himalayan blackberry (*Rubus armeniacus*), English ivy (*Hedera helix*), Scot's broom (*Cytisus scoparius*), nightshade (*Solanum* sp.), Canada thistle (*Cirsium arvense*), and reed canarygrass (*Phalaris arundinacea*). Species coverage values would be summed to determine the total areal coverage in each quadrat.

Photo Points

Permanent photo points would be established within the wetland and buffer mitigation areas to supplement the qualitative data. Photo points would be established at topographic vantage points that provide complete views of the mitigation area, if possible. Photos would document relative changes in plant cover, density, and height. Permanent markers would be established at each photo point (either PVC, wood lathe, or a combination of PVC and rebar) or the photo points would correspond with permanent site features meeting the above requirements.

MAINTENANCE AND CONTINGENCY ACTIONS

Maintenance and contingency actions would include, but are not limited to, irrigation, pruning, replacement of dead/dying or undesirable transplants with the appropriate vegetation, substitution of plant species, regular weeding and removal of noxious and invasive weeds, and installation of plant protective devices. No post-planting applications of fertilizer are anticipated. Irrigation would be provided for the first two years following construction to aid in establishing native plantings within the buffer area.

If the mitigation area is not providing the required cover of native estuarine wetland area by the end of Year 3, adaptive management approaches and additional contingency measures would be evaluated to determine whether waiting a longer period for the desired vegetation establishment is warranted, regrading or deepening of the wetland area is needed, replanting of vegetation or other measures are necessary to meet the project's performance requirements. In addition, contingency measures would be evaluated during each monitoring event to help ensure that the proposed mitigation is successful.

Attachments:
Table 1 – Plant Schedule for Wetland Mitigation Planting Area
Table 2 – Plant Schedule for Buffer Planting Area
Figure 1 – Vicinity Map
Figure 2 – Wetland Mitigation Plan
Figure 3 – Wetland Mitigation Cross Section
Figure 4 – Conceptual Stormwater Drainage Conveyance and Swale Profile
Isolated Wetlands Information Sheet
Wetland Rating Form - Western Washington

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TABLES

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Table 1 - Plant Schedule for Wetland Mitigation Planting Area

Common Name	Scientific Name	Condition	Minimum Spacing (on center in feet)	Planting Notes	Quantity
Emergents					
Pickleweed	*Salicornia virginica*	Division or plug	1 to 3	Plant in groups of 10 to 15	880
Saltgrass	*Distichlis spicata*	Division or plug	1 to 3	Plant in groups of 10 to 15	880
Seacoast bulrush	*Scirpus maritimus*	Division or plug	1 to 3	Plant in groups of 10 to 15	880
Total Emergents					**2,640**

Note: Plant species and quantities are subject to change.

Table 2 - Plant Schedule for Buffer Planting Area

Common Name	Scientific Name	Condition	Minimum Spacing (on center in feet)	Planting Notes	Quantity
Trees					
Douglas fir	*Pseudotsuga menziesii*	1 gallon	10 to 12	Plant individually	55
Shore pine	*Pinus contorta*	1 gallon	10 to 12	Plant individually	55
Black cottonwood	*Populus balsamifera*	1 gallon	10 to 12	Plant individually	55
Big-leaf maple	*Acer macrophyllum*	1 gallon	10 to 12	Plant individually	55
Total Trees					**220**
Shrubs					
Oceanspray	*Holodiscus discolor*	1 gallon	5 to 7	Plant in groups of 4 to 8	110
Vine maple	*Acer circinatum*	1 gallon	5 to 7	Plant in groups of 4 to 8	110
Red elderberry	*Sambucus racemosa*	1 gallon	5 to 7	Plant in groups of 4 to 8	110

Common Name	Scientific Name	Condition	Minimum Spacing (on center in feet)	Planting Notes	Quantity
Nootka rose	*Rosa nutkana*	1 gallon	5 to 7	Plant in groups of 4 to 8	110
Red-flowering currant	*Ribes sanguineum*	1 gallon	5 to 7	Plant in groups of 4 to 8	110
Snowberry	*Symphoricarpos albus*	1 gallon	5 to 7	Plant in groups of 4 to 8	110
Thimbleberry	*Rubus parviflorus*	1 gallon	5 to 7	Plant in groups of 4 to 8	110
Salal	*Gaultheria shallon*	1 gallon	5 to 7	Plant in groups of 4 to 8	110
Douglas hawthorne [a]	*Crataegus douglasii*	1 gallon	3 to 5	Plant individually in alternating rows	110
Rose (to be determined) [a]	*Rosa* sp.	1 gallon	3 to 5	Plant individually in alternating rows	110
Total Shrubs					**1,100**
Herbs					
Dunegrass [b]	*Leymus mollis*	Division or plug	1 to 3	Plant in groups of 10 to 15	660
Coastal strawberry	*Fragaria chiloensis*	4-inch	3 to 5	Plant in groups of 4 to 8	605
Kinnikinnick	*Arctorstaphylos uva-ursi*	4-inch	3 to 5	Plant in groups of 4 to 8	605
Total Herbs					**1,870**

Note: Plant species and quantities are subject to change.

[a] For installation as a barrier planting along the perimeter of the buffer only.

[b] For installation along the shoreline and slope between wetland and buffer only.

FIGURES

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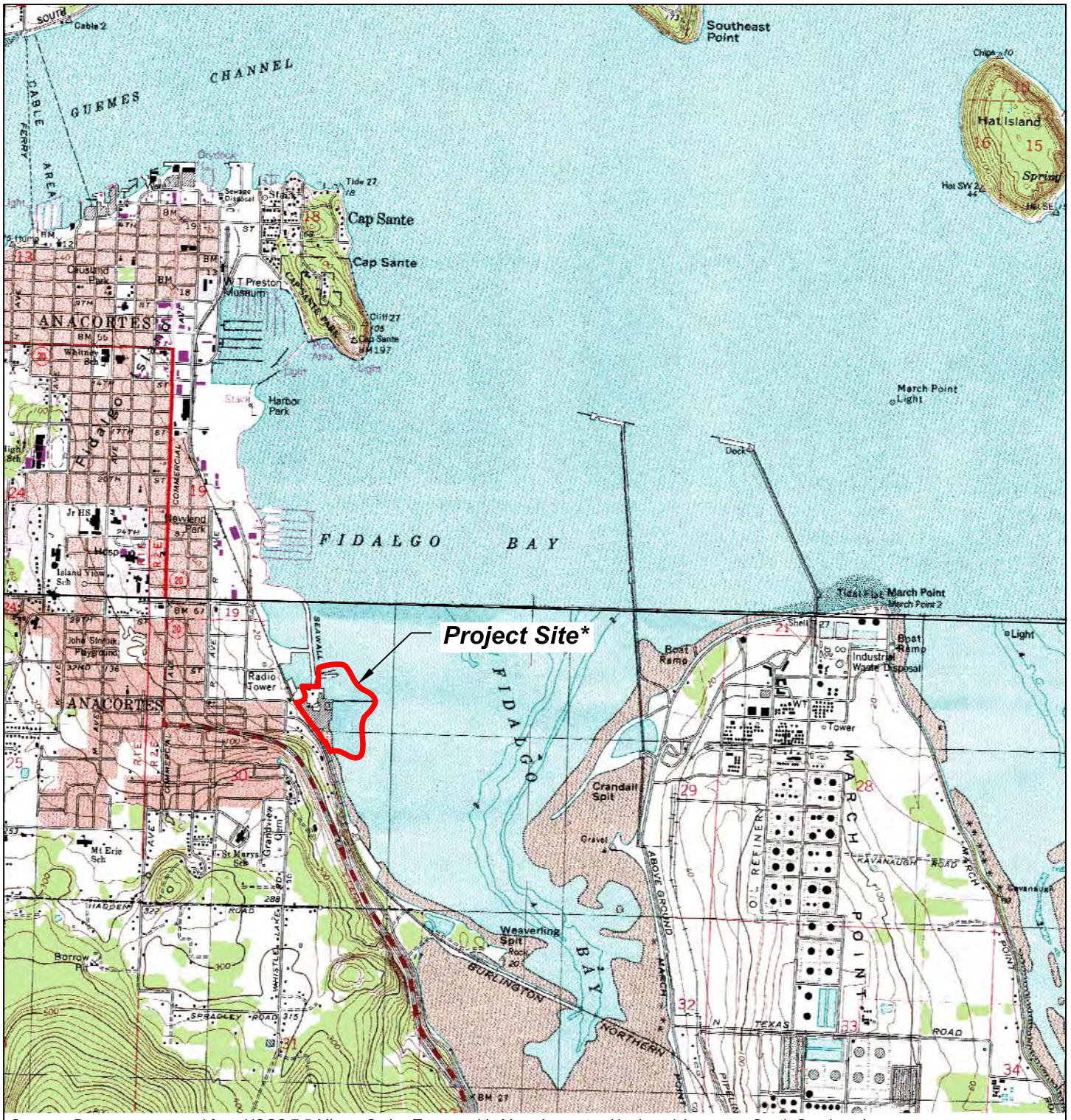
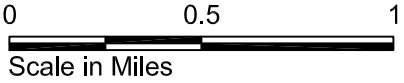
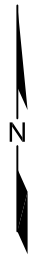


Source: Base map prepared from USGS 7.5-Minute Series Topographic Map, Anacortes North and Anacortes South Quadrangles.

* Represents upland and aquatic portions of the site included with current Feasibility Study.





Custom Plywood Site
Anacortes, Washington

Vicinity Map

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HARTCROWSER

Figure
1

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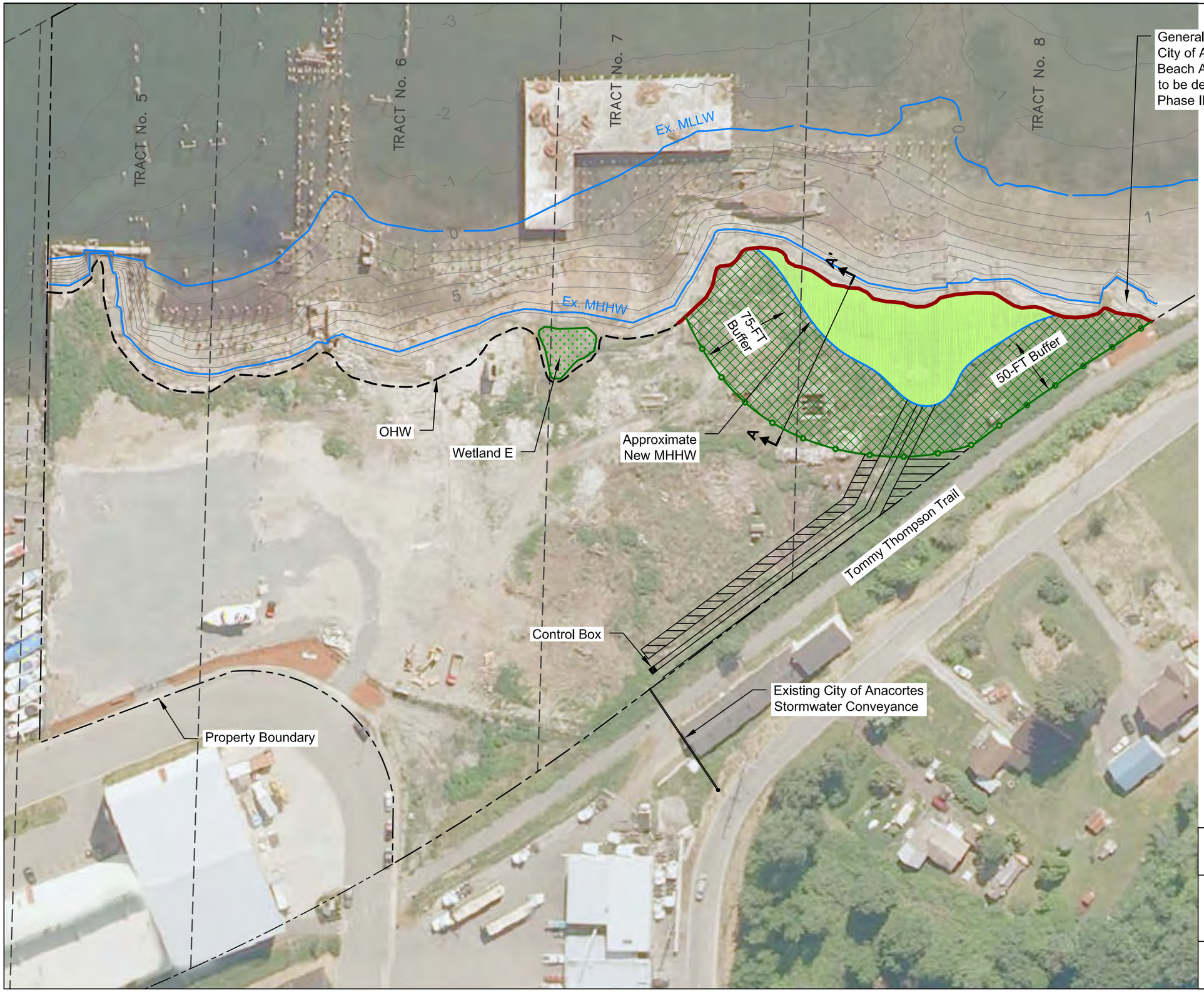

General Area of Future City of Anacortes Public Beach Access Facility, to be developed during Phase II Aquatic Cleanup

- Estuarine Wetland (12,050 sf)
- Buffer (26840 sf)
- Swale and Conveyance
- Temporary Fencing and Barrier Plantings
- Temporary Shoreline Berm
- Stormwater Plantings
- A A' Cross Section Location and Designation

Note: See Figure 4 for stormwater conveyance and swale details.

N

0 80 160

Scale in Feet

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

Custom Plywood Site
Anacortes, Washington

Wetland Mitigation Plan

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HARTCROWSER

Figure
2

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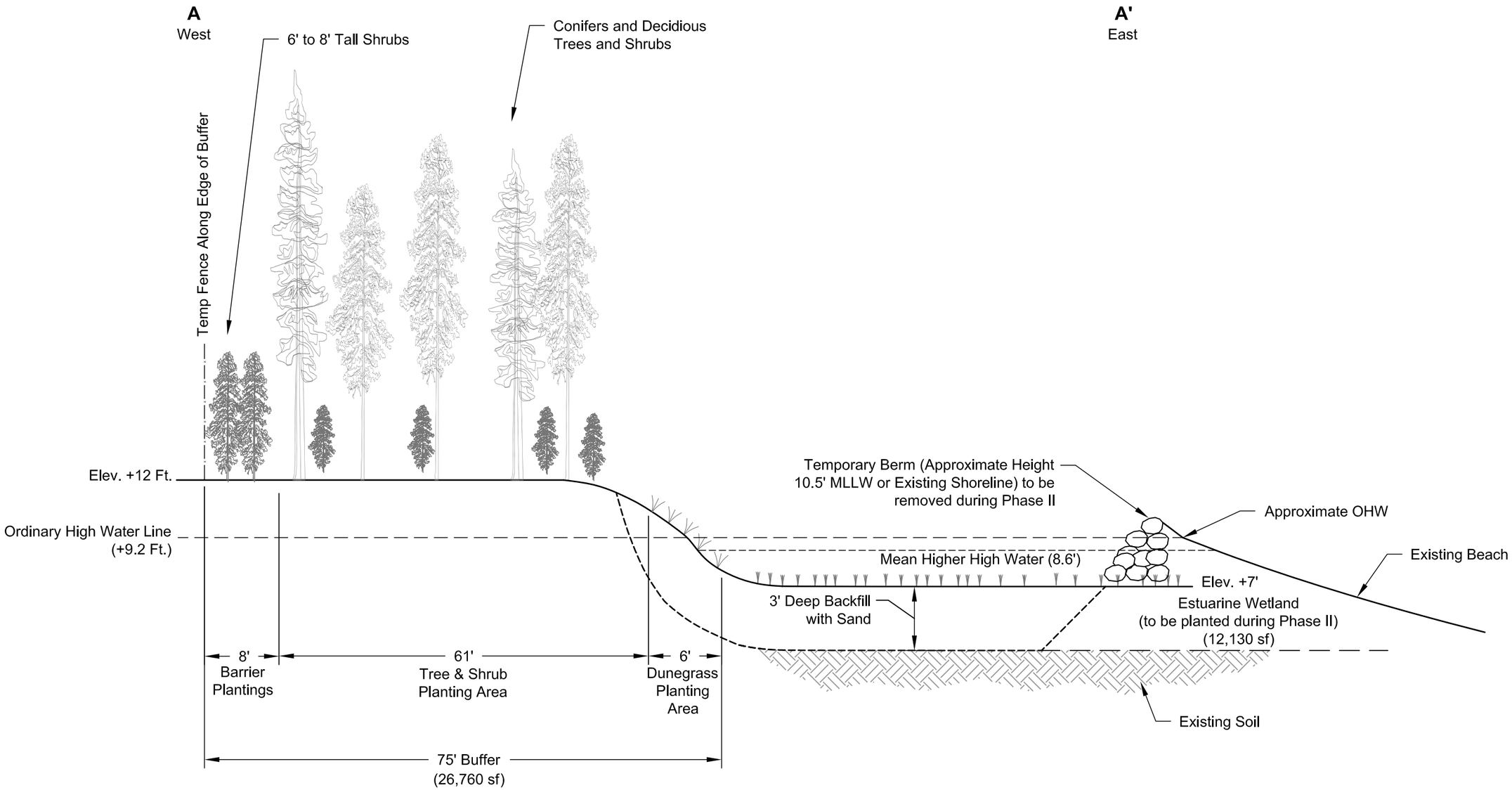

Elevation Datum: Mean Lower Low Water

Horizontal Scale in Feet
0 15 30
0 5 10
Vertical Scale in Feet
Vertical Exaggeration x 3

Custom Plywood Site
Anacortes, Washington

Wetland Mitigation Cross Section

17330-27 (B-1) 9/11

HARTCROWSER

Figure
3

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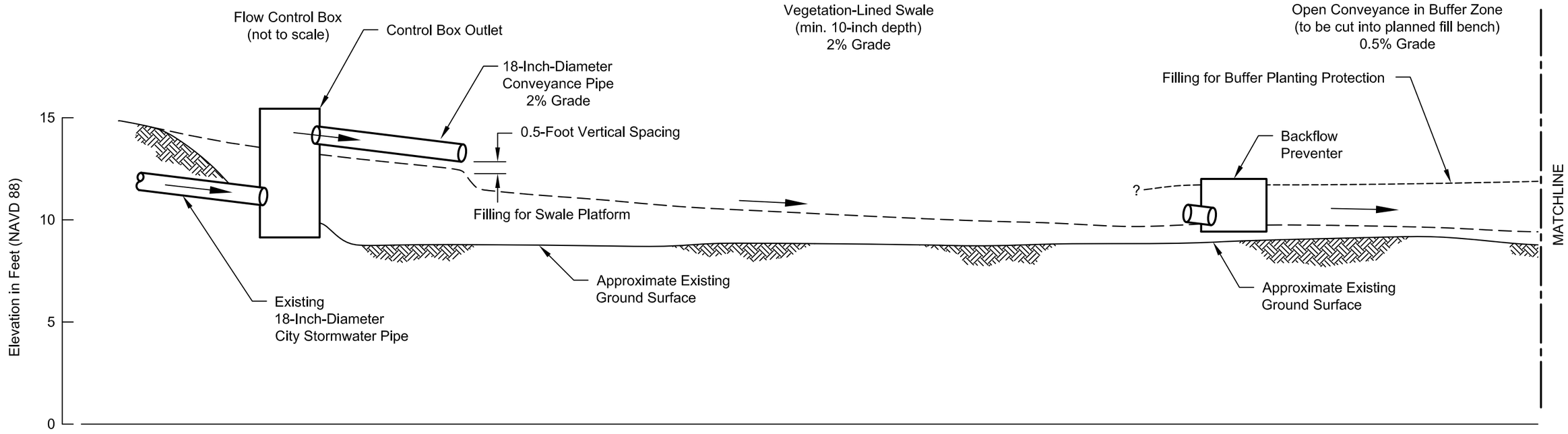

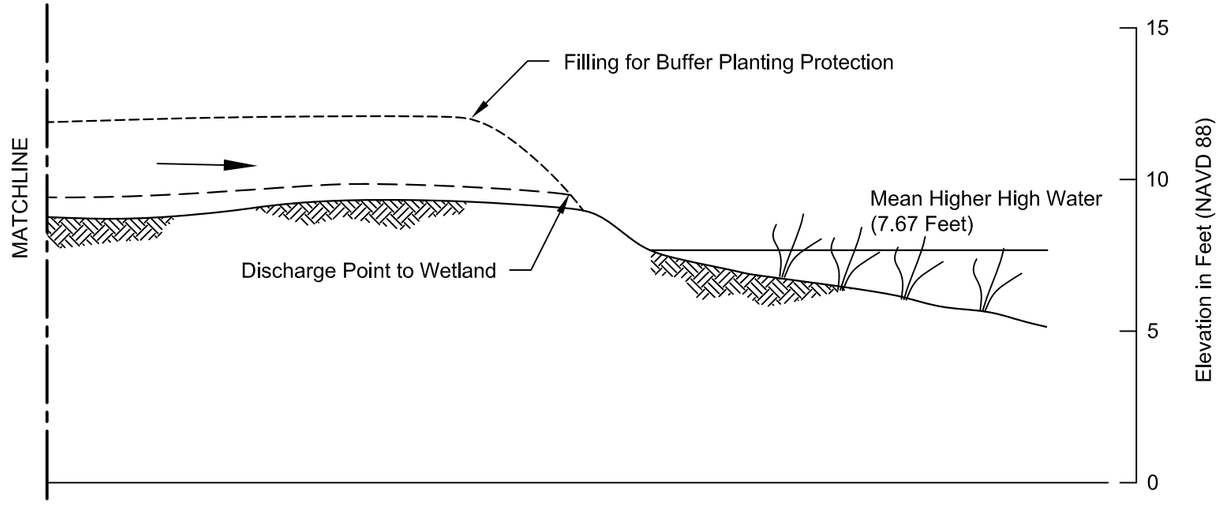

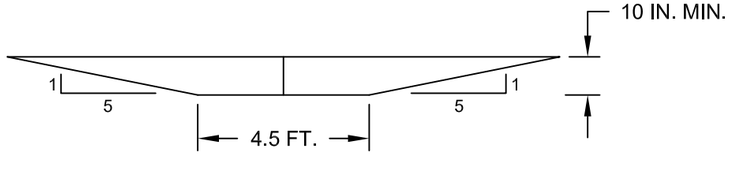

CONCEPTUAL SWALE CROSS SECTION

Target Design Elevations

City Stormwater Pipe Invert Elevation at Control Box: 10.14 Feet (Surveyed)
Control Box Outlet Elevation: 13.9 Feet
Swale Inlet Elevation: 12.4 Feet
Swale Outlet Elevation: 8.9 Feet
Discharge Elevation at Estuarine Wetland: 8.0 Feet

Notes:

→ Stormwater Flow Direction

Not Shown for Clarity:
- In-line treatment/settling structure between control box and swale inlet
- Energy dissipation structure at swale inlet
- Level spreader at wetland discharge point

Horizontal Scale in Feet
0 25 50
0 5 10
Vertical Scale in Feet
Vertical Exaggeration x 5

Custom Plywood Site
Anacortes, Washington

Conceptual Stormwater Drainage Conveyance and Swale Profile

17330-27 (B-1) 2/11

HARTCROWSER

Figure
4

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ISOLATED WETLANDS INFORMATION SHEET

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DEPARTMENT OF ECOLOGY
State of Washington

Isolated Wetlands Information Sheet

If you are proposing to fill or otherwise alter an isolated wetland, you will need to obtain authorization from Ecology through an administrative order. To help expedite review of your project, you can provide the information requested below. Answer the following questions to the best of your ability and attach any reports or documents that provide supporting information. This information can also augment information provided in a Joint Aquatic Resources Permit Application[1]. You may need to hire a qualified wetland professional[2] to assist you. Failure to provide this information may result in delays in review of your project.

1.	**Wetland Area and Location (provide a delineation report, including data sheets--see 5a below)**
	a. How large (in acres or square feet) is the wetland or wetlands (including contiguous portions offsite)? Wetland A = 120 sf Wetland B = 124 sf Wetland C = 367 sf Wetland D = 9,910 sf Total (Wetlands A, B, C and D) = 10,521 sf
	b. How far is the wetland(s) from the nearest surface water body (lake, river, wetland, etc.)? All wetlands are located within approximately 250 feet of the shoreline of Fidalgo Bay and within approximately 150 feet of one another.
	c. Is the wetland(s) within a FEMA-mapped 100-year floodplain? No.
2.	**Wetland Rating** (http://www.ecy.wa.gov/programs/sea/wetlands/ratingsystems/)
	What is the category(ies) of the wetland(s) according to the Washington State Wetland Rating System (eastern or western Washington version as appropriate)? Wetland A = Category 4 Wetland B = Category 4 Wetland C = Category 2 Wetland D = Category 3

[1] The Joint Aquatic Resource Application (JARPA) is available on the web at: http://www.epermitting.wa.gov/.
[2] For more information on how to hire a qualified wetland professional go to: http://www.ecy.wa.gov/programs/sea/wetlands/professional.html.

3.	**Cowardin Classification**	
	Describe the Cowardin[3] vegetation class(es) in the wetland (for example, emergent, scrub/shrub, forested, open water, etc.), and list the dominant plant species in each class.	
	Cowardin Class	**Dominant Plant Species**
	Wetland A = PEM Wetland B = PEM Wetland C = EEM Wetland D = PEM	Wetland A = Typha latifolia Wetland B = Typha latifolia Wetland C = Scirpus maritimus and Distichlis spicata Wetland D = Festuca sp., Chenopodium album, Rumex occidentalis, Equisetum arvense, and Rubus armeniacus
4.	**Wetland Impacts**	
	How much wetland area (in acres or square feet) is proposed to be:	
	a. Filled? 10,521 sf	
	b. Excavated? 10,521 sf	
	c. Drained?	
	d. Flooded?	
	e. Cleared, vegetation altered? 10,521 sf	
	f. Other? (list)	
5.	**Please provide copies of the following information if available:**	
	a. Wetland delineation report, including data sheets (http://www.ecy.wa.gov/programs/sea/wetlands/delineation.html)	
	b. Photographs of wetland	
	c. Wetland rating form (http://www.ecy.wa.gov/programs/sea/wetlands/ratingsystems/)	
	d. Wetland function assessment report	
	e. Project plans, including grading plan	
	f. Erosion control and stormwater control plans, and reports	
	g. Wetland mitigation plan (http://www.ecy.wa.gov/programs/sea/wetlands/mitigation/guidance/)	

[3] Refers to the U.S. Fish and Wildlife Service's classification system (Cowardin et al, *Classification of Wetlands and Deepwater Habitats of the United States*, 1979).

WETLAND RATING FORM - WESTERN WASHINGTON

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Wetland name or number D

WETLAND RATING FORM – WESTERN WASHINGTON

Version 2 - Updated July 2006 to increase accuracy and reproducibility among users
Updated Oct 2008 with the new WDFW definitions for priority habitats

Name of wetland (if known): D - Custom Plywood Date of site visit: 8/9/10

Rated by C. Abercrombie Trained by Ecology? Yes X No ___ Date of training 4/05

SEC: 30 TWNSHP: 35N RNGE: 2E Is S/T/R in Appendix D? Yes ___ No X

Map of wetland unit: Figure ___ Estimated size 9,900 sf.

SUMMARY OF RATING

Category based on FUNCTIONS provided by wetland

I___ II___ III X IV___

Category I = Score >=70
Category II = Score 51-69
Category III = Score 30-50
Category IV = Score < 30

Score for Water Quality Functions	16
Score for Hydrologic Functions	20
Score for Habitat Functions	10
TOTAL score for Functions	46

Category based on SPECIAL CHARACTERISTICS of wetland

I___ II___ **Does not Apply** X

Final Category (choose the "highest" category from above) III

Summary of basic information about the wetland unit

Wetland Unit has Special Characteristics		Wetland HGM Class used for Rating	
Estuarine		**Depressional**	X
Natural Heritage Wetland		**Riverine**	
Bog		**Lake-fringe**	
Mature Forest		**Slope**	
Old Growth Forest		**Flats**	
Coastal Lagoon		**Freshwater Tidal**	
Interdunal			
None of the above	X	Check if unit has multiple HGM classes present	

Wetland name or number 1

Does the wetland unit being rated meet any of the criteria below?

If you answer YES to any of the questions below you will need to protect the wetland according to the regulations regarding the special characteristics found in the wetland.

Check List for Wetlands That May Need Additional Protection (in addition to the protection recommended for its category)	YES	NO
SP1. *Has the wetland unit been documented as a habitat for any Federally listed Threatened or Endangered **animal or plant** species (T/E species)?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state or federal database.		X
SP2. *Has the wetland unit been documented as habitat for any State listed Threatened or Endangered **animal** species?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state database. Note: Wetlands with State listed plant species are categorized as Category I Natural Heritage Wetlands (see p. 19 of data form).		X
SP3. *Does the wetland unit contain individuals of Priority species listed by the WDFW for the state?*		X
SP4. *Does the wetland unit have a local significance in addition to its functions*? For example, the wetland has been identified in the Shoreline Master Program, the Critical Areas Ordinance, or in a local management plan as having special significance.		X

To complete the next part of the data sheet you will need to determine the Hydrogeomorphic Class of the wetland being rated.

The hydrogeomorphic classification groups wetlands into those that function in similar ways. This simplifies the questions needed to answer how well the wetland functions. The Hydrogeomorphic Class of a wetland can be determined using the key below. See p. 24 for more detailed instructions on classifying wetlands.

Wetland name or number D

Classification of Wetland Units in Western Washington

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-7 apply, and go to Question 8.

1. Are the water levels in the entire unit usually controlled by tides (i.e. except during floods)?

NO – go to 2 **YES** – the wetland class is **Tidal Fringe**

If yes, is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)? **YES – Freshwater Tidal Fringe NO – Saltwater Tidal Fringe (Estuarine)**

*If your wetland can be classified as a Freshwater Tidal Fringe use the forms for **Riverine** wetlands. If it is Saltwater Tidal Fringe it is rated as an **Estuarine** wetland.* Wetlands that were called estuarine in the first and second editions of the rating system are called Salt Water Tidal Fringe in the Hydrogeomorphic Classification. Estuarine wetlands were categorized separately in the earlier editions, and this separation is being kept in this revision. To maintain consistency between editions, the term "Estuarine" wetland is kept. Please note, however, that the characteristics that define Category I and II estuarine wetlands have changed (see p.).

2. The entire wetland unit is flat and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.

NO – go to 3 **YES** – The wetland class is **Flats**

If your wetland can be classified as a "Flats" wetland, use the form for **Depressional** wetlands.

3. Does the entire wetland unit **meet both** of the following criteria?

___The vegetated part of the wetland is on the shores of a body of permanent open water (without any vegetation on the surface) at least 20 acres (8 ha) in size;

___At least 30% of the open water area is deeper than 6.6 ft (2 m)?

NO – go to 4 **YES** – The wetland class is **Lake-fringe (Lacustrine Fringe)**

4. Does the entire wetland unit **meet all** of the following criteria?

____The wetland is on a slope (*slope can be very gradual*),

____The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks.

____The water leaves the wetland **without being impounded**?

NOTE: *Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3ft diameter and less than 1 foot deep).*

NO - go to 5 **YES** – The wetland class is **Slope**

5. Does the entire wetland unit **meet all** of the following criteria?

____ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river

____ The overbank flooding occurs at least once every two years.

NOTE: The riverine unit can contain depressions that are filled with water when the river is not flooding.

NO - go to 6 **YES** – The wetland class is **Riverine**

6. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

NO – go to 7 **YES** – The wetland class is **Depressional**

7. Is the entire wetland unit located in a very flat area with no obvious depression and no overbank flooding. The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched, but has no obvious natural outlet.

NO – go to 8 **YES** – The wetland class is **Depressional**

8. Your wetland unit seems to be difficult to classify and probably contains several different HGM clases. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within your wetland. NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM Classes within the wetland unit being rated	*HGM Class to Use in Rating*
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake-fringe	Lake-fringe
Depressional + Riverine along stream within boundary	Depressional
Depressional + Lake-fringe	Depressional
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE under wetlands with special characteristics

If you are unable still to determine which of the above criteria apply to your wetland, or if you have more than 2 HGM classes within a wetland boundary, classify the wetland as **Depressional** for the rating.

Wetland name or number D

	D Depressional and Flats Wetlands HYDROLOGIC FUNCTIONS - Indicators that the wetland unit functions to reduce flooding and stream degradation	Points (only 1 score per box)
	D 3. Does the wetland unit have the potential to reduce flooding and erosion?	*(see p.46)*
D	D 3.1 Characteristics of surface water flows out of the wetland unit Unit is a depression with no surface water leaving it (no outlet) points = 4 Unit has an intermittently flowing, OR highly constricted permanently flowing outlet points = 2 Unit is a "flat" depression (Q. 7 on key), or in the Flats class, with permanent surface outflow **and no obvious natural outlet** and/or outlet is a man-made ditch points = 1 *(If ditch is not permanently flowing treat unit as "intermittently flowing")* Unit has an unconstricted, or slightly constricted, surface outlet (*permanently flowing*) points = 0	4
D	D 3.2 Depth of storage during wet periods *Estimate the height of ponding above the bottom of the outlet. For units with no outlet measure from the surface of permanent water or deepest part (if dry).* Marks of ponding are 3 ft or more above the surface or bottom of outlet points = 7 The wetland is a "headwater" wetland" points = 5 Marks of ponding between 2 ft to < 3 ft from surface or bottom of outlet points = 5 Marks are at least 0.5 ft to < 2 ft from surface or bottom of outlet points = 3 Unit is flat (yes to Q. 2 or Q. 7 on key) but has small depressions on the surface that trap water points = 1 Marks of ponding less than 0.5 ft points = 0	3
D	D 3.3 Contribution of wetland unit to storage in the watershed *Estimate the ratio of the area of upstream basin contributing surface water to the wetland to the area of the wetland unit itself.* The area of the basin is less than 10 times the area of unit points = 5 The area of the basin is 10 to 100 times the area of the unit points = 3 The area of the basin is more than 100 times the area of the unit points = 0 Entire unit is in the FLATS class points = 5	3
D	**Total for D 3** *Add the points in the boxes above*	10
D	**D 4. Does the wetland unit have the opportunity to reduce flooding and erosion?** Answer YES if the unit is in a location in the watershed where the flood storage, or reduction in water velocity, it provides helps protect downstream property and aquatic resources from flooding or excessive and/or erosive flows. Answer NO if the water coming into the wetland is controlled by a structure such as flood gate, tide gate, flap valve, reservoir etc. OR you estimate that more than 90% of the water in the wetland is from groundwater in areas where damaging groundwater flooding does not occur. *Note which of the following indicators of opportunity apply.* — Wetland is in a headwater of a river or stream that has flooding problems — Wetland drains to a river or stream that has flooding problems — Wetland has no outlet and impounds surface runoff water that might otherwise flow into a river or stream that has flooding problems X Other Limited downslope resources **YES** multiplier is **2** **NO** multiplier is **1**	*(see p. 49)* multiplier 2?
D	**TOTAL - Hydrologic Functions** Multiply the score from D 3 by D 4 ***Add score to table on p. 1***	20

Possibly 100 times area of unit

Wetland development is a result of stormwater routed onto the property.

Wetland name or number D

D	**Depressional and Flats Wetlands** **WATER QUALITY FUNCTIONS** - Indicators that the wetland unit functions to improve water quality	**Points** (only 1 score per box)
D	**D 1. Does the wetland unit have the potential to improve water quality?**	*(see p.38)*
D	D 1.1 Characteristics of surface water flows out of the wetland: Unit is a depression with no surface water leaving it (no outlet) points = 3 Unit has an intermittently flowing, OR highly constricted permanently flowing outlet points = 2 Unit has an unconstricted, or slightly constricted, surface outlet (*permanently flowing*) points = 1 Unit is a "flat" depression (Q. 7 on key), or in the Flats class, with permanent surface outflow **and no obvious natural outlet** and/or outlet is a man-made ditch points = 1 (*If ditch is not permanently flowing treat unit as "intermittently flowing"*) Provide photo or drawing	Figure ___ 3
D	S 1.2 The soil 2 inches below the surface (or duff layer) is clay or organic *(use NRCS definitions)* YES points = 4 NO points = 0	0
D	D 1.3 Characteristics of persistent vegetation (emergent, shrub, and/or forest Cowardin class) Wetland has persistent, ungrazed, vegetation > = 95% of area points = 5 Wetland has persistent, ungrazed, vegetation > = 1/2 of area points = 3 Wetland has persistent, ungrazed vegetation > = 1/10 of area points = 1 Wetland has persistent, ungrazed vegetation <1/10 of area points = 0 Map of Cowardin vegetation classes	Figure ___ 3 GRASSY Weedy
D	D1.4 Characteristics of seasonal ponding or inundation. *This is the area of the wetland unit that is ponded for at least 2 months, but dries out sometime during the year. Do not count the area that is permanently ponded. Estimate area as the average condition 5 out of 10 yrs.* Area seasonally ponded is > ½ total area of wetland points = 4 Area seasonally ponded is > ¼ total area of wetland points = 2 Area seasonally ponded is < ¼ total area of wetland points = 0 Map of Hydroperiods	Figure ___ 2
D	**Total for D 1** *Add the points in the boxes above*	8
D	**D 2. Does the wetland unit have the opportunity to improve water quality?** Answer YES if you know or believe there are pollutants in groundwater or surface water coming into the wetland that would otherwise reduce water quality in streams, lakes or groundwater downgradient from the wetland. *Note which of the following conditions provide the sources of pollutants. A unit may have pollutants coming from several sources, but any single source would qualify as opportunity.* — Grazing in the wetland or within 150 ft X Untreated stormwater discharges to wetland — Tilled fields or orchards within 150 ft of wetland — A stream or culvert discharges into wetland that drains developed areas, residential areas, farmed fields, roads, or clear-cut logging X Residential, urban areas, golf courses are within 150 ft of wetland — Wetland is fed by groundwater high in phosphorus or nitrogen — Other_____ **YES** multiplier is 2 **NO** multiplier is 1	*(see p. 44)* multiplier 2
D	**TOTAL - Water Quality Functions** Multiply the score from D1 by D2 ***Add score to table on p. 1***	16

Wetland name or number 1

These questions apply to wetlands of all HGM classes. HABITAT FUNCTIONS - Indicators that unit functions to provide important habitat	**Points** (only 1 score per box)
H 1. Does the wetland unit have the potential to provide habitat for many species?	
H 1.1 Vegetation structure ***(see p. 72)***	**Figure** ___
Check the types of vegetation classes present (as defined by Cowardin)- Size threshold for each class is ¼ acre or more than 10% of the area if unit is smaller than 2.5 acres.	
___Aquatic bed	
X Emergent plants	
___Scrub/shrub (areas where shrubs have >30% cover)	
___Forested (areas where trees have >30% cover)	
If the unit has a forested class check if:	
___The forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the forested polygon	
Add the number of vegetation structures that qualify. If you have:	
4 structures or more — points = 4	
3 structures — points = 2	
2 structures — points = 1	
1 structure — points = 0	0
Map of Cowardin vegetation classes	
H 1.2. Hydroperiods ***(see p. 73)***	**Figure** ___
Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or ¼ acre to count. (see text for descriptions of hydroperiods)	
___Permanently flooded or inundated — 4 or more types present — points = 3	
X Seasonally flooded or inundated — 3 types present — points = 2	
___Occasionally flooded or inundated — 2 types present — point = 1	
___Saturated only — 1 type present — points = 0	0
___ Permanently flowing stream or river in, or adjacent to, the wetland	
___ Seasonally flowing stream in, or adjacent to, the wetland	
___ ***Lake-fringe wetland*** = 2 points	
___ ***Freshwater tidal wetland*** = 2 points	
Map of hydroperiods	
H 1.3. Richness of Plant Species ***(see p. 75)***	
Count the number of plant species in the wetland that cover at least 10 ft^2. (*different patches of the same species can be combined to meet the size threshold)*	
You do not have to name the species.	
Do not include Eurasian Milfoil, reed canarygrass, purple loosestrife, Canadian Thistle	
If you counted: > 19 species — points = 2	
5 - 19 species — points = 1	1
< 5 species — points = 0	
List species below if you want to:	
Rumex, Typha, Epilobium, Festuca, Equisetum, Chenopodium	

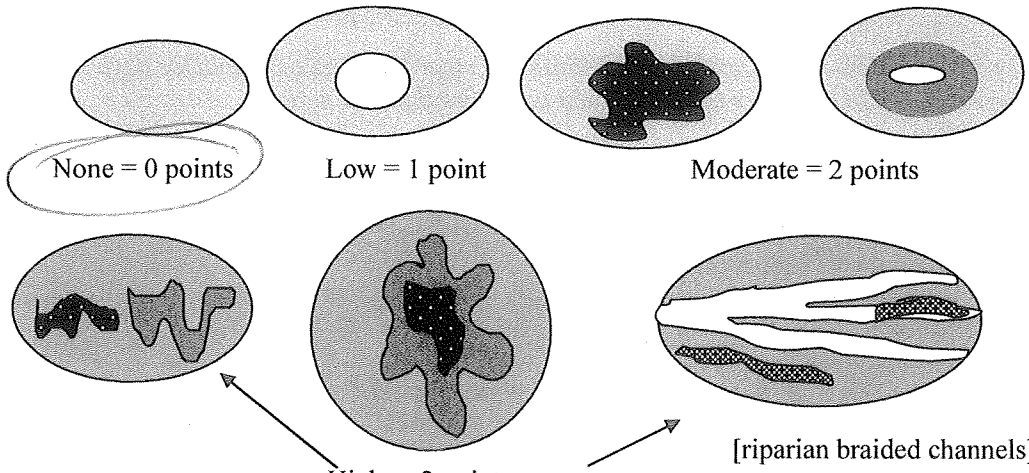
Total for page 1

Wetland name or number 1

H 1.4. Interspersion of habitats *(see p. 76)*

Figure ___

Decide from the diagrams below whether interspersion between Cowardin vegetation classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, medium, low, or none.



NOTE: If you have four or more classes or three vegetation classes and open water the rating is always "high". Use map of Cowardin vegetation classes

H 1.5. Special Habitat Features: *(see p. 77)*

Check the habitat features that are present in the wetland. The number of checks is the number of points you put into the next column.

____Large, downed, woody debris within the wetland (>4in. diameter and 6 ft long).

____Standing snags (diameter at the bottom > 4 inches) in the wetland

____Undercut banks are present for at least 6.6 ft (2m) and/or overhanging vegetation extends at least 3.3 ft (1m) over a stream (or ditch) in, or contiguous with the unit, for at least 33 ft (10m)

____Stable steep banks of fine material that might be used by beaver or muskrat for denning (>30degree slope) OR signs of recent beaver activity are present *(cut shrubs or trees that have not yet turned grey/brown)*

____At least ¼ acre of thin-stemmed persistent vegetation or woody branches are present in areas that are permanently or seasonally inundated. *(structures for egg-laying by amphibians)*

____ Invasive plants cover less than 25% of the wetland area in each stratum of plants

NOTE: The 20% stated in early printings of the manual on page 78 is an error.

H 1. TOTAL Score - potential for providing habitat
Add the scores from H1.1, H1.2, H1.3, H1.4, H1.5

Comments

Wetland name or number 1

H 2. Does the wetland unit have the opportunity to provide habitat for many species?	
H 2.1 Buffers ***(see p. 80)*** *Choose the description that best represents condition of buffer of wetland unit. The highest scoring criterion that applies to the wetland is to be used in the rating. See text for definition of "undisturbed."* — 100 m (330ft) of relatively undisturbed vegetated areas, rocky areas, or open water >95% of circumference. No structures are within the undisturbed part of buffer. (relatively undisturbed also means no-grazing, no landscaping, no daily human use) **Points = 5** — 100 m (330 ft) of relatively undisturbed vegetated areas, rocky areas, or open water > 50% circumference. **Points = 4** — 50 m (170ft) of relatively undisturbed vegetated areas, rocky areas, or open water >95% circumference. **Points = 4** — 100 m (330ft) of relatively undisturbed vegetated areas, rocky areas, or open water > 25% circumference, . **Points = 3** — 50 m (170ft) of relatively undisturbed vegetated areas, rocky areas, or open water for > 50% circumference. **Points = 3** **If buffer does not meet any of the criteria above** — No paved areas (except paved trails) or buildings within 25 m (80ft) of wetland > 95% circumference. Light to moderate grazing, or lawns are OK. **Points = 2** X — No paved areas or buildings within 50m of wetland for >50% circumference. Light to moderate grazing, or lawns are OK. **Points = 2** — Heavy grazing in buffer. **Points = 1** — Vegetated buffers are <2m wide (6.6ft) for more than 95% of the circumference (e.g. tilled fields, paving, basalt bedrock extend to edge of wetland **Points = 0.** — Buffer does not meet any of the criteria above. **Points = 1** Aerial photo showing buffers	Figure ___ Disturbed buffers 2
H 2.2 Corridors and Connections ***(see p. 81)*** H 2.2.1 Is the wetland part of a relatively undisturbed and unbroken vegetated corridor (either riparian or upland) that is at least 150 ft wide, has at least 30% cover of shrubs, forest or native undisturbed prairie, that connects to estuaries, other wetlands or undisturbed uplands that are at least 250 acres in size? (*dams in riparian corridors, heavily used gravel roads, paved roads, are considered breaks in the corridor*). YES = **4 points** (*go to H 2.3*) NO = go to H 2.2.2 H 2.2.2 Is the wetland part of a relatively undisturbed and unbroken vegetated corridor (either riparian or upland) that is at least 50ft wide, has at least 30% cover of shrubs or forest, and connects to estuaries, other wetlands or undisturbed uplands that are at least 25 acres in size? **OR** a **Lake-fringe** wetland, if it does not have an undisturbed corridor as in the question above? YES = **2 points** (*go to H 2.3*) NO = H 2.2.3 H 2.2.3 Is the wetland: within 5 mi (8km) of a brackish or salt water estuary OR within 3 mi of a large field or pasture (>40 acres) OR within 1 mi of a lake greater than 20 acres? YES = **1 point** NO = **0 points**	1

Total for page 3

H 2.3 Near or adjacent to other priority habitats listed by WDFW ***(see new and complete descriptions of WDFW priority habitats, and the counties in which they can be found, in the PHS report http://wdfw.wa.gov/hab/phslist.htm)***

Which of the following priority habitats are within 330ft (100m) of the wetland unit? *NOTE: the connections do not have to be relatively undisturbed.*

___ **Aspen Stands:** Pure or mixed stands of aspen greater than 0.4 ha (1 acre).

X **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report p. 152*).

___ **Herbaceous Balds:** Variable size patches of grass and forbs on shallow soils over bedrock.

___ **Old-growth/Mature forests:** (Old-growth west of Cascade crest) Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 20 trees/ha (8 trees/acre) > 81 cm (32 in) dbh or > 200 years of age. (Mature forests) Stands with average diameters exceeding 53 cm (21 in) dbh; crown cover may be less that 100%; crown cover may be less that 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80 - 200 years old west of the Cascade crest.

___ **Oregon white Oak:** Woodlands Stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158*).

___ **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

___ **Westside Prairies:** Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie (*full descriptions in WDFW PHS report p. 161*).

___ **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

X **Nearshore**: Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore. (*full descriptions of habitats and the definition of relatively undisturbed are in WDFW report: pp. 167-169 and glossary in Appendix A).*

___ **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

___ **Cliffs:** Greater than 7.6 m (25 ft) high and occurring below 5000 ft.

___ **Talus:** Homogenous areas of rock rubble ranging in average size 0.15 - 2.0 m (0.5 - 6.5 ft), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

___ **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 51 cm (20 in) in western Washington and are > 2 m (6.5 ft) in height. Priority logs are > 30 cm (12 in) in diameter at the largest end, and > 6 m (20 ft) long.

If wetland has **3 or more** priority habitats = **4 points**
If wetland has **2** priority habitats = **3 points**
If wetland has **1** priority habitat = **1 point** No habitats = 0 points

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list. Nearby wetlands are addressed in question H 2.4)

3

Wetland name or number 1

H 2.4 Wetland Landscape *(choose the **one** description of the landscape around the wetland that best fits)* ***(see p. 84)*** There are at least 3 other wetlands within ½ mile, and the connections between them are relatively undisturbed (light grazing between wetlands OK, as is lake shore with some boating, but connections should NOT be bisected by paved roads, fill, fields, or other development. points = 5 The wetland is Lake-fringe on a lake with little disturbance and there are 3 other lake-fringe wetlands within ½ mile points = 5 There are at least 3 other wetlands within ½ mile, BUT the connections between them are disturbed points = 3 The wetland is Lake-fringe on a lake **with** disturbance and there are 3 other lake-fringe wetland within ½ mile points = 3 There is at least 1 wetland within ½ mile. points = 2 There are no wetlands within ½ mile. points = 0	3
H 2. TOTAL Score - opportunity for providing habitat *Add the scores from H2.1,H2.2, H2.3, H2.4*	9
TOTAL for H 1 from page 14	1
Total Score for Habitat Functions – add the points for H 1, H 2 and record the result on p. 1	10

Wetland name or number D

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Please determine if the wetland meets the attributes described below and circle the appropriate answers and Category.

Wetland Type *Check off any criteria that apply to the wetland. Circle the Category when the appropriate criteria are met.*	**Category**
SC 1.0 Estuarine wetlands *(see p. 86)* Does the wetland unit meet the following criteria for Estuarine wetlands? — The dominant water regime is tidal, — Vegetated, and — With a salinity greater than 0.5 ppt. YES = Go to SC 1.1 NO P	
SC 1.1 Is the wetland unit within a National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park or Educational, Environmental, or Scientific Reserve designated under WAC 332-30-151? YES = Category I NO go to SC 1.2	**Cat. I**
SC 1.2 Is the wetland unit at least 1 acre in size and meets at least two of the following three conditions? YES = Category I NO = Category II — The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. If the non-native *Spartina* spp. are the only species that cover more than 10% of the wetland, then the wetland should be given a dual rating (I/II). The area of Spartina would be rated a Category II while the relatively undisturbed upper marsh with native species would be a Category I. Do not, however, exclude the area of Spartina in determining the size threshold of 1 acre. — At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. — The wetland has at least 2 of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands.	**Cat. I** **Cat. II** **Dual rating I/II**

Wetland name or number 1

SC 2.0 Natural Heritage Wetlands ***(see p. 87)*** Natural Heritage wetlands have been identified by the Washington Natural Heritage Program/DNR as either high quality undisturbed wetlands or wetlands that support state Threatened, Endangered, or Sensitive plant species. SC 2.1 Is the wetland unit being rated in a Section/Township/Range that contains a Natural Heritage wetland? *(this question is used to screen out most sites before you need to contact WNHP/DNR)* S/T/R information from Appendix D X or accessed from WNHP/DNR web site YES____ – contact WNHP/DNR (see p. 79) and go to SC 2.2 NO SC 2.2 Has DNR identified the wetland as a high quality undisturbed wetland or as or as a site with state threatened or endangered plant species? YES = Category I NO X not a Heritage Wetland	**Cat. I**
SC 3.0 Bogs ***(see p. 87)*** Does the wetland unit (**or any part of the unit**) meet both the criteria for soils and vegetation in bogs? *Use the key below to identify if the wetland is a bog.* ***If you answer yes you will still need to rate the wetland based on its functions.*** 1. Does the unit have organic soil horizons (i.e. layers of organic soil), either peats or mucks, that compose 16 inches or more of the first 32 inches of the soil profile? (See Appendix B for a field key to identify organic soils)? Yes - go to Q. 3 No - go to Q. 2 2. Does the unit have organic soils, either peats or mucks that are less than 16 inches deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on a lake or pond? Yes - go to Q. 3 No - Is not a bog for purpose of rating 3. Does the unit have more than 70% cover of mosses at ground level, AND other plants, if present, consist of the "bog" species listed in Table 3 as a significant component of the vegetation (more than 30% of the total shrub and herbaceous cover consists of species in Table 3)? Yes – Is a bog for purpose of rating No - go to Q. 4 NOTE: If you are uncertain about the extent of mosses in the understory you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16" deep. If the pH is less than 5.0 and the "bog" plant species in Table 3 are present, the wetland is a bog. *1.* Is the unit forested (> 30% cover) with sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Englemann's spruce, or western white pine, WITH any of the species (or combination of species) on the bog species plant list in Table 3 as a significant component of the ground cover *(> 30% coverage of the total shrub/herbaceous cover)?* 2. YES = Category I No X Is not a bog for purpose of rating	**Cat. I**

SC 4.0 Forested Wetlands ***(see p. 90)*** Does the wetland unit have at least 1 acre of forest that meet one of these criteria for the Department of Fish and Wildlife's forests as priority habitats? *If you answer yes you will still need to rate the wetland based on its functions.* — **Old-growth forests**: (west of Cascade crest) Stands of at least two tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/acre (20 trees/hectare) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 inches (81 cm) or more. NOTE: The criterion for dbh is based on measurements for upland forests. Two-hundred year old trees in wetlands will often have a smaller dbh because their growth rates are often slower. The DFW criterion is and "OR" so old-growth forests do not necessarily have to have trees of this diameter. — **Mature forests**: (west of the Cascade Crest) Stands where the largest trees are 80 – 200 years old OR have average diameters (dbh) exceeding 21 inches (53cm); crown cover may be less that 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth. YES = Category I NO X not a forested wetland with special characteristics	**Cat. I**
SC 5.0 Wetlands in Coastal Lagoons ***(see p. 91)*** Does the wetland meet all of the following criteria of a wetland in a coastal lagoon? — The wetland lies in a depression adjacent to marine waters that is wholly or partially separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks — The lagoon in which the wetland is located contains surface water that is saline or brackish (> 0.5 ppt) during most of the year in at least a portion of the lagoon *(needs to be measured near the bottom)* YES = Go to SC 5.1 NO X not a wetland in a coastal lagoon SC 5.1 Does the wetland meets all of the following three conditions? — The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 20% cover of invasive plant species (see list of invasive species on p. 74). — At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. — The wetland is larger than 1/10 acre (4350 square feet) YES = Category I NO = Category II	**Cat. I** **Cat. II**

Wetland name or number 1

SC 6.0 Interdunal Wetlands *(see p. 93)* Is the wetland unit west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? YES - go to SC 6.1 NO – not an interdunal wetland for rating ***If you answer yes you will still need to rate the wetland based on its functions.*** In practical terms that means the following geographic areas: • Long Beach Peninsula- lands west of SR 103 • Grayland-Westport- lands west of SR 105 • Ocean Shores-Copalis- lands west of SR 115 and SR 109 SC 6.1 Is the wetland one acre or larger, or is it in a mosaic of wetlands that is once acre or larger? YES = Category II NO – go to SC 6.2 SC 6.2 Is the unit between 0.1 and 1 acre, or is it in a mosaic of wetlands that is between 0.1 and 1 acre? YES = Category III	**Cat. II** **Cat. III**
Category of wetland based on Special Characteristics *Choose the "highest" rating if wetland falls into several categories, and record on p. 1.* If you answered NO for all types enter "Not Applicable" on p.1	N/A