

CRITICAL AREAS ASSESSMENT REPORT

Kennedy-Goetz Bulkhead Replacement Project
King County Parcels: 0823039061 and 0823039070
Vashon, Washington

Prepared by

LEON 
Environmental, LLC

May 2024

Prepared For:

9400 SW Dolphin Point LLC
Kathryn Kennedy (Owner)
Vashon, WA 98070

Prepared By:

Kristi Rettmann, PWS #3793, Senior Associate Biologist
Janae Dinkins, Biologist
Leon Environmental, LLC
Seattle, WA

Table of Contents

1.0 Introduction.....	1
1.1 Project Description	1
1.2 Statement of Accuracy	1
2.0 Desktop Evaluation	3
2.1 Location.....	3
2.2 Project Site Description	3
2.3 Background Data Reviewed.....	4
3.0 Baseline Conditions	3
3.1 Site Investigation	3
3.2 Surrounding Land/Water Uses	4
3.3 Vegetation and Habitat Features.....	4
3.4 Aquatic Substrate and Vegetation	5
3.5 Water and Sediment Quality.....	6
4.0 Critical Areas Review	3
4.1 Streams	3
4.2 Soils	3
4.3 Steep Slopes and Geologic Hazards.....	4
4.4 Critical Aquifer Recharge Areas	5
4.5 Floodplain.....	5
4.6 Wetlands, Ponds, and Lakes.....	6
4.7 Special Status Species and Priority Habitats.....	8
4.8 Critical Area Functions	9
5.0 Project Description.....	10
5.1 Proposed Project.....	10
5.2 Alternatives Analysis	10
5.3 Construction Process	11
5.4 Best Management Practices and Protection Measures.....	11
6.0 Impact Assessment.....	13
6.1 Project Overview	13
6.2 Possible Impacts to Specific Critical Areas.....	13
7.0 Conclusions	15
8.0 References	16

Figures

Figure 1. Project Vicinity	3
Figure 2. Project Site (ESRI Map).....	3
Figure 3. Slope Stability and Shore Modification (Ecology’s Water Quality Atlas)	4
Figure 4. Project Site Shoreline Substrate	6
Figure 5. Mapped 303d Listed Water (Ecology’s Water Quality Atlas)	7
Figure 6. Mapped Wetlands and Hydrology (USFWS 2024a)	3
Figure 7. Mapped Geologic Hazards (King County GIS iMap)	4
Figure 8. Flood Hazard Map (FEMA)	5

Figure 9. Offsite Wetland and Potential Offsite Drainage Feature8

Tables

Table 1. Site Plant Community5
Table 2. Mapped Soils.....4
Table 3. WDFW PHS Report Summary9
Table 4. ESA-Listed Species Potentially in the Vicinity of the Project Area9
Table 5. Authorized WDFW In-Water Work Windows for TRA 4 11

Appendices

Appendix A. Site Plans and Shoreline Geotechnical Assessment
Appendix B. Site Photos of Existing Residential Infrastructure
Appendix C. Ecology Wetland Rating Form with Figures & NRCS Soil Survey Report
Appendix D. USFWS IPaC Official Species List & WDFW Priority Habitats and Species

Abbreviations and Acronyms

BMP	best management practices
County	King County
CY	cubic yards
Ecology	Washington Department of Ecology
ESA	Endangered Species Act
FAC	Facultative
FACU	Facultative Upland
FACW	Facultative Wetland
FEMA	Federal Emergency Management Agency
FPAMT	Forest Practices Application Mapping Tool
FT	feet or foot
HTL	High Tide Line
KCC	King County Code
L-E	Leon Environmental, LLC
LF	linear feet or foot
MSDG	Marine Shoreline Design Guidelines
NMFS	National Marine Fisheries Service
NRCS	Natural Resources Conservation Service
NWI	National Wetland Inventory
NWPL	National Wetland Plant List
OBL	Obligate Wetland
OHW	ordinary high-water mark
PHS	Priority Habitat and Species
SF	square feet or foot
SFR	single-family residence
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources
WNHP	Washington National Heritage Program

Statements of Qualification

Kristi Rettmann, PWS #3793, Senior Associate Biologist

Kristi has 22 years of biological and field experience and holds four-year and advanced degrees in environmental science and biology. Her main areas of expertise include terrestrial ecology, riparian ecology, wetland and stream delineation, amphibian studies, and environmental permitting. She has received training from the Washington Department of Ecology (including Ecology's Western Washington wetland rating system; how to identify grasses, sedges and rushes; using field indicators for hydric soils; how to determine ordinary highwater mark in Western Washington; winter tree and shrub identification for Puget Lowland Habitats; and forage fish survey methods). Additionally, Kristi has received US Army Corps of Engineers (USACE)-based wetland delineation training from The Wetland Institute and biological assessment training with the Washington State Department of Transportation (WSDOT). She has completed numerous wetland and stream delineations, habitat assessments, critical areas studies, and biological assessments and evaluations over the last 9 years for a variety of Western Washington and Oregon projects.

Janae Dinkins, Biologist

Janae Dinkins is a professional biologist with 4 years of experience in the Pacific Northwest who holds a BS in Wildlife and Fisheries and Soil and Plant Science from Texas A&M University. Her areas of expertise include marine and nearshore ecology, fisheries biology and ecology, wetland science, and forage fish ecology. Additionally, she has received training by the Washington Department of Ecology, Washington Department of Fish and Wildlife, and U.S. Army Corps of Engineers.

1.0 Introduction

1.1 Project Description

The permit applicant, Kathryn Kennedy, has requested environmental permitting support from Leon Environmental, LLC (L-E). On March 19, 2024, biologists from L-E conducted a site assessment of the study area. This report addresses the King County (County) request for a Critical Area Report to provide required documentation in support of the permitting process.

The project proposes to replace the existing deteriorating shoreline protection (bulkhead) for the single-family residence (SFR) at 9400 SW Dolphin Point Road (project site), located along the northeastern shoreline of Vashon Island, Puget Sound in King County, Washington (Figure 1). In addition to L-E's work on March 19, 2024, Envirotech Engineering PLLC (Envirotech) completed a geotechnical evaluation (Appendix B; Envirotech 2024), which determined that this location requires a hard armored solution to mitigate the accelerating erosion hazard that jeopardizes the SFR and septic system at the project site.

The project site consists of two parcels (0823039061 and 0823039070) with the vast majority of the proposed project to occur along the entirety of the center project parcel (0823039061). The existing bulkhead consists of approximately 132-linear foot (LF) of deteriorating, creosote timber pile and treated wood with concrete steps. The project proposes to install an approximately 132 LF angular rock bulkhead at or landward of ordinary high water (OHW)/ high tide line (HTL), within the footprint of the existing, deteriorating creosote pile, treated timber, and concrete toe bulkhead. On the southern boundary of parcel 0823039061, the existing set of concrete stairs, are proposed to be removed and replaced with inset rock stairs. Additionally, at the northwest end of the center project parcel (0823039061), rock that has fallen onto the beach from the adjacent rock bulkhead to the north will be restacked within that same rock bulkhead to the north, thereby reestablishing approximately 108 square feet (SF) of upper intertidal beach habitat. The SFR and the septic system are located approximately 12 feet and 10 feet, respectively, from the top of the existing deteriorating bulkhead. Due to the substantial wind- and wave-energy at this location, the existing bulkhead shows signs of significant deterioration such as rotting or missing timber slats, the center of some creosote piles have rotted partially away, and void areas up to 4 feet wide are located immediately behind the bulkhead.

In response to the County letter dated February 20, 2024, L-E biologists prepared this critical areas report, including an alternatives analysis and impact analysis. This critical areas report was completed in compliance with King County Code (KCC) 21A.25.080, 21A.24.100, and 21A.24.125.

Information presented in this report is intended to demonstrate avoidance and/or minimization of impacts to sensitive areas and species, and to provide information for regulatory reviewers. The report is anticipated to support review by the County, U.S. Army Corps of Engineers (USACE), and/or the Washington State Department of Ecology (Ecology), and Washington State Department of Fish and Wildlife (WDFW).

1.2 Statement of Accuracy

Critical areas delineation, characterization, rating, and functional analyses were conducted/prepared by trained professionals at L-E and adhered to the protocols, guidelines, and generally accepted industry standards available at the time work was performed. Wetland delineations are based upon protocols defined in manuals and publications produced by federal,

state, and local agencies. The wetland methodology used in this report is consistent with methods described in the USACE *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (2010) and the *Army Corps of Engineers Wetland Delineation Manual* (USACE 1987). OHW is used to establish the jurisdictional line for waterbodies (streams, rivers, and lakes) and shorelines. In Washington, OHW is evaluated and delineated using methods established by Ecology in *Determining the Ordinary High-Water Mark for Shoreline Management Act Compliance in Washington State* (Ecology 2016). The findings and conclusions were based on conditions at the time of the site visit and on best professional judgement. This report is provided for the use of the named recipient only and is not intended for use by other parties for any other purpose. The information provided herein is accurate and true to the best of our knowledge. L-E does not warrant any assumptions or conclusions not expressly made in this report or based on information or analyses other than what is included herein.

2.0 Desktop Evaluation

2.1 Location

The project property is located at 9400 SW Dolphin Point Road, Vashon, Washington, 98070 (Figure 1). Situated on the northeast point of Vashon Island, along Puget Sound, the project property is within Township 23 North, Range 03 East, Section 08, W.M., and includes King County Tax Parcels 0823039061 and 0823039070, with the SFR and majority of the proposed project occurring on tax parcel 0823039061. The project parcels are zoned rural residential (RA5), and are located in Water Resource Inventory Area (WRIA) 15, Kitsap watershed.

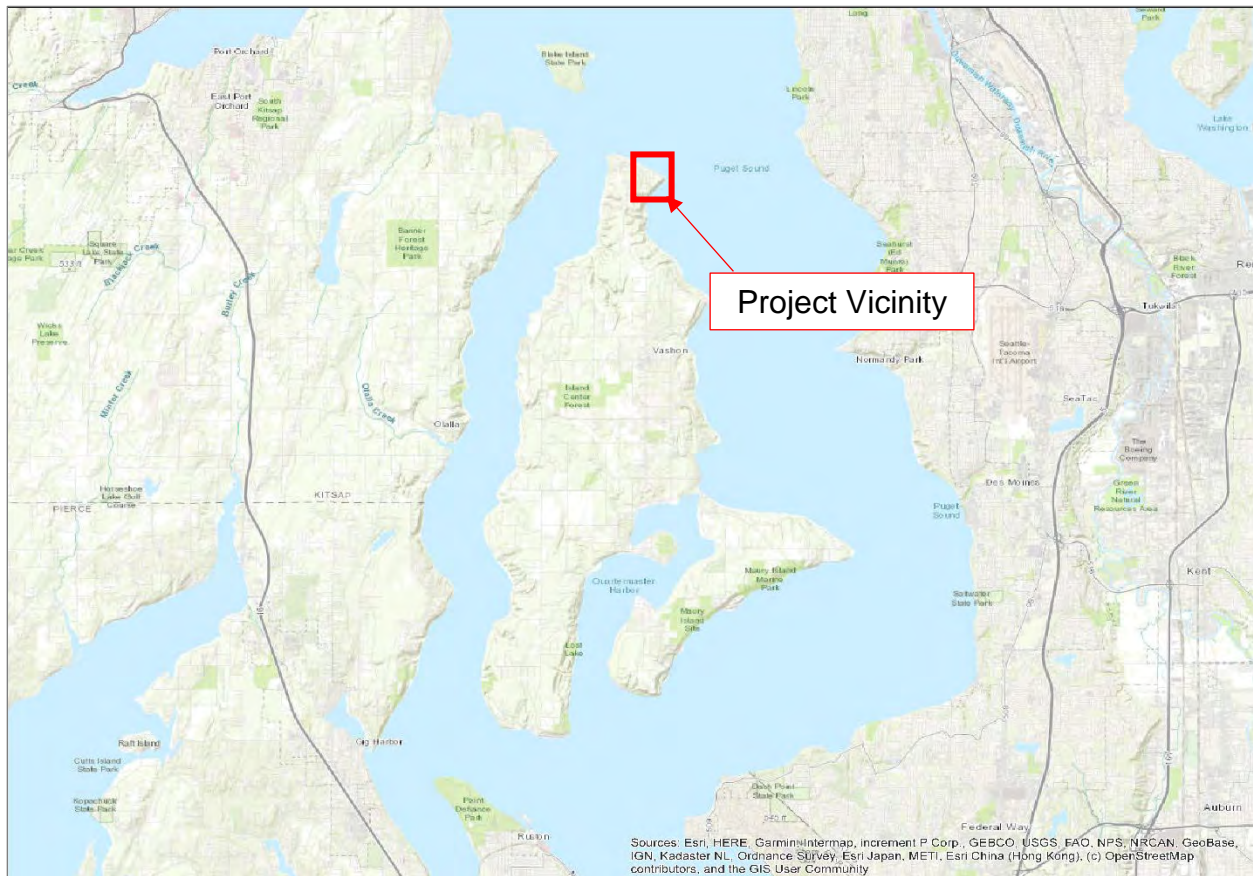


Figure 1. Project Vicinity

2.2 Project Site Description

The project site consists of a private residential parcel located along the northeastern shoreline of Vashon Island (Figure 1). The upland portion of the property includes a SFR, parking areas, landscaping, and residential infrastructure (well and septic system). From Dolphin Point Road, the SFR is accessible on foot by a set of descending cross back stairs along the back slope of the property just below Dolphin Point Road.

The main project location (0823039061) is a 0.53-acre waterfront parcel with a 1,260-SF 2-story home built in 1928. It has 2 bedrooms and 1 bathroom. The home has a 280 SF treated wood deck. Additional structures include a 260 SF wooden shed.

The Property's shoreline is protected by approximately 132 LF of deteriorating concrete reinforced creosote timber and treated wood plank bulkhead. The SFR is set up on a private septic system and well water. The septic system is approximately 10 feet (FT) from the top of the existing deteriorating bulkhead.

2.3 Background Data Reviewed

The background data review of existing information pertaining to the project site and project vicinity included an evaluation of publicly available maps, drawings, and reports. Specifically, the review focused on information related to soils, hydrology, vegetation, and previously identified habitat areas and County critical areas.

The background data review included the following list of resources:

- King County iMap GIS online database (<https://gismaps.kingcounty.gov/iMap/>);
- Aerial photograph and topographic maps of the property in King County's iMap GIS and historical and current imagery available using Google Earth Pro;
- WDFW's Priority Habitat and Species (PHS) data for the property and adjacent areas;
- WDFW's SalmonScape (<http://apps.wdfw.wa.gov/salmonscape/map.html>)
- Washington Natural Heritage Program (WNHP) data for sensitive or State- or Endangered Species Act (ESA)-listed plant species on the property and adjacent areas;
- National Oceanic and Atmospheric Administration (NOAA) Protected Resources App (<https://www.fisheries.noaa.gov/resource/map/protected-resources-app>);
- Natural Resources Conservation Service, National Hydric Soils List by State (www.soild.usda.gov/use/hydric/lists/state.html);
- Natural Resources Conservation Service (NRCS), Web Soil Survey (www.websoilsurvey.nrcs.usda.gov/app/);
- U.S. Department of Agriculture, NRCS soil survey maps (<http://websoilsurvey.nrcs.usda.gov/app/>);
- U.S. Fish and Wildlife Service National Wetland Inventory (NWI) maps (<https://www.fws.gov/wetlands/data/mapper.html>);
- Washington Department of Natural Resources (WDNR) Forest Practices Application Mapping Tool (FPAMT) (<https://fpamt.dnr.wa.gov/default.aspx>)
- Ecology's Coastal Atlas Map for 303(d) water bodies and sediment, and any hydrophilic aquatic vegetation mapped along the shoreline;
- U.S. Fish and Wildlife Service (USFWS) Environmental Conservation Online System (<https://ecos.fws.gov/ecp/>); and
- National Wetland Plant List (NWPL), Western Mountains, Valleys, and Coast (http://wetland_plants.usace.army.mil/).

3.0 Baseline Conditions

The project property is located along the Northeastern shoreline of Vashon Island (Figure 2). The project site and neighboring properties are partially developed with SFRs, accessory structures, and related shoreline infrastructure. Based on aerial photos, the remainder of the project property and immediately adjacent parcels are moderately forested with clearings for homes, out buildings, landscaping, and gardens. Structures along the beach include beach access (stairs and/or ramps), sheds, and bulkheads.



Figure 2. Project Site (ESRI Map)

3.1 Site Investigation

L-E biologists performed a site visit on Friday, March 19, 2024. Weather conditions were sunny with little to no wind. The site visit was performed during low tide and took approximately two hours. The overall condition of the beach and shoreline were examined, including general soil and vegetation characterization, potential critical habitats were identified throughout the property, and the presence of species of concern was investigated. Any wetlands, ponds, and streams on adjacent properties that were identified in the desktop evaluation were investigated at a distance since access to private properties surrounding the project parcel was not permitted at the time of the site visit.

3.2 Surrounding Land/Water Uses

Vashon Island’s shoreline is dominated by residential development and associated infrastructure. Figure 3 depicts existing mapped shoreline modification (armoring) and shoreline slope stability along and adjacent to the project area. The project area is identified with a red star. According to Ecology’s Coastal Atlas, the terrain of the project site is mapped as having a recent slide, is on an unstable slope, and is entirely armored (70%) (Ecology 2024).

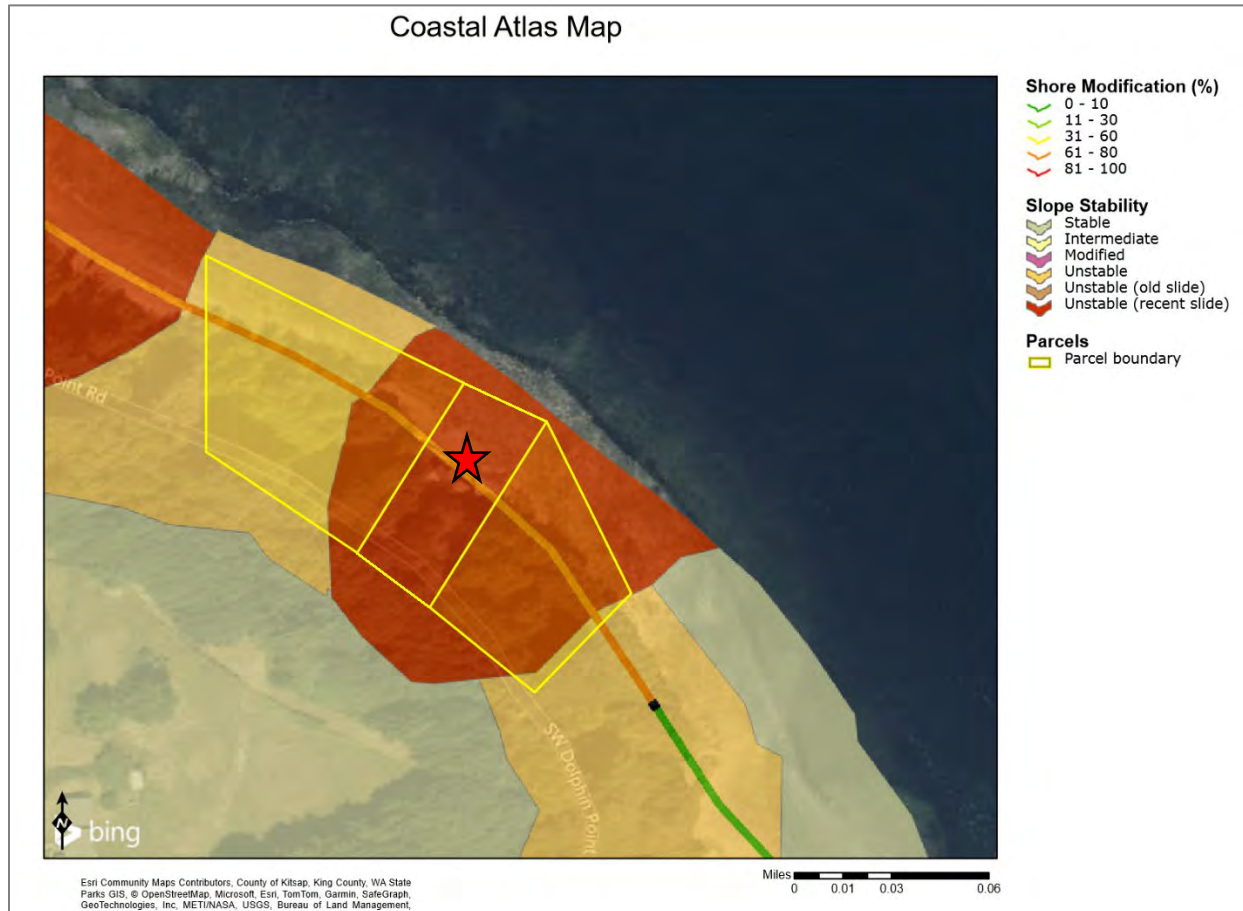


Figure 3. Slope Stability and Shore Modification (Ecology’s Water Quality Atlas)

3.3 Vegetation and Habitat Features

The shoreline bench of the center (main) project parcel (0823039061) is vegetated with a mixture of mostly landscaped native vegetation, dominated by grasses and forbs, with several trees along the southern portion of that parcel. From the top of the marine bluff to the existing deteriorating creosote, treated timber and concrete toe bulkhead, the vegetation is almost entirely lawn with random native forbs. Several native, upland shrub and tree species were observed along the back slope of that center parcel. The bench is covered primarily with a mix of grasses (*Poa spp.* and *Fescue spp.*) with dunegrass (*Leymus mollis*) lining the area between the home and the top of the existing bulkhead.

A more comprehensive list of the vegetation observed during the site visit can be found in the table below. This table shows that although there were some vegetation that could be considered wetland indicators, the overwhelming majority of the observed species consist of facultative and

facultative upland plants. Table 1 references the USACE's NWPL (USACE 2020) to categorize plant indicators by their occurrence in wetlands using the following indicator status convention: obligate wetland (OBL), facultative wetland (FACW), facultative (FAC), and facultative upland (FACU).

Table 1. Site Plant Community

Observed Species	Scientific / Technical Name	WMVC Indicator Status ^{1,2}
Trees		
Big leaf maple	<i>Acer macrophyllum</i>	FACU
Red alder	<i>Alnus rubra</i>	FAC
Douglas fir	<i>Pseudotsuga menziesii</i>	FACU
Western red cedar	<i>Thuja plicata</i>	FAC
Shrubs		
Beaked hazelnut	<i>Corylus cornuta</i>	FACU
American witch hazel	<i>Hammamelis virginiana</i>	FACU
Cherry laurel	<i>Prunus laurocerasus</i>	FACU
Rhododendron	<i>Rhododendron macrophyllum</i>	FACU
Black gooseberry	<i>Ribes lacustre</i>	FAC
Salmonberry	<i>Rubus spectabilis</i>	FAC
Pacific willow	<i>Salix lasiandra</i>	FACW
Red Elderberry	<i>Sambucus racemosa</i>	FACU
Herbs		
Lawn grasses	<i>Fescue spp. and Poa spp.</i>	N/A
Herb Robert	<i>Geranium robertianum</i>	FACU
English ivy	<i>Hedera helix</i>	FACU
Tall Alumroot	<i>Heuchera chlorantha</i>	FAC
Dunegrass	<i>Leymus mollis</i>	FACU
Sword fern	<i>Polystichum munitum</i>	FACU
Bracken fern	<i>Pteridium aquilinum</i>	FACU
Himalayan blackberry	<i>Rubus armeniacus</i>	FAC
Fringecup	<i>Tellima grandiflora</i>	FACU
White clover	<i>Trifolium repens</i>	FAC
Stinging nettle	<i>Urtica dioica</i>	FAC

¹NWPL, (USACE 2020).

²FAC=facultative, FACW=facultative wetland, FACU=facultative upland.

3.4 Aquatic Substrate and Vegetation

L-E biologists observed the beach substrate as a mix of sand, gravel and shell hash within the first 10-20 feet waterward of the existing shoreline protection, and a dense layer of rockweed (*Fucus gardneri*) covered the concrete toe of the existing bulkhead. From approximately 20 to 105 feet waterward of the existing shoreline protection, the sand, gravels and cobbles gradually shifted to a large area of a predominantly basalt rock outcrop intermixed with random sections of exposed hardpan (Figure 4). During the site visit, attached filamentous green algae (*Ulva spp.*) was observed on and throughout the basalt rock outcrop and cobbles, along with a few patches of unattached Turkish towels (*Mastocarpus papillatus*) and witches' hair (*Desmarestia aculeata*). Just beyond the rock outcrop, a patch of wireweed (*Sargassum muticum*) was also observed.

According to Ecology's Coastal Atlas, patchy (fringe) areas of kelp are present within the vicinity of the Kennedy-Goetz beach area (Ecology 2024), however, no kelp was observed during the site visit. Additionally, the Coastal Atlas identifies an area of patchy (fringe) eelgrass (Ecology 2024) southeast of the project site. Eelgrass was not observed on or adjacent to the project area at the time of the site visit.



Figure 4. Project Site Shoreline Substrate

3.5 Water and Sediment Quality

Several areas throughout Puget Sound are included on Ecology's 303(d) list of impaired water bodies for exceeding numerous state water and sediment quality criteria (Figure 5). Approximately 2.5 miles east and 3.6 miles northeast of the project site there are 303(d) listed waters and sediment for elevated bacteria levels. The water and sediment directly adjacent to the project site are not on the 303(d) list (Ecology 2024).

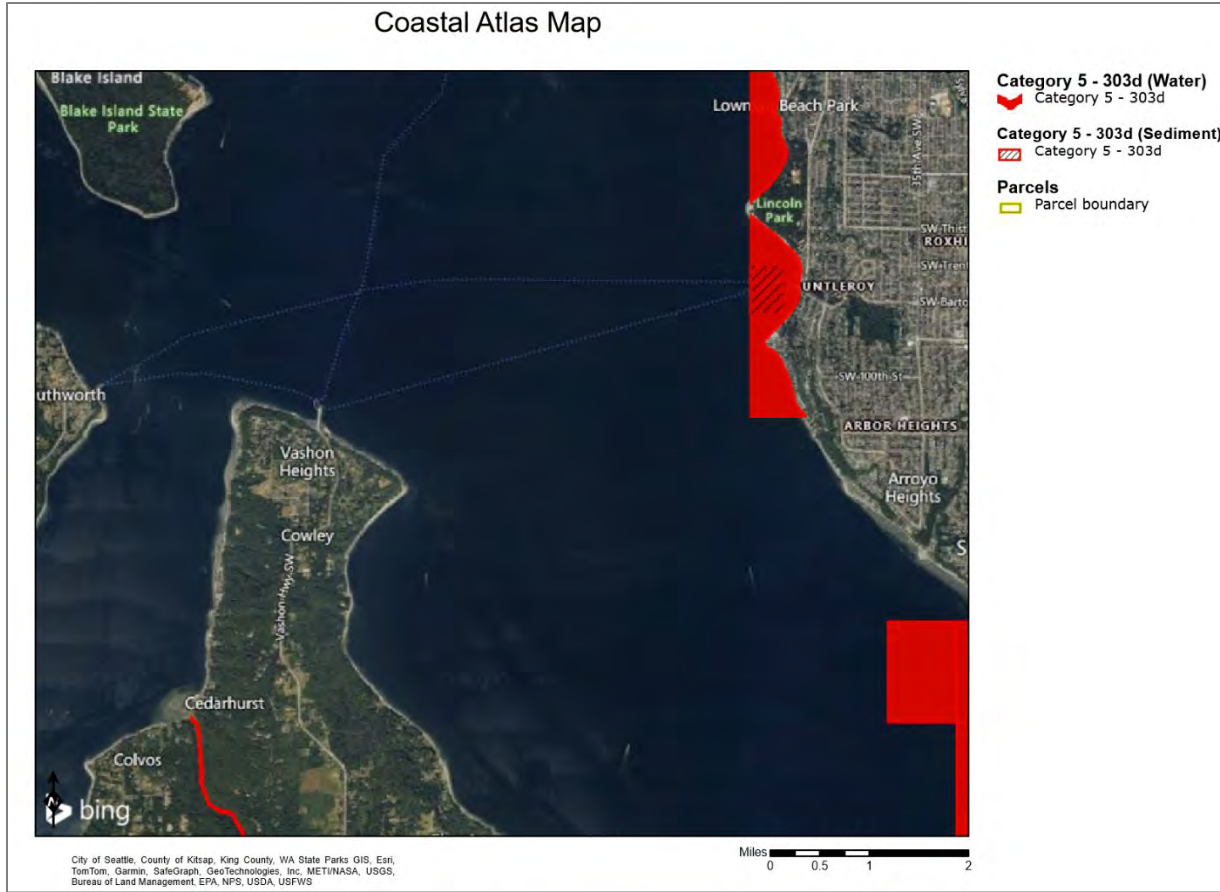


Figure 5. Mapped 303d Listed Water (Ecology’s Water Quality Atlas)

4.0 Critical Areas Review

4.1 Streams

According to King County iMap GIS database or WDFW SalmonScape (WDFW 2024a), no streams are mapped on or within 300 feet of the project site. However, WDNR’s FPAMT mapping tool (2024) indicates that an unknown and unclassified stream is identified to the northwest of the project property (Figure 6). During site reconnaissance on March 19, 2024, other than roadside ditches along the access road to the site, no perennial stream or wet drainage was encountered on the project property, nor observed on adjacent parcels.

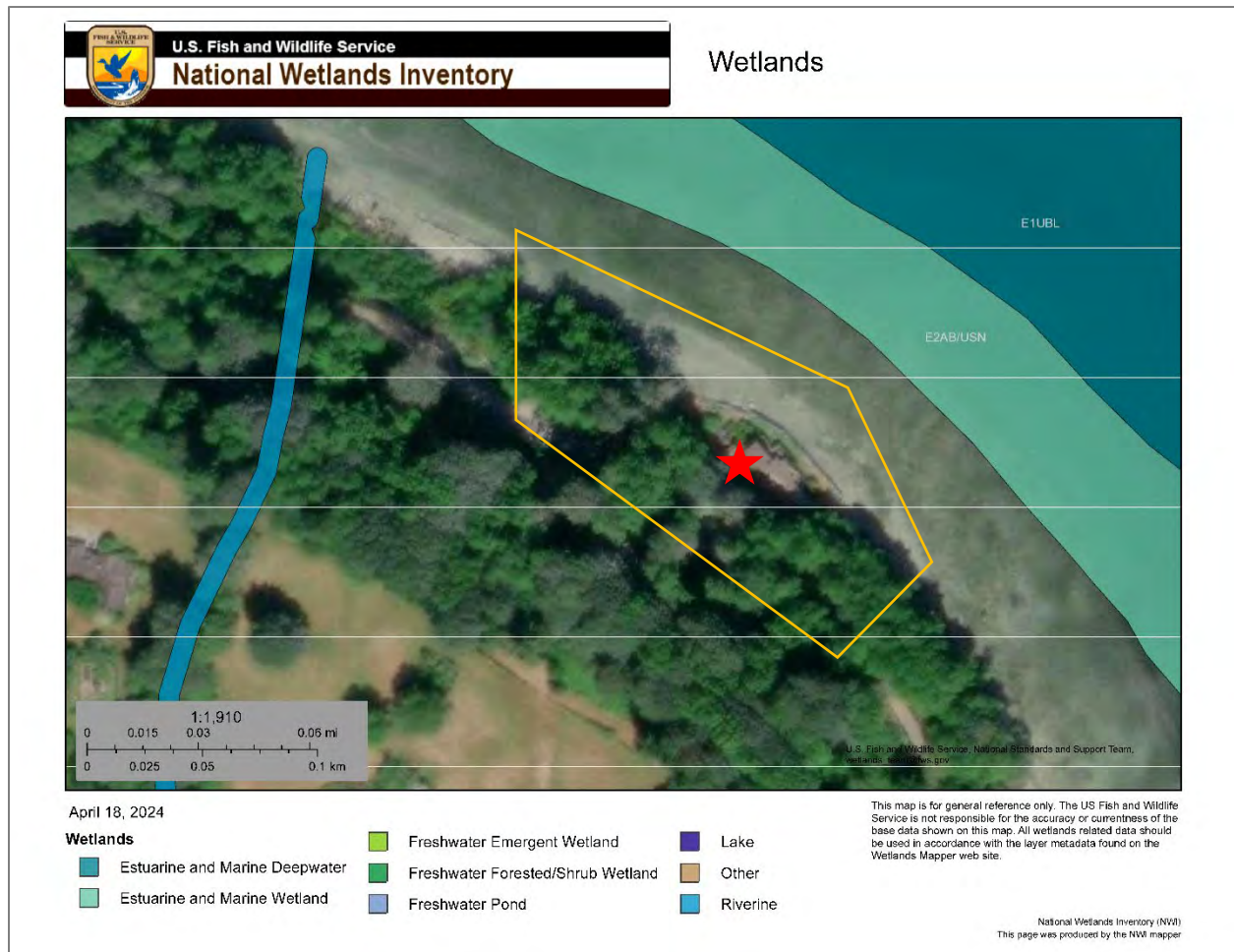


Figure 6. Mapped Wetlands and Hydrology (USFWS 2024a)

4.2 Soils

The site-specific soil survey identifies two soil unit types within or near the approximate study area boundaries (Appendix C). Table 2 summarizes the NRCS custom soil resource report for the project area (NRCS 2024). Neither mapped soil type is rated as hydric soil.

Table 2. Mapped Soils

Map Unit ¹	Map Unit Name ¹	Hydric Soil ¹	Typical Profile ¹
Cb	Coastal beaches	No	0 to 60 inches
AkF	Alderwood and Kitsap soils, very steep	No	0 to 12 inches: gravelly ashy sandy loam 12 to 27 inches: very gravelly sandy loam 27 to 60 inches: very gravelly sandy loam

¹Custom Soil Resources Report, USDA, NRCS 2024 (Appendix C).

4.3 Steep Slopes and Geologic Hazards

Mapped layers of County-regulated steep slopes, erosion hazards, and landslide hazards were found during the desktop evaluation (Figure 7). No seismic or coal mine hazards were mapped on or immediately adjacent to the project property. The geotechnical assessment estimated that the regulated steep slope area (behind the SFR) is at approximately 40% (Envirotech 2024). The toe of that steep slope and the existing SFR are separated by approximately 5 feet. During the site visit, no noticeable sliding, sloughing of the land, or surface water runoff areas were noted within this steep slope area. Several forbs, shrubs and trees of various diameters were well established and covering this slope, likely a contributing factor to keeping that slope in place.

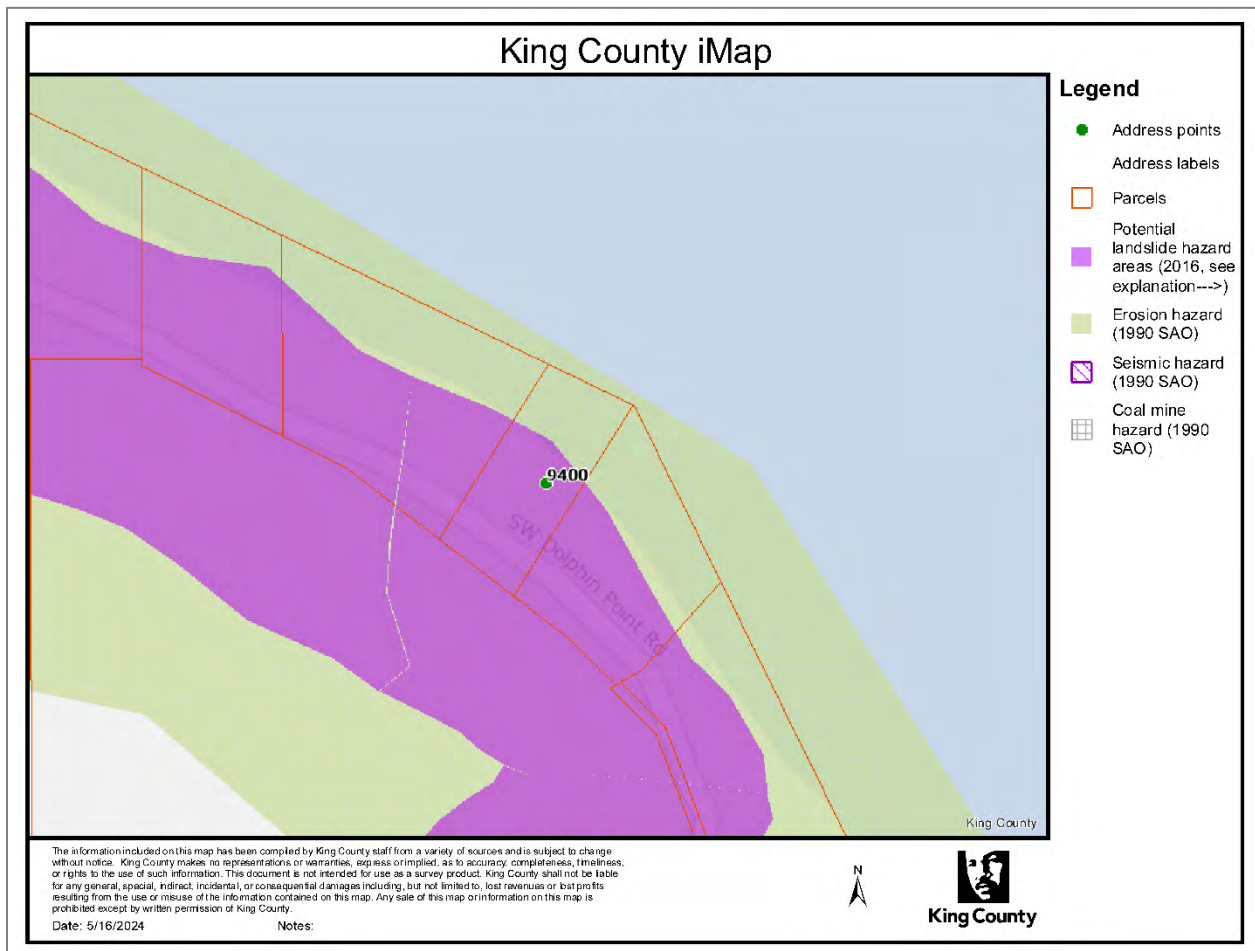


Figure 7. Mapped Geologic Hazards (King County GIS iMap)

4.4 Critical Aquifer Recharge Areas

According to King County’s iMap GIS online database, the SFR and existing deteriorating bulkhead are within a Category III critical aquifer recharge area, and portions of the rest of the property are within Category II and III critical aquifer recharge areas. L-E biologists are not qualified to confirm or rebut these findings in the field. Since the project involves replacing the existing bulkhead within the existing footprint of that bulkhead and no other work is proposed in this area, this project is unlikely to have negative impacts to the critical aquifer recharge areas.

4.5 Floodplain

Based on King County’s iMap GIS online database, the project property shoreline is within the Federal Emergency Management Agency (FEMA) floodway and 100-year floodplain. FEMA’s online flood hazard map identifies the area near the project shoreline as Zone VE with a base flood elevation of 19 feet along the existing deteriorated bulkhead. Additionally, the Northeastern portion of the project shoreline is identified as Zone VE with a base flood elevation of 17 feet (Figure 8). Since the project involves replacing the new bulkhead at or landward of the existing footprint, this project is unlikely to have any additional negative impacts to the floodway or 100-year floodplain areas.

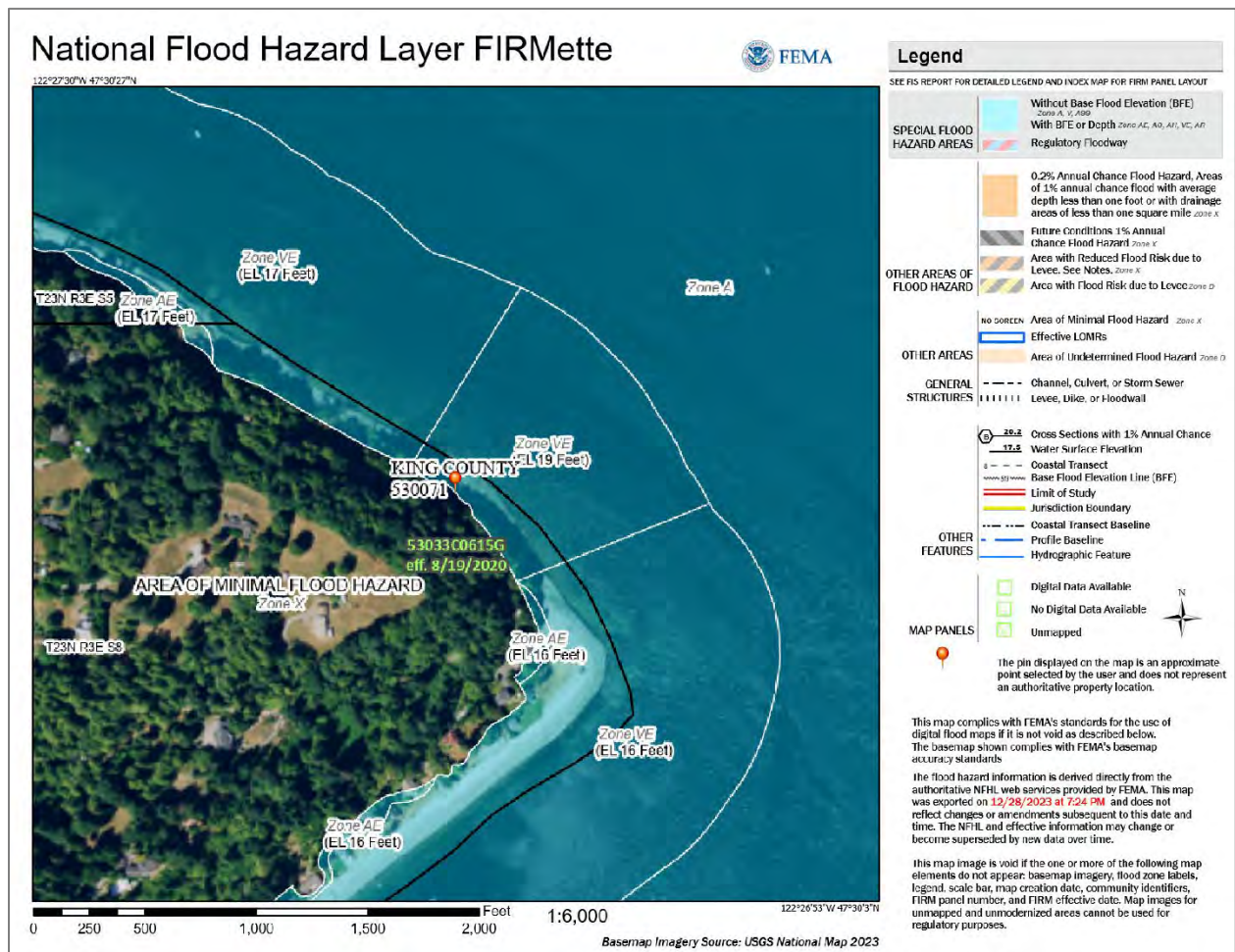


Figure 8. Flood Hazard Map (FEMA)

4.6 Wetlands, Ponds, and Lakes

The USFWS NWI online mapper was queried to determine if previously identified wetlands are present on or adjacent to the project property (USFWS 2024a). According to the NWI online mapper, there are E2USN (Estuarine Intertidal Unconsolidated Shore Regularly Flooded) and E1UBL (Estuarine Subtidal Unconsolidated Bottom Subtidal) estuarine wetlands immediately adjacent to the existing deteriorating creosote, treated timber, and concrete toe bulkhead (Figure 6). No ponds or lakes were identified by the NWI online mapper, nor were any mapped in King County GIS iMap database within 300 feet of the project property.

Onsite Wetlands

During the site visit, a wetland reconnaissance was conducted across the project property, from shoreline to upland, to identify potential hydrophytic vegetation, presence of hydric soils, and to determine the presence of any wetland hydrology. This wetland reconnaissance was conducted in accordance with the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (USACE 2010) and the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987).

At least one primary wetland indicator must be found for each of the three parameters (vegetation, hydrology, and soils) in order to make a positive wetland determination. An area is not considered a regulatory wetland if indicators for any one of these three parameters cannot be satisfied under normal conditions. If present, the boundary between upland and wetland areas would have been delineated by locating the transition where vegetation, hydrology, or soils no longer indicate that wetland parameters are met.

Methods for each of these parameters are as follows:

- **Hydrophytic Vegetation:** The plant community at each sample site is considered to be hydrophytic (wetland) vegetation if the vegetation exhibits indicators of hydrophytic vegetation as defined in the delineation methodology (USACE 2010). Most often the “Dominance Test” is used as the indicator. The sample plot meets the dominance test for hydrophytic vegetation if more than 50 percent of the dominant species from all strata have OBL, FACW, and/or FAC indicator status. Dominant species are the most abundant species that individually or collectively account for more than 50 percent of the total coverage of vegetation in the stratum (absolute percent cover), plus any other species that, by itself, accounts for at least 20 percent of the total. The wetland indicator status for each dominant species is then used to determine whether the plant community is dominated by hydrophytic vegetation. Occasionally, the “Prevalence Index” is used as the indicator of hydrophytic vegetation. The Prevalence Index is a weighted-average of all plant species in the sample plot.
- **Hydric Soils:** Soil test pits are hand dug to approximately 20 inches (or refusal) and soils are examined for hydric soil indicators. These formal soil test pits are labeled with a data point number and located on the delineation figure. Colors of the soil, including concentrations, depletions, or gleying, if present, are colored using a Munsell color chart (Munsell 2015). *Field Indicators of Hydric Soils in the United States* (USDA 2018) is used to determine hydric soils presence or absence.
- **Wetland Hydrology:** Site specific hydrology is assessed by an inspection of each site. Depth to shallow groundwater and/or saturation in each test pit is recorded, as are observations of other indicators of hydrology including but not limited to water marks, drift

lines, sediment deposits, and drainage patterns. This data provides information on timing and duration of ponding and/or saturation in the study area.

The site visit was conducted during the growing season, a time of year when vegetation is easily identified because plants have either leafed out or were flowering. Knowing that there were no hydric soils mapped for the project area, L-E biologists looked specifically for hydrophytic vegetation and hydrology indicators (standing water, saturated ground, distressed upland vegetation species, etc.) at multiple locations throughout the project area.

No indicators of freshwater wetlands were observed on the project property. Although some hydrophytic vegetation was noted in parts of the steep slope area along parcel 082303-9070, the vegetation present throughout the steep slope area was dominated by upland vegetation species. Hydrophytic vegetation was not observed immediately above the existing deteriorating creosote pile, treated timber, and concrete toe bulkhead, nor was any observed around or immediately upland of the SFR. Upland species were not found to be distressed anywhere on the project property. Additionally, a review of the NRCS Soil Survey (Appendix C) indicates that for the entire upland of the project property, Alderwood and Kitsap soils, very steep (AkF) are mapped, and are not hydric soils. L-E biologists dug random soil pits on the project property and confirmed the lack of hydric soil indicators on site. Areas of ponded water, saturated or spongy ground, water marks on trees, cracked soils, or other freshwater hydrology indicators were not found on the project property. Because wetland indicators were not observed on either project parcel, no freshwater wetlands were identified on the project property.

Offsite Wetlands

The only observed or known off-site wetland (Wetland C) was delineated by L-E biologists during an unrelated site investigation conducted May 17, 2022, and is located on the adjacent parcel Northwest of the project tax parcel 0823039070 (Figure 9). Wetland C was identified and named during that site visit, and is the only known wetland within 300 FT of the project parcel boundary. Wetland C was identified and rated as a Category IV slope wetland, and is situated above the existing bulkhead on parcel 0823039059 to the north of the project area. Based on the current wetland buffer table in KCC 21A.24.325, a Category IV wetland has a buffer of 40 feet for moderate intensity land use outside of an Urban Growth Area. Given that Wetland C is approximately 80 FT northwest of property line for parcel #0823039070, this wetland buffer does not extend onto either of the project parcels (Figure 9). Given that the proposed project occurs primarily on parcel #0823039061 and the replacement bulkhead activities will be approximately 340 FT southeast and downgradient of the edge of Wetland C's buffer, no impacts are anticipated as a result of the proposed project.

The potential offsite drainage feature to the southeast of the southwest Kennedy-Goetz parcel was also evaluated using aerial imagery and lidar data in King County's iMap due to access limitations. L-E biologists initially observed this potential offsite drainage feature during the March 19, 2024 site visit. This potential offsite drainage features was identified while walking along the SW Dolphin Point Road, approximately 300 feet from the project parcel boundary. In this offsite feature, L-E biologists noted an obvious transition from a FACU vegetation to a dominance of FAC vegetation and what appeared to be potentially saturated soils. The potential offsite drainage feature is positioned on a very steep slope and above an approximately 6 FT tall retaining wall along the road. No further investigation was undertaken because the potential offsite drainage feature was located on a property L-E biologists did not have permission to access. Given that this offsite feature is located approximately 500 feet upgradient of the replacement bulkhead activities, no impacts are anticipated as a result of the proposed project.

Wetland determination, wetland rating forms and supporting wetland rating figures for Wetland C are provided in Appendix C.

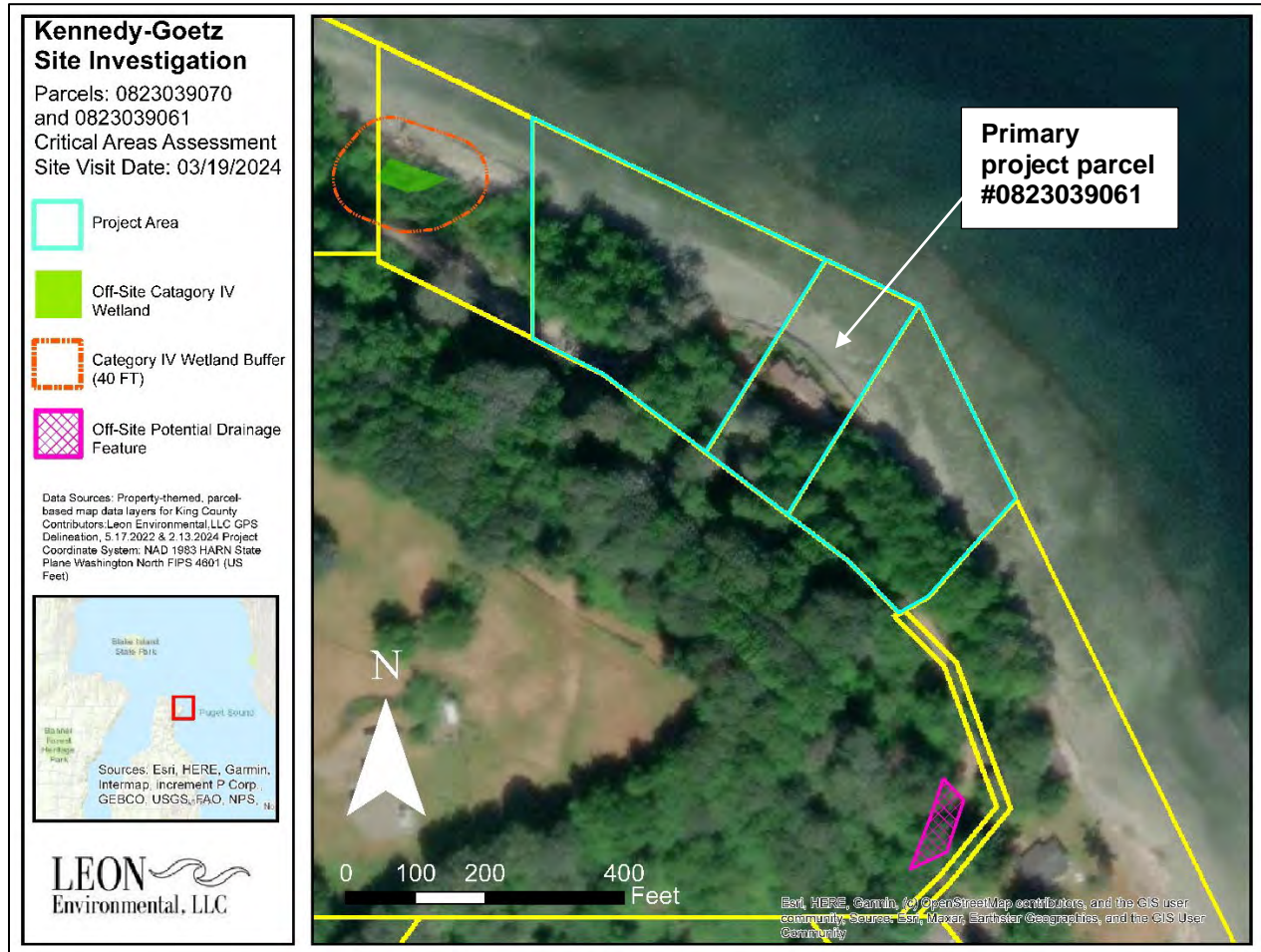


Figure 9. Offsite Wetland and Potential Offsite Drainage Feature

4.7 Special Status Species and Priority Habitats

Several state and federal resources were reviewed to identify the potential presence of ESA-listed species, Species of Concern, sensitive plant or wildlife species, and/or habitats. A review of WDNR’s WNHP determined that no current or historical accounts of any rare or sensitive plant species have been documented on or in the vicinity of the project property.

A review of the WDFW PHS Online tool (WDFW 2024b) determined that no ESA-listed species were identified on the project property (Table 3; Appendix D). Two priority habitats were identified within 300 feet of the project property’s shoreline: biodiversity areas and corridor (terrestrial habitat) and surf smelt breeding area.

Existing online sources for ESA-listed species in the vicinity of the project area were reviewed. ESA-listed species that may occur in the project area include Bull trout, Chinook salmon, Steelhead, Bocaccio rockfish, Yelloweye rockfish, Southern Resident killer whale, Marbled murrelet, Yellow-billed cuckoo, Northwestern pond turtle, and North American wolverine (Table 4). Table 4 summarizes ESA-listed species identified by the USFWS IPaC (2024b; Appendix D)

and National Marine Fisheries Service (NMFS 2024a, 2024b) online databases as having the potential to be on and in the vicinity of the project area.

Table 3. WDFW PHS Report Summary

Common Name	Scientific/ Technical Name	Washington State Listed Species? ¹	Priority Area ¹
Fish			
Surf Smelt	<i>Hypomesus pretiosus</i>	No	Breeding Area
Habitats			
Estuarine and Marine Wetland	N/A	N/A	N/A
Biodiversity Areas and Corridor	N/A	N/A	N/A

¹WDFW (2024b) PHS on the Web.

The project area is surrounded by developed residential areas and armored shorelines, and it is highly unlikely that these species will actually be found in the vicinity of the project area or impacted by the project that will be constructed within the footprint of the existing bulkhead and at OHW/HTL.

Table 4. ESA-Listed Species Potentially in the Vicinity of the Project Area

Common Name	Scientific Name	Listing Status ¹	Designated Critical Habitat?
Fishes			
Bull trout	<i>Salvelinus confluentus</i>	Threatened	Yes
Chinook salmon	<i>Oncorhynchus tshawytscha</i>	Threatened	Yes
Steelhead	<i>Oncorhynchus mykiss</i>	Threatened	Yes
Bocaccio rockfish	<i>Sebastes paucispinis</i>	Endangered	Yes
Yelloweye rockfish	<i>Sebastes ruberrimus</i>	Threatened	Yes
Mammals			
Southern Resident killer whale	<i>Orcinus orca</i>	Endangered	Yes
North American wolverine	<i>Gulo gulo luscus</i>	Threatened	No
Birds			
Marbled murrelet	<i>Brachyramphus marmoratus</i>	Threatened	Yes
Yellow-billed cuckoo	<i>Coccyzus americanus</i>	Threatened	Yes
Reptile			
Northwestern pond turtle	<i>Actinemys marmorata</i>	Proposed Threatened	No

¹U.S. Fish & Wildlife Service (USFWS 2024a) IPaC and NMFS online databases (2024a, 2024b).

4.8 Critical Area Functions

Although no freshwater wetlands were found to be present within the boundaries of the project property, there is an offsite Category IV wetland (Wetland C) to the north northwest of the project site and an offsite potential drainage feature located south southeast, both within 300 feet of the project property boundary. However, as discussed previously, this offsite wetland (Wetland C) and offsite potential drainage area are at a distance great enough and upgradient from the proposed project that no project impacts to the function or value of these critical areas is anticipated.

5.0 Project Description

5.1 Proposed Project

The proposed project will replace approximately 132 LF of a deteriorating creosote pile, treated timber, and concrete toe bulkhead, and will install an approximately 132 LF replacement angular rock bulkhead within inset rock stairs. The angular rock bulkhead will be installed at the toe of the marine bluff, at or landward of the existing, deteriorating creosote pile, treated timber, and concrete toe bulkhead. The existing bulkhead and concrete beach access stairs will be removed and disposed of at an approved upland disposal site. Photographs of existing structures can be found in Appendix B. Additionally, at the northwest end of the center project parcel (0823039061), rock that has fallen onto the beach from the adjacent rock bulkhead to the north will be restacked within that same rock bulkhead to the north, thereby reestablishing approximately 108 square feet (SF) of upper intertidal beach habitat.

During project construction, there may be small, temporary increases in traffic, stormwater runoff, and noise, although these increases will not be beyond typical baseline levels. Once the project is complete, the area will recover quickly from the short-term construction impacts within the authorized work corridor. Post-construction, the site will continue to be used as a SFR.

5.2 Alternatives Analysis

WDFW's Marine Shoreline Design Guidelines (MSDG) were developed to provide a comprehensive framework for site assessment and alternatives analysis to determine the need for shore protection and identify the technique that best suits the conditions at a given site (Johannessen *et al.* 2014). The geotechnical engineer completed an alternatives analysis commensurate with WDFW's MSDG and the applicable hydraulic code found in WAC 220-660-370(3)(c) (Envirotech 2024; Appendix A). This analysis provided responses for alternatives ranging from completely removing the existing armoring without replacement to replacing with a soft structure design to replacement with new hard armoring.

To assess the feasibility of shoreline stabilization alternatives, several geotechnical factors were taken into account along with proximity of the SFR and septic system to the existing bulkhead and marine energy conditions at the project site. The SFR and septic system are located approximately 12 and 10 feet, respectively, from the top of the existing deteriorating bulkhead. This project site is subject to significant storm surge and wave energy that would fully infiltrate any proposed soft shore stabilization methods, allowing the loose sandy sediments behind the existing deteriorating bulkhead to dissipate and expedite shoreline regression along this location. There is no feasible upland location to move the SFR and septic given the site constraints at this location. Per Envirotech's assessment, upland drainage is not a contributing factor to the deterioration of the existing bulkhead and vegetation or soft shore elements will not provide the protection necessary to protect against the erosional processes of this high energy environment. Additionally, removing the hard armoring and constructing upland retaining walls is not feasible given the close proximity of the SFR to the shoreline, and the retaining wall would have to be constructed about where the bulkhead is currently located. Consequently, Envirotech's professional recommendation is replacement of the deteriorating creosote pile, treated timber, and concrete toe bulkhead with a hard armored shoreline protection structure, as shown in the project site plans (Appendix A).

5.3 Construction Process

The bulkhead will be installed in approximately 20-foot sections at a time. Unstable soil will be excavated and the bulkhead placed a minimum 2 feet below the bed of the beach. Colluvial and fill soils will be removed in order to place the footing on stable soils. Clearing of vegetation will be the minimum necessary to complete the work and will only impact lawn along the shoreline. Suitable soils excavated for placement of the footing that contain coarse sand and gravels will be placed on the beach, as allowed by WDFW. No soils that contain clays or other fine material will be placed below OHW/HTL.

Bulkhead construction will occur during the allowed regulatory work windows. No work will occur when the area is tidally inundated and work each day will be limited to what can be completed in each low tide cycle. Materials and equipment will be brought in by barge and will operate within 25 feet of the existing shoreline protection. Existing stormwater tightlines will be integrated into the replacement shoreline protection.

Table 5. Authorized WDFW In-Water Work Windows for TRA 4

Authorized Work Windows by Month												
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Juvenile Salmonids ¹												
Surf Smelt ²												
Herring ³												

¹WAC 220-660-330, Tidal Reference Area 4

5.3.1 Construction Schedule

Construction activities are expected to occur during daylight hours. Work will take place when the project area is not tidally inundated. The project is within Tidal Reference Area 4, and the authorized in-water work window is between August 2 and September 30, when juvenile salmonids and forage fish are not present. Work between October 1 and April 15 will only be conducted after a WDFW trained forage fish biologist inspects the beach and determines that no spawning has occurred at that time. All work is anticipated to be completed within two weeks from the start of the project.

5.4 Best Management Practices and Protection Measures

Construction best management practices (BMP) are appropriate and practical measures that the contractor will follow in order to minimize project and construction impacts. The BMPs and the conservation measures below are meant to reduce potential impacts to listed salmonids and other aquatic species, and to protect water quality, aquatic and shoreline habitats. Any additional measures imposed by regulatory agencies will also be followed.

- Work below OHW/HTL will not occur from October 1 through July 31 of any year for the protection of migrating juvenile salmon and forage fish species, except as noted previously for the period between October 1 and April 15 if surveys show no forage fish spawning.
- Project activities below OHW/HTL will not occur when the project area is inundated by tidal waters.

- The creosote pile, treated timber, and concrete toe bulkhead will be removed from the beach and disposed at an appropriate upland facility.
- The angular rock bulkhead will be placed at the toe of the marine bluff, at or landward of OHW/HTL, within the footprint of the existing bulkhead, and will follow the shoreline.
- All trenches, depressions, or holes created in the beach area will be backfilled prior to inundation by tidal waters. Trenches excavated for footings may remain open during construction.
- All waste material such as construction debris, silt, excess dirt or overburden resulting from this project will be deposited above the limits of flood water in an approved upland disposal site.
- Anthropogenic debris on the beach will be removed and disposed upland such that it does not enter waters of the state.
- Natural habitat features on the beach larger than 12 inches in diameter, including trees, stumps, logs, and large rocks, will be retained on the beach following construction. These habitat features may be moved during construction if necessary.
- Project activities will be conducted to minimize siltation of the beach area and bed.
- Extreme care will be taken to ensure that no petroleum products, fresh cement, sediments, sediment-laden water, chemicals, or any other toxic or deleterious materials are allowed to enter or leach into the beach or water.
- Project activities will not degrade water quality to the detriment of fish life.

6.0 Impact Assessment

6.1 Project Overview

The proposed replacement bulkhead will have beneficial long-term impacts, compared to the existing creosote pile, treated timber, and concrete toe bulkhead. To compensate for short term construction-related impacts of the project, the following proposed avoidance and minimization measures include:

- Only working during authorized regulatory work windows.
- All work will be conducted only when the authorized work corridor is not inundated by tidal waters.
- Work each day will be limited to what can be completed in each low tide cycle.
- Materials and equipment will be brought in by barge and will operate only within 25 feet of the existing shoreline protection.
- Clearing of vegetation will be the minimum necessary to complete the work and will only impact a minuscule portion of lawn located immediately above the existing bulkhead.

As described in Section 5.1, the proposed project will take place within 300 ft of the buffer of an offsite Category IV wetland (Wetland C) identified on the neighboring parcel. Project work will not occur within Wetland C or its buffer, and all work will occur via barge on the shoreline, approximately 340 FT downgradient of offsite Wetland C. The proposed replacement angular rock bulkhead will increase the ecological function and values over the existing creosote pile, treated timber, and concrete toe bulkhead. Water-associated fish and wildlife habitat will be increased by placing approximately 22 cubic yards (CY) of WDFW recommended beach nourishment at the toe of the new bulkhead. This will provide immediate uplift to an area of approximately 1,188 SF of upper intertidal beach habitat. Upon completion of the project, Riparian fish and wildlife habitat should remain unchanged and at its current level of function and value. The only vegetation that will be impacted is a negligible section of lawn immediately above the existing bulkhead. Shade and cover by existing trees along the shoreline for wildlife and water temperature maintenance and wildlife corridor will not be impacted by the proposed project, and their functions and values will remain unchanged from the current conditions.

6.2 Possible Impacts to Specific Critical Areas

The bulkhead, SFR, and associated appurtenances (shed, deck, septic system) are legally non-conforming structures per KCC 25.08.310 and have been in this location for decades. Therefore, the long-term impacts have been in place since the house and bulkhead were constructed in 1923, with subsequent appurtenances constructed decades prior to the March 2024 site visit. The existing bulkhead is within several critical areas including: a critical aquifer recharge area (Category III), a steep slope and erosion hazard area 45 feet away, an aquatic area buffer of the shoreline, the floodway and 100-year floodplain, and within the buffer of an offsite Category IV wetland (Wetland C). The proposed project occurs primarily on parcel #0823039061 and the replacement bulkhead activities will be approximately 340 FT southeast and downgradient of the edge of Wetland C's buffer; therefore, no impacts to that offsite wetland are anticipated as a result of the proposed project.

By installing the replacement rock bulkhead within the footprint of the existing creosote pile, treated timber, and concrete toe bulkhead, no discernable impacts are anticipated to the critical aquifer recharge area or the steep slope and erosion hazard located 45 feet landward of the project area. The impacts to the aquatic buffer will be temporary and avoided and minimized through the use of appropriate construction BMPs and by working in the project area only when the area is not tidally inundated. The proposed angular rock bulkhead will allow surface or subsurface water to naturally drain or percolate through into the marine aquatic environment. Additionally, the proposed project will provide long term ecological uplift through removal of harmful creosote and treated timber, and concrete from the marine environment, and reestablishment of approximately 108 SF of upper intertidal habitat through restacking angular rock that currently sits on the beach. To further mitigate temporary impacts of bulkhead replacement, approximately 22 CY of WDFW-approved beach nourishment material will be placed on the beach immediately adjacent and waterward of the replacement bulkhead.

7.0 Conclusions

Although several options were considered for the project site, per the alternatives analysis provided in the site-specific geotechnical report (Envirotech, 2024), a hard armored bulkhead replacement is deemed necessary for this high marine energy environment. Ellisport Engineering has designed an appropriate angular rock replacement bulkhead with inset rock stairs to be placed within the footprint of the existing creosote, treated timber and concrete toe bulkhead.

Critical areas found during the site visit or mapped within the project area include a critical aquifer recharge area (Category III), a steep slope and erosion hazard area within 45 feet, an aquatic area buffer of the shoreline, the floodway and 100-year floodplain, and the buffer of an offsite Category IV wetland within 300 feet of the project site. By installing the replacement rock bulkhead within the footprint of the existing deteriorating bulkhead, no discernable impacts are anticipated to the critical aquifer recharge area or the steep slope and erosion hazard located 45 feet landward of the project area. The impacts to the aquatic buffer will be temporary and avoided and minimized through the use of appropriate construction BMPs and by working in the project area only when the area is not tidally inundated. The proposed project is located primarily on parcel #0823039061 and the replacement bulkhead activities will be approximately 340 FT southeast and downgradient of the edge of Wetland C's buffer; therefore, no impacts to that offsite wetland are anticipated as a result of the proposed project. Aside from the site being immediately adjacent to Puget Sound, no wetlands, streams, ponds or lakes are within 300 feet of the bulkhead replacement project.

Two priority habitats were identified within 300 feet of the project property's shoreline: biodiversity areas and corridor (terrestrial habitat) and surf smelt breeding area. Additionally, listed species that could potentially occur within the vicinity of the project include: Bull trout, Chinook salmon, Steelhead, Bocaccio rockfish, Yelloweye rockfish, Southern Resident killer whale, Marbled murrelet, Yellow-billed cuckoo, Northwestern pond turtle, and North American wolverine. However, the project area is surrounded by developed residential areas and armored shorelines, and it is very unlikely that these species will actually be found in the vicinity of the project area or adversely affected by the project. Additionally, given that the project is to remove an existing bulkhead within a currently disturbed area and to construct the replacement bulkhead within the footprint of the existing bulkhead at OHW/HTL, there are no anticipated impacts to ESA-listed species potentially in the vicinity of the project.

The proposed project will provide long term ecological uplift through removal of harmful creosote and treated timber, removal of concrete from the marine environment, and the reestablishment of approximately 108 SF of upper intertidal habitat through restacking angular rock that currently sits on the beach. To further mitigate temporary impacts of bulkhead replacement, approximately 22 CY of WDFW-approved beach nourishment material will be placed on the beach immediately adjacent and waterward of the replacement bulkhead. This will provide immediate uplift to an area of approximately of 1,188 SF of upper intertidal beach habitat. Upon completion of the project, riparian fish and wildlife habitat should remain unchanged at its current level of function and value. The only vegetation that will be impacted is a negligible section of lawn immediately above the existing bulkhead. Shade and cover by existing trees along the shoreline for wildlife and water temperature maintenance and wildlife corridor will not be impacted by the proposed project, and their functions and values will remain unchanged from the current conditions.

8.0 References

[Ecology] Washington Department of Ecology y. 2016. Determining the Ordinary High Water Mark for Shoreline Management Act Compliance in Washington State. October 2016 Final Review. Publication no. 16-06-029. Accessed online at:

<https://apps.ecology.wa.gov/publications/documents/1606029.pdf>

Ecology. 2024. Washington State Coastal Atlas. Data accessed from website:

<https://fortress.wa.gov/ecy/coastalatlus/>

Environmental Laboratory. 1987. Corps of Engineers Wetland Delineation Manual. Technical Report Y-87-1, U.S. Army Engineers Waterways Experiment Station, Vicksburg, MS.

[Envirotech] Envirotech Engineering. 2024. Geotechnical Report: Marine Bluff Geotechnical Report for Kennedy Bulkhead Replacement. 9400 SW Dolphin Point Road, Vashon. Parcel 0823039061. King County, Washington. April 27.

Johannessen, J., A. MacLennan, A. Blue, J. Waggoner, S. Williams, W. Gerstel, R. Barnard, R. Carman, and H. Shipman, 2014. Marine Shoreline Design Guidelines. Washington Department of Fish and Wildlife, Olympia, Washington.

Munsell Color. 2015. Munsell soil color book: with genuine Munsell color chips. Grand Rapids, MI. 2009 Year Revised; 2015 Production.

[NMFS] National Marine Fisheries Services. 2024a. Species Lists. Data accessed from website:

http://www.westcoast.fisheries.noaa.gov/protected_species/species_list/species_lists.html

NMFS. 2024b. Environmental Conservation Online System. Protected Resources App. Data accessed from website: <https://www.fisheries.noaa.gov/resource/map/protected-resources-app>

[NRCS] Natural Resource Conservation Service. 2024. United States Department of Agriculture Web Soil Survey [map online]. Data accessed from website:

<http://websoilsurvey.nrcs.usda.gov/>

[USACE] United States Army Corps of Engineers. *Corps of Engineers Wetlands Delineation Manual*. (1987). U.S. Army Engineer Waterways Experiment Station.

USACE. 2010. Regional Supplement to the *Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region*, ed. J.S. Wakeley, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-08-13. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

USACE. 2020. National Wetland Plant List, version 3.5. U.S. Army Corps of Engineers Engineer Research and Development Center Cold Regions Research and Engineering Laboratory, Hanover, NH. Accessed online at: https://cwbi-app.sec.usace.army.mil/nwpl_static/v34/home/home.html

[USDA] United States Department of Agriculture, Natural Resources Conservation Service. 2018. *Field Indicators of Hydric Soils in the United States, Version 8.2*. L.M. Vasilas, G.W. Hurt, and J.F. Berkowitz (eds.). USDA, NRCS, in cooperation with the National Technical Committee for Hydric Soils.

[USFWS] U.S. Fish and Wildlife Service. 2024a. National Wetlands Inventory Wetland Mapper [map online]. Data accessed from website: <https://www.fws.gov/wetlands/Data/Mapper.html>

USFWS. 2024b. IPaC Information for Planning and Consultation. Accessed online at: <https://ecos.fws.gov/ipac/>.

[WDFW] Washington State Department of Fish and Wildlife. 2024a. SalmonScape [online], Olympia, WA: <http://apps.wdfw.wa.gov/salmonscape/map.html>

WDFW. 2024b. PHS on the Web [map online]. <http://wdfw.wa.gov/mapping/phs/>

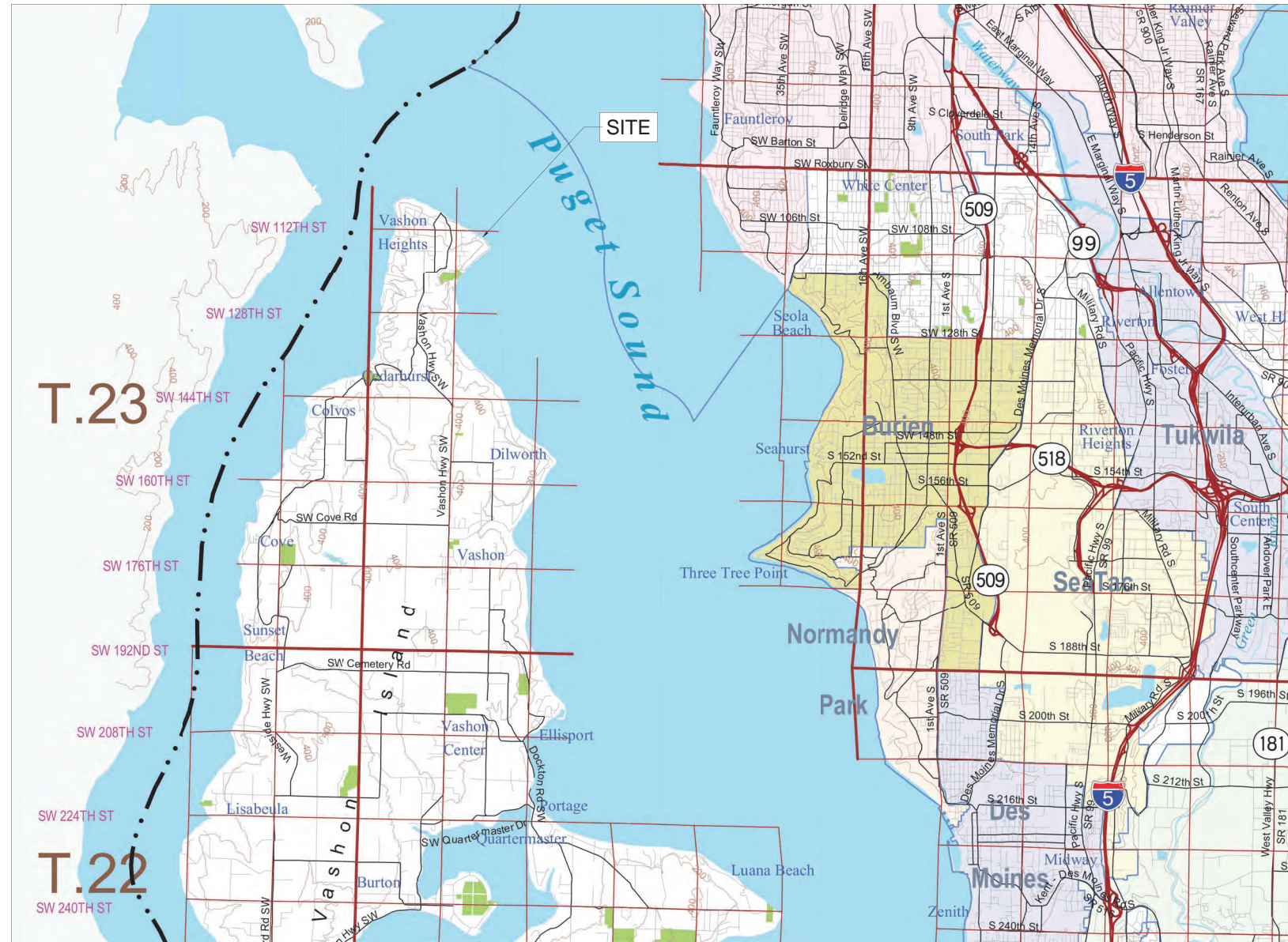
[WDNR] Washington Department of Natural Resources. 2024. Forest Practices Application Mapping Tool. Data accessed from website: <https://fpamt.dnr.wa.gov/default.aspx#>

Appendix A: Site Plans and Shoreline Geotechnical Assessment

KENNEDY GOETZ BULKHEAD

KING COUNTY, WASHINGTON

SECTION 8, TOWNSHIP 23 NORTH, RANGE 03 EAST



VICINITY MAP
NOT TO SCALE

SITE ADDRESS
9400 SW DOLPHIN POINT ROAD
VASHON, WASHINGTON 98070
PARCEL NO. 082303-9061
PARCEL NO. 082303-9070

OWNERS / DEVELOPERS
KATHRYN DAVIS KENNEDY
9400 SW DOLPHIN POINT ROAD
VASHON, WASHINGTON 98070

CONTRACTOR
T.B.D.

CIVIL ENGINEER
ELLISPORT ENGINEERING, INC
20501 81ST AVENUE SW
VASHON, WA 98070
(206) 463-5311

BENCHMARK AND DATUM

DATUM IS ASSUMED:
TOPOGRAPHIC AND BOUNDARY INFORMATION IS BASED ON INFORMATION PROVIDED BY KING COUNTY GIS. THE TOPOGRAPHY WAS GENERALLY CONFIRMED IN THE FIELD. CONTENT PROVIDED HEREIN MAY BE DEEMED RELIABLE BUT IS NOT GUARANTEED. THIS IS NOT A SURVEY.
VALUES FOR OHW AND HTL ARE RELATIVE TO A DATUM OF MLLW = 0.

LEGAL DESCRIPTION

PARCEL NO. 082303-9061:
POR OF FOLG LY NLY OF BUNKER TRAIL BEG 660 FT E OF NW COR GL 2 TH N 88-58-00 E 539.66 FT TH N 00-54-00 W 943.50 FT TH N 88-58-00 E 120.34 FT TH S 64-05-15 E 254 FT TH S 53-22-45 E 124.14 FT TO TPOB TH N 36-37-15 E 208.73 FT M/L TO MDR LN TH SELY ALG SD MDR LN 101.74 FT TH S 36-37-15 W 227.49 FT TH N 53-22-45 W 100 FT TO TPOB & TD LDS ADJ
PLAT BLOCK:
PLAT LOT:

PARCEL NO. 082303-9070:
POR OF FOLG DESC PROP LY NLY OF C/L OF KC TRAIL COMMONLY KWN AS BUNKER TRAIL - BEG 660 FT E OF NW COR GL 2 TH E 984.22 FT TH S 40-08-00 E 198.52 FT TO MDR LN TH NELY ALG SD LN 360 FT TH N 40-08-00 W 241.73 FT TH S 50-25-00 W 25 FT TH N 39-35-00 W 67.2 FT TH W 635.65 FT TH N 119.58 FT TO TPOB TH N 54-27-30 E 392.78 FT TH S 58-01-40 E 216.92 FT TH N 59-48-30 E 170.48 FT TH N 41-20-40 E 157.16 FT TO MDR LN TH NWLY ALG SD LN TO A PT 120.34 FT E & 728.74 FT N OF TPOB TH S 204.83 FT TH W 120.34 FT TH S 523.9 FT TO TPOB - LESS W 150 FT OF POR LY NLY OF BUNKER TRAIL & SLY OF SD MDR LN & LESS POR OF FOLG LY NLY OF BUNKER TRAIL BEG SE COR OF W 1/2 OF NW 1/4 OF NW 1/4 TH N 88-58-00 E 539.66 FT TH N 00-54-00 W 943.50 FT TH N 88-58-00 E 120.34 FT TH S 64-05-15 E 254 FT TH S 53-22-45 E 124.14 FT TO TPOB TH N 36-37-15 E 208.73 FT M/L TO MDR LN TH SELY ALG SD MDR LN 101.74 FT TH S 36-37-15 W 227.49 FT TH N 53-22-45 W 100 FT TO TPOB & TD LDS ADJ LESS CO TRAIL
PLAT BLOCK:
PLAT LOT:

CONTRACTOR NOTE

ALL EXISTING UTILITIES SHOWN ON PLANS ARE TO BE VERIFIED HORIZONTALLY AND VERTICALLY PRIOR TO ANY CONSTRUCTION. ALL EXISTING FEATURES INCLUDING BURIED UTILITIES ARE SHOWN AS INDICATED ON RECORD MAPS AND SURVEY FURNISHED BY OTHERS. WE ASSUME NO LIABILITY FOR THE ACCURACY OF THOSE RECORDS AND SURVEY, FOR THE FINAL LOCATION OF EXISTING UTILITIES IN AREAS CRITICAL TO CONSTRUCTION CONTACT THE UTILITY OWNER/AGENCY.

SHEET INDEX

VICINITY PLAN & PROJECT INFORMATION	C1
SITE PLAN	C2
PROPOSED PLAN	C3.1
PROPOSED SECTION	C3.2
DETAIL & GENERAL NOTES	C4

PRIVATE IMPROVEMENTS

DEVELOPMENT ENGINEER _____ DATE _____

KING COUNTY ORDINANCE NUMBER(S) _____

THESE ACTIONS MUST BE COMPLETED PRIOR TO BEGINNING CONSTRUCTION:

1. CONTACT THE APPLICANT'S RETAINED ENGINEER TO COORDINATE REQUIRED INSPECTIONS.

2. APPOINT A TRAINED ESC LEAD WHO SHALL BE PROVIDED A COPY OF THE ESC PLAN & INSPECTION SCHEDULE.

3. CONTACT THE AREA INSPECTOR, AT _____ TO COORDINATE THE PRECONSTRUCTION MEETING AND COUNTY INSPECTIONS.

FAILURE TO OBTAIN REQUIRED INSPECTIONS MAY ENDANGER OR DELAY PROJECT APPROVAL.

ALL WORK IN THE PUBLIC RIGHT-OF-WAY REQUIRES A PERMIT FROM THE KING COUNTY PUBLIC WORKS DEPARTMENT.

General Notes

No.	Revision/Issue	Date

Firm Name and Address
ELLISPORT ENGINEERING, INC.
20501 81st Ave SW
Vashon, WA 98070
206.463.5311 - phone
206.463.2578 - fax

Project Name and Address
KENNEDY GOETZ BULKHEAD
9400 SW Dolphin Point Road
Vashon, Washington 98070

Project KENNEDY GOETZ	Sheet C1
Date 5 OCT 2023	
Drafter DSD	Engineer STK

PUGET SOUND



PARCEL NO. 082303-9059

PARCEL NO. 082303-9070

9400 SW DOLPHIN POINT ROAD
PARCEL NO. 082303-9061

PARCEL NO. 082303-9070

PARCEL NO. 082303-9004

PARCEL NO. 082303-9001

NOTE:
SITE PLAN HAS BEEN ESTABLISHED THROUGH KING COUNTY GIS INFORMATION AND QUARTER SECTION MAP qs_NW082303,
BUT DOES NOT CONSTITUTE A LEGAL SURVEY AND SHOULD BE CONSIDERED APPROXIMATE ONLY.

SITE PLAN - EXISTING
1" = 20'-0"

General Notes

No.	Revision/Issue	Date

Firm Name and Address
ELLISPORT ENGINEERING, INC.
 20501 81st Ave SW
 Vashon, WA 98070
 206.463.5311 - phone
 206.463.2578 - fax

Project Name and Address
KENNEDY GOETZ BULKHEAD
 9400 SW Dolphin Point Road
 Vashon, Washington 98070

Project
KENNEDY GOETZ

Date
5 OCT 2023

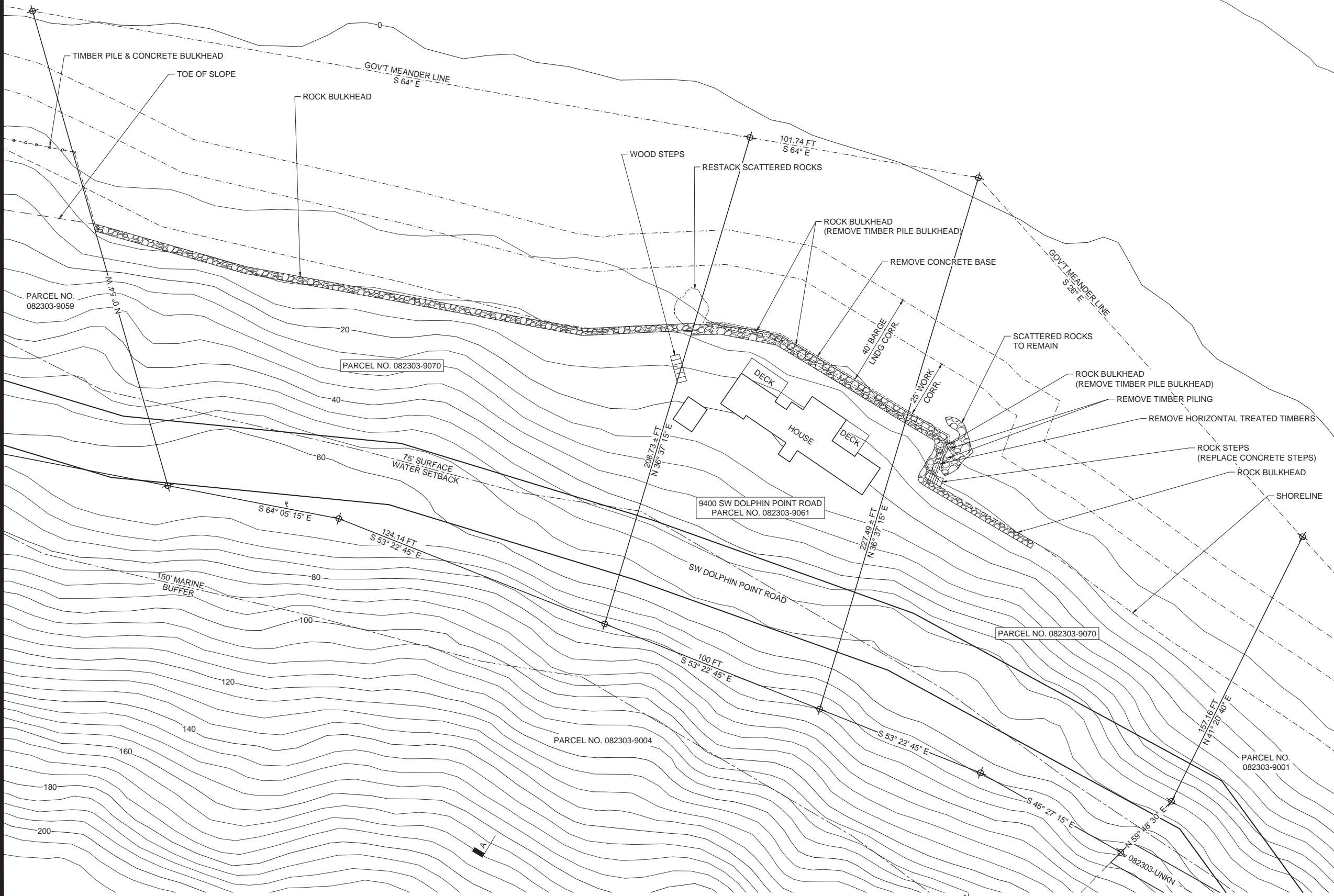
Drafter
DSD

Engineer
STK

Sheet
C2

PUGET SOUND

A/C3.2



General Notes

No.	Revision/Issue	Date

Firm Name and Address
ELLISPORT ENGINEERING, INC.
 20501 81st Ave SW
 Vashon, WA 98070
 206.463.5311 - phone
 206.463.2578 - fax

Project Name and Address
KENNEDY GOETZ BULKHEAD
 9400 SW Dolphin Point Road
 Vashon, Washington 98070

Project
KENNEDY GOETZ

Date
5 OCT 2023

Drafter
DSD

Engineer
STK

Sheet
C3.1

General Notes

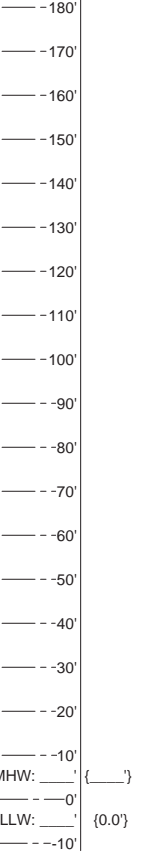
No.	Revision/Issue	Date

Firm Name and Address
ELLISPORT ENGINEERING, INC.
 20501 81st Ave SW
 Vashon, WA 98070
 206.463.5311 - phone
 206.463.2578 - fax

Project Name and Address
KENNEDY GOETZ BULKHEAD
 9400 SW Dolphin Point Road
 Vashon, Washington 98070

Project KENNEDY GOETZ	Sheet C3.2
Date 5 OCT 2023	
Drafter DSD	Engineer STK

NAVD88 (MLLW)



NAVD88 + _____' = MLLW

- HOUSE
- ROCK BULKHEAD
- REMOVE TIMBER PILE BULKHEAD
- REMOVE CONCRETE BASE

PARCEL NO. 082303-9004

PARCEL NO. 082303-9061

PUGET SOUND

SECTION AA - PROPOSED



PART 1: GENERAL

- THE CONTRACTOR SHALL OBTAIN AND CONFORM TO ALL LOCAL AND STATE PERMITS REQUIRED TO COMPLETE THE WORK. IF PERMIT REQUIREMENTS CONFLICT WITH THESE PLANS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE OWNER AND ENGINEER OF RECORD OF ANY CONFLICTS, SO THAT MODIFICATIONS TO THE PLANS CAN BE PROVIDED, AS APPROPRIATE.
- WORK SHALL INCLUDE FURNISHING ALL MATERIALS, LABOR, EQUIPMENT, AND SUPERVISION FOR CONSTRUCTION OF THE ROCK BULKHEAD IN ACCORDANCE WITH THESE PLANS AND SPECIFICATIONS, AND IN GENERAL CONFORMANCE WITH THE LINES, GRADES, DESIGN, AND DIMENSIONS SHOWN ON THE DRAWINGS OR AS ESTABLISHED BY THE OWNER OR THE OWNERS' REPRESENTATIVE.
- THE CONTRACTOR SHALL CONTACT THE ONE-CALL UNDERGROUND UTILITY LOCATION SERVICE AT 1-800-424-5555 TO HAVE ANY AND ALL UTILITIES LOCATED AT LEAST 2 FULL BUSINESS DAYS PRIOR TO BEGINNING SITE EXCAVATION.
- ALL MATERIALS AND WORKMANSHIP SHALL CONFORM TO THE CONTRACT DOCUMENTS, NOTES AND THE INTERNATIONAL BUILDING CODE.
- DURING CONSTRUCTION THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE SAFETY AND STABILITY OF THE ADJACENT PROPERTIES AND DOWNGRADE AREAS.
- THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR ALL CONSTRUCTION PROCEDURES INCLUDING EXCAVATION OF EXCESS SOIL, PROTECTION OF ADJACENT PROPERTY, STRUCTURES, STREETS, AND UTILITIES IN ACCORDANCE WITH ALL APPLICABLE NATIONAL, STATE AND LOCAL SAFETY REGULATIONS.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING THE WORK OF ALL TRADES, AND SHALL CHECK AND VERIFY ALL DIMENSIONS. ALL DISCREPANCIES SHALL BE CALLED TO THE ATTENTION OF THE ENGINEER *IN WRITING* AND SHALL BE RESOLVED BEFORE PROCEEDING WITH THE WORK.
- THE DRAWINGS INDICATE THE TYPICAL DETAILS OF CONSTRUCTION WHERE CONDITIONS ARE NOT SPECIFICALLY INDICATED, BUT ARE OF SIMILAR CHARACTER TO DETAILS SHOWN, SIMILAR DETAILS OF CONSTRUCTION SHALL BE USED SUBJECT TO REVIEW BY THE STRUCTURAL ENGINEER.
- ALL INFORMATION SHOWN ON THE DRAWINGS RELATIVE TO EXISTING CONDITIONS IS GIVEN AS THE BEST PRESENT KNOWLEDGE BUT WITHOUT ANY GUARANTEE OF WARRANTY OF ACCURACY. WHERE ACTUAL CONDITIONS CONFLICT WITH THE DRAWINGS, THEY SHALL BE REPORTED IN WRITING TO THE STRUCTURAL ENGINEER SO THAT PROPER REVISIONS MAY BE DEVELOPED. MODIFICATIONS OF DETAILS OF CONSTRUCTION SHALL NOT BE MADE WITHOUT PRIOR WRITTEN APPROVAL OF THE STRUCTURAL ENGINEER.
- ANY AND ALL CONTRACTOR INITIATED CHANGES SHALL BE SUBMITTED IN WRITING TO THE ENGINEER FOR APPROVAL PRIOR TO IMPLEMENTATION OF THE CONSTRUCTION.
- CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SAFETY PRECAUTIONS AND THE METHODS, TECHNIQUES, SEQUENCES, OR PROCEDURES REQUIRED TO PERFORM THE WORK.
- VEGETATION REMOVAL UPSLOPE FOR THE BULKHEAD SHALL BE MINIMIZED. PRESERVE ALL TREES.
- CONTRACTOR TO MAINTAIN REASONABLE ACCESS TO BOTH PARKING AREA AND PATHWAY TO NEIGHBORING PROPERTIES DURING CONSTRUCTION.
- AT CONSTRUCTION COMPLETION, THE CONTRACTOR SHALL PERFORM FINAL CLEANUP OF THE SITE. FINAL CLEANUP INCLUDES, BUT IS NOT LIMITED TO:
 - REMOVAL OF ALL RUBBISH, SURPLUS MATERIALS AND DISCARDED MATERIALS.
 - REMOVAL AND PROPER DISPOSAL OF ALL TREATED PILES.
 - REMOVAL OF ALL EQUIPMENT.
 - RESTORATION OF PARKING AREA AND ROAD, REMOVING TIRE TRACKS AND FILLING POTHoles.
 - FINAL GRADING PER PLANS.
- THE OWNER OR OWNERS REPRESENTATIVE SHALL WALK THROUGH WITH THE CONTRACTOR WHEN FINAL CLEANUP IS COMPLETE.

PART 2: MATERIALS

- BULKHEAD ROCK SHALL BE NON-WEATHERED, HARD, SOUND, AND DURABLE. ROCK SHALL BE FREE OF SEAMS, CRACKS, AND OTHER DEFECTS THAT REDUCE ITS RESISTANCE TO WEATHER. ROCK SHALL HAVE A MINIMUM DENSITY OF 160 POUNDS PER CUBIC FOOT. THE ROCK TYPE IDENTIFIED BY THE CONTRACTOR SHALL BE APPROVED BY THE OWNER PRIOR TO MOBILIZATION. APPROXIMATE ROCK SIZE IS PRESENTED IN THE TABLE BELOW.
- QUARRY SPALLS SHALL CONSIST OF 2 TO 6 INCH CRUSHED ROCK THAT CONFORMS TO SECTION 9-13.7(2) OF THE 2018 WSDOT STANDARD SPECIFICATIONS.
- PERMEABLE BALLAST SHALL CONFORM TO SECTION 9-03.9(2) OF THE 2018 WSDOT STANDARD SPECIFICATIONS.
- STORMWATER DISPERSION PIPE SHALL CONSIST OF NOMINAL 6-INCH DIAMETER PERFORATED CORRUGATED DOUBLE WALL N-12 HIGH DENSITY POLYETHYLENE (HDPE) PIPE, 6-INCH NOMINAL DIAMETER SDR11 PERFORATED SOLID WALL HDPE PIPE, OR NOMINAL 6-INCH DIAMETER SCHEDULE 40 PVC PIPE. THE PERFORATED DISPERSION PIPE SHALL HAVE A MINIMUM WATER INLET AREA (WIA) OF 1.5 SQUARE INCHES PER LINEAR FOOT OF PIPE. DISPERSION PIPE AND PIPE JOINTS SHALL BE COMPATIBLE WITH REROUTED STORM WATER TIGHTLINE PIPES.
- GEOTEXTILE FILTER FABRIC SHALL CONSIST OF MIRAFI FW403, OR APPROVED EQUIVALENT.

PART 3: DESIGN CRITERIA

- ALLOWABLE BEARING CAPACITY OF 1500 PSF BASED ON THE 2018 INTERNATIONAL BUILDING CODE, UNLESS A SITE-SPECIFIC GEOTECHNICAL ENGINEERING REPORT IS PROVIDED.
- SITE PLAN TOPOGRAPHY WAS OBTAINED FROM THE KING COUNTY GIS, WHICH USES NAVD88 AS THE VERTICAL DATUM.

PART 4: EXECUTION

- VERIFICATION OF EXISTING SITE CONDITIONS**
 - THE CONTRACTOR SHALL VERIFY ON-SITE GRADES AND CONDITIONS PRIOR TO CONSTRUCTION. THE OWNER AND THE ENGINEER-OF-RECORD SHALL BE IMMEDIATELY NOTIFIED IF ON-SITE CONDITIONS DIFFER FROM THE BULKHEAD DESIGN DRAWINGS.
- EXCAVATION**
 - THE CONTRACTOR SHALL EXCAVATE TO THE LINES AND GRADES REQUIRED FOR CONSTRUCTION OF THE BULKHEAD, AS SHOWN ON THE DESIGN DRAWINGS.
 - THE CONTRACTOR SHALL DIVERT SURFACE WATER AND PROVIDE TEMPORARY DEWATERING AS REQUIRED TO PREPARE THE BULKHEAD'S SUBGRADE SOILS.
 - THE CONTRACTOR SHALL PROTECT EXISTING SITE FEATURES, OFF-SITE FEATURES, AND SITE IMPROVEMENTS FROM DAMAGE DURING CONSTRUCTION INCLUDING, BUT NOT LIMITED TO, THE LARGE TREE NEAR THE BULKHEAD. TEMPORARY EXCAVATION STABILITY AND SHORING SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
 - THE EXISTING SITE SOILS ALONG THE SHORELINE, PRONE TO WAVE AND TIDAL EROSION WHEN EXPOSED, SHALL BE REMOVED FROM THE SITE UNLESS DISPERSAL OF THE SOIL ON THE BEACH AS NOURISHMENT IS PERMITTED BY THE WASHINGTON STATE DEPARTMENT OF FISH AND WILDLIFE.
 - SITE EXCAVATIONS SHALL BE COMPLETED IN SECTIONS TO REDUCE THE POTENTIAL FOR TEMPORARY SLOPE INSTABILITY. ONE CONSTRUCTION SECTION SHALL BE EQUAL TO THE LENGTH OF BULKHEAD THAT CAN BE EXCAVATED, BACKFILLED, AND CONSTRUCTED IN ONE WORK DAY.

3. BULKHEAD AND ROCKERY CONSTRUCTION

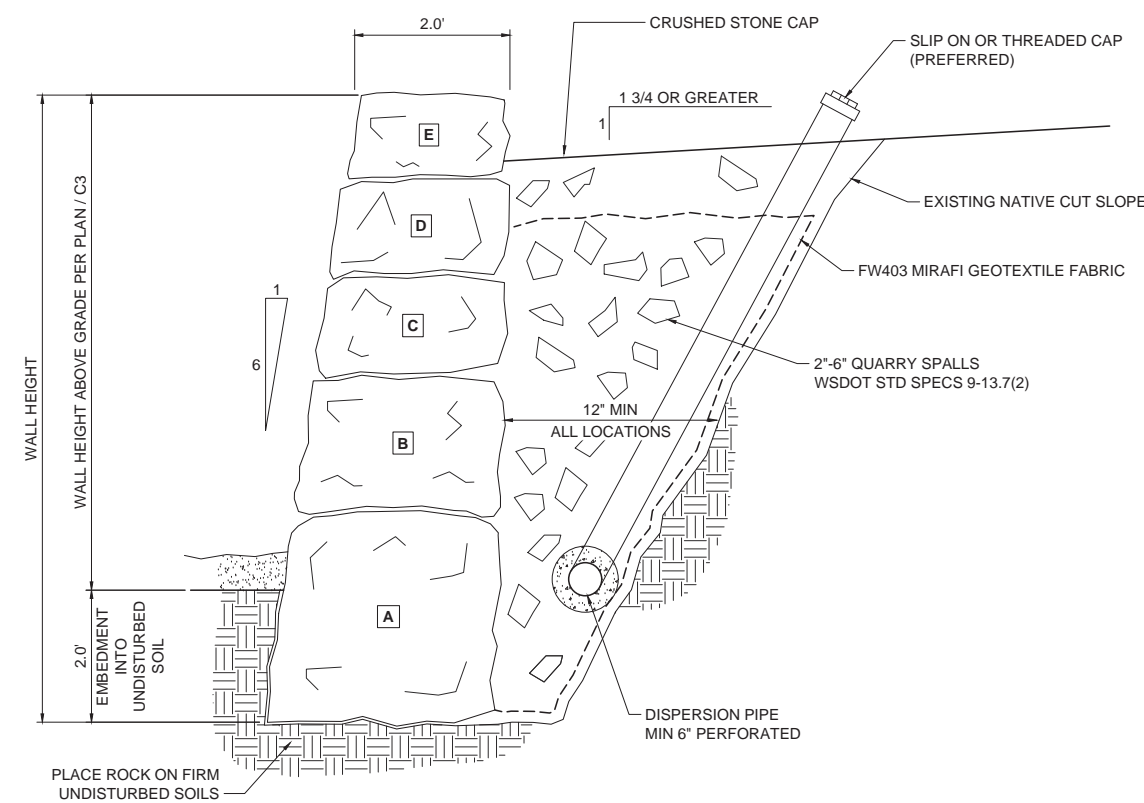
- THE BULKHEAD SHALL BE FOUNDED ON FIRM AND UNYIELDING NATIVE SOILS.
- THE BULKHEAD FACE BATTER SHALL BE 6 VERTICAL TO 1 HORIZONTAL.
- ROCK SHALL DECREASE IN SIZE FROM THE BOTTOM TO THE TOP OF THE BULKHEAD AT A UNIFORM RATE. REFER TO THE ROCK SIZE DESIGNATION TABLE FOR SPECIFIC ROCK SIZES. CONTRACTOR SHALL NOT SUBSTITUTE A SMALLER ROCK THAN THAT SPECIFIED IN THE TABLE.
- EMBEDMENT OF THE LOWEST COURSE OF ROCK SHALL BE A MINIMUM OF 24 INCHES BELOW EXISTING BEACH ELEVATION AT THE FACE OF THE BULKHEAD.
- THE LONG DIMENSION OF THE ROCK SHALL EXTEND PERPENDICULAR TO THE ROCK FACE.
- ROCKS SHALL BE PLACED TO AVOID CONTINUOUS JOINT PLANES IN VERTICAL OR LATERAL DIRECTIONS. EACH ROCK SHALL BEAR ON TWO OR MORE ROCKS BELOW IT, WITH GOOD FLAT-TO-FLAT ROCK CONTACT.
- QUARRY SPALL BACKFILL BEHIND THE BULKHEAD SHALL BE PLACED BEHIND EACH COURSE AND TAMPED TO PROVIDE A STABLE CONDITION PRIOR TO PLACING ROCKS FOR THE NEXT SUCCESSIVE COURSE.
- GEOTEXTILE FABRIC SHALL COVER THE BOTTOM OF THE WALL EXCAVATION, EXTEND UP THE CUT FACE, AND COVER THE TOP OF THE QUARRY SPALL BACKFILL. GEOTEXTILE FABRIC JOINTS SHALL OVERLAP AT LEAST 18 INCHES.
- ROCK WALLS ARE PRIMARILY EROSION CONTROL STRUCTURES. NATIVE MATERIALS MUST BE STABLE AND FREE STANDING IN CUT FACE.
- QUALITY CONTROL**
 - WE RECOMMEND THAT THE OWNER RETAIN THE ENGINEER-OF-RECORD TO PERFORM PERIODIC OBSERVATIONS DURING CONSTRUCTION.
 - THE ABOVE FIELD OBSERVATIONS DO NOT RELIEVE THE CONTRACTOR OF THEIR RESPONSIBILITY TO MEET THE MORE STRINGENT OF THE DESIGN DRAWINGS, PERMIT REQUIREMENTS, OR OTHER MANUFACTURER'S REQUIREMENTS.

PART 5: SPECIAL DESIGN PROVISIONS

- THE BULKHEAD SHALL BE COMPLETED IN GENERAL ACCORDANCE WITH THESE PLANS AND THE CURRENT EDITION OF THE ASSOCIATED ROCKERY CONTRACTORS (ARC) STANDARD ROCK WALL CONSTRUCTION GUIDELINES.
- IF SITE CONDITIONS OR DESIGN PARAMETERS ARE DIFFERENT THAN WHAT HAS BEEN PRESENTED HEREIN, THE OWNER AND ENGINEER-OF-RECORD SHALL BE NOTIFIED IMMEDIATELY.
- ANY REVISIONS TO DESIGN PARAMETERS OR PROPOSED BULKHEAD GEOMETRY MAY REQUIRE DESIGN MODIFICATIONS PRIOR TO PROCEEDING WITH CONSTRUCTION.

MAX. HEIGHT FEET	MIN. HEIGHT FEET	MIN. ABOVE GRADE SPACE FEET	A	B	C	D	E
6	4	1	1	1	1	1	1
8	6	1	1	1	1	1	1
10	8	1	1	1	1	1	1
12	10	1	1	1	1	1	1
14	12	1	1	1	1	1	1
16	14	1	1	1	1	1	1
			SEE TABLE 8				
			EQUAL TO ROCK SIZE				

ROCK SIZE	APPROXIMATE DIMENSION	APPROXIMATE WEIGHT	USE
CLASS A	12" x 12"	100 LBS	TOP COURSE
CLASS B	10" x 10"	80 LBS	TOP COURSE
CLASS C	8" x 8"	60 LBS	TOP COURSE
CLASS D	6" x 6"	40 LBS	TOP COURSE
CLASS E	4" x 4"	20 LBS	TOP COURSE
CLASS F	3" x 3"	10 LBS	TOP COURSE
CLASS G	2" x 2"	5 LBS	TOP COURSE
CLASS H	1" x 1"	2 LBS	TOP COURSE



TYPICAL BULKHEAD SECTION
NOT TO SCALE

General Notes

No.	Revision/Issue	Date

Firm Name and Address

ELLISPORT ENGINEERING, INC.
20501 81st Ave SW
Vashon, WA 98070
206.463.5311 - phone
206.463.2578 - fax

Project Name and Address

KENNEDY GOETZ BULKHEAD
9400 SW Dolphin Point Road
Vashon, Washington 98070

Project KENNEDY GOETZ	Sheet C4
Date 5 OCT 2023	C4
Drafter DSD	
Engineer STK	

Shoreline Geotechnical Assessment

Kennedy Bulkhead Replacement

9400 SW Dolphin Point Road

Parcel No. 0823039061

Vashon, Washington

April 27, 2024

Project #24095

Prepared For:

Kathryn Kennedy
9400 SW Dolphin Point Road
Vashon, Washington 98070

Prepared By:

Envirotech Engineering, PLLC
PO Box 984
Belfair, Washington 98528
Phone: 360-275-9374



TABLE OF CONTENTS

1.0 INTRODUCTION	1
1.1 PROJECT INFORMATION	1
1.2 PURPOSE OF INVESTIGATION AND SCOPE OF WORK	1
2.0 SURFACE CONDITIONS.....	3
2.1 GENERAL OBSERVATIONS AND BULKHEAD CONDITION	3
2.2 TOPOGRAPHY	3
2.3 SURFACE DRAINAGE AND HYDROLOGY	3
2.4 SLOPE AND EROSION OBSERVATIONS	3
3.0 SUBSURFACE INVESTIGATION	5
3.1 FIELD METHODS, SAMPLING AND FIELD TESTING	5
3.2 GEOLOGIC CONDITIONS	5
3.3 SPECIFIC SUBSURFACE CONDITIONS	6
3.3.1 Groundwater and Hydrogeology	6
4.0 ENGINEERING CONCLUSIONS & RECOMMENDATIONS	7
4.1 LANDSLIDE HAZARDS AND EFFECTS OF PROPOSED DEVELOPMENT	7
4.2 EROSION HAZARDS	7
4.3 SEISMIC HAZARDS.....	8
4.4 SHORELINE DEVELOPMENT CONCLUSIONS & RECOMMENDATIONS.....	8
4.4.1 Local Beach Conditions	9
4.4.2 Alternative Approaches Analysis	10
4.4.3 Shoreline Stabilization per King County Code.....	12
4.4.4 Mitigation Measures	13
4.5 CONSTRUCTION RECOMMENDATIONS.....	14
4.5.1 Foundations	14
4.5.2 Earthwork Construction Recommendations	14
4.5.3 Retaining Walls and Lateral Earth Pressures.....	15
4.5.4 Drainage Considerations	16
5.0 CLOSURE.....	17

Appendix A - Site Plan

Appendix B – Photographs

Appendix C – Cumulative Risk Model

1.0 INTRODUCTION

Envirotech Engineering, PLLC (Envirotech) has completed this shoreline geotechnical assessment for a proposed bulkhead replacement located at 9400 SW Dolphin Point Road, identified as parcel number 0823039061 in Vashon, Washington. As presented herein, this assessment includes information pertaining to the project in this Introduction Section; observations of the property and surrounding terrain in the Surface Conditions Section; soils and geological descriptions in the Subsurface Investigation Section; and, assessments and considerations for the development of this project in the Conclusions and Recommendations Section.

1.1 Project Information

Information pertaining to the project was provided by the proponent of the property. The proposed project is planned to consist of a bulkhead replacement on the Puget Sound. The existing bulkhead is in failure mode as described later in this report, and has been repaired over the years. The existing bulkhead consists of piles with wood lagging on both sides of the pile and concrete filled in the middle. Concrete has been placed at the base due to past undermining. The height is approximately 8 feet maximum, and about 120 feet in length.

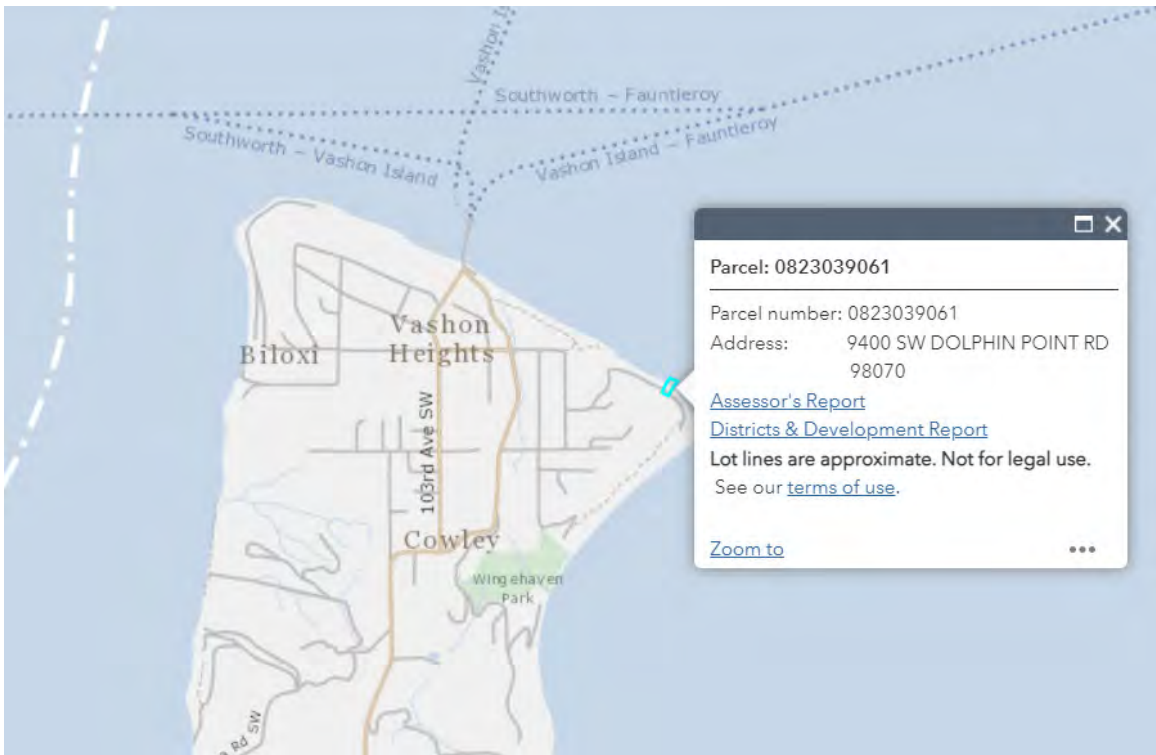
The proposed bulkhead is a rock armoring of similar height and location. The purpose of the wall is to benefit the integrity of the existing residential structure as further elaborated later in this report. Approximate site development with relation to site features are illustrated in the Site Map in Appendix A.

1.2 Purpose of Investigation and Scope of Work

The purpose of this shoreline geotechnical assessment was to evaluate the proposed project with relation to erosion, geologic hazards, shoreline alternatives, site adequacy, and geological and hydrological impacts to the property and adjacent/ downstream properties.

In order to fulfill the purpose of investigation, the geotechnical program completed for the proposed improvements include:

- Review project information provided by the proponent of the property;
- Conduct a site visit to document the site conditions that may influence the construction and performance of the proposed improvements;
- Define general subsurface conditions of the site by observing near surface soils and review soil/ geological maps for the vicinity of the project;
- Complete an engineering assessment supported by planned site alterations and the surface and subsurface conditions that were identified by the field investigation, soil testing, and applicable project research; and,
- Establish engineering conclusions and recommendations based on findings and the anticipated development.



Vicinity Map from King County Website

2.0 SURFACE CONDITIONS

Information pertaining to the existing surface conditions for the project was gathered on April 13, 2024 by a representative with Envirotech. During the site visit, site features were documented that may influence construction or reveal potential geological or hydrologic hazards. This Surface Conditions Section provides information on general observations, vegetation, topography, drainage and slope/ erosion conditions for the project and surrounding areas.

2.1 General Observations and Bulkhead Condition

The project is currently developed with a single family residence, bulkhead, beach access, and other ancillary features typical of this type of development. Vegetation consists mainly of firs, alders, and other typical vegetation of the Pacific NW. Beach flora or fauna near the bulkhead was not observed at the time of our site visit.

The existing bulkhead is in failure mode, and has been repaired/ patched several times over the years. Degradation of the treated wood piles and lagging was observed to include hollowing of the piles, decay of the lagging, and soft wood. Several wood patches and board replacements were observed. Other problems observed included scour within the wall backfill, loss of backfill soil through the wall, and past undermining that was repaired with concrete.

An aerial photo of the project and immediate vicinity is provided below. See the photographs in Appendix B for illustrations of site conditions.

2.2 Topography

The topographic information provided in this section was extrapolated from a public lidar source, and incorporated observations and field measurements, where necessary. Slopes are relatively mild from the bulkhead to just beyond the existing home with steep ascending slopes of over 40% beyond.

2.3 Surface Drainage and Hydrology

Surface water such as storm runoff, streams or wetlands do not appear to affect the property or the bulkhead. The ordinary high water mark of the Puget Sound is approximately 3 feet in height at the face of the existing bulkhead.

Significant scour behind the existing bulkhead was observed, and appears to be from waves and storm surges. Significant beach erosion or sediment transport on the beach was apparent within the immediate vicinity of the project due to the exposed hardpan near the beach surface. It is apparent that the bulkhead area is within the FEMA flood zone.

2.4 Slope and Erosion Observations

Signs of significant shoreline bank movement was observed at the time of our site visit. Besides the aforesaid bulkhead backfill erosion, slope instability indicators were not observed to affect the existing bulkhead or shoreline. However, slope instability indicators were observed upslope from the residence such as leaning/ bowing trees.



Aerial Photo from King County Website

3.0 SUBSURFACE INVESTIGATION

Information on subsurface conditions pertaining to the project was gathered during research and a site reconnaissance. The site visit was accomplished on April 13, 2024 by a representative with Envirotech. Specific information on field methods, sampling, field testing, subsurface conditions, and results from soil testing are presented in this section of the report.

3.1 Field Methods, Sampling and Field Testing

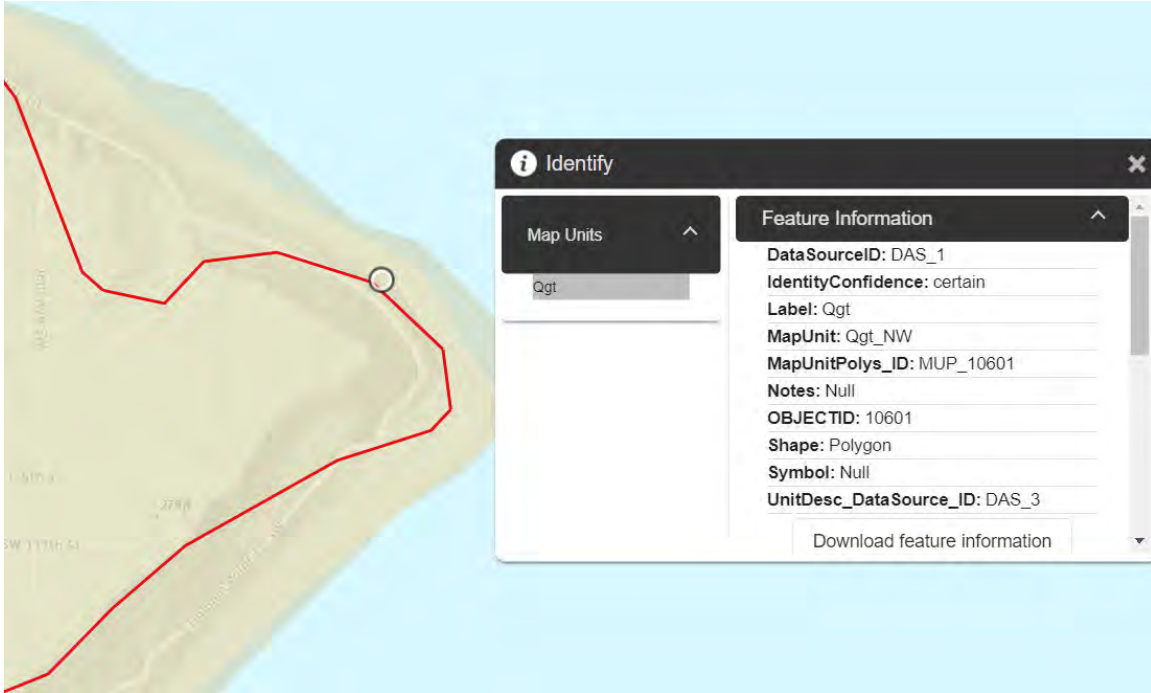
Information on subsurface conditions for the project was accomplished by probing the project area with hand tools. Information on subsurface conditions also included reviewing geological and other soil mapping/ logging within the vicinity of the property. Envirotech measured the relative density of the in-situ soils by gauging the resistance of hand tools.

3.2 Geologic Conditions

In general, soils at the project are composed of materials from glacial advances. The geologic conditions as presented in the “Geologic Map of Washington,” compiled by J. Eric Schuster, 2002 indicates Quaternary sediments, Q_g. Quaternary sediments are generally unconsolidated deposits, and dominantly deposited from glacial drift, including alluvium deposits. This project is located within the Puget Lowland. Typically, “lower tertiary sedimentary rocks unconformably overlie the Crescent Formation.” as revealed in the Geologic Map. Initial sedimentary rocks were formed from shales, sandstones and coal deposits from rivers. During the Quaternary period, the Puget Lowland was covered by numerous ice sheets, with the most recent being the Fraser glacier with a peak of approximately 14,000 years ago. Upon the glacial retreat, the landscape was formed by glacial erosion glacial drift deposits.

The “Interactive Geologic Map” from the Department of Natural Resources provides the following caption(s) for the project area:

Map Unit: Qgt
Age: Quaternary
Name: Till
Description: Unsorted, unstratified, highly compacted mixture of clay, silt, sand, gravel, and boulders deposited by glacial ice; may contain interbedded stratified sand, silt, and gravel.



Geological Map Department of Natural Resources Washington State

3.3 Specific Subsurface Conditions

The following subsurface conditions are estimated descriptions of the project subgrade utilizing information from the depth of penetration at all testing, sampling, observed and investigated locations. Soils for this project were described utilizing the Unified Soil Classification System (USCS). Using the USCS in conjunction with estimated relative densities and other anticipated engineering properties of the soil, susceptibility for potential landslides, erosion and seismic hazards may be assessed.

Soils within the upper 2 to 3 inches below the existing beach grade were observed to be primarily medium sand and gravel beach material overlying a very dense, cemented clayey glacial till. The backfill of the bulkhead and foundation support of the existing home nearest the bulkhead appears to be a conglomerate of granular fill soils consisting of sand, silts and gravel.

3.3.1 Groundwater and Hydrogeology

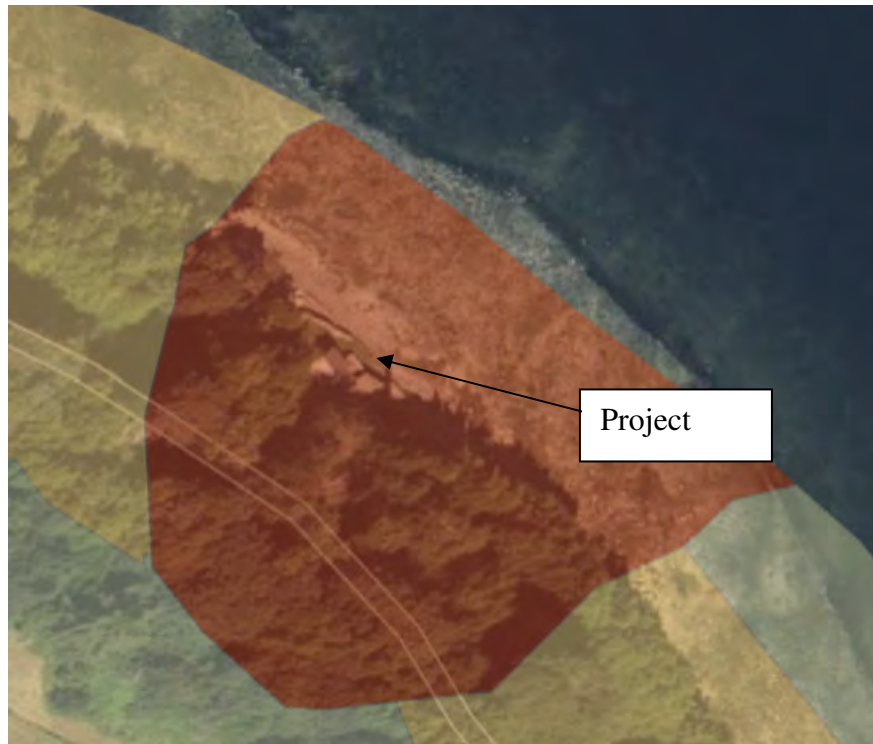
Permanent groundwater is expected to be at least 30 feet directly below the ground surface at the beach. Groundwater at shallow depths or surface seepage was not observed at the time of our site visit. Any groundwater is expected to flow on the surface of the hardpan to the Puget Sound.

4.0 ENGINEERING CONCLUSIONS & RECOMMENDATIONS

The following sections present engineering assessments and conclusions concerning the project. These conclusions have been made available based on the planned construction activities as outlined in the Introduction Section of this report; general observations of drainage and topography as summarized in the Surface Conditions Section; and, soil conditions that were identified by the field investigation and soils testing as outlined in the Subsurface Investigation Section. Conclusions for the project that is provided herein, includes pertinent information for landslide, erosion and seismic hazards.

4.1 Landslide Hazards and Effects of Proposed Development

According to the Coastal Zone Atlas of King County, Washington, the project is within and near terrain labeled 'Unstable Recent Slide' regarding potential landslide activity. See the map below from the Coastal Zone Atlas. Full descriptions may be found in the aforesaid Atlas.



Map from Washington State Department of Ecology Website

4.2 Erosion Hazards

Based on the USCS description of the project soils, the surface soils are considered moderately erodible. According to the Resource Map from the Washington State DNR, the project is not within terrain labeled 'highly erodible.'

It is our opinion that this property has a high susceptibility risk for additional shoreline erosion if the bulkhead is not replaced. See further details provided later in this report.

4.3 Seismic Hazards

There does not appear to be a fault within 300 feet of the property. This information is supported by the USGS Quaternary Fault and Fold Database for the United States.

The potential for liquefaction are believed to be low for this project. According to the Interactive Geologic Map of Washington, liquefaction susceptibility is very low within the vicinity of this project. This is also based on subsurface conditions such as soil characteristics and the lack of a permanent and substantial shallow water table. Subgrade characteristics that particularly contribute to problems caused by seismic events include submerged and confined, poorly-graded granular soils. Although gravel- and silt-sized soil particles could be problematic, fine and medium grained sands are typically subjected to these types of seismic hazards.

4.4 Shoreline Development Conclusions & Recommendations

Conclusions in this report are based on the type and location of the anticipated development, and existing on-site and off-site conditions. Site development that significantly deviates from the anticipated improvements presented in this report, or future nearby development that influences this project may require a geotechnical re-evaluation.

This Shoreline Development Conclusions and Recommendations Section provides our analysis and conclusions of the local shoreline process and how it relates to the existing and/ or proposed infrastructure. Envirotech analyzed alternative approaches and mitigation measures for the project site. We also included recommendations for the structural aspect and development.

The property appears adequate for the proposed development as described in this report because, in our opinion, the project will not have a negative impact on geological, hydrological or shoreline dynamics with respect to current conditions. Since the bulkhead replacement consists of cantered boulders instead of vertical treated wood and concrete, it is our opinion that there will be benefits to the local ecology. The rock height should be at least the height of the existing bulkhead and higher due to signs of backfill erosion. However, additional height for flood control should be analyzed per the bulkhead designer. The rock should be placed no further waterward than the existing bulkhead as to result in no net loss of ecological functions on the beach.

Project Necessity

The bulkhead replacement is required because in our opinion, if the bulkhead fails, the primary residence will be in imminent danger within 3 years. The existing residence is located as close as 12 feet from the bulkhead, with the deck as close as 8 feet. Since the soil profile between the home and bulkhead is substantially loose, granular fill – these soils will erode rapidly upon bulkhead collapse and could put the house in danger within hours or days of bulkhead collapse. See the cross section below that illustrates existing site conditions.

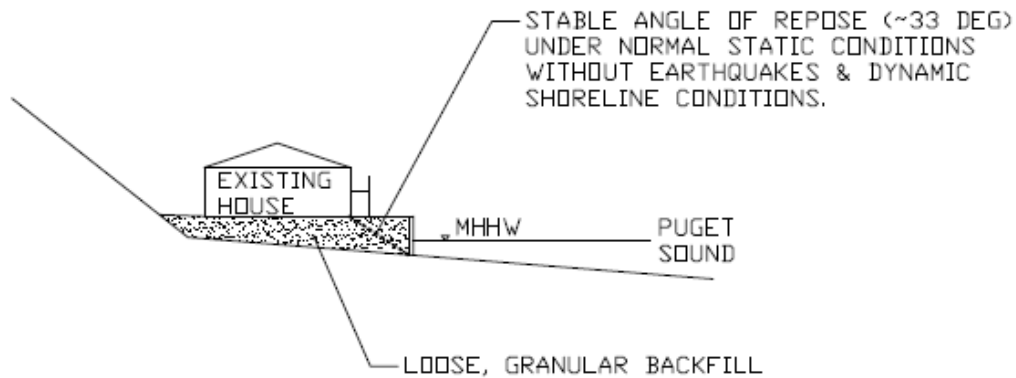


Figure 1. Cross Section








Per the illustration above, the existing home will be in a compromised, unstable position upon bulkhead failure assuming an earthquake never occurs and the shoreline processes are non-existent. With the 3-foot MHHW height, and standard tidal influence, we expect that the loose backfill soils will erode immediately creating conditions for imminent large settlements and structural damage to the existing home.

4.4.1 Local Beach Conditions

During our site visit, Envirotech observed that waves and other tidal processes have eroded the backfill/ shoreline bank and transports sediments away from the project area. This is evident from the exposed shoreline as described in the Surface Conditions of this report, and the presence of a shallow beach sediment layer over cemented glacial till as described in the Subsurface Investigation Section of this report. The property is mapped as having a feeder bluff per the Washington State Department of Ecology. See the following illustration.



Coastal Landform Map from Washington State Department of Ecology Website

-  Feeder bluff exceptional
-  Feeder bluff
-  Transport zone
-  Feeder bluff - Talus
-  Accretion shoreform
-  Pocket beach
-  Pocket beach - artificial

4.4.2 Alternative Approaches Analysis

Alternative approaches were considered in our geotechnical assessment as outlined in the Washington Administrative Code (WAC) 220-660-370 (3). Per this selection process, the code requires the use of the least impacting technically feasible shoreline stabilization alternative, whereas feasible means available and capable of being done after taking into consideration cost, existing technology, and logistics in light of the overall project purposes. Furthermore, the WAC states that a hard armoring technique should be

proposed after considering site characteristics such as the threat to major improvements, wave energy, and other factors in an alternative analysis.

The following key excerpts from that are relevant to geological and shoreline hazards and the need for to maintain a functional, hard armored bulkhead (such as what is proposed in the current plans) is provided below in bold type. Below each code provision, we describe how the project satisfies or dissatisfies all of the key criteria cited in that code provision with respect to our field of study.

WAC 220-660-370(3)(c) – Common alternatives for replacement or rehabilitation of residential shoreline stabilization are, from most preferred to least preferred:

(i) Remove the existing shoreline stabilization structure and restore the beach.

This alternative is infeasible because a major improvement (existing residence) is in danger without an adequately functioning bulkhead. As previously substantiated in this report, the loose granular backfill soils and close proximity of the home could be compromised in less than 3 years if existing shoreline stabilization completely fails.

(ii) Remove the existing shoreline stabilization structure and install native vegetation.

This alternative is infeasible due to vegetation having a lack of shoreline bank protective qualities for this specific project. The critical nature of this project requires complete arrest of shoreline regression.

(iii) Remove the existing shoreline stabilization structure and control upland drainage.

As previously outlined in Section 2.3 of this report, upland drainage issues are not a problem for this project, therefore this alternative analysis is not feasible.

(iv) Remove the existing shoreline stabilization structure and replace it with a soft structure constructed of natural materials, including bioengineering.

Soft armoring such as logs and root wads are not advised for this project. This is due to the following:

- The project is high risk per the Marine Shoreline Design Guidelines (MSDG) by the Washington Department of Fish & Wildlife. It is recommended by the MSDG that high risk sites do not use soft armoring. See Appendix C for a depiction of the cumulative risk model that pertains to this project.
- Stability and safety of the existing home is extremely sensitive to the mitigation technique for bank erosion. Soft armoring has not been proven to mitigate erosion over the long term as compared to hard armoring,
- Soft shore armoring will allow the loose granular backfill soils to erode

immediately because shoreline waves and currents fully penetrate soft shore methods, and allows the loose sediments to dissipate through piping failure,

- Due to the exposed soils and loose backfill directly behind the existing bulkhead, freeze-thaw cycles and wave action significantly induce bank erosion. Soft shore armoring usually provides no protection against this type of erosion, while hard armoring usually arrests this type of erosion, and
- The limited height of soft armoring does not protect the shoreline as would a hard bulkhead during storm surges and wave energy.

(v) Remove the existing hard structure and construct upland retaining walls.

This alternative is not feasible. The removal of the existing hard structure would allow for rapid shoreline bank erosion due to the loose sandy soils. With very little distance between the shoreline and existing home, an upland retaining wall between the shoreline and home would be expected to fail quickly due to undermining.

(vi) Remove the existing hard structure and replace it landward with another hard structure, preferably at or above the ordinary high water line.

For the specific site conditions of this project, this alternative is not feasible. The residence is deemed too close to the shoreline for an effective hard structure located between the existing bulkhead and residence.

(vii) Remove the existing hard structure and replace it in the same footprint with another hard structure.

This option is feasible as it will virtually mimic what has been pre-existing which has been protecting the existing home for decades.

4.4.3 Shoreline Stabilization per King County Code

This section specifically pertains to how our geotechnical analysis is pursuant to the current shoreline stabilization standards in KCC 21A.25.170.B for structural shoreline stabilization.

The following key excerpts from that are relevant to geological and shoreline hazards and the need for to maintain a functional, hard armored bulkhead is provided below in bold type. Below each code provision, we describe how this project satisfies said code:

KCC 21A.25.170.B – Shoreline Stabilization

- 1. The applicant provides a geotechnical analysis that demonstrates that erosion from waves or currents is imminently threatening or that, unless the structural shoreline stabilization is constructed, damage is expected to occur within three years;**

This code provision has been satisfied as explained in the Project Necessity subsection within Section 4.4 of this report, and illustrated in Figure 1 of this report.

2. The erosion is not caused by upland conditions;

Shoreline erosion is not a consequence of upland conditions such as drainage problems as explained in Section 2.3, or any other upland conditions.

3. The proposed structural shoreline protection will provide greater protection than feasible, nonstructural alternatives such as slope drainage systems, vegetative growth stabilization, gravel berms and beach nourishment;

Nonstructural alternatives as presented in this code are not feasible for the protection of the existing home. Hard armored structural shoreline protection is imperative for the site conditions of this project. An alternative Approach Analysis has been provided in Section 4.4.2 of this report, and are deemed as inadequate protection and/ or irrelevant to this project.

4. The proposal is the minimum necessary to protect existing legally established primary structures, new or existing non-water-dependent development, new or existing water dependent development or projects restoring ecological functions or remediating hazardous substance discharges;

The proposal for hard armoring replacement is the minimum necessary to protect an existing legally established primary structure. As established in this report, the primary structure is only 12 feet away (8 feet for decks) from a failing bulkhead that is separated by loose, granular fill that is extremely erodible.

5. Adequate mitigation measures will be provided to maintain existing shoreline processes and critical fish and wildlife habitat and ensure no net loss or function of the intertidal or riparian habitat.

Reviewing agency approval is expected to have mitigation measures for improving shoreline ecological functions as part of the permit approval. In addition, the proposed hard armoring will not extend waterward of the existing bulkhead so that no net loss will occur. As outlined in Section 4.4.4 of this report, the proposed rock armoring will benefit local ecological functions compared to existing site conditions.

4.4.4 Mitigation Measures

Measures to mitigate potential site specific and cumulative geological and hydrological impacts of the proposed development are provided herein in order to mitigate adverse impacts to adjacent and down-current properties.

Envirotech believes that the hard armoring should consist of rock over concrete. Rock will not impede groundwater flow, would be cantered, and will provide an overall positive ecological friendly configuration that would not change shoreline dynamics with respect to existing conditions.

Since the planned armoring is virtually the same type and location as the existing bulkhead, this alone is mitigation in order to maintain current conditions. Habitat management protocols from the reviewing authority should be implemented as per their code. In conclusion, there will be no adverse impacts to off-site properties from the planned bulkhead replacement with relation to existing condition, and could be enhanced depending on final development and permit conditions.

4.5 Construction Recommendations

The following recommendations are offered for the proposed project. This includes foundations, earthwork and drainage considerations.

4.5.1 Foundations

Foundations (bottom rock) shall be established on relatively undisturbed native soil. For a bearing capacity requirement of no more than 3000 psf, rock shall be placed at a minimum depth of 24 inches below beach grade or deeper if required by the structural engineer or per code. Foundation recommendations are made available based on adherence to the remaining recommendations that are provided in this report.

Total and differential settlement that a structure will undergo depends primarily on the subsurface conditions, type of structure, amount and duration of pressure exerted by the structure, reduction of pore water pressure, and in some instances, the infiltration of free moisture. Based on the expected native soil conditions, anticipated development, and construction abides by the recommendations in this report, the assumed foundation system may undergo a maximum of 0.50 inch total settlement, and a maximum differential settlement of 0.25 inch over a 50 ft span.

4.5.2 Earthwork Construction Recommendations

Founding material for building foundations shall consist of undisturbed native soils to the foundation depths previously provided in this report.

Excavation is recommended to remove any deleterious material, if present, beneath foundations and to achieve appropriate foundation depth. Additional sub-excavation will be required for this project if the soils below the required foundation depth are loose, or otherwise incompetent due to inappropriate land disturbing.

Temporary and permanent earth cuts and fill slopes exceeding 4 feet in height should be limited to a slope of 2:1 (horizontal:vertical). Utility trenches or other confined excavations exceeding 4 feet should conform to OSHA safety regulations. Permanent cut and fill slopes shall be limited to a slope of 2:1, unless otherwise approved by an engineer.

Standard crushed ballast is recommended behind the bulkhead per the requirements of a structural engineer. Standard compaction is not necessary. Fill beneath foundations should be avoided for this project.

4.5.3 Retaining Walls and Lateral Earth Pressures

The proposed shoreline protection is a rock retaining system. The lateral earth pressures exerted through the backfill of a retaining wall are dependent upon several factors including height of retained soil behind the wall, type of soil that is retained, degree of backfill compaction, slope of backfill, surcharges, hydrostatic pressures, earthquake pressures, and the direction and distance that the top of the wall moves.

An equivalent fluid unit weight used for structural design may be estimated as the product of the backfill soil unit weight and the earth pressure coefficient for at-rest pressures. Retaining walls should be designed to resist a lateral earth pressure based on an equivalent fluid unit weight of the following:

	<u>At-Rest</u>	<u>Active</u>
Native Soils	49 pcf	32 pcf
Engineered Fill Soils	45 pcf	28 pcf

The values provided above shall be increased by 1 pcf for every 1 degree of backfill/natural slope angle. These equivalent fluid unit weight values do not include lateral earth pressures induced by earthquakes, groundwater, or surcharges from live loads. Earthquake pressures should be added to the wall analysis, and treated as an inverted pressure triangle where the resultant pressure is located at 2/3 of the wall height, or other method approved by a structural engineer. The following resultant earthquake pressures as a function of the wall height (H) may be utilized:

	<u>At-Rest</u>	<u>Active</u>
Native Soils	15.4H psf	9.8H psf
Engineered Fill Soils	13.6H psf	8.2H psf

See the Earthwork Construction Recommendations Section for details concerning the use of native soils, engineered fill and placement of backfill.

Native soils may be used as retaining wall backfill for this project if the total wall height is 4 feet or less and the recommendations below are followed. Native soils for retaining walls exceeding 4 feet in height must be approved by the local authority or evaluated by an engineer. Backfill may consist of engineered fill, as presented in this report, or borrow material approved by a geotechnical engineer. Compaction of these materials shall be achieved in compacted lifts of about 12 inches. Each lift should be uniformly compacted to at least 85%, and no more than 90% of the modified Proctor maximum dry density (ASTM D 1557). If pavement or building loads are planned to be located within retaining wall backfill, then 90% compaction is required. In addition, heavy construction

equipment should be at a distance of at least ½ the wall height. Over-compaction and limiting heavy construction equipment should be prevented to minimize the risk of excess lateral earth pressure on the retaining structure. Envirotech recommends that retaining wall backfill is compacted with light equipment such as a hand-held power tamper. If clean, coarse gravel soils are utilized as engineered fill, and surcharges will not influence the retaining wall, compaction may be achieved by reasonably densifying granular soils with construction equipment.

4.5.4 Drainage Considerations

Rock ballast behind the planned bulkhead as designed by the structural engineer should be sufficient means for drainage behind the bulkhead.

5.0 CLOSURE

Based on the project information and site conditions as presented in this report, it is Envirotech's opinion that additional geotechnical studies are not required to further evaluate this project.

Due to the inherent natural variations of the soil stratification and the nature of the geotechnical subsurface exploration, there is always a possibility that soil conditions encountered during construction are different than those described in this report. Therefore, it is recommended that Envirotech is promptly notified if project and subsurface conditions found on-site are not as presented in this report so that we can re-evaluate our recommendations.

This report presents a geological/ geotechnical assessment, and is intended only for the owner, or owners' representative. Furthermore, this report is only valid for the project information and location described herein. Significant geological or property changes prior to the implementation of this project could render this report outdated, and will require additional geotechnical studies.

The services described in this report were prepared under the responsible charge of Michael Staten, a professional engineer with Envirotech. Michael Staten has appropriate education and experience in the field of geotechnical engineering in order to assess landslide hazards, erosion hazards, earthquake hazards, and shoreline dynamics.

Please contact Michael Staten at 360-275-9374 if you have any questions, comments, or require additional information.

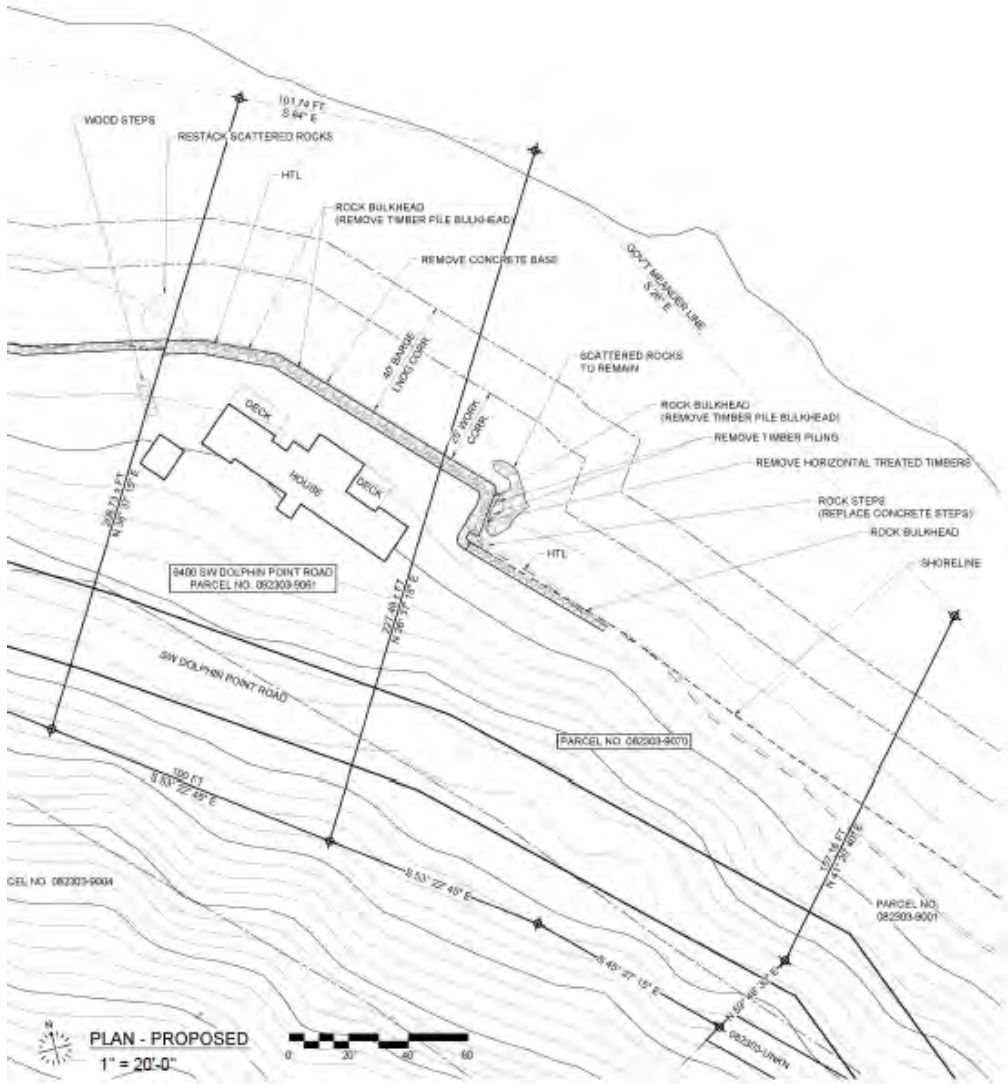
Sincerely,
Envirotech Engineering



Michael Staten, P.E.
Geotechnical Engineer

APPENDIX A

SITE PLAN



Site plan provided by client used for permitting

APPENDIX B

PHOTOGRAPHS



Bulkhead in poor condition with close proximity of primary structure



Bulkhead wood degradation and undermining



Wood patching and repairs



Backfill scour that has been repaired with cobble stone fill and plantings

APPENDIX C

CUMULATIVE RISK MODEL

CUMULATIVE RISK MODEL			
EROSION POTENTIAL			
Shoretype	Score	Fetch	Score
No Appreciable Drift (NAD)-Bedrock/Low Energy	0	0–1 mile	1
Modified, Accretion Shoreform, NAD-Delta	1		
NAD- Artificial , Transport Zone, Pocket Beach	2	1–5 miles	2
Feeder Bluff	3	5–15 miles	3
Feeder Bluff Exceptional	4	15+ miles	4
Erosion Potential Score = Shoretype Score + Fetch Score			7
INFRASTRUCTURE THREAT			
Setback	Score	Infrastructure Type	Score
>60 ft	1	Property without structures	1
36–60 ft	2	Septic drainfield or unattached residential infrastructure, not lived in	2
21–35 ft	3	Home or residential building	3
0–20 ft	4	Major infrastructure	4
Infrastructure Threat Score = Setback Score + Infrastructure Type Score			7
CUMULATIVE RISK TOTAL (product):		Erosion Potential x Infrastructure Threat	42

Table 3-4 from the Washington Department of Fish & Wildlife, Marine Shoreline Design Guidelines

- ◆ Low risk scores between 0–15
- ◆ Moderate risk scores between 16–36
- ◆ High risk scores greater than 36

Feeder bluff delination from WA State Department of Ecology Coastal Atlas Map

Fetch is measured as greatest distance of open water to project site from aerial mapping.

Appendix B: Site Photos of Existing Residential Infrastructure



Bulkhead Face and SFR from Shoreline



Looking Northwest Above the Bulkhead from Eastside of Property



Back filled hole in front of the Septic System



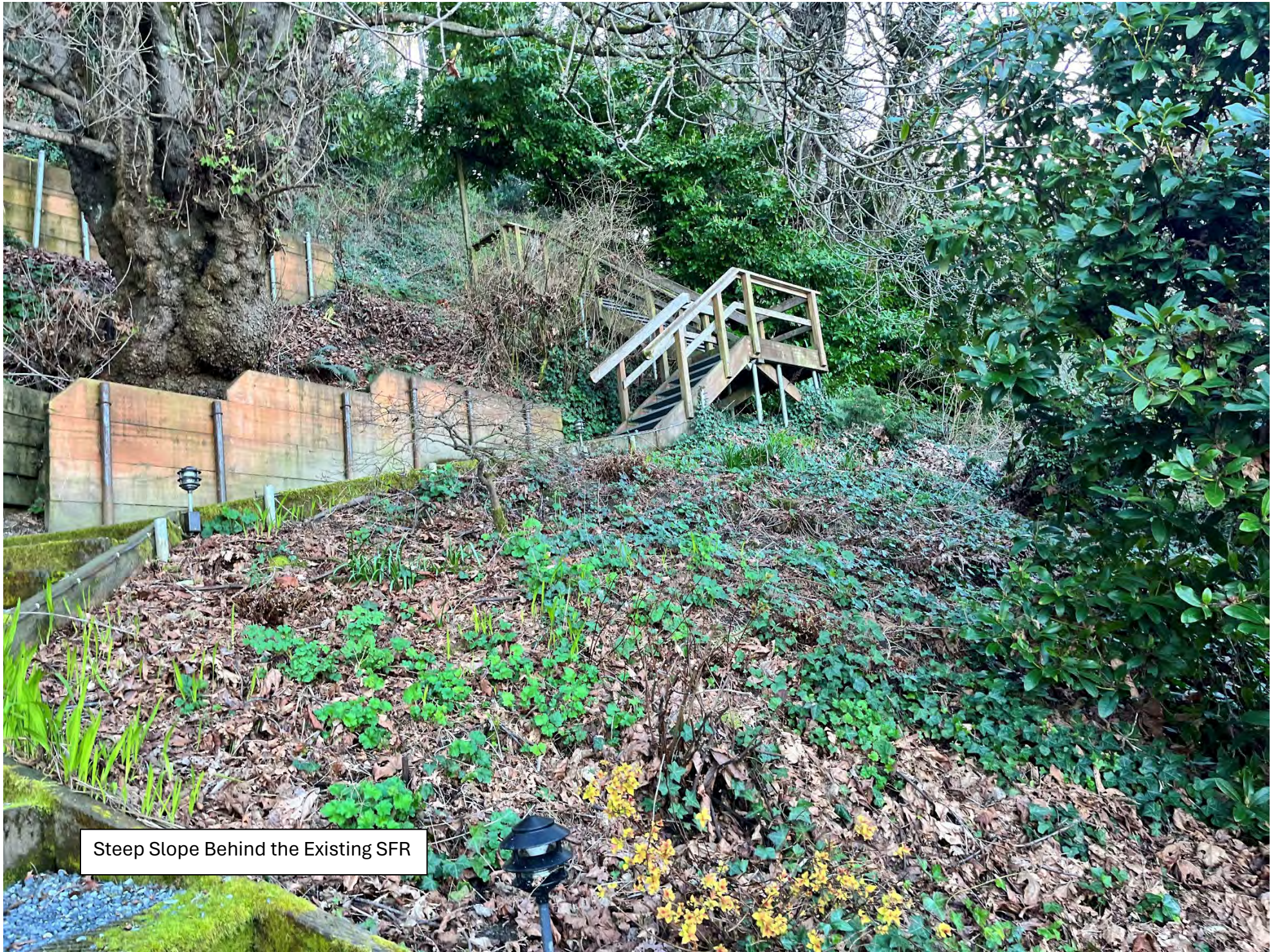
Looking Waterward Above Bulkhead and Septic Location



Looking Up Slope to Shed and Existing Landscaping



Existing Stairs and Scattered Loose Rocks at Southeast End of Project



Steep Slope Behind the Existing SFR



Looking Northwest Down Slope Behind the Existing SFR



**Appendix C: Ecology Wetland Rating Form with Figures &
NRCS Soil Survey Report**

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: DPRMA Project City/County: Vashon/King Sampling Date: 5/17/2022
 Applicant/Owner: DPRMA State: WA Sampling Point: SPC1
 Investigator(s): A. Crispin, PWS; K. Rettmann Section, Township, Range: S8 T23N R3
 Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): concave Slope (%): 30
 Subregion (LRR): A Lat: 47.5042 N Long: -122.45313 W Datum: NAVD88
 Soil Map Unit Name: Alderwood and Kitsap soils, very steep NWI Classification: na

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No (If no, explain in Remarks.)
 Are Vegetation , Soil , or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes No
 Are Vegetation , Soil , or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? <input checked="" type="radio"/> Yes <input type="radio"/> No Hydric Soil Present? <input checked="" type="radio"/> Yes <input type="radio"/> No Wetland Hydrology Present? <input checked="" type="radio"/> Yes <input type="radio"/> No	Is the Sampled Area within a Wetland? <input checked="" type="radio"/> Yes <input type="radio"/> No
Remarks:	

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: <u>30ft x 30ft</u>)	Absolute % Cover	Dom. Sp.?	Relative % Cover	Indicator Status																																		
1. <u><i>Alnus rubra</i></u>	50	Y	55.6	FAC	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>6</u> (A) Total Number of Dominant Species Across All Strata: <u>6</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100.0%</u> (A/B)																																	
2. <u><i>Acer circinatum</i></u>	40	Y	44.4	FAC																																		
3. _____																																						
4. _____																																						
<u>90</u> = Total Cover																																						
Sapling/Shrub Stratum (Plot size: <u>15ft x 15ft</u>)																																						
1. <u><i>Rubus spectabilis</i></u>	40	Y	66.7	FAC	Prevalence Index worksheet: <table style="width:100%; border-collapse: collapse;"> <tr> <td align="center" colspan="2">Total % Cover of:</td> <td align="center" colspan="2">Multiply by:</td> </tr> <tr> <td>OBL species</td> <td align="center"><u>0</u></td> <td align="center">x 1 =</td> <td align="center"><u>0</u></td> </tr> <tr> <td>FACW species</td> <td align="center"><u>0</u></td> <td align="center">x 2 =</td> <td align="center"><u>0</u></td> </tr> <tr> <td>FAC species</td> <td align="center"><u>255</u></td> <td align="center">x 3 =</td> <td align="center"><u>765</u></td> </tr> <tr> <td>FACU species</td> <td align="center"><u>0</u></td> <td align="center">x 4 =</td> <td align="center"><u>0</u></td> </tr> <tr> <td>UPL species</td> <td align="center"><u>0</u></td> <td align="center">x 5 =</td> <td align="center"><u>0</u></td> </tr> <tr> <td>Column Totals:</td> <td align="center"><u>255</u> (A)</td> <td></td> <td align="center"><u>765</u> (B)</td> </tr> <tr> <td align="center" colspan="4">Prevalence Index = B/A =</td> <td align="center"><u>3.000</u></td> </tr> </table>	Total % Cover of:		Multiply by:		OBL species	<u>0</u>	x 1 =	<u>0</u>	FACW species	<u>0</u>	x 2 =	<u>0</u>	FAC species	<u>255</u>	x 3 =	<u>765</u>	FACU species	<u>0</u>	x 4 =	<u>0</u>	UPL species	<u>0</u>	x 5 =	<u>0</u>	Column Totals:	<u>255</u> (A)		<u>765</u> (B)	Prevalence Index = B/A =				<u>3.000</u>
Total % Cover of:		Multiply by:																																				
OBL species	<u>0</u>	x 1 =	<u>0</u>																																			
FACW species	<u>0</u>	x 2 =	<u>0</u>																																			
FAC species	<u>255</u>	x 3 =	<u>765</u>																																			
FACU species	<u>0</u>	x 4 =	<u>0</u>																																			
UPL species	<u>0</u>	x 5 =	<u>0</u>																																			
Column Totals:	<u>255</u> (A)		<u>765</u> (B)																																			
Prevalence Index = B/A =				<u>3.000</u>																																		
2. <u><i>Acer circinatum</i></u>	10	N	16.7	FAC																																		
3. <u><i>Rubus armeniacus</i></u>	10	N	16.7	FAC																																		
4. _____																																						
5. _____																																						
<u>60</u> = Total Cover																																						
Herb Stratum (Plot size: <u>15ft x 15ft</u>)																																						
1. <u><i>Equisetum arvense</i></u>	50	Y	47.6	FAC	Hydrophytic Vegetation Indicators: <input type="checkbox"/> 1 - Rapid Test for Hydrophytic Vegetation <input checked="" type="checkbox"/> 2 - Dominance Test is >50% <input checked="" type="checkbox"/> 3 - Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> 5 - Wetland Non-Vascular Plants ¹ <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.																																	
2. <u><i>Urtica dioica</i></u>	15	N	14.3	FAC																																		
3. <u><i>Tolmiea menziesii</i></u>	20	Y	19.0	FAC																																		
4. <u><i>Ranunculus repens</i></u>	20	Y	19.0	FAC																																		
5. _____																																						
6. _____																																						
7. _____																																						
8. _____																																						
9. _____																																						
10. _____																																						
11. _____																																						
<u>105</u> = Total Cover																																						
Woody Vine Stratum (Plot size: <u>5ft x 5ft</u>)																																						
1. _____																																						
2. _____																																						
_____ = Total Cover																																						
% Bare Ground in Herb Stratum <u>5</u>																																						

Remarks:
 recent sloughing of soil at base of hillside just above LWD at toe of slope

SOIL

Sampling Point: SPC1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks		
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²				
0-7	10YR	3/2	100				Sandy Clay			
7-16	10YR	4/1	90	10YR	5/8	10	C	M	Silty Clay	concentration is prominent

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

<input type="checkbox"/> Histosol (A1)	<input type="checkbox"/> Sandy Redox (S5)	<input type="checkbox"/> 2 cm Muck (A10)
<input type="checkbox"/> Histic Epipedon (A2)	<input type="checkbox"/> Stripped Matrix (S6)	<input type="checkbox"/> Red Parent Material (TF2)
<input type="checkbox"/> Black Histic (A3)	<input type="checkbox"/> Loamy Mucky Mineral (F1) (except MLRA 1)	<input type="checkbox"/> Very Shallow Dark Surface (TF12)
<input type="checkbox"/> Hydrogen Sulfide (A4)	<input type="checkbox"/> Loamy Gleyed Matrix (F2)	<input type="checkbox"/> Other (Explain in Remarks)
<input type="checkbox"/> Depleted Below Dark Surface (A11)	<input checked="" type="checkbox"/> Depleted Matrix (F3)	
<input type="checkbox"/> Thick Dark Surface (A12)	<input type="checkbox"/> Redox Dark Surface (F6)	
<input type="checkbox"/> Sandy Mucky Mineral (S1)	<input type="checkbox"/> Depleted Dark Surface (F7)	
<input type="checkbox"/> Sandy Gleyed Matrix (S4)	<input type="checkbox"/> Redox Depressions (F8)	

Indicators for Problematic Hydric Soils³:

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes No

Remarks:
some small gravels present throughout test pit

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)	Secondary Indicators (2 or more required)
<input checked="" type="checkbox"/> Surface Water (A1)	<input type="checkbox"/> Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Salt Crust (B11)
<input checked="" type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Aquatic Invertebrates (B13)
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Oxidized Rhizospheres along Living Roots (C3)
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Presence of Reduced Iron (C4)
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Stunted or Stressed Plants (D1) (LRR A)
<input type="checkbox"/> Surface Soil Cracks (B6)	<input type="checkbox"/> Other (Explain in Remarks)
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	
<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)	

Field Observations:

Surface Water Present? Yes No Depth (inches): surface

Water Table Present? Yes No Depth (inches): _____

Saturation Present? Yes No Depth (inches): to surface

(includes capillary fringe)

Wetland Hydrology Present? Yes No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: DPRMA Project City/County: Vashon/King Sampling Date: 5/17/2022
 Applicant/Owner: DPRMA State: WA Sampling Point: SPC2
 Investigator(s): A. Crispin, PWS; K. Rettmann Section, Township, Range: S8 T23N R3
 Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): concave Slope (%): 30
 Subregion (LRR): A Lat: 47.5042 N Long: -122.45313 W Datum: NAVD88
 Soil Map Unit Name: Alderwood and Kitsap soils, very steep NWI Classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No (If no, explain in Remarks.)
 Are Vegetation , Soil , or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes No
 Are Vegetation , Soil , or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? <input type="radio"/> Yes <input checked="" type="radio"/> No Hydric Soil Present? <input type="radio"/> Yes <input checked="" type="radio"/> No Wetland Hydrology Present? <input type="radio"/> Yes <input checked="" type="radio"/> No	Is the Sampled Area within a Wetland? <input type="radio"/> Yes <input checked="" type="radio"/> No
Remarks:	

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: <u>30ft x 30ft</u>)	Absolute % Cover	Dom. Sp.?	Relative % Cover	Indicator Status																																									
1. <u><i>Acer macrophyllum</i></u>	60	Y	54.5	FACU	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>3</u> (A) Total Number of Dominant Species Across All Strata: <u>6</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>50.0%</u> (A/B)																																								
2. <u><i>Alnus rubra</i></u>	50	Y	45.5	FAC																																									
3. _____																																													
4. _____																																													
<u>110</u> = Total Cover																																													
Sapling/Shrub Stratum (Plot size: <u>15ft x 15ft</u>)					Prevalence Index worksheet: <table style="width:100%; border-collapse: collapse;"> <tr> <td style="width:30%;"></td> <td style="width:20%; text-align: center;">Total % Cover of:</td> <td style="width:20%;"></td> <td style="width:20%; text-align: center;">Multiply by:</td> <td style="width:20%;"></td> </tr> <tr> <td>OBL species</td> <td align="center">0</td> <td></td> <td align="center">x 1 =</td> <td align="center">0</td> </tr> <tr> <td>FACW species</td> <td align="center">0</td> <td></td> <td align="center">x 2 =</td> <td align="center">0</td> </tr> <tr> <td>FAC species</td> <td align="center">120</td> <td></td> <td align="center">x 3 =</td> <td align="center">360</td> </tr> <tr> <td>FACU species</td> <td align="center">120</td> <td></td> <td align="center">x 4 =</td> <td align="center">480</td> </tr> <tr> <td>UPL species</td> <td align="center">0</td> <td></td> <td align="center">x 5 =</td> <td align="center">0</td> </tr> <tr> <td>Column Totals:</td> <td align="center">240</td> <td align="center">(A)</td> <td></td> <td align="center">840 (B)</td> </tr> <tr> <td align="right" colspan="5">Prevalence Index = B/A = <u>3.500</u></td> </tr> </table>		Total % Cover of:		Multiply by:		OBL species	0		x 1 =	0	FACW species	0		x 2 =	0	FAC species	120		x 3 =	360	FACU species	120		x 4 =	480	UPL species	0		x 5 =	0	Column Totals:	240	(A)		840 (B)	Prevalence Index = B/A = <u>3.500</u>				
	Total % Cover of:		Multiply by:																																										
OBL species	0		x 1 =	0																																									
FACW species	0		x 2 =	0																																									
FAC species	120		x 3 =	360																																									
FACU species	120		x 4 =	480																																									
UPL species	0		x 5 =	0																																									
Column Totals:	240	(A)		840 (B)																																									
Prevalence Index = B/A = <u>3.500</u>																																													
1. <u><i>Rubus armeniacus</i></u>	30	Y	37.5	FAC																																									
2. <u><i>Sambucus nigra</i></u>	30	Y	37.5	FAC																																									
3. <u><i>Rubus spectabilis</i></u>	10	N	12.5	FAC																																									
4. <u><i>Acer macrophyllum</i></u>	10	N	12.5	FACU																																									
5. _____																																													
<u>80</u> = Total Cover																																													
Herb Stratum (Plot size: <u>15ft x 15ft</u>)					Hydrophytic Vegetation Indicators: <input type="checkbox"/> 1 - Rapid Test for Hydrophytic Vegetation <input type="checkbox"/> 2 - Dominance Test is >50% <input type="checkbox"/> 3 - Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> 5 - Wetland Non-Vascular Plants ¹ <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.																																								
1. <u><i>Polystichum munitum</i></u>	40	Y	80.0	FACU																																									
2. <u><i>Hedera helix</i></u>	10	Y	20.0	FACU																																									
3. _____																																													
4. _____																																													
5. _____																																													
6. _____																																													
7. _____																																													
8. _____																																													
9. _____																																													
10. _____																																													
11. _____																																													
<u>50</u> = Total Cover																																													
Woody Vine Stratum (Plot size: <u>5ft x 5ft</u>)					Hydrophytic Vegetation Present? <input type="radio"/> Yes <input checked="" type="radio"/> No																																								
1. _____																																													
2. _____																																													
_____ = Total Cover																																													
% Bare Ground in Herb Stratum <u>5</u>																																													
Remarks:																																													

SOIL

Sampling Point: SPC2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-7	10YR	2/2	100				Silt Loam	earthworms and live roots
7-16	10YR	5/3	100				Silt Loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1)
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Loamy Mucky Mineral (F1) (except MLRA 1)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)

Indicators for Problematic Hydric Soils³:

- 2 cm Muck (A10)
- Red Parent Material (TF2)
- Very Shallow Dark Surface (TF12)
- Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____
Depth (inches): _____

Hydric Soil Present? Yes No

Remarks:
gravels throughout test pit

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- Surface Water (A1)
- High Water Table (A2)
- Saturation (A3)
- Water Marks (B1)
- Sediment Deposits (B2)
- Drift Deposits (B3)
- Algal Mat or Crust (B4)
- Iron Deposits (B5)
- Surface Soil Cracks (B6)
- Inundation Visible on Aerial Imagery (B7)
- Sparsely Vegetated Concave Surface (B8)
- Water-Stained Leaves (B9) (except MLRA 1, 2, 4A, and 4B)
- Salt Crust (B11)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres along Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- Stunted or Stressed Plants (D1) (LRR A)
- Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- Drainage Patterns (B10)
- Dry-Season Water Table (C2)
- Saturation Visible on Aerial Imagery (C9)
- Geomorphic Position (D2)
- Shallow Aquitard (D3)
- FAC-Neutral Test (D5)
- Raised Ant Mounds (D6) (LRR A)
- Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes No Depth (inches): _____
 Water Table Present? Yes No Depth (inches): _____
 Saturation Present? Yes No Depth (inches): _____
 (includes capillary fringe)

Wetland Hydrology Present? Yes No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland name or number: DPRMA_wetland_C

RATING SUMMARY - Western Washington

Name of wetland (or ID#): DPRMA_wetland_C Date of site visit: 05/17/2022
 Rated By: Michael Cecil Kristi Rettmann Trained by Ecology? Yes [X] No [] Date of Training: 09/15/2022
 HGM Class used for rating: Slope
 Wetland has multiple HGM classes? Yes [] No [X]

NOTE: Form is not complete without the figures requested (figures can be combined).
 Source of base aerial photo/map:

OVERALL WETLAND CATEGORY: [Category IV] (based on functions [X] or special characteristics [])

1. Category of wetland based on FUNCTIONS

- [] **Category I** - Total score = 23 - 27
- [] **Category II** - Total score = 20 - 22
- [] **Category III** - Total score = 16 - 19
- [X] **Category IV** - Total score = 9 - 15

Score for each function based on three ratings (order of ratings is not important)	
9 = H,H,H	6 = M,M,M
8 = H,H,M	5 = H,L,L
7 = H,H,L	5 = M,M,L
7 = H,M,M	4 = M,L,L
6 = H,M,L	3 = L,L,L

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
Site Potential	L	L	L	
Landscape Potential	L	L	H	
Value	M	L	M	Total
Score Based on Ratings	4	3	6	13

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY
Estuarine	
Wetland of High Conservation Value	
Bog	
Forested	
Coastal Lagoon	
Interdunal	
None of the above	Not Applicable

Maps and figures required to answer questions correctly for Western Washington

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Plant cover of dense trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of dense, rigid trees, shrubs, and herbaceous plants (can be added to figure above)	S 4.1	
Boundary of area within 150 ft of the wetland (can be added to another figure)	S 2.1, S 5.1	
1km Polygon: Area that extends 1km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	S 3.3	

SLOPE WETLANDS

Water Quality Functions - Indicators that the site functions to improve water quality

S 1.0 Does the site have the potential to improve water quality?

S 1.1 What are the characteristics of the average slope of the wetland?

Slope is >1%-2% points = 2 **Score: 2**

S 1.2 What is the soil 2in below the surface or duff layer?

None of the above points = 0 **Score: 0**

S 1.3 Characteristics of the plants in the wetland that trap sediments and pollutants

Dense, uncut, herbaceous plants cover >50% of the wetland area points = 3 **Score: 3**

Total for S 1: 5

Rating of Site Potential 12-16 = H 6-11 = M 0-5 = L *Record the rating on the first page*

S 2.0 Does the landscape have the potential to support the water quality function of the site?

S 2.1 Is >10% of the area within 150ft on the uphill side of the wetland in land uses that generate pollutants?

No points = 0 **Score: 0**

S 2.2 Are there other sources of pollutants coming into the wetland that are not listed in question S 2.1?

No points = 0 **Score: 0**

S 2.3 What are the other sources of pollutants coming into the wetland?

Total for S 2: 0

Rating of Landscape Potential 3-4 = H 1-2 = M 0 = L *Record the rating on the first page*

Wetland name or number: DPRMA_wetland_C

S 3.0 Is the water quality improvement provided by the site valuable to society?

S 3.1 Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, lake, or marine water that is on the 303(d) list?

No points = 0 **Score: 0**

S 3.2 Is the wetland in a basin or sub-basin where water quality is an issue?

Yes points = 1 **Score: 1**

S 3.3 Has the site been identified in a watershed or local plan as important for maintaining water quality?

No points = 0 **Score: 0**

Total for S 3: **1**

Rating of Value 2-4 = H 1 = M 0 = L *Record the rating on the first page*

SLOPE WETLANDS

Hydrologic Functions - Indicators that the site functions to reduce flooding and stream degradation

S 4.0 Does the site have the potential to reduce flooding and erosion?

S 4.1 What are the characteristics of the plants that reduce the velocity of surface flows during storms?

All other conditions points = 0 **Score: 0**

Total for S 4: **0**

Rating of Site Potential 1 = M 0 = L *Record the rating on the first page*

S 5.0 Does the landscape have the potential to support the hydrologic functions of the site?

S 5.1 Is more than 25% of the area within 150 ft upslope of wetland in land uses or cover that generate excess surface runoff?

No points = 0 **Score: 0**

Total for S 5: **0**

Rating of Landscape Potential 1 = M 0 = L *Record the rating on the first page*

S 6.0 Are the hydrologic functions provided by the site valuable to society?

S 6.1 Is the wetland in a landscape that has flooding problems?

There are no problems with flooding downstream of the wetland points = 0 **Score: 0**

S 6.2 Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan?

No points = 0 **Score: 0**

Total for S 6: **0**

Rating of Value 2-4 = H 1 = M 0 = L *Record the rating on the first page*

Wetland name or number: DPRMA_wetland_C

HABITAT FUNCTIONS

These questions apply to wetlands of all HGM classes - Indicators that the site functions to provide important habitat

H 1.0 Does the wetland have the potential to provide habitat for many species?

H 1.1 What is the structure of the plant community?

- Aquatic Bed
- Emergent
- Scrub-shrub
- Forested
- Multiple strata within the Forested class (canopy, sub-canopy, shrubs, herbaceous, moss/ground cover)

2 structures

points = 1

Score: 1

H 1.2 What are the hydroperiods that meet the size thresholds in the wetland?

- Permanently flooded or inundated
- Seasonally flooded or inundated
- Occasionally flooded or inundated
- Saturated only
- Permanently flowing stream or river in, or adjacent to, the wetland
- Seasonally flowing stream in, or adjacent to, the wetland
- Lake Fringe wetland
- Freshwater Tidal wetland

2 types present

points = 1

Score: 1

H 1.3 What is the richness of the plant species in the wetland?

5-19 species

points = 1

Score: 1

H 1.4 What is the interspersion of habitats?

Low

points = 1

Score: 1

Wetland name or number: DPRMA_wetland_C

H 1.5 What are the special habitat features in the wetland?

- Large, downed, woody debris within the wetland (>4in diameter and 6ft long).
- Standing snags (dbh >4in) within the wetland
- Undercut banks are present for at least 6.6ft (2m) and/or overhanging plants extend at least 3.3ft (1m) over open water or a stream (or ditch) in, or contiguous with the wetland, for at least 33ft (10m)
- Stable steep banks of fine material that might be used by beaver or muskrat for denning (>30 degree slope) OR signs of recent beaver activity are present (cut shrubs or trees that have not yet weathered where wood is exposed)
- At least 0.25ac of thin-stemmed persistent plants 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 every stratum of plants (see H 1.1 for list of strata)

1 habitat selected

points = 1

Score: 1

Total for H 1:

5

Rating of Site Potential

[] 15-18 = H [] 7-14 = M [X] 0-6 = L

Record the rating on the first page

H 2.0 Does the landscape have the potential to support habitat functions of the site?

H 2.1 What is the percentage of accessible habitat within 1km of the wetland?

>33% of 1km Polygon

points = 3

Score: 3

H 2.2 What is the percentage of total habitat in a 1km polygon around the wetland?

Total habitat is >50% of the Polygon

points = 3

Score: 3

H 2.3 What is the land use intensity in the 1km polygon?

<50% of the Polygon is high intensity land use

points = 0

Score: 0

Total for H 2:

6

Rating of Landscape Potential

[X] 4-6 = H [] 1-3 = M [] 0 = L

Record the rating on the first page

Wetland name or number: DPRMA_wetland_C

H 3.0 Is the habitat provided by the site valuable to society?

H 3.1 Does the site provide habitat for species valued in laws, regulations, or policies?

- Aspen Stands
- Biodiversity Areas and Corridors
- Herbaceous Balds
- Old-growth/Mature Forests
- Oregon White Oak
- Riparian
- Westside Prarie
- Fresh Deepwater
- Instream
- Nearshore (Coastal, Open Coast, Puget Sound)
- Caves
- Cliffs
- Snags and Logs
- Talus

The following criteria automatically score 2 points:

- The wetland provides habitat for Threatened or Endangered species
- The wetland is mapped as a location for an individual WDFW priority species
- The wetland is a Wetland of High Conservation Value
- The wetland has been categorized as an important habitat site in a local plan

The site has 1 or 2 WDFW priority habitats within 100m

points = 1

Score: 1

Total for H 3: 1

Rating of Value

[] 2 = H [X] 1 = M [] 0 = L

Record the rating on the first page

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

SC 1.0 Estuarine Wetlands

SC 1.1 Does the wetland meet all of the following criteria for Estuarine wetlands?

- The dominant water regime is tidal
- The wetland is vegetated
- The water salinity is greater than 0.5 ppt

No - Not an Estuarine Wetland

Result: Not an Estuarine Wetland

Wetland name or number: DPRMA_wetland_C

SC 2.0 Wetlands of High Conservation Value

SC 2.1 Is the wetland listed by Washington Natural Heritage Program WDNR as a Wetland of High Conservation Value (WHCV)?

No - Go to SC 2.2

Result: Go to SC 2.2

SC 2.2 Does the wetland have a rare plant species, rare plant community, or high-quality common plant community that may qualify the site as a WHCV?

No - Not a Wetland of High Conservation Value

Result: Not a Wetland of High Conservation Value

SC 3.0 Bogs

SC 3.1 Does an area within the wetland unit have organic soil horizons, either peats or mucks, that compose 16in or more of the first 32in of the soil profile?

No - Go to SC 3.2

Result: Go to SC 3.2

SC 3.2 Does an area within the wetland unit have organic soils, either peats or mucks, that are less than 16 in deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond?

No - Not a Bog Wetland

Result: Not a Bog Wetland

SC 4.0 Forested Wetlands

SC 4.1 Does the wetland have at least 1 contiguous acre of forest that meets one of the following criteria?

Old-growth forests

Mature forests

No - Not a Forested Wetland

Result: Not a Forested Wetland

SC 5.0 Wetlands in Coastal Lagoons

SC 5.1 Coastal Lagoons: 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 rocks

The depression in which the wetland is located contains ponded water that is saline or brackish (>0.5 ppt) during most of the year in at least a portion of the open water area (measured near the bottom)

No - Not a Coastal Lagoon Wetland

Result: Not a Coastal Lagoon Wetland

Wetland name or number: DPRMA_wetland_C**SC 6.0 Interdunal Wetlands****SC 6.1** Is the wetland west of the 1889 line (also called the Western Boundary of Upland Ownership WBUO)?

No - Not an Interdunal Wetland

**Result: Not an
Interdunal Wetland****Category of wetland based on Special Characteristics**

If you answered No for all types, enter "Not Applicable" on Summary Form

**Final Category: Not
Applicable**

Add/Remove map data layers

^ Habitat Items

Generates excessive runoff

Generates pollutants

Generates excessive runoff and pollutants

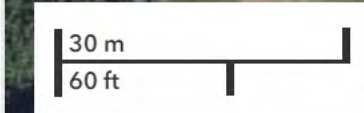
Upland within 150' wetland buffer

Wetland

Wetland buffer (150')

Find address or place

Bing Imagery



Data transparency 10%

Add/Remove map data layers

Wetland Width Items

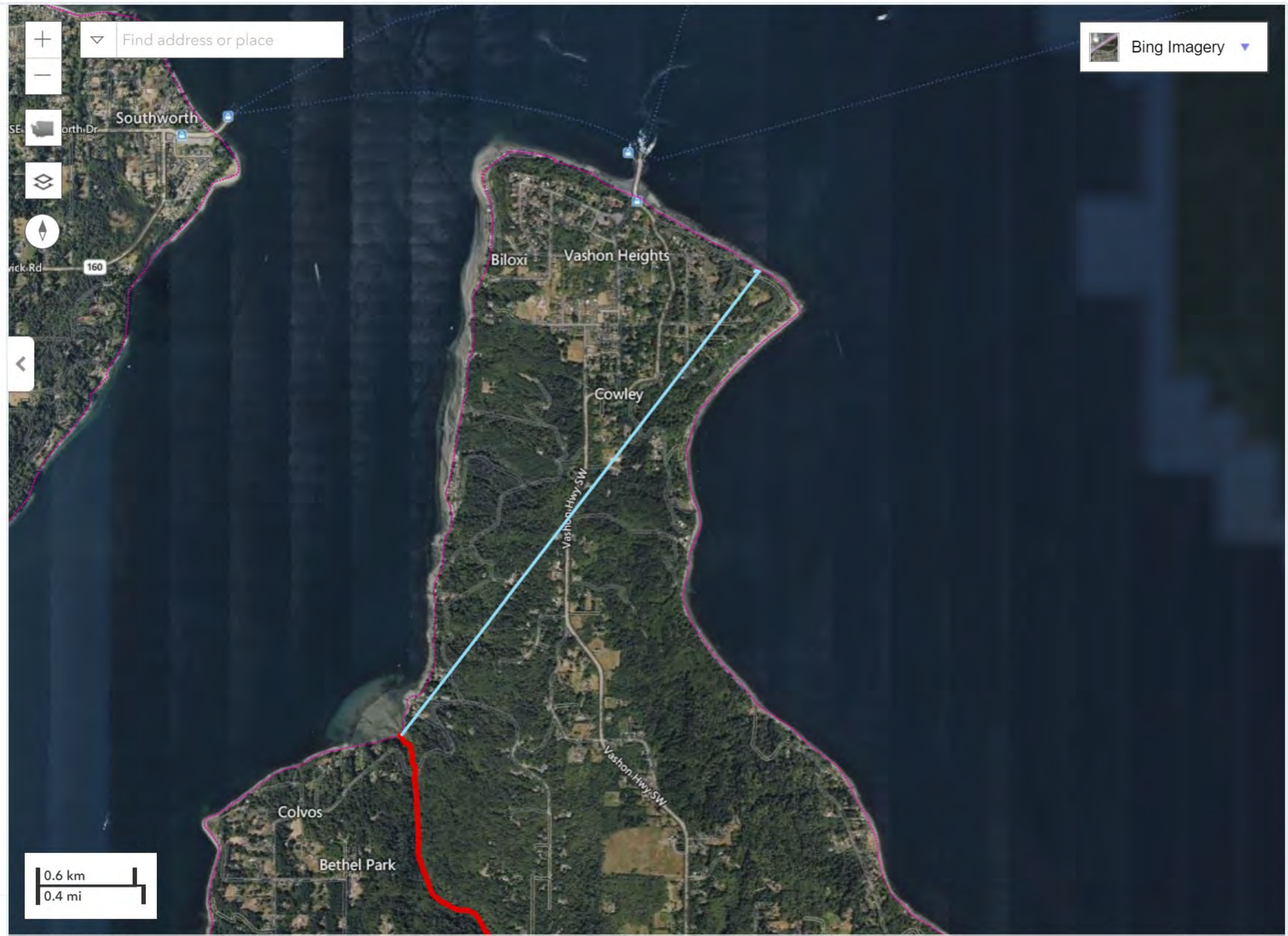
- Wetland
- Distance from wetland to nearest 303(d) listing

303(d) List

- Category 5 Water
- Category 5 Sediment

Subbasins (12 digit HUCs)

- HUC boundary

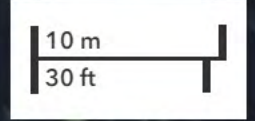


Add/Remove map data layers

Cowardin Plant Class Items

Cowardin Classes

- Forested
- Scrub-shrub
- Emergent
- Aquatic bed
- Open water
- Wetland/Unmapped wetland

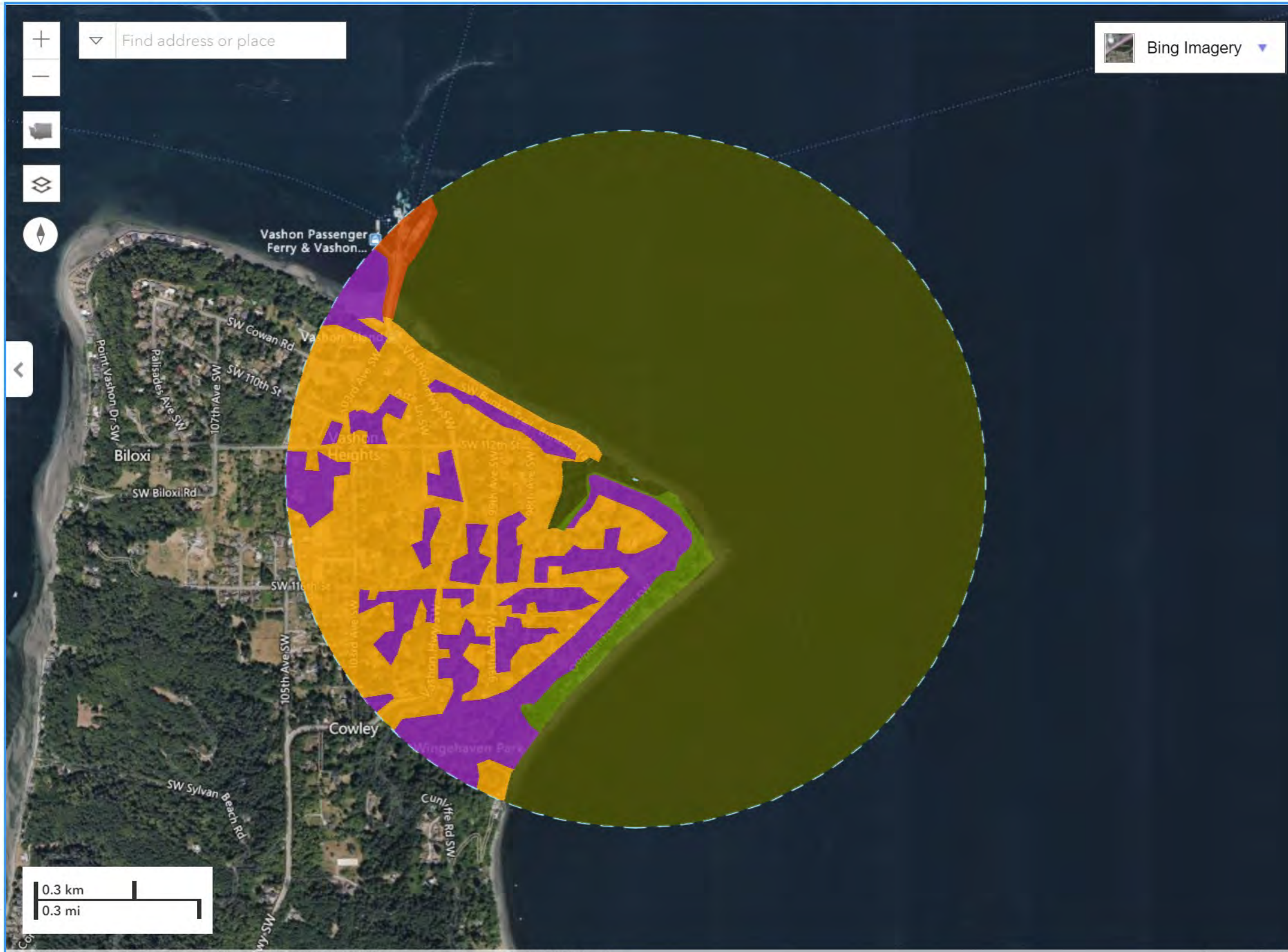


Data transparency 10%

Add/Remove map data layers

^ Habitat Items

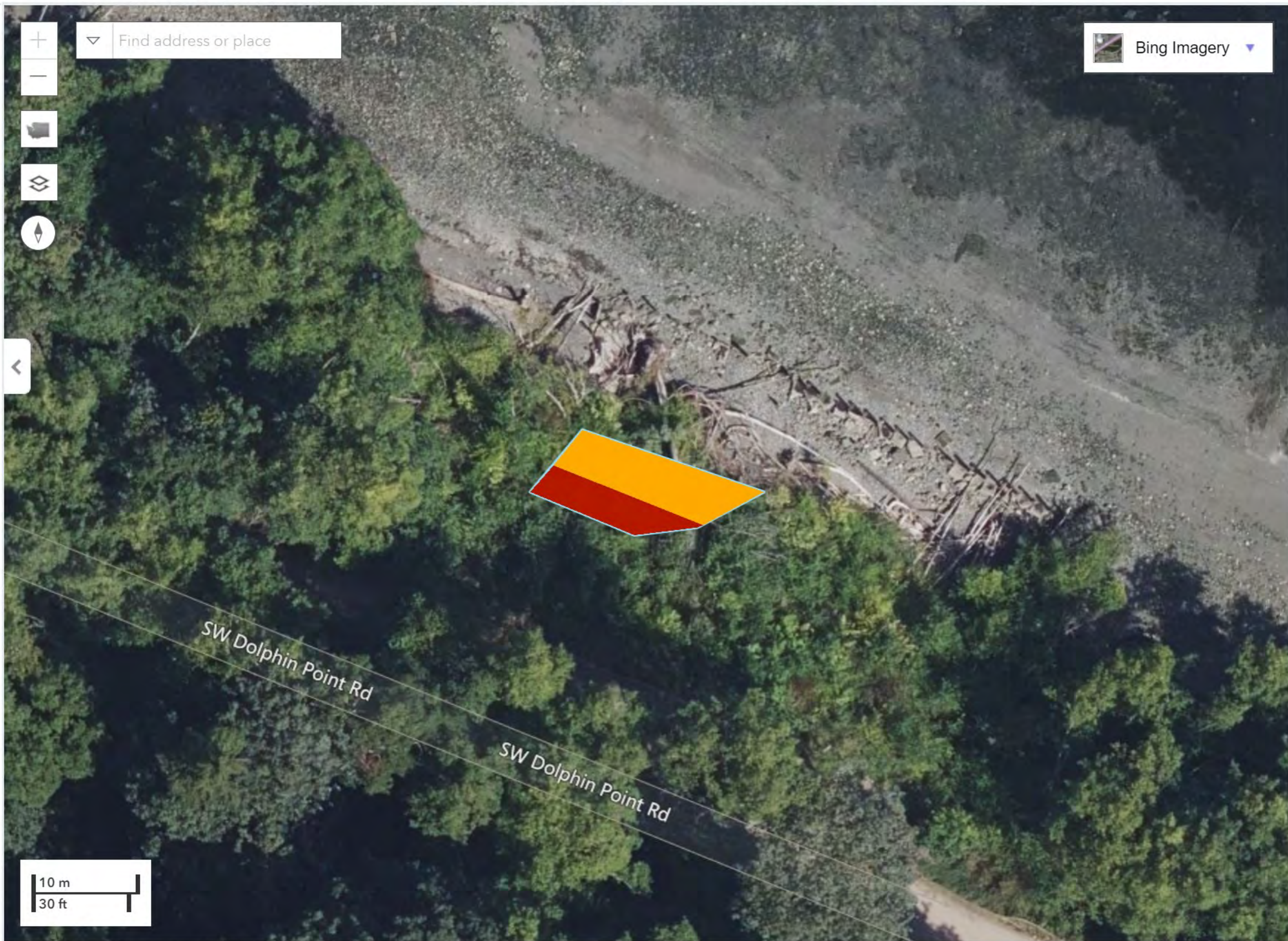
- Relatively undisturbed - accessible
- Low/Moderate intensity - accessible
- Relatively undisturbed - not accessible
- Low/Moderate intensity - not accessible
- High Intensity
- Wetland
- Unmapped wetland buffer (1 km)



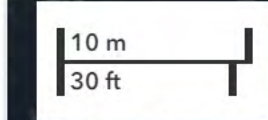
Data transparency 10%

Find address or place

Bing Imagery



Map navigation controls including zoom in (+), zoom out (-), pan, home, layers, and compass.



Define hydroperiods

Pan - Identify
 Draw Boundary
 Import Shapefile
 Edit Boundary

Hydroperiod

Tool Help ▾ Draw Boundary

- Seasonally [delete](#)
- Occasionally [delete](#)

Transparency

Mark as done Success

Add/Remove map data layers

^ Plant Cover (Dense and Rigid Slopes) Items

Wetland

Plant Cover

Dense woody

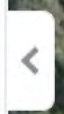
Dense herbaceous rigid

Dense herbaceous non-rigid



Find address or place

Bing Imagery



Data transparency 10%

Add/Remove map data layers

Project Area Items

Wetland

Project Area

Parcels

Parcel boundary





Bing Imagery

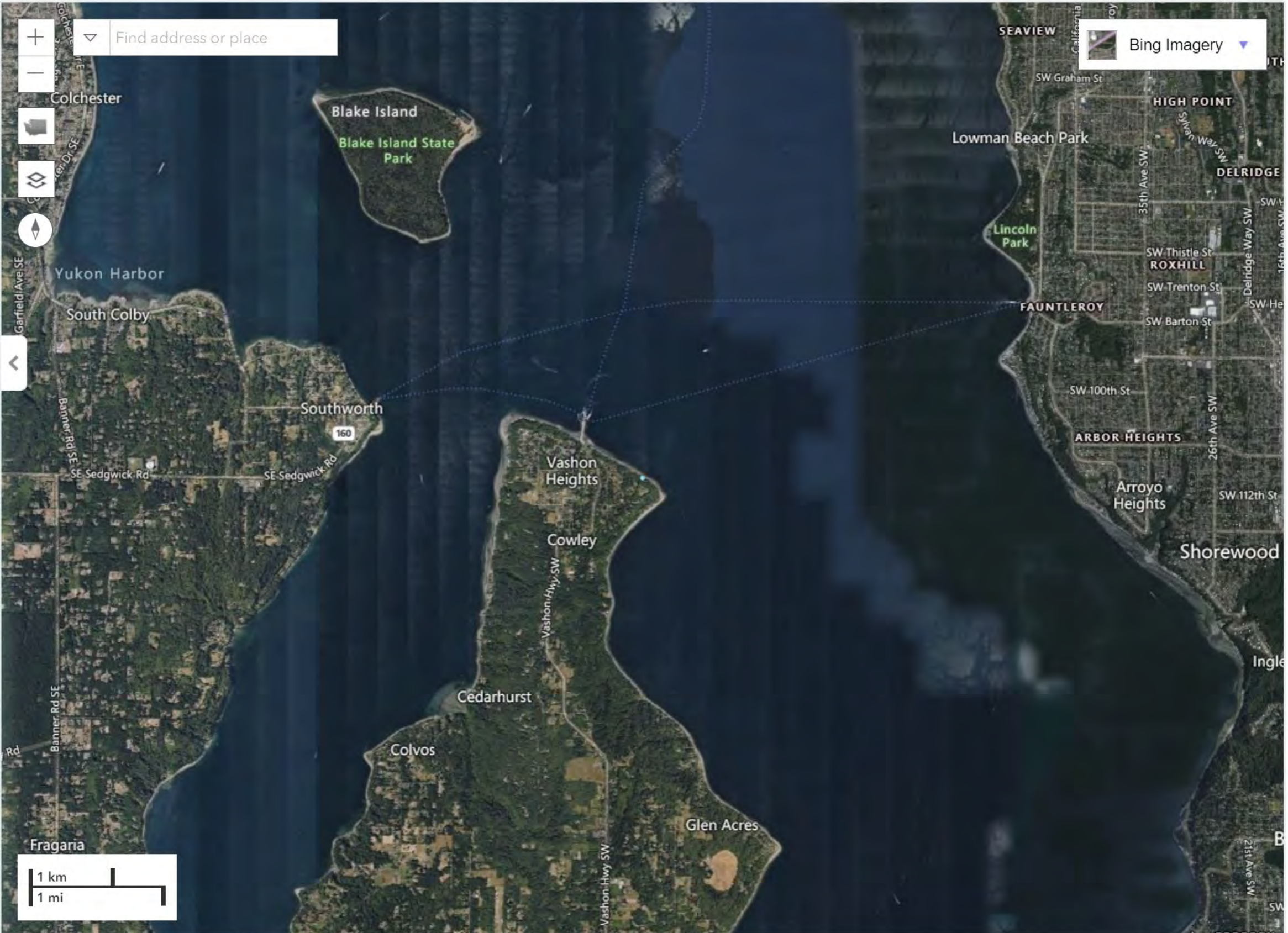


Data transparency 10%

TMDL ?

 **Pan - Identify**

Mark as done  Success



**Appendix D: USFWS IPaC Official Species List &
WDFW Priority Habitats and Species**



United States Department of the Interior



FISH AND WILDLIFE SERVICE
Washington Fish And Wildlife Office
510 Desmond Drive Se, Suite 102
Lacey, WA 98503-1263
Phone: (360) 753-9440 Fax: (360) 753-9405

In Reply Refer To:

04/16/2024 19:38:20 UTC

Project Code: 2024-0077961

Project Name: Kennedy-Goetz Bulkhead Replacement Project

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological

evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

<https://www.fws.gov/sites/default/files/documents/endangered-species-consultation-handbook.pdf>

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts, see <https://www.fws.gov/program/migratory-bird-permit/what-we-do>.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures, see <https://www.fws.gov/library/collections/threats-birds>.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit <https://www.fws.gov/partner/council-conservation-migratory-birds>.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Washington Fish And Wildlife Office
510 Desmond Drive Se, Suite 102
Lacey, WA 98503-1263
(360) 753-9440

PROJECT SUMMARY

Project Code: 2024-0077961

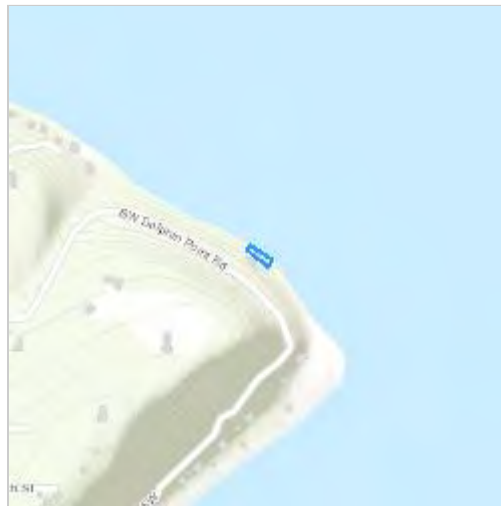
Project Name: Kennedy-Goetz Bulkhead Replacement Project

Project Type: Bulkhead - Maintenance/Modification

Project Description: The proposed project will replace the compromised existing timber and concrete bulkhead with an angular rock bulkhead, designed to protect the existing single-family residence from continued shoreline erosion due to significant wind- and wave-action at this location.

Project Location:

The approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/@47.50424769999999,-122.45295508987476,14z>



Counties: King County, Washington

ENDANGERED SPECIES ACT SPECIES

There is a total of 6 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries¹, as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

-
1. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
North American Wolverine <i>Gulo gulo luscus</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5123	Threatened

BIRDS

NAME	STATUS
Marbled Murrelet <i>Brachyramphus marmoratus</i> Population: U.S.A. (CA, OR, WA) There is final critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/4467	Threatened
Yellow-billed Cuckoo <i>Coccyzus americanus</i> Population: Western U.S. DPS There is final critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3911	Threatened

REPTILES

NAME	STATUS
Northwestern Pond Turtle <i>Actinemys marmorata</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1111	Proposed Threatened

FISHES

NAME	STATUS
Bull Trout <i>Salvelinus confluentus</i> Population: U.S.A., coterminous, lower 48 states There is final critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8212	Threatened

INSECTS

NAME	STATUS
Monarch Butterfly <i>Danaus plexippus</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

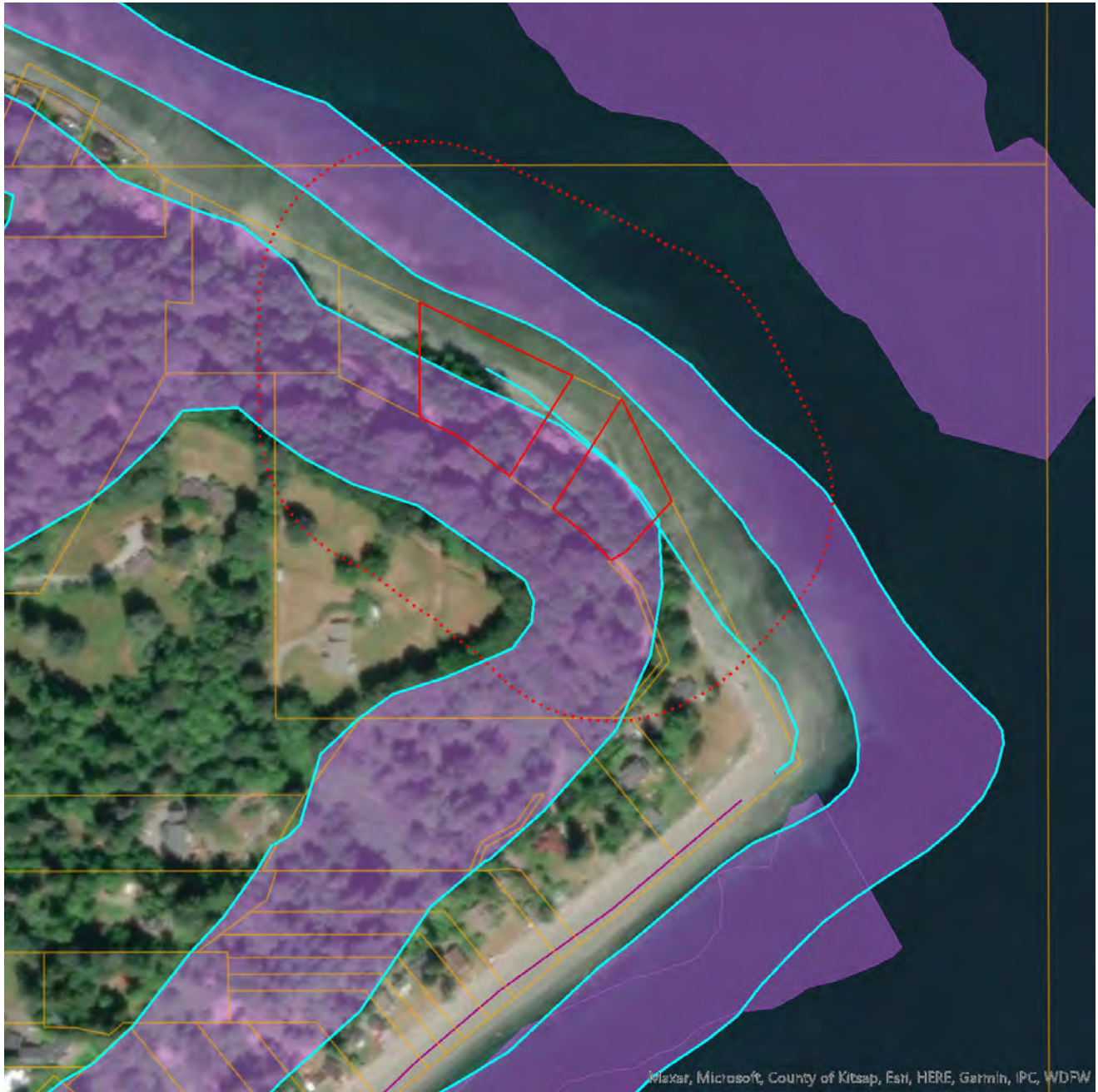
CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.



Priority Habitats and Species on the Web



Buffer radius: 300 Feet

Report Date: 05/16/2024, Parcel ID: [0823039070](#)

PHS Species/Habitats Overview:

Occurrence Name	Federal Status	State Status	Sensitive Location
Surf Smelt	N/A	N/A	No
Biodiversity Areas And Corridor	N/A	N/A	No
Estuarine and Marine Wetland	N/A	N/A	No

PHS Species/Habitats Details:

Surf Smelt	
Scientific Name	<i>Hypomesus pretiosus</i>
Priority Area	Breeding Area
Site Name	Station Number: 19
Accuracy	NA
Source Record	11245
Source Dataset	Forage_Fish_Survey
Source Date	Forage_Fish_Survey
Source Name	Not Given
Source Entity	WDFW
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Species or Habitat
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
Geometry Type	Lines

Biodiversity Areas And Corridor	
Priority Area	Terrestrial Habitat
Site Name	VASHON/MAURY ISLAND OPEN SPACE
Accuracy	1/4 mile (Quarter Section)
Notes	MINIMALLY DISTURBED FORESTED AREAS. SOME ON STEEP SLOPES AND SOME CONTAIN SMALLSTREAMS OR SPRINGS AND ASSOCIATED RIPARIAN CORRIDORS.
Source Record	902691
Source Dataset	PHSREGION
Source Name	OPPERMANN, TONY
Source Entity	WA Dept. of Fish and Wildlife
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=00023
Geometry Type	Polygons

Estuarine and Marine Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Estuarine and Marine Wetland - NWI Code: E2AB/USN
Source Dataset	NWIIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

DISCLAIMER. This report includes information that the Washington Department of Fish and Wildlife (WDFW) maintains in a central computer database. It is not an attempt to provide you with an official agency response as to the impacts of your project on fish and wildlife. This information only documents the location of fish and wildlife resources to the best of our knowledge. It is not a complete inventory and it is important to note that fish and wildlife resources may occur in areas not currently known to WDFW biologists, or in areas for which comprehensive surveys have not been conducted. Site specific surveys are frequently necessary to rule out the presence of priority resources. Locations of fish and wildlife resources are subject to variation caused by disturbance, changes in season and weather, and other factors. WDFW does not recommend using reports more than six months old.

IPAC USER CONTACT INFORMATION

Agency: Private Entity
Name: Janae Dinkins
Address: 8047 Burke Ave N
City: Seattle
State: WA
Zip: 98103
Email: dinkins@leon-environmental.com
Phone: 2142635575



United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for King County Area, Washington



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

Preface	2
How Soil Surveys Are Made	5
Soil Map	8
Soil Map.....	9
Legend.....	10
Map Unit Legend.....	11
Map Unit Descriptions.....	11
King County Area, Washington.....	13
AkF—Alderwood and Kitsap soils, very steep.....	13
Cb—Coastal beaches.....	14
References	16

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

Custom Soil Resource Report

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

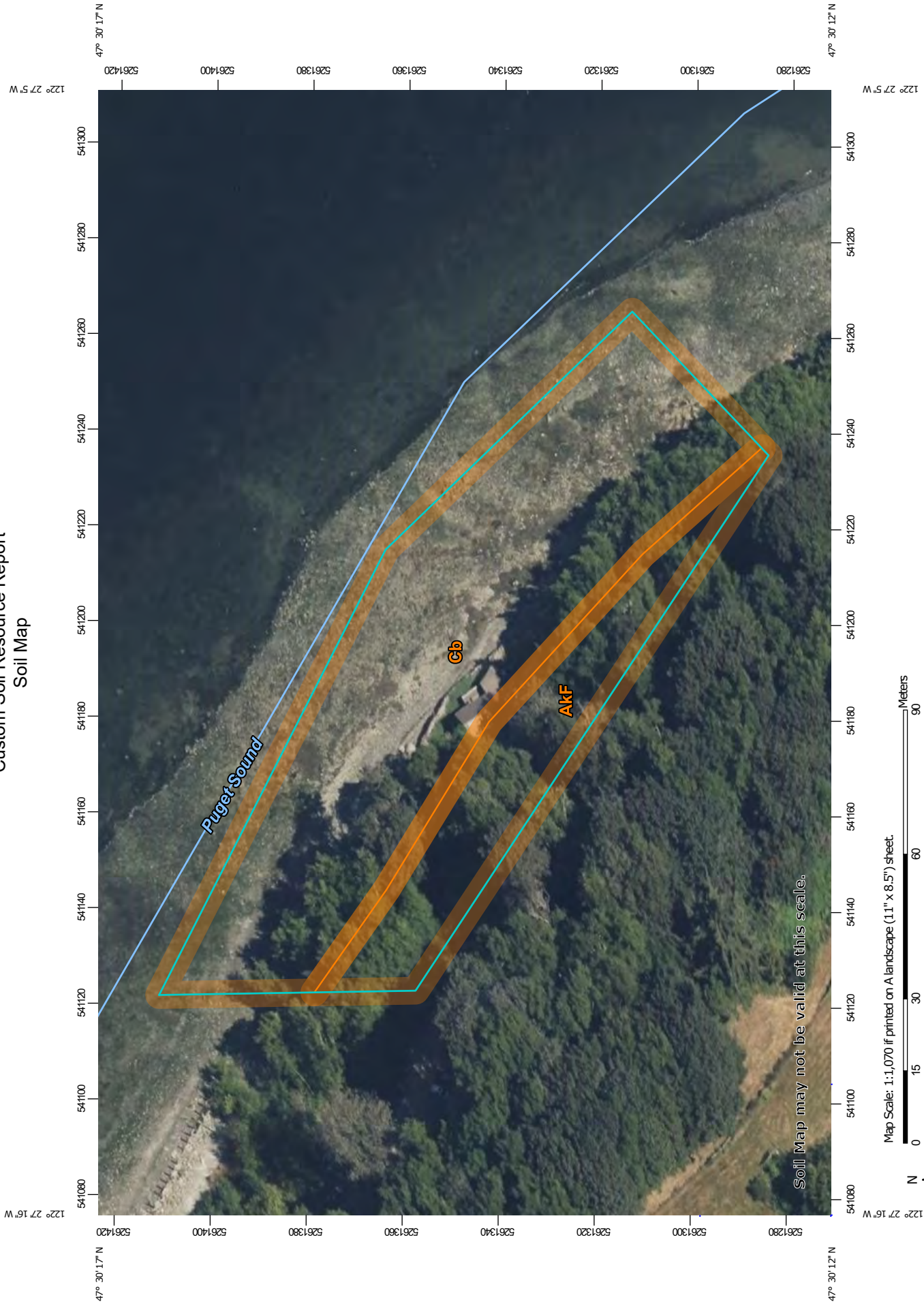
Custom Soil Resource Report

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map


































Map Scale: 1:1,070 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84



MAP LEGEND

- Area of Interest (AOI)**
-  Area of Interest (AOI)
- Soils**
-  Soil Map Unit Polygons
-  Soil Map Unit Lines
-  Soil Map Unit Points
- Special Point Features**
-  Blowout
-  Borrow Pit
-  Clay Spot
-  Closed Depression
-  Gravel Pit
-  Gravelly Spot
-  Landfill
-  Lava Flow
-  Marsh or swamp
-  Mine or Quarry
-  Miscellaneous Water
-  Perennial Water
-  Rock Outcrop
-  Saline Spot
-  Sandy Spot
-  Severely Eroded Spot
-  Sinkhole
-  Slide or Slip
-  Sodic Spot
-  Spoil Area
-  Stony Spot
-  Very Stony Spot
-  Wet Spot
-  Other
-  Special Line Features
- Water Features**
-  Streams and Canals
- Background**
-  Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL:
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: King County Area, Washington
 Survey Area Data: Version 19, Aug 29, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 31, 2022—Aug 8, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AkF	Alderwood and Kitsap soils, very steep	0.5	25.1%
Cb	Coastal beaches	1.4	74.9%
Totals for Area of Interest		1.9	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

Custom Soil Resource Report

onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

King County Area, Washington

AkF—Alderwood and Kitsap soils, very steep

Map Unit Setting

National map unit symbol: 1hmsn
Elevation: 50 to 800 feet
Mean annual precipitation: 25 to 60 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 160 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Alderwood and similar soils: 50 percent
Kitsap and similar soils: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Alderwood

Setting

Landform: Till plains, moraines
Parent material: Basal till with some volcanic ash

Typical profile

H1 - 0 to 12 inches: gravelly ashy sandy loam
H2 - 12 to 27 inches: very gravelly sandy loam
H3 - 27 to 60 inches: very gravelly sandy loam

Properties and qualities

Slope: 25 to 70 percent
Depth to restrictive feature: 24 to 40 inches to densic material
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 18 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: F002XA004WA - Puget Lowlands Forest
Hydric soil rating: No

Description of Kitsap

Setting

Landform: Terraces
Parent material: Lacustrine deposits with a minor amount of volcanic ash

Typical profile

H1 - 0 to 5 inches: ashy silt loam
H2 - 5 to 24 inches: ashy silt loam
H3 - 24 to 60 inches: stratified silt to silty clay loam

Properties and qualities

Slope: 25 to 70 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 11.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: F002XA004WA - Puget Lowlands Forest
Hydric soil rating: No

Cb—Coastal beaches

Map Unit Composition

Beaches: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Beaches

Setting

Landform: Beaches

Typical profile

H1 - 0 to 60 inches: Error

Properties and qualities

Slope: 1 to 5 percent
Depth to water table: About 0 inches
Frequency of flooding: Very frequent

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

Minor Components

Tidal marsh

Percent of map unit: 5 percent
Landform: Alluvial cones
Hydric soil rating: Yes

Custom Soil Resource Report

References

- American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.
- American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.
- Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.
- Federal Register. July 13, 1994. Changes in hydric soils of the United States.
- Federal Register. September 18, 2002. Hydric soils of the United States.
- Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.
- National Research Council. 1995. Wetlands: Characteristics and boundaries.
- Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262
- Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577
- Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580
- Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.
- United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.
- United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374
- United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. <http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084>

Custom Soil Resource Report

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf