ENVIRONMENTAL ASSESSMENT

Port of Port Angeles

Intermodal Handling and Transfer Facility Improvements Project
Port Angeles, Washington

June 2025

Prepared for
US Department of Transportation
Maritime Administration

And

Port of Port Angeles
Port Angeles, Washington

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LIST OF ABBREVIATIONS AND ACRONYMS

APE	area of potential effect
BFE	base flood elevation
bgs	below ground surface
BMP	best management practice
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CH_4	methane
CIP	Capital Improvement Plan
City	City of Port Angeles
CO	carbon monoxide
COD	chemical oxygen demand
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
CZMP	Coastal Zone Management Program
DAHP	Washington State Department of Archaeology and Historic Preservation
dBA	A-weight decibels
DPS	distinct population segment
EA	environmental assessment
Ecology	Washington State Department of Ecology
EFH	Essential Fish Habitat
EO	executive order
EPA	US Environmental Protection Agency
ESA	Endangered Species Act
ESU	evolutionarily significant unit
FHWA	Federal Highway Administration
FPPA	Farmland Protection Policy Act
ft	foot/feet
FTA	Federal Transit Administration
HCI	Hart Crowser, Inc.
HTL	high tide line
IH	industrial heavy
IHTF	Intermodal Handling and Transfer Facility
IPaC	Information for Planning and Consultation
in/s	inches per second
ISGP	Industrial Stormwater General Permit

LIST OF ABBREVIATIONS AND ACRONYMS (CONTINUED)

LEKT	Lower Elwha Klallam Tribe
Leq	equivalent continuous sound pressure level
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MARAD	Maritime Administration
MMPA	Marine Mammal Protection Act
MHHW	mean higher-high water
MHW	mean high water
MIDP	Monitoring and Inadvertent Discovery Plan
MLLW	mean lower-low water
MOA	Memorandum of Agreement
MOVES	Motor Vehicle Emission Simulator
MSE	mechanically stabilized earth
MTCA	Model Toxics Control Act
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act of 1969
NGVD	National Geodetic Vertical Datum
NHPA	National Historic Preservation Act of 1966
NMFS	National Marine Fisheries Service
NO_X	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
ODT	Olympic Discovery Trail
03	Ozone
PAMC	Port Angeles Municipal Code
PAH	polycyclic aromatic hydrocarbon
PHS	Priority Habitats and Species
PIDP	Port Infrastructure Development Program
PLP	potentially liable person
Port	Port of Port Angeles
PPV	peak particle velocity
Project/Proposed Action	IHTF Improvements Project
RHA	Rivers and Harbors Act
RIWP	remedial investigation work plan
RCNM	roadway construction noise model
sf	square foot/square feet

LIST OF ABBREVIATIONS AND ACRONYMS (CONTINUED)

SHPO	State Historic Preservation Offices
SIP	State Implementation Plan
SMA	Shoreline Management Act
SMP	Shoreline Master Program
SO_2	sulfur dioxide
SR	State Route
SWPPP	Stormwater Pollution Prevention Plan
TSS	total suspended solids
USACE	US Army Corps of Engineers
USC	United States Code
USDA	US Department of Agriculture
USDOT	US Department of Transportation
USFWS	US Fish and Wildlife Service
VOC	volatile organic compound
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WOTUS	Waters of the United States
WRDA	Water Resources Development Act
WDNR	Washington State Department of Natural Resources
WQC	Water Quality Certification

1.0 INTRODUCTION

This Environmental Assessment (EA) was prepared in accordance with the National Environmental Policy Act of 1969 (NEPA); the Council on Environmental Quality (CEQ) regulations implementing NEPA (40 CFR §§ 1501-1508)[1]; 42 United States Code (USC) §§ 4321-4370f; US Department of Transportation (USDOT) Order 5610.1C (Procedures for Considering Environmental Impacts); and the Maritime Administration (MARAD) Maritime Administrative Order 600-1.

Landau Associates, Inc. prepared this EA on behalf of the Port of Port Angeles (Port) to address the potential environmental impacts related to the proposed Intermodal Handling and Transfer Facility (IHTF) Improvements Project (Proposed Action).

The Port received federal funding to implement the Proposed Action, which requires review under NEPA. Federal funding awarded to the Port for the Proposed Action includes a MARAD grant under the Port Infrastructure Development Program (PIDP) 2022 and a US Army Corps of Engineers (USACE) grant under the Water Resources Development Act (WRDA). The details regarding the allocation of project components funded by the two federal agencies are provided below in Section 1.1.1. MARAD is the lead Federal agency for the oversight of the NEPA process for the Proposed Action.

1.1 Project Description

The Intermodal Harbor Transfer Facility is a 32-acre waterfront log yard in Port Angeles, Washington, directly adjacent to the Port Angeles Harbor on the Strait of Juan de Fuca. Owned and operated by the Port of Port Angeles, the IHTF plays a crucial role in the regional timber trade, facilitating the export and import of logs and wood chips (wood fiber) from the region's extensive public and private timberlands in Clallam and Jefferson Counties.

Wood fiber (raw logs and wood chips), sourced from local and regional forests, is staged, stored, and sorted at the IHTF for domestic and international markets. It is transported to and from the facility via various modes:

- Water: Barges dock at the existing Cofferdam Dock barge facility, directly adjacent to the harbor.
- Land: Trucks and containers utilize the state highway system.

The IHTF's operations support the regional timber industry, including local sawmills and paper and sawmills in the greater Pacific Northwest region.

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[1] MARAD is aware of CEQ's rescission of its NEPA-implementing regulations at 40 CFR 1500–1508. This environmental assessment was prepared when the CEQ regulations (40 CFR 1500–1508) were still in effect. In an effort to efficiently process NEPA documents, this document may still reflect previous CEQ regulatory language. MARAD also utilized the Department of Transportation (USDOT Order 5610.1C) and MARAD (MAO 600-1) procedures implementing NEPA, to meet the agency's obligations under NEPA, 42 U.S.C. 4321 et seq.

The IHTF is situated within an industrial zone, bordered by the Lower Elwha Klallam Tribe land, a paper mill, and a public marina to the east and west. To the south, the facility adjoins a marina bluff and residential properties.

The Port of Port Angeles proposes to enhance the cargo-handling infrastructure at the IHTF, located at 1301 Marine Drive, Port Angeles, Washington (Figure 1).

Figure 1 – Vicinity Map

The IHTF Improvements Project (Project) encompasses 12 acres of the existing 32-acre facility and includes the following elements within the Project Area (Figure 2):

1. Cofferdam Dock Facility Improvements

The Cofferdam Dock Facility is a barge loading structure or berth that consists of approximately 335 linear feet of steel sheet pile, forming the primary wall, which is laterally supported by a parallel sheet pile wall situated roughly 30 feet landward. Multiple 24-inch-diameter steel pipe piles extend landward from the water-facing sheet pile wall and are positioned behind stacked ecology blocks, which serve to retain earthen material along the sheet pile wall's edge. Structural tie rods link the two sheet pile walls and are anchored to a double-channel waler beam positioned above the mean higher high water (MHHW) mark, ensuring stability and load distribution.

The Cofferdam Dock Facility Improvements include the following elements (See Appendix A for Cofferdam Dock Facility permit drawings):

- Construction of a mechanically stabilized earth (MSE) wall because the existing backfill material behind the waterward sheet pile wall, consisting of loose fill and wood debris, is unsuitable for long-term industrial use. The MSE wall behind the waterward sheet pile wall will provide a durable foundation for industrial activities at the log yard.

  Construction will be conducted from the upland side of the sheet pile wall using excavators. The project involves excavating material landward of the sheet pile to an elevation of 3 feet above mean lower low water (MLLW) (approximately 12 feet below ground surface). Excavation will extend 60 feet landward from the waterward sheet pile wall, with slopes graded between 2:1 and 1:1 as site conditions allow. The MSE wall will be built using compacted gravel borrow backfill with geogrid reinforcement every 2 feet. The upper 2 feet will be surfaced with quarry spalls and crushed rock to create a stable, permeable surface.

  Existing ecology blocks will be relocated during construction and placed directly upland of the waterward sheet pile wall in their original footprint. A 1-foot-wide section of free-draining rock will be installed along the length of the wall, with weep holes added to facilitate stormwater drainage. Site stormwater conveyance will be addressed separately in a future project.

- The installation of fiberglass encasement sheets along the waterward side of the existing sheet pile bulkhead to protect this structure. This improvement includes installing a custom-fabricated, 1.25-inch-thick fiberglass encasement approximately 1 inch waterward of the existing wall. This encasement is designed to conform precisely to the shape of the sheet pile wall, providing a protective barrier to prevent further steel corrosion and extend the structure's service life. The encasement will be installed along the full 335 linear feet of the wall, including its sides, and will extend approximately 6 inches below the mudline.

  Installation will be carried out using an excavator staged from the log yard. The excavator will position the encasement and press it into the mudline, with minor adjustments to riprap along the structure's sides if necessary. The approximately 1-inch gap between the fiberglass encasement and the sheet pile wall will then be filled with underwater epoxy grout, ensuring a secure seal. Divers will assist in the grouting process, beginning at the lowest elevation and proceeding upward to the top elevation of 11 feet above (MLLW).

- Replacing the existing contiguous waler beam in kind to restore the structural integrity of the wall. Additionally, the tie rods connecting the waterward sheet pile to the landward sheet pile will be inspected and serviced. This work will include installing end caps, anti-corrosion wraps, and grout plugs to enhance durability and prevent further deterioration.

  The replacement and servicing activities will be conducted during upland excavation when these structural components are fully exposed. An excavator or pulley system, used in conjunction with a skiff, will facilitate the installation of the waler beams and end caps, ensuring precision and minimizing environmental impact.

2. IHTF Upland Site Improvements

The Project footprint, comprising 12 acres[2], will be regraded and resurfaced with high-load capacity asphalt concrete. A stormwater treatment facility will also be constructed to support compliance with the Port's National Pollutant Discharge Elimination System Industrial Stormwater General Permit (ISGP). Ground disturbance will be minimized by raising the ground elevation with the placement of crushed rock, installation of geogrid reinforcement, and placement of asphalt concrete pavement. Additionally, approximately 6 acres of the IHTF will be set aside for mitigation under Section 106 consultation to address cultural resource considerations. The existing office Conex/trailer and truck scale in this mitigation footprint will be relocated or constructed on the 12-acre resurfaced footprint. The existing 1,500-square-foot warehouse building adjacent to the office will be demolished and not rebuilt or relocated.

The stormwater treatment facility will be a three-stage biofiltration facility. Stage 1 is a pre-filter that will consist of a pea gravel filter medium that will be installed in three 18,000-gallon steel tanks. Stage 2 will filter stormwater through a biofiltration soil mix placed in an aboveground, cast-in-place concrete retaining wall structure. Lastly, the stormwater will pass through a stage 3 polishing medium, which will similarly be installed in an aboveground, cast-in-place concrete retaining wall structure. The polishing medium will be installed later after sufficient data are collected from water quality monitoring of the inflow and outflow of the stage 2 treatment cell. Surface runoff from the IHTF will drain or sheet flow to a pump station, conveying flows to the proposed biofiltration system. From the proposed biofiltration system, treated stormwater will be discharged through an existing Port-owned outfall pipe. The IHTF grading plan will also include approximately 1.55 acres of additional impervious surfaces that drain to an adjacent low spot and pond. This collected stormwater will be pumped to the biofiltration treatment system, as necessary, during the wet season.

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[2] The upland resurfacing footprint for the project has been modified from the originally proposed 14.4 acres, as detailed in the ESA Section 7 consultation, to 12 acres. This change is due to the inclusion of 2.9 acres of proposed paving area around the existing truck scales within a 6.13-acre "Protection Area" designated to protect cultural resources as required by Section 106 mitigation measures.

The resurfacing of the Log Yard will have significant water quality benefits by reducing the amount of sediment and woody debris that becomes suspended in stormwater runoff. These improvements will allow for routine sweeping and collection of sediment and wood debris, which will significantly reduce the pollutant load that needs to be filtered out by the proposed biofiltration system prior to discharge to Port Angeles Harbor. Additionally, the resurfacing will enhance the efficiency of cargo handling, providing a smoother and more durable surface for operations and further improving overall productivity at the facility.

1.1.1 Project Funding Allocation

The proposed IHTF improvements outlined above will be funded through a combination of MARAD's PIDP and USACE's WRDA funding. The allocation of project components between these funding programs is as follows:

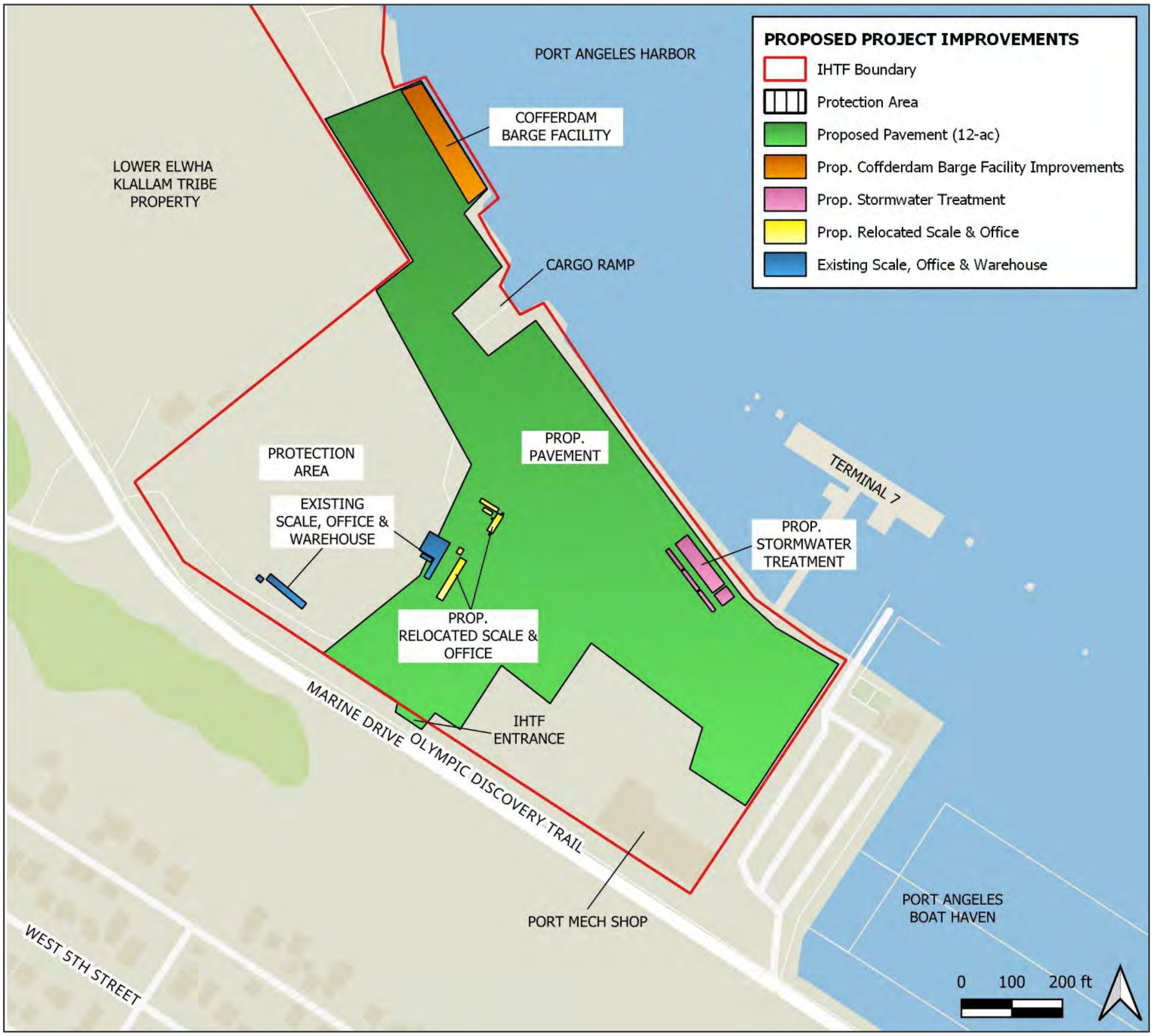
MARAD PIDP

- 100% of the Cofferdam Dock Facility improvements
- 10 acres of upland paving
- 100% of the relocation or reconstruction of the office trailer and truck scale

USACE WRDA

- 2 acres of upland paving
- 100% of the stormwater biofiltration facility

Figure 2 – Project Overview



1.2 Project Purpose and Need

The Port of Port Angeles is committed to enhancing safety, efficiency, and reliability at its Intermodal Transfer Facility (IHTF) in order to support the regional forest products industry. The IHTF is a critical component of the regional transportation network, facilitating the movement of forest products through domestic and international supply chains. The proposed improvements to the IHTF, including resurfacing and structural upgrades, are essential to maintain and enhance the facility's ability to efficiently handle increasing cargo volumes, while also ensuring the safety of personnel and equipment.

The purpose of the proposed action is to address the current operational inefficiencies at the IHTF, specifically in the loading and unloading of forest products, and to improve the overall performance of the facility. The existing conditions at the facility, including an uneven and deteriorating upland yard surface and structural deficiencies at the Cofferdam Dock, create significant operational challenges. These inefficiencies limit the Port's capacity to meet potential future demand and hinder its ability to handle forest products efficiently. The proposed improvements will directly enhance throughput capacity, streamline the movement of goods within and around the facility, and reduce the time and resources required for loading and unloading.

The primary need for the proposed improvements is to:

1. **Enhance the Safety and Efficiency of Operations:** The Current conditions at the Cofferdam Dock and upland yard present operational challenges, including delays in transit, equipment malfunctions, and increased wear and tear on machinery due to uneven surfaces and structural deficiencies. By resurfacing the upland IHTF with smooth, consistent asphalt, improving drainage, and upgrading the structural integrity of the Cofferdam Dock, the project will reduce disruptions and improve safety for Port personnel and stakeholders.
2. I**mprove Throughput and Capacity:** While the Port is not anticipated to increase its overall cargo throughput, as this is tied to regional and international markets, the proposed improvements will enhance the Port's ability to meet greater demand if needed. The facility has seen a 13% annual increase in load counts over the past three years, and the resurfacing and structural upgrades are expected to improve efficiency by approximately 10%, reducing the time required for loading and unloading operations. These enhancements will better position the Port to handle both current and potential future increases in demand, particularly for forest products.
3. **Ensure Long-Term Resilience and Compliance with Environmental Standards:** The Cofferdam Dock, originally designed as a temporary structure, is critical to the Port's operations. Without necessary structural upgrades, the facility risks losing this vital piece of infrastructure, which could lead to significant operational disruptions. The proposed improvements, including raising the Cofferdam Dock to mitigate high tide and storm surge damage, will ensure that the Port can continue to operate safely and meet environmental requirements, such as National Pollutant Discharge Elimination System (NPDES) permit benchmarks for stormwater management.
4. **Promote Economic Vitality:** The Port's IHTF plays a key role in the regional economy by providing an affordable, reliable logistics hub for over a dozen forest products companies. The proposed improvements will help the Port maintain its competitive pricing structure, support the growth of the forest products industry, and attract new business opportunities. Enhanced efficiency at the IHTF will also reduce congestion around the Port and improve access to markets both regionally and internationally, benefiting the local economy.

In summary, the purpose of the proposed action is to upgrade the IHTF to ensure the facility can meet current and future demand, enhance safety and operational efficiency. These improvements are vital for the continued success of the Port of Port Angeles and the region's forest products industry.

2.0 ALTERNATIVES CONSIDERED

This section describes the reasonable alternatives considered for the Proposed Action, which consist of the No Action Alternative and the Action Alternative.

2.1 No Action Alternative

In accordance with NEPA and the CEQ implementing regulations (40 CFR §§ 1500–1508), the No Action Alternative must be considered and analyzed as part of the Environmental Assessment to provide a baseline for comparing the potential impacts of the Proposed Action. Under the No Action Alternative, the Port would not conduct the Proposed Action. The No Action Alternative fails to address critical inefficiencies and structural deficiencies at the IHTF, hindering safety, efficiency, and the Port's ability to support the regional forest products industry; as such, the Project's purpose and need would not be met, although the No Action Alternative is considered within this document.

2.2 Action Alternative

The Action Alternative (Proposed Action) encompasses 12 acres of the existing 32-acre IHTF and includes the following elements within the Project Area (Figure 2):

- Cofferdam Dock Facility Improvements
    a. Remove and replace the existing retaining wall with a mechanically stabilized earth (MSE) wall
    b. Install a fiberglass sheet pile encasement
    c. Replace the structural steel waler beam
- IHTF Upland Site Improvements
    a. Raise the existing surface elevation and construct a high-load capacity asphalt concrete surface covering approximately 12 acres for operational efficiency and stormwater conveyance.
    b. Approximately 6 acres of the IHTF will be dedicated to National Historic Preservation Act (NHPA) Section 106 mitigation. The existing office Conex trailer and truck scale will be relocated to another part of the facility. The 1,500-square-foot warehouse building adjacent to the office will be demolished and not rebuilt or relocated.
    c. Construct a three-stage biofiltration facility to treat stormwater from the resurfaced IHTF prior to discharge to Port Angeles Harbor.

3.0 ENVIRONMENTAL CONDITIONS AND ENVIRONMENTAL CONSEQUENCES

This section includes descriptions of the existing environmental conditions in the Project Area and an evaluation of impacts (i.e., consequences) as a result of the Proposed Action and No Action Alternative. The analysis of environmental consequences considers adverse and beneficial, direct and indirect, short-term (i.e., during construction), and long-term (i.e., operations) impacts. This section also discusses mitigation measures, as necessary, to address potential adverse environmental consequences.

3.1 Land Use

The 12-acre Proposed Action Area is the Port's active 32-acre IHTF within a waterfront heavy industrial setting. The site is flat, with the current operating surface being a mixture of gravel, deteriorated asphalt, and concrete with a rip-rap armored shoreline along Port Angeles Harbor. The only vegetation in the Proposed Action Area is noxious weeds and invasive plants such as Scotch Broom (Cytisus scoparius), Himalayan Blackberry (Rubus armeniacus), and Canada thistle (Cirsium arvense) in a ten-foot section along the top of the shoreline adjacent to Port Angeles Harbor. The invasive plants are managed through mechanical removal on a seasonal basis by the Port.

The Cofferdam Dock Facility at the IHTF is a barge berth constructed of a sheet pile bulkhead along the shoreline of Port Angeles Harbor. The existing working surface of this barge berth is graveled surface.

Existing adjacent land uses include Lower Elwha Klallam Tribe's (Tribe) property, which is the location of Či̇́xwicən archaeological site that holds significant cultural importance to the Tribe and the community; The Port's Port Angeles Boat Haven, a public marina with approximately 400 slips; the McKinley Paper mill's administration and employee parking facility; and residential property located south across Marine Drive and on top of marine bluff overlooking Port Angeles Harbor.

The Proposed Action will occur on land within and under the jurisdiction of the City of Port Angeles (City). The City zoning at the site is industrial heavy (IH) per City Municipal Code Chapter 17.34. The current land use at the project site is industrial land use and is, therefore, consistent with the City land use and zoning designations.

In addition to zoning, the City has specific land use requirements for areas regulated as "shoreline of the state" under the Washington Shoreline Management Act (SMA: 90.58 RCW). As required by the SMA the City has developed and implemented a state-approved Shoreline Master Program (SMP) to regulate shorelines in their jurisdiction. Per the SMP the Project Action Area is designated as a High-Intensity Industrial Environment with the purpose of this designation to provide for continued use and development of high-intensity water-oriented heavy and more significant scale industrial or port uses. The current use of the shoreline and the proposed Project Action align with this SMP designation, as the IHTF operations are tied directly to harbor access to move timber products within the supply chain.

3.1.1 Proposed Action

The Proposed Action will not significantly change the site's existing land use. It is currently utilized as a waterfront facility for sorting, staging, and storing logs and wood chips (cargo). These materials are temporarily held at the site before export or import via water-based or land-based transportation. The continuation of these activities is consistent with the current land use designation and aligns with the site's operational purpose as a cargo-handling facility.

As part of the Proposed Action, 6.13 acres of the IHTF will be transferred to the Lower Elwha Klallam Tribe. This transfer will support the protection of cultural and historical resources tied to the Tse-whit-zen village site as part of the mitigation required under Section 106 of the NHPA. See Section 3.13 for a detailed discussion of cultural and tribal resources at the project site. The land use for this mitigation property will change from cargo storage and truck-scale operations to an area designated for the protection of cultural resources.

This change in land use is expected to have a minor impact on existing operations at the IHTF. While 6.13 acres will be set aside for cultural resource protection, improvements to other areas of the facility will enable more efficient operations, offsetting any potential disruptions. The remaining IHTF property will not experience a change in use and will continue to function as a hub for log and wood chip handling.

During the construction phase, operations will be temporarily impacted due to reduced available space for cargo staging and storage. These impacts are anticipated to be short-lived and limited to the duration of the construction period. Temporary adjustments to operational processes may be required to accommodate the construction activities, including rerouting or rescheduling cargo operations. However, no permanent disruptions to facility operations are anticipated due to the Proposed Action.

Overall, the Proposed Action supports the continued use of the site as a critical hub for log and wood chip handling while incorporating measures to protect important cultural and historical resources. The impact will be minor on the existing and continued IHTF operations. The temporary construction impacts are expected to be minor and manageable within the facility's broader operational framework.

3.1.2 No Action Alternative

No change in land use would occur as a result of the No Action Alternative as the Port would continue the use of the Cofferdam Dock Facility and IHTF for cargo handling, sorting, and staging.

3.2 Visual and Aesthetic Resources

The Project Area consists of the existing Cofferdam Dock Facility and Intermodal Handling and Transfer Facility, both integral to industrial cargo handling operations. This area features a limited number of structures, including a storage warehouse, office trailer, and temporarily stacked logs for sorting, staging, and handling activities. The visual character reflects its operational purpose as an industrial waterfront facility.

Adjacent to the Project Area are several noteworthy features, including the Číxwicən archaeological site, an area of significant cultural and historical importance to local Tribes. This site is recognized as a deeply valued heritage resource, representing centuries of Indigenous history and connections to the land. While not visually prominent, the site's proximity to the Project Area underscores the importance of maintaining sensitivity to its cultural context during all phases of the proposed action and mitigation from the proposed project impacts on the archaeological site are detailed in Section 3.13 in a discussion of National Historic Preservation Act Section 106 context.

Additional adjacent features include the nearby yacht club and marina, which provide a contrasting recreational and aesthetic character with moored vessels, docks, and associated activities. Elevated residences to the west, approximately 170 feet above the Project Area, and Ediz Hook to the east, offer key vantage points for observing the surrounding landscape, including the Project Area's industrial operations. Proposed Action

The proposed action will not substantially alter the visual character of the Project Area, which will remain consistent with its current industrial use as a cargo handling yard. Temporary construction activities may introduce minor and short-lived visual disturbances, such as construction equipment and materials staged on-site. These changes are expected to be localized and have minimal impact on the visual quality of the adjacent areas, including the Číxwicən site, yacht club, marina, and nearby viewpoints.

Careful consideration will be given to avoid adverse visual or operational impacts on the Číxwicən site during construction, ensuring its cultural and historical integrity remains unaffected. With these measures in place, the long-term visual impact of the proposed action is anticipated to be negligible, maintaining the Project Area's industrial character while respecting the aesthetic and cultural values of its surroundings as detailed in Section 3.13 Cultural and Tribal Resources decision in this EA

3.2.1 No Action Alternative

The No Action Alternative would not result in a change in visual/aesthetic resources, as the Port would continue to use the Cofferdam Dock Facility and IHTF for cargo handling, sorting, and staging.

3.3 Geology and Soils

General geologic information for the Project Area and surrounding area was obtained from the *Geologic Map of the Port Angeles and Ediz Hook 7.5-Minute Quadrangles, Clallam County, Washington* (Schasse et al. 2004). Surficial site soil is mapped as artificial fill and modified land (Qf) consisting of silt, sand, gravel, organic matter, and other debris used to reshape the land. The fill deposits vary in composition and are commonly mapped along the Port Angeles waterfront. Landslide deposits (Qmw) are mapped immediately south of the Project Area and are described as consisting of boulders, gravel, sand, and silt in a loose, unsorted condition. Recessional outwash (Qgo) is mapped to the south of the landslide deposits and generally consists of well-sorted gravel, clay, silt, and sand, in a loose condition.

Hart Crowser, Inc. (HCI) produced a geotechnical engineering design report dated October 30, 2020 in support of Cofferdam rehabilitation at the site (Appendix B). The geotechnical report included summary test pit and boring logs from explorations advanced in November 2018 and October 2002, respectively. HCI encountered sand and gravel fill over alluvial deposits near the Cofferdam location. Test pits along the Cofferdam area encountered wood debris over gravel with silt, sand, and organics. A layer of quarry spalls was encountered 6 to 7 ft below ground surface (bgs). Test pits southwest of the Cofferdam area encountered sand and gravel fill with variable organic content.

The soil conditions reported by HCI are in general agreement with the geologic conditions mapped at the site. The US Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey (USDA NRCS; accessed August 7, 2023) identifies the Project Area as a “beaches” landform (Appendix B), which is inconsistent with current conditions as identified by HCI.

The current surface of the Project Area is a mixture of gravel and deteriorated asphalt and concrete, and there is the transfer of mud and debris from the Project Area as trucks leave the site during the wet season/following precipitation events (see photographs in Appendix B).

Groundwater was observed between 7.0 and 12.5 ft bgs during HCI’s October 2002 and November 2018 field investigations. The site is adjacent to the Port Angeles Harbor and as a result, site groundwater levels are likely influenced by tidal fluctuations. Liquefaction is a phenomenon in which the strength and stiffness of soil is reduced by earthquake shaking. In saturated soils, porewater pressure rises and the stress between soil particles decreases, reducing the overall strength of the soil and temporarily causing it to behave like a liquid. Loose to medium-dense sands, sandy or silty gravels, silty sands, and low-plasticity silts are most susceptible to liquefaction. HCI considers the saturated alluvium from approximately 37 to 57 ft bgs to be susceptible to seismically induced liquefaction.

According to the Washington State Department of Natural Resources Geologic Information Portal, the Project Area could be subject to “very strong” shaking intensity from a Cascadia Subduction Zone earthquake (WDNR; accessed July 7, 2023). The map indicates that the liquefaction susceptibility of site soils is “high.” The site is also mapped as International Building Code seismic design category “E,” indicating the potential for severe and destructive ground shaking for buildings near active major faults. There is an inferred fault mapped approximately 1.9 miles south of the Project Area (WDNR; accessed July 7, 2023). According to HCI, the potential for lateral spreading is considered high due to the potential for seismically induced liquefaction.

3.3.1 Proposed Action

Earthwork activities associated with the proposed action include fill placement regarding the site, construction of new pavement, construction of a biofiltration facility, and improvements to the Cofferdam Dock Facility by means of replacing an existing retaining structure with an MSE wall. The site has previously been developed and disturbed through construction and routine Port operations.

During construction, best management practices (BMPs) will be used to control soils from mobilizing in stormwater runoff and leaving the Project Area on construction equipment. The Proposed Action would provide Cofferdam wall and surface improvements that would improve both the static and seismic stability of the facility and would not adversely affect soils or geology. According to HCI, the proposed

MSE wall is considered globally and internally stable (i.e., target factors of safety are achieved) under static, pseudo-static, and liquefaction conditions (Appendix B). Therefore, the Proposed Action will have a negligible effect on the site's geology, soils, and seismic hazard designation.

3.3.2 No Action Alternative

Under the No Action Alternative, there would be no changes to geology, soil, or seismicity within the Project Area. Surface conditions would remain the same, with no new construction or disturbance to existing site features. However, current surface conditions would continue to have a minor impact on soils.

Small amounts of soil would likely continue to be mobilized from the site on trucks leaving the Project Area as part of ongoing operations. In addition, soil and debris may continue to be mobilized by stormwater runoff during precipitation events. The existing surface conditions, including unpaved or disturbed areas, provide pathways for erosion and sediment transport, which may contribute to minor off-site impacts. These effects are expected to remain minimal and consistent with current conditions under the No Action Alternative.

Overall, the No Action Alternative would not introduce any new impacts but would perpetuate the existing minor soil mobilization issues associated with operational activities and stormwater dynamics.

3.4 Farmland Soils

The Farmland Protection Policy Act (FPPA) is intended to minimize the impact that federal programs have on the unnecessary and irreversible conversion of farmland to non-agricultural uses. Under the FPPA, the USDA NRCS assures that, to the extent possible, federal programs are administered to be compatible with state and local units of government and private programs and policies to protect farmland. The Proposed Project is subject to FPPA requirements if they may irreversibly convert farmland (directly or indirectly) to nonagricultural use and are completed by a federal agency or with assistance from a federal agency.

The USDA NRCS Web Soil Survey (USDA NRCS; accessed August 7, 2023) identifies the Project Area as a "beaches" landform (Appendix C), which is not classified as prime farmland soil.

3.4.1 Proposed Action

No impacts would occur to farmland soils as a result of the Proposed Action as none occur in the Project Area.

3.4.2 No Action Alternative

No impacts would occur to farmland soils as a result of the No Action Alternative as none occur in the Project Area.

3.5 Water Quality

Water resources in and adjacent to the Project Area include the surface water of Port Angeles Harbor and groundwater.

Port Angeles Harbor is listed on the Washington State Department of Ecology's (Ecology) Clean Water Act Section 303(d) list for the water quality parameter bacteria. The Section 303(d) list identifies water bodies that do not meet water quality standards. The primary source of bacteria in the harbor is attributed to urban runoff, as reported by the Washington State Department of Ecology. As part of the geotechnical evaluation at the Project Area, groundwater was encountered between 7.0 and 12.5 ft bgs during HCI's October 2002 and November 2020 field investigations (Appendix D). The site is adjacent to Port Angeles Harbor and as a result, site groundwater levels are likely influenced by tidal fluctuations.

The following sections summarize water quality considerations associated with the Proposed Action and No Action Alternative.

3.5.1 Stormwater

The Port's ongoing operations at the IHTF are covered by the ISGP (WAR-000314), issued to the Port most recently on January 1, 2025, by Ecology's Water Quality Program.

Stormwater discharges from IHTF have historically triggered source control improvements, known as Level 2 Corrective Action requirements for copper, total suspended solids (TSS) and chemical oxygen demand (COD), and treatment improvements known as Level 3 Corrective Action requirements for turbidity and copper under the ISGP. As a result, Ecology issued Administrative Order No. 22449, which requires final stormwater treatment to be installed by 2026. The Port is currently working with Ecology and the Lower Elwha Klallam Tribe on the design and construction of the IHTF stormwater treatment and conveyance improvements; this project is part of those improvements. designed to convey and treat stormwater prior to discharge to Port Angeles Harbor.

3.5.1.1 Proposed Action

During the construction of the Proposed Action, activities have the potential to impact water quality, particularly from stormwater runoff. However, standard BMPs will be implemented to minimize these risks, and adherence to the Washington State Department of Ecology's Construction Stormwater General Permit will ensure compliance with water quality standards. BMPs will include the development and implementation of a temporary erosion control plan specific to managing upland work elements and the placement of a temporary debris boom for use during in-water work (see Section 3.9: Wetlands and Waters of the US). Additionally, a Section 401 Clean Water Act Water Quality Certification will be issued as part of the in-water permitting process. With these measures in place, no significant impacts on water quality are anticipated during construction. Water quality treatment of stormwater runoff from the completed Proposed Action would be provided by a three-stage biofiltration facility designed in accordance with the administrative order issued by Ecology. This system will improve the quality of stormwater discharge from the Project Area. The biofiltration facility is designed to treat TSS, turbidity, zinc, copper, and COD. Pilot testing of a similar facility at the Port determined that a similar three-stage stormwater treatment system provided an approximately 90 percent reduction in total copper and zinc concentrations in stormwater runoff. During operation of the Proposed Action, there is the potential for the release of chemicals and other materials during potential spills or leaks from cargo handling equipment or trucks. Methods to both prevent and handle such occurrences will be addressed by both the Port and local agency spill response plans and teams. Spill risk assessment and response procedures will continue to be revised as necessary as facility operations progress beyond the Proposed Action.

No adverse impacts would occur to water quality as a result of the Proposed Action because of the proposed stormwater and spill response BMPs to be implemented.

3.5.1.2 No Action Alternative

Existing conditions at the Project Area include issues with stormwater discharge that contribute to the failure to meet water quality standards. These issues are primarily caused by debris and solids from unpaved sections of the facility, which are carried into stormwater runoff during precipitation events. Under the No Action Alternative, no improvements to the site’s stormwater management would occur, and these conditions would persist. Without the implementation of the Proposed Action, including resurfacing and the construction of a stormwater treatment facility, the unpaved areas would continue to generate sediment and debris, resulting in moderate impacts on water quality.

3.6 Hazardous Materials

The operations at the existing IHTF involve the inflow and outflow of wood fiber (whole logs and wood chips) and do not involve the production, handling, or temporary storage of hazardous materials. Still, the site has a history of industrial activity, including wood treatment and storage, which has led to concerns about potential soil, groundwater, and sediment contamination. Past investigations identified some contamination. To address these concerns, a recent investigation focused on detecting if contamination is migrating toward the harbor has been started under the Washington State Model Toxics Control Act (MTCA), with the WA State Department of Ecology being the regulatory agency and directing the cleanup investigation. According to the National Priorities List (NPL), there are no proposed, current, or past Superfund sites, nor any sites listed on the NPL, located at the project site or within a 50-mile radius.

Under the MTCA cleanup, the Port is identified as a potentially liable person (PLP), and is responsible for investigating contamination at the IHTF, also known as Terminals 5, 6, and 7. This area, designated as the Uplands Study Area under Cleanup Site ID 15440, includes the eastern portion of the project area.

Under this cleanup action and associated agreed order, the Port is implementing Phase 1 of a Remedial Investigation Work Plan (RIWP; Floyd | Snider 2023). The investigation, initiated in the summer of 2023, focuses on determining whether contamination in soil or groundwater is migrating from the cleanup site into Port Angeles Harbor. A network of groundwater monitoring wells has been installed along the IHTF bulkhead, with quarterly monitoring ongoing through 2024. To date, monitoring data do not indicate the presence of uncontrolled upgradient contaminant plumes. A localized area near monitoring wells MW-33 and MW-34 has shown limited concentrations of carcinogenic polycyclic aromatic hydrocarbon (PAH) toxicity equivalence, which appears to be related to the heterogeneous quality of historical fill material (Floyd | Snider 2024). Based on findings to date, no interim cleanup actions are currently recommended.

The in-water portion of the project at the Cofferdam Dock facility is within the Western Port Angeles Harbor Sediment Cleanup Site. Sediment contamination within western Port Angeles Harbor and in-water portions of this proposed project reflects over a century of industrial activities, including sawmills, plywood manufacturing, paper production, shipping, boat building, bulk fuel storage, marinas, and commercial fishing and processing. Pollutants such as heavy metals, PAHs, and dioxins/furans have accumulated in the harbor's sediments, adversely affecting benthic habitats and posing risks to aquatic ecosystems and human health. Cleanup efforts, guided by the Western Port Angeles Harbor Remedial Investigation and Feasibility Study (RIFS, Floyd Snider 2020), are focused on mitigating contamination, reducing ecological harm, and preventing further impacts to support the long-term recovery of the harbor's aquatic resources and ecological functions through a combination intertidal excavation, capping, enhanced monitored natural recovery and monitored natural recovery. Adjacent to the project area and the Cofferdam Dock Facility, no active sediment remediation is proposed because the facility is an active barge berth, and no active cleanup technologies can be implemented protectively or effectively.

3.6.1 Proposed Action

3.6.1.1 Upland - Proposed Action

As discussed in Section 3.6, based on the upland MTCA site cleanup investigation conducted to date, no cleanup actions or remediation are proposed within the IHTF project footprint. This is because no significant levels of contamination have been identified, and major excavations within the footprint of the proposed improvements are not feasible due to the presence of potential cultural resources.

For the upland portion of the project, the ground disturbance associated with construction for the Proposed Action will be minimized by raising the ground elevation to create the new site surface rather than the extensive excavation of potentially contaminated soil. The construction of the new site surface will involve the placement of crushed rock, installation of geogrid reinforcement, and application of asphalt and concrete pavement cover. While excavation will be limited, some digging may still occur, particularly for the stormwater biofiltration system, constructed above grade with excavations restricted to a maximum depth of 12 inches bgs. Despite efforts to minimize disturbance, there is a possibility that contaminated soil and miscellaneous debris (such as concrete and scrap metal) may be encountered and generated during construction activities for the Proposed Action. Soils generated as part of the Proposed Action would be loaded onto trucks during excavation or staged in designated stockpiling areas for testing to evaluate appropriate handling, transport, and disposal requirements. Soils would be evaluated for suitability for onsite reuse or offsite disposal through the completion of environmental waste-designation testing. Soil determined unsuitable for onsite reuse would be disposed of in an approved, permitted Subtitle D landfill. Soil from the site is not anticipated to be designated as hazardous or dangerous waste based on previous characterization efforts.

Contaminated groundwater is not expected to be encountered as part of the Cofferdam excavation, as a shallow, unconfined aquifer has been documented to be present beneath the Project Area at depths between 3.5 and 7.0 ft bgs (i.e., below the vertical extent of excavation).

Under the Proposed Action, the following items are slated for demolition and disposal: the existing 1,500-square-foot storage warehouse, Cofferdam walers, tire fenders and chains, and ecology blocks. Other miscellaneous construction and demolition waste materials may also be generated. Construction debris, including concrete, scrap metal, and electronic waste, would be recycled by an approved, licensed handler.

Non-recyclable material would be disposed of in an approved, offsite, permitted Subtitle D (solid waste) landfill. Treated timber, if encountered, would be disposed of at a permitted solid waste landfill or treatment, storage, and disposal facility if test results do not designate it as a federal toxic characteristic hazardous waste (Ecology 2021)Debris would be segregated, tracked, and manifested during construction to minimize the potential for material cross-contamination and document that debris transported for disposal reaches the appropriate landfill or recycling center.

Existing environmental monitoring wells may also be present within the Project Area. Monitoring wells would need to be protected during construction and then raised to the new surface elevation (by a licensed driller) or decommissioned and reinstalled.

Upon completion, the project will significantly improve the operational surface for cargo handling activities within the Port Angeles Harbor. The newly paved asphalt surface will replace the current exposed fill material, which consists of heterogeneous and potentially contaminated remnants from historical and past industrial activities, including mill operations and log storage.

This modernization effort ensures that cargo operations will occur on a clean, durable, and stable surface, reducing direct contact with exposed fill material. By eliminating the interaction between operational activities and potentially hazardous underlying materials, the project mitigates risks of pollutant mobilization, such as sediment displacement or leaching of contaminants into surrounding soil and groundwater. Additionally, the paved surface enhances operational efficiency by creating a more uniform and load-bearing platform, suitable for modern cargo handling equipment and logistics.

This improvement aligns with ongoing remedial efforts to contain and minimize exposure to contaminants from historical industrial activities, in line with environmental compliance under the MTCA. It represents a significant step toward ensuring the sustainable use of the site for economic development while protecting human health and the surrounding environment. The project thus supports the dual goals of environmental stewardship and enhanced functionality of the Port's cargo operations area.

As a result, the Upland Proposed Action will have a negligible impact on hazardous materials at the project site.

3.6.1.2 In-Water - Proposed Action

In the in-water portion of the project at the Coffer Dam Dock Facility, the installation of the fiberglass encasement will provide significant benefits in protecting the sheet pile wall from further corrosion; it is important to consider potential impacts to the contaminated sediment in the immediate vicinity of the work area. Water quality can be affected by the potential for increased suspended sediment levels or the re-suspension of contaminated sediment during installation. Increased suspended sediment can negatively affect aquatic life, particularly salmonids, by causing direct mortality, gill tissue damage, physiological stress, and behavioral changes. These impacts occur through multiple mechanisms, including reduced oxygen availability and interference with feeding and migration. The proposed project could disturb sediment near the midline, particularly where the fiberglass encasement is pressed into place and the gap between the encasement and the steel wall is filled with underwater epoxy grout. Although the disturbance is expected to be minimal, there is a potential for sediment resuspension, which may result in a temporary increase in turbidity and could mobilize contaminants such as heavy metals, PAHs, and dioxins/furans from the harbor’s historically contaminated sediments.

The installation of the fiberglass encasement is the only project element with the potential to generate turbidity. While the activity of pressing the encasement six inches into the mudline could result in localized sediment disturbance, it is not expected to increase turbidity beyond the natural variability of the intertidal zone. Additionally, the minor movement of riprap along the sides of the structure, which will be conducted in the dry, is not anticipated to cause turbidity. The underwater epoxy grout used to seal the gap between the encasement and the sheet pile wall will further limit sediment disturbance. The overall impact on water quality is expected to be minimal, with short-term, localized turbidity not extending beyond the immediate area of the encasement installation.

Overall, while there may be minor, short-term impacts to the sediment due to the installation process, the proposed project is expected to have a net positive effect on the environment by reducing the risk of continued corrosion of the sheet pile wall and providing a long-term solution that will help protect the harbor's aquatic resources. The controlled nature of the installation, along with the use of best management practices, will minimize the potential for significant impacts on contaminated sediments and water quality.

Upon project completion, barge activity associated with cargo operations is not anticipated to have a significant impact on sediment quality in Port Angeles Harbor. The operational improvements provided by the project, including the installation of the fiberglass encasement around the corroding sheet pile wall and the development of a paved asphalt surface for cargo handling, will enhance the structural integrity and operational efficiency of the site while minimizing interactions with underlying contaminated sediments.

Barge operations, including docking, loading, and unloading, will primarily occur in areas where sediment disturbance has historically been limited. The presence of the new paved surface upland will reduce direct contact with contaminated fill material, thereby decreasing the likelihood of sediment migration into the aquatic environment. Furthermore, the fiberglass encasement will stabilize the waterward sheet pile wall, reducing potential sediment erosion or mobilization caused by structural degradation or hydraulic forces generated by barge activity.

Operational protocols will continue to adhere to best management practices to limit potential sediment disturbance. These include careful maneuvering of barges to minimize propeller wash and the avoidance of overloading activities that might lead to accidental spillage of materials into the harbor. The presence of riprap along the bulkhead and near the sheet pile wall will further mitigate sediment mobilization by providing physical stability to the sediment surface.

Given these measures, post-project barge operations are expected to have a negligible impact on sediment quality in Port Angeles Harbor. The project's design and implementation effectively mitigate potential sediment disturbance, contributing to the long-term stability and environmental health of the harbor.

3.6.2 No Action Alternative

No generation of hazardous materials or non-regulated wastes would occur under the No Action Alternative. Contamination in the Project Area will continue to be addressed as part of the MTCA process.

3.7 Floodplains

DOT Order 5650.2 aligns with Executive Order 11988 Floodplain Management, which requires federal activities to avoid, to the extent possible, long- and short-term adverse impacts to floodplains and to avoid direct or indirect impacts of floodplain development wherever there is a practicable alternative. Federal Emergency Management Agency flood insurance mapping identifies the area along the Port Angeles Harbor shoreline adjacent to the Project Area as occurring in the 100-year floodplain (i.e., Zone V1), with a corresponding base flood elevation (BFE) of 8 ft (National Geodetic Vertical Datum [NGVD] 1929; 11.3 ft mean lower-low water [MLLW]; FEMA 1990).

3.7.1 Proposed Action

The upland development portion of the Proposed Action that includes paving and construction of a stormwater treatment system would occur at elevation 12 ft (MLLW) and higher, which is outside of the BFE. The Cofferdam Dock rehabilitation will occur below the BFE but is not anticipated to result in a loss of flood storage capacity. Work in the floodplain will include vertical placement of the fiberglass encasement waterward of the existing sheet pile, which extends approximately 2 inches from the existing sheet pile. Construction of the MSE wall and replacement of waler beams will take place in the footprint of the existing ecology block wall and waler beams. Since the purpose of the Proposed Action is to rehabilitate the Cofferdam Dock, there is no practicable alternative to the proposed construction activities outside the floodplain that would still meet the purpose and needs of the project.

The Proposed Action, which includes upland paving improvements and the rehabilitation of the Cofferdam Dock, is anticipated to have minimal impact on the hydrology, drainage, and flooding conditions of the upland and adjacent Port Angeles Harbor. The operation of the IHTF will have no impact on the floodplain.

3.7.2 No Action Alternative

There would be no change to existing conditions and this would result in no impacts to the floodplain.

3.8 Wild and Scenic Rivers

No waterways classified as wild and scenic pursuant to the federal Wild and Scenic Rivers Act, Public Law 90-542 are located in the vicinity of the Proposed Action. The nearest wild and scenic river is a segment of the Skagit River, located approximately 60 miles northeast of the Project Area (NWSRS; accessed August 7, 2023).

3.8.1 Proposed Action

No impacts would occur to wild or scenic rivers as a result of the Proposed Action as none occur in the Project Area.

3.8.2 No Action Alternative

No impacts would occur to wild or scenic rivers as a result of the No Action Alternative as none occur in the Project Area.

3.9 Wetlands and Waters of the US

The U.S. Army Corps of Engineers regulates activities affecting Waters of the United States (WOTUS) through two primary legal authorities. Section 404 of the Clean Water Act (CWA) governs the discharge of dredged or fill material into WOTUS, including wetlands, to protect aquatic ecosystems from significant harm. Section 10 of the Rivers and Harbors Act (RHA) regulates activities involving the construction, excavation, or deposition of materials in, over, or under navigable waters to maintain navigability and protect the integrity of waterways.

The Project Area is located adjacent to Port Angeles Harbor, part of the Strait of Juan de Fuca, which is a federally recognized navigable water of the United States. Regulatory jurisdiction in this tidal area is defined by the high tide line (HTL) under Section 404 of the CWA, which is established at 7.16 feet MLLW, and the mean high water (MHW) under Section 10 of the RHA, which is set at 6.51 feet MLLW. Based on on-site surveys, no jurisdictional wetlands are present within the Project Area; therefore, no direct impacts on wetlands are anticipated. However, since the project involves activities adjacent to and potentially discharging into WOTUS, compliance with both CWA and RHA requirements is necessary.

Under Section 401 of the Clean Water Act, federally permitted activities that may result in a discharge into WOTUS must obtain a Water Quality Certification (WQC) to ensure compliance with state water quality standards. The Washington Department of Ecology (Ecology) oversees the Section 401 certification process for projects within the state. For this project, the WQC will address compliance with water quality standards, including parameters such as turbidity, temperature, dissolved oxygen, and potential pollutant discharges. The certification process also requires the implementation of BMPs to mitigate potential impacts during construction, such as minimizing sedimentation, controlling erosion, and preventing contamination. Monitoring and reporting obligations may be imposed as part of the certification conditions to ensure ongoing compliance with water quality standards and to detect potential environmental impacts.

Coordination between the project proponent, USACE, and Ecology is essential to obtain the necessary permits, including a Section 404/Section 10 permit and a Section 401 certification. Although no wetlands are present in the Project Area, the proposed activities must demonstrate efforts to avoid or minimize impacts to adjacent WOTUS, including Port Angeles Harbor. Compliance with the terms and conditions of Section 401 certification will be critical to maintaining water quality and ensuring that project activities align with state and federal environmental standards.

3.9.1 Proposed Action

The Cofferdam Dock rehabilitation as part of the Proposed Action would occur below the HTL/MHW and would be limited to placement of the fiberglass encasement 1 inch waterward of the existing sheet pile, removal of a portion of the existing ecology block wall (landward of the existing sheet pile wall) and replacement with an MSE wall in the existing footprint, and replacement of waler beams, also within the existing footprint. All Project-related heavy equipment will be staged on uplands. A small dive boat and/or skiff will assist with in-water work and access the site via existing boat ramps and vessel lanes at the Port. However, construction would primarily be from uplands.

Because work would occur below the HTL/MHW, authorization from the USACE for the Proposed Action would be obtained by the Port. The 1.25-inch-thick encasement will be constructed of fiberglass and installed along the face and sides of the 335-linear feet of the sheet pile. It will be offset from the sheet pile by approximately 1 inch. Epoxy grout would fill the 1-inch void. This will result in approximately 65 square feet (sf) of fill waterward of the existing steel sheet pile bulkhead.

The amount of fill material introduced into the Waters of the United States will be minor, as it is limited to the fiberglass encasement itself and the underwater epoxy grout used to seal it against the existing sheet pile wall. These materials will not significantly alter the footprint of the structure or disturb the surrounding sediments.

The project will comply with the conditions of the CWA Section 401 Water Quality Certification, which will ensure that water quality is protected during and after construction. BMPs will be implemented as required under state and federal regulations. These include stormwater controls and construction BMPs mandated by the Construction Stormwater General Permit administered under the state's NPDES program. The Port will be required to prepare a Stormwater Pollution Prevention Plan (SWPPP) as part of these authorizations. The SWPPP will detail specific BMPs designed to reduce or eliminate the discharge of pollutants into the Waters of the United States and to ensure the stabilization of the site following construction. The SWPPP will adhere to the guidelines established in the Stormwater Management Manual for Western Washington (Ecology 2024), reflecting the highest standards for stormwater and water quality management.

In conclusion, while the project involves a minor amount of fill to support the encasement installation, the activities are designed to have minimal impact on the Waters of the United States within Port Angeles Harbor.

Barge operations at the completed project are anticipated to have minimal impact on the Waters of the United States within Port Angeles Harbor. The design ensures that barges will not ground out during operations, thereby reducing the risk of habitat disturbance or sediment resuspension. Additionally, spill response BMPs will be implemented to mitigate potential impacts from accidental releases, further protecting water quality and marine resources. These measures collectively support the project's compliance with environmental standards while minimizing impacts to the harbor's aquatic environment.

Upland development of the Proposed Action will occur at an elevation 12 ft MLLW, which is above the jurisdictional limits of Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of Port Angeles Harbor. Furthermore, the construction and operations of the Proposed Action would not affect wetlands because none are present within the Project Area.

3.9.2 No Action Alternative

There would be no change to existing conditions, and this would result in no impacts to the wetlands or navigable waters of the US as a result of the No Action Alternative. floodplain.

3.10 Coastal Zone Management Act

Pursuant to the Coastal Zone Management Act regulations (Title 15 CFR Parts 930 & 923), participating coastal states have the authority to implement comprehensive coastal management programs and to conduct a consistency review for a federal action that may have a reasonably foreseeable effect to resources contained within the State’s coastal zone. The Washington State Coastal Zone Management Program is administered by the Washington State Department of Ecology (Ecology).

3.10.1 Proposed Action

The project site falls under the jurisdiction of the Coastal Zone Management Act (CZMA) and Washington State’s Coastal Zone Management Program (CZMP). As part of the permitting and review process, the Port will ensure compliance by submitting a Certification of Consistency form to both the U.S. Army Corps of Engineers (USACE) and the Washington State Department of Ecology (Ecology), as required. This certification will demonstrate that the proposed project is consistent with the enforceable policies of the state’s CZMP, including those related to shoreline management, water quality, and habitat protection. The consistency certification is an essential step for securing the necessary USACE permit under Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act and ensuring alignment with state coastal management objectives. The Port’s submission of the Certification of Consistency ensures compliance with the state’s approved CZMP. As the project aligns with these enforceable policies and regulatory requirements, no impacts to the coastal zone are anticipated.

3.10.2 No Action Alternative

The No Action Alternative would not require CZMP consistency as no federal action would occur.

3.11 Wildlife

This section addresses wildlife species and habitat within the upland Project Area. The assessment presented here is based on a review of the Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species (PHS) online mapper and incidental observations made during biological reconnaissance field visits in 2020 and 2023 for the preparation of the biological assessments for this project. Upland and aquatic species protected under the Endangered Species Act (ESA) and the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) are discussed separately in Section 3.12.

The upland of the Project Area encompasses approximately 12 acres of existing industrial waterfront property. The site is characterized by flat, heavily modified terrain with a shoreline that is armored with riprap and a sheet pile wall along Port Angeles Harbor. The surface condition consists of a mix of unpaved gravel, deteriorated asphalt, and concrete (see Appendix A). Vegetation within the Project Area is minimal and limited to a 5- to 10-foot-wide strip of herbaceous noxious weeds along the southern shoreline. These species include Scotch broom (Cytisus scoparius), Himalayan blackberry (Rubus armeniacus), Canada thistle (Cirsium arvense), and various grasses. This vegetated strip is not part of the planned upland project improvements and is managed by the Port through annual mechanical removal in the spring to control the spread of noxious weeds.

Birds that may be present in or adjacent to the Proposed Action Area include the Red-tailed hawk (Buteo jamaicensis) and various songbirds and waterfowl at the project shoreline. No nesting or roosting habitat for Bald eagles (Haliaeetus leucocephalus), Golden eagles (Aquila chrysaetos), or migratory birds such as Canada goose (Branta canadensis) has been identified within or near the Project Area due to a lack of trees and vegetation cover at and adjacent to the project area. The lack of vegetation and consistent industrial activity further limit the potential for wildlife presence or habitat use.

Mammals that are typically associated with urban areas, such as Black-tailed deer (Odocoileus hemionus columbianus), Raccoons (Procyon lotor), opossums (Didelphis virginianus), and mice, are also likely to present in and adjacent to the Proposed Action Area. River otters (Lutra canadensis) are also present along the shoreline of Port Angeles Harbor.

Due to the industrial nature of the Project Area, wildlife use is expected to be limited. Cargo trucks, heavy equipment, and machinery operate continuously in this area, reducing the habitat's suitability for wildlife. Some songbirds and seabirds accustomed to urban and industrial environments may be present but are likely transient visitors. The Project Area is not expected to support nesting or rearing activities for these species due to the high levels of human activity and habitat disturbance.

In summary, the Project Area provides minimal wildlife habitat due to its industrial nature, lack of vegetation, and constant human activity. Wildlife presence is limited to transient individuals of urban-adapted species, with no significant or critical habitat features identified within the upland Project Area

3.11.1 Proposed Action

Given these conditions, the construction and operation of the Proposed Action will result in no impacts to Bald Eagles, Golden Eagles, migratory birds or other wildlife. The project site is situated in an industrial area that has long been subject to similar disturbances from ongoing cargo yard activities. The project design ensures that construction activities will avoid creating new disturbances that could impact local wildlife populations.

Operation of the Proposed Action will continue within the established industrial context, with no significant changes to the types or levels of activity currently occurring in the area. Since these conditions are consistent with those to which local wildlife has adapted, there will be no significant behavioral or habitat use changes. The absence of natural upland or sensitive habitats further reduces the potential for impact on wildlife.

In summary, the construction and operation of the Proposed Action have been designed and planned to avoid impacts on migratory birds and other wildlife, ensuring that the surrounding areas outside the project footprint or operations area continue to support their existing ecological functions.

3.11.2 No Action Alternative

No impact to upland wildlife would occur as a result of the No Action Alternative as the Port would continue use of the Cofferdam Dock Facility and IHTF for cargo handling, sorting, and staging.

3.12 Threatened, Endangered Species, Marine Mammals and Essential Fish Habitat

3.12.1 Endangered Species Act

Federally listed species and their habitats are protected under the Endangered Species Act (ESA) of 1973 (16 USC § 1531-1544, 87 Stat. 884), as amended. Section 7 of the ESA requires that federal actions not jeopardize the continued existence of any threatened, endangered, or proposed species or result in the destruction or adverse modification of designated critical habitat. Both the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) share responsibility for implementing the Endangered Species Act. USFWS’s primary responsibilities are terrestrial and freshwater organisms, while the responsibilities of NMFS are mainly marine wildlife and anadromous fish.

ESA-listed species that may occur in the Project Area vicinity are listed below in Table 1. ESA-listed species potentially occurring in the project area were identified using the U.S. Fish and Wildlife Service's Information for Planning and Consultation (IPaC) tool, along with a review of critical habitat maps and available species occurrence data for the region on the NMFS website.

Table 1: Endangered Species Act-Listed Species Potentially Occurring in the Project Action Area

Species	Species Listing Status	Critical Habitat	Consulting Agency
Marbled murrelet (*Brachyramphus marmoratus*)	Threatened	Designated	USFWS
Yellow-billed cuckoo (*Coccyzus americanus*)	Threatened	Designated	USFWS
Short-tailed albatross (*Phoebastria =Diomedea) albatrus)*	Endangered	Not Designated	USFWS
Taylor's checkerspot (*Euphydryas editha taylori*)**	Endangered	Designated	USFWS
Northwestern pond turtle (Actinemys marmorata)	Proposed Threatened	Not Designated	USFWS
Coastal-Puget Sound DPS bull trout (*Salvelinus confluentus*)	Threatened	Designated*	USFWS
Dolly varden (Salvelinus malma)	Proposed Similarity of Appearance (Threatened)	Not Designated	USFWS
Monarch butterfly (Danaus Plexippus)	Proposed Threatened	Not Designated	USFWS
Golden paintbrush (*Castilleja levisecta*)	Delisted 2023***	Not Designated	USFWS
Humpback whale (*Megaptera novaeangliae*)	Endangered	Not Designated	NOAA Fisheries
Southern Resident DPS killer whale (*Orcinus orca*)	Endangered	Designated*	NOAA Fisheries
Puget Sound-Georgia Basin DPS bocaccio rockfish (*Sebastes paucispinis*)	Endangered	Designated	NOAA Fisheries
Puget Sound-Georgia Basin Yelloweye rockfish (*S. ruberrimus*)	Threatened	Designated	NOAA Fisheries
Puget Sound ESU Chinook salmon (*Oncorhynchus tshawytscha*)	Threatened	Designated*	NOAA Fisheries
Puget Sound steelhead trout (*O. mykiss*)	Threatened	Designated	NOAA Fisheries
Hood Canal summer-run ESU chum salmon (*O. keta*)	Threatened	Designated	NOAA Fisheries
Southern DPS eulachon (*Thaleichthys pacificus*)	Threatened	Designated	NOAA Fisheries
Southern DPS North American green sturgeon (*Acipenser medirostris*)	Threatened	Designated	NOAA Fisheries
Leatherback sea turtle (*Dermochelys coriacea*)	Endangered	Designated	NOAA Fisheries

Notes:

DPS = distinct population segment
ESU = evolutionarily significant unit
(*) Designated Critical Habitat occurs in the action area.
(**) Listed in the 2023 IPaC search but not listed in the 2024 IPaC search. This is likely because open prairie habitat does not exist near the project area.
(***) Delisted, no longer a threatened species.

Although the species listed in Table 1 are identified in the USFWS and NMFS databases, the following species are not present in the project area, and the site does not contain their known habitats: Yellow-billed cuckoo, Short-tailed albatross, Taylor's checkerspot, Northwestern pond turtle, Dolly Varden, Monarch butterfly, Golden paintbrush, Leatherback sea turtle, Bocaccio rockfish, and Yelloweye rockfish. As a result, the proposed project's construction and operation will have No Effect on these species due to their absence from the project site and lack of suitable habitat in the area.

3.12.2 Marine Mammal Protection Act

The Marine Mammal Protection Act (MMPA) of 1972 establishes a moratorium on the "take" of marine mammals within U.S. waters by U.S. citizens on the high seas and on the importation of marine mammals and their products into the United States. The term "take" under the MMPA includes actions such as harassment, hunting, capturing, or killing of marine mammals. This legislation is a cornerstone of marine conservation in the United States, aiming to ensure the protection and sustainability of marine mammal populations and their habitats.

The MMPA is administered by the NMFS and the USFWS. It seeks to maintain marine mammal populations at their optimum sustainable levels. While the act enforces strict protections, it allows exceptions under specific conditions, including:

- Incidental take during authorized activities (e.g., commercial fishing or construction).
- Scientific research aimed at improving marine mammal conservation.
- Subsistence hunting by Alaska Natives.
- Conservation activities to aid the recovery of endangered or threatened marine mammal species.

Federal actions must comply with the MMPA, requiring evaluations of potential impacts on marine mammals. Where necessary, mitigation measures must be implemented to minimize harm. Additionally, some marine mammals are also protected under the Endangered Species Act, which provides additional safeguards for species at risk of extinction. In the context of the proposed IHTF project and this Environmental Assessment, species such as the humpback whale and the Southern Resident Orca are discussed further in Sections 3.12.1 and 3.12.4.

The Strait of Juan de Fuca and Port Angeles Harbor are home to a variety of marine mammal species. According to NMFS, these species, along with their prevalence in the area, are outlined in the table below:

Table 2: Marine Mammals Potentially Occurring in the Project Action Area

Species	Prevalence in Port Angeles Harbor/Strait of Juan de Fuca
Sea Otter (Enhydra lutris)	Uncommon
Harbor Seal (Phoca vitulina)	Abundant; reside in the Harbor
Northern Fur Seal (Callorhinus ursinus)	Uncommon
Steller's Sea Lion (Eumetopias jubatus)	Uncommon
California Sea Lion (Zalophus californianus)	Uncommon
Northern Elephant Seal (Mirounga angustirostris)	Rare
Gray Whale (Eschrichtius robustus)	Uncommon
Minke Whale (Balaenoptera acutorostrata)	Uncommon
Humpback Whale (Megaptera novaeangliae)	Uncommon
Harbor Porpoise (Phocoena phocoena)	Common; transition through the Harbor in summer
Orca (Orcinus orca)	Common; transition through the Harbor in summer and fall
Dall’s Porpoise (Phocoenoides dalli)	Uncommon
Pacific White-Sided Dolphin (Lagenorhynchus obliquidens)	Uncommon

This project will not result in the incidental harassment or take of marine mammals, as there is no pile driving or dredging proposed in Port Angeles Harbor. The absence of these activities eliminates potential underwater noise or habitat disturbances that could impact or affect marine mammals. Further analysis of potential effects on Orcas and Humpback Whales, both of which are listed under the ESA, is discussed in Sections 3.12.1 and 3.12.4 of this document.

3.12.3 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), mandates that all federal agencies consult with NMFS regarding activities proposed or authorized, funded, or undertaken by the agency that may result in an adverse effect on Essential Fish Habitat (EFH). EFH is defined in the Magnuson-Stevens Act as those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity. The objective of the EFH assessment is to determine whether the proposed action(s) “may adversely affect” designated EFH for relevant commercially, federally managed fishery species within the proposed action area. It also describes conservation measures proposed to avoid, minimize, or otherwise offset potential adverse effects to designated EFH resulting from the Proposed Action. Three federal fishery management plans and their associated EFH are applicable to projects within Washington State: 1) Pacific coast groundfish fishery, 2) Coastal pelagic species fishery, and 3) Pacific coast salmon fishery.

3.12.4 Proposed Action

A Biological Evaluation has been prepared for the Proposed Action providing effect determinations for ESA-listed species, critical habitat, and EFH, and used by MARAD for consultation with USFWS and NMFS (Appendix E). The results of consultations with USFWS and NMFS regarding the Proposed Action are summarized in the subsections below. The upland resurfacing footprint for the project has been modified from the originally proposed 14.4 acres, as detailed in the ESA Section 7 consultation, to 12 acres. This change is due to the inclusion of 2.4 acres of the proposed paving area around the existing truck scales within a 6.13-acre "Protection Area" designated to protect cultural resources as required by Section 106 mitigation measures. However, impacts on ESA-listed species are not expected to change as a result of this reduction in the proposed paving area. The in-water improvements at the Cofferdam Dock Structure will remain the same, and stormwater from the proposed paved surface will still be treated by the proposed bioretention and filtration system, ensuring that there are no additional adverse effects on listed species.

3.12.4.1 USFWS Concurrence Letter

MARAD requested concurrence from USFWS that the proposed action “may affect, but is not likely to adversely affect” due to insignificant impacts to both the marbled murrelet and bull trout and the designated critical habitat for bull trout. USFWS concurred with the effect determination, and this correspondence is included in Appendix E.

As determined by the USFWS regarding marbled murrelet and bull trout:

> *The proposed action will result in little change to the features and footprint of existing in-water structures and will provide measurable long-term benefits in the form of improved source control and treatment of industrial site stormwater runoff. The effects of the proposed action, temporary and permanent, will not prevent marbled murrelets or bull trout from successfully foraging in the action area. The proposed action will have no measurable effects, or will have only measurable beneficial effects, to the marbled murrelet, bull trout, their habitat, and prey resources. The Service concludes that the direct and indirect, long-term effects of the proposed action are therefore considered insignificant*.

Regarding bull trout critical habitat, project effects are limited to potential impediments to migration, and the USFWS determined:

> *The action may temporarily introduce an impediment or barrier within migration habitat; i.e., elevated turbidity associated with placement of the fiberglass encasement. These effects will be limited in physical extent, limited in duration, and intermittent…. Furthermore, once the Project has been completed, the stormwater treatment upgrades will result in beneficial effects to the condition of this PCE due to water quality improvements. The action’s foreseeable, persistent, and long-term effects are insignificant.*

3.12.4.2 NOAA Fisheries Biological Opinion

MARAD requested formal consultation from NMFS and MARAD made the following determinations on project action effects on ESA-listed species and habitat as summarized in Table 3. The NMFS EFH determination is an adverse effect on pacific coast salmon and groundfish and coastal pelagic species. The complete NMFS biological opinion is included in Appendix E.

Table 3: NOAA Fisheries Endangered Species Act Determinations

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely to Jeopardize Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely to Destroy or Adversely Modify Critical Habitat?
North American green sturgeon, southern DPS (*Acipenser mediostris*)	Threatened	No	N/A	No	N/A
Hood Canal summer-run (HCSR) chum salmon (*Oncorhynchus keta*)	Threatened	Yes	No	No	N/A
Puget Sound (PS) steelhead trout (*O. mykiss*)	Threatened	Yes	No	No	N/A
PS Chinook salmon (*O. tshawytscha*)	Threatened	Yes	No	Yes	No
Eulachon, Southern DPS (*Thaleichthys pacificus*)	Threatened	No	N/A	No	N/A
Southern Resident Killer Whale (SRKW) (*Orcinus orca*)	Endangered	No	N/A	No	N/A
Humpback Whale (*Megaptera novaeangliae*) (Central America DPS/ Mexico DPS)	CAM (Endangered) MEX (Threatened)	No	N/A	No	N/A

To minimize, mitigate, or avoid impacts on ESA-listed and EFH species, the Port will implement the measures and conservation recommendations detailed in the NMFS biological opinion, as summarized in Section 5 of this EA. By adhering to these mitigation strategies, the project proponent aims to ensure compliance with the ESA, EFH, and MMPA while safeguarding the ecological integrity of Port Angeles Harbor and the Strait of Juan de Fuca.

3.12.5 No Action Alternative

Under the No Action Alternative, no construction or port improvements to the site would occur. As such, there would be no change to existing conditions, and this would result in no impacts to any Endangered Species, Marine Mammals, or Essential Fish Habitat.

3.13 Cultural and Tribal Resources

Section 106 of the National Historic Preservation Act of 1966 requires federal agencies to consider the effects on historic properties of projects they carry out, assist, fund, permit, license, or approve.

Per the Clallam County geographic information systems portal, the Project Area overlaps four parcels owned by the Port (Nos. 063000190090, 063000505520, 063099190035, and 063099190025). Two adjacent parcels are under Lower Elwha Klallam Tribe ownership (Parcel Nos. 063099190045 and 063099190050). The Port has consulted with the Washington State Department of Archaeology and Historic Preservation (DAHP) and Lower Elwha Klallam Tribe since 2017 to refine the Project design and footprint. The Area of Potential Effect (APE) extends beyond the Project Area and is inclusive of the anticipated Project physical, visual, and acoustic effects on the character or use of historic properties and was developed based on multiple cultural resource surveys conducted at the project area from 2017 to 2021 and included in Appendix F

The APE contains a portion of a previously recorded precontact site, 45CA523 (Appendix F)[3], which is listed in the National Register of Historic Places (NRHP).

The APE also contains three previously recorded historic archaeological resources: 45CA773 (railroad spur), 45CA796 (railroad spur), and 45CA797 (kiln stack/historic debris scatter); all three sites were previously recommended as not eligible for listing in the NRHP.

3.13.1 Proposed Action

The Proposed Action constitutes an undertaking under Section 106 of the NHPA. MARAD initiated consultation with DAHP, and the following Tribes:

- Hoh Indian Tribe
- Jamestown S’Klallam Tribe
- Lower Elwha Klallam Tribe
- Makah Tribe
- Port Gamble S’Klallam Tribe
- Quileute Nation
- Suquamish Tribe
- Confederated Tribes of Warm Springs.

Correspondence to and from DAHP and the Tribes is provided in Appendix F.

The Project activities would not physically alter Site 45CA523. However, the Project will introduce new visual elements that diminish the overall integrity of setting, feeling, and association for the historic property. MARAD has determined that the Project will have an adverse effect on the NRHP-listed site (45CA523), and DAHP provided concurrence with this determination (Appendix F). The Suquamish Tribe and Jamestown S’Klallam Tribe provided responses deferring to the Lower Elwha Klallam Tribe for cultural resource consultation (Appendix F).

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[3] Because of the sensitive nature of locational information related to cultural resources, the location of Site 45CA523 is considered privileged and confidential pursuant to Revised Code of Washington 42.56.300 and 16 USC § 470hh(a) and mapping identifying the site and omitted from this EA.

MARAD and the Port has completed Section 106 consultation with the Lower Elwha Klallam Tribe and DAHP to address adverse effects from implementation of the Build Alternative and appropriate mitigation measures are documented in a Memorandum of Agreement (MOA; Appendix F) and summary of these measures is included in Section 5 of this EA. A record of tribal correspondence is included in Appendix F.

3.13.2 No Action Alternative

Consultations under Section 106 of the NHPA would not be required as part of the No Action Alternative as no federal action would occur.

3.14 Section 4(f) Resources

Section 4(f) refers to the original section within the US Department of Transportation Act of 1966, which provided for the consideration of park and recreation lands, wildlife and waterfowl refuges, and historic sites during transportation project development. Section 4(f) applies to projects that receive funding from or require approval by an agency of the USDOT. Before approving a project that uses Section 4(f) property, it must be determined that there is no feasible and prudent alternative that avoids the Section 4(f) properties and that the project includes all possible planning to minimize harm to the Section 4(f) properties; or, the agency of the USDOT makes a finding that the project has a *de minimis* impact on the Section 4(f) property.

Generally, “use” occurs with a USDOT-approved project or program when 1) land from a Section 4(f) site is permanently incorporated into a transportation facility; 2) there is a temporary occupancy of land that is adverse in terms of the statute’s preservationist purposes; or 3) the proximity impact of the transportation project on the Section 4(f) site, without acquisition of land, is so great that the purposes for which the Section 4(f) site exists are substantially impaired.

Section 4(f) resources within 0.25 miles of the Project Area vicinity include:

- A segment of the Olympic Discovery Trail (ODT) is located within the Marine Drive right-of-way adjacent to the IHTF Project Area and is managed by the City of Port Angeles. There is an existing driveway from Marine Drive to the Project Area that crosses the ODT.
- The Port Angeles Boat Haven is a publicly owned recreational facility that is directly adjacent to the project area and includes a pocket park and boat launch used by the general public.
- The APE, established as part of Section 106 of the NHPA (see Section 3.13: Cultural and Tribal Resources), contains a portion of a previously recorded precontact site, Site 45CA523. Site 45CA523 is listed in the NRHP.

3.14.1 Proposed Action

Appendix G includes the Section 4(f) Applicability and Exceptions Documentation, which evaluates the three significant Section 4(f) resources at or adjacent to the proposed Port IHTF Project: archaeological site 45CA523, Port of Port Angeles Boat Haven, and the ODT.

- **Archaeological Site (45CA523):** The proposed Build Alternative for this project would result in the permanent Section 4(f) use of the significant and NRHP-listed Site 45CA523.
    - Site 45CA523 is recognized for its potential to yield important information under Criterion D of the NRHP. Through Section 106 of the NHPA consultation process, adverse effects to Site 45CA523 will be mitigated pursuant to a Section 106 NHPA MOA.
    - The Section 4(f) resource Site 45CA523 qualifies for an exception from the Section 4(f) approval process per 23 CFR 774.13(b). The exception allows the project to proceed without data recovery by recognizing that one aspect of the archaeological site's importance is informational. In contrast, the NHPA Section 106 process focuses on mitigating adverse effects on the site.
    - Correspondence with the State Historic Preservation Office (SHPO) and the Lower Elwha Klallam Tribe requesting coordination and documenting no objection to the finding of an exception to the Section 4(f) approval process per 23 CFR 774.13(b) is included in Appendix G.
- **Port Angeles Boat Haven:** The proposed Build Alternative will not result in a permanent, temporary or constructive Section 4(f) use of the Boat Haven as a significant recreational resource.
    - Correspondence with the Port requesting coordination with the findings that the Boat Haven is significant and that the Build Alternative would not result in a Section 4(f) use of the Boat Haven as a recreational resource is documented in Appendix G.
- **Olympic Discovery Trail:** The proposed Build Alternative will not result in a permanent, temporary or constructive Section 4(f) use of the ODT as a significant recreational resource.
    - Correspondence with the City requesting coordination and documenting their concurrence with the finding that the ODT is significant and concurrence with the finding that the Build Alternative would not result in a Section 4(f) temporary occupancy use of the ODT as a recreational resource is documented in Appendix G.

Because there is no use of the two recreational properties, and the archaeological site qualifies for an exception to the Section 4(f) approval process with any impacts mitigated through NHPA Section 106 consultation and an associated MOA, it has been determined that no further Section 4(f) analysis is required. This satisfies the requirements of Section 4(f).

3.14.2 No Action Alternative

Evaluation under Section 4(f) would not be required as part of the No Action Alternative as no federal action by a USDOT agency would occur.

3.15 Air Quality[4]

The U.S. Environmental Protection Agency (EPA) established National Ambient Air Quality Standards (NAAQS) and specified future dates for states to develop and implement plans, known as State

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[4] On May 5, 2025, the Office of Management and Budget (OMB) issued *Guidance Implementing Section 6 of Executive Order 14154, Entitled "Unleashing American Energy*." Quantification of greenhouse gas emissions has been removed from the text of the EA. However, some documents in the appendices were finalized prior to the issuance of this guidance and MARAD is

Implementation Plans (SIPs), to achieve these standards; Washington State's SIP serves as its unique air quality implementation plan, separate from the NAAQS themselves. The standards are divided into primary and secondary standards; the former are set to protect human health within an adequate margin of safety, and the latter to protect environmental values, such as plant and animal life. The EPA is required to set NAAQS for six criteria air pollutants: oxides of nitrogen (NOx), carbon monoxide (CO), ozone (O3), particulate matter (PM10 and PM2.5), sulfur dioxide (SO2), and lead (Pb). The Washington State Department of Ecology monitors these pollutants, taking action if levels become unhealthy, and has established state standards for these pollutants that are at least as stringent as the federal NAAQS.

Based on monitoring information collected over a period of years, the EPA and Ecology designate regions as being in attainment or non-attainment areas for regulated air pollutants. Attainment status indicates that air quality in an area meets the NAAQS, and non-attainment status indicates that air quality in an area does not meet those standards.

The portion of Clallam County in which the Port's Proposed Action is located in is designated as an attainment area (i.e., meeting NAAQS) for all current criteria pollutants) (EPA; accessed August 7, 2023; see Appendix H).

The Project Area is located near major industrial facilities (point sources of air pollution), such as McKinley Paper Company, Lakeside Industries, and Interfor Pacific, which are regulated by their respective air operating permits. In 2017, the most substantial non-point sources of air pollution in Clallam County were related to agricultural tilling and harvesting, livestock, construction, shipping, non-road mobile equipment, and vehicles (Ecology 2020). The 2019 respiratory cancer risk in the Port of Port Angeles area was 20 cancer cases per million population (EPA; accessed July 13, 2023), which is typical of other urban areas in Washington State.

The IHFT serves to mitigate emissions by promoting a more energy-efficient form of freight transportation. Specifics of potential air impacts due to the Proposed Action are discussed further in this section.

3.15.1 Proposed Action

Short-term construction associated with the Proposed Action could result in temporary, localized air quality impacts, including dust and emissions from diesel engines. Estimated short-term construction-related emissions of CO, NO_X, volatile organic compounds (VOCs), and SO_2 associated with the Proposed Action are anticipated to be below applicable EPA *de minimis* thresholds. Estimated emissions associated with the construction of the Proposed Action are summarized as follows: 2.65 tons of CO, 2.77 tons of NO_X, 0.07 tons of VOCs, and 0.0028 tons of SO_2 all well below the EPA *de minimis* thresholds (Appendix H, Table 1).

Regardless of the limited and temporary nature of anticipated air emissions, impacts will be minimized through the use of dust control strategies, equipment maintenance, and minimization of vehicle idling.

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unable to amend those documents. As such, to meet the Administration's goals of efficient processing of projects pursuant to EO 14154, certain appendices may reference greenhouse gas emissions.

The construction contractor will prepare a Dust Control Plan that commits the construction crews to implement all reasonable control measures described in the Associated General Contractors of Washington's Guide to Handling Fugitive Dust from Construction Projects (AGCW 2009). The Dust Control Plan could include, but is not limited to, the following BMPs to control fugitive dust and odors emitted by diesel construction equipment:

- Use water sprays or other non-toxic dust control methods on unpaved roadways
- Minimize vehicle speed while traveling on unpaved surfaces
- Cover all trucks transporting materials and any soil piles when practicable.

The following measures will be used by construction contractors to minimize air quality and odor issues caused by tailpipe emissions:

- Maintain the engines of construction equipment according to manufacturers' specifications
- Minimize idling of equipment while the equipment is not in use.

Although emissions will occur, they will be temporary in nature and limited to the duration of the construction period. Overall, with the implementation of BMPs, construction impacts on air quality from vehicle emissions and fugitive dust are expected to be minor. As discussed in Section 1.2, the Proposed Action, including resurfacing efforts at the Port's IHTF, is expected to improve operational efficiency by reducing the time required to process a load through the facility by approximately 10%. This increase in throughput efficiency is projected to reduce operational air emissions from the IHTF, providing a tangible benefit to air quality. These improvements will support current demand and better accommodate potential increases in future cargo volumes moved through the facility if markets dictate such an increase.

3.15.2 No Action Alternative

Under the No Action Alternative, there would be no short-term construction-related emissions associated with the Proposed Action. However, operational emissions would likely increase over time as vessel and land-based vehicle traffic grows in response to unmet demand at the IHTF. Without resurfacing improvements, the existing inefficiencies caused by uneven paving would persist, limiting the facility's ability to optimize loading and unloading operations.

If demand increases, the inability to enhance throughput efficiency will result in more products being transported by truck, leading to higher land-based emissions. Over time, these inefficiencies may lead to vessel backups in the local area and higher emissions as vessels seek alternative ports farther away. In summary, the No Action Alternative could result in increased local emissions, driven by reduced operational efficiency, increased land-based transport, and the inability to meet future demand. In summary, the No Action Alternative would likely result in a minimal impact or increase in local emissions and a negligible impact or increase in emissions because of the small footprint of this operation on a Pacific Rim scale.

3.16 Noise and Vibration

The Port is located in the City of Port Angeles and is subject to the Port Angeles Municipal Code (PAMC). Chapter 15.16 of the PAMC adopts, by reference, the noise limits and exemptions promulgated in Chapter 173-60 of the Washington Administrative Code (WAC). Construction noise is exempt from the noise limits set forth in the WAC between the hours of 7 a.m. and 10 p.m. Regardless, construction noise associated with the Proposed Action was assessed at the nearest residential areas based on the methods outlined in the Federal Transit Administration's (FTA's) 2018 Transit Noise and Vibration Impact Assessment Manual (FTA 2018). Sound levels from construction associated with the Proposed Action were compared to the guidance criteria threshold established in the FTA manual, which is an hourly average sound level of 80 A-weighted decibels (dBA; i.e., hourly Leq[5]) for residential receivers. If the threshold is exceeded, the FTA recommends assessment mitigation measures to reduce the noise levels. A summary of the fundamentals of sound, noise, and vibration are provided in Appendix I.

Existing noise sources at the Project Area include water-based vessel traffic, land-based vehicular traffic (freight and employee vehicles), and operational equipment. The land immediately surrounding the IHTF is primarily zoned for heavy industrial use (non-residential). Noise levels in industrial areas can be as high as 60 dBA to 70 dBA. The nearest existing residences are located approximately 500 ft to the south of the Project Area. Noise levels in urban residential areas typically range from approximately 45 to 55 dBA. Proximity to major roadways can increase noise levels to approximately 60 to 65 dBA and railroad operations on nearby railroad tracks can increase noise levels to 70 dBA or more, depending on distance, frequency of train traffic, and other factors (Wyle Laboratories 1971).

3.16.1 Proposed Action

Construction noise associated with the Cofferdam Dock Facility Improvements and the upland IHTF site improvements were assessed and conservatively assumed to occur simultaneously. Reference sound profiles from the USDOT's Federal Highway Administration (FHWA's) Roadway Construction Noise Model Versions 1.0 and 2.0 (RCNM) were used to assign an overall sound level for each equipment type (FHWA 2017). Reference sound levels for equipment that are anticipated to be used for the Project are provided in Table 4 below. For this assessment, it was conservatively assumed that all equipment for the two primary construction scenarios (i.e., Cofferdam Dock Facility Improvements and IHTF Upland Site Improvements) would operate simultaneously. The location of the cumulative sound source for each construction scenario was positioned at the approximate center point of the construction area to represent the average sound level of equipment that could operate throughout the area.

The residential receiver nearest to the locations where the two scenarios would occur is located approximately 1,500 ft and 750 ft to the south of the Cofferdam Dock and IHTF construction zones, respectively, as shown in Figure I-1 in Appendix I. Sound levels at this nearest residential receiver were assessed by evaluating the cumulative noise level from all equipment expected to be used during the Cofferdam Dock construction (i.e., an excavator, a dump truck, and a front-end loader) and IHFT construction (i.e., excavator, dump truck, concrete pump truck, asphalt paver, double drum roller,

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[5] The Leq is energy-average sound level over a given time period.

compactor, dozer, front-end loader, grader, street sweepers, asphalt sprayer, asphalt grinder). Noise levels associated with anticipated construction equipment are provided in Table 4.

As outlined in Table 4 below, results indicate that sound levels at the residential receiver nearest construction activities related to Cofferdam Dock and IHTF construction would be 70 dBA, well within the FTA guidance criterion of 80 dBA, even with the conservation assumption that all equipment would operate concurrently. Based on the estimated sound levels detailed above and in Table 4 below, this construction project would have a negligible impact on noise levels at and near the project area.

Table 4: Construction Equipment Sound Levels

Equipment	Sound Pressure Level (dBA) at 50 ft (a)
Concrete Pump Truck (b)	84
Compactor (ground) (b)	80
Dozer (b, c)	80
Grader (pass by) (b)	81
Street Sweeper(b)	76
Street Sweeper (Vacuum) (b)	72
Asphalt Distributor Truck (b) (Asphalt Sprayer)	87
Asphalt Grinder (b)	83
Dump Truck (b)	82
Excavator (b, c)	76
Front-End Loader (b, c)	72
Asphalt Paver (b)	87
Double Drum Roller (b)	85

Notes:

(a) For Project-related construction equipment that is not included in RCNM, reference sound levels from similar, representative equipment were applied.
(b) Equipment used during the IHTF construction scenario.
(c) Equipment used during the Cofferdam Dock construction scenario.

Table 5: Cumulative Sound Level Results

Construction Scenario	Cumulative Leq Sound Level Nearest Residence (dBA)	FTA Guidance Criteria Threshold (dBA)
IHTF and Cofferdam Dock	70	80

Note:

See Table 4 for equipment types included in each construction scenario.

For a construction vibration assessment, the Proposed Action involves using a double drum roller during the upland IHTF Site Improvements construction phase. According to the FTA manual, the double drum roller has an approximate peak particle velocity (PPV) at 25 ft of 0.21 inches per second (in/s).

The nearest structure to the IHTF construction is the residence located approximately 750 ft to the south, at 1334 West 4th Street. At this distance, the PPV is predicted to be 0.001 in/s, which is below the lowest FTA allowable vibration limit for buildings extremely susceptible to vibration damage (0.12 in/s, Appendix I).

Based on these calculations, no adverse impacts are expected from vibrations during construction of the Proposed Action.

The proposed Action includes resurfacing the upland IHTF and the working surface of the Cofferdam Dock Facility with an even and consistent asphalt surface. Compared to existing conditions, this improvement is expected to reduce noise and vibration impacts during facility operations.

Currently, the uneven surface of the project area contributes to elevated noise levels as vehicles, including loaders and trucks, navigate the facility. Irregularities on the surface can cause excessive rattling and impact noise from cargo handling equipment. Resurfacing with consistent asphalt is expected to reduce these noise sources by providing a smoother path for vehicles, thereby minimizing the clattering and jolts caused by surface imperfections. This reduction in operational noise will enhance the acoustic environment for workers and reduce the potential for noise impacts on nearby areas.

The existing uneven pavement also generates vibrations during operations, particularly when heavy equipment and fully loaded trucks move across the yard. These vibrations can result in increased wear and tear on equipment, discomfort for operators, and potential structural impacts to nearby infrastructure. By resurfacing the facility with a uniform asphalt surface, the Proposed Action will reduce vibrations, leading to smoother operations and less mechanical strain on equipment. This improvement will not only increase the longevity of the equipment but also create a more efficient and worker-friendly environment.

The resurfacing under the Proposed Action will address operational inefficiencies caused by noise and vibration, benefiting day-to-day activities at the cargo yard. Reduced noise and vibration levels are particularly important as the facility prepares to meet the increased demand for intermodal cargo operations. These improvements align with the Port's goals of enhancing operational efficiency while minimizing environmental impacts.

3.16.2 No Action Alternative

No impact would occur to the noise or vibration levels as a result of the No Action Alternative.

3.17 Traffic and Safety

Marine Drive is a designated Washington State Truck Freight Economic Corridor that connects the Port's IHTF to State Route (SR) 101. All cargo being transported to and from the Port by truck uses Marine Drive. Freight heading east of the Project site will travel east along Marine Drive, which transitions to

1st Street and then to eastbound SR 101. Freight heading west initially heads east on Marine Drive for less than a mile before turning onto SR 117 heading south before connecting to westbound SR 101. There are no alternative freight routes. During the loading of forest products onto barges, there is commonly a line of tractor-trailers that extends throughout the Port property and spills onto the adjacent public street, causing congestion. Currently, tractor-trailers and machinery are required to drive, load, and unload on different surfaces, including pavement, asphalt, gravel, and dirt. The lack of an adequate operating surface creates bottlenecks in distribution throughout the site.

The Port's IHTF reduces the annual truck miles on public highways by approximately 750,000 miles, which results in an average reduction of three highway accidents per year (Appendix J).

In regard to water transportation, Port Angeles Harbor spans thousands of acres, providing ample space for barge operations. Currently, there are no significant issues or bottlenecks associated with barge or ship traffic in the harbor. The expansive size of the harbor ensures that barge movements and operations remain efficient, with sufficient room to accommodate current and anticipated traffic without disruption. This issue is preserving the steel sheet pile wall bulkhead at the Cofferdam Dock Facility to maintain a safe and reliable location for the loading and unloading of cargo onto barges.

3.17.1 Proposed Action

The Proposed Action will temporarily generate additional construction traffic on offsite roads during resurfacing and improvement activities. This traffic would primarily consist of construction vehicles, equipment deliveries, and worker commutes. These impacts are expected to be short-term and minimal, with traffic levels similar to those observed during peak operational periods at the facility. To minimize disruptions, traffic management measures, such as scheduling deliveries during off-peak hours and employing flaggers, will be implemented. As a result, no long-term adverse effects on traffic flow or road safety are anticipated during the construction phase.

As described in Section 1.2, the Proposed Action is designed to improve the efficiency of operations at the existing yard and is not directly connected to any action that would increase cargo volumes at the Port. Instead, it enhances the Port's ability to accommodate larger volumes if needed in the future. Therefore, offsite traffic on surrounding roads is not expected to be directly impacted by the Proposed Action. The improvements to the facility, including resurfacing and upgrades to the Cofferdam Dock, will relieve congestion within the yard and streamline the movement of goods into, out of, and around the site. These enhancements will reduce the likelihood of delays and congestion spilling onto nearby roadways, thereby indirectly benefiting traffic flow and safety on adjacent streets.

The improved surface of the IHTF will enhance the physical stability and traction of vehicles and equipment, reducing the risk of accidents such as falls, equipment rollovers, or collisions caused by uneven pavement. These upgrades will also create safer and more efficient traffic flows within the facility, alleviating bottlenecks and enabling more predictable operations. These improvements will reduce risks not only onsite but also at facility access points, contributing to a safer overall transportation environment.

The Proposed Action addresses operational inefficiencies within the facility without directly increasing cargo volumes or traffic on offsite roads. By improving internal efficiency and reducing congestion, the project will help ensure smoother operations within the yard, reduce the potential for traffic backups on adjacent roadways, and enhance overall safety for both the facility and the surrounding road network.

In addition to upland improvements, the proposed protection and improvements to the bulkhead of the Cofferdam Dock barge berth will enable the continued safe and reliable intermodal operations of this cargo facility.

The Proposed Action is anticipated to have a moderate positive impact on safety and traffic. While temporary construction traffic will occur, it will be short-term and managed effectively. Long-term, the improvements will enhance operational efficiency, reduce congestion within the facility, and improve traffic flow and safety both onsite and on adjacent roadways without increasing offsite traffic volumes.

3.17.2 No Action Alternative

The No Action Alternative would maintain potential traffic and safety issues associated with substandard surface conditions that limit operational efficiencies. The Port will continue using the Cofferdam Dock Facility and IHTF for cargo handling, sorting, and staging.

3.18 Public Utilities

Utilities serving the Project Area include underground electrical, water, storm drainage, and sanitary sewer.

The facility is covered under ISGP No. WAR000314, which establishes benchmark values and monitoring requirements. Permit conditions require that discharges not cause or contribute to a violation of surface water quality standards.

3.18.1 Proposed Action

Modification to underground electrical utilities would occur as part of the Proposed Action, and disruptions would be temporary during construction. No modifications to water or sanitary sewer utilities would occur as part of the Proposed Action. No change in the service demand on water, sanitary sewer, or electricity would occur as part of the Proposed Action.

Ensuring the Port can operate the IHTF into the future will depend heavily on the Port’s ability to consistently meet ISGP pollutant benchmarks. The Proposed Action would construct asphalt surfaces and a new stormwater treatment facility, which will improve stormwater collection and treatment from the Project Area (see Section 3.5: Water Quality). There would be no change to public utilities adjacent to or at the project site, and this would result in no impacts to public utilities.

3.18.2 No Action Alternative

The No Action Alternative would have no effect on existing utilities as the Port would continue use of the Cofferdam Dock Facility and IHTF for cargo handling, sorting, and staging. The current site conditions and stormwater facilities have resulted in multiple National Pollutant Discharge Elimination System permit benchmark exceedances; under the No Action Alternative, there would continue to be the potential for benchmark exceedances.

4.0 EFFECTS

In regard to direct effects, the Proposed Action maintains and improves the existing operations at the IHTF and generally avoids direct adverse effects. However, MARAD has determined that the Project will have an adverse effect on the NRHP-listed site (45CA523), and DAHP provided concurrence with this determination (see Appendix F). NMFS also identified that the Proposed Action may adversely affect Hood Canal summer-run chum salmon, Puget Sound steelhead trout, and Puget Sound Chinook salmon and have an adverse effect on EFH. No additional adverse direct effects were identified. BMPs will be employed during construction to further avoid/minimize direct effects (see Section 5: Mitigation). The overall impact of the Proposed Action on air quality is anticipated to be minor. The project involves construction activities, which may result in some emissions due to equipment operation, vehicle travel, and other typical construction-related activities. However, these emissions are expected to be temporary and localized, with no significant impact on air quality.

The Proposed Action will provide potential beneficial direct effects through improved site conditions that support efficient operations of the IHTF, including potential improvements to traffic flow and improved stormwater management, providing benefit to water quality. In addition, the Proposed Action will provide containment of existing contaminated soil and groundwater at the Project Area. The upland improvements will include importing clean fill material and covering the Project Area with asphalt, which will help contain existing contamination in soil and groundwater and mitigate contaminant mobilization risk from site runoff that could otherwise discharge to Port Angeles Harbor.

No indirect effects are anticipated with the Proposed Action. The purpose of the Proposed Action is repair/improvement of an existing industrial site and will not result in changes of operations at the facility or increase the berthing capacity of the Port. The Cofferdam Dock Facility Improvements will result in relatively minor impacts to benthic habitat (see Appendix E) that are anticipated to have negligible habitat impacts. The IHTF Site Improvements do not include any activities adversely affecting long-term habitat conditions.

The Cofferdam Dock and IHTF Upland Improvements have been long-term strategic priorities for the Port, with planning efforts dating back to 2018 and 2014, respectively. Stormwater treatment and discharge at the project site are regulated under the ISGP, which uses adaptive management and BMPs to meet multi-tiered water quality protection requirements. The facility's stormwater pollution prevention plan will document and guide adaptive stormwater management for the proposed treatment facility.

The Port’s 5-Year Capital Improvement Plan (CIP) identifies and prioritizes projects across three categories: committed projects, critical maintenance projects, and rated projects. Committed projects receive priority due to external funding, regulatory mandates, or alignment with long-term strategic goals. Maintenance projects ensure infrastructure integrity, while rated projects are prioritized based on job creation, return on investment, environmental benefits, and strategic planning importance. Upcoming CIP projects in 2025 include Marine Trade Center development and repairs to Terminals 1 and 3, ensuring functionality and industrial growth. The proposed project is located approximately 4,000 feet east of the IHTF on the Port Angeles waterfront at the foot of Cedar Street. The Marine Trade Center site will provide industrial facilities for Port tenants, including stormwater infrastructure and access roads, and the repairs to the terminals will ensure a continued working waterfront in the community for years to come.

The Port and Ecology are addressing contamination at the IHTF under the Model Toxics Control Act (MTCA) through a phased remedial investigation. Phase 1 of the work plan assesses whether soil or groundwater contamination is migrating into Port Angeles Harbor, with potential remedial actions to protect human health and the environment. While these efforts involve complex, overlapping initiatives, no adverse cumulative effects are anticipated from the Proposed Action or related activities outlined in the CIP or MTCA Agreed Order because all these actions are managed and implemented under strict regulatory frameworks. The additional impacts from this modest-sized project are unlikely to induce any indirect, secondary, or cumulative impacts. Additionally, the Port’s strategic planning and prioritization of projects in the CIP ensure coordinated efforts that minimize potential adverse environmental impacts.

4.1 No Action Alternative

In regard to direct effects, the No Action Alternative maintains the existing land use of the IHTF and generally avoids direct adverse effects. However, minor adverse effects to traffic and air emissions may be maintained as bottlenecks in the IHTF would continue.

Similar to the Proposed Action, no indirect effects are anticipated with the No Action Alternative. The No Action Alternative would maintain the existing use of the facility, however in suboptimal condition.

5.0 MITIGATION & PERMITS

The Port will obtain all applicable federal, state, and local permits and approvals before commencing the Proposed Action. BMPs in these permits would be implemented during construction and operations that avoid or minimize the potential for adverse impacts on the environment. Avoidance and minimization measures and BMPs are described in Section 3 within the context of the applicable resources. The Proposed Action also provides operational efficiencies, which will minimize adverse effects on air quality, water quality, and hazardous materials.

Mitigation beyond BMPs and design considerations include the following to reduce or eliminate impacts to ESA-listed species and Cultural and Tribal Resources:

1. **Threatened & Endangered Species and Essential Fish Habitat:** Per consultation with NMFS and USFWS on ESA and EFH implementation and documented in Appendix E, the Port will implement the following measures and conservation recommendations:
    a. Turbidity Monitoring: The Port or its contractor will visually monitor turbidity during in-water activities. Work will cease if a visible plume extends beyond 150 feet until compliance is restored, with adjustments made as needed to prevent further exceedances in accordance with Washington State Surface Water Quality Standards.
    b. Barge Operations: Barges and workboats will not be allowed to ground out in the mudline.
    c. Riprap Installation: Riprap repositioning at the Cofferdam Dock will be conducted carefully to minimize sediment disturbance, preferably in dry conditions.
    d. Spill Prevention: A Spill Prevention, Control, and Countermeasures Plan will be developed to manage fuel and hazardous materials storage and cleanup during construction.
    e. Stormwater Maintenance: The Port will implement a preventive maintenance program to sweep paved loading/unloading areas and an adaptive management plan to upgrade stormwater treatment as new science and methods become available.
    f. Post-Project Reporting: The Port will submit a report to NOAA Fisheries summarizing project dimensions, completed stormwater improvements, fiberglass encasement installation, maintenance plans, and fish impact monitoring results, including identification of distressed or dead fish during in-water work.

2. **Cultural and Tribal Resources:** Per consultation with the Lower Elwha Klallam Tribe and SHPO per Section 106 of NHPA, the following mitigation measures will be implemented by the Port as documented in Appendix F:
    a. Protection Area Transfer: The Port will transfer approximately 6.13 acres of the "Protection Area" property at the IFTF to the Lower Elwha Klallam Tribe (LEKT) after creating the parcel boundaries, preparing the deed, and removing existing structures, paving, and debris.
    b. Cultural Resource Monitoring:

c. Ground-disturbing activities will be monitored by a professional archaeologist meeting Secretary of the Interior standards, as outlined in the Monitoring and Inadvertent Discovery Plan (MIDP).

d. A Tribal Cultural Resources Monitor from LEKT will observe all monitoring activities.

e. The Port will obtain necessary archaeological permits and compensate LEKT for cultural resource monitor services.

The following permits are identified to be needed for the construction of the proposed IHTF improvements and will be applied for following the NEPA evaluation:

- U.S. Army Corps of Engineers: Nationwide Permit for Maintenance
- Washington Department of Ecology: Section 401 Water Quality Certification and Consistency Determination with the Coastal Zone Management Act
- Washington Department of Ecology: Construction Stormwater General Permit
- Washington Department of Fish and Wildlife: Hydraulic Project Approval
- Olympic Region Clean Air Agency: Demolition Notification
- City of Port Angeles: Shoreline Substantial Development Permit
- City of Port Angeles: Building and Clearing & Grading Permit

6.0 AGENCY, TRIBAL, AND PUBLIC CONSULTATION

To communicate the needs, benefits, and impacts of this Project, the Port has had direct engagement with stakeholders in the community and local tribes. This outreach has included and is documented in Appendix L:

- Presentations to multiple service and fraternal organizations in the community about this Project over the past 2 years.
    - November 9, 2023 – Rotary Club of Sequim Sunrise
    - January 15, 2024 – Port Angeles Business Association
    - February 15, 2024 – Kiwanis Club Port Angeles
    - January 23, 2025 – North Olympic Development Council
- Informal consultation and multiple meetings with the Lower Elwha Klallam Tribe to discuss the Project and the protection of cultural resources along the community's waterfront.
- A Joint Port/Clallam County public meeting on April 25, 2022 discussed the Port's grant applications and the Project's benefits to the County.

MARAD initiated consultation with DAHP and the following Tribes:

- Hoh Indian Tribe
- Jamestown S'Klallam Tribe
- Lower Elwha Klallam Tribe
- Makah Tribe
- Port Gamble S'Klallam Tribe
- Quileute Nation
- Suquamish Tribe
- Confederated Tribes of Warm Springs.

Correspondence to and from DAHP and the Tribes is provided in Appendix F. The Suquamish Tribe and Jamestown S'Klallam Tribe provided responses deferring to the Lower Elwha Klallam Tribe for cultural resource issues (Appendix F).

7.0 CONCLUSION

The Port is proposing to improve the cargo handling infrastructure at its IHTF. The Proposed Action includes Cofferdam Dock Facility Improvements and IHTF Upland Improvements. The Proposed Action would improve the safety and efficiency of the movement and sorting of forest products through the IHTF. The Proposed Action incorporates mitigation through design considerations, BMPs, and additional mitigation required through agency consultations to avoid and minimize significant adverse impacts. This EA discusses the environmental issues and effects of the Proposed Action and specifies appropriate mitigation measures and standard conditions of approval in order to minimize environmental effects. A mitigated Finding of No Significant Impact (FONSI) on the Environment is an appropriate finding for this Proposed Action.

8.0 PREPARERS

Landau Associates:

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- Stephanie Hyder
- Kat Baker
- Kaila Anderson
- Jeffrey Fellows
- Kevin Warner
- Jennifer Wynkoop
- Steven Wright
- Amy Maule
- Christopher Young

Moffett and Nichol:

- Margaret Schwertner

Port of Port Angeles:

- Jesse Waknitz

9.0 REFERENCES

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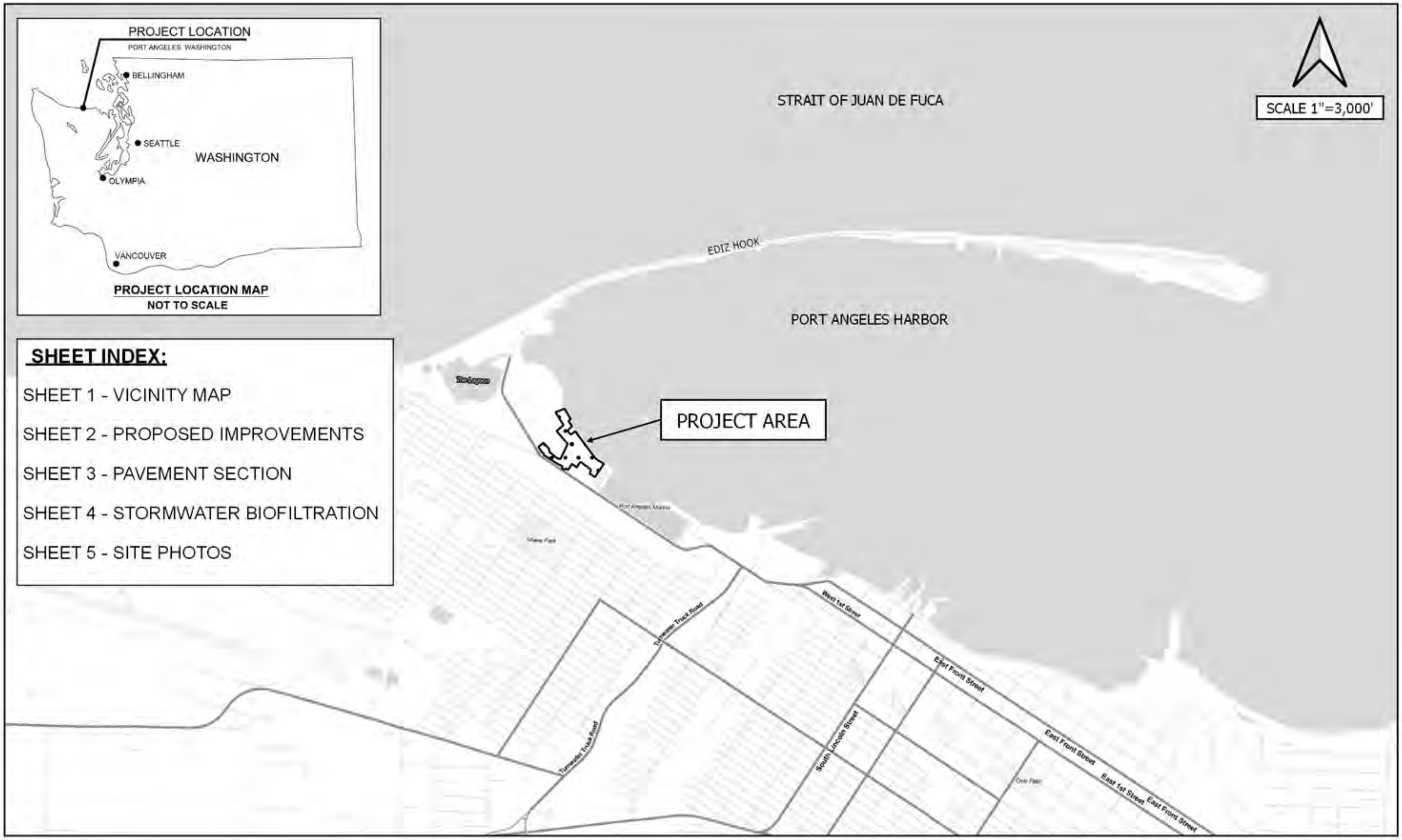
APPENDIX A

Project Plans



SHEET INDEX:

SHEET 1 - VICINITY MAP

SHEET 2 - PROPOSED IMPROVEMENTS

SHEET 3 - PAVEMENT SECTION

SHEET 4 - STORMWATER BIOFILTRATION

SHEET 5 - SITE PHOTOS

IN: ADJACENT TO PORT ANGELES HARBOR

AT: PORT OF PORT ANGELES LOG YARD, 1301 MARINE DRIVE

CITY: PORT ANGELES **COUNTY:** CLALLAM

STATE: WASHINGTON

APPLICATION BY: PORT OF PORT ANGELES

REFERENCE NO:

PURPOSE: IMPROVE CARGO HANDLING INFRASTRUCTURE AT IHTF THAT INCLUDES MAINTENANCE TO COFFERDAM DOCK, ASPHALT PAVING OF 14.4-ACRES AND CONSTRUCTION OF STORMWATER TREATMENT SYSTEM

SECTION: NW 4 **LAT:** 48.130634 N

TOWNSHIP: 30 N **LONG:** -123.460395 W

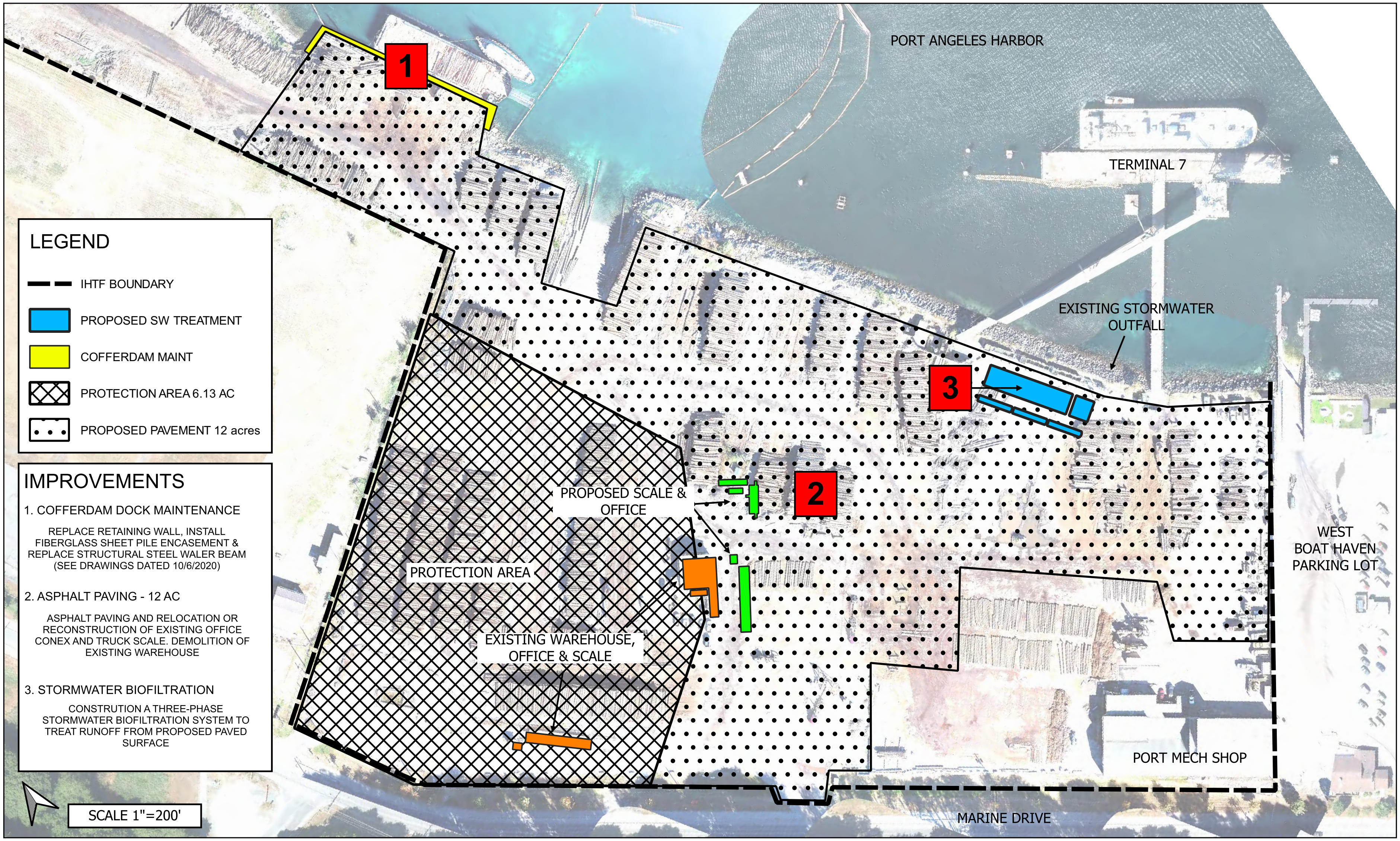
RANGE: 6 W **DATUM:** MLLW = 0.0'

INTERMODAL HANDLING AND TRANSFER FACILITY (IHTF) IMPROVEMENTS PROJECT

VICINITY MAP

DATE: 4/27/2023

SHEET: 01 OF 05



LEGEND

- ▬ ▬ IHTF BOUNDARY
- 🟦 PROPOSED SW TREATMENT
- 🟨 COFFERDAM MAINT
- ▨ PROTECTION AREA 6.13 AC
- ⁚ PROPOSED PAVEMENT 12 acres

IMPROVEMENTS

1. COFFERDAM DOCK MAINTENANCE

REPLACE RETAINING WALL, INSTALL FIBERGLASS SHEET PILE ENCASEMENT & REPLACE STRUCTURAL STEEL WALER BEAM (SEE DRAWINGS DATED 10/6/2020)

2. ASPHALT PAVING - 12 AC

ASPHALT PAVING AND RELOCATION OR RECONSTRUCTION OF EXISTING OFFICE CONEX AND TRUCK SCALE. DEMOLITION OF EXISTING WAREHOUSE

3. STORMWATER BIOFILTRATION

CONSTRUTION A THREE-PHASE STORMWATER BIOFILTRATION SYSTEM TO TREAT RUNOFF FROM PROPOSED PAVED SURFACE

IN: ADJACENT TO PORT ANGELES HARBOR

AT: PORT OF PORT ANGELES LOG YARD, 1301 MARINE DRIVE

CITY: PORT ANGELES **COUNTY:** CLALLAM

STATE: WASHINGTON

APPLICATION BY: PORT OF PORT ANGELES

REFERENCE NO:

PURPOSE: IMPROVE CARGO HANDLING INFRASTRUCTURE AT IHTF THAT INCLUDES MAINTENANCE TO COFFERDAM DOCK, ASPHALT PAVING OF 12-ACRES AND CONSTRUCTION OF STORMWATER TREATMENT SYSTEM

SECTION: NW 4

LAT: 48.130634 N

TOWNSHIP: 30 N

LONG: -123.460395 W

RANGE: 6 W

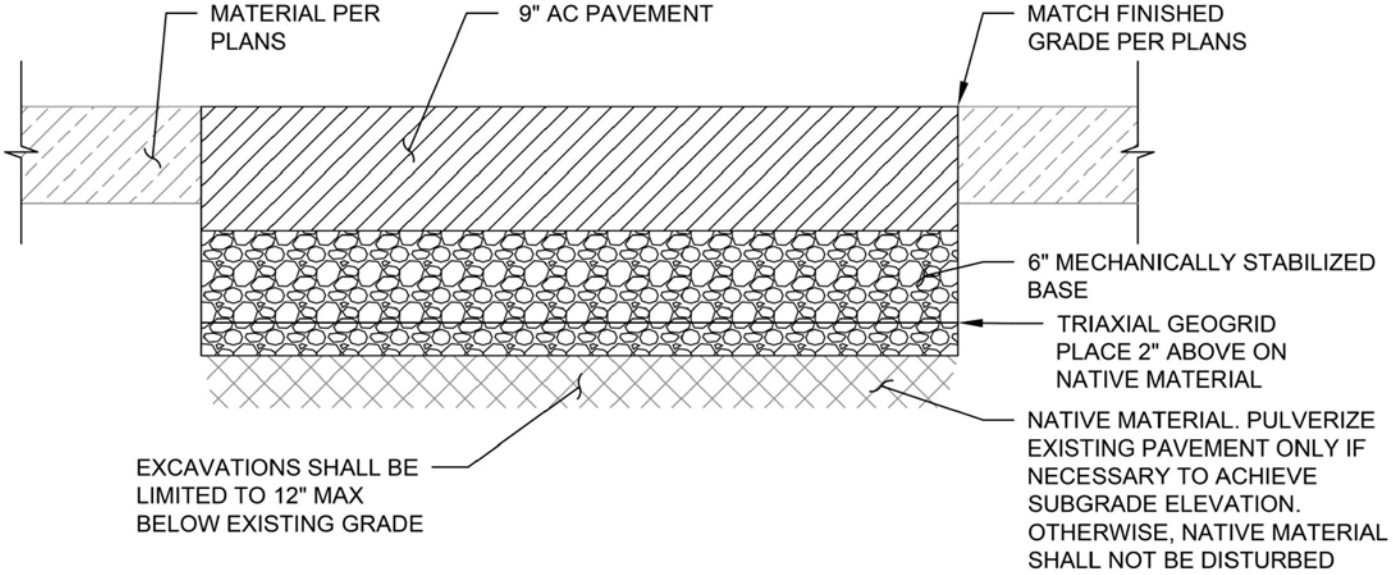
DATUM: MLLW = 0.0'

INTERMODAL HANDLING AND TRANSFER FACILITY (IHTF) IMPROVEMENTS PROJECT

PROPOSED IMPROVEMENTS

DATE: 11/27/2024
REVISED 1/28/2025

SHEET: 02 OF 05



TYPICAL PAVEMENT SECTION - NTS

IN: ADJACENT TO PORT ANGELES HARBOR

AT: PORT OF PORT ANGELES LOG YARD, 1301 MARINE DRIVE

CITY: PORT ANGELES **COUNTY:** CLALLAM

STATE: WASHINGTON

APPLICATION BY: PORT OF PORT ANGELES

REFERENCE NO:

PURPOSE: IMPROVE CARGO HANDLING INFRASTRUCTURE AT IHTF THAT INCLUDES MAINTENANCE TO COFFERDAM DOCK, ASPHALT PAVING OF 14.4-ACRES AND CONSTRUCTION OF STORMWATER TREATMENT SYSTEM

SECTION: NW 4 **LAT:** 48.130634 N

TOWNSHIP: 30 N **LONG:** -123.460395 W

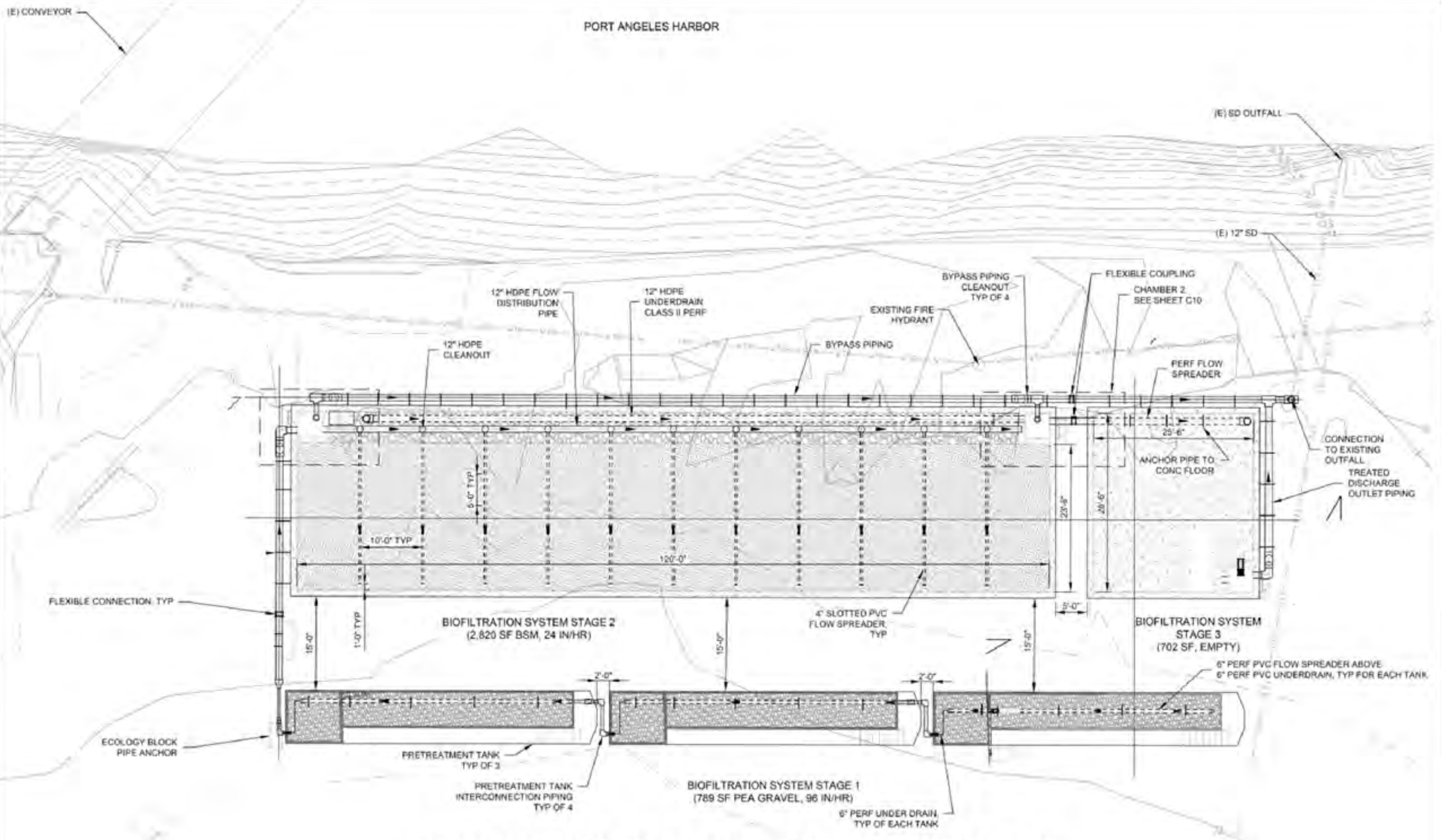
RANGE: 6 W **DATUM:** MLLW = 0.0'

INTERMODAL HANDLING AND TRANSFER FACILITY (IHTF) IMPROVEMENTS PROJECT

PAVEMENT SECTION

DATE: 4/27/2023

SHEET: 03 OF 05



STORMWATER BIOFILTRATION SYSTEM

▨ PEA GRAVEL

▨ BIOFILTRATION SOIL

☐ CONCRETE (EMPTY TANK)

IN: ADJACENT TO PORT ANGELES HARBOR

AT: PORT OF PORT ANGELES LOG YARD, 1301 MARINE DRIVE

CITY: PORT ANGELES **COUNTY:** CLALLAM

STATE: WASHINGTON

APPLICATION BY: PORT OF PORT ANGELES

REFERENCE NO:

PURPOSE: IMPROVE CARGO HANDLING INFRASTRUCTURE AT IHTF THAT INCLUDES MAINTENANCE TO COFFERDAM DOCK, ASPHALT PAVING OF 14.4-ACRES AND CONSTRUCTION OF STORMWATER TREATMENT SYSTEM

SECTION: NW 4

TOWNSHIP: 30 N

RANGE: 6 W

LAT: 48.130634 N

LONG: -123.460395 W

DATUM: MLLW = 0.0'

INTERMODAL HANDLING AND TRANSFER FACILITY (IHTF) IMPROVEMENTS PROJECT

STORMWATER BIOFILTRATION SYSTEM

DATE: 4/27/2023

SHEET: 04 OF 05

PHOTO1 - LOOKING WEST AT PROJECT AREA

PHOTO 4 - EXISTING SITE SURFACE

PHOTO 5 - EXISTING SITE SURFACE

PHOTO 2 - LOOKING SOUTH AT PROJECT AREA

PHOTO 3 - LOOKING SOUTH AT COFFER DAM DOCK

IN: ADJACENT TO PORT ANGELES HARBOR

AT: PORT OF PORT ANGELES LOG YARD, 1301 MARINE DRIVE

CITY: PORT ANGELES **COUNTY:** CLALLAM

STATE: WASHINGTON

APPLICATION BY: PORT OF PORT ANGELES

REFERENCE NO:

PURPOSE: IMPROVE CARGO HANDLING INFRASTRUCTURE AT IHTF THAT INCLUDES MAINTENANCE TO COFFERDAM DOCK, ASPHALT PAVING OF 14.4-ACRES AND CONSTRUCTION OF STORMWATER TREATMENT SYSTEM

SECTION: NW 4 **LAT:** 48.130634 N

TOWNSHIP: 30 N **LONG:** -123.460395 W

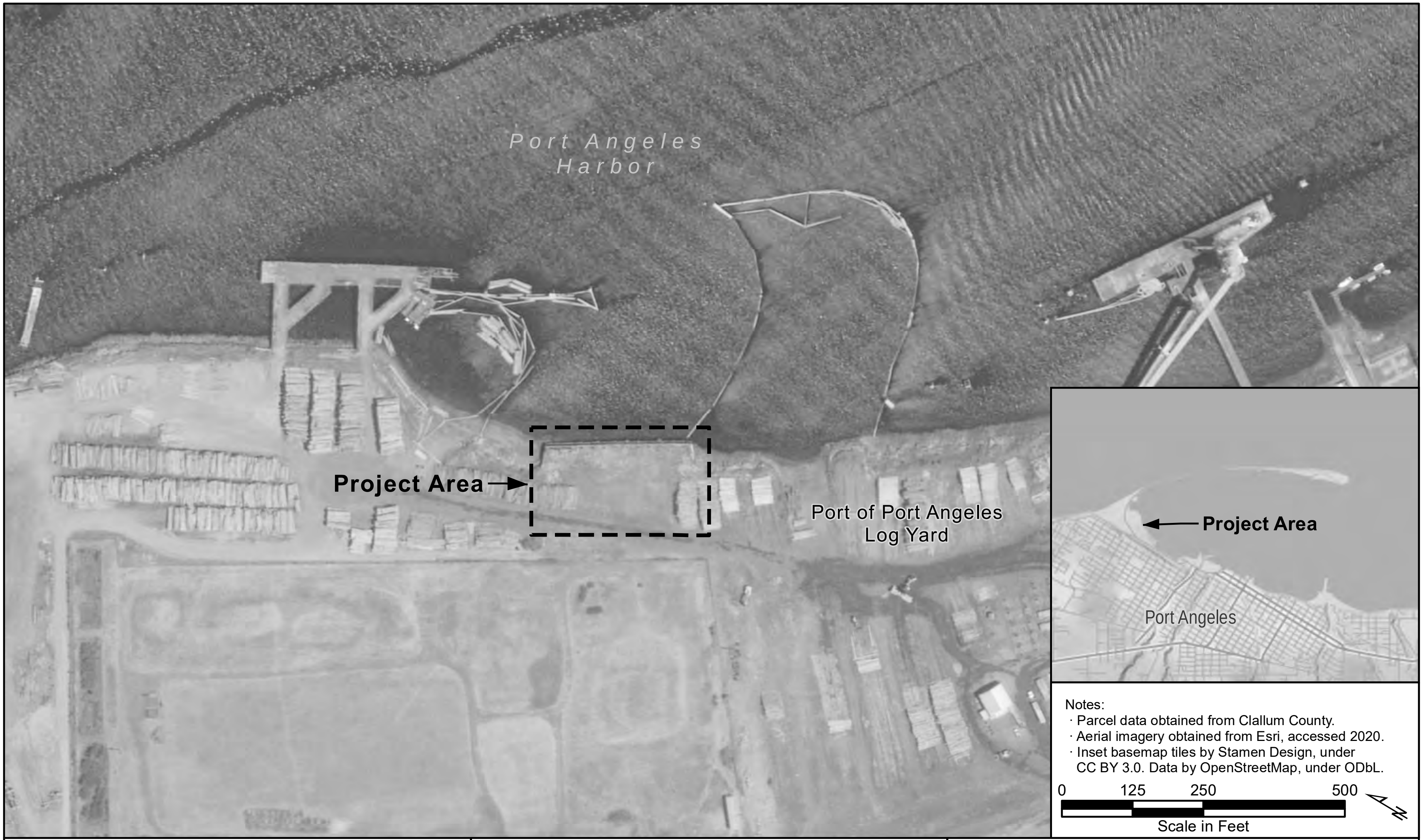
RANGE: 6 W **DATUM:** MLLW = 0.0'

INTERMODAL HANDLING AND TRANSFER FACILITY (IHTF) IMPROVEMENTS PROJECT

SITE PHOTOS

DATE: 4/27/2023

SHEET: 05 OF 05



Notes:
- Parcel data obtained from Clallum County.
- Aerial imagery obtained from Esri, accessed 2020.
- Inset basemap tiles by Stamen Design, under CC BY 3.0. Data by OpenStreetMap, under ODbL.

IN: STRAIGHT OF JUAN DE FUCA

AT: PORT OF PORT ANGELES COFFERDAM

CITY: PORT ANGELES **COUNTY:** CLALLAM

STATE: WASHINGTON **PARCEL:** 063099190035

APPLICATION BY: PORT OF PORT ANGELES

REFERENCE NO: NWS-2020-779

PURPOSE: PROVIDE MAINTENANCE AND REPAIRS TO EXISTING COFFFERDAM STRUCTURE AT THE PORT OF PORT ANGELES LOG YARD FACILITY

SECTION: S4 **LATITUDE:** 48° 7' 42.49" N

TOWNSHIP: 30N **LONGITUDE:** 123° 28' 26.4" W

RANGE: 6W **DATUM:** MLLW = 0.00'

PORT OF PORT ANGELES COFFERDAM

LOADING STRUCTURE MAINTENANCE AND REPAIR PROJECT

VICINITY MAP

DATE: 10/06/2020

SHEET: 1 of 14

I:\GIS\Projects\KPFF-POPA Cofferdam\MXD\Cofferdam Loading Structure Improvement Project\Sheet 1 of 11 - Vicinity Map.mxd
4/7/2020

BMPs FOR IMPLEMENTATION DURING CONSTRUCTION

CONTRACTOR SHALL PROTECT-IN-PLACE ALL STRUCTURES, UTILITIES AND OBJECTS NOT IDENTIFIED AS BEING DEMOLISHED ON THE PLANS. ANY DAMAGE TO ITEMS NOT BEING DEMOLISHED SHALL BE REPAIRED BY THE CONTRACTOR AT THEIR EXPENSE.

CONTRACTOR SHALL IMPLEMENT THE FOLLOWING BMPS AND COMPLY WITH ALL PERMIT CONDITIONS PRIOR TO CONSTRUCTION.

1. ALL EQUIPMENT THAT WILL OPERATE OVERWATER WILL BE CLEANED OF ACCUMULATED GREASE, OIL, OR MUD. ALL LEAKS WILL BE REPAIRED PRIOR TO ARRIVING ON-SITE. EQUIPMENT WILL BE INSPECTED DAILY FOR LEAKS, ACCUMULATIONS OF GREASE, AND THE LIKE, AND ANY IDENTIFIED PROBLEMS WILL BE FIXED BEFORE OPERATING OVER WATER.
2. CONTRACTOR WILL HAVE EMERGENCY SPILL EQUIPMENT AVAILABLE WHENEVER WORKING IN OR NEAR THE WATER.
3. CONTRACTOR SHALL IMPLEMENT ALL BMPS NECESSARY TO PREVENT WORK MATERIALS OR DEBRIS FROM ENTERING THE WATER.
4. ANY MATERIALS DROPPED INTO THE WATER WOULD IMMEDIATELY BE PICKED UP BY THE CONTRACTOR.
5. SURFACE PREPARATION AREA WILL BE CONTAINED TO PREVENT DUST AND ABRASIVE MATERIAL FROM ENTERING THE SURROUNDING ENVIRONMENT.

SURVEY CONTROL

EXISTING CONDITIONS SURVEY PROVIDED BY ZENOVIC AND ASSOCIATES DATED DECEMBER 19TH, 2018.

HORIZONTAL DATUM = NORTH AMERICAN VERTICAL DATUM OF 1983 (91 ADJUSTMENT)

VERTICAL DATUM IS MLLW = 0 (NAVD88:+0.42)

HIGH TIDE LINE:

FOR THE PURPOSE OF THIS PROJECT, THE HTL IS DEFINED AS THE HIGHEST ASTRONOMICAL TIDE (HAT) WHICH IS 9.06 FT MLLW (NOAA STATION #9444090).

MEAN HIGH WATER (MHW) = 6.51' (NAVD88;+0.42)

ABBREVIATIONS

ANCH	ANCHOR
ARCH	ARCHITECTURAL
BLDG	BUILDING
BLKG	BLOCKING
BM	BEAM
CAP	CAPACITY
CIP	CAST IN PLACE
CL	CENTERLINE
CLG	CEILING
CMU	CONCRETE MASONRY UNIT
CONC	CONCRETE
CONST	CONSTRUCTION
CONT	CONTINUOUS
COORD	COORDINATE
CY	CUBIC YARD
DBL	DOUBLE
DEMO	DEMOLISH
DET	DETAIL
DIA	DIAMETER
DIAG	DIAGONAL
DOE	DEPARTMENT OF ECOLOGY
DWG	DRAWING
EA	EACH
EL	ELEVATION
ELECT	ELECTRICAL
EQUIP	EQUIPMENT
EXIST	EXISTING
EXP	EXPANSION
EXT	EXTERIOR
FT	FEET
FTG	FOOTING
GA	GAUGE
GALV	GALVANIZED
GEN	GENERAL
GOVT	GOVERNMENT
GR	GRADE
HAT	HIGHEST ASTRONOMICAL TIDE
HORIZ	HORIZONTAL
HP	HIGH POINT
HTL	HIGH TIDE LINE
IBC	INTERNATIONAL BUILDING CODE
IE	INVERT ELEVATION
IN	INCH
INFO	INFORMATION
ISGP	INDUSTRIAL STORMWATER GENERAL PERMIT
JST	JOIST
JT	JOINT
K	KIP (1,000 LBS.)
KSF	KIPS PER SQUARE FOOT
LF	LINEAL FOOT
MAX	MAXIMUM
MECH	MECHANICAL
MIN	MINIMUM
MISC	MISCELLANEOUS
NTS	NOT TO SCALE
OC	ON CENTER
PL	PROPERTY LINE
PT	POINT
R	RADIUS
SECT	SECTION
SHT	SHEET
SIM	SIMILAR
SPEC	SPECIFICATION
STD	STANDARD
STRUCT	STRUCTURAL
SWMMWW	STORMWATER MANAGEMENT MANUAL FOR WESTERN WASHINGTON
SWPPP	STORMWATER POLLUTION PREVENTION PLAN
TBD	TO BE DETERMINED
THRU	THROUGH
TYP	TYPICAL
VERT	VERTICAL
WL	WATER LINE
WP	WORK POINT

SHEET NO.	DESCRIPTION
01	VICINITY MAP
02	SHEET INDEX, GENERAL NOTES AND ABBREVIATIONS
03	EXISTING SITE PLAN
04	TESC PLAN
05	TESC DETAILS
06	DEMOLITION AND EXCAVATION PLAN AND SECTION
07	GRADING PLAN
08	GRADING SECTION
09	STRUCTURAL PLAN
10	TYPICAL SECTION AND DETAILS
11	FIBERGLASS ENCASEMENT DETAILS

IN: STRAIT OF JUAN DE FUCA

AT: PORT OF PORT ANGELES COFFERDAM

CITY: PORT ANGELES **COUNTY:** CLALLUM

STATE: WASHINGTON **PARCEL #:** 063099190035

APPLICATION BY: PORT OF PORT ANGELES

REFERENCE NO: NWS-2020-779

PURPOSE: PROVIDE MAINTENANCE AND REPAIRS TO EXISTING COFFERDAM STRUCTURE AT THE PORT OF PORT ANGELES LOG YARD FACILITY

SECTION: NW 4 **LAT:** 48° 7’ 42.49” N

TOWNSHIP: 31N **LONG:** 123° 28’ 26.4” W

RANGE: 6W **DATUM:** MLLW = 0.00’

PORT OF PORT ANGELES COFFERDAM

LOADING STRUCTURE MAINTENANCE AND REPAIR PROJECT

SHEET INDEX, GENERAL NOTES, AND ABBREVIATIONS

DATE: 10/6/2020

SHEET: 02 OF 14

EXISTING SITE PLAN

SCALE: 1" = 60'

0 30 60 90

SCALE IN FEET

SURVEY NOTES:

1. BASIS OF BEARINGS: NAD 83 (1991 ADJUSTMENT) PER MEASUREMENTS MADE TO MONUMENTS SHOWN ON VOLUME 34 OF SURVEYS, PAGE 22, RECORDS OF CLALLAM COUNTY, WASHINGTON.
2. VERTICAL DATUM: MLLW, BASED ON THE ABOVE CITED MEASUREMENTS AND CONVERTED FROM NAVD 88 USING THE TIDAL DATUM FOR PORT ANGELES (STATION 9444090) AS PROVIDED AT "WWW.TIDESANDCURRENTS.NOAA.GOV". MLLW ELEVATION AT PORT ANGELES (STATION 9444090) = −0.42 FEET (NAVD 88).
3. TIDE LEVELS:

A.	HAT	9.06'
B.	MHHW	7.06'
C.	MHW	6.51'
D.	MLLW	0.00'

4. THE SUBJECT LANDS ARE USED AS A LOG PROCESSING AND STORAGE YARD. CONDITIONS AND GRADES ARE SUBJECT TO FREQUENT CHANGES.
5. SURVEY SHOWN PERFORMED BY ZENOVIC AND ASSOCIATES IN DECEMBER 2018.
6. BATHYMETRY SHOWN PERFORMED BY SUNCHASERS IN MAY 2010.
7. UNDERGROUND UTILITIES SHOWN HEREON ARE BASED ON OBSERVED FIELD EVIDENCE, CITY OF PORT ANGELES GIS MAPPING, AND DRAWINGS PROVIDED BY THE PORT OF PORT ANGELES. ADDITIONAL UTILITY ROUTES AND ALIGNMENTS MAY EXIST. ZENOVIC AND ASSOCIATES IS NOT TO BE HELD LIABLE FOR THE ACCURACY AND/OR THE COMPLETENESS OF THE UNDERGROUND UTILITIES SHOWN HEREON.
8. GEOTECHNICAL TEST PITS WERE DUG IN 2019 AS PART OF PROJECT DESIGN. THE TEST PITS WERE OBSERVED BY AN ARCHAEOLOGIST; NO PRECONTACT ARCHEOLOGICAL MATERIALS WERE DISCOVERED.

LEGEND:

—15—	GRADE CONTOUR
———	STORM DRAIN
—X—X—X—X—	FENCE
○	PLUGGED CATCH BASIN
⊞	TEST PIT

IN: STRAIT OF JUAN DE FUCA

AT: PORT OF PORT ANGELES COFFERDAM

CITY: PORT ANGELES **COUNTY:** CLALLAM

STATE: WASHINGTON **PARCEL #:** 063099190035

APPLICATION BY: PORT OF PORT ANGELES

REFERENCE NO: NWS-2020-779

PURPOSE: PROVIDE MAINTENANCE AND REPAIRS TO EXISTING COFFERDAM STRUCTURE AT THE PORT OF PORT ANGELES LOG YARD FACILITY

SECTION: NW 4 **LAT:** 48° 7' 42.49" N

TOWNSHIP: 31N **LONG:** 123° 28' 26.4" W

RANGE: 6W **DATUM:** MLLW = 0.00'

PORT OF PORT ANGELES COFFERDAM

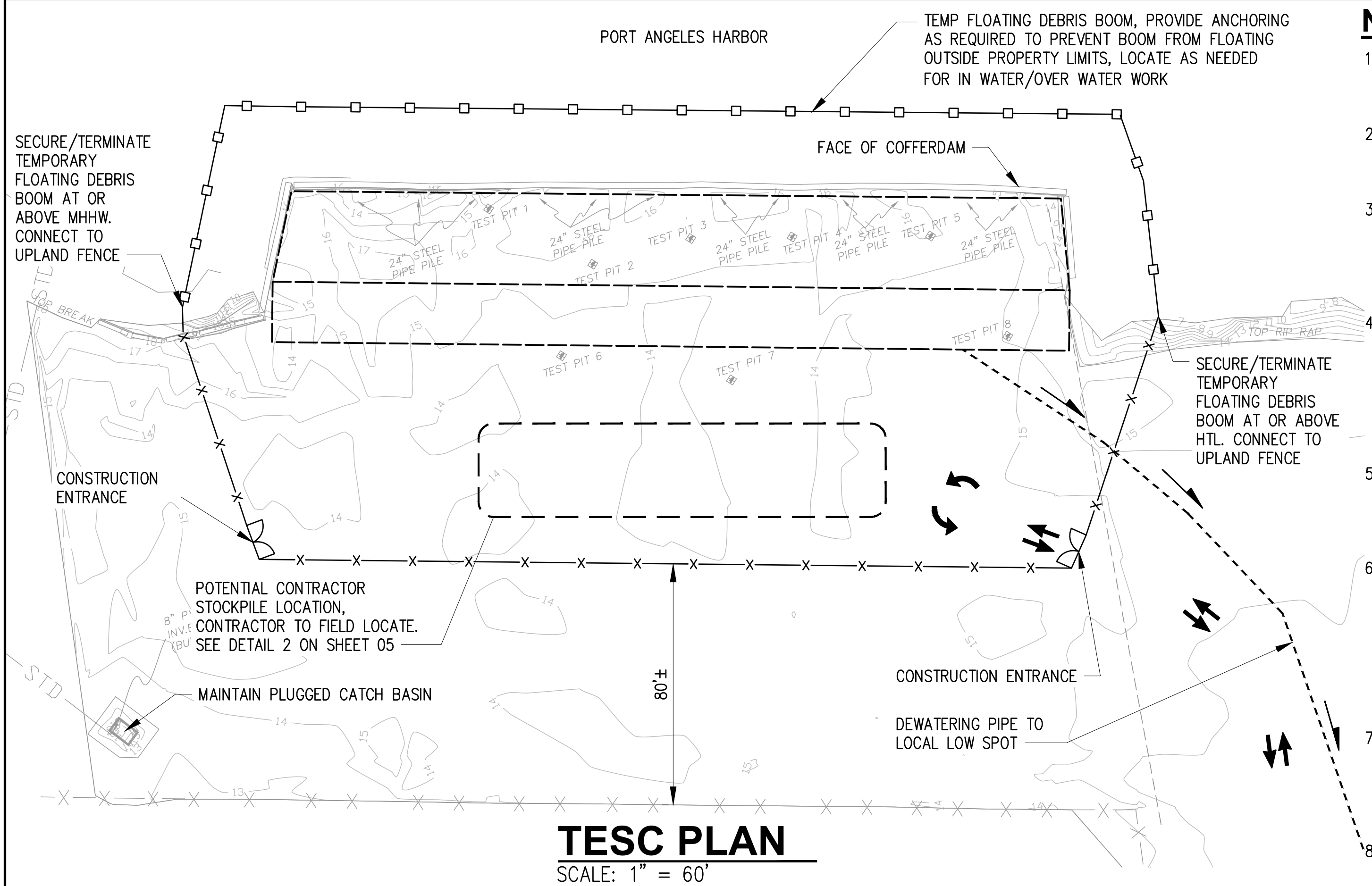
LOADING STRUCTURE MAINTENANCE AND REPAIR PROJECT

EXISTING SITE PLAN

DATE: 10/6/2020

SHEET: 03 OF 14

Plotted: Oct 04, 2020 – 4:47pm jhollenbach Layout: G2.0
M:\2018\1800020 POPA Conditions Assessment\Drawings\Exhibits\2020-10-02 JARPA – 8.5x11\03_1800020_ExistingSitePlan.dwg



TESC PLAN

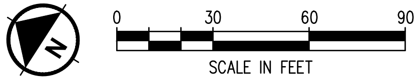
SCALE: 1" = 60'

LEGEND:

TEMPORARY FLOATING DEBRIS BOOM (1/05)
TEMPORARY CONSTRUCTION FENCE (3/05)
CONSTRUCTION ENTRANCE
STRUCTURAL WORK LIMITS
STOCKPILE AREA BOUNDARY
DEWATERING PIPE
VEHICLE ROUTING

NOTES:

1. CONTRACTOR TO MAINTAIN PLUGGED CATCH BASINS, NOTE THAT NO STORM DRAINAGE FROM WITHIN PROJECT LIMITS SHALL DRAIN TO THE PORT DRAINAGE SYSTEM.
2. THE CONTRACTOR SHALL COMPLY WITH, MAINTAIN, AND MODIFY AS NEEDED THE APPROVED CONSTRUCTION SWPPP IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
3. THE IMPLEMENTATION OF THESE TESC PLANS AND CONSTRUCTION, MAINTENANCE, REPLACEMENT AND UPGRADING OF THESE FACILITIES IS THE RESPONSIBILITY OF THE CONTRACTOR UNTIL ALL CONSTRUCTION IS COMPLETED AND APPROVED.
4. THE TESC FACILITIES SHOWN ON THIS PLAN ARE THE MINIMUM REQUIREMENTS ANTICIPATED FOR SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE TESC FACILITIES SHALL BE UPGRADED AS NEEDED FOR UNEXPECTED STORM EVENTS AND TO ENSURE THAT SEDIMENT AND SEDIMENT-LADEN WATER DOES NOT LEAVE THE SITE.
5. ON-SITE EROSION CONTROL MEASURES SHALL BE INSTALLED PRIOR TO THE START OF WORK AND SHALL BE MAINTAINED DURING AND AFTER EXCAVATION AND GRADING OPERATIONS TO THE APPROVAL OF THE PORT.
6. THE TESC FACILITIES SHALL BE INSPECTED DAILY BY THE CONTRACTOR AND MAINTAINED AS NECESSARY TO ENSURE THEIR CONTINUED FUNCTION. DAILY INSPECTION REPORTS MUST BE REVIEWED BY THE CONTRACTOR, SIGNED AND MADE AVAILABLE TO THE PORT, CITY AND ANY OTHER ENVIRONMENTAL AUTHORITIES AT ALL TIMES. A COPY OF ALL INSPECTION RECORDS SHALL BE KEPT ON SITE.
7. THE TEMPORARY FLOATING DEBRIS BOOM SHALL BE INSTALLED AT THE START OF WORK AND MAINTAINED, UPGRADED, REPAIRED OR REPLACED THE ENTIRE CONSTRUCTION PERIOD UNTIL ALL CONSTRUCTION IS COMPLETED AND APPROVED.
8. CONTRACTOR SHALL PROVIDE ALL PUMPS, TANKS, SHORING, LABOR, AND EQUIPMENT NECESSARY TO ADEQUATELY DEWATER AND STABILIZE EXCAVATIONS SEE GEOTECHNICAL REPORT FOR ANTICIPATED GROUNDWATER ELEVATIONS.



IN: STRAIT OF JUAN DE FUCA
AT: PORT OF PORT ANGELES COFFERDAM
CITY: PORT ANGELES **COUNTY:** CLALLUM
STATE: WASHINGTON **PARCEL #:** 063099190035
APPLICATION BY: PORT OF PORT ANGELES
REFERENCE NO: NWS-2020-779

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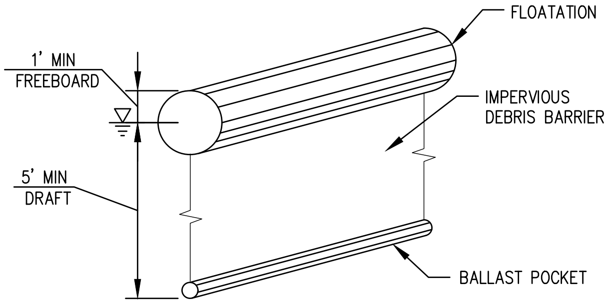
TOWNSHIP: 31N **LONG:** 123° 28' 26.4" W
RANGE: 6W **DATUM:** MLLW = 0.00'

PORT OF PORT ANGELES COFFERDAM
LOADING STRUCTURE MAINTENANCE AND REPAIR PROJECT

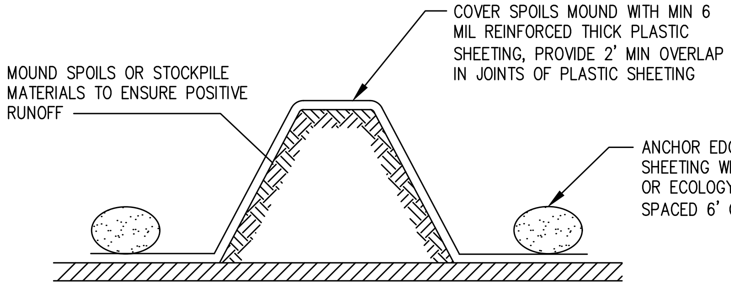
TESC PLAN

DATE: 10/6/2020
SHEET: 04 OF 14



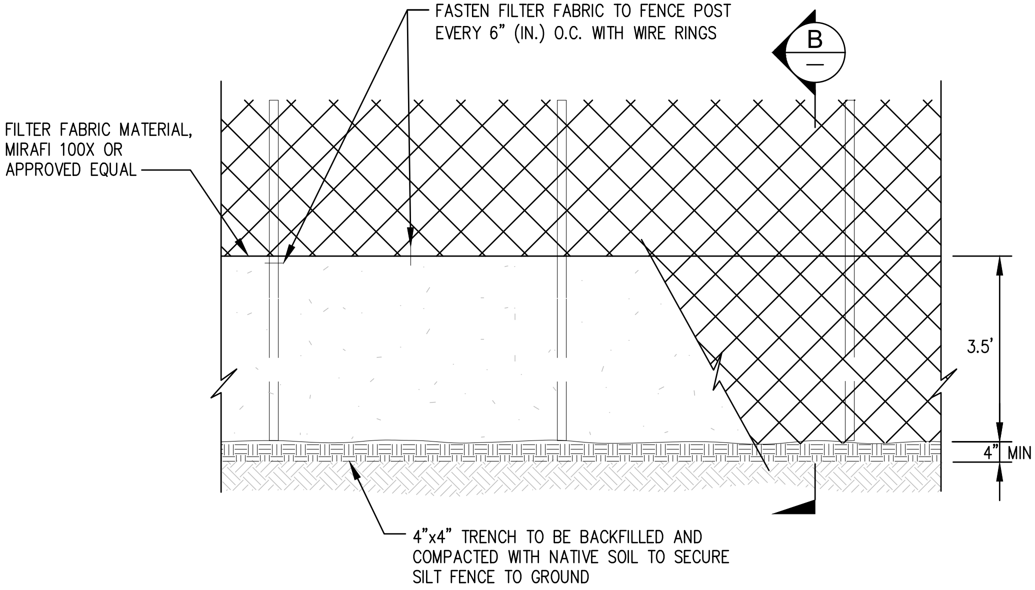
1/04 DEBRIS BOOM

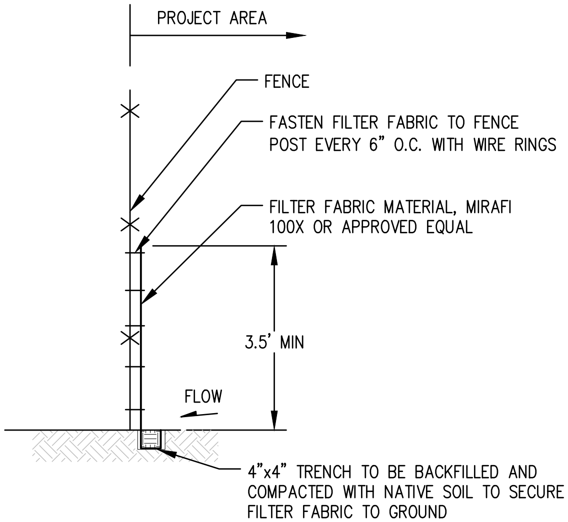
NTS



2/04 STOCKPILE PROTECTION DETAIL

NTS





SECTION B

3/04 CONSTRUCTION FENCE

NTS

IN: STRAIT OF JUAN DE FUCA

AT: PORT OF PORT ANGELES COFFERDAM

CITY: PORT ANGELES **COUNTY:** CLALLUM

STATE: WASHINGTON **PARCEL #:** 063099190035

APPLICATION BY: PORT OF PORT ANGELES

REFERENCE NO: NWS-2020-779

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RANGE: 6W **DATUM:** MLLW = 0.00'

PORT OF PORT ANGELES COFFERDAM

LOADING STRUCTURE MAINTENANCE AND REPAIR PROJECT

TESC DETAILS

DATE: 10/6/2020

SHEET: 05 OF 14

Plotted: Oct 05, 2020 – 7:13pm jhollenbach Layout: 1800020_G3.1
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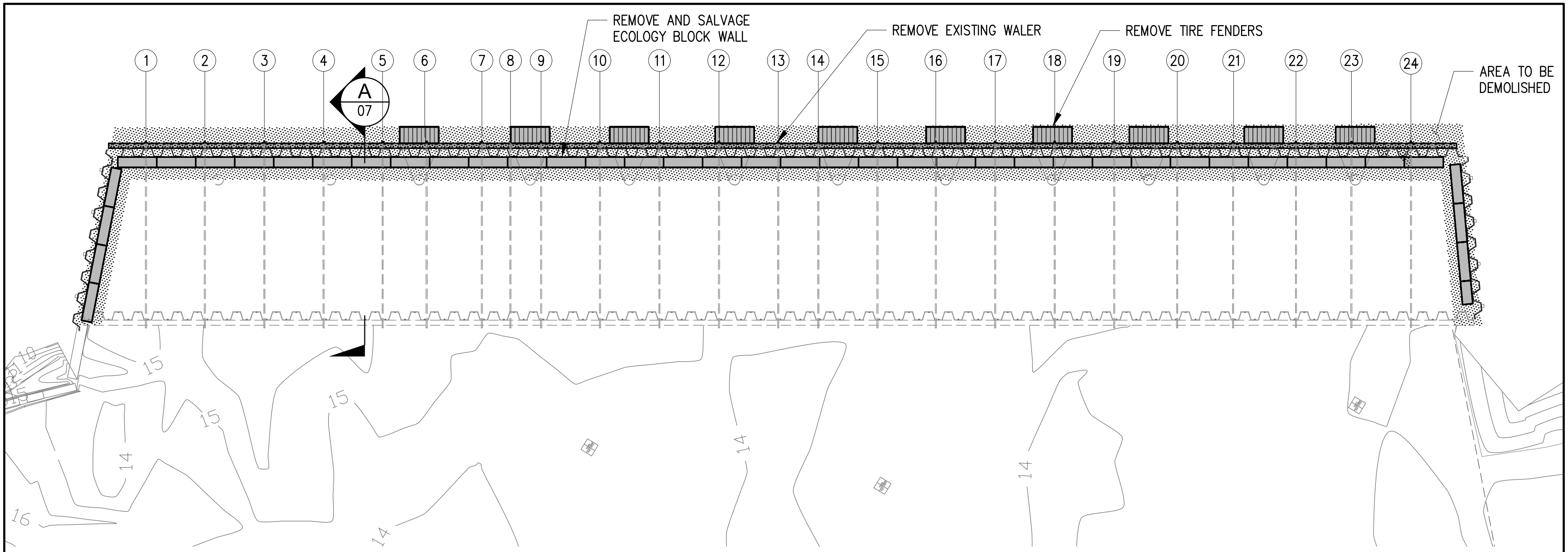
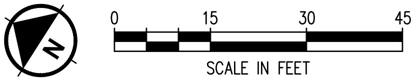


DEMOLITION AND EXCAVATION PLAN

SCALE: 1" = 30'



NOTES

1. CONTRACTOR TO DETERMINE LAYBACK SLOPE AS NEEDED FOR WORK. 2:1 BACKSLOPE SHOWN IS MAXIMUM BACKSLOPE ANTICIPATED.

LEGEND

▨ AREA OF DEMOLITION WORK

■ REMOVE

IN: STRAIT OF JUAN DE FUCA

AT: PORT OF PORT ANGELES COFFERDAM

CITY: PORT ANGELES **COUNTY:** CLALLUM

STATE: WASHINGTON **PARCEL #:** 063099190035

APPLICATION BY: PORT OF PORT ANGELES

REFERENCE NO: NWS-2020-779

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PORT OF PORT ANGELES COFFERDAM

LOADING STRUCTURE MAINTENANCE AND REPAIR PROJECT

DEMOLITION AND EXCAVATION PLAN

DATE: 10/6/2020

SHEET: 06 OF 14

Plotted: Oct 04, 2020 – 5:13pm jhollenbach Layout: Demo&Exca Plan
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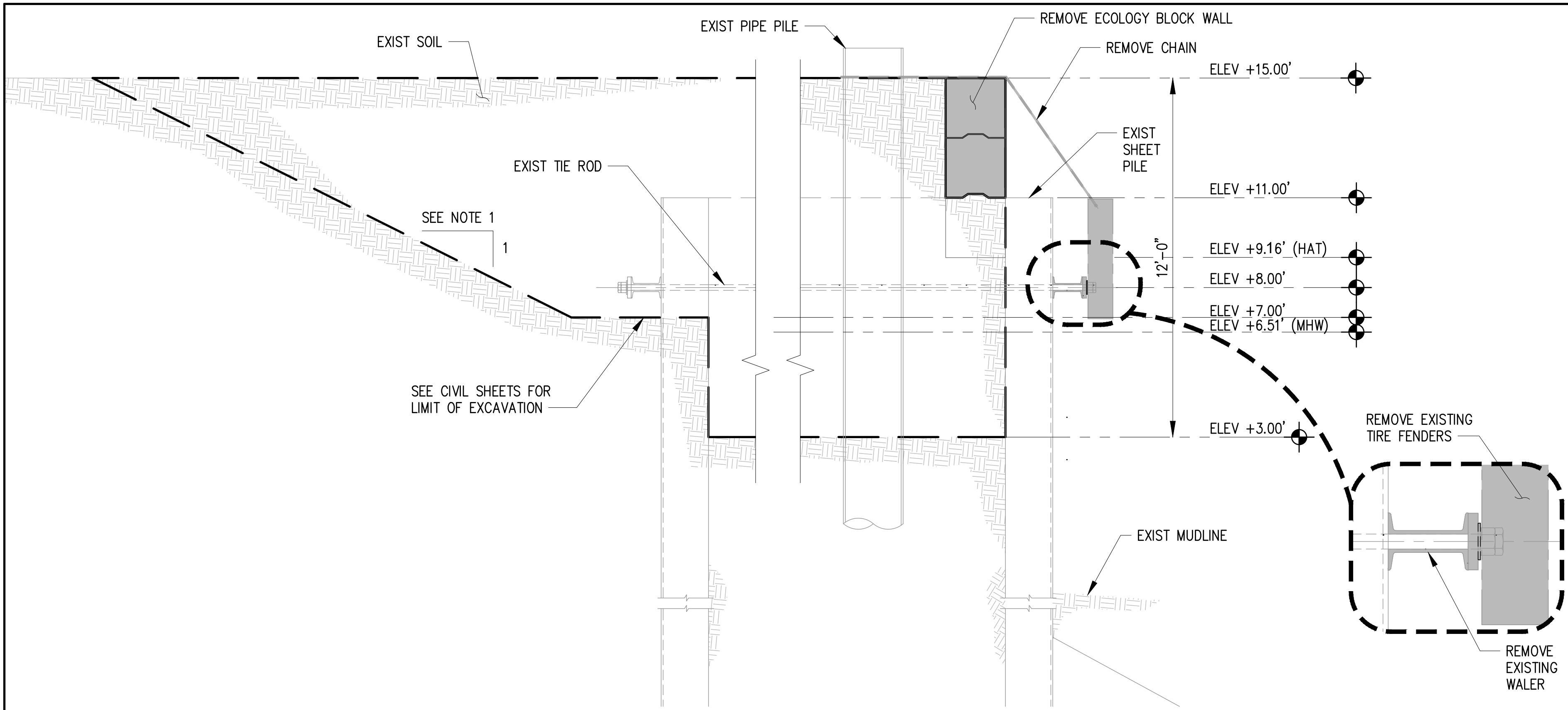

A/06 TYPICAL SECTION

SCALE: 3/16" = 1'-0"

0 1 2 4 8
SCALE IN FEET

NOTES

1. CONTRACTOR TO DETERMINE LAYBACK SLOPE AS NEEDED FOR WORK. 2:1 BACKSLOPE SHOWN IS MAXIMUM BACKSLOPE ANTICIPATED.

LEGEND

— —	AREA OF WORK
▨	REMOVE

IN: STRAIT OF JUAN DE FUCA

AT: PORT OF PORT ANGELES COFFERDAM

CITY: PORT ANGELES **COUNTY:** CLALLUM

STATE: WASHINGTON **PARCEL #:** 063099190035

APPLICATION BY: PORT OF PORT ANGELES

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PORT OF PORT ANGELES COFFERDAM

LOADING STRUCTURE MAINTENANCE AND REPAIR PROJECT

DEMOLITION AND EXCAVATION SECTION

DATE: 10/6/2020

SHEET: 07 OF 14

Plotted: Oct 04, 2020 - 6:25pm jhollenbach Layout: Demo & Exca Section
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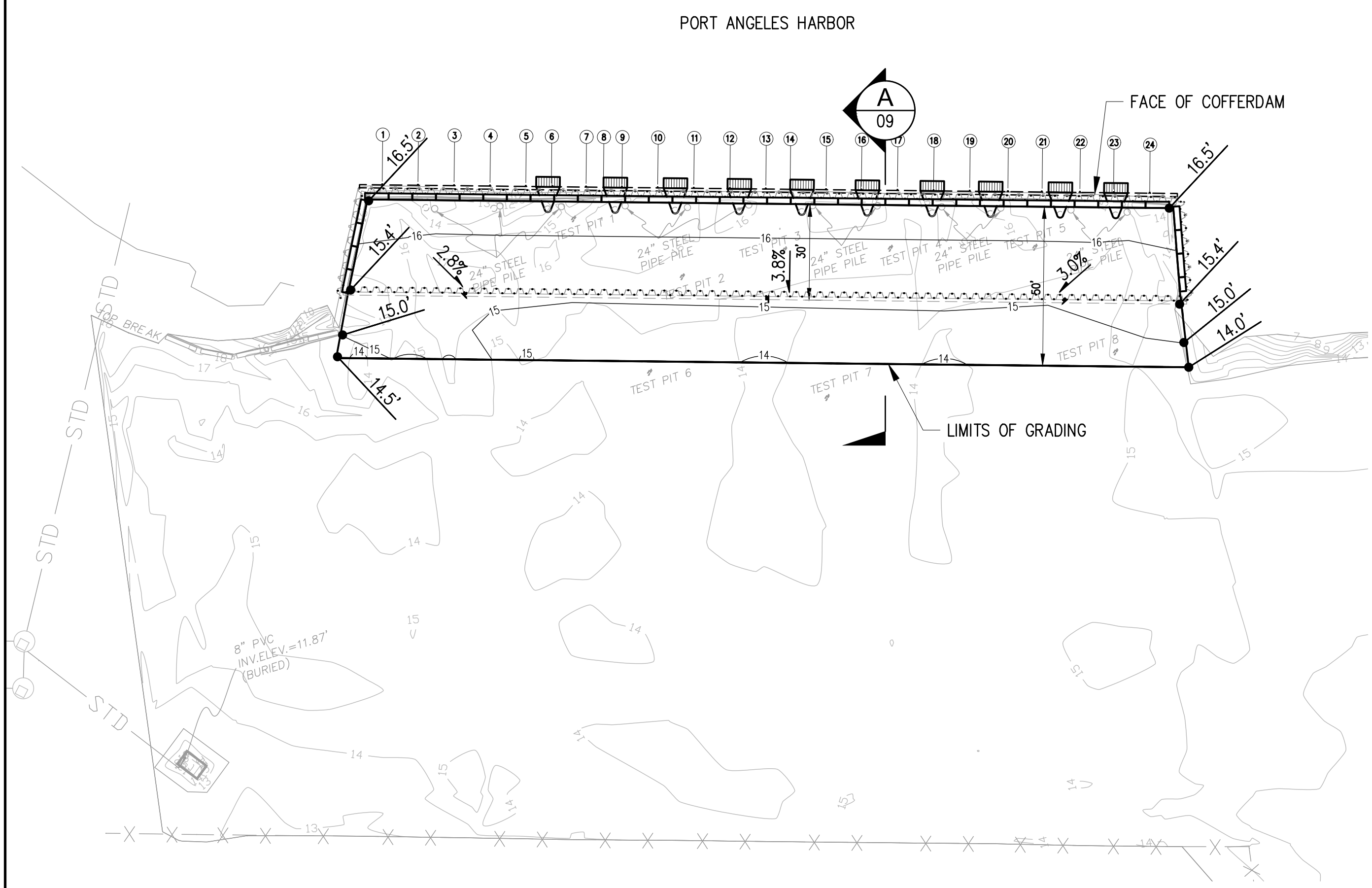

GRADING PLAN

SCALE: 1" = 60'

0 30 60 90

SCALE IN FEET

NOTES:

1. ALL SPOT ELEVATIONS REPRESENT TOP OF GRADING.
2. STRAIGHT GRADES SHALL BE MAINTAINED BETWEEN SPOT ELEVATIONS UNLESS OTHERWISE NOTED.
3. ALL AREAS DISTURBED OR OVER-EXCAVATED DURING CONSTRUCTION SHALL BE COMPACTED PER SPECIFICATIONS.
4. CONTRACTOR SHALL FOLLOW THE WSDOT SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION (2018).
5. CONTRACTOR SHALL PROVIDE THE STORMWATER POLLUTION PREVENTION PLAN (SWPPP).

LEGEND:

——15——	EXISTING GRADE CONTOUR
——15——	PROPOSED GRADE CONTOUR
—— ··· —— ··· ——	FLOW LINE
————	LIMITS OF GRADING
—— STD ——	EXISTING STORM DRAIN
0.7%	FLOW DIRECTION
●——	SPOT ELEVATION
①	TIE ROD GRID

IN: STRAIT OF JUAN DE FUCA

AT: PORT OF PORT ANGELES COFFERDAM

CITY: PORT ANGELES **COUNTY:** CLALLUM

STATE: WASHINGTON **PARCEL #:** 063099190035

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PORT OF PORT ANGELES COFFERDAM

LOADING STRUCTURE MAINTENANCE AND REPAIR PROJECT

GRADING PLAN

DATE: 10/6/2020

SHEET: 08 OF 14

Plotted: Oct 05, 2020 – 3:31pm jhollenbach Layout: GradingPlan
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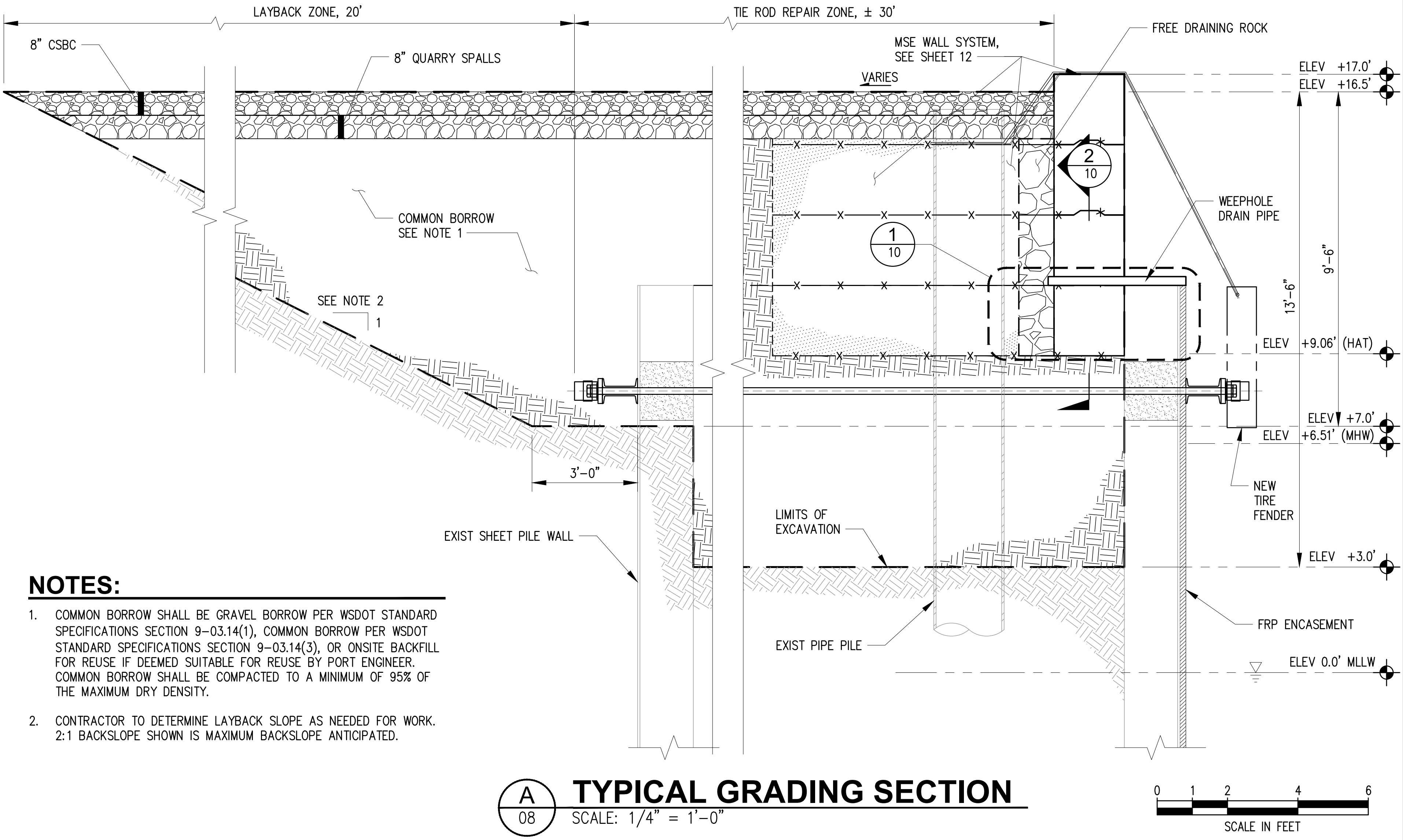

NOTES:

1. COMMON BORROW SHALL BE GRAVEL BORROW PER WSDOT STANDARD SPECIFICATIONS SECTION 9-03.14(1), COMMON BORROW PER WSDOT STANDARD SPECIFICATIONS SECTION 9-03.14(3), OR ONSITE BACKFILL FOR REUSE IF DEEMED SUITABLE FOR REUSE BY PORT ENGINEER. COMMON BORROW SHALL BE COMPACTED TO A MINIMUM OF 95% OF THE MAXIMUM DRY DENSITY.

2. CONTRACTOR TO DETERMINE LAYBACK SLOPE AS NEEDED FOR WORK. 2:1 BACKSLOPE SHOWN IS MAXIMUM BACKSLOPE ANTICIPATED.

A
08

TYPICAL GRADING SECTION

SCALE: 1/4" = 1'-0"

IN: STRAIT OF JUAN DE FUCA

AT: PORT OF PORT ANGELES COFFERDAM

CITY: PORT ANGELES **COUNTY:** CLALLUM

STATE: WASHINGTON **PARCEL #:** 063099190035

APPLICATION BY: PORT OF PORT ANGELES

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RANGE: 6W **DATUM:** MLLW = 0.00'

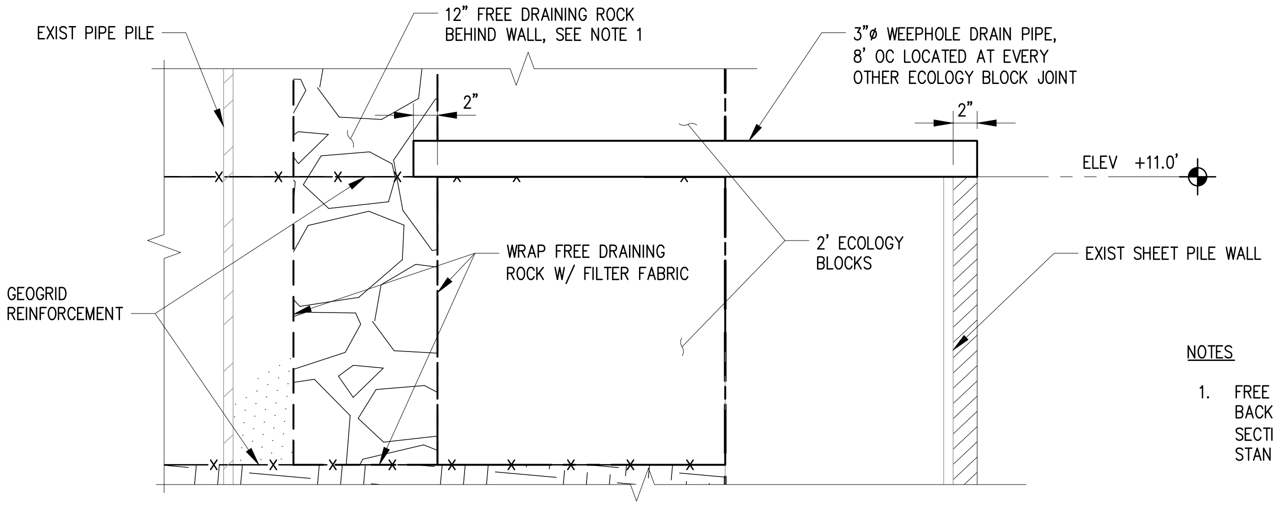
PORT OF PORT ANGELES COFFERDAM

LOADING STRUCTURE MAINTENANCE AND REPAIR PROJECT

TYPICAL GRADING SECTION

DATE: 10/6/2020

SHEET: 09 OF 14



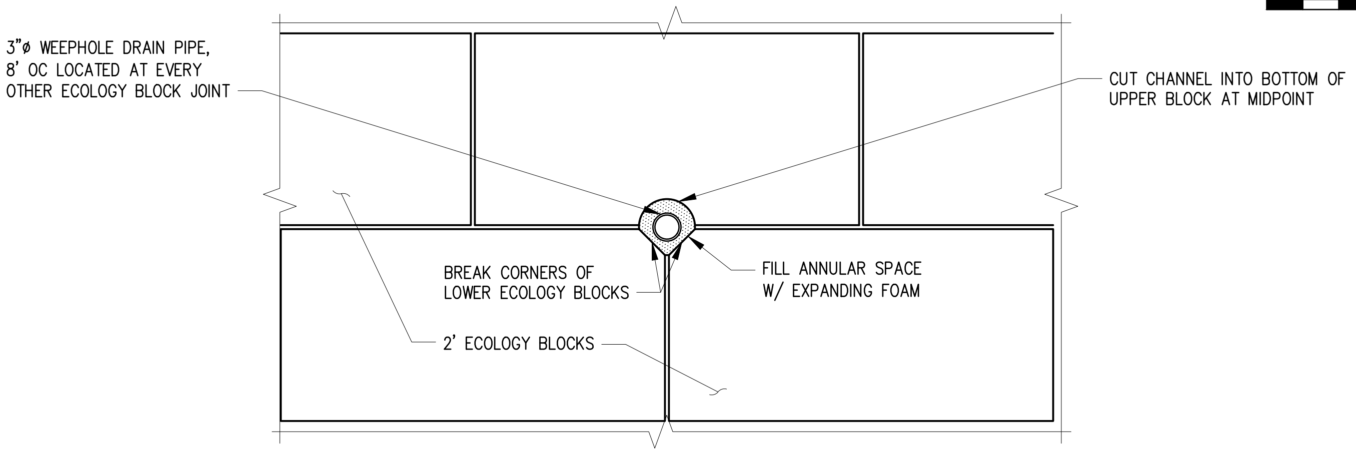
NOTES

1. FREE DRAINING ROCK SHALL BE GRAVEL BACKFILL FOR WALLS, AS DEFINED BY SECTION 9–03.12(2) IN THE WSDOT STANDARD SPECIFICATIONS..

1/09 FREE DRAINING ROCK AND WEEPHOLE DRAIN PILE DETAIL

SCALE: 3/4" = 1'–0"

0 1 2
SCALE IN FEET



2/09 WEEPING DRAIN PILE AT ECOLOGY BLOCK JOINT DETAIL

NTS

IN: STRAIT OF JUAN DE FUCA
AT: PORT OF PORT ANGELES COFFERDAM
CITY: PORT ANGELES **COUNTY:** CLALLUM
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PORT OF PORT ANGELES COFFERDAM
LOADING STRUCTURE MAINTENANCE AND REPAIR PROJECT

GRADING DETAILS

DATE: 10/6/2020
SHEET: 10 OF 14

Plotted: Oct 05, 2020 – 9:47pm jhollenbach Layout: GradingSection
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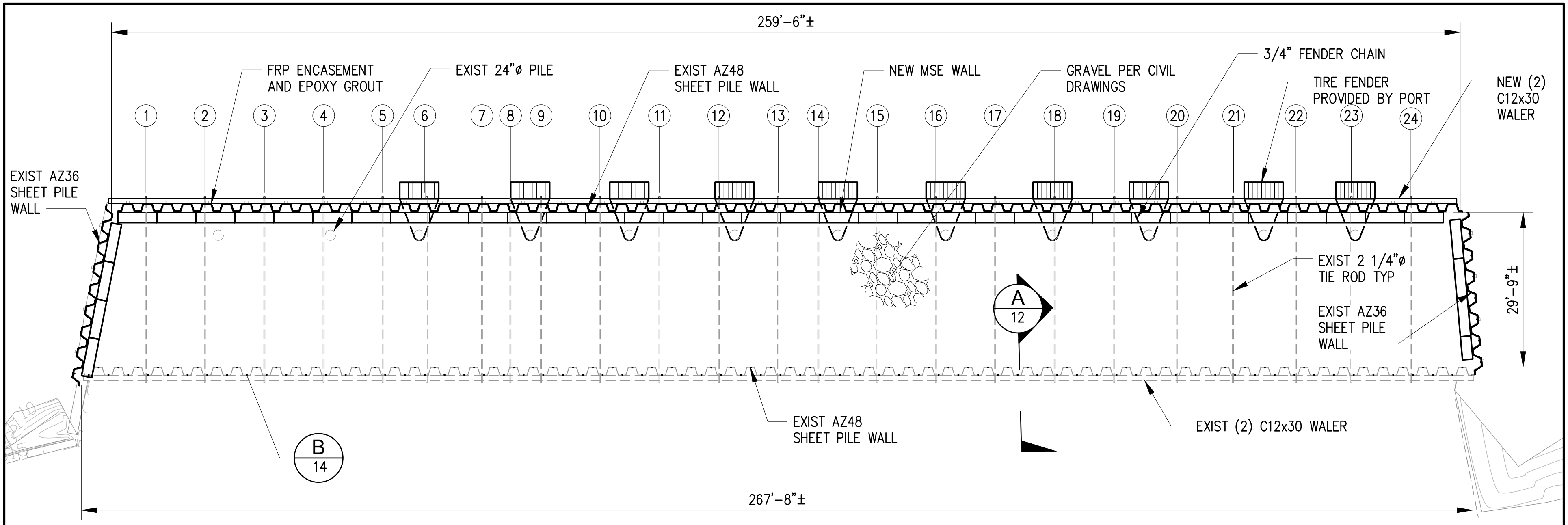

STRUCTURAL PLAN

SCALE: 1" = 30'

0 15 30 45

SCALE IN FEET

IN: STRAIT OF JUAN DE FUCA

AT: PORT OF PORT ANGELES COFFERDAM

CITY: PORT ANGELES **COUNTY:** CLALLUM

STATE: WASHINGTON **PARCEL #:** 063099190035

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PORT OF PORT ANGELES COFFERDAM

LOADING STRUCTURE MAINTENANCE AND REPAIR PROJECT

STRUCTURAL PLAN

DATE: 10/6/2020

SHEET: 11 OF 14

Plotted: Oct 05, 2020 – 7:03pm jhollenbach Layout: StructuralPlan
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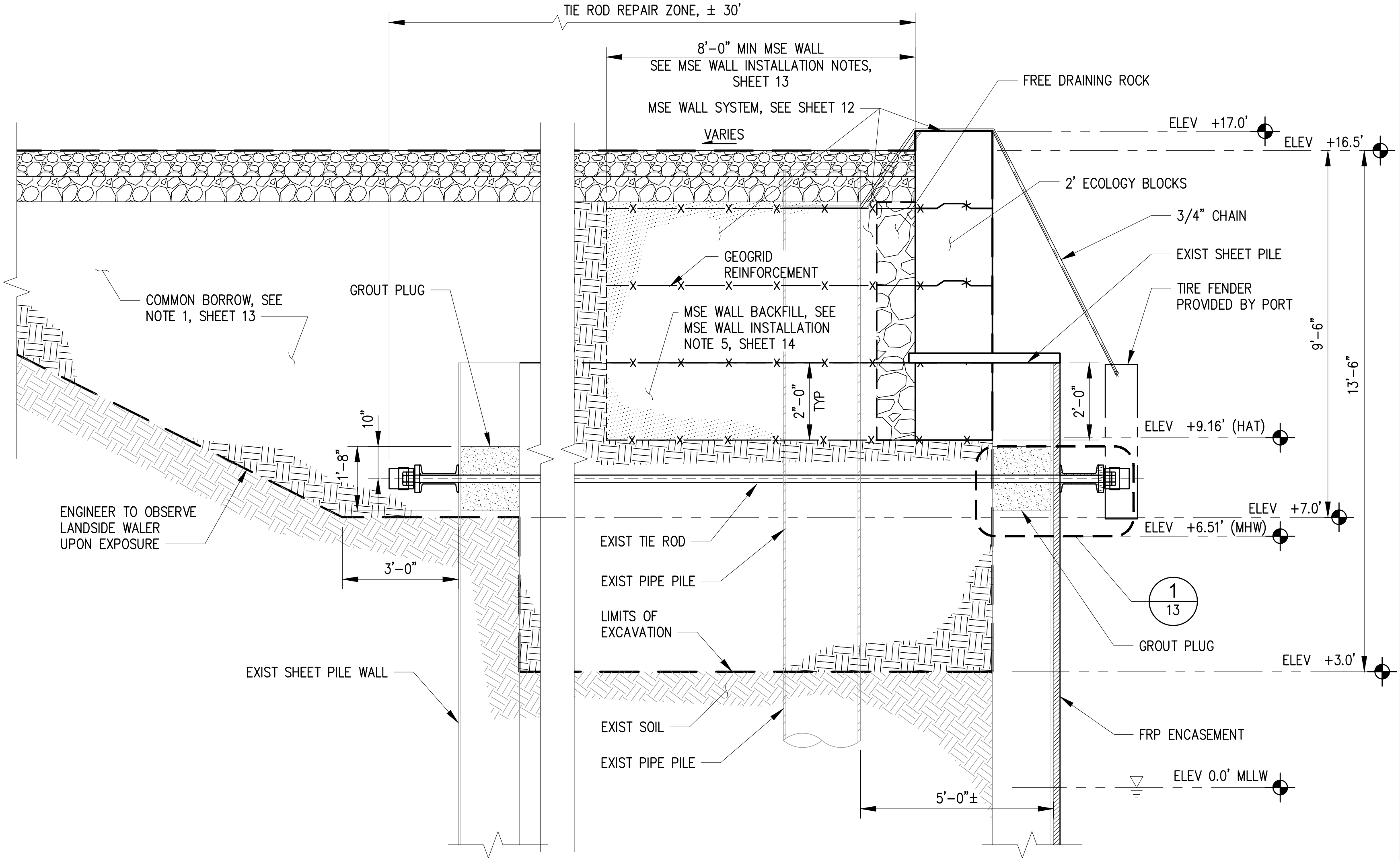

A
XX

TYPICAL SECTION AT TIE ROD

SCALE: 1/4" = 1'-0"

0 1 2 4 6
SCALE IN FEET

IN: STRAIT OF JUAN DE FUCA

AT: PORT OF PORT ANGELES COFFERDAM

CITY: PORT ANGELES **COUNTY:** CLALLUM

STATE: WASHINGTON **PARCEL #:** 063099190035

APPLICATION BY: PORT OF PORT ANGELES

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PORT OF PORT ANGELES COFFERDAM

LOADING STRUCTURE MAINTENANCE AND REPAIR PROJECT

TYPICAL SECTION

DATE: 10/6/2020

SHEET: 12 OF 14

Plotted: Oct 07, 2020 - 4:31pm jhollenbach Layout: 1800020_S3.0
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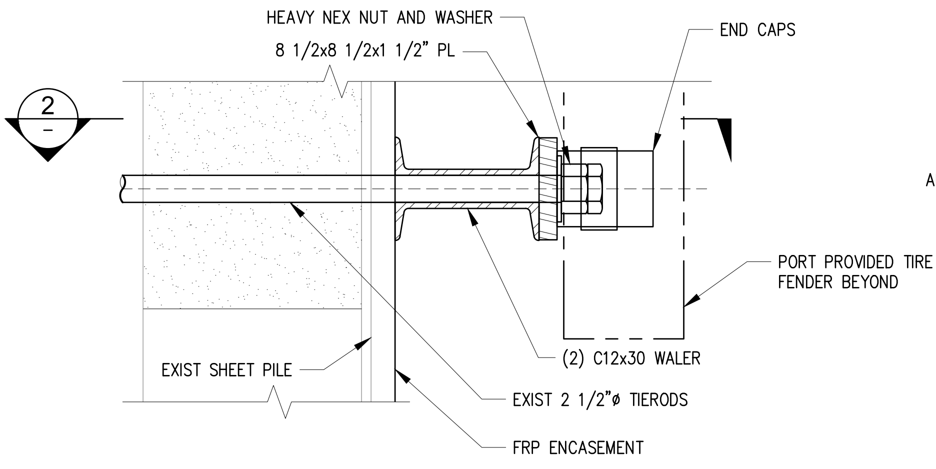
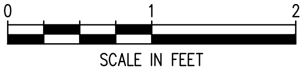
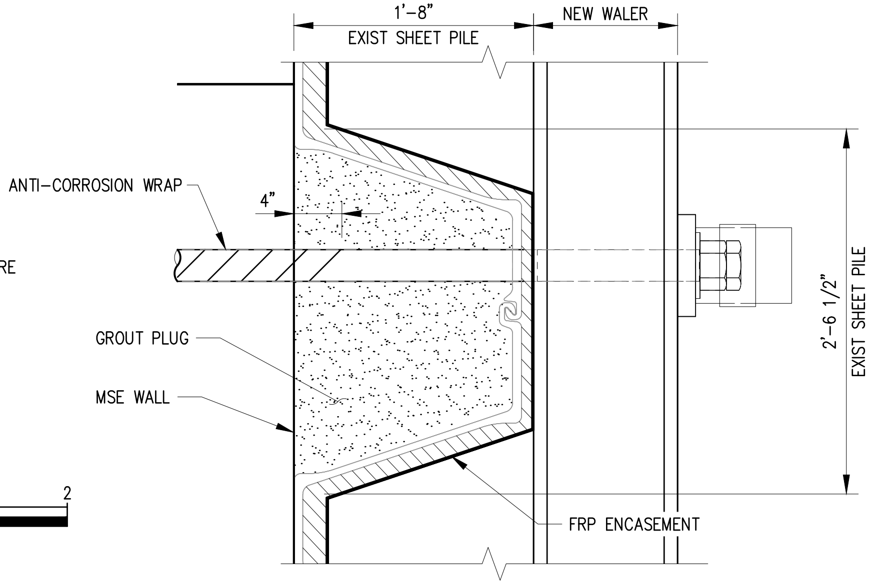


1
12
DETAIL
SCALE: 3/4" = 1'-0"





2
–
TIE ROD ENCAPSULATION DETAIL EACH SIDE
SCALE: 3/4" = 1'-0"

NOTES

WATERSIDE WALER REPLACEMENT–CONSTRUCTION SEQUENCE REQUIREMENTS;
MEANS AND METHOD TO BE DETERMINED BY CONTRACTOR:

1. LANDSIDE EXCAVATION DOWN TO ELEVATION +3.00' MIN BEFORE REMOVING WALER.
2. ENGINEER TO OBSERVE LANDSIDE WALER. CONTRACTOR TO NOTIFY ENGINEER WHEN WALER IS AVAILABLE FOR OBSERVATION.
3. REMOVE AND REPLACE WALER WITH (2) C12x30 WALER BEAMS.
4. APPLY TRENTON PILE PRIMER, WAX TAPE #2, AND MC0110 OUTER WRAP OR BETTER ON ALL EXIST TIE RODS.
5. REPLACE WASHER AND NUT ON TIE ROD END AND TIGHTEN UNTIL WALL IS PLUMB. BEGIN BACK FILLING.
6. INSTALL A 20" GROUT PLUG CENTERED ABOUT THE TIE ROD ON LANDSIDE AND WATERSIDE.
7. MONITOR WALL FOR PLUMBNESS AND CONTINUALLY ADJUST TIE ROD NUT ASSEMBLY TO ENSURE WALL IS PLUMB DURING BACKFILL OPERATION.
8. ENCAPSULATE WATERSIDE AND LANDSIDE TIE ROD ENDS USING WILLIAMS FORM GREASE FILLED FIBER REINFORCED NYLON END CAPS OR BETTER.

MSE WALL INSTALLATION NOTES

1. MSE WALL SHALL BEGIN APPROXIMATELY 2 FT BELOW TOP OF EXIST SHEET PILE.
2. REUSE EXIST ECOLOGY BLOCKS OR PURCHASE NEW ECOLOGY BLOCKS AT CONTRACTOR'S OPTION.
3. GEOGRID REINFORCEMENT SHALL CONFORM TO WSDOT STANDARD SPECS AND HAVE A MINIMUM ULTIMATE TENSILE STRENGTH OF 5,500 POUNDS PER FOOT.
4. GEOGRID SHALL BE INSTALLED IN CONTINUOUS SHEETS AT A VERTICAL SPACING OF 2 FEET. MANUFACTURER SHALL DESIGN AND SUBMIT SHOP DRAWINGS OF CONNECTION OF GEOTEXTILE BETWEEN ECOLOGY BLOCKS PRIOR TO INSTALLATION.
5. MSE WALL BACKFILL SHALL BE GRAVEL BORROW BACKFILL, AS DEFINED BY WSDOT STANDARD SPECIFICATIONS SECTION 9-03.14(1), COMPACTED TO A MINIMUM OF 95% OF THE MAXIMUM DRY DENSITY AS DEFINED BY THE MODIFIED PROCTOR TEST, ASTM D1557.
6. MSE SUBGRADE SHALL BE COMPACTED TO A FIRM AND UNYIELDING SURFACE AND SHOULD BE OBSERVED AND APPROVED BY A QUALIFIED GEOTECHNICAL ENGINEER.

IN: STRAIT OF JUAN DE FUCA
AT: PORT OF PORT ANGELES COFFERDAM
CITY: PORT ANGELES **COUNTY:** CLALLUM
STATE: WASHINGTON **PARCEL #:** 063099190035
APPLICATION BY: PORT OF PORT ANGELES
REFERENCE NO: NWS-2020-779

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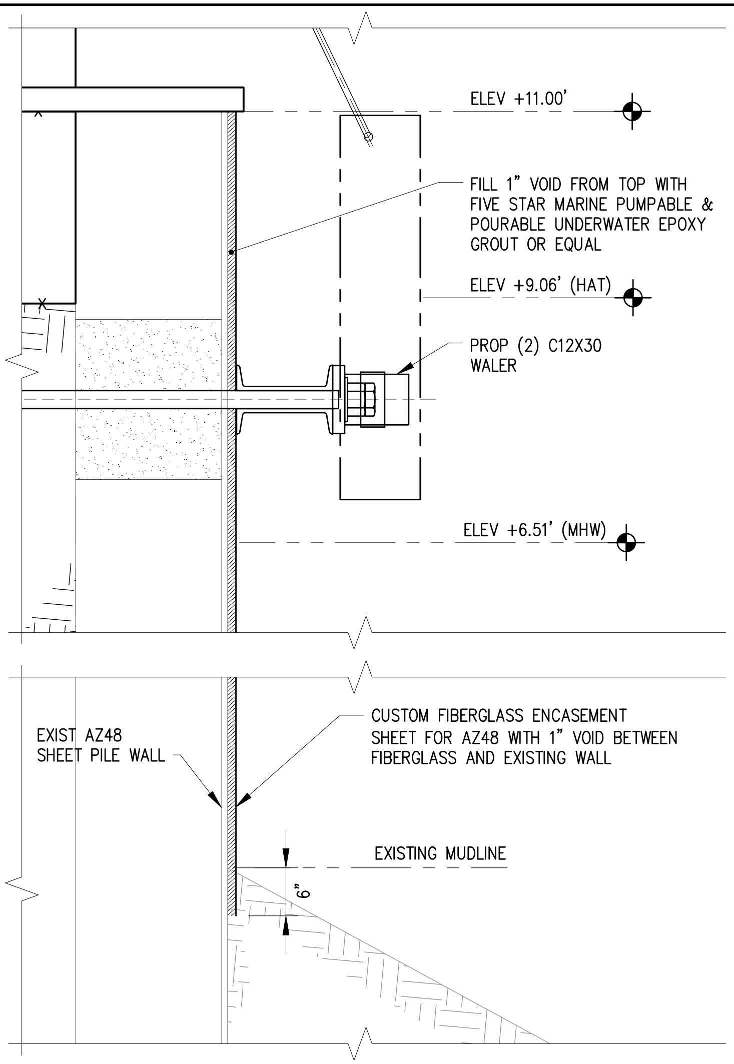
RANGE: 6W **DATUM:** MLLW = 0.00'

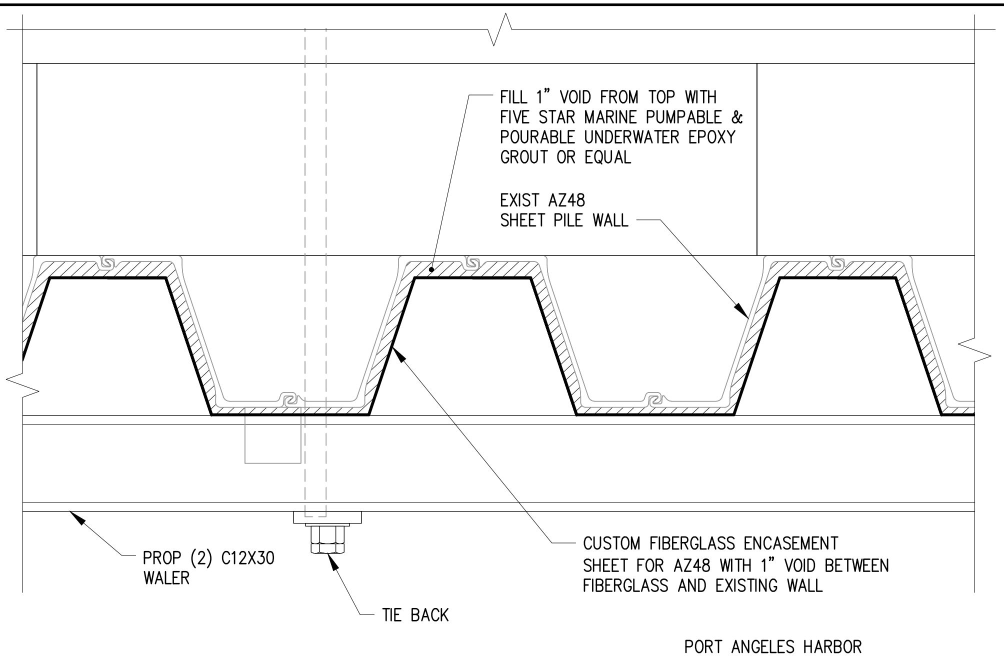
PORT OF PORT ANGELES COFFERDAM
LOADING STRUCTURE MAINTENANCE AND REPAIR PROJECT

DETAILS AND NOTES
DATE: 10/6/2020
SHEET: 13 OF 14



A XX SECTION - FRP ENCASEMENT

SCALE: 1/2" = 1'-0"



1 XX DETAIL - FRP ENCASEMENT

SCALE: 1/2" = 1'-0"

0 1 2 3
SCALE IN FEET

IN: STRAIT OF JUAN DE FUCA

AT: PORT OF PORT ANGELES COFFERDAM

CITY: PORT ANGELES **COUNTY:** CLALLUM

STATE: WASHINGTON **PARCEL #:** 063099190035

APPLICATION BY: PORT OF PORT ANGELES

REFERENCE NO: NWS-2020-779

PURPOSE: PROVIDE MAINTENANCE AND REPAIRS TO EXISTING COFFERDAM STRUCTURE AT THE PORT OF PORT ANGELES LOG YARD FACILITY

SECTION: NW 4 **LAT:** 48° 7' 42.49" N

TOWNSHIP: 31N **LONG:** 123° 28' 26.4" W

RANGE: 6W **DATUM:** MLLW = 0.00'

PORT OF PORT ANGELES COFFERDAM

LOADING STRUCTURE MAINTENANCE AND REPAIR PROJECT

FIBERGLASS ENCASEMENT DETAILS

DATE: 10/6/2020

SHEET: 14 OF 14

Plotted: Oct 05, 2020 – 7:56pm jhollenbach Layout: FiberglassEncaseDetails
M:\2018\1800020 POPA Conditions Assessment\Drawings\Exhibits\2020-10-02 JARPA – 8.5x11\14_1800020_FiberglassEncasementDetails.dwg

APPENDIX B

Geology and Soils Supporting Documentation

DESCRIPTIONS OF MAP UNITS

HOLOCENE NONGLACIAL DEPOSITS

Qf **Fill (recent)**—Clay, silt, sand, gravel, organic matter, riprap, and debris emplaced to elevate and reshape the land surface; includes engineered and non-engineered fills; shown only where fill placement is relatively extensive, sufficiently thick to be of geotechnical significance, and readily verifiable.

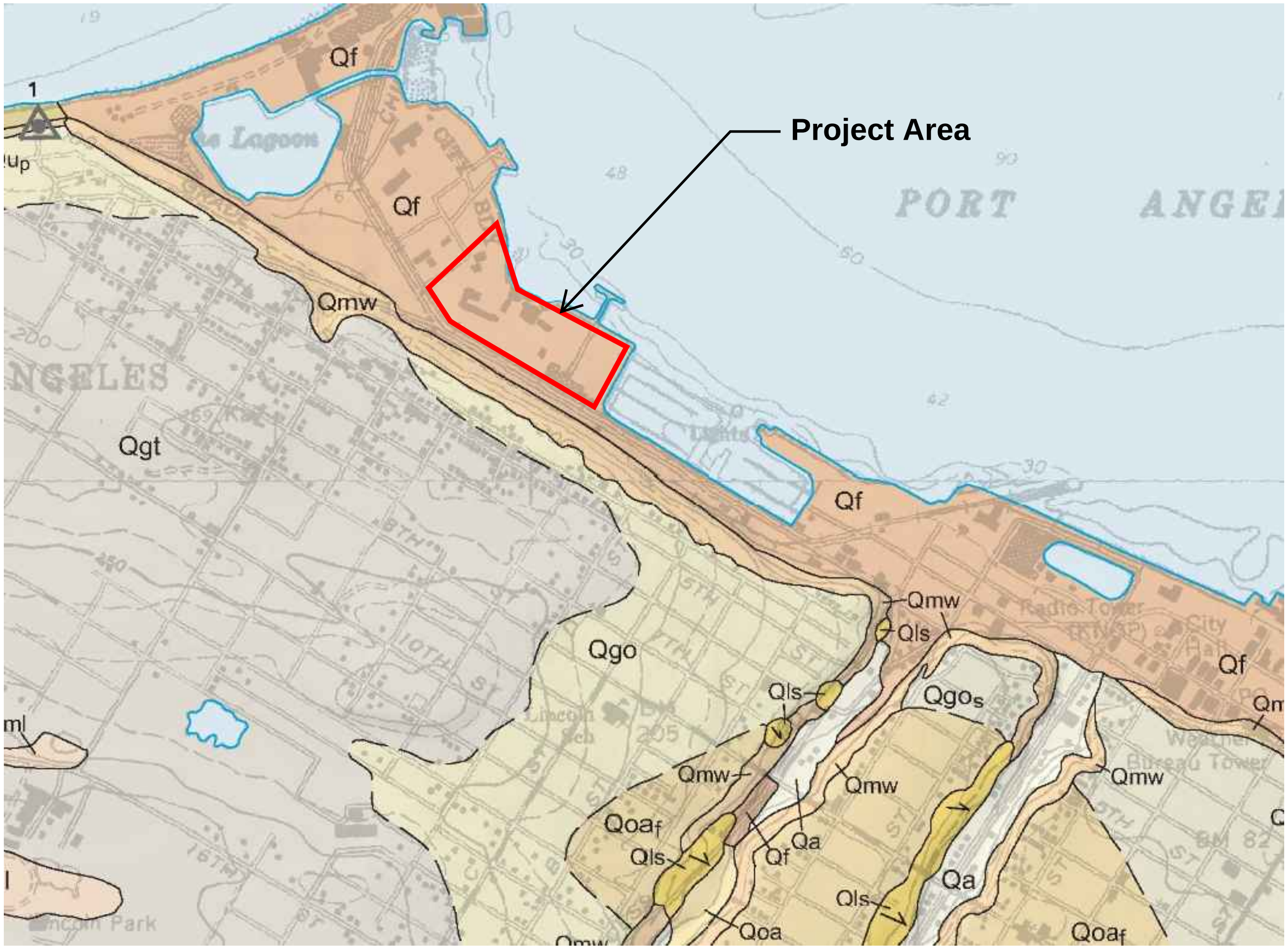
Qmw **Mass wasting deposits (Holocene)**—Boulders, gravel, sand, silt, and clay; generally unsorted but may be locally stratified; typically loose; shown along mostly colluvium-covered slopes that appear potentially unstable; contains exposures of underlying units and landslides that we either could not map with confidence or are too small to show as separate features.

LATE WISCONSINAN GLACIAL DEPOSITS

Qgo
Qgo$_s$
Qgo

Recessional outwash and glaciomarine drift (Pleistocene)—Gravel, sand, silt, clay, and locally peat; characterized by northern rock types; typically well rounded; loose; generally well sorted; mostly stratified; deposited by glacial meltwater as opposed to nonglacial streams; locally grades up into or interfingers with post-glacial alluvium (units Qoa and Qa). Glaciomarine drift facies includes pebbly silt and clay and discontinuous layers of silty sand and is weakly stratified to nonstratified. Glaciomarine deposits (included with unit Qgo$_s$ in the northern part of the map area) are deposited to a minimum level of approximately 130 ft (Dethier and others, 1995, fig. 3). Several subtle topographic steps that roughly parallel the shoreline on the coastal plain may include additional older, higher, post-glacial shoreline berms; unit Qgo is generally stratigraphically beneath, but partially coeval with unit Qoa, and deposition of unit Qgo may locally have continued thousands of years after deposition of unit Qoa ceased (Fig. 1; Polenz and others, 2004; Heusser, 1973). Units Qgo and Qoa are typically difficult to distinguish from each other. Deposition of unit Qgo began as ice receded some time between 14,460 ±200 ^{14}C yr B.P. and 12,000 ±310 ^{14}C yr B.P. (Heusser, 1973; Petersen and others, 1983) and may locally have continued until after 8 ^{14}C ky (Heusser, 1973). Deposition of the glaciomarine drift facies occurred at or about 12,600 ± 200 ^{14}C yr B.P. (Dethier and others, 1995; Fig. 1). The glaciomarine facies of unit Qgo is the lithostratigraphic equivalent of Everson Glaciomarine Drift in the Puget Lowland. Subscript 's' indicates sand or finer-grained facies. Subscript 'i' indicates outwash interpreted as ice-contact deposits, which are characterized by hummocky topography and ice-collapse features and are mined for their sand and gravel resource.

Qgt **Juan de Fuca lobe till (Pleistocene)**—Unsorted and highly compacted mixture of clay, silt, sand, gravel, and boulders deposited directly by glacier ice; gray where fresh and light yellowish brown where oxidized; permeability very low where lodgement till is well developed; clasts are northern source but with abundant Olympic rock types where Olympic sediments are abundant in the substrate; most commonly matrix supported but locally clast supported; matrix more angular than water-worked sediments; cobbles and boulders commonly faceted and (or) striated; forms a patchy cover ranging from <0.5 ft to 20 ft thick; thicknesses of 2 to 10 ft are most common; may include outwash clay, sand, silt, and gravel, or loose ablation till that is too thin to substantially mask the underlying, rolling till plain; erratic boulders commonly signal that this unit is underfoot, but such boulders may also occur as lag deposits where the underlying deposits have been modified by meltwater; typically, weakly developed modern soil has formed on the cap of loose gravel, but the underlying till is unweathered; local textural features include flow banding. Unit Qgt may be overlain by unit Qgo and underlain by unit Qga or other older units. Unit Qgt may include local exposures of older till that are indistinguishable in stratigraphic position, lithology, and appearance.



Source: WA State DNR

Note

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

LANDAU ASSOCIATES

Intermodal Handling and Transfer Facility Improvements Project
Port of Port Angeles
Port Angeles, Washington

Geologic Map of the Project Area

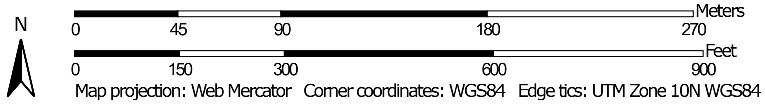
Figure
X-1

\\edmdata01\projects\274\006\T\Geotech\Attachment - Soil Surface Photos.docx

Intermodal Handling and Transfer Facility Improvements Project Port of Port Angeles Port Angeles, Washington	**Selected Site Photographs – Current Surface Conditions**	Figure X-2

Soil Map—Clallam County Area, Washington
(Project_Area)

Map Scale: 1:3,300 if printed on A portrait (8.5" x 11") 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
- Λ 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
- ψ Wet Spot
- △ Other
- ⋯ Special Line Features

Water Features

- ∼ Streams and Canals

Transportation

- ┼┼┼ Rails
- 〰 Interstate Highways
- 〰 US Routes
- 〰 Major Roads
- 〰 Local Roads

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: Clallam County Area, Washington
Survey Area Data: Version 20, Aug 30, 2022

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

Date(s) aerial images were photographed: Aug 8, 2022—Aug 29, 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
3	Beaches	7.1	49.1%
Totals for Area of Interest		**14.5**	**100.0%**

Clallam County Area, Washington

3—Beaches

Map Unit Composition

Beaches: 100 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

Data Source Information

Soil Survey Area: Clallam County Area, Washington
Survey Area Data: Version 20, Aug 30, 2022

100 Percent Geotechnical Engineering Design Report

Port of Port Angeles Cofferdam Rehabilitation

Port Angeles, WA

Prepared for
KPFF Consulting Engineers

October 30, 2020
19373-01

HARTCROWSER
A division of Haley & Aldrich

A division of Haley & Aldrich

100 Percent Geotechnical Engineering Design Report

Port of Port Angeles Cofferdam Rehabilitation

Port Angeles, WA

Prepared for
KPFF Consulting Engineers

October 30, 2020
19373-01

Prepared by
Hart Crowser, a division of Haley & Aldrich

Zach Yell
Senior Staff, Geotechnical Engineer

GARRY E. HORVITZ
19478
10|30|2020

Jeff Bruce
Project, Geotechnical Engineer

Garry Horvitz, PE, LEG
Senior Principal, Geotechnical Engineer

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Seattle, Washington 98121
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Field Exploration Methods and Analysis

APPENDIX B

Geotechnical Laboratory Tests

APPENDIX C

Historical Site Plan and Explorations

Geotechnical Assessment

Port of Port Angeles Cofferdam Rehabilitation

Port Angeles, WA

1.0 INTRODUCTION

The Port of Port Angeles (POPA) cofferdam consists of two historically constructed sheet pile walls within POPA property situated along the Port Angeles Harbor in Port Angeles, Washington. The intent of the current project is the rehabilitation of this cofferdam for reuse by the Port. The purpose of this report is to present our understanding and interpretation of the subsurface conditions and provide preliminary geotechnical engineering recommendations to support the 100 percent design submittal for this rehabilitation.

Our scope of work for this assessment included:

- Performing a single day of test pit explorations to assess the condition of the surficial soils to aid the pavement design;
- Performing geotechnical laboratory analysis to characterize the soils encountered during the field explorations;
- Developing design recommendations for the proposed Mechanically Stabilized Earth (MSE) wall;
- Developing design recommendations for the proposed concrete pavement using information gathered from our field explorations; and
- Summarizing our findings in this geotechnical engineering report.

The location of the site is shown on Figure 1. The existing site layout and location of soil explorations are shown on Figure 2. Soil exploration logs are in Appendix A, the results of geotechnical laboratory testing are in Appendix B, and historical exploration logs are in Appendix C. The elevation datum used throughout this report is the Mean Lower Low Water Datum (MLLW), unless otherwise noted.

We completed this work in general accordance with our subconsultant agreement with KPFF dated April 12, 2018 and amendment to this agreement with KPFF dated October 12, 2018. This report is for the exclusive use of KPFF, Port of Port Angeles, and their design consultants and construction contractors for specific application to the subject project and site. We performed our work in general accordance with geotechnical engineering practices accepted for work done in the same or similar localities, related to the nature of the work we accomplished here, and done at the time our services were performed. No other warranty, express or implied, is made.

2.0 SITE CONDITIONS

2.1 Existing Surface Conditions

The project site consists of an open, roughly graded laydown area adjacent to the cofferdam structure and harbor. The cofferdam consists of interlocking sheet piles approximately 250 feet long, laid out in a rectangular pattern and supported laterally with tie rods. Due to the varying mudline elevation along the waterside of the cofferdam, the exposed height of the cofferdam varies from approximately 9 feet to 18 feet. Approximately 4 feet of compacted fill and loose fill/wood debris from elevation 11 to 15 feet is retained behind an ecology block wall constructed along the edge of the cofferdam. The ground surface is relatively flat along the top of the cofferdam with assorted materials staged in the vicinity.

2.2 Historical Surface Conditions

The project site was formally used as a wood processing facility, predominately consisting of lumber stockpiles and equipment traffic. In the early 2000s, the Washington State Department of Transportation (WSDOT) purchased the property to construct a graving dock to facilitate construction of the concrete pontoons to be used for the SR-520 floating bridge. Construction for this project commenced with the installation of the current cofferdam structure. The subsequent preliminary earthwork encountered significant archeological artifacts. As a result, the project was shut down and ultimately abandoned. The site was restored and backfilled to about 4 feet above the top of the cofferdam sheet piles. Since the early 2000s, the site has been used as a laydown area for the POPA.

2.3 Subsurface Conditions

Our interpretation of the subsurface soil conditions at the cofferdam is based on historical borings from Hart Crowser's 2002 report for the Port Angeles Graving Dock and our field exploration program performed as part of this study. Hart Crowser performed seven geotechnical borings throughout the area of the proposed graving dock as part of this 2002 report. We primarily used information from the boring drilled within the area of the cofferdam for our analysis (H-4-02). Our field exploration program consisted of digging eight test pits (TP-1 to TP-8) on November 16, 2018 and performing geotechnical laboratory analysis of the samples collected. The test pits were dug to approximate depths of 6 to 11 feet below the ground surface, and subsurface conditions were logged by a senior staff engineer from Hart Crowser and recorded on detailed test pit logs.

2.3.1 Soils

At the time of the 2002 study, soils near the proposed cofferdam area generally consisted of sand and gravel fill over alluvial deposits and underlain by glacially overridden silts and sands. Test pits performed along the cofferdam (TP-1 through TP-5) as part of the current study encountered soils generally consisting of approximately 1 to 2 feet of wood debris over poorly graded gravel with silt, sand, and trace organics. All five of these test pits encountered a layer of historically placed quarry spalls underlying this gravel layer beginning at depths of about 6 to 7 feet below ground surface (bgs).

The thickness of the quarry spalls ranged between 2 and 2.5 feet with only TP-4 penetrating through the spalls to encounter a soft clayey sand to sandy clay material.

Test pits performed within the proposed pavement area (TP-6 through TP-8) generally encountered 1 to 2 feet of very loose fill and wood debris over historically placed loose to medium dense fill generally consisting of gravels and sands with varying amounts of organics and construction debris.

2.4 Groundwater Conditions

Groundwater was observed during drilling of all seven historical borings (H-1-02 to H-8-02). At the time of drilling of H-4-02, groundwater was encountered at approximately 12.5 feet bgs (approximately an elevation of 2.7 feet). Groundwater was encountered at approximately 7 feet bgs (approximately an elevation of 8 feet) in the test pits dug as a part of this study. We recommend a design groundwater elevation for the project area of 8 feet (MLLW).

Note that measured groundwater levels represent the times indicated. Fluctuations in groundwater levels may occur due to variations in tides, rainfall, temperature, seasons, and other factors. It is important that the contractor provides contingencies for dealing with groundwater on this project. When excavating below the groundwater table, the contractor should be prepared to perform dewatering through the use of well points or similar. Temporary construction dewatering should assume a groundwater elevation equal to high tide at the time of construction.

3.0 SEISIMIC CONSIDERATIONS

The site is in a seismically active area. In this section, we discuss the seismic setting and seismically induced geotechnical hazards.

3.1 Seismic Setting

The seismicity of western Washington is dominated by the Cascadia Subduction Zone (CSZ), in which the offshore Juan de Fuca plate is subducting beneath the continental North American plate. Three types of earthquakes are typically associated with subduction zone environments: interface subduction, intraslab subduction, and crustal. Seismic records in the Puget Sound area clearly indicate a distinct shallow zone of crustal seismicity (e.g., the Seattle Fault) that may have surficial expressions and can extend to depths of up to 15 to 18 miles. A deeper zone is associated with the subducting Juan de Fuca plate. This deeper zone produces intraslab subduction earthquakes at depths of 24 to 42 miles beneath the Puget Sound region (e.g., the 1949, 1965, and 2001 earthquakes) and interface subduction earthquakes at shallow depths near the Washington coast (e.g., the 1700 earthquake, with an approximate magnitude of 9.0).

To evaluate the seismic stability of slopes and liquefaction potential of soil, the appropriate hazard level must be selected to estimate the peak ground acceleration (PGA) associated with a design earthquake event (according to governing code or design criteria). We used a return period of 975 years, following recommendations set forth in AASHTO 2017, to estimate the PGA for use in the slope stability analysis. We obtained parameters for this event from the U.S. Seismic Design Maps web application (http://earthquake.usgs.gov/designmaps/us/application.php; USGS 2008) using the 2009 AASHTO design code reference document.

3.2 Seismically Induced Geotechnical Hazards

Potential seismically induced geotechnical hazards at the project site we considered were surface rupture, liquefaction, and seismically induced lateral spreading. Our assessment of these hazards is based on the soils encountered in our explorations, regional experience, and our knowledge of local seismicity.

3.2.1 Surface Rupture

We are not aware of any known faults that intersect the cofferdam area, so we consider the potential for surface rupture to be very small. Rather than attempting to design against potential surface rupture, it would be reasonable to plan to repair any damage potential surface rupture may cause.

3.2.2 Liquefaction Potential

When cyclic loading occurs during an earthquake, the shaking can increase the pore pressure in loose to medium dense saturated sand and silt, and certain low-plasticity clay. The rapid increase in pore water pressure reduces the effective normal stress between soil particles, resulting in the sudden loss of shear strength in the soil. Granular soils, which rely on interparticle friction for strength, are susceptible to liquefaction until the excess pore pressures can dissipate. Sand boils and flows observed at the ground surface after an earthquake are the result of excess pore pressures dissipating upwards, carrying soil particles with the draining water. In general, loose, saturated sands with low silt and clay contents are the most susceptible to liquefaction. Silts with low plasticity are moderately susceptible to liquefaction under relatively higher levels of ground shaking. For any soil type, the soil must be saturated for liquefaction to occur.

We performed site-specific liquefaction potential analysis on the sandy soils underlying the site using procedures outlined in Idriss and Boulanger (2008). The analysis was conducted using standard penetration test (SPT) data from the historical boring logs available at the site. We used a site adjusted PGA of 0.42 g and associated earthquake magnitude of 7.6 in our analysis.

The analysis showed an approximately 20-foot thick layer of alluvial deposits encountered about 37 to 57 feet bgs to generally be liquefiable.

3.2.3 Lateral Spreading

Based on the anticipated soil conditions and liquefaction analysis, the potential for lateral spreading of the alluvial deposits on the waterside of the cofferdam is considered high due to the potential for liquefaction within the alluvial deposits. If these soils liquefy, there is the potential of losing passive resistance in front of the cofferdam structure.

4.0 GEOTECHNICAL ENGINEERING ASSESSMENT

This section presents our conclusions and recommendations for geotechnical design aspects of the proposed MSE wall and concrete pavement. We developed our engineering analyses and provide these geotechnical recommendations based on our current understanding of the project, subsurface conditions encountered by our explorations at discrete locations, and laboratory tests.

4.1 Mechanically Stabilized Earth Wall Design Assessment

The current design involves the rehabilitation of the 4-foot-high ecology block retaining wall along the waterfront, on top of the existing cofferdam. This includes construction of an MSE wall using segmented ecology blocks reinforced with geosynthetics to a final grade of elevation 16.3 feet. We understand the existing 2-foot-tall ecology blocks on site may be used pending inspection of their condition. Alternatively, new segmented blocks may be procured. We have performed the analysis described herein for both conditions.

The following subsections provide our design recommendations for the proposed MSE wall. We designed the wall such that global, internal, and external stabilities are satisfied following AASHTO 2017 design guidelines for MSE walls. Global stability analyses for the proposed MSE wall were conducted to assess the feasibility of using an MSE retaining wall system to support the loading area and the results are presented in later sections.

4.1.1 MSE Backfill Materials

We recommend select backfill for MSE retaining walls following requirements provided by the 2018 WSDOT Standard Specifications (WSDOT 2018). Section 9-03.14(1) of WSDOT 2018 provides the minimum gradation requirements for Gravel Borrow for MSE wall backfill (reinforced zone) used in Western Washington. Backfill materials should be compacted to a minimum of 95 percent of the maximum dry density as determined by the modified proctor following ASTM D1557.

4.1.2 MSE Subgrade

The MSE subgrade areas should be compacted to a firm and unyielding surface and should be observed and approved by a qualified geotechnical engineer. The prepared subgrade should be free of organic material and soft areas. Any identified organic or soft areas should be over excavated to a firm subgrade and backfilled with properly compacted structural fill under the observation of the geotechnical engineering field representative. We recommend following the subgrade preparation recommendations presented in Section 4.3.2 of this report should thick deposits of soft soils be encountered or over excavation below the groundwater table be required.

4.1.3 MSE Wall Recommendations

Based on the results of our external and internal stability assessment, we recommend the following:

- Use imported Gravel Borrow backfill with a minimum friction angle per recommendations in Section 4.1.1 of this report. These values assume granular fill, free of organic material, placed and compacted to the degree presented in the MSE Backfill Materials section of this report.

- The MSE wall should begin approximately 2 feet below the top of the existing sheet pile wall (at approximately an elevation of 9 feet).
- The MSE wall should be 7.3 feet in height with 5.3 feet of this height above the existing cofferdam.
- Construct the wall using either the existing 2-foot-tall ecology blocks onsite or Ultrablock, Inc.'s half-size blocks (block height of 1.25 feet) with Geogrid extended from, and connected between, each block layer. This assumes the existing ecology blocks onsite are in acceptable structural condition.
- Geogrid reinforcement should be used as the reinforcement within the MSE wall. The Geogrid should conform to AASHTO Section 11.10.6.4.2b and WSDOTSS Section 9-33.1. A list of approved Geogrid reinforcement can be found within the WSDOT Qualified Products List (WSDOT QPL). The Geogrid should be installed in continuous sheets at vertical spacings of 1.25 feet (between each Ultrablock) or 2 feet (between the existing ecology blocks). The Geogrid selected should have a minimum Ultimate Tensile Strength (MARV) of 3,500 pounds per foot for the 1.25-foot-tall half-size Ultrablocks or 5,500 pounds per foot for the 2-foot-tall existing ecology blocks.
- The Geogrid used to reinforce the MSE wall should extend behind the back of the ecology blocks or Ultrablocks a minimum of 8 feet in order to achieve external and internal stability.
- Install a minimum of 12 inches of free-draining backfill immediately adjacent to the back side of the Ultrablock wall, per manufacturer recommendation. Perforated drain pipe with filter fabric should be installed at the base of the wall to facilitate drainage. The drainage system should be capable of diverting and removing groundwater (perched or otherwise) and stormwater to prevent hydrostatic pressure from building up behind or beneath the retaining walls.
- We assumed a surcharge of 200 pounds per square foot (psf) applied at the ground surface to account for temporary traffic loading.
- For lateral earth pressure acting on the reinforced soil prism of the MSE wall system, use an equivalent fluid density (EFD) of 34 pounds per cubic foot, assuming level backfill and active soil pressure conditions for yielding wall systems (minimum wall movement of about 0.001 times the height of the wall).
- Seismic surcharge loads will act over the entire back of the MSE wall. Assuming a level ground surface behind the wall and a design horizontal PGA of 0.209 g, use a uniform horizontal seismic pressure of 8H psf (assuming a yielding wall), where H is the height of the wall.

4.1.4 External Stability Assessment

According to Section 11.10.5 of AASHTO 2017, sliding resistance, bearing resistance, and overturning of abutments shall be assessed to satisfy external stability requirements. We used a coefficient of horizontal acceleration of 0.209 g (half of design PGA) in our seismic condition calculations.

4.1.4.1 Sliding Resistance Assessment

Forces acting behind the proposed retaining wall shall not exceed the sliding resistances beneath the proposed retaining wall. Sliding resistances were calculated at the strength and extreme limit states per Section 11.10.5.3 of AASHTO 2017. Table 1 below presents our estimated sliding resistances and acting forces for both the strength and extreme limit state. Using an MSE wall length of 8 feet, the factored sliding resistance of the MSE wall satisfies requirements set forth in AASHTO Section 11.10.5.3.

Table 1 – Calculated Sliding Resistances and Acting Forces for MSE Retaining Wall

Resisting Forces		Acting Forces	
Strength Limit State (kips/foot)	Extreme Limit State (kips/foot)	Strength Limit State (kips/foot)	Extreme Limit State (kips/foot)
2.26	2.51	0.27	0.62

Notes:

a. Allowable sliding resistances calculated using resistance factors in Table 10.5.5.2.2-1, Section 10.5.5.3, and Table 11.5.7-1 in AASHTO 2017.

4.1.4.2 Bearing Resistance Assessment

Bearing pressures beneath the proposed retaining wall shall not exceed the bearing resistances of the subgrade soils. Bearing resistances were calculated at the strength and extreme limit states per Section 11.10.5.4 of AASHTO 2017 for the proposed reinforcement length, as shown in Table 2.

Table 2 – Calculated Allowable Bearing Resistances for MSE retaining walls

Reinforcement Length (feet)	Strength Limit State Bearing Resistances (ksf)	Extreme Limit State Bearing Resistances (ksf)
8.0	6.3	8.7

Notes:

a. ksf = kips per square foot

b. Bearing capacities were calculated assuming a wall with infinite length and finite width.

c. Allowable bearing resistances calculated using resistance factors in Table 11.5.7-1 Section 11.5.7 and Section 11.5.8 in AASHTO 2017.

4.1.4.3 Overturning Resistance Assessment

Overturning of the MSE wall was assessed using Section 10.10.5.5 of AASHTO 2017. To ensure there will be no overturning of the MSE wall, the location of the resultant of the reaction forces acting on the MSE wall shall be within the middle two-thirds of the base width per Section 10.10.5.5. Using an MSE wall length of 8 feet will ensure that the resultant of the forces acting on the MSE wall are within the middle two-thirds of the MSE wall for both the static and seismic conditions, thus satisfying minimum requirements from AASHTO.

4.1.5 Internal Stability Assessment

According to Section 11.10.6 and Section 11.10.7 of AASHTO 2017, the internal stability to MSE abutments shall be assessed by checking reinforcement pullout, reinforcement rupture within the reinforced soil mass, and reinforcement rupture at the wall connection. We used a coefficient of horizontal acceleration of 0.209 g (half of design PGA) in our seismic condition calculations.

4.1.5.1 Reinforcement Pullout Assessment

The horizontal stress at each reinforcement level must be overcome by the friction of the Geogrid within the reinforced soil mass. Using an 8-foot-long continuous Geogrid at 1.25-foot intervals (between each Ultrablock) or 2-foot intervals (between the existing ecology blocks) will ensure that the Geogrid will not pull out of the reinforced soil mass during both static and seismic conditions.

4.1.5.2 Reinforcement Rupture Assessment

The maximum horizontal stress acting at each Geogrid reinforcement layer must not be enough to rupture the Geogrid within the reinforced soil mass at the zone of maximum stress. We assumed a Geogrid that conforms to Section 11.10.6.4.2b in AASHTO 2017 will be used. We also assumed a strength reduction factor (RF) of 7.0 based on Table 11.10.6.4.3b-1 in AASHTO 2017 to take into consideration the variety of Geogrids that may be used for this MSE wall. In order to prevent reinforcement rupture for both static and seismic conditions, it is recommended to use a Geogrid with a minimum Ultimate Tensile Strength (MARV) of 3,500 pounds per foot for the 1.25-foot-tall half-size Ultrablocks or 5,500 pounds per foot for the 2-foot-tall existing ecology blocks.

4.1.5.3 Reinforcement/Facing Connection Rupture Assessment

The maximum horizontal stress acting at each Geogrid reinforcement layer must not be enough to rupture the Geogrid’s connection with the MSE wall facing. We assumed a Geogrid that conforms to Section 11.10.6.4.2b in AASHTO 2017 will be used. We also assumed a chemical and biological strength reduction factor to prevent rupture of reinforcement (RF_d) of 1.1 based on Section 11.10.6.4.3b in AASHTO 2017 and a long-term connection strength reduction factor (CR_{cr}) of 0.5.

4.1.6 Global Stability of MSE Wall/Cofferdam System

We analyzed for global stability using the computer program Slide and critical rotational failure mechanisms were searched using the Morgenstern-Price, Simplified Bishop, and Spencer limit equilibrium methods. The MSE wall in the global stability analysis was modeled following drawings provided by KPFF. We analyzed three scenarios for global stability:

- Static;
- Static, Liquefied; and
- Psuedo-static, Non-liquefied.

For all cases we applied an anticipated traffic surcharge of 200 psf at the top of the wall. The traffic surcharge was modeled as being uniformly distributed over the length of the MSE wall and paved area behind the wall. For the Extreme limit state, a pseudo-static slope stability analysis was performed using a coefficient of horizontal acceleration of 0.209g (half of design PGA).

Table 3 below presents the estimated factors of safety from our analysis. Our slope stability results indicate that stability requirements are satisfied for the static, liquefied, and pseudo-static cases. Figures 3 through 5 (attached) present the most critical results of the slope stability analysis. As shown, the most critical failure planes mobilize beneath the mechanically reinforced soils. As such, the minimum reinforcement length of 8.0 feet does not affect the global stability of the MSE wall/cofferdam system.

Table 3 – Estimated Factors of Safety for MSE Retaining Wall Global Stability Analysis

Static		**Liquefied, Static**		**Pseudostatic, Non-Liquefied**	
Calculated	**Target**	**Calculated**	**Target**	**Calculated**	**Target**
2.9	1.3	2.7	1.3	1.2	1.1

Slope stabilities were solved using limit equilibrium methods which generally provide conservative results because stresses are only considered in two dimensions. Realistically, the stability of a slope is governed by stress conditions in three dimensions, and factors of safety calculated for three dimensional models are typically higher than those calculated for idealized two dimensional counterparts.

4.1.7 Settlement of MSE Retaining Walls

The subgrade that will support the MSE wall primarily consists of historically compacted fill and quarry spalls. Given the area is currently loaded with soil volume approximately equal to that being added, we anticipate additional settlement to be less than 1 inch, primarily resulting from the placement of denser backfill material.

4.2 Portland Cement Concrete Pavement Recommendations

We understand that two of the proposed options for the site redevelopment includes new construction of concrete pavement. The pavement would be constructed upland of the MSE wall area, over the historically placed fill. For the design of new concrete pavement, we recommend the following:

- Portland Cement Concrete (PCC) Pavement, should overlay a minimum 4 inches of granular base compacted to 95 percent of the maximum dry density, as determined by the modified proctor test (ASTM D1557).

- We recommend using a subgrade modulus of soil reaction of 300 pounds per cubic inch (pci) for concrete pavement design.

The surficial layer of loose fill and wood debris should be removed prior to placement of base course or concrete. We recommend the contractor perform a proof roll of the subgrade in the pavement area prior to placement of base course material. A representative of Hart Crowser should be on site to observe the proof roll to confirm our design assumptions and identify potential areas of soft, compressible subgrade.

4.3 Site Work

This section presents our recommendations for geotechnical-related topics during construction, including temporary open cuts, structural fill, and utility trenching and installation.

4.3.1 Temporary Open Cuts

The stability and safety of cut slopes depends on several factors, including:

- The type and density of the soil;
- The presence and amount of any seepage;
- The depth of the cut;
- The proximity of the cut to any surcharge loads near the top of the cut, such as stockpiled material, traffic, or structures, and the magnitude of these surcharges;
- The duration of the open excavation; and
- The care and methods used by the contractor.

Temporary soil cuts for site excavations that are more than 4 feet deep should be adequately sloped back to prevent sloughing or collapse in accordance with Washington Department of Occupational Safety and Health (DOSH) guidelines (Washington Administrative Code [WAC] Chapter 296-155 Part N). Using these guidelines, the fill and native gravel/sands at the site are classified as Type C.

We recommend the following for open cuts:

- For excavations less than 20 feet deep, use a maximum allowable slope of 1.5H:1V for cuts in Soil Type C.
- Use a maximum allowable slope of 1.5H:1V or less steep if groundwater seepage is encountered within the excavation slopes.
- Consult with the geotechnical engineer during construction to limit the size of these excavations and the amount of time they remain open.
- Protect the slope from erosion by using plastic sheeting, especially during wet weather excavation.
- Limit the maximum duration of the open excavation to the shortest time possible.

- Place no surcharge loads (equipment, materials) within 10 feet of the top of the slope, in general. However, more or less stringent requirements may apply depending on field conditions and actual surcharge loads.

Because of the variables involved, before construction, actual slope angles required for stability in temporary cut areas can only be estimated. We recommend that stability of the temporary slopes used for construction be solely the responsibility of the contractor, since the contractor is in control of the construction operation and is continuously at the site to observe the nature and condition of the subsurface. All excavations should be made in accordance with all local, state, and federal safety requirements.

4.3.2 Subgrade Preparation below Ground Water Table

We understand that the project may involve excavation beneath the groundwater table to facilitate the installation of below-ground structures. For excavation and subgrade preparation below the groundwater table we recommend the following:

- Overexcavate a minimum of 3 feet below the design bottom elevation of the structure.

- Geotextile fabric (high strength, high survivability) should be laid along the bottom of the excavation and extending up the sides.

- A 2.5-foot layer of 2-inch to 6-inch quarry spalls should be placed and compacted directly over the geotextile fabric at the bottom of the excavation, ensuring that the geotextile wraps up and around the sides of this layer of quarry spalls. A 6-inch thick layer of levelling course (clean crushed rock or railroad ballast) should be placed above the quarry spalls layer.

4.3.3 Structural Fill

Backfill placed behind the MSE wall or below the paved areas, should be considered structural fill. The following sections discuss whether site soil can be used as structural fill and provide our recommendations for selecting imported structural fill. Placement and compaction are also discussed.

4.3.3.1 Use of Site Soil as Structural Fill

The suitability of excavated site soils for use as compacted structural fill depends on the gradation and moisture content of the soil when it is placed. As the amount of fines (that portion passing the U.S. No. 200 sieve expressed as a percentage of the fraction passing the 3/4-inch sieve size) increases, the soil's sensitivity to small changes in moisture content increases, and adequate compaction becomes more difficult to achieve. Soil containing more than about 5 percent fines cannot be consistently compacted to a dense non-yielding condition when the water content is greater than about 2 percent above or below optimum. Reused soil must also be free of organic or other unsuitable material.

Four samples taken during the field explorations were tested for grain-size distribution. The results indicate that most of the site soils to be excavated (fill and gravels) will contain small amounts of fines (between 5 and 15 percent). It may, therefore, be difficult to reuse portions of on-site soil during periods of wet weather. However, some could be used as structural fill during the summer, when the moisture content of the material can be maintained near its optimum level. The loose fill and wood debris encountered within the upper approximately 2 feet will not be suitable for reuse.

We recommend stockpiling the excavated fill or native soil intended for reuse as structural fill separately and having the on-site geotechnical engineer or geologist review it for suitability. Stockpiles should be protected with plastic sheeting so they do not get wet during rainy weather.

4.3.3.2 Selection of Imported Fill

We recommend a non-silty, well-graded sand or sand and gravel with less than 5 percent passing the U.S. No. 200 sieve by dry weight (based on the minus 3/4-inch fraction) for imported structural fill placed during wet weather. Compaction of material containing more than about 5 percent fine material may be difficult if the material is wet or becomes wet during rainy weather. However, during dry weather, imported soil can contain up to 20 to 30 percent by weight passing the U.S. No. 200 mesh sieve (based on the minus 3/4-inch fraction), provided it is compacted at a moisture content within 2 percent of the optimum moisture content.

WSDOT Standard Specifications 9-03.14(2) Select Borrow and 9-03.14(3) Common Borrow could be used for imported structural fill provided the material has a maximum particle size of 6 inches or less. If the structural fill is placed during wet weather, the material should contain less than 5 percent passing the U.S. No. 200 sieve by weight. Material specifications are provided as a suggestion. Alternative materials may also be acceptable. Any material used within the MSE wall backfill should conform to recommendations presented in Section 4.1.1 of this report.

4.3.3.3 Placement and Compaction of Structural Fill

We recommend the following for structural fill:

- Before fill control can begin, the compaction characteristics of proposed fill material must be determined from representative samples. Samples should be obtained as soon as possible, but at least five days before use on site. Optimum and natural moisture content of the soil at the time of placement should be determined. Additionally, the grain-size distribution and maximum dry density of the fill should be determined.

- Structural fill can consist of either imported soil or re-compacted on-site soil, if its moisture content is suitable and weather conditions allow.

- Structural fill should be compacted to a minimum of 95 percent of the maximum dry density, as determined by the modified Proctor (ASTM D1557) test method.

- Moisture content should be maintained within 2 percent of the optimum (ASTM D1557).

- Structural fill should be placed only on dense, non-yielding subgrade soils.

- All structural fill should be placed and compacted in even lifts with a loose thickness no greater than 10 inches. If small, hand-operated compaction equipment is used to compact structural fill, fill lifts should not exceed 6 to 8 inches in loose thickness.
- In wet subgrade areas, clean material with a gravel content (material coarser than a U.S. No. 4 sieve) of at least 30 to 35 percent may be necessary.
- The compacted densities of all lifts should be verified by testing. Any material to be used as structural fill should be sampled and tested before use on site to determine its maximum dry density and gradation.

4.3.4 Utility Trenching and Installation

Utility trench cut design should generally be the contractor’s responsibility. For shallow trench excavations (less than 4 feet deep), open cutting may be used, provided the side walls are stable enough. Use of trench boxes or temporary shoring may be necessary for unstable side wall conditions or if deeper excavations are required for placement of utilities. The contractor should verify the conditions of the side slopes during construction and slope back trench cuts as necessary to conform to current standards of practice and safety requirements.

Our recommendations for bedding and trench backfill materials are summarized in Table 4 and described in the following section. The minimum dry densities recommended are a percentage of the modified Proctor maximum dry density, as determined by the ASTM D1557 test procedure.

Table 4 – Material Specifications for Utility Trenching and Installation

Use	Material Specification[a]
Structural Fill	See sections 4.1.1 for MSE fill and 4.2.3 for general structural fill
Pipe/utility vault bedding	WSDOT 9-03.12(3) Gravel Backfill for Pipe Zone Bedding
Pipe zone backfill	WSDOT 9-03.12(3) Gravel Backfill for Pipe Zone Bedding
Trench/vault backfill	WSDOT 9-03.15 Native Material for Trench Backfill
Trench/vault backfill (settlement sensitive areas)	WSDOT 9-03.19 Bank Run Gravel for Trench Backfill

a. Material specifications are provided as a suggestion. Alternative materials may be acceptable.

4.3.4.1 Pipe and Utility Vault Bedding

At least 4 inches of bedding material is recommended for all utility pipes. For bedding material beneath catch basins and manholes, we recommend at least 6 inches. The bedding materials should meet requirements of WSDOT 9-03.12(3), Gravel Backfill for Pipe Zone Bedding, except that the amount passing the U.S. No. 200 sieve should be less than 3 percent (based on the minus 3/4-inch fraction). The bedding materials should be compacted to at least 90 percent.

4.3.4.2 Pipe Zone Backfill

The pipe zone extends from the top of the bedding to 6 inches above the top of the utility pipe. The pipe zone backfill should meet the requirements recommended for bedding material. The backfill material used should meet the specific gradation requirements associated with the utility being installed.

4.3.4.3 Utility Trench/Vault Backfill

The recommendations for the trench backfill (extending from the top of the pipe zone) depend on the location of the utility trenches. Utility trenches outside of the roadway prism or building footprint can be backfilled with compacted on-site native material as long as it meets the requirements of WSDOT Standard Specification 9-03.15, Native Material for Trench Backfill. Utility trenches inside the roadway prism or building footprint can be backfilled with a compacted import gravel material meeting the requirements of WSDOT Standard Specification 9-03.19, Bank Run Gravel for Trench Backfill.

In settlement-sensitive areas (such as paved areas), the upper 2 feet of backfill should be compacted to at least 95 percent. Below the upper 2 feet, backfill should be compacted to at least 90 percent.

4.3.4.4 Compaction Equipment

We recommend using hand-operated compaction equipment within 12 inches of any pipe, catch basin, or similar structure to reduce risk of damage. The contractor should be responsible for selecting appropriate compaction equipment and adjusting the lift thickness of the backfill as needed to avoid damage to the pipe.

5.0 RECOMMENTAIONS FOR CONTINUING GEOTECHNICAL SERVICES

During the construction phase of the project, we recommend that a Hart Crowser representative be present to review contractor submittals and observe the following activities:

- Excavation and preparation of subgrades for pavement sections and MSE wall backfill;
- Installation of earth retention elements;
- Placement and density testing of structural fill at the site;
- Installation of MSE wall drainage; and
- Backfilling of utility trenches.

6.0 REFERENCES

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Note: Feature locations are approximate.

POPA Cofferdam Final Design
Port Angeles, Washington

Vicinity Map

19373-01

1/19

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Figure

1

Legend

▨ Test Pit (Hart Crowser, 2018)

● Historical Boring (Hart Crowser, 2002)

▭ Approximate Cofferdam Area

0 30 60 120 Feet

Note: Feature locations are approximate.

N

POPA Cofferdam Final Design
Port Angeles, Washington

Site and Exploration Plan

19373-01

1/19

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Figure

2

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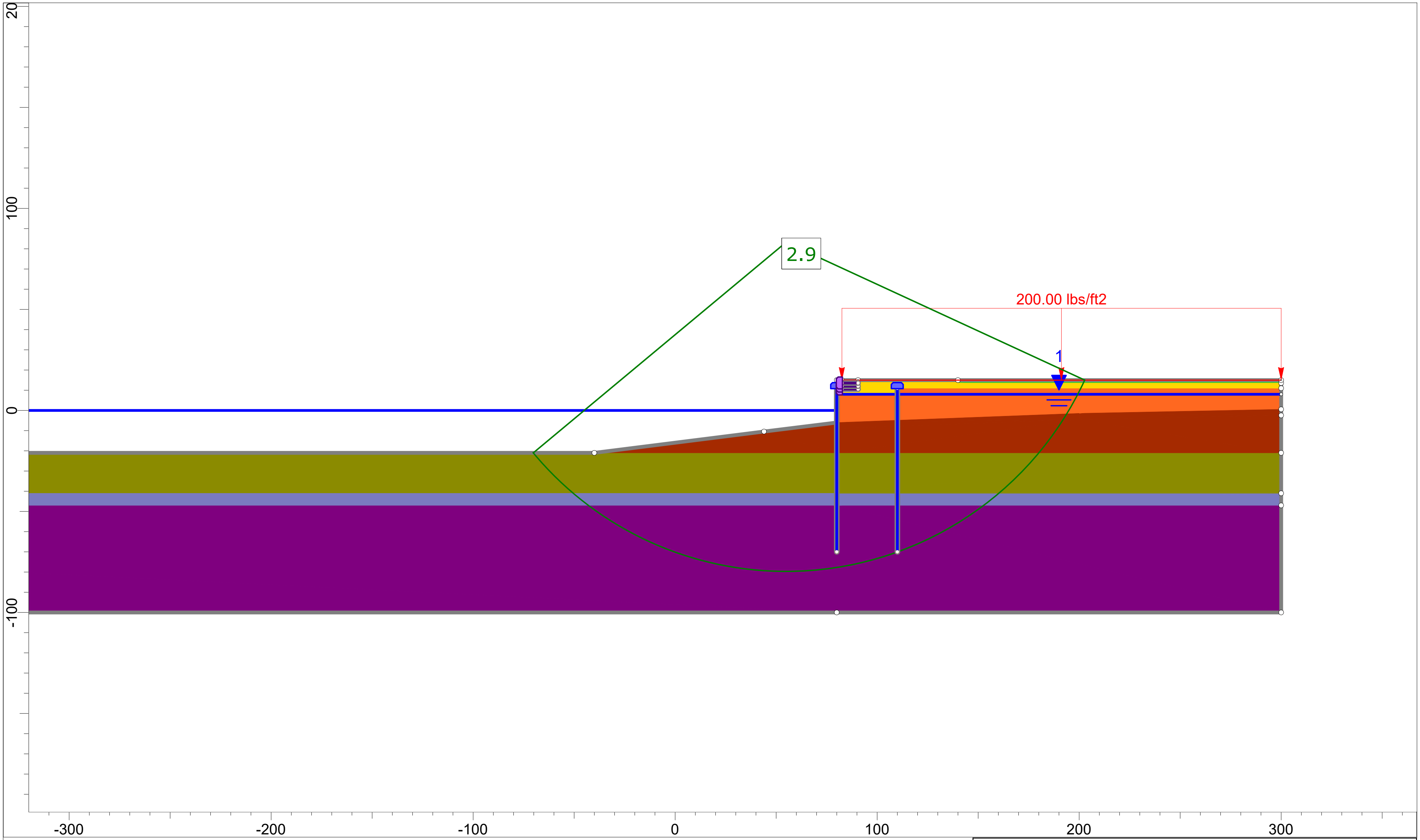

POPA Cofferdam Final Design
Port Angeles, Washington

Static Condition

19373-01 Scale 1:800 1/19

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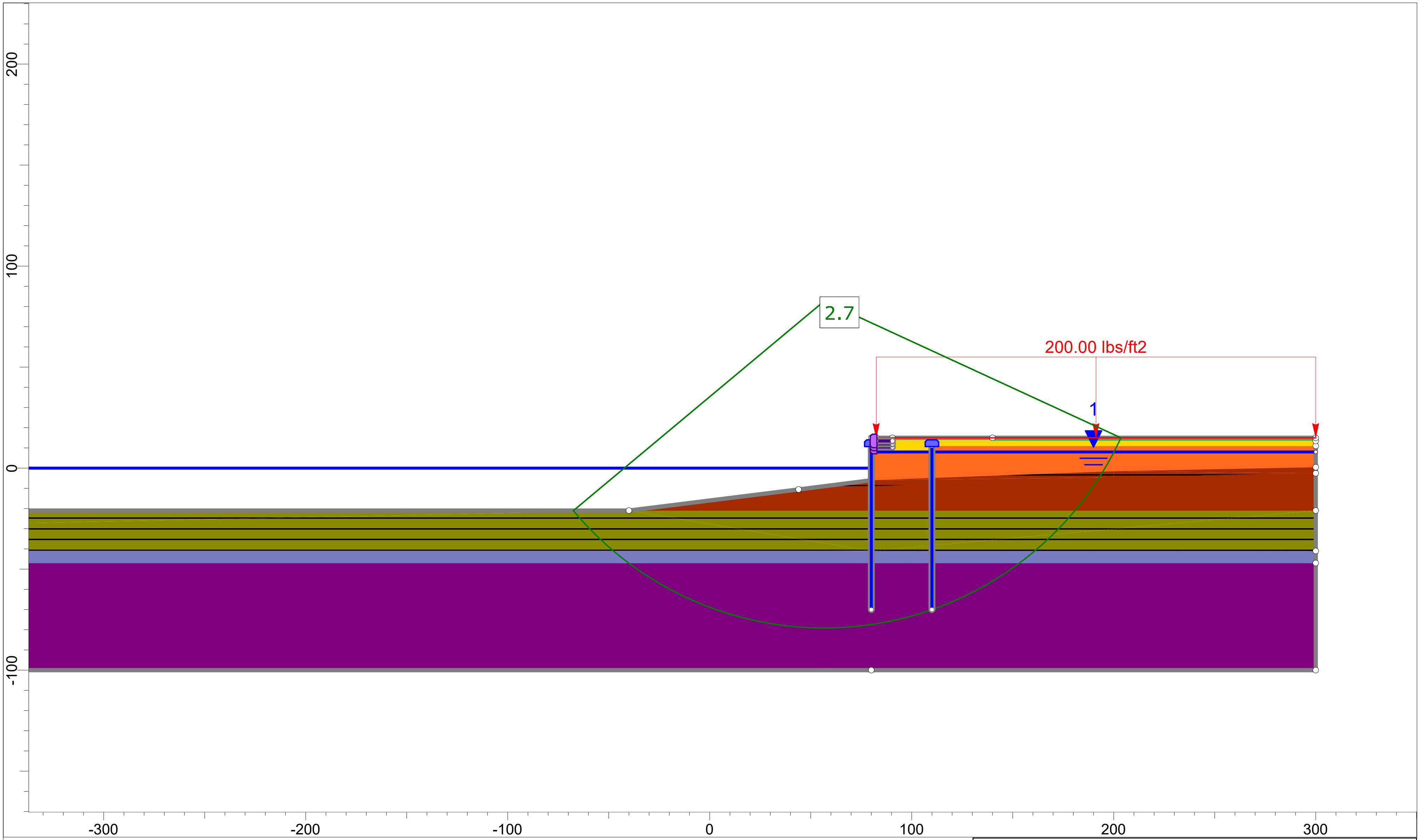
Figure
3



POPA Cofferdam Final Design
Port Angeles, WA

Liquefied Condition

19373-01 Scale 1:800 1/19

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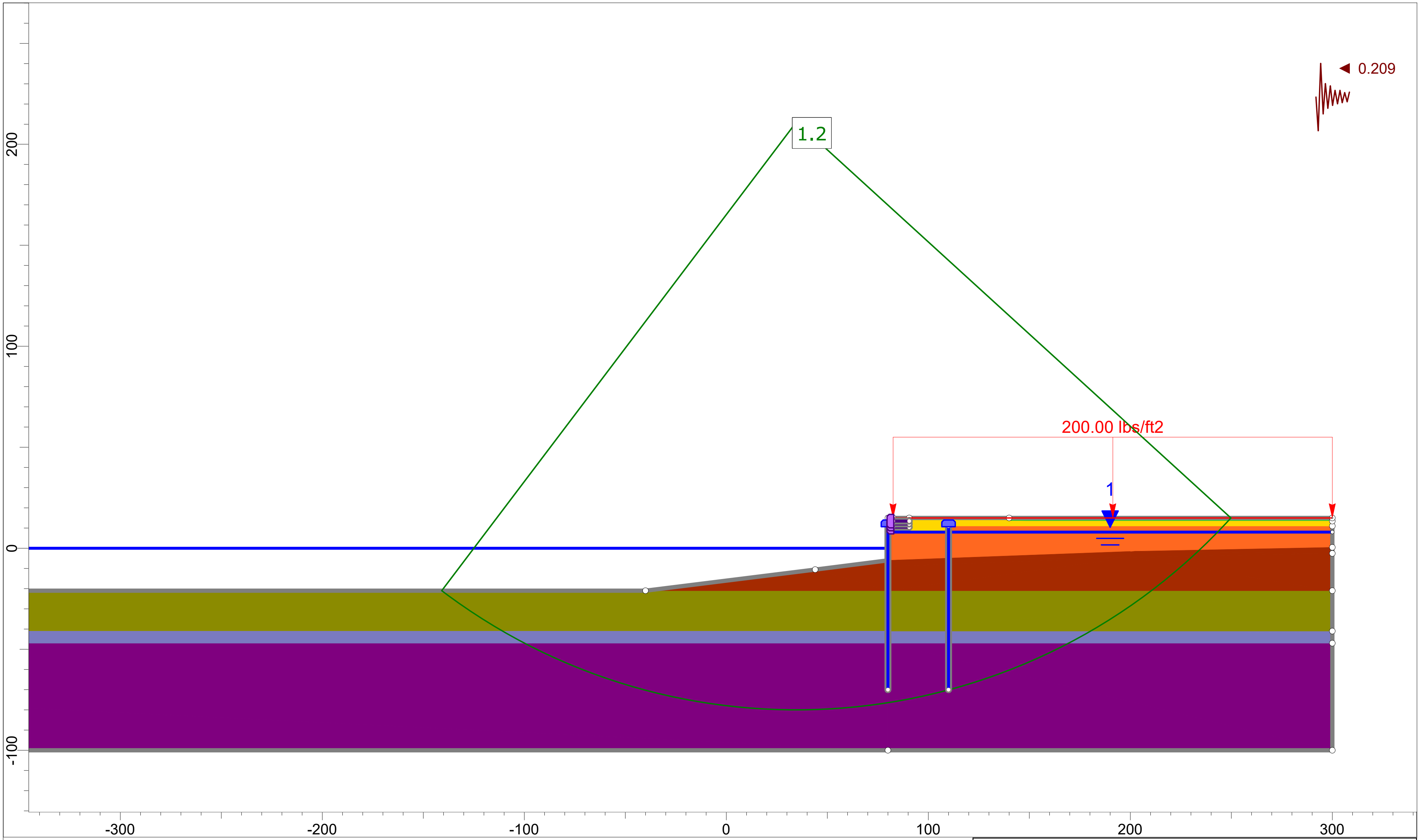
Figure
4



POPA Cofferdam Final Design
Port Angeles, WA

Pseudo Static Condition

19373-01 Scale 1:800 1/19

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Figure
5

APPENDIX A
Field Exploration Methods and Analysis

APPENDIX A

Field Exploration Methods and Analysis

This appendix documents the processes Hart Crowser used to determine the nature of the site soils. Sections are:

- Explorations and Their Location;
- Hollow-Stem Auger Borings;
- Test Pit Logs; and
- Standard Penetration Test Procedures.

Explorations and Their Location

Explorations. Subsurface explorations for this project were eight hollow-stem auger borings (H-1-02 to H-8-02) and eight test pits (TP-1 to TP-8). We primarily used boring H-4-02 and TP-1 to TP-8 for this study. The exploration logs in this appendix show our interpretation of the drilling, sampling, and testing data. They indicate the depth where the soils change; the change may be gradual. In the field, we classified the samples taken from the explorations according to the methods on Figure A-1, Key to Exploration Logs; the legend explains the symbols and abbreviations used in the logs and tables.

Locations. Figure 2 shows the locations of the explorations. The locations of the borings are based on the previous geotechnical and hydrogeologic study performed by Hart Crowser in 2002.

Hollow-Stem Auger Borings

Eight hollow-stem auger borings (H-1-02 to H-8-02) were drilled in October 2002 to depths of 44 feet to 90 feet below the existing ground surface. A geologist from Hart Crowser continuously observed the drilling. Detailed field logs were prepared of each boring. Using the SPT, we obtained samples at depth intervals of 5 feet.

The borings logs are presented on Figures A-2 through A-9 at the end of this appendix.

Test Pit Logs

Eight test pits (TP-1 to TP-8) were dug on November 16, 2018 to depth of 6 feet to 11 feet below the existing ground surface. A senior staff engineer from Hart Crowser continuously observed the digging. Detailed field logs were prepared for each test pit.

The test pit logs are presented on Figures A-2 through A-9 at the end of this appendix.

Standard Penetration Test Procedures

The SPT is an approximate measure of soil density and consistency. To be useful, the results must be used with engineering judgment in conjunction with other tests. The SPT (as described in ASTM D1586) was used to obtain disturbed samples. This test employs a standard 2-inch-outside-diameter split-spoon sampler. A 140-pound hammer free-falling 30 inches drives the sampler into the soil for

18 inches. The number of blows required to drive the sampler the last 12 inches only is the standard penetration resistance. This resistance, or blow count, measures the relative density of granular soils and the consistency of cohesive soils. The blow counts are plotted on the boring logs at their respective sample depths. Soil samples are recovered from the split-barrel sampler, field classified, placed into watertight jars, and taken to Hart Crowser's laboratory for further testing, as described in Appendix B.

Occasionally, very dense materials preclude driving the total 18-inch sample. When this happens, the penetration resistance is entered on logs as follows:

Penetration less than 6 inches. The log indicates the total number of blows over the number of inches of penetration.

Penetration greater than 6 inches. The blow count noted on the log is the sum of the total number of blows completed after the first 6 inches of penetration. This sum is expressed over the number of inches driven that exceed the first 6 inches. The number of blows needed to drive the first 6 inches is not reported. For example, a blow count series of 12 blows for 6 inches, 30 blows for 6 inches, and 50 (the maximum number of blows counted within a 6-inch increment for SPT) for 3 inches would be recorded as 80/9.

Sample Description

Identification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. ASTM D 2488 visual-manual identification methods were used as a guide. Where laboratory testing confirmed visual-manual identifications, then ASTM D 2487 was used to classify the soils.

Relative Density/Consistency

Soil density/consistency in borings is related primarily to the standard penetration resistance (N). Soil density/consistency in test pits and probes is estimated based on visual observation and is presented parenthetically on the logs.

SAND or GRAVEL Relative Density	N (Blows/Foot)	SILT or CLAY Consistency	N (Blows/Foot)
Very loose	0 to 4	Very soft	0 to 1
Loose	5 to 10	Soft	2 to 4
Medium dense	11 to 30	Medium stiff	5 to 8
Dense	31 to 50	Stiff	9 to 15
Very dense	>50	Very stiff	16 to 30
		Hard	>30

Moisture

Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

USCS Soil Classification Chart (ASTM D 2487)

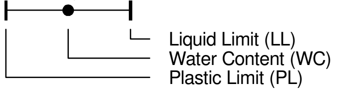
Major Divisions			Symbols		Typical Descriptions
			Graph	USCS	
Coarse Grained Soils More than 50% of Material Retained on No. 200 Sieve	Gravel and Gravelly Soils More than 50% of Coarse Fraction Retained on No. 4 Sieve	Clean Gravels *(<5% fines)*	●	GW	Well-Graded Gravel; Well-Graded Gravel with Sand
			○	GP	Poorly Graded Gravel; Poorly Graded Gravel with Sand
		Gravels *(5-12% fines)*	● ▥	GW-GM	Well-Graded Gravel with Silt; Well-Graded Gravel with Silt and Sand
			● ▨	GW-GC	Well-Graded Gravel with Clay; Well-Graded Gravel with Clay and Sand
			○ ▥	GP-GM	Poorly Graded Gravel with Silt; Poorly Graded Gravel with Silt and Sand
			○ ▨	GP-GC	Poorly Graded Gravel with Clay; Poorly Graded Gravel with Clay and Sand
		Gravels with Fines *(>12% fines)*	○▥	GM	Silty Gravel; Silty Gravel with Sand
			○▨	GC	Clayey Gravel; Clayey Gravel with Sand
	Sand and Sandy Soils More than 50% of Coarse Fraction Passing No. 4 Sieve	Sands with few Fines *(<5% fines)*	⁘●	SW	Well-Graded Sand; Well-Graded Sand with Gravel
			⁘	SP	Poorly Graded Sand; Poorly Graded Sand with Gravel
		Sands *(5-12% fines)*	⁘● ▥	SW-SM	Well-Graded Sand with Silt Well-Graded Sand with Silt and Gravel
			⁘● ▨	SW-SC	Well-Graded Sand with Clay; Well-Graded Sand with Clay and Gravel
			⁘ ▥	SP-SM	Poorly Graded Sand with Silt; Poorly Graded Sand with Silt and Gravel
			⁘ ▨	SP-SC	Poorly Graded Sand with Clay; Poorly Graded Sand with Clay and Gravel
		Sands with Fines *(>12% fines)*	⁘▥	SM	Silty Sand; Silty Sand with Gravel
			⁘▨	SC	Clayey Sand; Clayey Sand with Gravel
Fine Grained Soils More than 50% of Material Passing No. 200 Sieve	Silts		▥	ML	Silt; Silt with Sand or Gravel; Sandy or Gravelly Silt
			▮▮▮	MH	Elastic Silt; Elastic Silt with Sand or Gravel; Sandy or Gravelly Elastic Silt
	Silty Clay *(based on Atterberg Limits)*		▨▥	CL-ML	Silty Clay; Silty Clay with Sand or Gravel; Gravelly or Sandy Silty Clay
	Clays		▨	CL	Lean Clay; Lean Clay with Sand or Gravel; Sandy or Gravelly Lean Clay
			▩	CH	Fat Clay; Fat Clay with Sand or Gravel; Sandy or Gravelly Fat Clay
	Organics		☰	OL/OH	Organic Soil; Organic Soil with Sand or Gravel; Sandy or Gravelly Organic Soil
Highly Organic *(>50% organic material)*			⊥⊥	PT	Peat - Decomposing Vegetation - Fibrous to Amorphous Texture

Minor Constituents

	Estimated Percentage
Sand, Gravel	
Trace	<5
Few	5 - 15
Cobbles, Boulders	
Trace	<5
Few	5 - 10
Little	15 - 25
Some	30 - 45

Soil Test Symbols

%F	Percent Passing No. 200 Sieve
AL	Atterberg Limits (%)



CA	Chemical Analysis
CAUC	Consolidated Anisotropic Undrained Compression
CAUE	Consolidated Anisotropic Undrained Extension
CBR	California Bearing Ratio
CIDC	Consolidated Drained Isotropic Triaxial Compression
CIUC	Consolidated Isotropic Undrained Compression
CK0DC	Consolidated Drained k0 Triaxial Compression
CK0DSS	Consolidated k0 Undrained Direct Simple Shear
CK0UC	Consolidated k0 Undrained Compression
CK0UE	Consolidated k0 Undrained Extension
CRSCN	Constant Rate of Strain Consolidation
DSS	Direct Simple Shear
DT	In Situ Density
GS	Grain Size Classification
HYD	Hydrometer
ILCN	Incremental Load Consolidation
K0CN	k0 Consolidation
kc	Constant Head Permeability
kf	Falling Head Permeability
MD	Moisture Density Relationship
OC	Organic Content
OT	Tests by Others
P	Pressuremeter
PID	Photoionization Detector Reading
PP	Pocket Penetrometer
SG	Specific Gravity
TRS	Torsional Ring Shear
TV	Torvane
UC	Unconfined Compression
UUC	Unconsolidated Undrained Triaxial Compression
VS	Vane Shear
WC	Water Content (%)

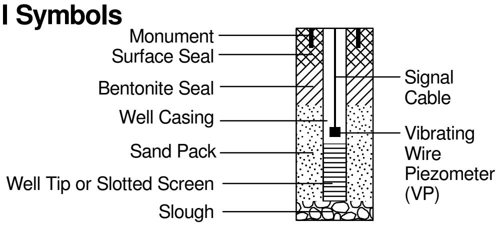
Groundwater Indicators

▽	Groundwater Level on Date or At Time of Drilling (ATD)
▼	Groundwater Level on Date Measured in Piezometer
♀	Groundwater Seepage (Test Pits)

Sample Symbols

☒ 1.5" I.D. Split Spoon	◧ Core Run	⊠ Grab
◪ 3.0" I.D. Split Spoon	⌇ Sonic Core	▥ Cuttings
◨ Modified California Sampler	◫ Thin-walled Sampler	

Well Symbols



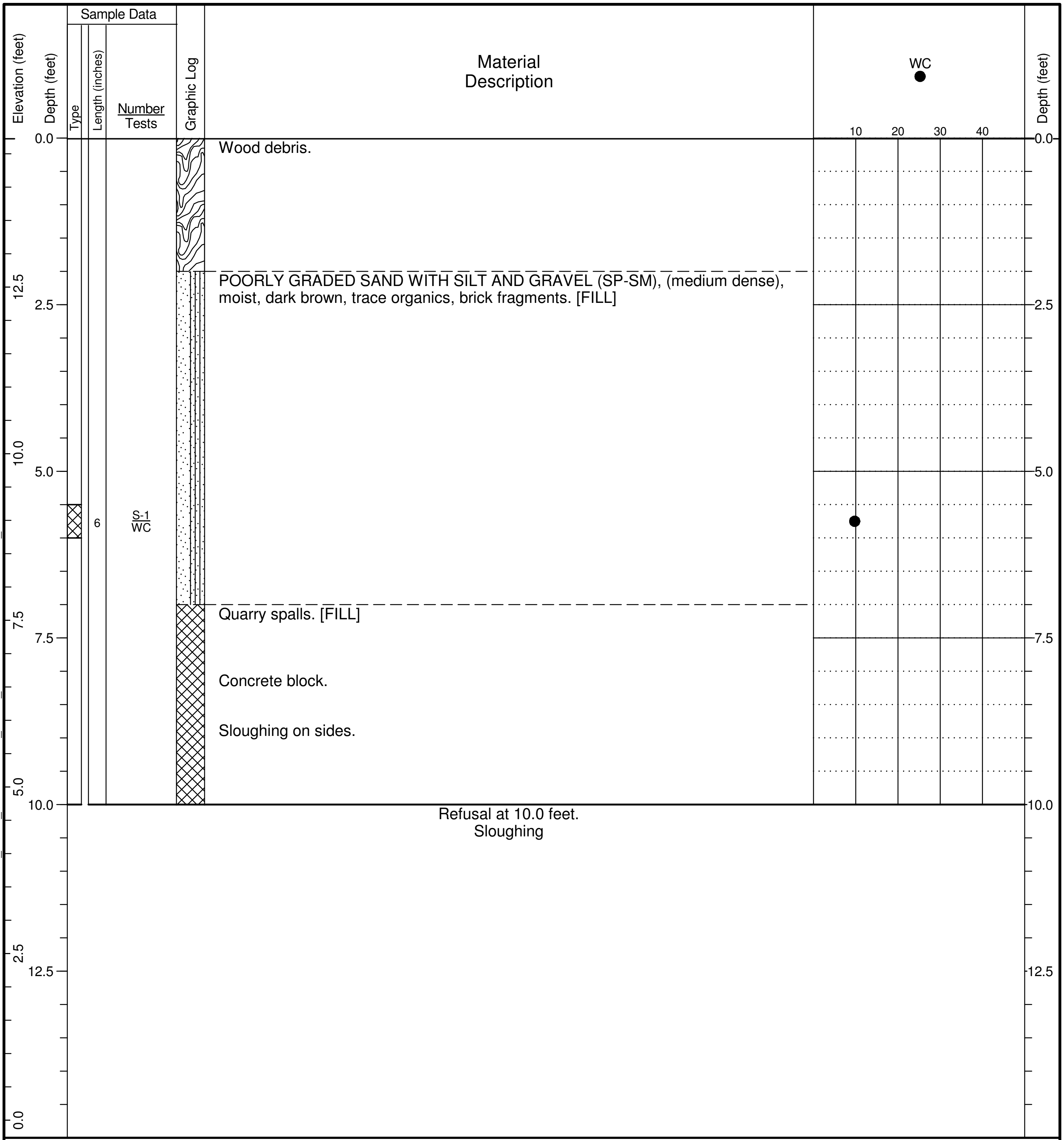
HARTCROWSER

Project: POPA Cofferdam Assessment Final Design
Location: Port Angeles
Project No.: 19373-01

Key to Exploration Logs

Figure **A-1**
Sheet **1 of 1**

Date Started: 11/16/18
Date Completed: 11/16/18
Logged by: J. Jacoby
Checked by: J. Bruce/Z. Yell
Location: N: 423,502.64 E: 998,994.52
Ground Surface Elevation: 14.737 feet
Horizontal Datum:
Vertical Datum: NAVD 88
Contractor/Crew:
Rig Model/Type:
Total Depth: 10 feet
Depth to Seepage: Not Encountered
Comments: Location and ground surface elevations are approximate.



Wood debris.

POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), (medium dense), moist, dark brown, trace organics, brick fragments. [FILL]

Quarry spalls. [FILL]

Concrete block.

Sloughing on sides.

Refusal at 10.0 feet.
Sloughing

General Notes:

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between material strata or geologic units. Dashed stratum lines indicate gradual or approximate change between material strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

HARTCROWSER

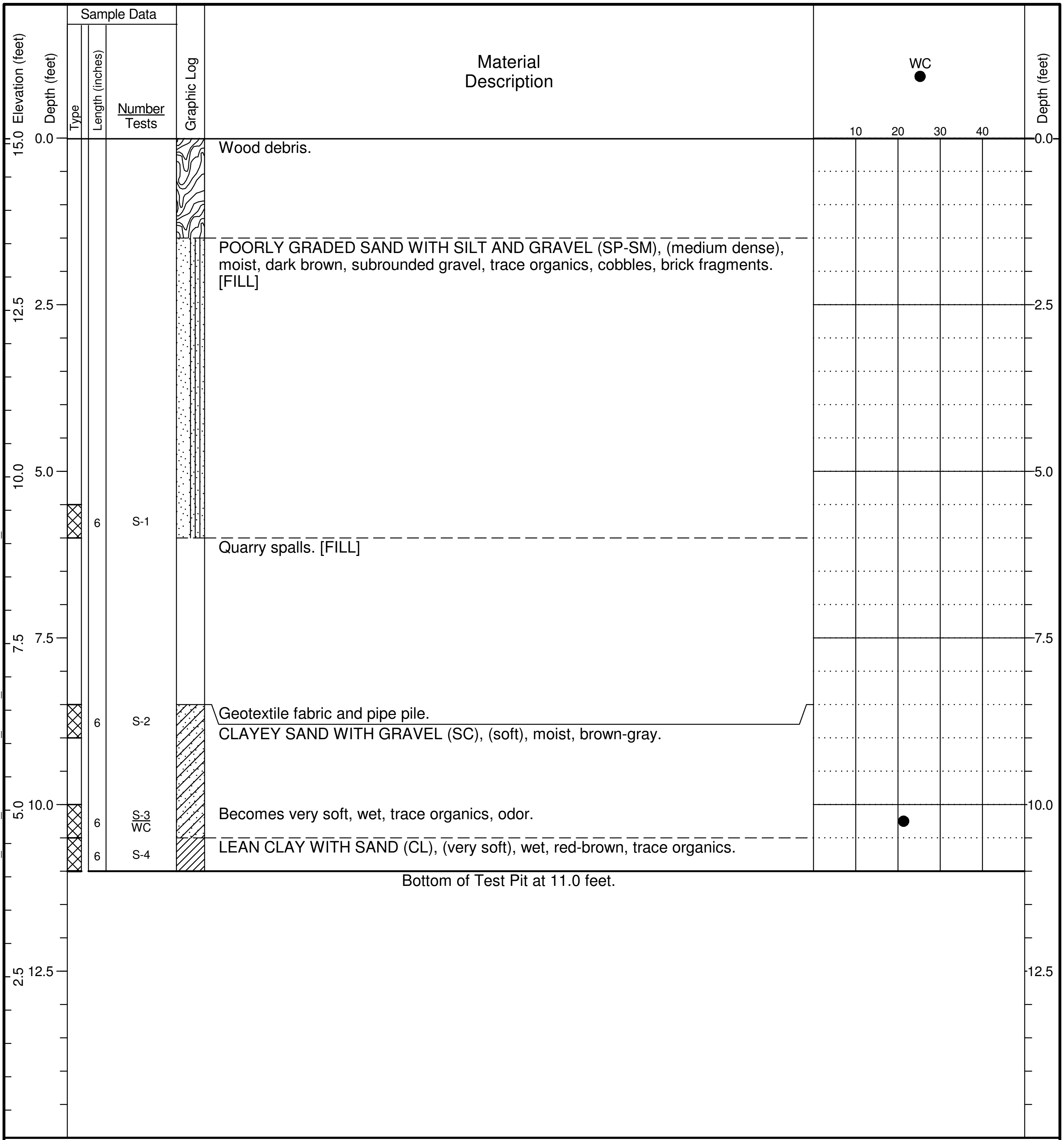
Project: POPA Cofferdam Assessment Final Design
Location: Port Angeles
Project No.: 19373-01

Test Pit Log
TP-1

Figure **A-2**
Sheet **1 of 1**

Date Started: 11/16/18
Date Completed: 11/16/18
Logged by: J. Jacoby
Checked by: J. Bruce/Z. Yell
Location: N: 423,463.73 E: 998,997.50
Ground Surface Elevation: 15.083 feet
Horizontal Datum:
Vertical Datum: NAVD 88

Contractor/Crew:
Rig Model/Type:
Total Depth: 11 feet
Depth to Seepage: Not Encountered
Comments: Location and ground surface elevations are approximate.



Wood debris.

POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), (medium dense), moist, dark brown, subrounded gravel, trace organics, cobbles, brick fragments. [FILL]

Quarry spalls. [FILL]

Geotextile fabric and pipe pile.

CLAYEY SAND WITH GRAVEL (SC), (soft), moist, brown-gray.

Becomes very soft, wet, trace organics, odor.

LEAN CLAY WITH SAND (CL), (very soft), wet, red-brown, trace organics.

Bottom of Test Pit at 11.0 feet.

General Notes:

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between material strata or geologic units. Dashed stratum lines indicate gradual or approximate change between material strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

HARTCROWSER

Project: POPA Cofferdam Assessment Final Design
Location: Port Angeles
Project No.: 19373-01

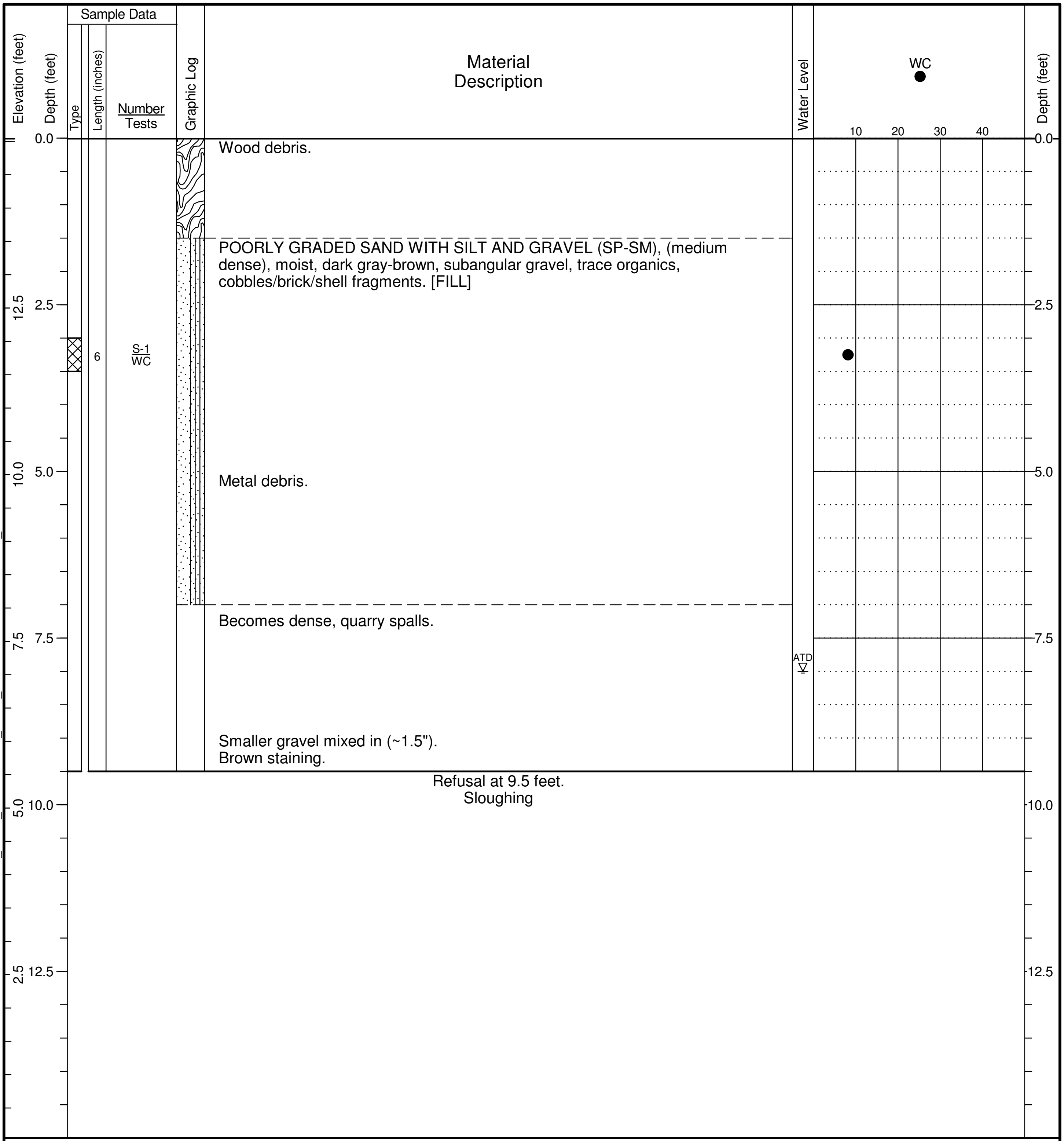
Test Pit Log
TP-2

Figure **A-3**
Sheet **1 of 1**

HC TEST PIT - J:\GINT\HC_LIBRARY.GLB - 12/19/18 11:39 - L:\NOTEBOOKS\1937301_POPA_COFFERDAM_FINAL_DESIGN\FIELD DATA\PERM_GINT FILES\1937301-BL.GPJ - kzl

Date Started: 11/16/18
Date Completed: 11/16/18
Logged by: J. Jacoby
Checked by: J. Bruce/Z. Yell
Location: N: 423,440.89 E: 999,022.06
Ground Surface Elevation: 15.05 feet
Horizontal Datum:
Vertical Datum: NAVD 88

Contractor/Crew:
Rig Model/Type:
Total Depth: 9.5 feet
Depth to Seepage: 8 feet
Comments: Location and ground surface elevations are approximate.



Wood debris.

POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), (medium dense), moist, dark gray-brown, subangular gravel, trace organics, cobbles/brick/shell fragments. [FILL]

Metal debris.

Becomes dense, quarry spalls.

Smaller gravel mixed in (~1.5").
Brown staining.

Refusal at 9.5 feet.
Sloughing

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between material strata or geologic units. Dashed stratum lines indicate gradual or approximate change between material strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

HARTCROWSER

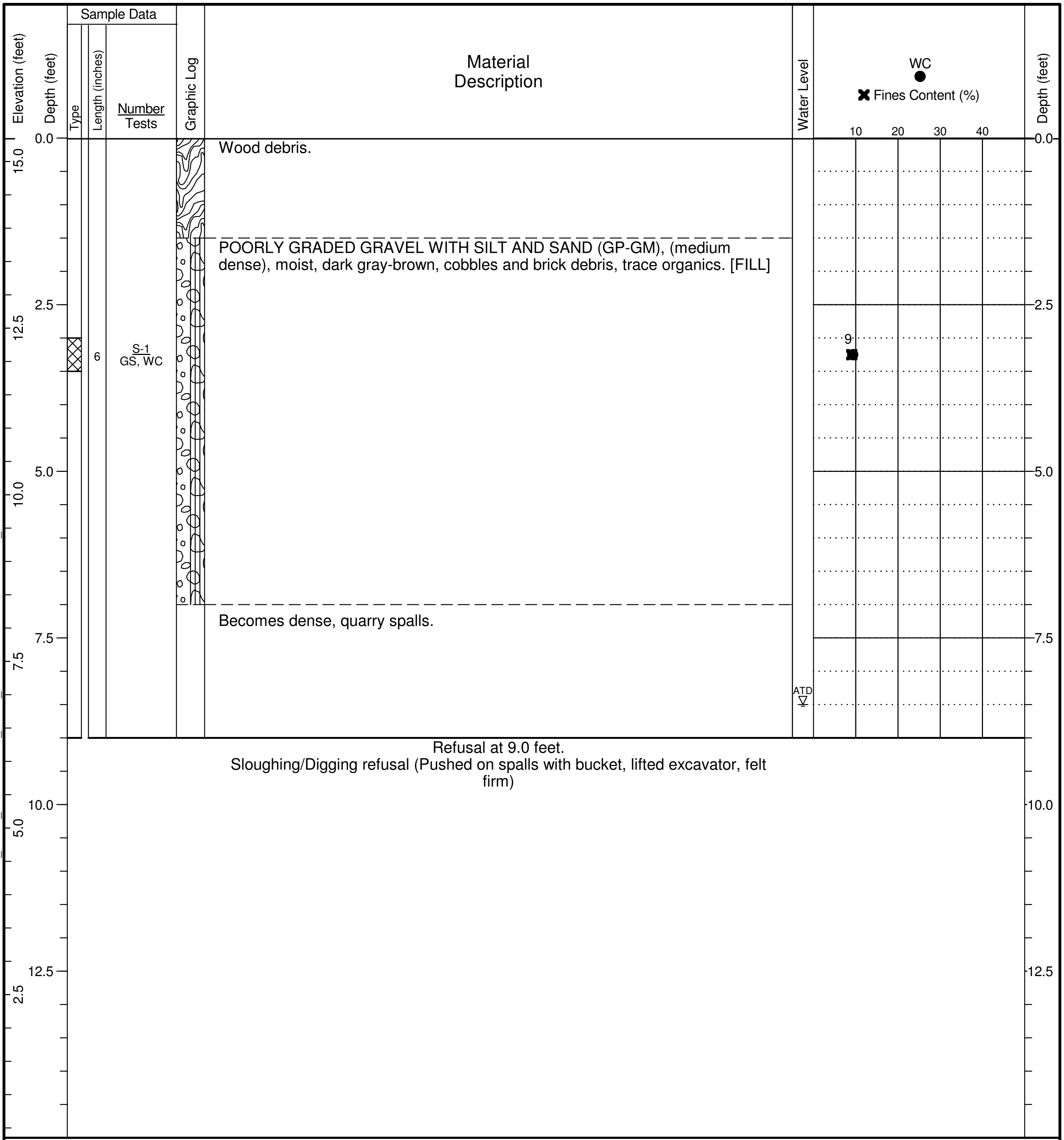
Project: POPA Cofferdam Assessment Final Design
Location: Port Angeles
Project No.: 19373-01

Test Pit Log
TP-3

Figure **A-4**
Sheet **1 of 1**

HC TEST PIT - J:\GINT\HC_LIBRARY.GLB - 12/19/18 11:39 - L:\NOTEBOOKS\1937301_POPA_COFFERDAM_FINAL_DESIGN\FIELD DATA\PERM_GINT FILES\1937301-BL.GPJ - kzl

Date Started: 11/16/18
Date Completed: 11/16/18
Logged by: J. Jacoby
Checked by: J. Bruce/Z. Yell
Location: N: 423,412.82 E: 999,040.47
Ground Surface Elevation: 15.352 feet
Horizontal Datum:
Vertical Datum: NAVD 88
Contractor/Crew:
Rig Model/Type:
Total Depth: 9 feet
Depth to Seepage: 8.5 feet
Comments: Location and ground surface elevations are approximate.



Wood debris.

POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), (medium dense), moist, dark gray-brown, cobbles and brick debris, trace organics. [FILL]

Becomes dense, quarry spalls.

Refusal at 9.0 feet.
Sloughing/Digging refusal (Pushed on spalls with bucket, lifted excavator, felt firm)

General Notes:

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between material strata or geologic units. Dashed stratum lines indicate gradual or approximate change between material strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

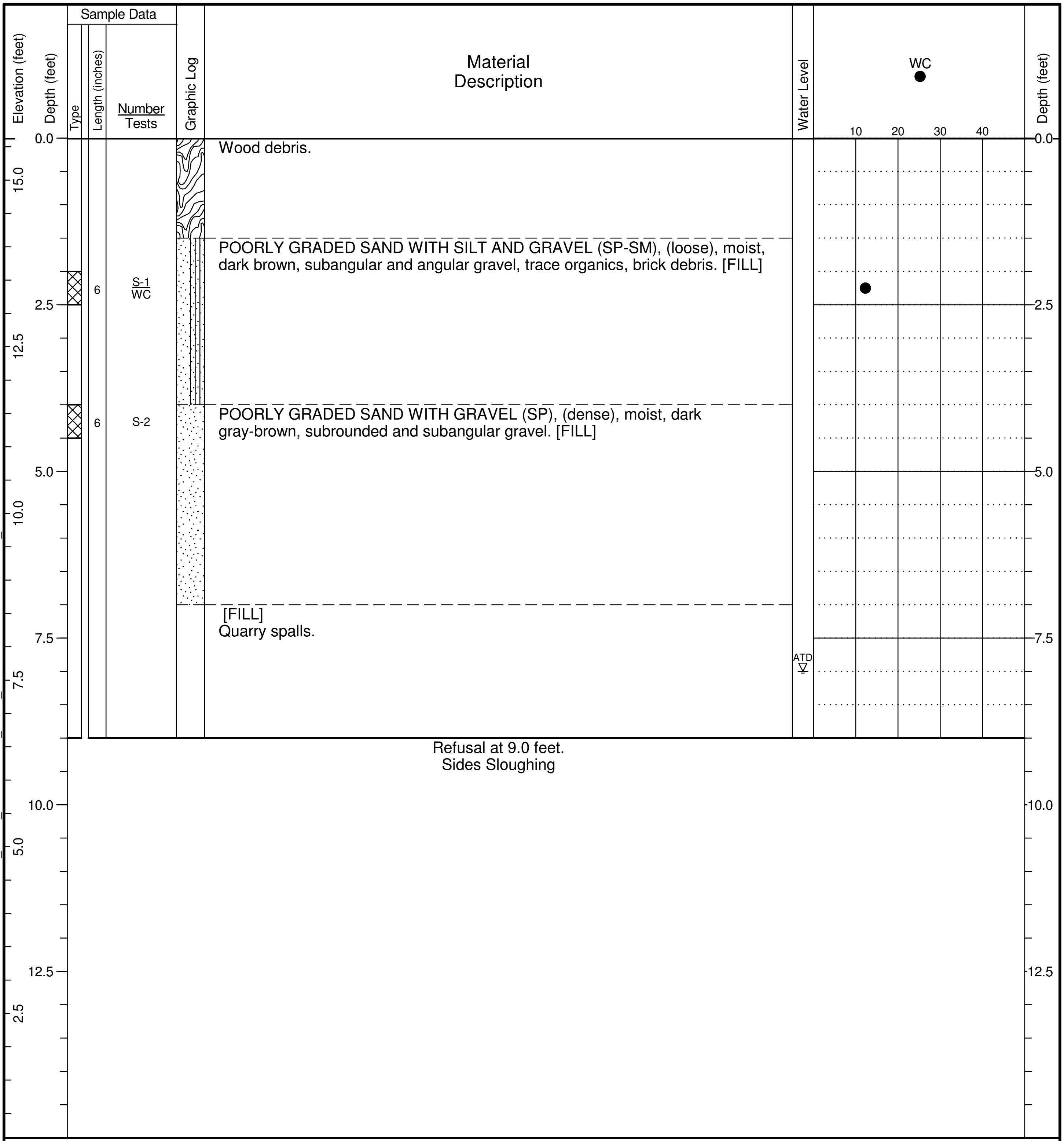
HARTCROWSER

Project: POPA Cofferdam Assessment Final Design
Location: Port Angeles
Project No.: 19373-01

Test Pit Log
TP-4

Figure **A-5**
Sheet **1 of 1**

Date Started: 11/16/18
Date Completed: 11/16/18
Logged by: J. Jacoby
Checked by: J. Bruce/Z. Yell
Location: N: 423,374.31 E: 999,065.28
Ground Surface Elevation: 15.632 feet
Horizontal Datum:
Vertical Datum: NAVD 88
Contractor/Crew:
Rig Model/Type:
Total Depth: 9 feet
Depth to Seepage: 8 feet
Comments: Location and ground surface elevations are approximate.



Depth (feet)	Length (inches)	Number / Tests	Material Description	Water Level
0.0			Wood debris.	
	6	S-1 / WC	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), (loose), moist, dark brown, subangular and angular gravel, trace organics, brick debris. [FILL]	
	6	S-2	POORLY GRADED SAND WITH GRAVEL (SP), (dense), moist, dark gray-brown, subrounded and subangular gravel. [FILL]	
			[FILL] Quarry spalls.	ATD

Refusal at 9.0 feet.
Sides Sloughing

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between material strata or geologic units. Dashed stratum lines indicate gradual or approximate change between material strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

HARTCROWSER

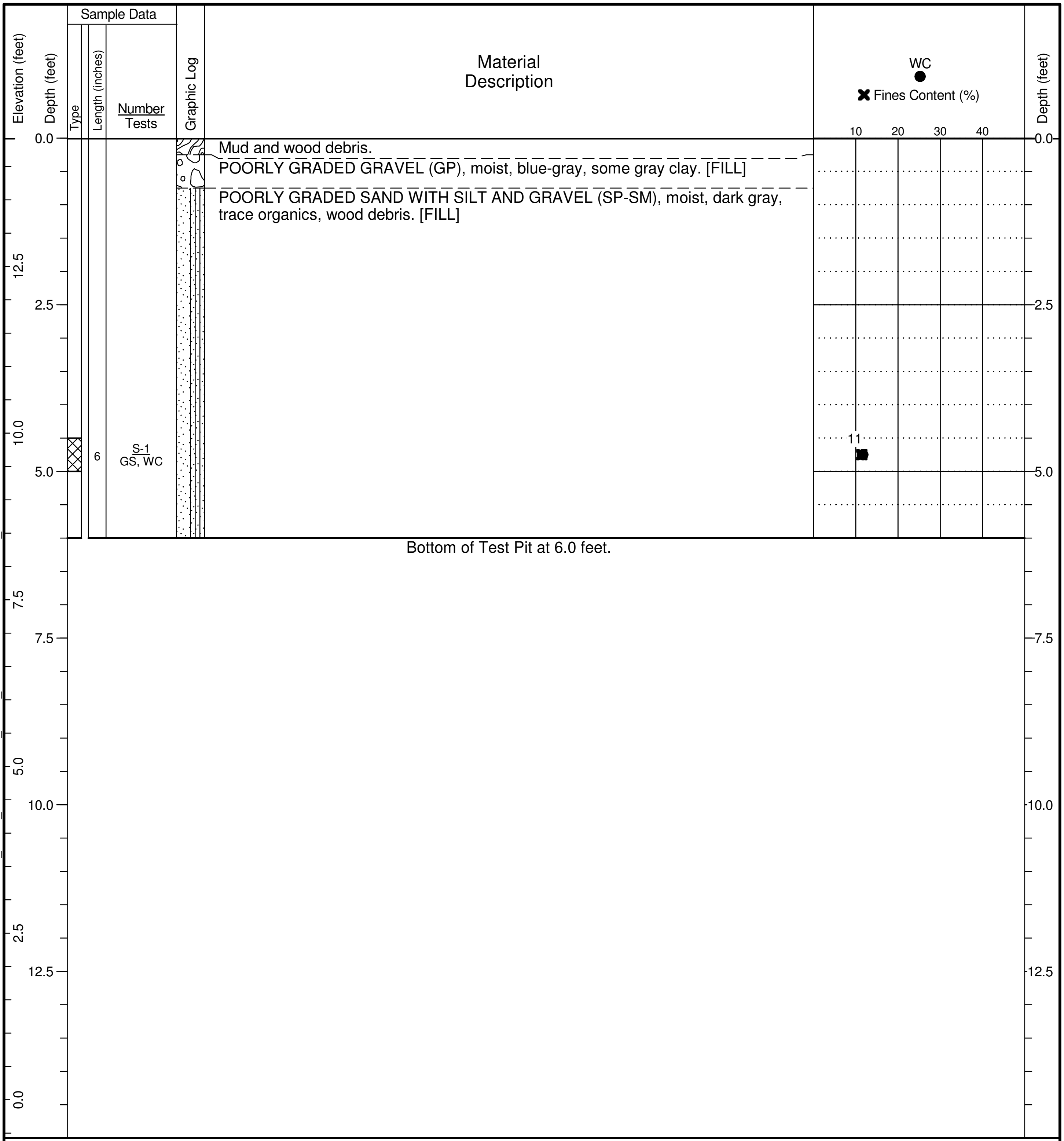
Project: POPA Cofferdam Assessment Final Design
Location: Port Angeles
Project No.: 19373-01

Test Pit Log
TP-5

Figure **A-6**
Sheet **1 of 1**

Date Started: 11/16/18 Date Completed: 11/16/18
Logged by: J. Jacoby Checked by: J. Bruce/Z. Yell
Location: N: 423,456.23 E: 998,966.36
Ground Surface Elevation: 14.425 feet
Horizontal Datum:
Vertical Datum: NAVD 88

Contractor/Crew:
Rig Model/Type:
Total Depth: 6 feet Depth to Seepage: Not Encountered
Comments: Location and ground surface elevations are approximate.



Mud and wood debris.

POORLY GRADED GRAVEL (GP), moist, blue-gray, some gray clay. [FILL]

POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), moist, dark gray, trace organics, wood debris. [FILL]

Bottom of Test Pit at 6.0 feet.

General Notes:

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between material strata or geologic units. Dashed stratum lines indicate gradual or approximate change between material strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

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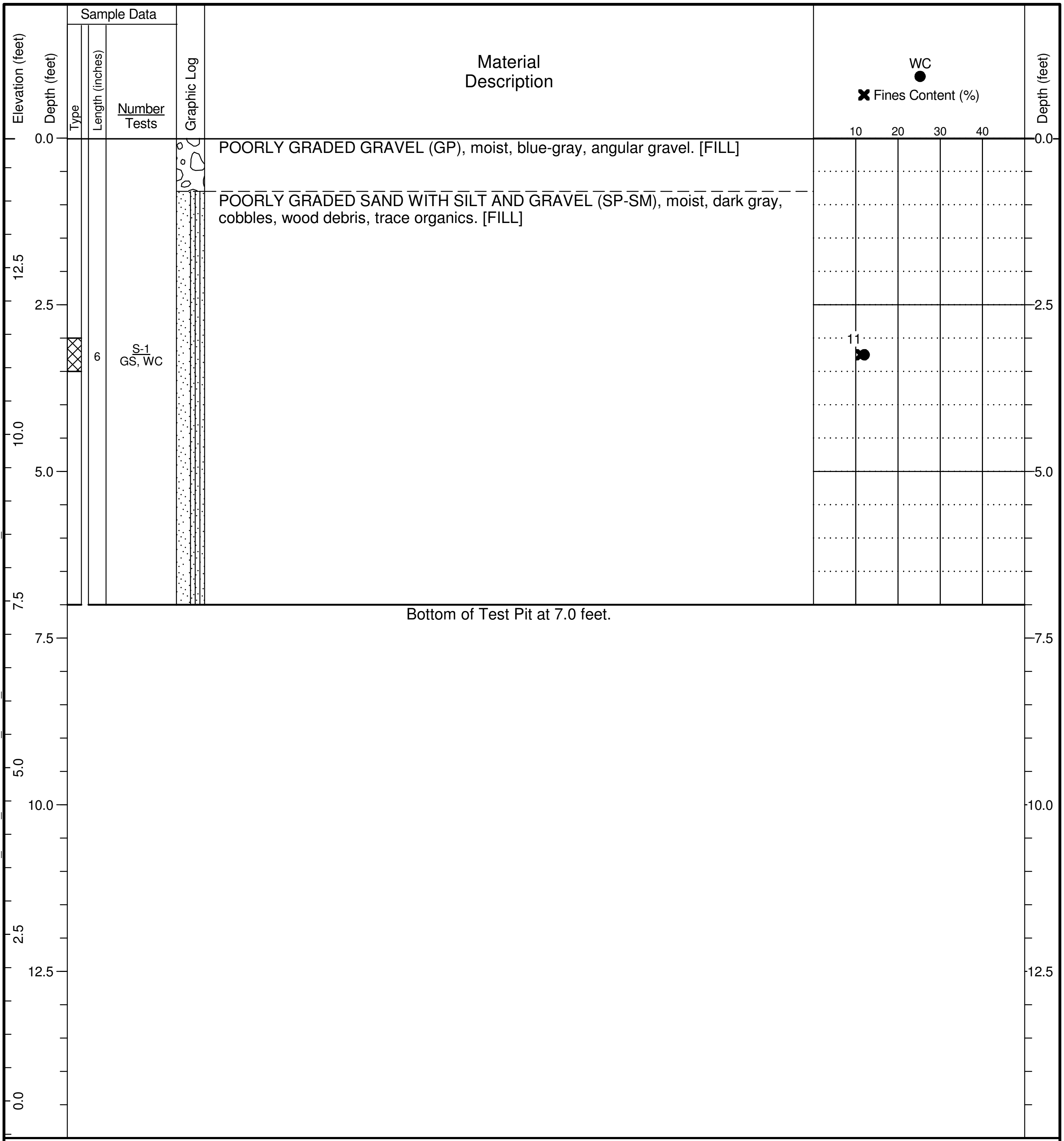
Project: POPA Cofferdam Assessment Final Design
Location: Port Angeles
Project No.: 19373-01

Test Pit Log
TP-6

Figure **A-7**
Sheet **1 of 1**

HC TEST PIT - J:\GINT\HC_LIBRARY.GLB - 12/19/18 11:39 - L:\NOTEBOOKS\1937301_POPA_COFFERDAM_FINAL_DESIGN\FIELD DATA\PERM_GINT FILES\1937301-BL.GPJ - kzl

Date Started: 11/16/18
Date Completed: 11/16/18
Logged by: J. Jacoby
Checked by: J. Bruce/Z. Yell
Location: N: 423,409.42 E: 998,989.75
Ground Surface Elevation: 14.442 feet
Horizontal Datum:
Vertical Datum: NAVD 88
Contractor/Crew:
Rig Model/Type:
Total Depth: 7 feet
Depth to Seepage: Not Encountered
Comments: Location and ground surface elevations are approximate.



POORLY GRADED GRAVEL (GP), moist, blue-gray, angular gravel. [FILL]

POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), moist, dark gray, cobbles, wood debris, trace organics. [FILL]

Bottom of Test Pit at 7.0 feet.

General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between material strata or geologic units. Dashed stratum lines indicate gradual or approximate change between material strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

HC TEST PIT - J:\GINT\HC_LIBRARY.GLB - 12/19/18 11:39 - L:\NOTEBOOKS\1937301_POPA_COFFERDAM_FINAL_DESIGN\FIELD DATA\PERM_GINT FILES\1937301-BL.GPJ - kzl

HARTCROWSER

Project: POPA Cofferdam Assessment Final Design
Location: Port Angeles
Project No.: 19373-01

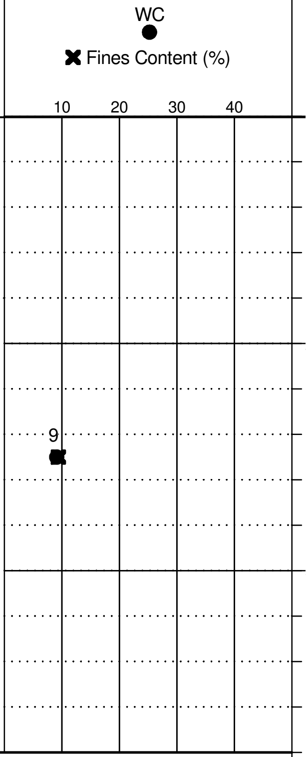
Test Pit Log
TP-7

Figure **A-8**
Sheet **1 of 1**

Date Started: 11/16/18 Date Completed: 11/16/18
Logged by: J. Jacoby Checked by: J. Bruce/Z. Yell
Location: N: 423,334.94 E: 999,050.97
Ground Surface Elevation: 14.922 feet
Horizontal Datum:
Vertical Datum: NAVD 88

Contractor/Crew:
Rig Model/Type:
Total Depth: 7 feet Depth to Seepage: Not Encountered
Comments: Location and ground surface elevations are approximate.

Elevation (feet)	Depth (feet)	Sample Data Type	Sample Data Length (inches)	Sample Data Number / Tests	Graphic Log	Material Description	WC ● / ✖ Fines Content (%)	Depth (feet)
	0.0					Wood debris.		0.0
12.5	2.5					POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), moist, dark gray, cobbles, brick and concrete debris, trace organics. [FILL]		2.5
		☒	6	S-1 GS, WC			9	
10.0	5.0							5.0
						Bottom of Test Pit at 7.0 feet.		
7.5	7.5							7.5
5.0	10.0							10.0
2.5	12.5							12.5
0.0								



General Notes:
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Material descriptions and stratum lines are interpretive and actual changes may be gradual. Solid stratum lines indicate distinct contact between material strata or geologic units. Dashed stratum lines indicate gradual or approximate change between material strata or geologic units.
3. USCS designations are based on visual-manual identification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling/excavation (ATD) or for date specified. Level may vary with time.

HARTCROWSER

Project: POPA Cofferdam Assessment Final Design
Location: Port Angeles
Project No.: 19373-01

Test Pit Log
TP-8

Figure **A-9**
Sheet **1 of 1**

APPENDIX B
Geotechnical Laboratory Tests

APPENDIX B

Geotechnical Laboratory Tests

Laboratory tests were performed to evaluate the basic index and geotechnical engineering properties of the site soils. Only disturbed samples from test pit excavations and SPT split spoons were tested. The tests performed and the procedures followed are outlined below.

Soil Classification

Soil samples from the explorations were visually classified in the field; classifications were verified in our relatively controlled laboratory environment. Field and laboratory observations were density/consistency, moisture, and grain size and plasticity estimates. We used laboratory tests such as Atterberg limits determinations and grain size analysis to check classifications of selected samples. Soil was classified in general accordance with the Unified Soil Classification (USC) System, ASTM D2488, as presented on Figure A-1.

Water Content Determination

Water content was determined for a representative number of samples recovered in the explorations in general accordance with ASTM D2216 as soon as possible after their arrival in our laboratory. The results of these tests are plotted at the respective sample depths on the exploration logs. In addition, water content is routinely determined for samples subjected to other testing. These results are also presented on the exploration logs.

Grain Size Analysis

Grain size distribution was analyzed on representative samples in general accordance with ASTM D422. Wet sieve analysis was used to determine the size distribution greater than the U.S. No. 200 mesh sieve. The results of the tests are summarized on Table B-1 and presented as curves on Figure B-3, which plot percent finer by weight versus grain size.

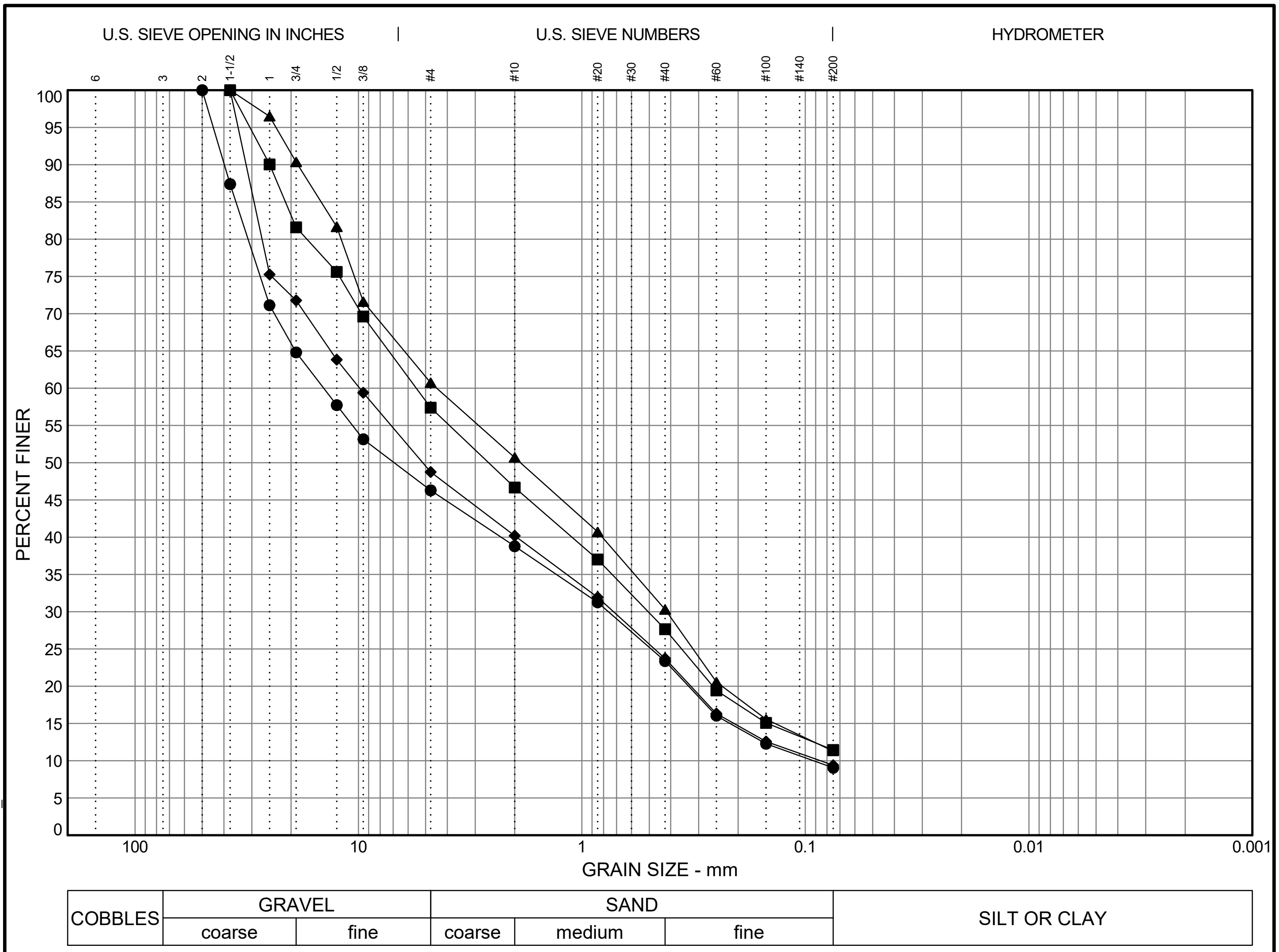
TABLE B-1: SUMMARY OF LABORATORY RESULTS

HARTCROWSER

PROJECT NAME POPA Cofferdam Assessment Final Design

PROJECT NUMBER 1937301 **PROJECT LOCATION** Port Angeles

Borehole	Sample ID	Depth	% Gravel	% Sand	% Fines	Liquid Limit	Plastic Limit	Water Content (%)	USCS Group Symbol	Soil Description
TP-1	S-1	5.5						9.8		
TP-2	S-1	5.5								
TP-2	S-2	8.5								
TP-2	S-3	10.0						21.3		
TP-2	S-4	10.5								
TP-3	S-1	3.0						8.2		
TP-4	S-1	3.0	53.7	37.2	9.0			9.3	GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND
TP-5	S-1	2.0						12.3		
TP-5	S-2	4.0								
TP-6	S-1	4.5	42.6	46.0	11.4			11.7	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL
TP-7	S-1	3.0	39.3	49.4	11.3			12.0	SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL
TP-8	S-1	3.5	51.2	39.4	9.4			9.1	GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND



Location and Description	% Cobbles	% Gravel	% Sand	% Silt	% Clay	MC%	USCS
● **Source:** TP-4 **Sample No.:** S-1 **Depth:** 3.0 to 3.5 POORLY GRADED GRAVEL WITH SILT AND SAND	0.0	53.7	37.2	9.0		9	GP-GM
■ **Source:** TP-6 **Sample No.:** S-1 **Depth:** 4.5 to 5.0 POORLY GRADED SAND WITH SILT AND GRAVEL	0.0	42.6	46.0	11.4		12	SP-SM
▲ **Source:** TP-7 **Sample No.:** S-1 **Depth:** 3.0 to 3.5 POORLY GRADED SAND WITH SILT AND GRAVEL	0.0	39.3	49.4	11.3		12	SP-SM
◆ **Source:** TP-8 **Sample No.:** S-1 **Depth:** 3.5 to 4.0 POORLY GRADED GRAVEL WITH SILT AND SAND	0.0	51.2	39.4	9.4		9	GP-GM

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			35.335	14.304	6.916	0.761	0.217	0.092	0.44	155.12
■			21.224	5.508	2.618	0.506	0.148		0.81	96.19
▲			14.679	4.459	1.884	0.418	0.137		0.65	73.40
◆			29.326	9.866	5.151	0.722	0.209	0.086	0.62	115.10

Remarks:

● Occasional organics
■ Occasional organics
▲ Occasional organics
◆ Occasional organics

HARTCROWSER

Project: POPA Cofferdam Assessment Final Design
Location: Port Angeles
Project No.: 19373-01

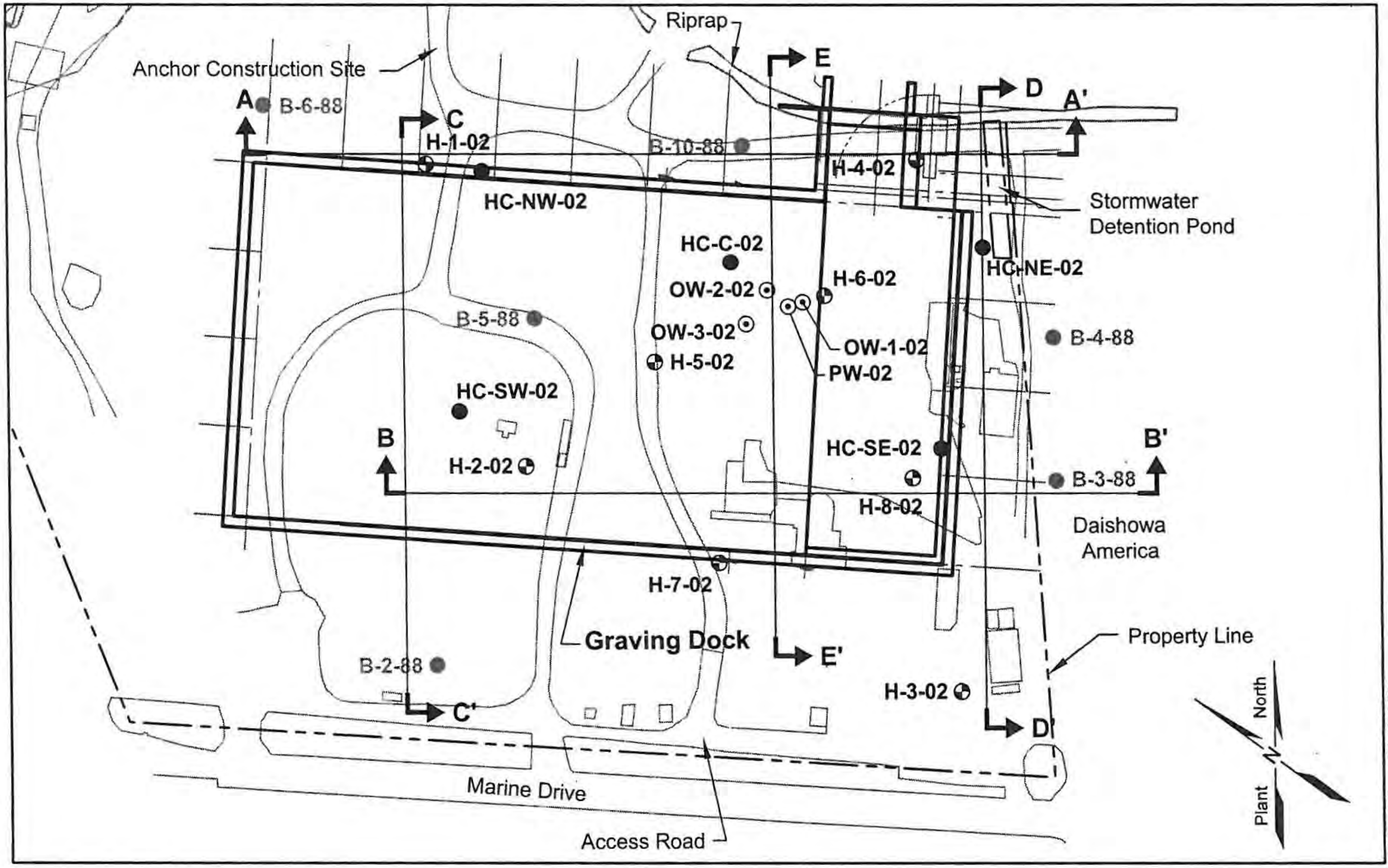
Particle-Size Analysis

Figure **B-3**
Sheet **1 of 1**

HC GRAIN SIZE - J:\GINT\HC_LIBRARY.GLB - 12/21/18 11:16 - L:\NOTEBOOKS\1937301_POPA_COFFERDAM_FINAL_DESIGN\FIELD DATA\PERM_GINT FILES\1937301-BL.GPJ - hclab

APPENDIX C
Historical Site Plan and Explorations

Site and Exploration Plan



Exploration Location and Number

H-1-02 ⊕	Geotechnical Boring (Current Study)
OW-2-02 ⊙	Wells (Current Study)
HC-SW-02 ●	Environmental Boring (Current Study)
B-2-88 ●	Environmental Boring (1988 Study)

B B' Cross Section Location and Designation

0 200 400
Scale in Feet

Notes:

1) Current exploration locations were surveyed by WSDOT except geotechnical boring H-8-02 (refer to Appendix A for explanation).
2) Base map including the location of the graving dock was provided by KPFF dated 12-10-02.

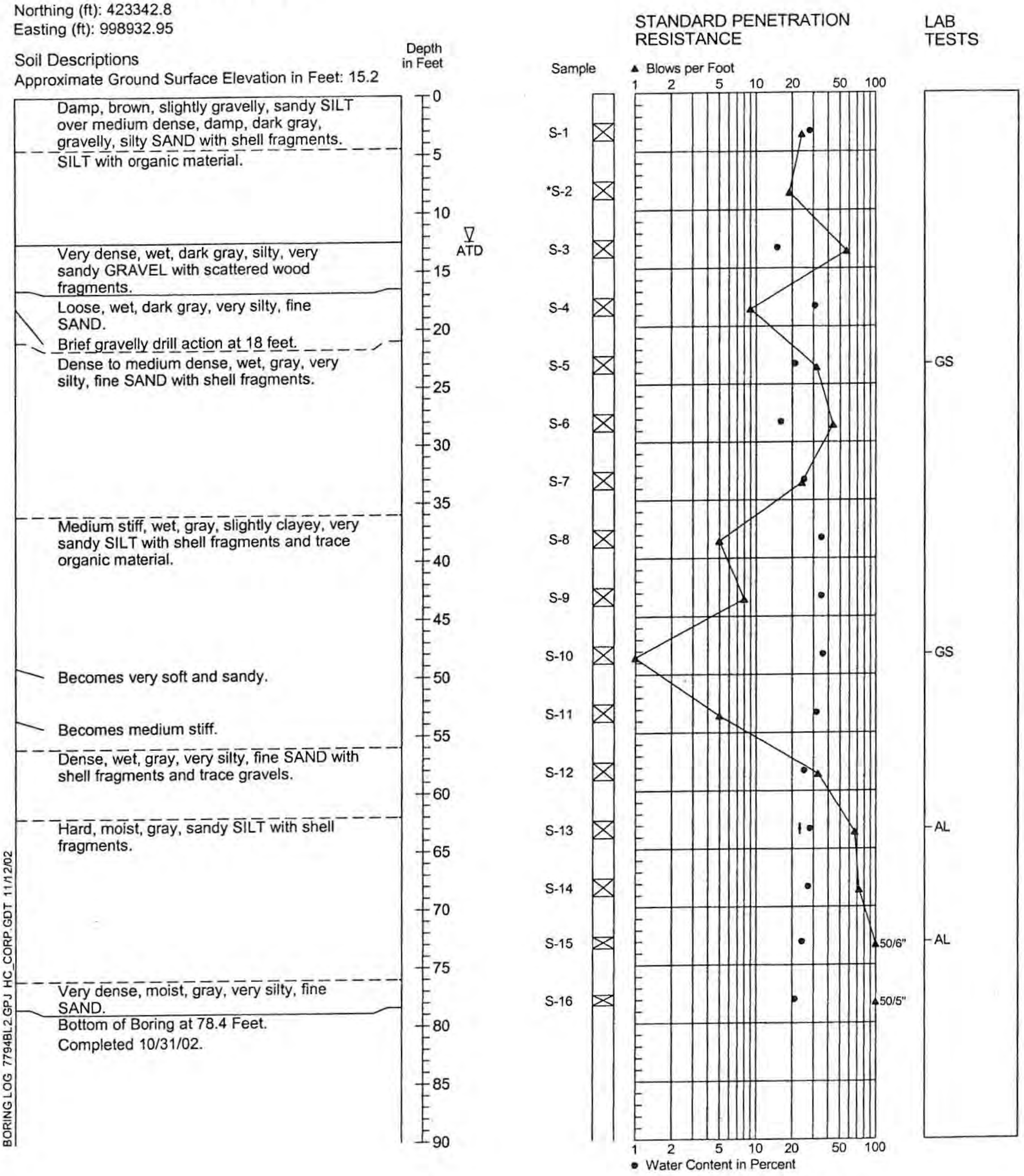
HARTCROWSER
7794 12/02
Figure 2

7794000007 HEL 12/19/02

Boring Log H-4-02

Northing (ft): 423342.8
Easting (ft): 998932.95

Soil Descriptions
Approximate Ground Surface Elevation in Feet: 15.2



Damp, brown, slightly gravelly, sandy SILT over medium dense, damp, dark gray, gravelly, silty SAND with shell fragments.

SILT with organic material.

Very dense, wet, dark gray, silty, very sandy GRAVEL with scattered wood fragments.

Loose, wet, dark gray, very silty, fine SAND.

Brief gravelly drill action at 18 feet.

Dense to medium dense, wet, gray, very silty, fine SAND with shell fragments.

Medium stiff, wet, gray, slightly clayey, very sandy SILT with shell fragments and trace organic material.

Becomes very soft and sandy.

Becomes medium stiff.

Dense, wet, gray, very silty, fine SAND with shell fragments and trace gravels.

Hard, moist, gray, sandy SILT with shell fragments.

Very dense, moist, gray, very silty, fine SAND.

Bottom of Boring at 78.4 Feet.

Completed 10/31/02.

BORING LOG 7794BL2.GPJ HC_CORP.GDT 11/12/02

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

7794 **10/02**

Figure A-5

HARTCROWSER
A division of Haley & Aldrich

MEMORANDUM

GARRY E. HORVITZ
19478
11/2/2020

DATE: November 2, 2020

TO: Bob Riley; KPFF

FROM: Garry Horvitz, PE and Jeff Bruce, EIT

RE: **FINAL POPA Cofferdam Geotechnical Analysis**
Port Angeles Cofferdam Study
19373-00

This final letter presents results for the cofferdam stability analysis as well as preliminary design parameters for the sheet pile walls. The results of this analysis are subject to modifications as the design development progresses.

Subsurface Soil Conditions

Our interpretation of the subsurface soil conditions at the cofferdam is based on historical borings from Hart Crowser's 2002 report for the Port Angeles Graving Dock. Hart Crowser performed seven geotechnical borings throughout the area of the proposed graving dock as part of this report. We primarily used information from the boring drilled within the area of the cofferdam for our analysis (H-4-02). The boring log for H-4-02 as well as a historical site plan showing the boring locations are attached.

At the time of the 2002 study, soils near the proposed cofferdam area generally consisted of sand and gravel fill over alluvial deposits and underlain by glacially overridden silts and sands. Within this varying stratigraphy, five separate engineering soil units were identified for the analysis. Boring H-4-02 observed all five of these ESUs within the soils near the cofferdam area.

Construction following the 2002 report included installation of sheet piles for the cofferdam and placement of compacted fill within the cofferdam and adjacent to the landside sheet piles. Approximately 4 feet of material was then placed over the cofferdam. No additional borings have been performed following construction of the cofferdam and placement of the fill. Information gathered during a site reconnaissance on May 3, 2018 identified loose fill and wood debris within this surficial 4-foot layer.

For the current study, we have assumed soil properties for this material based on the available information from construction records and the May 3, 2018 site reconnaissance. Table 1 below presents

3131 Elliott Avenue, Suite 600
Seattle, Washington 98121
Tel 206.324.9530

the soil properties we have assumed for the five historical borings and two additional soil units identified during this study.

Table 1. Non-liquefied Soil Properties

Unit Description	Engineering Soil Unit (ESU)	Friction Angle (Degrees Fahrenheit)	Total Unit Weight (pcf[b])	Effective Unit Weight (pcf[b])	Active Earth Pressure Coefficient	Passive Earth Pressure Coefficient
Medium dense sand/gravel (fill)	1[a]	35	125	61	0.27	3.69
Medium dense silty sand (alluvium)	2[a]	33	120	56	0.29	2.62
Soft sandy silt (alluvium)	3[a]	27	110	46	0.38	2.66
Loose sand to gravelly sand	4[a]	32	120	56	0.31	3.25
Hard sandy silt (glacially overridden)	5[a]	40	135	71	0.22	4.60
Loose fill/wood debris	6	30	120	56	0.22	3.00
Compacted fill	7	35	125	61	0.27	3.69

Notes:
a. Engineering soil units identified from the 2002 geotechnical report.
b. pcf = pounds per cubic foot

Cofferdam Stability Analysis

Failure Modes

Six potential failure modes were analyzed following guidelines published in Chapter 6 of UFC 3-220-01N. In addition to UFC 3-220-01N, we also reviewed the 1984 Steel Sheet Piling Design Manual, the 1986 NAVFAC Design Manual 7.02 for Foundations and Earth Structures, and the 1989 U.S. Army Corps of Engineers Engineer Manual 1110-2-2503 for the Design of Sheet Pile Cellular Structures Cofferdams and Retaining Structures.

Sliding on Foundation

Global failure due to sliding of the cofferdam structure occurs when the driving lateral forces overcome the passive and frictional resisting forces. The analysis incorporates the active and passive effective soil pressures of the exterior soils, the frictional resistance along the potential failure plane at the toe elevation of the cofferdam and any differential water pressure between the waterside and landside of the cofferdam.

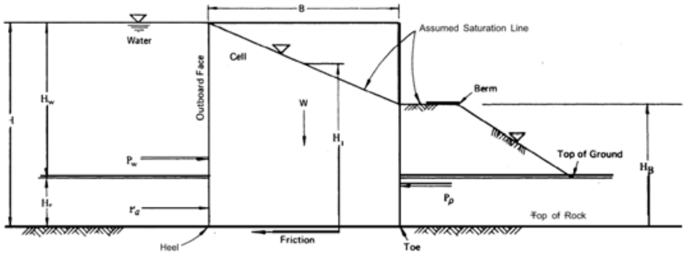


Exhibit C: Example Sliding Forces on Cellular Cofferdam

Slipping Between Sheeting and Cell Fill

The active and passive soil pressures impose bending forces on the cofferdam structure. Moments about the toe of the cofferdam present the potential for failure through slipping of the outboard sheets from the interior cell fill soils, allowing the fill to ravel out of the bottom of the cofferdam. This failure mechanism is a function of the active and passive forces on the exterior of the cell. Standard of practice for this mechanism ignores the resistance due to the weight of the fill, assuming the fill does not lift with the cofferdam sheets during failure.

Vertical Shear

Vertical shear failure occurs as the overturning moments due to the surrounding soils overcome the resisting forces of the friction between the cell sheets and fill soils taken with respect to the centerline of the system. This analysis requires the formulation of effective active lateral earth pressures due to the interior fill.

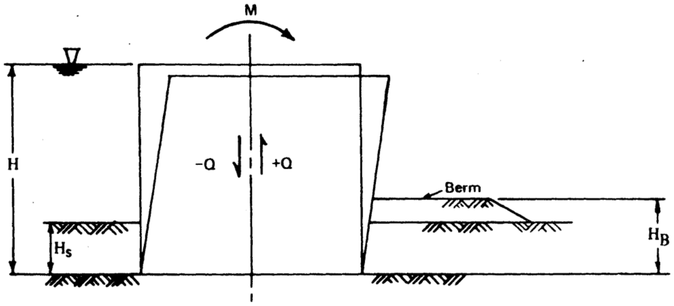


Exhibit D: Vertical Shear Diagram

Horizontal Shear

The Cummings' Method provides an alternative method to analyze the resistance to tilting compared to the previously described vertical shear mechanism. This method assumes horizontal shear due to the cell fill providing a large majority of the resistance to tilting. Empirical tests showed soil typically failed below a line following the slope of the internal friction of the cell fill material providing the resistance.

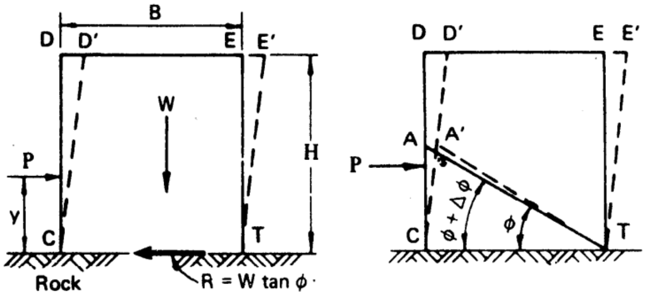


Exhibit E: Horizontal Shear Diagram

Bearing Capacity

Bearing capacity of the underlying granular soils creates an additional failure mechanism when the cellular cofferdams do not extend into rock or very strong soil. Strength properties as well as empirical bearing capacity factors are incorporated to calculate the resistance of the soil to global bearing failure.

Pull-Out of Outer Face Sheeting

With tip elevations within granular soils, there arises the potential for failure through slipping of the sheets out of the fill due to active bending forces on the cell. The pullout capacity of the sheets compared to the exterior active bending forces need to be analyzed.

Loading Cases

We analyzed the cofferdam structure for static as well as its pseudo-static stability. For the pseudo-static case, we applied a horizontal pseudo-static force calculated from the peak ground acceleration using the code-based 975-year spectra and a soil site class of E.

Stability Analysis Results

Recommended minimum factors of safety for both the static and seismic cases are presented in Table 2. Table 3, below, presents the calculated factors of safety for each failure mode.

Table 2. Recommended Minimum Factors of Safety

Case	Sliding on Foundation	Slipping Between Sheeting and Cell Fill	Vertical Shear	Horizontal Shear	Bearing Capacity	Pull-Out of Outer Face Sheeting
Static	1.5	1.5	1.5	1.5	2	1.5
Pseudo-Static	1.3	1.1	1.1	1.1	1.3	1.1

Table 3. Resulting Factors of Safety for the Port Angeles Cofferdam

Case	Sliding on Foundation	Slipping Between Sheeting and Cell Fill	Vertical Shear	Horizontal Shear	Bearing Capacity	Pull-Out of Outer Face Sheeting
Static	10.3	9.4	Greater than 2.0	11.4	24.7	Greater than 2.0
975-Year Pseudo-Static	4.3	3.0	Greater than 2.0	3.6	24.7	Greater than 2.0

Conclusions

The analysis showed the factor of safety for all failure modes to be well above recommended minimums.

The original cofferdam design required embedment of the sheet piles deep enough to facilitate adjacent excavation for the graving dock structure. This embedment depth is greater than what would typically be required given the exposed height in the cofferdam’s current configuration. As a result, the system gains the added benefit of additional passive pressure along the waterside sheet pile wall and frictional resistance between the sheet piles and adjacent soils. Our analysis showed the acting forces on the cofferdam did not overcome these resisting forces.

Lateral Analysis of Deep Foundations

This section presents our recommendations for LPILE analysis and lateral earth pressures for a single sheet pile wall system. However, the cofferdam configuration for the current analysis includes two relatively closely spaced sheet pile walls with overlapping zones of influence between the active and passive pressures. The full capacity calculated from an LPILE analysis then cannot be relied on. Should the waterside sheet pile wall be determined strong enough to support the proposed use without the structural benefit of the landside sheet pile wall, then the following recommendations may be applicable.

Inputs for LPILE Analysis

For laterally-loaded deep foundation evaluated using LPILE, we recommend using the soil parameters in Table 4.

Table 4. Soil Parameters for LPILE Input

Engineering Soil Unit (ESU)	Layer Depth in Feet	Layer Elevation in Feet (MLLW)	Effective Unit Weight in pcf	Soil Model	Friction Angle in Degrees	Undrained Shear Strength in psf	Slope of Soil Modulus (k) in pci[a]
7	0 to 13	11 to –2	61	API Sand	35	0	80 (132)
2	13 to 32	–2 to –21	56	API Sand	33	0	58
3	32 to 52	–21 to –41	46	API Sand	27	0	5
4	52 to 58	–41 to –47	56	API Sand	32	0	48
5	below 58	below –47	71	API Sand	40	0	155

Notes:

a. pci = pounds per cubic inch

Lateral Earth Pressure Recommendations

Please see attached Figures 1 and 2 for recommendations on lateral earth pressures for the sheet pile walls.

Deadman System

An alternative approach to look at the global stability of the cofferdam system assumes the combination of the rear sheet pile wall and tierods between the two sheet pile walls to act as a deadman system. The passive resistance generated from the embedment of the landside sheet pile wall acts to support the lateral earth pressures acting on the waterside wall. Tie-rods between the two walls act as the load transfer mechanism.

We understand, following discussion with KPFF, that the reaction in the tie-rods due to the lateral earth pressures on the waterside wall equate to 208 kips per rod. This assumes a tie-rod spacing of 11 feet. We estimated the rear sheet pile wall would need approximately 26 feet of embedment to mobilize an appropriate amount of passive resistance to resist this reaction force. We applied a factor of safety of 1.5 to the calculated passive resistance. Additionally, our calculations incorporated a reduction in the passive resistance for the overlapping wedges of the mobilized passive resistance and active lateral pressures on the front wall.

Geotechnical Engineering Analysis for Sheet Piles

Surcharge Loads

We understand two types of equipment are being considered for the proposed use of the cofferdam system: a 4-wheel loader and a 2-track loader. Our understanding of the associated loads, load distribution and geometry of the equipment comes from a conceptional sketch provided by KPFF (see Attachment 4).

Figures 3 and 4 present our recommendations for the surcharge loads imposed on the waterside sheet pile wall due to both proposed pieces of equipment.

Sheet Pile Compressive Capacity

The wheel loader previously described may use a steel ramp to facilitate loading and offloading barges moored against the cofferdam. Should the ramp bear on the existing sheet pile wall, the vehicle loads will transfer to the sheet pile wall as vertical compressive loads.

We analyzed the vertical compressive capacity of the sheet pile wall to determine its ability to sustain these loads. From this analysis, we recommend assuming an ultimate compressive capacity of 16.8 kips/foot along the length of the wall. This results in a factor of safety of approximately 6.2 for the vertical loads imposed by the wheel loader (75.2 kips distributed over a 14-foot steel ramp).

Mechanically Stabilized Earth (MSE) Wall

Approximately 4 feet of fill sits above the tops of the sheet pile cofferdam from an elevation of 11 feet to 15 feet. A small wall of stacked ecology blocks currently restrains the soil along the edge of the cofferdam. We understand this ecology block wall requires reconstruction to stabilize and/or reinforce the fill. This section presents our recommendations for a MSE approach to the retaining system. We based our recommendations off of discussion with the project team and our experience with similar MSE applications.

Ultrablock/Geogrid System

We recommend the use of stacked Ultrablock, Inc. ecology blocks reinforced with Geogrid to stabilize the fill area at the edge of the cofferdam. Regarding this retaining system, we make the following recommendations:

- The stacked system should begin approximately 2 feet below the top of the existing sheet pile wall (approximately an elevation of 9 feet).

- Construct the wall using Ultrablock, Inc.'s half-size ecology blocks (block height of 1.25 feet) with Geogrid extended from, and connected between, each block layer.

- Install a minimum of 12 inches of free-draining backfill immediately adjacent to the back side of the Ultrablock wall, per manufacturer recommendation. Perforated drain pipe with filter fabric should be installed at the base of the wall to facilitate drainage.

Concrete Pavement Design

We understand two of the proposed options for the site redevelopment includes new construction of concrete pavement. The pavement would be constructed upland of the cofferdam area, over the historically placed fill placed during the previous construction. For this pavement design, we recommend the following:

- For preliminary design, use a modulus of subgrade reaction of 300 pci.

Finished Rock Surfaces

Heavy equipment traffic can lead to degradation and damage of concrete pavement sections over time. Constructing a section of gravel and/or quarry spalls can prove to be a more cost-effective design, both during construction and for routine maintenance over the lifespan of the traffic area. For the design and construction of this section, we recommend the following:

- Excavate and remove soft organic soils and other deleterious surface material.

- Place a high-strength, high-separation geotextile on the subgrade below the rock section.

- Place 12 inches of quarry spalls overlain with 6 inches of crushed rock.

References

Department of Defense 2005. Geotechnical Engineering Procedures for Foundation Design of Buildings and Structures, Unified Facilities Criteria 3-220-01N.

Federal Highway Administration, 2000. Micropile Design and Construction Guidelines, Publication No. FHWA-SA-97-070.

Hart Crowser, 2003. Geotechnical and Hydrogeologic Study Port Angeles Graving Dock.

Naval Facilities Engineering Command 1986. Foundations and Earth Structures, Design Manual 7.02.

United States Army Corps of Engineers 1989. Design of Sheet Pile Cellular Structures Cofferdams and Retaining Structures, Engineer Manual 1110-2-2503.

United States Steel 1984. Steel Sheet Piling Design Manual.

Figures:
Figure 1 – Cantilevered Sheet Piles Lateral Earth Pressure Recommendations
Figure 2 – Cantilevered Retaining Wall Lateral Earth Pressure Recommendations Due to Surcharge Pressures
Figure 3 – Surcharge Pressures Due to Wheel Loader
Figure 4 – Surcharge Pressures Due to Track Loader

Attachments:
1 - Historical Site Plan
2 - Boring Log H-4-02
3 - Port of Angeles Cofferdam Cross Section (KPFF provided sketch)
4 - Port of Angeles Equipment Loads (KPFF provided detail)

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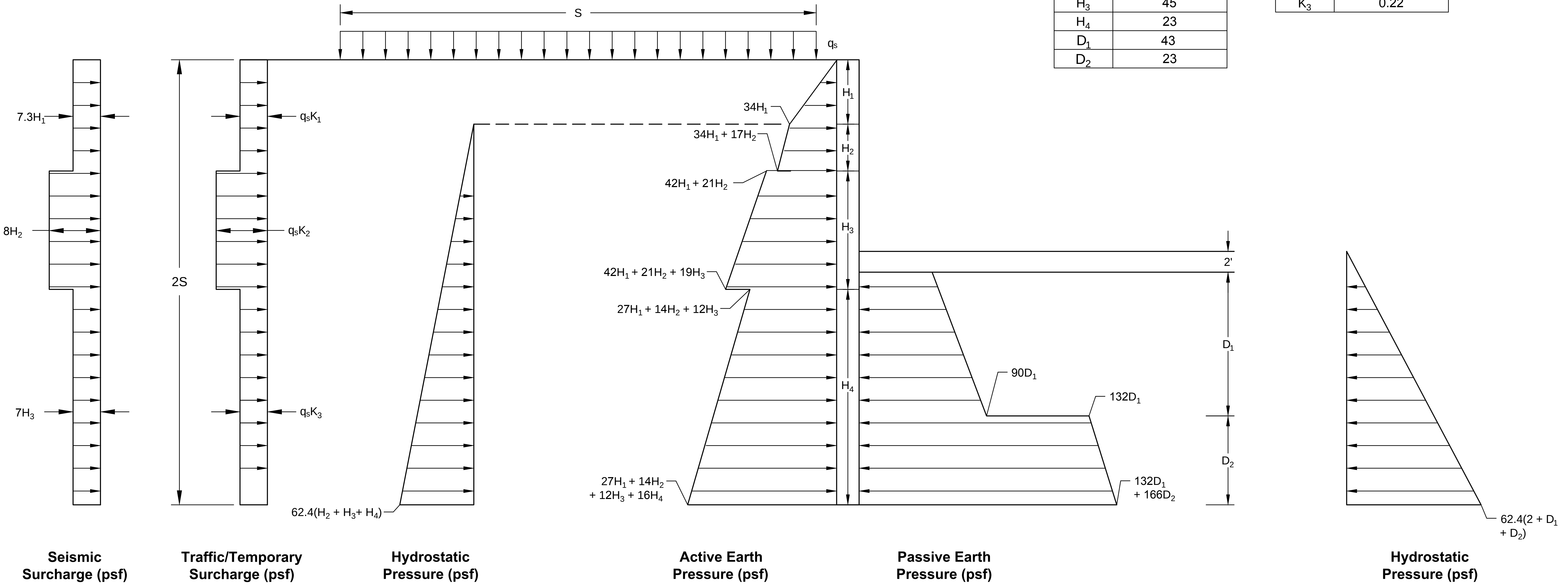
Section	Recommended Value (ft)
H_1	4
H_2	9
H_3	45
H_4	23
D_1	43
D_2	23

K	Recommended Value
K_1	0.27
K_2	0.33
K_3	0.22



Notes:

1. Active pressure assumed to act wall width.
2. Passive pressure include Factor of Safety of about 1.5.
3. Ignore passive resistance in upper two feet below base of excavation.
4. q_s = 250 psf for traffic and temporary loads. See figure 2 for additional surcharge recommendations, if necessary.
5. All dimensions in feet.

q_s = 500 psf (overlying fill) + 250 psf (traffic and temporary loads) + additional surcharge loads.

GWL = Groundwater Level

NOT TO SCALE

Port Angeles Cofferdam Study
Port Angeles, Washington

Cantilevered Sheet Piles
Lateral Earth Pressure
Recommendations

19373-00
5/18

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Figure
1

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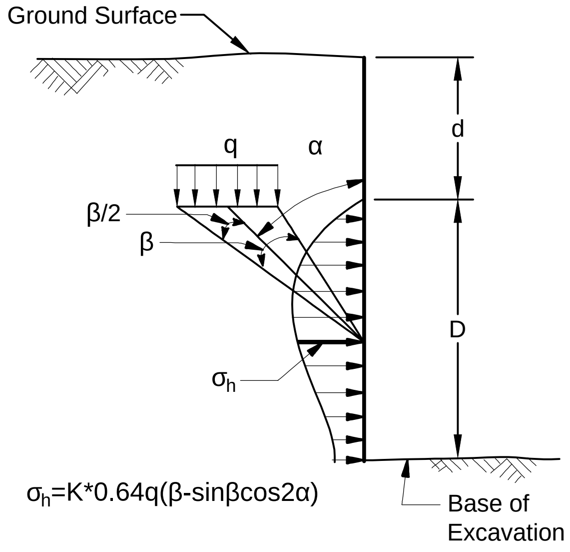
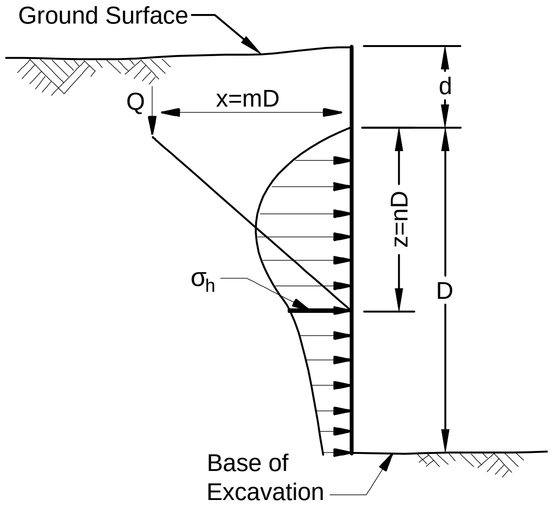
A. Strip Footing Cross Section View



$\sigma_h = K*0.64q(\beta - \sin\beta\cos2\alpha)$

B(1). Small Isolated Footing Cross Section View



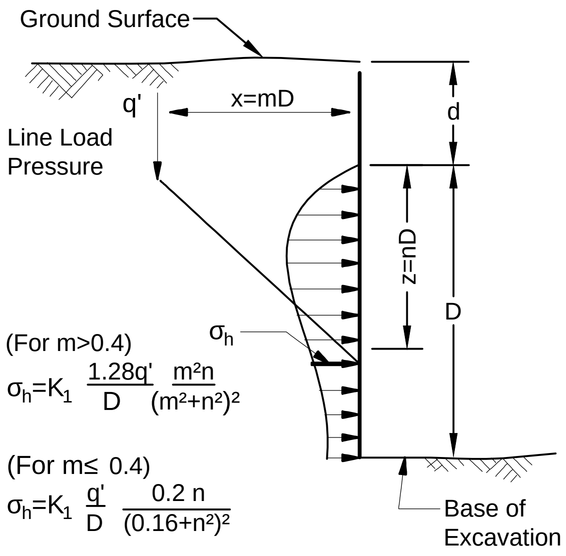
(For m>0.4)

$$\sigma_h = K_1 \frac{1.77Q}{D^2} \frac{m^2n^2}{(m^2+n^2)^3}$$

(For m≤ 0.4)

$$\sigma_h = K_1 \frac{0.28Q}{D^2} \frac{n^2}{(0.16+n^2)^3}$$

C. Continuous Wall Footing Parallel to Excavation Cross Section View



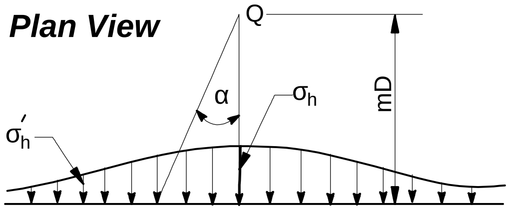
(For m>0.4)

$$\sigma_h = K_1 \frac{1.28q'}{D} \frac{m^2n}{(m^2+n^2)^2}$$

(For m≤ 0.4)

$$\sigma_h = K_1 \frac{q'}{D} \frac{0.2\ n}{(0.16+n^2)^2}$$

B(2). Plan View



$\sigma_h' = \sigma_h \cos^2(1.1\alpha)$

Definition and Units

Q	Footing Load in Pounds
D	Excavation Depth below Footing in Feet
d	Depth to Base of Footing in Feet
σ_h	Lateral Soil Pressure in PSF
q	Unit Loading Pressure in PSF
q'	Footing Load in Pounds per Foot
α, β	Radians

K_1	Conditions
0.35	Active earth pressure on a flexible wall (e.g., shoring)
0.5	At-rest conditons, where surcharge loads exist prior to excavation
1.0	At-rest conditions, where surcharge loads are applied after construction on permanent wall

Notes:
1. Lateral pressures from adjacent structures should be added to lateral pressures on Figure 1.
2. Wall footings acting other than parallel to the excavation can be treated as series of discrete point loads, using Diagram B.
3. Contact Hart Crowser for surcharge recommendations, if necessary.

Port Angeles Cofferdam Study
Port Angeles, Washington

Cantilevered Retaining Wall Lateral Earth Pressure Recommendations Due to Surcharge Pressures

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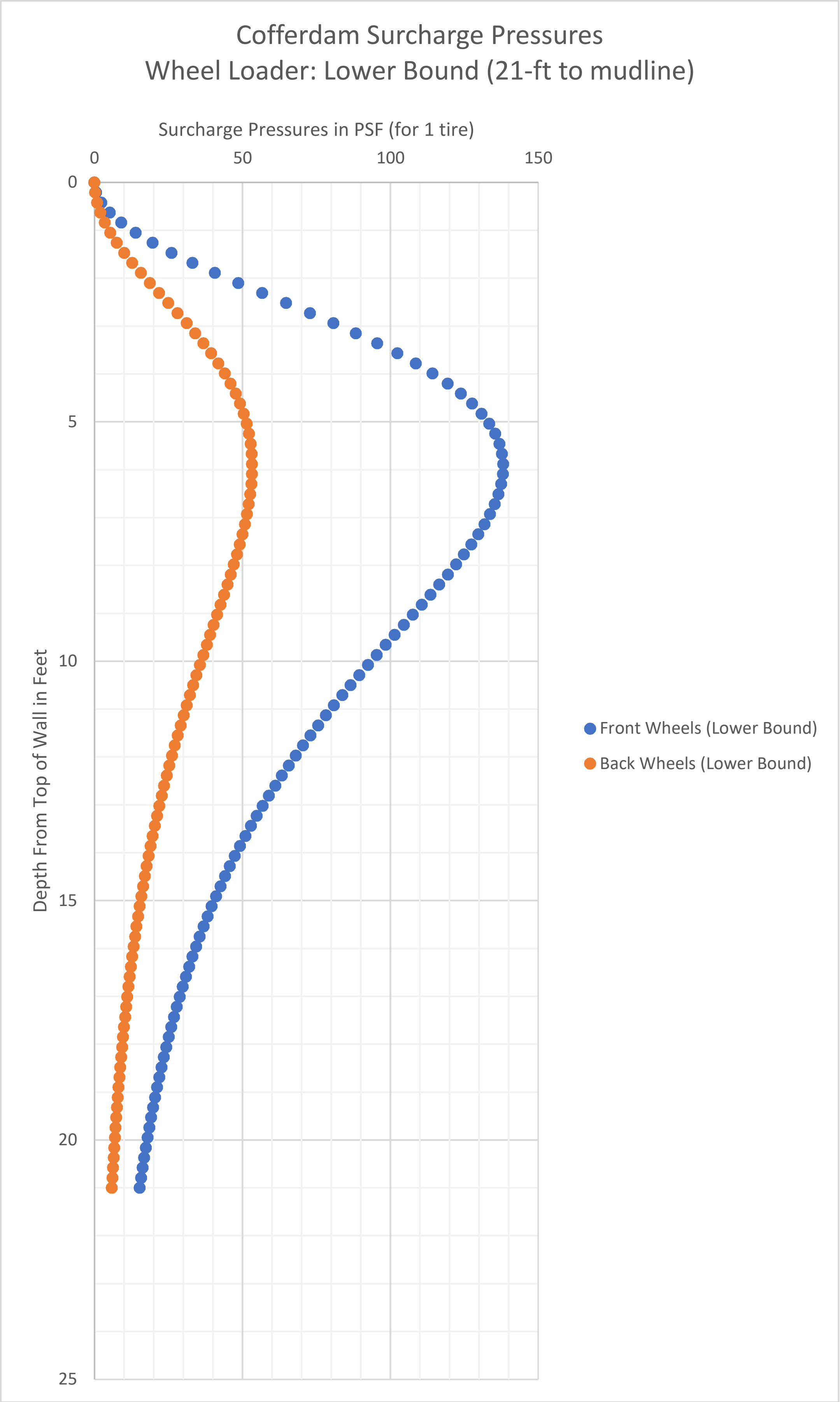
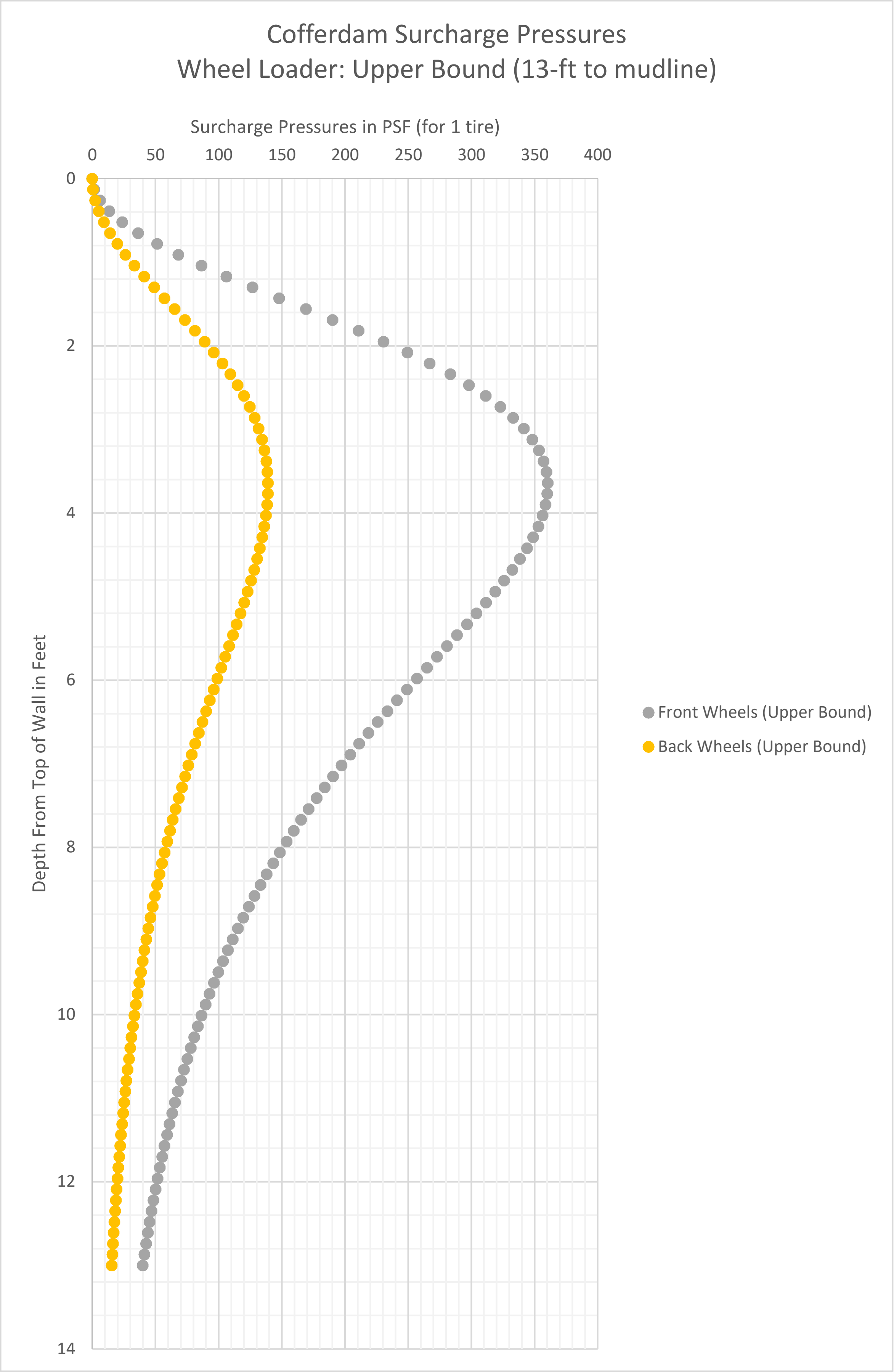
Figure
2


Cofferdam Surcharge Pressures
Wheel Loader: Lower Bound (21-ft to mudline)


Cofferdam Surcharge Pressures
Wheel Loader: Upper Bound (13-ft to mudline)

Travelift Pier and Cofferdam Study
Port Angeles, Washington

Surcharge Pressures Due to Wheel Loader

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Figure
3

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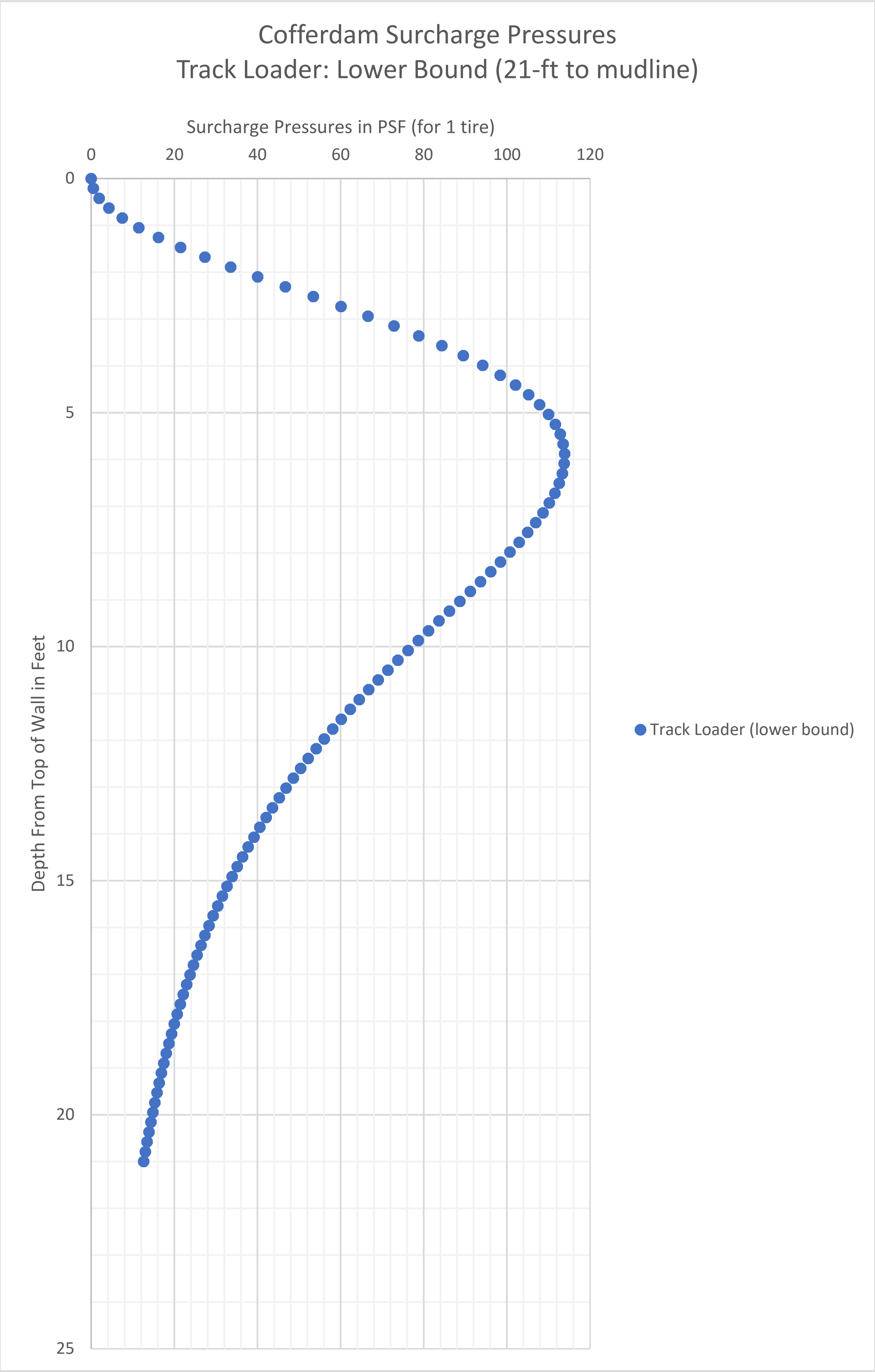
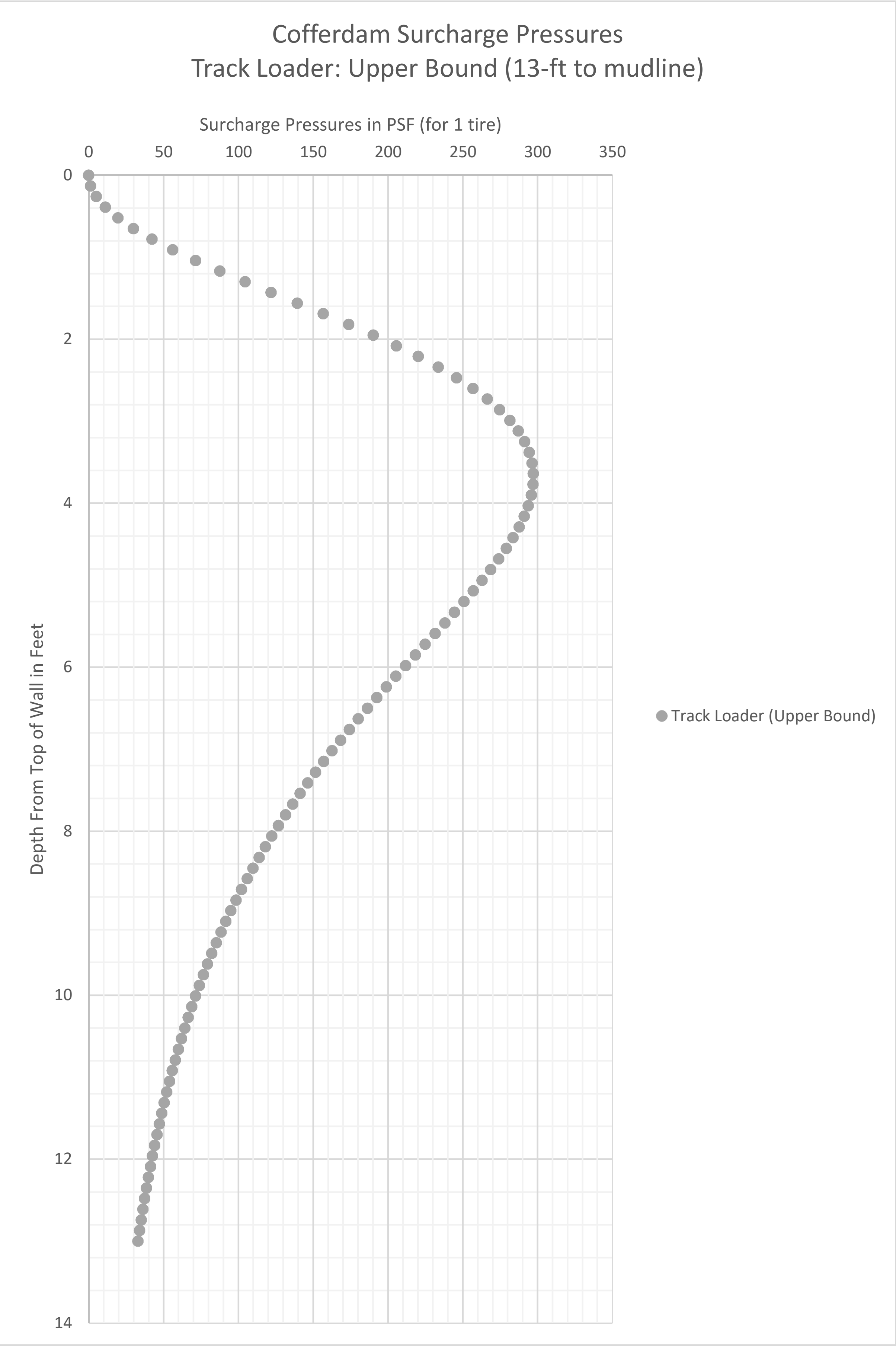


Cofferdam Surcharge Pressures
Track Loader: Lower Bound (21-ft to mudline)



Cofferdam Surcharge Pressures
Track Loader: Upper Bound (13-ft to mudline)

Travelift Pier and Cofferdam Study
Port Angeles, Washington

Surcharge Pressures Due to Track Loader

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Figure
4

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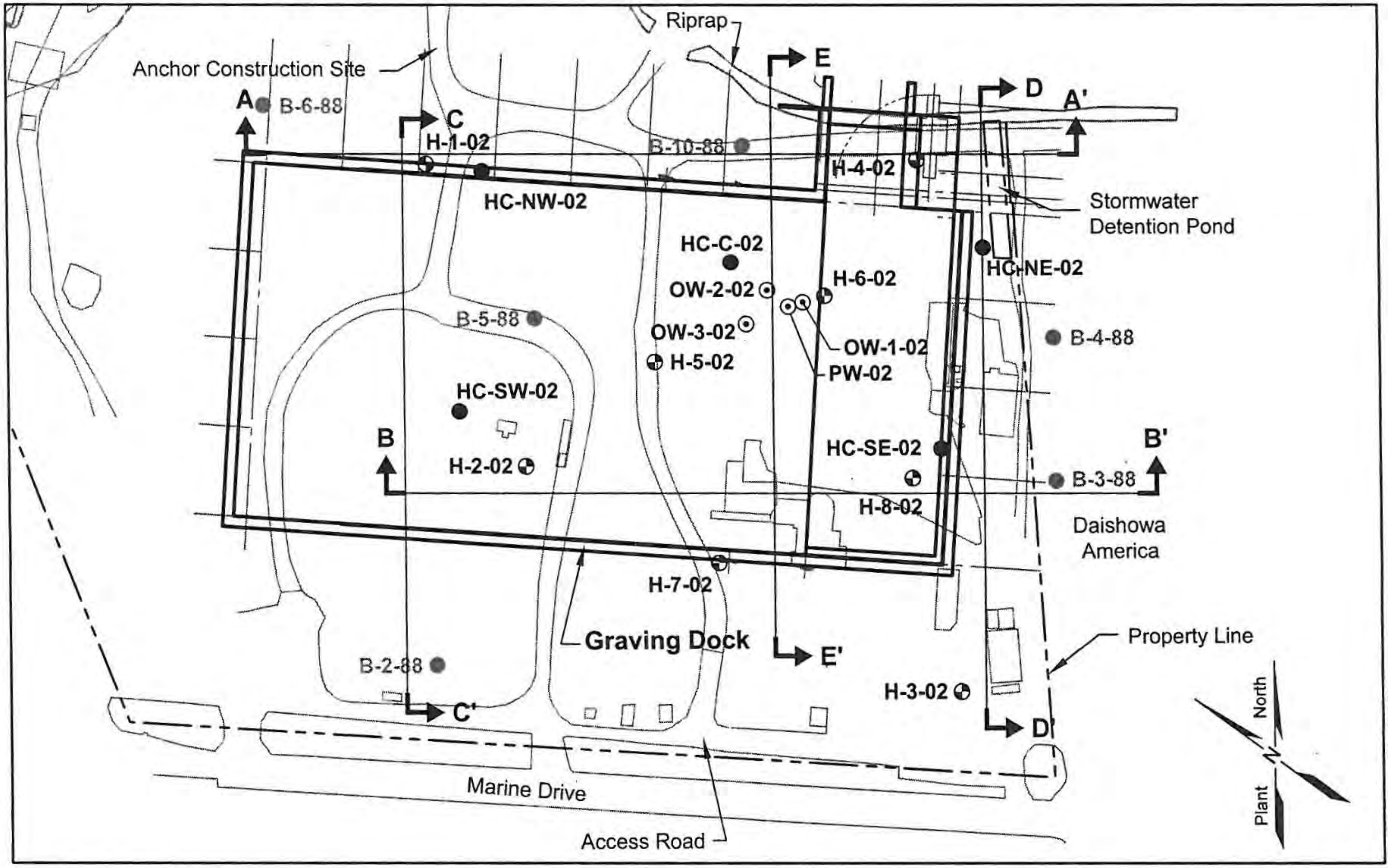
Site and Exploration Plan



HARTCROWSER
7794 12/02
Figure 2

Notes:
1) Current exploration locations were surveyed by WSDOT except geotechnical boring H-8-02 (refer to Appendix A for explanation).
2) Base map including the location of the graving dock was provided by KPFF dated 12-10-02.

Exploration Location and Number

H-1-02 ⊕	Geotechnical Boring (Current Study)
OW-2-02 ⊙	Wells (Current Study)
HC-SW-02 ●	Environmental Boring (Current Study)
B-2-88 ●	Environmental Boring (1988 Study)

B B' Cross Section Location and Designation

0 200 400
Scale in Feet

Boring Log H-4-02

Northing (ft): 423342.8
Easting (ft): 998932.95

Soil Descriptions
Approximate Ground Surface Elevation in Feet: 15.2

Damp, brown, slightly gravelly, sandy SILT over medium dense, damp, dark gray, gravelly, silty SAND with shell fragments.

SILT with organic material.

Very dense, wet, dark gray, silty, very sandy GRAVEL with scattered wood fragments.

Loose, wet, dark gray, very silty, fine SAND.

Brief gravelly drill action at 18 feet.

Dense to medium dense, wet, gray, very silty, fine SAND with shell fragments.

Medium stiff, wet, gray, slightly clayey, very sandy SILT with shell fragments and trace organic material.

Becomes very soft and sandy.

Becomes medium stiff.

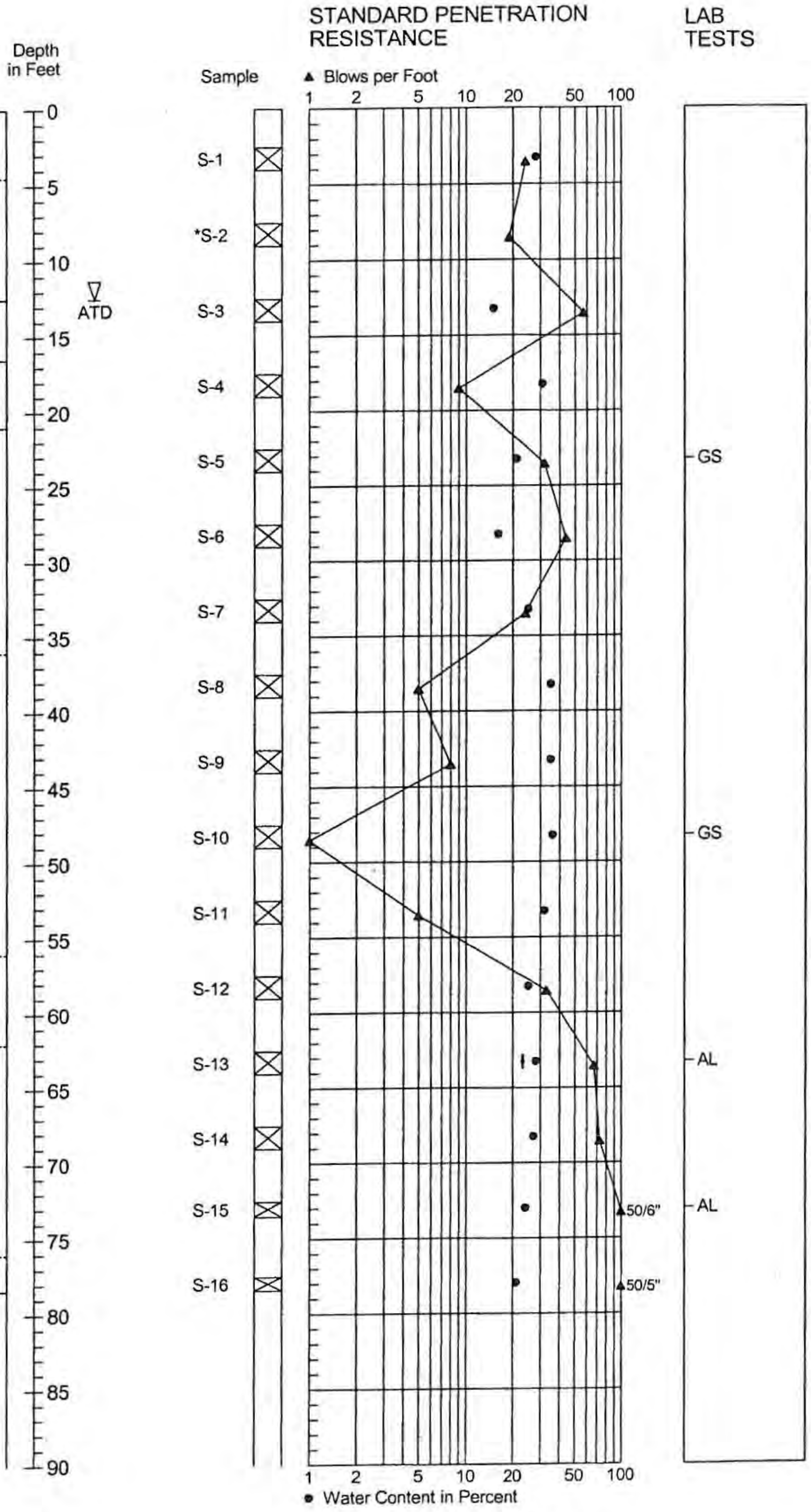
Dense, wet, gray, very silty, fine SAND with shell fragments and trace gravels.

Hard, moist, gray, sandy SILT with shell fragments.

Very dense, moist, gray, very silty, fine SAND.

Bottom of Boring at 78.4 Feet.

Completed 10/31/02.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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Figure A-5

sheet no.

job no.

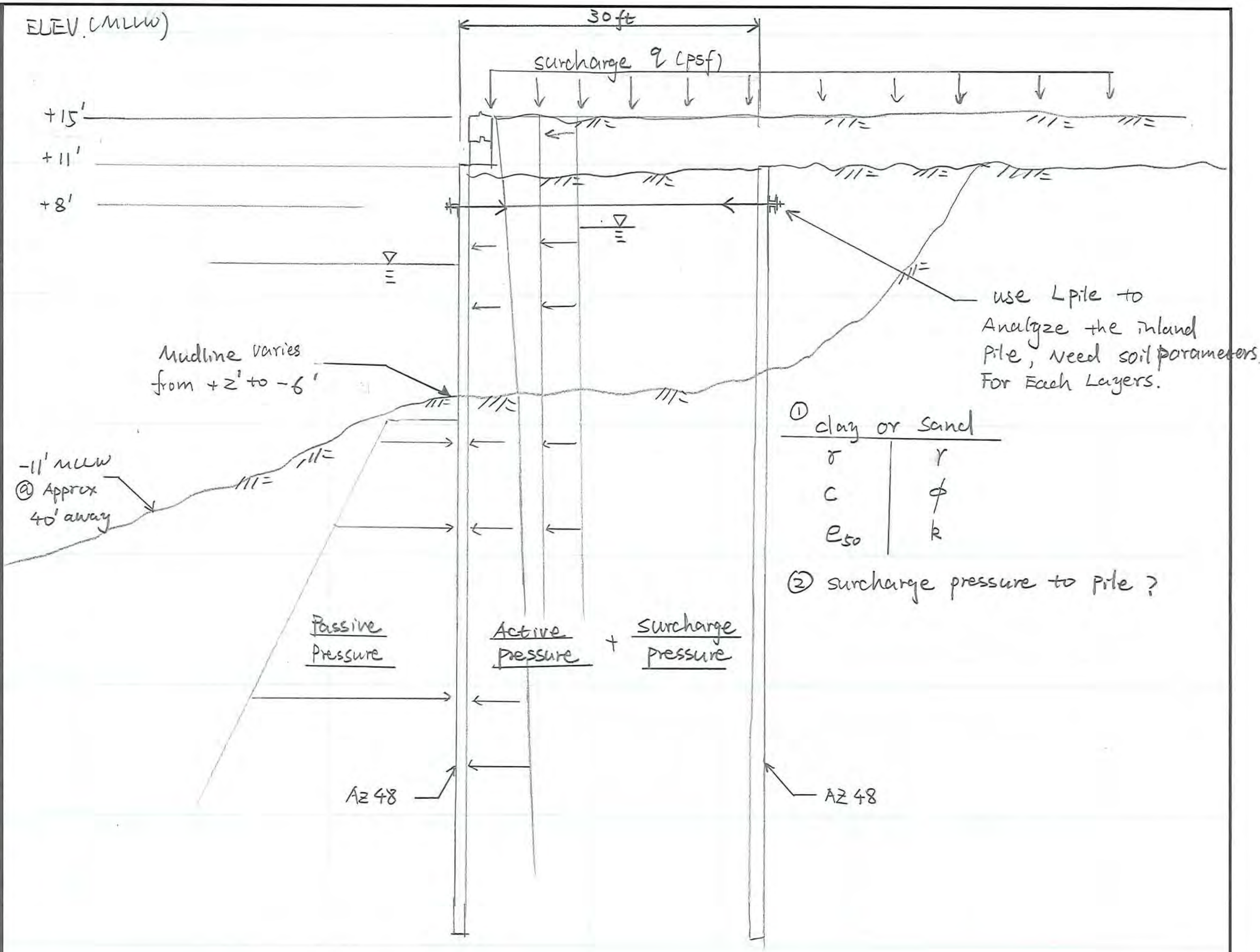
by

date 3/17/18

project Port Angeles - Cofferdam

location

client



use Lpile to Analyze the inland Pile, Need soil parameters For Each Layers.

①

clay	or sand
γ	γ
c	φ
e_{50}	k

② surcharge pressure to pile ?

kpff

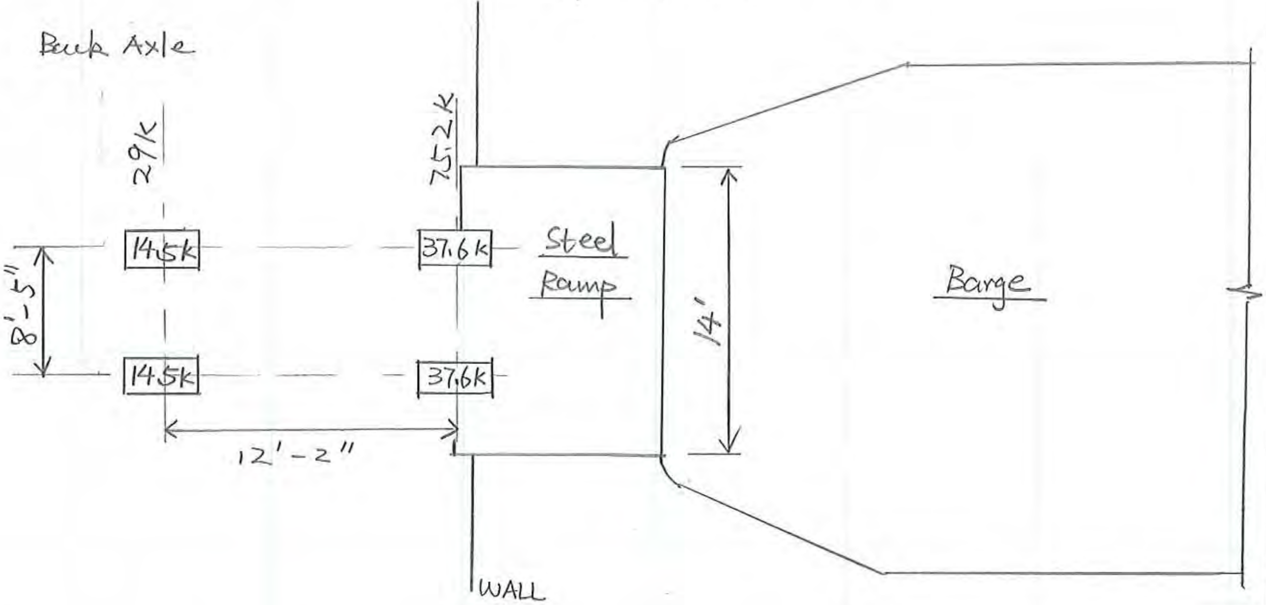
project Port of Angeless
location
client Port of Angeless
Equipment Surcharge
by GJC
date 7/12/18
sheet no.
job no.

Two types of equipments are considered in this design.

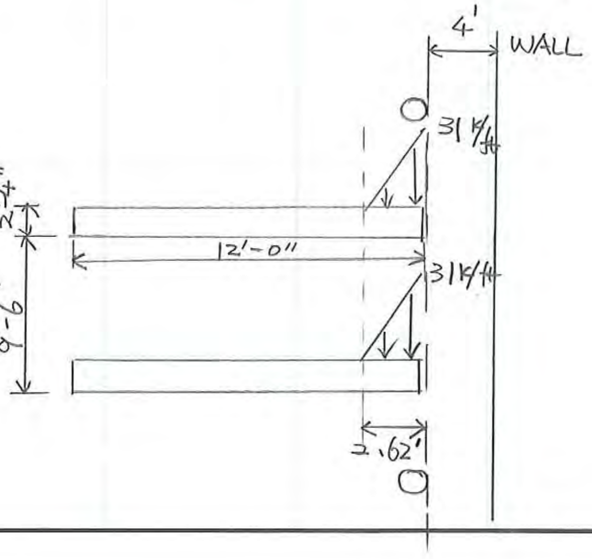
① Wheel Loader: 884 John Deere With Tink Rollout Chip Bucket weighs 14,815 lbs. Rated Capacity is 17,500 lbs.

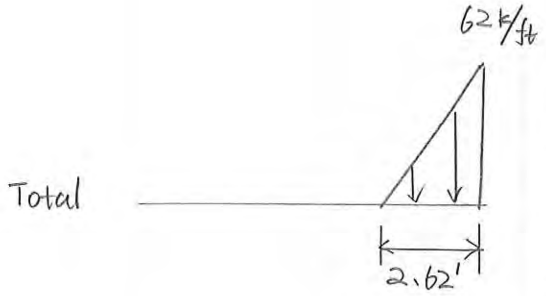
② Doosan 225 Log Loader (Track loader)

① Wheel Loader: (Dead + 1.25 x Rated Capacity)
↖ impact factor



② Track Loader: (Dead + 1.25x Rated Capacity)
↖ Impact Factor





APPENDIX C

Farmland Soils Supporting Documentation

Farmland Classification—Clallam County Area, Washington
(Project_Area)

Map Scale: 1:3,300 if printed on A portrait (8.5" x 11") 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 Rating Polygons

- 🟥 Not prime farmland
- 🟩 All areas are prime farmland
- 🟩 Prime farmland if drained
- 🟩 Prime farmland if protected from flooding or not frequently flooded during the growing season
- 🟨 Prime farmland if irrigated
- 🟨 Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- 🟫 Prime farmland if irrigated and drained
- ⬜ Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- ⬜ Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- 🟦 Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- 🟦 Prime farmland if irrigated and reclaimed of excess salts and sodium
- 🟦 Farmland of statewide importance
- 🟦 Farmland of statewide importance, if drained
- 🟪 Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
- 🟧 Farmland of statewide importance, if irrigated
- 🟩 Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
- 🟩 Farmland of statewide importance, if irrigated and drained
- 🟫 Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season
- ⬜ Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
- ⬜ Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- 🟪 Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
- 🟨 Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
- 🟦 Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
- 🟫 Farmland of statewide importance, if warm enough
- 🟥 Farmland of statewide importance, if thawed
- 🟦 Farmland of local importance
- 🟧 Farmland of local importance, if irrigated
- 🟦 Farmland of unique importance
- ⬜ Not rated or not available

Soil Rating Lines

- 〰 Not prime farmland
- 〰 All areas are prime farmland
- 〰 Prime farmland if drained
- 〰 Prime farmland if protected from flooding or not frequently flooded during the growing season
- 〰 Prime farmland if irrigated
- 〰 Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- 〰 Prime farmland if irrigated and drained
- 〰 Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

- 〰 Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- 〰 Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- 〰 Prime farmland if irrigated and reclaimed of excess salts and sodium
- 〰 Farmland of statewide importance
- 〰 Farmland of statewide importance, if drained
- 〰 Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
- 〰 Farmland of statewide importance, if irrigated
- 〰 Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
- 〰 Farmland of statewide importance, if irrigated and drained
- 〰 Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season
- 〰 Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
- 〰 Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- 〰 Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
- 〰 Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
- 〰 Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
- 〰 Farmland of statewide importance, if warm enough
- 〰 Farmland of statewide importance, if thawed
- 〰 Farmland of local importance
- 〰 Farmland of local importance, if irrigated
- 〰 Farmland of unique importance
- 〰 Not rated or not available

Soil Rating Points

- 🟥 Not prime farmland
- 🟩 All areas are prime farmland
- 🟩 Prime farmland if drained
- 🟩 Prime farmland if protected from flooding or not frequently flooded during the growing season
- 🟨 Prime farmland if irrigated
- 🟨 Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- 🟫 Prime farmland if irrigated and drained
- 🟫 Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- 🟧 Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- 🟩 Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- 🟩 Prime farmland if irrigated and reclaimed of excess salts and sodium
- 🟦 Farmland of statewide importance
- 🟦 Farmland of statewide importance, if drained
- 🟪 Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
- 🟧 Farmland of statewide importance, if irrigated

- 🟩 Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
- 🟩 Farmland of statewide importance, if irrigated and drained
- 🟥 Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season
- ■ Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
- ■ Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- 🟪 Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
- 🟨 Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
- ■ Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
- 🟫 Farmland of statewide importance, if warm enough
- 🟥 Farmland of statewide importance, if thawed
- 🟦 Farmland of local importance
- 🟧 Farmland of local importance, if irrigated
- 🟦 Farmland of unique importance
- ⬜ Not rated or not available

Water Features

- 〜 Streams and Canals

Transportation

- ┼┼┼ Rails
- 〜 Interstate Highways
- 〜 US Routes
- 〜 Major Roads
- 〜 Local Roads

Background

- ▨ Aerial Photography

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: Clallam County Area, Washington
Survey Area Data: Version 20, Aug 30, 2022

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

Date(s) aerial images were photographed: Aug 8, 2022—Aug 29, 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.

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
3	Beaches	Not prime farmland	7.1	49.1%
Totals for Area of Interest			**14.5**	**100.0%**

Description

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

APPENDIX D

Water Quality Supporting Documentation

Note:
- Orthoimagery obtained from NAIP, 2015.

Abbreviations:
LEKT = Lower Elwha Klallam Tribe
RI = Remedial Investigation

FLOYD | SNIDER
strategy ▪ science ▪ engineering

RI Work Plan – Phase I
Port of Port Angeles Terminals 5, 6, and 7
Port Angeles, Washington

Figure 3.1
Historical Groundwater and Soil Sampling Locations

I:\GIS\Projects\POPA AO T5,6,7\MXD\RIFS Work Plan-Phase 1\Figure 3.1 Historical Groundwater and Soil Sampling Locations.mxd
10/18/2022

3.0 Summary of Previous Investigations

This section provides a summary of environmental investigations that have been completed on the Study Area to date, which resulted in the collection of surface and subsurface soil data and groundwater data. Limited sediment and surface water data were also collected in the vicinity of the Study Area but are not described in detail in this Work Plan, as future investigations will be focused on uplands properties only. The objectives and field activities for each of the investigations, and an overall summary of soil and groundwater quality, are presented in the following sections. Sample locations are shown on Figure 3.1 and monitoring well completion details are presented in Table 3.1. The data reports for all of the investigations are included as Appendix A.

3.1 OVERVIEW OF INVESTIGATIONS

Previous investigations have been primarily focused on evaluation of potential impacts from M&R operations and activities at Terminals 5, 6, and 7, and potential impacts to graving dock construction from former wood processing operations at Terminal 5. M&R Property investigations are discussed in Section 3.1.1 and graving dock investigations are discussed in Section 3.1.2.

3.1.1 M&R Property Investigations

Two investigations were performed to evaluate impacts from M&R operations, described in the following reports:

- *Preliminary Environmental Site Evaluation and Focused Pentachlorophenol Explorations, Merrill and Ring, Inc.* (Hart Crowser 1988)
- *Focused Site Investigation of the Former Merrill & Ring Property* (CH2M Hill 1989)

The scope of each investigation is described in the following sections.

3.1.1.1 Terminals 5, 6, and 7 investigations (1988)

In March through June 1988, Hart Crowser, on behalf of M&R, completed phased investigations on Terminals 5, 6, and 7 to evaluate whether the M&R property was potentially contaminated due to M&R operations and site activities. The investigations were conducted as part of a due diligence process for purchase by Daishowa and expansion of Daishowa mill operations. Sampling locations were generally targeted to potential Study Area source areas and are discussed below by media. In addition to field investigations, historical research, regulatory agency file review, and underground storage tank (UST) inspections were conducted.

Surface Soil

Surface soil samples included the following:

- In May 1988, two surface soil samples (SS-02-Phase 1 and SS-03-Phase 1) were collected in the vicinity of the new planer mill and near the Terminal 7 shoreline and analyzed for phenols (i.e., PCP, TeCP, sodium tetrachlorophenate, and sodium pentachlorophenate).
- In May 1988, five surface soil samples (TR-01 through TR-05) were collected in the vicinity of transformers and analyzed for total PCBs as Aroclors.
- In June 1988, 11 surface soil samples were collected near the old planer mill (SS-01 through SS-11) and analyzed for PCP and TeCP.
- In September 1988, five surface samples (VI-SS-200 through VI-SS-204) were collected near the old and new planer mills and the truck maintenance shop and analyzed for PCP and TeCP.

Subsurface Soil and Monitoring Wells

A number of subsurface soil borings were advanced, most of which were converted to monitoring wells. These borings included the following:

- In May 1988, six subsurface soil borings (B-03 through B-08) were advanced. Composite soil samples were collected, and borings were converted to monitoring wells (MW-03A, MW-04A, MW-05A, MW-06A, MW-07, and MW-08) for collection of groundwater samples. Borings were advanced at potential source areas including two suspected wood treatment areas near the new and old planer mills and in the vicinity of the two former ASTs and two USTs. Seven soil samples and six groundwater samples were collected and analyzed for at least one of benzene, toluene, ethylbenzene, and xylenes (BTEX), phenanthrene, PCP, and TeCP.
- On June 2, 1988, four subsurface soil borings (B-11 through B-14) were advanced. Composite soil samples were collected, and borings were converted to monitoring wells (MW-11 through MW-14) for collection of groundwater samples. Borings were advanced in the vicinity of the former ASTs, the historical truck maintenance shop, and the former Fibreboard mill. Four soil samples were collected and analyzed for volatile organic compounds (VOCs) and phenanthrene, and four groundwater samples were collected and analyzed for BTEX and phenanthrene.
- Between June 9 and 12, 1988, seven subsurface soil borings (B-15 through B-19, MW-21, MW-22) were advanced near the old planer mill. Soil samples were collected, and borings were converted to monitoring wells (MW-15, MW-16A, MW-18, MW-19, MW-21, MW-22) for collection of groundwater samples. A total of 64 soil samples were collected and analyzed for PCP and TeCP. Additionally, 15 groundwater samples were collected from newly installed and previously installed monitoring wells and analyzed for PCP, TeCP, and total hydrocarbons (MW-16 only).

- On June 11 and 12, 1988, six shallow subsurface hand augur locations were advanced (HA-1 through HA-6) and one monitoring well was installed (MW-20) near the new planer mill. A total of 19 soil samples and one groundwater sample were collected and analyzed for PCP and TeCP.
- On June 12, 1988, three dioxin/furan samples were collected from two locations near the old planer mill (MW-15 and MW-16) and on Terminal 7 (BG-1, intended to serve as a background soil sample). One groundwater sample (MW-16A) was also collected.

Surface Water and Sediments

- Six surface water (OSW-1 through OSW-6) and six surface sediment samples (OSS-1 through OSS-6) were collected adjacent to the old planer mill from four locations and analyzed for PCP and TeCP.

3.1.1.2 Daishowa Terminal 5 investigation (1988)

In August through November 1988, CH2M Hill, on behalf of Daishowa, completed a focused investigation on Terminal 5 to evaluate whether the M&R property was potentially contaminated due to M&R operations and site activities. The site investigation was focused on a 2-acre area with the main objective to evaluate the magnitude and extent of PCP and TeCP potentially released to soil, groundwater, and sediments by M&R. The investigation included the following activities:

- Twelve subsurface soil borings were advanced. Soil samples were collected, and borings were converted to monitoring wells for collection of groundwater samples. Locations included MW-06B, MW-06C, MW-08B, MW-16B, B-16C, MW-23, MW-24A, MW-24B, MW-25A, MW-25B, MW-26, and B-28. A total of 60 soil samples were collected and analyzed for PCP and TeCP. Additionally, 29 soil samples were analyzed for mercury, and 17 samples were analyzed for semivolatile organic compounds (SVOCs).
- Forty-four groundwater samples were collected from 19 newly installed and previously installed monitoring wells and analyzed for PCP and TeCP. Additionally, three groundwater samples were analyzed for SVOCs.
- Five surface sediment samples (MS-01 through MS-05) were collected adjacent to Terminal 5 and analyzed for PCP and TeCP. One sample was analyzed for SVOCs.

3.1.2 WSDOT Graving Dock Investigations (2002)

Two investigations were performed to evaluate impacts to construction related to former wood processing operations. In August and November 2002, WSDOT completed preliminary and supplemental environmental investigations in the Study Area. At the time of the investigation, WSDOT was considering Terminal 5 as a possible graving dock, as described in Section 2.1.2. The purpose was to evaluate the potential impacts from past uses as wood processing facilities that might impact the construction of the graving dock. The investigations included the following activities:

- In September 2002, five subsurface soil borings (HC-NE-PA, HC-SE-PA, HC-C-PA, HC-NW-PA, and HC-SW-PA) were advanced. Three of these were located on the LEKT property. Soil samples were collected, and borings were converted to monitoring wells for collection of groundwater samples. Thirteen soil samples and five groundwater samples were collected and analyzed for metals, SVOCs, select VOCs, diesel-range and oil-range total petroleum hydrocarbons (TPH), and dinoseb.
- In October 2002, seven geotechnical borings (H-1 through H-7) were advanced as deep as 90 feet bgs. Nine soil samples were collected in the top 10 feet of the boring and analyzed for metals, SVOCs, and diesel-range and oil-range TPH.

The results of these investigations were summarized in two letter reports to WSDOT: *Port of Port Angeles Graving Yard Environmental Investigation Results* (Hart Crowser 2002a) and *Port of Port Angeles Graving Yard Supplemental Environmental Investigation Results* (Hart Crowser 2002b).

3.1.3 WPAH Source Control Evaluation

As part of the WPAH RI/FS (WPAH Group 2020), a shoreline survey to evaluate areas of potential nearshore bank soil erosion was completed in February 2014. During the survey, all banks accessible by foot were observed during low water conditions to determine the presence/absence of riprap, bulkheads, exposed soils, and outfalls. Appendix E of the WPAH RI/FS presents a figure of the shoreline survey extent, which includes all of the Study Area, and photographs of the shoreline. During the shoreline survey, areas of the shoreline with the potential for bank erosion were noted, including relatively steep slopes and banks where erosion was observed. These areas are generally exposed, non-vegetated soil that are not constrained or restricted by rocks, riprap, or other structures. Further investigation of the shoreline has not been conducted, and analytical results are not available. The areas identified as potentially erosional during the shoreline survey are presented in Figure 2.1.

3.2 ANALYTICAL RESULTS SUMMARY

A brief summary of existing groundwater and soil data is presented below. It is important to note that reporting limits at the time of analysis were greater than groundwater and soil quality criteria currently applied at shoreline sites. Therefore, non-detect results from the historical dataset cannot be used to draw conclusions about the presence or absence of chemicals. Groundwater and soil quality criteria for use in future data evaluation are presented in Section 4.3.

3.2.1 Groundwater

Due to the age of the groundwater data (collected 32 years ago) and limited investigation scope and analytical results, few conclusions can be drawn relative to groundwater quality. Existing groundwater data will not be used in the groundwater dataset for the RI; however, Table 3.2 presents groundwater analytical results for completeness.

Generally, PCP and TeCP were historically detected in groundwater at concentrations as great as 14,000 and 10,000 micrograms per liter (µg/L), respectively, at locations near or immediately downgradient of suspected wood treatment areas on Terminal 5 (MW-06A, MW-06C, MW-16A) and one downgradient well adjacent to the shoreline (MW-19). The lowest concentrations of PCP and TeCP were detected in MW-19, with concentrations ranging from non-detect (reporting limit of 10 µg/L) to 15 µg/L and non-detect (5 µg/L) to 350 µg/L, respectively. On Terminals 5 and 6, the majority of chemicals aside from PCP and TeCP (metals, SVOCs, VOCs, and TPH) were frequently not detected or, if detected, were not obviously associated with known historical activities. Dioxins/furans were analyzed for at MW-16A, immediately downgradient of the suspected wood treatment areas, and were not detected at a detection limit for dioxin/furan TEQ of 6.0×10^{-5} µg/L.

Limited historical groundwater data are available on Terminal 7. The existing wells on Terminal 7 (MW-03A, MW-04A, MW-11, MW-13, MW-14, and MW-20) were analyzed for phenanthrene, BTEX, PCP, and TeCP, with only low-level detections of phenanthrene at three locations in the central, upland portion of Terminal 7 (MW-04A, MW-13, and MW-14) and total xylenes at one location (MW-04A). Historical groundwater data are not available along the shoreline at Terminal 7.

3.2.2 Soil

3.2.2.1 Surface Soil

Twenty-five surface soil samples have been collected in the Study Area. Table 3.3 presents analytical results for surface soils. The majority of samples were analyzed for PCP and TeCP, with detections observed near the old planer mill (SS-01 through SS-04, and SS-08) in the vicinity of the PCP- and TeCP-contaminated groundwater area. One TeCP detection was also observed in the eastern corner of the Study Area, near the former Fibreboard mill. PCP and TeCP were not detected, with reporting limits ranging from 0.05 to 2.5 milligrams per kilograms (mg/kg), in soil samples collected downgradient of the old planer mill along the Terminal 5 shoreline or on Terminal 7, away from suspected wood treatment areas.

Stained soil and sawdust samples were collected adjacent to former transformers and analyzed for total PCBs. Transformers were generally located on concrete pads, with leakage and staining on the pads and surrounding soils and sawdust observed during the reconnaissance conducted by Hart Crowser in 1988. Sample TR-05 was collected by scraping leaking oil from the side of the transformer located near the Terminal 7 shoreline, with a reported total PCB concentration of 4.8 mg/kg. Samples were also collected near the old planer mill on Terminal 5 (TR-02), near the kiln on the LEKT property (TR-03) and near the new planer mill on Terminal 7 (TR-04). Total PCBs were not detected in these samples; however, reporting limits were elevated (2.4 mg/kg).

3.2.2.2 Subsurface Soil

A total of 166 subsurface soil samples have been collected in the Study Area. The majority of samples were analyzed for PCP and TeCP, with a subset of samples additionally analyzed for metals, TPH (diesel- and oil- range), polycyclic aromatic hydrocarbons (PAHs), and other SVOCs, selected VOCs or dioxins/furans. Tables 3.4 and 3.5 present analytical results for PCP and TeCP in subsurface soils and all other analytes in subsurface soils, respectively.

PCP and TeCP were detected in subsurface soil in the vicinity of and immediately downgradient of the historical wood treatment areas on Terminal 5 (i.e., at B-06, B-15, B-16, B-16A, B-16C, B-17, B-18, B-19, B-24, and HA-1). The greatest concentrations of PCP were detected in the 10 to 11.5 feet bgs interval at B-16 and B-16A, immediately to the north of the old planer mill. PCP was detected in soil at a maximum depth of approximately 30 feet bgs at B-17 and B-18 downgradient of the historical wood treatment area, and 36.5 feet at B-24 west of the planer mill. The maximum detected depth of PCP in soil at B-16 and B-16A closer to the planer mill was approximately 20 feet bgs. TeCP was generally collocated with and present at lesser concentrations than PCP.

Scattered detections of metals, including primarily chromium and mercury, were noted within the Study Area. Detected chromium concentrations ranged from 5 to 30 mg/kg compared to the Puget Sound natural background concentration for chromium of 48 mg/kg (Ecology 1994). Detected mercury concentrations ranged from 0.048 to 0.29 mg/kg compared to the Puget Sound natural background concentration of 0.07 mg/kg. A slightly elevated lead concentration (140 mg/kg) relative to natural background (24 mg/kg) was detected in shallow soil (3 to 4 feet bgs) at H-4 in the northeastern portion of Terminals 5 and 6. The greatest mercury concentrations were detected at depths ranging from 0 to 6.5 feet bgs at B-06, B-24B, and B-25B in the vicinity of the old planer mill. The slightly elevated lead and mercury concentrations were detected in soil presumed to be fill.

TPH was generally not detected, except for diesel-range organics detections slightly greater than the reporting limit in shallow soil (between 3 and 9 feet bgs) at H-3-02 and HC-SE-PA near the southern boundary of Terminal 5 and 6 on the LEKT property and an oil-range organics detection at a concentration of 640 mg/kg at H-4-02 (3 to 4 feet bgs) approximately 150 feet from the Terminal 5 and 6 shoreline.

PAHs were generally not detected at reporting limits ranging from 0.1 to 1.3 mg/kg, except for scattered detections of phenanthrene in composite samples including B-05 on LEKT property and B-04, B-11, B-13, and B-14 in the upland areas of Terminal 7. cPAHs were not detected in any subsurface soil samples. Other SVOCs detected included 2,4,5-trichlorophenol, 4-methylphenol, and phenol, which were each detected once in soil samples from the vicinity of the old planer mill. For the non-detect results, reporting limits for those compounds ranged from 0.1 to 3.2 mg/kg. Scattered detections of di-n-butyl phthalate were also noted in four locations in the vicinity of the old planer mill and on the LEKT property (B-06, B-23, B-24, and B-26) with concentrations ranging from 0.051 to 0.26 mg/kg. For the non-detect results, reporting limits for those compounds ranged from 0.1 to 1.3 mg/kg.

For VOCs, methylene chloride was detected at concentrations ranging from 0.005 to 0.17 mg/kg in composite soil samples from B-12 on the LEKT property and B-13 and B-14 in the upland area of Terminal 7. BTEX compounds were not detected in the six samples analyzed, with the exception of two detections of total xylenes at concentrations of 0.024 and 0.034 mg/kg in composite soil samples from B-04 in the upland area of Terminal 7 and B-05 on the LEKT property. Reporting limits for BTEX compounds ranged from 0.001 to 0.012 mg/kg.

Dioxins/furans were analyzed only in samples collected from the vicinity of the old planer mill, including surface samples from B-15 and B-16 and the 10 to 11.5 feet bgs sample from B-16A, where the greatest concentration of PCP was detected (PCP was also detected at lesser concentrations in the two surface samples analyzed). Dioxins/furans were detected in all three samples, with the greatest dioxin/furan TEQ concentration detected in the sample collected from B-16A, which is also the sample most impacted by PCP.

Table 3.2
Groundwater Analytical Data

				Terminal 7				Terminal 7		Terminal 7			
		Location Name	HC-C-PA	HC-NE-PA	HC-NW-PA	HC-SE-PA	HC-SW-PA	MW-03A		MW-04A		MW-05A	
		Sample Name	MW-C-PA-091102	MW-NE-PA-091102	MW-NW-PA-091102	MW-SE-PA-091102	MW-SW-PA-091102	MW3A-051788	MW3A-061188	MW4A-051788	MW4A-061188	MW5A-051788	MW5A-060988
		Sample Date	9/11/2002	9/11/2002	9/11/2002	9/11/2002	9/11/2002	5/17/1988	6/11/1988	5/17/1988	6/11/1988	5/17/1988	6/9/1988
Analyte	**CAS No.**	**Unit**											
Conventionals													
Alkalinity (as CaCO3)	--	mg-CaCO$_3$/L											
Chloride	16887-00-6	µg/L											
Conductivity	--	µohm/cm						320		910		710	
Nitrate	14797-55-8	µg/L											
pH	pH	pH						6.91		6.97		6.37	
Sulfate	14808-79-8	µg/L											
Temperature	--	°C						11		13		13	
Total Dissolved Solids	--	µg/L											
Total Suspended Solids	--	µg/L	190,000	250,000	100,000	59,000	1,100,000						
Metals													
Arsenic	7440-38-2	µg/L	9.9	2.5 U	2.5 U	10	31						
Barium	7440-39-3	µg/L	14	21	12	23	22						
Cadmium	7440-43-9	µg/L	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U						
Chromium	7440-47-3	µg/L	10 U	11	10 U	10 U	23						
Copper	7440-50-8	µg/L											
Lead	7439-92-1	µg/L	10 U	10 U	10 U	10 U	10 U						
Mercury	7439-97-6	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.26						
Selenium	7782-49-2	µg/L	50 U	50 U	50 U	50 U	50 U						
Silver	7440-22-4	µg/L	10 U	10 U	10 U	10 U	10 U						
Vanadium	7440-62-2	µg/L											
Zinc	7440-66-6	µg/L											
Total Petroleum Hydrocarbons													
Diesel-range organics	DRO	µg/L	200 U	200 U	200 U	200 U	200 U						
Oil-range organics	ORO	µg/L	500 U	500 U	500 U	500 U	500 U						
Total DRO & ORO	T_DRO&ORO (U=0)	µg/L	500 U	500 U	500 U	500 U	500 U						
Total Petroleum Hydrocarbons	--	µg/L											
Polycyclic Aromatic Hydrocarbons													
Acenaphthene	83-32-9	µg/L	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U						
Acenaphthylene	208-96-8	µg/L	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U						
Anthracene	120-12-7	µg/L	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U						
Benzo(a)anthracene	56-55-3	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U						
Benzo(a)pyrene	50-32-8	µg/L	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U						
Benzo(b)fluoranthene	205-99-2	µg/L	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U						
Benzo(g,h,i)perylene	191-24-2	µg/L	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U						
Benzo(k)fluoranthene	207-08-9	µg/L	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U						
Chrysene	218-01-9	µg/L	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U						
cPAHs (MTCA TEQ-HalfND)	BaPEq (U=1/2)	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U						
cPAHs (MTCA TEQ-ZeroND)	BaPEq (U=0)	µg/L	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U						
Dibenzo(a,h)anthracene	53-70-3	µg/L	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U						
Fluoranthene	206-44-0	µg/L	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U						
Fluorene	86-73-7	µg/L	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U						
Indeno(1,2,3-c,d)pyrene	193-39-5	µg/L	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U						
Naphthalene	91-20-3	µg/L	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U						
Phenanthrene	85-01-8	µg/L	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U			280		200 U	
Pyrene	129-00-0	µg/L	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U						

Table 3.2
Groundwater Analytical Data

				Terminal 7				Terminal 7		Terminal 7			
		Location Name	HC-C-PA	HC-NE-PA	HC-NW-PA	HC-SE-PA	HC-SW-PA	MW-03A		MW-04A		MW-05A	
		Sample Name	MW-C-PA-091102	MW-NE-PA-091102	MW-NW-PA-091102	MW-SE-PA-091102	MW-SW-PA-091102	MW3A-051788	MW3A-061188	MW4A-051788	MW4A-061188	MW5A-051788	MW5A-060988
		Sample Date	9/11/2002	9/11/2002	9/11/2002	9/11/2002	9/11/2002	5/17/1988	6/11/1988	5/17/1988	6/11/1988	5/17/1988	6/9/1988
Analyte	**CAS No.**	**Unit**											
Semivolatile Organic Compounds													
2,3,4,6-Tetrachlorophenol	58-90-2	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U						
2,4,5-Trichlorophenol	95-95-4	µg/L	10 U	10 U	10 U	10 U	10 U						
2,4,6-Trichlorophenol	88-06-2	µg/L	10 U	10 U	10 U	10 U	10 U						
2,4-Dichlorophenol	120-83-2	µg/L	10 U	10 U	10 U	10 U	10 U						
2,4-Dimethylphenol	105-67-9	µg/L	10 U	10 U	10 U	10 U	10 U						
2,4-Dinitrophenol	51-28-5	µg/L	10 U	10 U	10 U	10 U	10 U						
2,6-Dichlorophenol	87-65-0	µg/L	10 U	10 U	10 U	10 U	10 U						
2-Chloronaphthalene	91-58-7	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U						
2-Chlorophenol	95-57-8	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U						
2-Methylphenol	95-48-7	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U						
2-Nitrophenol	88-75-5	µg/L	10 U	10 U	10 U	10 U	10 U						
3- & 4-Methylphenol	15831-10-4	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U						
4-Chloro-3-methylphenol	59-50-7	µg/L	10 U	10 U	10 U	10 U	10 U						
4-Nitrophenol	100-02-7	µg/L	10 U	10 U	10 U	10 U	10 U						
Bis(2-chloroethoxy)methane	111-91-1	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U						
Bis(2-ethylhexyl)phthalate	117-81-7	µg/L											
Butyl benzyl phthalate	85-68-7	µg/L	10 U	10 U	10 U	10 U	10 U						
Diethylphthalate	84-66-2	µg/L	10 U	10 U	10 U	10 U	10 U						
Dimethyl phthalate	131-11-3	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U						
Di-n-butyl phthalate	84-74-2	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U						
Di-n-octyl phthalate	117-84-0	µg/L	10 U	10 U	10 U	10 U	10 U						
Hexachlorobutadiene	87-68-3	µg/L	10 U	10 U	10 U	10 U	10 U						
Hexachlorocyclopentadiene	77-47-4	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U						
Hexachloropropene	1888-71-7	µg/L	10 U	10 U	10 U	10 U	10 U						
N-Nitrosodiphenylamine	86-30-6	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U						
Pentachlorophenol	87-86-5	µg/L	10 U	10 U	10 U	10 U	10 U	1.0 U	10 U		10 U		10 U
Phenol	108-95-2	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U						
Phenols (total)	--	µg/L											
Tetrachlorophenols (total)	25167-83-3	µg/L						1.0 U	10 U		10 U		10 U
Volatile Organic Compounds													
1,2,4-Trichlorobenzene	120-82-1	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U						
1,2-Dichlorobenzene	95-50-1	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U						
1,3-Dichlorobenzene	541-73-1	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U						
1,4-Dichlorobenzene	106-46-7	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U						
4-Chlorophenyl phenyl ether	7005-72-3	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U						
Benzene	71-43-2	µg/L								1.0 U		1.0 U	
Bis(2-chloroethyl)ether	111-44-4	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U						
Bis(2-chloroisopropyl)ether	39638-32-9	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U						
Ethylbenzene	100-41-4	µg/L								1.0 U		1.0 U	
Hexachlorobenzene	118-74-1	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U						
Pentachloroethane	76-01-7	µg/L	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U						
Toluene	108-88-3	µg/L								1.0 U		1.0 U	
Xylene (total)	1330-20-7	µg/L								5.0		2.0	

Table 3.2
Groundwater Analytical Data

				Terminal 7				Terminal 7		Terminal 7			
		Location Name	HC-C-PA	HC-NE-PA	HC-NW-PA	HC-SE-PA	HC-SW-PA	MW-03A		MW-04A		MW-05A	
		Sample Name	MW-C-PA-091102	MW-NE-PA-091102	MW-NW-PA-091102	MW-SE-PA-091102	MW-SW-PA-091102	MW3A-051788	MW3A-061188	MW4A-051788	MW4A-061188	MW5A-051788	MW5A-060988
		Sample Date	9/11/2002	9/11/2002	9/11/2002	9/11/2002	9/11/2002	5/17/1988	6/11/1988	5/17/1988	6/11/1988	5/17/1988	6/9/1988
Analyte	**CAS No.**	**Unit**											
Dioxins/Furans													
2,3,7,8-TCDD	1746-01-6	µg/L											
1,2,3,7,8-PeCDD	40321-76-4	µg/L											
1,2,3,4,7,8-HxCDD	39227-28-6	µg/L											
1,2,3,6,7,8-HxCDD	57653-85-7	µg/L											
1,2,3,7,8,9-HxCDD	19408-74-3	µg/L											
1,2,3,4,6,7,8-HpCDD	35822-46-9	µg/L											
OCDD	3268-87-9	µg/L											
2,3,7,8-TCDF	51207-31-9	µg/L											
1,2,3,7,8-PeCDF	57117-41-6	µg/L											
2,3,4,7,8-PeCDF	57117-31-4	µg/L											
1,2,3,4,7,8-HxCDF	70648-26-9	µg/L											
1,2,3,6,7,8-HxCDF	57117-44-9	µg/L											
1,2,3,7,8,9-HxCDF	72918-21-9	µg/L											
2,3,4,6,7,8-HxCDF	60851-34-5	µg/L											
1,2,3,4,6,7,8-HpCDF	67562-39-4	µg/L											
1,2,3,4,7,8,9-HpCDF	55673-89-7	µg/L											
OCDF	39001-02-0	µg/L											
Dioxin/Furans (MTCA TEQ-HalfND)	DF_TEQ (U=1/2)	µg/L											
Dioxin/Furans (MTCA TEQ-ZeroND)	DF_TEQ (U=0)	µg/L											
Pesticide-Herbicides													
Dinoseb	88-85-7	µg/L	10 U	10 U	10 U	10 U	10 U						

Notes:

Blank cells are intentional.

All results presented in this table are rounded to two significant figures, with the exception of those for the dioxin/furan TEQ, which are rounded to three significant figures.

-- Not available.

Abbreviations:

°C	Degrees Celsius	µg/L	Micrograms per liter
CAS	Chemical Abstracts Service	mg-CaCO3/L	Milligrams of calcium chloride per liter
CDD	Chlorodibenzo-dioxin	MTCA	Model Toxics Control Act
CDF	Chlorodibenzofuran	OCDD	Octachlorodibenzodioxin
cPAH	Carcinogenic polycyclic hydrocarbon	OCDF	Octachlorodibenzofuran
DRO	Diesel-range organics	ORO	Oil-range organics
HpCDD	Heptachlorodibenzo-p-dioxin	PeCDD	Pentachlorodibenzo-p-dioxin
HpCDF	Heptachlorodibenzofuran	PeCDF	Pentachlorodibenzofuran
HxCDD	Hexachlorodibenzo-p-dioxin	TCDF	Tetrachlorodibenzofuran
HxCDF	Hexachlorodibenzofuran	TEQ	Toxic Equivalent
µohm/cm	Microohms per centimeter	TCDD	Tetrachlorodibenzo-p-dioxin

Qualifiers:

J	Analyte is detected and the concentration is estimated.
JM	Concentration is estimated due to poor match to standard.
U	Analyte is not detected at the associated reporting limit.
UJ	Analyte is not detected at the associated reporting limit, which is an estimate.

Table 3.2
Groundwater Analytical Data

		Location Name	MW-05A (cont.)		MW-06A					MW-06B	
		Sample Name	DSA-MW5-082888	DSA-MW5-100688	MW6A-051788	MW6A-060888	DSA-MW6A-082488	DSA-MW6A-100688	DSA-MW6A-101388	DSA-MW6B-092188	DSA-MW6B-101388
		Sample Date	8/28/1988	10/6/1988	5/17/1988	6/8/1988	8/24/1988	10/6/1988	10/13/1988	9/21/1988	10/13/1988
Analyte	**CAS No.**	**Unit**									
Conventionals											
Alkalinity (as CaCO3)	--	mg-CaCO$_3$/L	352	256				900	913	2,200	2,210
Chloride	16887-00-6	µg/L	51,000	62,000				170,000	81,000	10,000,000	11,000,000
Conductivity	--	µohm/cm	960	825	1,740			2,380	1,175	41,000	32,000
Nitrate	14797-55-8	µg/L	500 U	500 U				2,500 U	500 U	500 U	5,000 U
pH	pH	pH	6.5	6.6	6.79			7.2	7.4	8.0	7.6
Sulfate	14808-79-8	µg/L	1,000 U	1,000 U				22,000	13,000	6,700	35,000
Temperature	--	°C			14						
Total Dissolved Solids	--	µg/L	510,000	530,000				1,300,000	1,600,000	20,000,000	20,000,000
Total Suspended Solids	--	µg/L									
Metals											
Arsenic	7440-38-2	µg/L									40
Barium	7440-39-3	µg/L									120
Cadmium	7440-43-9	µg/L									
Chromium	7440-47-3	µg/L									
Copper	7440-50-8	µg/L									
Lead	7439-92-1	µg/L									
Mercury	7439-97-6	µg/L									
Selenium	7782-49-2	µg/L									
Silver	7440-22-4	µg/L									
Vanadium	7440-62-2	µg/L									
Zinc	7440-66-6	µg/L									
Total Petroleum Hydrocarbons											
Diesel-range organics	DRO	µg/L									
Oil-range organics	ORO	µg/L									
Total DRO & ORO	T_DRO&ORO (U=0)	µg/L									
Total Petroleum Hydrocarbons	--	µg/L									
Polycyclic Aromatic Hydrocarbons											
Acenaphthene	83-32-9	µg/L									
Acenaphthylene	208-96-8	µg/L									
Anthracene	120-12-7	µg/L									
Benzo(a)anthracene	56-55-3	µg/L									
Benzo(a)pyrene	50-32-8	µg/L									
Benzo(b)fluoranthene	205-99-2	µg/L									
Benzo(g,h,i)perylene	191-24-2	µg/L									
Benzo(k)fluoranthene	207-08-9	µg/L									
Chrysene	218-01-9	µg/L									
cPAHs (MTCA TEQ-HalfND)	BaPEq (U=1/2)	µg/L									
cPAHs (MTCA TEQ-ZeroND)	BaPEq (U=0)	µg/L									
Dibenzo(a,h)anthracene	53-70-3	µg/L									
Fluoranthene	206-44-0	µg/L									
Fluorene	86-73-7	µg/L									
Indeno(1,2,3-c,d)pyrene	193-39-5	µg/L									
Naphthalene	91-20-3	µg/L								10 U	20 U
Phenanthrene	85-01-8	µg/L									
Pyrene	129-00-0	µg/L									

Table 3.2
Groundwater Analytical Data

		Location Name	MW-05A (cont.)		MW-06A					MW-06B	
		Sample Name	**DSA-MW5-082888**	**DSA-MW5-100688**	**MW6A-051788**	**MW6A-060888**	**DSA-MW6A-082488**	**DSA-MW6A-100688**	**DSA-MW6A-101388**	**DSA-MW6B-092188**	**DSA-MW6B-101388**
		Sample Date	**8/28/1988**	**10/6/1988**	**5/17/1988**	**6/8/1988**	**8/24/1988**	**10/6/1988**	**10/13/1988**	**9/21/1988**	**10/13/1988**
Analyte	**CAS No.**	**Unit**									
Semivolatile Organic Compounds											
2,3,4,6-Tetrachlorophenol	58-90-2	µg/L									
2,4,5-Trichlorophenol	95-95-4	µg/L								10 U	20 U
2,4,6-Trichlorophenol	88-06-2	µg/L									
2,4-Dichlorophenol	120-83-2	µg/L								10 U	20 U
2,4-Dimethylphenol	105-67-9	µg/L									
2,4-Dinitrophenol	51-28-5	µg/L									
2,6-Dichlorophenol	87-65-0	µg/L									
2-Chloronaphthalene	91-58-7	µg/L									
2-Chlorophenol	95-57-8	µg/L									
2-Methylphenol	95-48-7	µg/L									
2-Nitrophenol	88-75-5	µg/L									
3- & 4-Methylphenol	15831-10-4	µg/L									
4-Chloro-3-methylphenol	59-50-7	µg/L									
4-Nitrophenol	100-02-7	µg/L									
Bis(2-chloroethoxy)methane	111-91-1	µg/L									
Bis(2-ethylhexyl)phthalate	117-81-7	µg/L								44 UJ	20 UJ
Butyl benzyl phthalate	85-68-7	µg/L									
Diethylphthalate	84-66-2	µg/L									
Dimethyl phthalate	131-11-3	µg/L									
Di-n-butyl phthalate	84-74-2	µg/L								10 U	20 U
Di-n-octyl phthalate	117-84-0	µg/L									
Hexachlorobutadiene	87-68-3	µg/L									
Hexachlorocyclopentadiene	77-47-4	µg/L									
Hexachloropropene	1888-71-7	µg/L									
N-Nitrosodiphenylamine	86-30-6	µg/L									
Pentachlorophenol	87-86-5	µg/L	5.0 U	5.0 U	5,700	100	3,100	510 J	2,100	5.0 U	5.0 U
Phenol	108-95-2	µg/L									
Phenols (total)	--	µg/L									
Tetrachlorophenols (total)	25167-83-3	µg/L	5.0 U	5.0 U	7,400	10	2,800	280 JM	1,400 J	10	5.0 U
Volatile Organic Compounds											
1,2,4-Trichlorobenzene	120-82-1	µg/L									
1,2-Dichlorobenzene	95-50-1	µg/L									
1,3-Dichlorobenzene	541-73-1	µg/L									
1,4-Dichlorobenzene	106-46-7	µg/L									
4-Chlorophenyl phenyl ether	7005-72-3	µg/L									
Benzene	71-43-2	µg/L									
Bis(2-chloroethyl)ether	111-44-4	µg/L									
Bis(2-chloroisopropyl)ether	39638-32-9	µg/L									
Ethylbenzene	100-41-4	µg/L									
Hexachlorobenzene	118-74-1	µg/L									
Pentachloroethane	76-01-7	µg/L									
Toluene	108-88-3	µg/L									
Xylene (total)	1330-20-7	µg/L									

Table 3.2
Groundwater Analytical Data

		Location Name	MW-05A (cont.)		MW-06A					MW-06B	
		Sample Name	DSA-MW5-082888	DSA-MW5-100688	MW6A-051788	MW6A-060888	DSA-MW6A-082488	DSA-MW6A-100688	DSA-MW6A-101388	DSA-MW6B-092188	DSA-MW6B-101388
		Sample Date	8/28/1988	10/6/1988	5/17/1988	6/8/1988	8/24/1988	10/6/1988	10/13/1988	9/21/1988	10/13/1988
Analyte	**CAS No.**	**Unit**									
Dioxins/Furans											
2,3,7,8-TCDD	1746-01-6	µg/L									
1,2,3,7,8-PeCDD	40321-76-4	µg/L									
1,2,3,4,7,8-HxCDD	39227-28-6	µg/L									
1,2,3,6,7,8-HxCDD	57653-85-7	µg/L									
1,2,3,7,8,9-HxCDD	19408-74-3	µg/L									
1,2,3,4,6,7,8-HpCDD	35822-46-9	µg/L									
OCDD	3268-87-9	µg/L									
2,3,7,8-TCDF	51207-31-9	µg/L									
1,2,3,7,8-PeCDF	57117-41-6	µg/L									
2,3,4,7,8-PeCDF	57117-31-4	µg/L									
1,2,3,4,7,8-HxCDF	70648-26-9	µg/L									
1,2,3,6,7,8-HxCDF	57117-44-9	µg/L									
1,2,3,7,8,9-HxCDF	72918-21-9	µg/L									
2,3,4,6,7,8-HxCDF	60851-34-5	µg/L									
1,2,3,4,6,7,8-HpCDF	67562-39-4	µg/L									
1,2,3,4,7,8,9-HpCDF	55673-89-7	µg/L									
OCDF	39001-02-0	µg/L									
Dioxin/Furans (MTCA TEQ-HalfND)	DF_TEQ (U=1/2)	µg/L									
Dioxin/Furans (MTCA TEQ-ZeroND)	DF_TEQ (U=0)	µg/L									
Pesticide-Herbicides											
Dinoseb	88-85-7	µg/L									

Notes:

Blank cells are intentional.

All results presented in this table are rounded to two significant figures, with the exception of those for the dioxin/furan TEQ, which are rounded to three significant figures.

-- Not available.

Abbreviations:

°C	Degrees Celsius	µg/L	Micrograms per liter
CAS	Chemical Abstracts Service	mg-CaCO3/L	Milligrams of calcium chloride per liter
CDD	Chlorodibenzo-dioxin	MTCA	Model Toxics Control Act
CDF	Chlorodibenzofuran	OCDD	Octachlorodibenzodioxin
cPAH	Carcinogenic polycyclic hydrocarbon	OCDF	Octachlorodibenzofuran
DRO	Diesel-range organics	ORO	Oil-range organics
HpCDD	Heptachlorodibenzo-p-dioxin	PeCDD	Pentachlorodibenzo-p-dioxin
HpCDF	Heptachlorodibenzofuran	PeCDF	Pentachlorodibenzofuran
HxCDD	Hexachlorodibenzo-p-dioxin	TCDF	Tetrachlorodibenzofuran
HxCDF	Hexachlorodibenzofuran	TEQ	Toxic Equivalent
µohm/cm	Microohms per centimeter	TCDD	Tetrachlorodibenzo-p-dioxin

Qualifiers:

J	Analyte is detected and the concentration is estimated.
JM	Concentration is estimated due to poor match to standard.
U	Analyte is not detected at the associated reporting limit.
UJ	Analyte is not detected at the associated reporting limit, which is an estimate.

Table 3.2
Groundwater Analytical Data

		Location Name	MW-06C			MW-07		MW-08				MW-08B	
		Sample Name	**DSA-MW6C-101388**	**DSA-MW6C-110188**	**DSA-MW6C-112188**	**MW7-051788**	**MW7-061188**	**MW8-051788**	**DSA-MW8-081788**	**DSA-MW8-082688**	**DSA-MW8A-100388**	**DSA-MW8B-092688**	**DSA-MW8B-100388**
		Sample Date	**10/13/1988**	**11/1/1988**	**11/21/1988**	**5/17/1988**	**6/11/1988**	**5/17/1988**	**8/17/1988**	**8/26/1988**	**10/3/1988**	**9/26/1988**	**10/3/1988**
Analyte	**CAS No.**	**Unit**											
Conventionals													
Alkalinity (as CaCO3)	--	mg-CaCO$_3$/L	924						431	433		706	759
Chloride	16887-00-6	µg/L	100,000						110,000	110,000		5,500,000	6,200,000
Conductivity	--	µohm/cm	2,000			770		1,092	1,400	1,250		16,500	15,500
Nitrate	14797-55-8	µg/L	500 U						500 U	500 U		3,300	500 U
pH	pH	pH	7.7			6.62		6.9	7.0	7.2		7.7	7.8
Sulfate	14808-79-8	µg/L	9,900						11,000	11,000		390,000	450,000
Temperature	--	°C				18		15					
Total Dissolved Solids	--	µg/L	1,500,000						700,000	920,000		9,900,000	11,000,000
Total Suspended Solids	--	µg/L											
Metals													
Arsenic	7440-38-2	µg/L											
Barium	7440-39-3	µg/L	190										
Cadmium	7440-43-9	µg/L											
Chromium	7440-47-3	µg/L	20										
Copper	7440-50-8	µg/L	13										
Lead	7439-92-1	µg/L	3.0										
Mercury	7439-97-6	µg/L											
Selenium	7782-49-2	µg/L											
Silver	7440-22-4	µg/L											
Vanadium	7440-62-2	µg/L	20										
Zinc	7440-66-6	µg/L	50										
Total Petroleum Hydrocarbons													
Diesel-range organics	DRO	µg/L											
Oil-range organics	ORO	µg/L											
Total DRO & ORO	T_DRO&ORO (U=0)	µg/L											
Total Petroleum Hydrocarbons	--	µg/L											
Polycyclic Aromatic Hydrocarbons													
Acenaphthene	83-32-9	µg/L											
Acenaphthylene	208-96-8	µg/L											
Anthracene	120-12-7	µg/L											
Benzo(a)anthracene	56-55-3	µg/L											
Benzo(a)pyrene	50-32-8	µg/L											
Benzo(b)fluoranthene	205-99-2	µg/L											
Benzo(g,h,i)perylene	191-24-2	µg/L											
Benzo(k)fluoranthene	207-08-9	µg/L											
Chrysene	218-01-9	µg/L											
cPAHs (MTCA TEQ-HalfND)	BaPEq (U=1/2)	µg/L											
cPAHs (MTCA TEQ-ZeroND)	BaPEq (U=0)	µg/L											
Dibenzo(a,h)anthracene	53-70-3	µg/L											
Fluoranthene	206-44-0	µg/L											
Fluorene	86-73-7	µg/L											
Indeno(1,2,3-c,d)pyrene	193-39-5	µg/L											
Naphthalene	91-20-3	µg/L	77										
Phenanthrene	85-01-8	µg/L											
Pyrene	129-00-0	µg/L											

Table 3.2
Groundwater Analytical Data

		Location Name	MW-06C			MW-07		MW-08				MW-08B	
		Sample Name	DSA-MW6C-101388	DSA-MW6C-110188	DSA-MW6C-112188	MW7-051788	MW7-061188	MW8-051788	DSA-MW8-081788	DSA-MW8-082688	DSA-MW8A-100388	DSA-MW8B-092688	DSA-MW8B-100388
		Sample Date	10/13/1988	11/1/1988	11/21/1988	5/17/1988	6/11/1988	5/17/1988	8/17/1988	8/26/1988	10/3/1988	9/26/1988	10/3/1988
Analyte	**CAS No.**	**Unit**											
Semivolatile Organic Compounds													
2,3,4,6-Tetrachlorophenol	58-90-2	µg/L											
2,4,5-Trichlorophenol	95-95-4	µg/L	80 J										
2,4,6-Trichlorophenol	88-06-2	µg/L											
2,4-Dichlorophenol	120-83-2	µg/L	11 J										
2,4-Dimethylphenol	105-67-9	µg/L											
2,4-Dinitrophenol	51-28-5	µg/L											
2,6-Dichlorophenol	87-65-0	µg/L											
2-Chloronaphthalene	91-58-7	µg/L											
2-Chlorophenol	95-57-8	µg/L											
2-Methylphenol	95-48-7	µg/L											
2-Nitrophenol	88-75-5	µg/L											
3- & 4-Methylphenol	15831-10-4	µg/L											
4-Chloro-3-methylphenol	59-50-7	µg/L											
4-Nitrophenol	100-02-7	µg/L											
Bis(2-chloroethoxy)methane	111-91-1	µg/L											
Bis(2-ethylhexyl)phthalate	117-81-7	µg/L	20 UJ										
Butyl benzyl phthalate	85-68-7	µg/L											
Diethylphthalate	84-66-2	µg/L											
Dimethyl phthalate	131-11-3	µg/L											
Di-n-butyl phthalate	84-74-2	µg/L	2.0 J										
Di-n-octyl phthalate	117-84-0	µg/L											
Hexachlorobutadiene	87-68-3	µg/L											
Hexachlorocyclopentadiene	77-47-4	µg/L											
Hexachloropropene	1888-71-7	µg/L											
N-Nitrosodiphenylamine	86-30-6	µg/L											
Pentachlorophenol	87-86-5	µg/L	14,000	270	160		10 U	1.0 U	5.0 U	5.0	5.0 U	5.0 U	5.0 U
Phenol	108-95-2	µg/L											
Phenols (total)	--	µg/L											
Tetrachlorophenols (total)	25167-83-3	µg/L	10,000 J	230	40		10 U	1.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Volatile Organic Compounds													
1,2,4-Trichlorobenzene	120-82-1	µg/L											
1,2-Dichlorobenzene	95-50-1	µg/L											
1,3-Dichlorobenzene	541-73-1	µg/L											
1,4-Dichlorobenzene	106-46-7	µg/L											
4-Chlorophenyl phenyl ether	7005-72-3	µg/L											
Benzene	71-43-2	µg/L				1.0 U							
Bis(2-chloroethyl)ether	111-44-4	µg/L											
Bis(2-chloroisopropyl)ether	39638-32-9	µg/L											
Ethylbenzene	100-41-4	µg/L				1.0 U							
Hexachlorobenzene	118-74-1	µg/L											
Pentachloroethane	76-01-7	µg/L											
Toluene	108-88-3	µg/L				1.0 U							
Xylene (total)	1330-20-7	µg/L				2.0							

Table 3.2
Groundwater Analytical Data

		Location Name	MW-06C			MW-07		MW-08				MW-08B	
		Sample Name	DSA-MW6C-101388	DSA-MW6C-110188	DSA-MW6C-112188	MW7-051788	MW7-061188	MW8-051788	DSA-MW8-081788	DSA-MW8-082688	DSA-MW8A-100388	DSA-MW8B-092688	DSA-MW8B-100388
		Sample Date	10/13/1988	11/1/1988	11/21/1988	5/17/1988	6/11/1988	5/17/1988	8/17/1988	8/26/1988	10/3/1988	9/26/1988	10/3/1988
Analyte	**CAS No.**	**Unit**											
Dioxins/Furans													
2,3,7,8-TCDD	1746-01-6	µg/L											
1,2,3,7,8-PeCDD	40321-76-4	µg/L											
1,2,3,4,7,8-HxCDD	39227-28-6	µg/L											
1,2,3,6,7,8-HxCDD	57653-85-7	µg/L											
1,2,3,7,8,9-HxCDD	19408-74-3	µg/L											
1,2,3,4,6,7,8-HpCDD	35822-46-9	µg/L											
OCDD	3268-87-9	µg/L											
2,3,7,8-TCDF	51207-31-9	µg/L											
1,2,3,7,8-PeCDF	57117-41-6	µg/L											
2,3,4,7,8-PeCDF	57117-31-4	µg/L											
1,2,3,4,7,8-HxCDF	70648-26-9	µg/L											
1,2,3,6,7,8-HxCDF	57117-44-9	µg/L											
1,2,3,7,8,9-HxCDF	72918-21-9	µg/L											
2,3,4,6,7,8-HxCDF	60851-34-5	µg/L											
1,2,3,4,6,7,8-HpCDF	67562-39-4	µg/L											
1,2,3,4,7,8,9-HpCDF	55673-89-7	µg/L											
OCDF	39001-02-0	µg/L											
Dioxin/Furans (MTCA TEQ-HalfND)	DF_TEQ (U=1/2)	µg/L											
Dioxin/Furans (MTCA TEQ-ZeroND)	DF_TEQ (U=0)	µg/L											
Pesticide-Herbicides													
Dinoseb	88-85-7	µg/L											

Notes:

Blank cells are intentional.

All results presented in this table are rounded to two significant figures, with the exception of those for the dioxin/furan TEQ, which are rounded to three significant figures.

-- Not available.

Abbreviations:

°C	Degrees Celsius	µg/L	Micrograms per liter
CAS	Chemical Abstracts Service	mg-CaCO3/L	Milligrams of calcium chloride per liter
CDD	Chlorodibenzo-dioxin	MTCA	Model Toxics Control Act
CDF	Chlorodibenzofuran	OCDD	Octachlorodibenzodioxin
cPAH	Carcinogenic polycyclic hydrocarbon	OCDF	Octachlorodibenzofuran
DRO	Diesel-range organics	ORO	Oil-range organics
HpCDD	Heptachlorodibenzo-p-dioxin	PeCDD	Pentachlorodibenzo-p-dioxin
HpCDF	Heptachlorodibenzofuran	PeCDF	Pentachlorodibenzofuran
HxCDD	Hexachlorodibenzo-p-dioxin	TCDF	Tetrachlorodibenzofuran
HxCDF	Hexachlorodibenzofuran	TEQ	Toxic Equivalent
µohm/cm	Microohms per centimeter	TCDD	Tetrachlorodibenzo-p-dioxin

Qualifiers:

J	Analyte is detected and the concentration is estimated.
JM	Concentration is estimated due to poor match to standard.
U	Analyte is not detected at the associated reporting limit.
UJ	Analyte is not detected at the associated reporting limit, which is an estimate.

Table 3.2
Groundwater Analytical Data

Terminal 7 Terminal 7 Terminal 7

		Location Name	MW-11		MW-12		MW-13		MW-14		MW-15		
		Sample Name	MW11-060388	MW11-061188	MW12-060388	MW12-060988	MW13-060388	MW13-061188	MW14-060388	MW14-061188	MW15-060988	DSA-MW15-082488	DSA-MW15-100488
		Sample Date	6/3/1988	6/11/1988	6/3/1988	6/9/1988	6/3/1988	6/11/1988	6/3/1988	6/11/1988	6/9/1988	8/24/1988	10/4/1988
Analyte	**CAS No.**	**Unit**											
Conventionals													
Alkalinity (as CaCO3)	--	mg-CaCO$_3$/L										1,280	1,290
Chloride	16887-00-6	µg/L										7,900,000	6,400,000
Conductivity	--	µohm/cm										28,500	24,000
Nitrate	14797-55-8	µg/L										50,000 U	3,600
pH	pH	pH										7.0	6.9
Sulfate	14808-79-8	µg/L										430,000	330,000
Temperature	--	°C											
Total Dissolved Solids	--	µg/L										15,000,000	13,000,000
Total Suspended Solids	--	µg/L											
Metals													
Arsenic	7440-38-2	µg/L											
Barium	7440-39-3	µg/L											
Cadmium	7440-43-9	µg/L											
Chromium	7440-47-3	µg/L											
Copper	7440-50-8	µg/L											
Lead	7439-92-1	µg/L											
Mercury	7439-97-6	µg/L											
Selenium	7782-49-2	µg/L											
Silver	7440-22-4	µg/L											
Vanadium	7440-62-2	µg/L											
Zinc	7440-66-6	µg/L											
Total Petroleum Hydrocarbons													
Diesel-range organics	DRO	µg/L											
Oil-range organics	ORO	µg/L											
Total DRO & ORO	T_DRO&ORO (U=0)	µg/L											
Total Petroleum Hydrocarbons	--	µg/L											
Polycyclic Aromatic Hydrocarbons													
Acenaphthene	83-32-9	µg/L											
Acenaphthylene	208-96-8	µg/L											
Anthracene	120-12-7	µg/L											
Benzo(a)anthracene	56-55-3	µg/L											
Benzo(a)pyrene	50-32-8	µg/L											
Benzo(b)fluoranthene	205-99-2	µg/L											
Benzo(g,h,i)perylene	191-24-2	µg/L											
Benzo(k)fluoranthene	207-08-9	µg/L											
Chrysene	218-01-9	µg/L											
cPAHs (MTCA TEQ-HalfND)	BaPEq (U=1/2)	µg/L											
cPAHs (MTCA TEQ-ZeroND)	BaPEq (U=0)	µg/L											
Dibenzo(a,h)anthracene	53-70-3	µg/L											
Fluoranthene	206-44-0	µg/L											
Fluorene	86-73-7	µg/L											
Indeno(1,2,3-c,d)pyrene	193-39-5	µg/L											
Naphthalene	91-20-3	µg/L											
Phenanthrene	85-01-8	µg/L	200 U		200 U		420		420				
Pyrene	129-00-0	µg/L											

Table 3.2

Groundwater Analytical Da

			Terminal 7				Terminal 7		Terminal 7				
		Location Name	**MW-11**		**MW-12**		**MW-13**		**MW-14**		**MW-15**		
		Sample Name	**MW11-060388**	**MW11-061188**	**MW12-060388**	**MW12-060988**	**MW13-060388**	**MW13-061188**	**MW14-060388**	**MW14-061188**	**MW15-060988**	**DSA-MW15-082488**	**DSA-MW15-100488**
		Sample Date	**6/3/1988**	**6/11/1988**	**6/3/1988**	**6/9/1988**	**6/3/1988**	**6/11/1988**	**6/3/1988**	**6/11/1988**	**6/9/1988**	**8/24/1988**	**10/4/1988**
Analyte	**CAS No.**	**Unit**											
Semivolatile Organic Compounds													
2,3,4,6-Tetrachlorophenol	58-90-2	µg/L											
2,4,5-Trichlorophenol	95-95-4	µg/L											
2,4,6-Trichlorophenol	88-06-2	µg/L											
2,4-Dichlorophenol	120-83-2	µg/L											
2,4-Dimethylphenol	105-67-9	µg/L											
2,4-Dinitrophenol	51-28-5	µg/L											
2,6-Dichlorophenol	87-65-0	µg/L											
2-Chloronaphthalene	91-58-7	µg/L											
2-Chlorophenol	95-57-8	µg/L											
2-Methylphenol	95-48-7	µg/L											
2-Nitrophenol	88-75-5	µg/L											
3- & 4-Methylphenol	15831-10-4	µg/L											
4-Chloro-3-methylphenol	59-50-7	µg/L											
4-Nitrophenol	100-02-7	µg/L											
Bis(2-chloroethoxy)methane	111-91-1	µg/L											
Bis(2-ethylhexyl)phthalate	117-81-7	µg/L											
Butyl benzyl phthalate	85-68-7	µg/L											
Diethylphthalate	84-66-2	µg/L											
Dimethyl phthalate	131-11-3	µg/L											
Di-n-butyl phthalate	84-74-2	µg/L											
Di-n-octyl phthalate	117-84-0	µg/L											
Hexachlorobutadiene	87-68-3	µg/L											
Hexachlorocyclopentadiene	77-47-4	µg/L											
Hexachloropropene	1888-71-7	µg/L											
N-Nitrosodiphenylamine	86-30-6	µg/L											
Pentachlorophenol	87-86-5	µg/L		10 U		10 U		10 U		10 U	10 U	9.0	5.0 U
Phenol	108-95-2	µg/L											
Phenols (total)	--	µg/L											
Tetrachlorophenols (total)	25167-83-3	µg/L		10 U		10 U		10 U		10 U	10 U	5.0 U	5.0 U
Volatile Organic Compounds													
1,2,4-Trichlorobenzene	120-82-1	µg/L											
1,2-Dichlorobenzene	95-50-1	µg/L											
1,3-Dichlorobenzene	541-73-1	µg/L											
1,4-Dichlorobenzene	106-46-7	µg/L											
4-Chlorophenyl phenyl ether	7005-72-3	µg/L											
Benzene	71-43-2	µg/L	1.0 U		1.0 U		1.0 U						
Bis(2-chloroethyl)ether	111-44-4	µg/L											
Bis(2-chloroisopropyl)ether	39638-32-9	µg/L											
Ethylbenzene	100-41-4	µg/L	1.0 U		1.0 U		1.0 U						
Hexachlorobenzene	118-74-1	µg/L											
Pentachloroethane	76-01-7	µg/L											
Toluene	108-88-3	µg/L	1.0 U		1.0 U		1.0 U						
Xylene (total)	1330-20-7	µg/L	1.0 U		1.0 U		1.0 U						

Table 3.2
Groundwater Analytical Data

Terminal 7 Terminal 7 Terminal 7

		Location Name	MW-11		MW-12		MW-13		MW-14		MW-15		
		Sample Name	MW11-060388	MW11-061188	MW12-060388	MW12-060988	MW13-060388	MW13-061188	MW14-060388	MW14-061188	MW15-060988	DSA-MW15-082488	DSA-MW15-100488
		Sample Date	6/3/1988	6/11/1988	6/3/1988	6/9/1988	6/3/1988	6/11/1988	6/3/1988	6/11/1988	6/9/1988	8/24/1988	10/4/1988
Analyte	**CAS No.**	**Unit**											
Dioxins/Furans													
2,3,7,8-TCDD	1746-01-6	µg/L											
1,2,3,7,8-PeCDD	40321-76-4	µg/L											
1,2,3,4,7,8-HxCDD	39227-28-6	µg/L											
1,2,3,6,7,8-HxCDD	57653-85-7	µg/L											
1,2,3,7,8,9-HxCDD	19408-74-3	µg/L											
1,2,3,4,6,7,8-HpCDD	35822-46-9	µg/L											
OCDD	3268-87-9	µg/L											
2,3,7,8-TCDF	51207-31-9	µg/L											
1,2,3,7,8-PeCDF	57117-41-6	µg/L											
2,3,4,7,8-PeCDF	57117-31-4	µg/L											
1,2,3,4,7,8-HxCDF	70648-26-9	µg/L											
1,2,3,6,7,8-HxCDF	57117-44-9	µg/L											
1,2,3,7,8,9-HxCDF	72918-21-9	µg/L											
2,3,4,6,7,8-HxCDF	60851-34-5	µg/L											
1,2,3,4,6,7,8-HpCDF	67562-39-4	µg/L											
1,2,3,4,7,8,9-HpCDF	55673-89-7	µg/L											
OCDF	39001-02-0	µg/L											
Dioxin/Furans (MTCA TEQ-HalfND)	DF_TEQ (U=1/2)	µg/L											
Dioxin/Furans (MTCA TEQ-ZeroND)	DF_TEQ (U=0)	µg/L											
Pesticide-Herbicides													
Dinoseb	88-85-7	µg/L											

Notes:

Blank cells are intentional.

All results presented in this table are rounded to two significant figures, with the exception of those for the dioxin/furan TEQ, which are rounded to three significant figures.

-- Not available.

Abbreviations:

°C	Degrees Celsius	µg/L	Micrograms per liter
CAS	Chemical Abstracts Service	mg-CaCO3/L	Milligrams of calcium chloride per liter
CDD	Chlorodibenzo-dioxin	MTCA	Model Toxics Control Act
CDF	Chlorodibenzofuran	OCDD	Octachlorodibenzodioxin
cPAH	Carcinogenic polycyclic hydrocarbon	OCDF	Octachlorodibenzofuran
DRO	Diesel-range organics	ORO	Oil-range organics
HpCDD	Heptachlorodibenzo-p-dioxin	PeCDD	Pentachlorodibenzo-p-dioxin
HpCDF	Heptachlorodibenzofuran	PeCDF	Pentachlorodibenzofuran
HxCDD	Hexachlorodibenzo-p-dioxin	TCDF	Tetrachlorodibenzofuran
HxCDF	Hexachlorodibenzofuran	TEQ	Toxic Equivalent
µohm/cm	Microohms per centimeter	TCDD	Tetrachlorodibenzo-p-dioxin

Qualifiers:

J	Analyte is detected and the concentration is estimated.
JM	Concentration is estimated due to poor match to standard.
U	Analyte is not detected at the associated reporting limit.
UJ	Analyte is not detected at the associated reporting limit, which is an estimate.

Table 3.2
Groundwater Analytical Data

		Location Name	MW-16A				MW-16B			MW-18		
		Sample Name	**MW16A-061288**	**DSA-MW16-082888**	**DSA-MW16A-101488**	**DSA-MW16AD-101488**	**DSA-MW16B-092388**	**DSA-MW16BD-092388**	**DSA-MW16B-100488**	**MW18-061288**	**DSA-MW18-082488**	**DSA-MW18-100488**
		Sample Date	**6/12/1988**	**8/28/1988**	**10/14/1988**	**10/14/1988**	**9/23/1988**	**9/23/1988**	**10/4/1988**	**6/12/1988**	**8/24/1988**	**10/4/1988**
Analyte	**CAS No.**	**Unit**										
Conventionals												
Alkalinity (as CaCO3)	--	mg-CaCO$_3$/L		943	906		2,050		2,030		396	252
Chloride	16887-00-6	µg/L		180,000	190,000		10,000,000		11,000,000		14,000,000	15,000,000
Conductivity	--	µohm/cm		2,460	2,000		35,800		30,000		48,500	53,000
Nitrate	14797-55-8	µg/L		2,500 U	500 U		8,000		85,000		50,000 U	50,000 U
pH	pH	pH		7.2	7.1		7.3		7.1		6.6	6.6
Sulfate	14808-79-8	µg/L		5,000 U	5,200		16,000		1,000 U		1,600,000	2,400,000
Temperature	--	°C										
Total Dissolved Solids	--	µg/L		1,300,000	1,300,000		20,000,000		20,000,000		25,000,000	29,000,000
Total Suspended Solids	--	µg/L										
Metals												
Arsenic	7440-38-2	µg/L					14					
Barium	7440-39-3	µg/L					190					
Cadmium	7440-43-9	µg/L										
Chromium	7440-47-3	µg/L										
Copper	7440-50-8	µg/L										
Lead	7439-92-1	µg/L					22					
Mercury	7439-97-6	µg/L										
Selenium	7782-49-2	µg/L										
Silver	7440-22-4	µg/L										
Vanadium	7440-62-2	µg/L										
Zinc	7440-66-6	µg/L										
Total Petroleum Hydrocarbons												
Diesel-range organics	DRO	µg/L										
Oil-range organics	ORO	µg/L										
Total DRO & ORO	T_DRO&ORO (U=0)	µg/L										
Total Petroleum Hydrocarbons	--	µg/L	4,000									
Polycyclic Aromatic Hydrocarbons												
Acenaphthene	83-32-9	µg/L										
Acenaphthylene	208-96-8	µg/L										
Anthracene	120-12-7	µg/L										
Benzo(a)anthracene	56-55-3	µg/L										
Benzo(a)pyrene	50-32-8	µg/L										
Benzo(b)fluoranthene	205-99-2	µg/L										
Benzo(g,h,i)perylene	191-24-2	µg/L										
Benzo(k)fluoranthene	207-08-9	µg/L										
Chrysene	218-01-9	µg/L										
cPAHs (MTCA TEQ-HalfND)	BaPEq (U=1/2)	µg/L										
cPAHs (MTCA TEQ-ZeroND)	BaPEq (U=0)	µg/L										
Dibenzo(a,h)anthracene	53-70-3	µg/L										
Fluoranthene	206-44-0	µg/L										
Fluorene	86-73-7	µg/L										
Indeno(1,2,3-c,d)pyrene	193-39-5	µg/L										
Naphthalene	91-20-3	µg/L				2.0 J						
Phenanthrene	85-01-8	µg/L										
Pyrene	129-00-0	µg/L										

Table 3.2
Groundwater Analytical Data

		Location Name	MW-16A				MW-16B			MW-18		
		Sample Name	MW16A-061288	DSA-MW16-082888	DSA-MW16A-101488	DSA-MW16AD-101488	DSA-MW16B-092388	DSA-MW16BD-092388	DSA-MW16B-100488	MW18-061288	DSA-MW18-082488	DSA-MW18-100488
		Sample Date	6/12/1988	8/28/1988	10/14/1988	10/14/1988	9/23/1988	9/23/1988	10/4/1988	6/12/1988	8/24/1988	10/4/1988
Analyte	**CAS No.**	**Unit**										
Semivolatile Organic Compounds												
2,3,4,6-Tetrachlorophenol	58-90-2	µg/L										
2,4,5-Trichlorophenol	95-95-4	µg/L				20 U						
2,4,6-Trichlorophenol	88-06-2	µg/L										
2,4-Dichlorophenol	120-83-2	µg/L				20 U						
2,4-Dimethylphenol	105-67-9	µg/L										
2,4-Dinitrophenol	51-28-5	µg/L										
2,6-Dichlorophenol	87-65-0	µg/L										
2-Chloronaphthalene	91-58-7	µg/L										
2-Chlorophenol	95-57-8	µg/L										
2-Methylphenol	95-48-7	µg/L										
2-Nitrophenol	88-75-5	µg/L										
3- & 4-Methylphenol	15831-10-4	µg/L										
4-Chloro-3-methylphenol	59-50-7	µg/L										
4-Nitrophenol	100-02-7	µg/L										
Bis(2-chloroethoxy)methane	111-91-1	µg/L										
Bis(2-ethylhexyl)phthalate	117-81-7	µg/L				20 UJ						
Butyl benzyl phthalate	85-68-7	µg/L										
Diethylphthalate	84-66-2	µg/L										
Dimethyl phthalate	131-11-3	µg/L										
Di-n-butyl phthalate	84-74-2	µg/L				20 U						
Di-n-octyl phthalate	117-84-0	µg/L										
Hexachlorobutadiene	87-68-3	µg/L										
Hexachlorocyclopentadiene	77-47-4	µg/L										
Hexachloropropene	1888-71-7	µg/L										
N-Nitrosodiphenylamine	86-30-6	µg/L										
Pentachlorophenol	87-86-5	µg/L	590	52	5.0 U	64	5.0 U	5.0 U	5.0 U	10 U	6.0	5.0 U
Phenol	108-95-2	µg/L										
Phenols (total)	--	µg/L	1,000 U									
Tetrachlorophenols (total)	25167-83-3	µg/L	10 U	110 JM	6.0 JM	92 J	5.0 U	5.0 U	5.0 U	10 U	5.0 U	5.0 U
Volatile Organic Compounds												
1,2,4-Trichlorobenzene	120-82-1	µg/L										
1,2-Dichlorobenzene	95-50-1	µg/L										
1,3-Dichlorobenzene	541-73-1	µg/L										
1,4-Dichlorobenzene	106-46-7	µg/L										
4-Chlorophenyl phenyl ether	7005-72-3	µg/L										
Benzene	71-43-2	µg/L										
Bis(2-chloroethyl)ether	111-44-4	µg/L										
Bis(2-chloroisopropyl)ether	39638-32-9	µg/L										
Ethylbenzene	100-41-4	µg/L										
Hexachlorobenzene	118-74-1	µg/L										
Pentachloroethane	76-01-7	µg/L										
Toluene	108-88-3	µg/L										
Xylene (total)	1330-20-7	µg/L										

Table 3.2
Groundwater Analytical Data

Location Name			MW-16A				MW-16B			MW-18		
Sample Name			MW16A-061288	DSA-MW16-082888	DSA-MW16A-101488	DSA-MW16AD-101488	DSA-MW16B-092388	DSA-MW16BD-092388	DSA-MW16B-100488	MW18-061288	DSA-MW18-082488	DSA-MW18-100488
Sample Date			6/12/1988	8/28/1988	10/14/1988	10/14/1988	9/23/1988	9/23/1988	10/4/1988	6/12/1988	8/24/1988	10/4/1988
Analyte	**CAS No.**	**Unit**										
Dioxins/Furans												
2,3,7,8-TCDD	1746-01-6	µg/L	0.0000480 U									
1,2,3,7,8-PeCDD	40321-76-4	µg/L	0.0000600 U									
1,2,3,4,7,8-HxCDD	39227-28-6	µg/L	0.0000750 U									
1,2,3,6,7,8-HxCDD	57653-85-7	µg/L	0.0000700 U									
1,2,3,7,8,9-HxCDD	19408-74-3	µg/L	0.0000920 U									
1,2,3,4,6,7,8-HpCDD	35822-46-9	µg/L	0.000205 U									
OCDD	3268-87-9	µg/L	0.000960 U									
2,3,7,8-TCDF	51207-31-9	µg/L	0.0000300 U									
1,2,3,7,8-PeCDF	57117-41-6	µg/L	0.0000400 U									
2,3,4,7,8-PeCDF	57117-31-4	µg/L	0.0000430 U									
1,2,3,4,7,8-HxCDF	70648-26-9	µg/L	0.0000370 U									
1,2,3,6,7,8-HxCDF	57117-44-9	µg/L	0.0000330 U									
1,2,3,7,8,9-HxCDF	72918-21-9	µg/L	0.0000600 U									
2,3,4,6,7,8-HxCDF	60851-34-5	µg/L	0.0000480 U									
1,2,3,4,6,7,8-HpCDF	67562-39-4	µg/L	0.0000880 U									
1,2,3,4,7,8,9-HpCDF	55673-89-7	µg/L	0.000123 U									
OCDF	39001-02-0	µg/L	0.000638 U									
Dioxin/Furans (MTCA TEQ-HalfND)	DF_TEQ (U=1/2)	µg/L	0.0000600 U									
Dioxin/Furans (MTCA TEQ-ZeroND)	DF_TEQ (U=0)	µg/L	0.0000600 U									
Pesticide-Herbicides												
Dinoseb	88-85-7	µg/L										

Notes:

Blank cells are intentional.

All results presented in this table are rounded to two significant figures, with the exception of those for the dioxin/furan TEQ, which are rounded to three significant figures.

-- Not available.

Abbreviations:

°C	Degrees Celsius	µg/L	Micrograms per liter
CAS	Chemical Abstracts Service	mg-CaCO3/L	Milligrams of calcium chloride per liter
CDD	Chlorodibenzo-dioxin	MTCA	Model Toxics Control Act
CDF	Chlorodibenzofuran	OCDD	Octachlorodibenzodioxin
cPAH	Carcinogenic polycyclic hydrocarbon	OCDF	Octachlorodibenzofuran
DRO	Diesel-range organics	ORO	Oil-range organics
HpCDD	Heptachlorodibenzo-p-dioxin	PeCDD	Pentachlorodibenzo-p-dioxin
HpCDF	Heptachlorodibenzofuran	PeCDF	Pentachlorodibenzofuran
HxCDD	Hexachlorodibenzo-p-dioxin	TCDF	Tetrachlorodibenzofuran
HxCDF	Hexachlorodibenzofuran	TEQ	Toxic Equivalent
µohm/cm	Microohms per centimeter	TCDD	Tetrachlorodibenzo-p-dioxin

Qualifiers:

J	Analyte is detected and the concentration is estimated.
JM	Concentration is estimated due to poor match to standard.
U	Analyte is not detected at the associated reporting limit.
UJ	Analyte is not detected at the associated reporting limit, which is an estimate.

Table 3.2
Groundwater Analytical Data

Terminal 7

		Location Name	MW-19			MW-20	MW-21			MW-22		
		Sample Name	MW19-061288	DSA-MW19-082688	DSA-MW19-101588	MW20-061288	MW21-061288	DSA-MW21-082488	DSA-MW21-100588	MW22-061288	DSA-MW22-082888	DSA-MW22-100588
		Sample Date	6/12/1988	8/26/1988	10/15/1988	6/12/1988	6/12/1988	8/24/1988	10/5/1988	6/12/1988	8/28/1988	10/5/1988
Analyte	**CAS No.**	**Unit**										
Conventionals												
Alkalinity (as CaCO3)	--	mg-$CaCO_3$/L		411	352			882	881		766	793
Chloride	16887-00-6	µg/L		15,000,000	16,000,000			96,000	1,200,000		120,000	110,000
Conductivity	--	µohm/cm		57,300	52,500			1,920	1,770		1,990	1,780
Nitrate	14797-55-8	µg/L		100,000 U	50,000 U			500 U	500 U		500 U	500 U
pH	pH	pH		6.6	6.5			7.4	7.4		7.3	7.7
Sulfate	14808-79-8	µg/L		2,000,000	2,000,000			4,400	1,000 U		41,000	25,000
Temperature	--	°C										
Total Dissolved Solids	--	µg/L		28,000,000	29,000,000			1,100,000	1,200,000		1,100,000	1,100,000
Total Suspended Solids	--	µg/L										
Metals												
Arsenic	7440-38-2	µg/L										
Barium	7440-39-3	µg/L										
Cadmium	7440-43-9	µg/L										
Chromium	7440-47-3	µg/L										
Copper	7440-50-8	µg/L										
Lead	7439-92-1	µg/L										
Mercury	7439-97-6	µg/L										
Selenium	7782-49-2	µg/L										
Silver	7440-22-4	µg/L										
Vanadium	7440-62-2	µg/L										
Zinc	7440-66-6	µg/L										
Total Petroleum Hydrocarbons												
Diesel-range organics	DRO	µg/L										
Oil-range organics	ORO	µg/L										
Total DRO & ORO	T_DRO&ORO (U=0)	µg/L										
Total Petroleum Hydrocarbons	--	µg/L										
Polycyclic Aromatic Hydrocarbons												
Acenaphthene	83-32-9	µg/L										
Acenaphthylene	208-96-8	µg/L										
Anthracene	120-12-7	µg/L										
Benzo(a)anthracene	56-55-3	µg/L										
Benzo(a)pyrene	50-32-8	µg/L										
Benzo(b)fluoranthene	205-99-2	µg/L										
Benzo(g,h,i)perylene	191-24-2	µg/L										
Benzo(k)fluoranthene	207-08-9	µg/L										
Chrysene	218-01-9	µg/L										
cPAHs (MTCA TEQ-HalfND)	BaPEq (U=1/2)	µg/L										
cPAHs (MTCA TEQ-ZeroND)	BaPEq (U=0)	µg/L										
Dibenzo(a,h)anthracene	53-70-3	µg/L										
Fluoranthene	206-44-0	µg/L										
Fluorene	86-73-7	µg/L										
Indeno(1,2,3-c,d)pyrene	193-39-5	µg/L										
Naphthalene	91-20-3	µg/L										
Phenanthrene	85-01-8	µg/L										
Pyrene	129-00-0	µg/L										

Table 3.2
Groundwater Analytical Data

Terminal 7

		Location Name	MW-19			MW-20	MW-21			MW-22		
		Sample Name	MW19-061288	DSA-MW19-082688	DSA-MW19-101588	MW20-061288	MW21-061288	DSA-MW21-082488	DSA-MW21-100588	MW22-061288	DSA-MW22-082888	DSA-MW22-100588
		Sample Date	6/12/1988	8/26/1988	10/15/1988	6/12/1988	6/12/1988	8/24/1988	10/5/1988	6/12/1988	8/28/1988	10/5/1988
Analyte	**CAS No.**	**Unit**										
Semivolatile Organic Compounds												
2,3,4,6-Tetrachlorophenol	58-90-2	μg/L										
2,4,5-Trichlorophenol	95-95-4	μg/L										
2,4,6-Trichlorophenol	88-06-2	μg/L										
2,4-Dichlorophenol	120-83-2	μg/L										
2,4-Dimethylphenol	105-67-9	μg/L										
2,4-Dinitrophenol	51-28-5	μg/L										
2,6-Dichlorophenol	87-65-0	μg/L										
2-Chloronaphthalene	91-58-7	μg/L										
2-Chlorophenol	95-57-8	μg/L										
2-Methylphenol	95-48-7	μg/L										
2-Nitrophenol	88-75-5	μg/L										
3- & 4-Methylphenol	15831-10-4	μg/L										
4-Chloro-3-methylphenol	59-50-7	μg/L										
4-Nitrophenol	100-02-7	μg/L										
Bis(2-chloroethoxy)methane	111-91-1	μg/L										
Bis(2-ethylhexyl)phthalate	117-81-7	μg/L										
Butyl benzyl phthalate	85-68-7	μg/L										
Diethylphthalate	84-66-2	μg/L										
Dimethyl phthalate	131-11-3	μg/L										
Di-n-butyl phthalate	84-74-2	μg/L										
Di-n-octyl phthalate	117-84-0	μg/L										
Hexachlorobutadiene	87-68-3	μg/L										
Hexachlorocyclopentadiene	77-47-4	μg/L										
Hexachloropropene	1888-71-7	μg/L										
N-Nitrosodiphenylamine	86-30-6	μg/L										
Pentachlorophenol	87-86-5	μg/L	10 U	15		10 U	10 U	21	5.0 U	10 U	25	5.0 U
Phenol	108-95-2	μg/L										
Phenols (total)	--	μg/L										
Tetrachlorophenols (total)	25167-83-3	μg/L	10 U	5.0 U	350 J	10 U	10 U	5.0 U	5.0 U	10 U	5.0 U	5.0 U
Volatile Organic Compounds												
1,2,4-Trichlorobenzene	120-82-1	μg/L										
1,2-Dichlorobenzene	95-50-1	μg/L										
1,3-Dichlorobenzene	541-73-1	μg/L										
1,4-Dichlorobenzene	106-46-7	μg/L										
4-Chlorophenyl phenyl ether	7005-72-3	μg/L										
Benzene	71-43-2	μg/L										
Bis(2-chloroethyl)ether	111-44-4	μg/L										
Bis(2-chloroisopropyl)ether	39638-32-9	μg/L										
Ethylbenzene	100-41-4	μg/L										
Hexachlorobenzene	118-74-1	μg/L										
Pentachloroethane	76-01-7	μg/L										
Toluene	108-88-3	μg/L										
Xylene (total)	1330-20-7	μg/L										

Table 3.2
Groundwater Analytical Data

Terminal 7

		Location Name	MW-19			MW-20	MW-21			MW-22		
		Sample Name	MW19-061288	DSA-MW19-082688	DSA-MW19-101588	MW20-061288	MW21-061288	DSA-MW21-082488	DSA-MW21-100588	MW22-061288	DSA-MW22-082888	DSA-MW22-100588
		Sample Date	6/12/1988	8/26/1988	10/15/1988	6/12/1988	6/12/1988	8/24/1988	10/5/1988	6/12/1988	8/28/1988	10/5/1988
Analyte	CAS No.	Unit										
Dioxins/Furans												
2,3,7,8-TCDD	1746-01-6	µg/L										
1,2,3,7,8-PeCDD	40321-76-4	µg/L										
1,2,3,4,7,8-HxCDD	39227-28-6	µg/L										
1,2,3,6,7,8-HxCDD	57653-85-7	µg/L										
1,2,3,7,8,9-HxCDD	19408-74-3	µg/L										
1,2,3,4,6,7,8-HpCDD	35822-46-9	µg/L										
OCDD	3268-87-9	µg/L										
2,3,7,8-TCDF	51207-31-9	µg/L										
1,2,3,7,8-PeCDF	57117-41-6	µg/L										
2,3,4,7,8-PeCDF	57117-31-4	µg/L										
1,2,3,4,7,8-HxCDF	70648-26-9	µg/L										
1,2,3,6,7,8-HxCDF	57117-44-9	µg/L										
1,2,3,7,8,9-HxCDF	72918-21-9	µg/L										
2,3,4,6,7,8-HxCDF	60851-34-5	µg/L										
1,2,3,4,6,7,8-HpCDF	67562-39-4	µg/L										
1,2,3,4,7,8,9-HpCDF	55673-89-7	µg/L										
OCDF	39001-02-0	µg/L										
Dioxin/Furans (MTCA TEQ-HalfND)	DF_TEQ (U=1/2)	µg/L										
Dioxin/Furans (MTCA TEQ-ZeroND)	DF_TEQ (U=0)	µg/L										
Pesticide-Herbicides												
Dinoseb	88-85-7	µg/L										

Notes:

Blank cells are intentional.

All results presented in this table are rounded to two significant figures, with the exception of those for the dioxin/furan TEQ, which are rounded to three significant figures.

-- Not available.

Abbreviations:

°C	Degrees Celsius	µg/L	Micrograms per liter
CAS	Chemical Abstracts Service	mg-CaCO3/L	Milligrams of calcium chloride per liter
CDD	Chlorodibenzo-dioxin	MTCA	Model Toxics Control Act
CDF	Chlorodibenzofuran	OCDD	Octachlorodibenzodioxin
cPAH	Carcinogenic polycyclic hydrocarbon	OCDF	Octachlorodibenzofuran
DRO	Diesel-range organics	ORO	Oil-range organics
HpCDD	Heptachlorodibenzo-p-dioxin	PeCDD	Pentachlorodibenzo-p-dioxin
HpCDF	Heptachlorodibenzofuran	PeCDF	Pentachlorodibenzofuran
HxCDD	Hexachlorodibenzo-p-dioxin	TCDF	Tetrachlorodibenzofuran
HxCDF	Hexachlorodibenzofuran	TEQ	Toxic Equivalent
µohm/cm	Microohms per centimeter	TCDD	Tetrachlorodibenzo-p-dioxin

Qualifiers:

J	Analyte is detected and the concentration is estimated.
JM	Concentration is estimated due to poor match to standard.
U	Analyte is not detected at the associated reporting limit.
UJ	Analyte is not detected at the associated reporting limit, which is an estimate.

Table 3.2
Groundwater Analytical Data

		Location Name	MW-23		MW-24A		MW-24B		MW-25A		
		Sample Name	**DSA-MW23-090188**	**DSA-MW23-100688**	**DSA-MW24A-091388**	**DSA-MW24A-100388**	**DSA-MW24B-091388**	**DSA-MW24BD-091388**	**DSA-MW25A-092688**	**DSA-MW25A-100488**	**DSA-MW25AD-100488**
		Sample Date	**9/1/1988**	**10/6/1988**	**9/13/1988**	**10/3/1988**	**9/13/1988**	**9/13/1988**	**9/26/1988**	**10/4/1988**	**10/4/1988**
Analyte	**CAS No.**	**Unit**									
Conventionals											
Alkalinity (as CaCO3)	--	mg-$CaCO_3$/L	461	501	1,820	1,980	890		542	545	
Chloride	16887-00-6	µg/L	97,000	99,000	11,000,000	12,000,000	78,000		92,000	97,000	
Conductivity	--	µohm/cm	1,120	1,250	43,700	32,000	2,250		1,300	1,430	
Nitrate	14797-55-8	µg/L	500 U	500 U	13,000	50,000 U	500 U		500 U	500 U	
pH	pH	pH	6.9	6.9	7.4	7.4	7.8		6.7	7.7	
Sulfate	14808-79-8	µg/L	5,200	3,600	16,000	100,000 U	8,500		51,000	44,000	
Temperature	--	°C									
Total Dissolved Solids	--	µg/L	660,000	740,000	21,000,000	21,000,000	1,200,000		890,000	1,000,000	
Total Suspended Solids	--	µg/L									
Metals											
Arsenic	7440-38-2	µg/L									
Barium	7440-39-3	µg/L			16						
Cadmium	7440-43-9	µg/L									
Chromium	7440-47-3	µg/L									
Copper	7440-50-8	µg/L			8.0						
Lead	7439-92-1	µg/L			3.0						
Mercury	7439-97-6	µg/L									
Selenium	7782-49-2	µg/L									
Silver	7440-22-4	µg/L									
Vanadium	7440-62-2	µg/L			10						
Zinc	7440-66-6	µg/L			20						
Total Petroleum Hydrocarbons											
Diesel-range organics	DRO	µg/L									
Oil-range organics	ORO	µg/L									
Total DRO & ORO	T_DRO&ORO (U=0)	µg/L									
Total Petroleum Hydrocarbons	--	µg/L									
Polycyclic Aromatic Hydrocarbons											
Acenaphthene	83-32-9	µg/L									
Acenaphthylene	208-96-8	µg/L									
Anthracene	120-12-7	µg/L									
Benzo(a)anthracene	56-55-3	µg/L									
Benzo(a)pyrene	50-32-8	µg/L									
Benzo(b)fluoranthene	205-99-2	µg/L									
Benzo(g,h,i)perylene	191-24-2	µg/L									
Benzo(k)fluoranthene	207-08-9	µg/L									
Chrysene	218-01-9	µg/L									
cPAHs (MTCA TEQ-HalfND)	BaPEq (U=1/2)	µg/L									
cPAHs (MTCA TEQ-ZeroND)	BaPEq (U=0)	µg/L									
Dibenzo(a,h)anthracene	53-70-3	µg/L									
Fluoranthene	206-44-0	µg/L									
Fluorene	86-73-7	µg/L									
Indeno(1,2,3-c,d)pyrene	193-39-5	µg/L									
Naphthalene	91-20-3	µg/L									
Phenanthrene	85-01-8	µg/L									
Pyrene	129-00-0	µg/L									

Table 3.2
Groundwater Analytical Data

		Location Name	MW-23		MW-24A		MW-24B		MW-25A		
		Sample Name	DSA-MW23-090188	DSA-MW23-100688	DSA-MW24A-091388	DSA-MW24A-100388	DSA-MW24B-091388	DSA-MW24BD-091388	DSA-MW25A-092688	DSA-MW25A-100488	DSA-MW25AD-100488
		Sample Date	9/1/1988	10/6/1988	9/13/1988	10/3/1988	9/13/1988	9/13/1988	9/26/1988	10/4/1988	10/4/1988
Analyte	**CAS No.**	**Unit**									
Semivolatile Organic Compounds											
2,3,4,6-Tetrachlorophenol	58-90-2	µg/L									
2,4,5-Trichlorophenol	95-95-4	µg/L									
2,4,6-Trichlorophenol	88-06-2	µg/L									
2,4-Dichlorophenol	120-83-2	µg/L									
2,4-Dimethylphenol	105-67-9	µg/L									
2,4-Dinitrophenol	51-28-5	µg/L									
2,6-Dichlorophenol	87-65-0	µg/L									
2-Chloronaphthalene	91-58-7	µg/L									
2-Chlorophenol	95-57-8	µg/L									
2-Methylphenol	95-48-7	µg/L									
2-Nitrophenol	88-75-5	µg/L									
3- & 4-Methylphenol	15831-10-4	µg/L									
4-Chloro-3-methylphenol	59-50-7	µg/L									
4-Nitrophenol	100-02-7	µg/L									
Bis(2-chloroethoxy)methane	111-91-1	µg/L									
Bis(2-ethylhexyl)phthalate	117-81-7	µg/L									
Butyl benzyl phthalate	85-68-7	µg/L									
Diethylphthalate	84-66-2	µg/L									
Dimethyl phthalate	131-11-3	µg/L									
Di-n-butyl phthalate	84-74-2	µg/L									
Di-n-octyl phthalate	117-84-0	µg/L									
Hexachlorobutadiene	87-68-3	µg/L									
Hexachlorocyclopentadiene	77-47-4	µg/L									
Hexachloropropene	1888-71-7	µg/L									
N-Nitrosodiphenylamine	86-30-6	µg/L									
Pentachlorophenol	87-86-5	µg/L	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	45 U	5.0 U	5.0 U
Phenol	108-95-2	µg/L									
Phenols (total)	--	µg/L									
Tetrachlorophenols (total)	25167-83-3	µg/L	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	45 JM	5.0 U	5.0 U
Volatile Organic Compounds											
1,2,4-Trichlorobenzene	120-82-1	µg/L									
1,2-Dichlorobenzene	95-50-1	µg/L									
1,3-Dichlorobenzene	541-73-1	µg/L									
1,4-Dichlorobenzene	106-46-7	µg/L									
4-Chlorophenyl phenyl ether	7005-72-3	µg/L									
Benzene	71-43-2	µg/L									
Bis(2-chloroethyl)ether	111-44-4	µg/L									
Bis(2-chloroisopropyl)ether	39638-32-9	µg/L									
Ethylbenzene	100-41-4	µg/L									
Hexachlorobenzene	118-74-1	µg/L									
Pentachloroethane	76-01-7	µg/L									
Toluene	108-88-3	µg/L									
Xylene (total)	1330-20-7	µg/L									

Table 3.2
Groundwater Analytical Data

		Location Name	MW-23		MW-24A		MW-24B		MW-25A		
		Sample Name	DSA-MW23-090188	DSA-MW23-100688	DSA-MW24A-091388	DSA-MW24A-100388	DSA-MW24B-091388	DSA-MW24BD-091388	DSA-MW25A-092688	DSA-MW25A-100488	DSA-MW25AD-100488
		Sample Date	9/1/1988	10/6/1988	9/13/1988	10/3/1988	9/13/1988	9/13/1988	9/26/1988	10/4/1988	10/4/1988
Analyte	**CAS No.**	**Unit**									
Dioxins/Furans											
2,3,7,8-TCDD	1746-01-6	µg/L									
1,2,3,7,8-PeCDD	40321-76-4	µg/L									
1,2,3,4,7,8-HxCDD	39227-28-6	µg/L									
1,2,3,6,7,8-HxCDD	57653-85-7	µg/L									
1,2,3,7,8,9-HxCDD	19408-74-3	µg/L									
1,2,3,4,6,7,8-HpCDD	35822-46-9	µg/L									
OCDD	3268-87-9	µg/L									
2,3,7,8-TCDF	51207-31-9	µg/L									
1,2,3,7,8-PeCDF	57117-41-6	µg/L									
2,3,4,7,8-PeCDF	57117-31-4	µg/L									
1,2,3,4,7,8-HxCDF	70648-26-9	µg/L									
1,2,3,6,7,8-HxCDF	57117-44-9	µg/L									
1,2,3,7,8,9-HxCDF	72918-21-9	µg/L									
2,3,4,6,7,8-HxCDF	60851-34-5	µg/L									
1,2,3,4,6,7,8-HpCDF	67562-39-4	µg/L									
1,2,3,4,7,8,9-HpCDF	55673-89-7	µg/L									
OCDF	39001-02-0	µg/L									
Dioxin/Furans (MTCA TEQ-HalfND)	DF_TEQ (U=1/2)	µg/L									
Dioxin/Furans (MTCA TEQ-ZeroND)	DF_TEQ (U=0)	µg/L									
Pesticide-Herbicides											
Dinoseb	88-85-7	µg/L									

Notes:

Blank cells are intentional.

All results presented in this table are rounded to two significant figures, with the exception of those for the dioxin/furan TEQ, which are rounded to three significant figures.

-- Not available.

Abbreviations:

°C	Degrees Celsius	µg/L	Micrograms per liter
CAS	Chemical Abstracts Service	mg-CaCO3/L	Milligrams of calcium chloride per liter
CDD	Chlorodibenzo-dioxin	MTCA	Model Toxics Control Act
CDF	Chlorodibenzofuran	OCDD	Octachlorodibenzodioxin
cPAH	Carcinogenic polycyclic hydrocarbon	OCDF	Octachlorodibenzofuran
DRO	Diesel-range organics	ORO	Oil-range organics
HpCDD	Heptachlorodibenzo-p-dioxin	PeCDD	Pentachlorodibenzo-p-dioxin
HpCDF	Heptachlorodibenzofuran	PeCDF	Pentachlorodibenzofuran
HxCDD	Hexachlorodibenzo-p-dioxin	TCDF	Tetrachlorodibenzofuran
HxCDF	Hexachlorodibenzofuran	TEQ	Toxic Equivalent
µohm/cm	Microohms per centimeter	TCDD	Tetrachlorodibenzo-p-dioxin

Qualifiers:

J	Analyte is detected and the concentration is estimated.
JM	Concentration is estimated due to poor match to standard.
U	Analyte is not detected at the associated reporting limit.
UJ	Analyte is not detected at the associated reporting limit, which is an estimate.

Table 3.2
Groundwater Analytical Data

		Location Name	MW-25B		MW-26	
		Sample Name	DSA-MW25B-092688	DSA-MW25B-100488	DSA-MW26-092688	DSA-MW26-100588
		Sample Date	9/26/1988	10/4/1988	9/26/1988	10/5/1988
Analyte	CAS No.	Unit				
Conventionals						
Alkalinity (as CaCO3)	--	mg-$CaCO_3$/L	1,160	1,130	292	313
Chloride	16887-00-6	µg/L	7,300,000	6,900,000	71,000	66,000
Conductivity	--	µohm/cm	18,900	17,000	890	890
Nitrate	14797-55-8	µg/L	2,700	3,900	500 U	500 U
pH	pH	pH	8.0	8.1	6.6	6.7
Sulfate	14808-79-8	µg/L	25,000	100,000	2,000	3,400
Temperature	--	°C				
Total Dissolved Solids	--	µg/L	12,000,000	12,000,000	580,000	930,000
Total Suspended Solids	--	µg/L				
Metals						
Arsenic	7440-38-2	µg/L				
Barium	7440-39-3	µg/L				
Cadmium	7440-43-9	µg/L				
Chromium	7440-47-3	µg/L				
Copper	7440-50-8	µg/L				
Lead	7439-92-1	µg/L				
Mercury	7439-97-6	µg/L				
Selenium	7782-49-2	µg/L				
Silver	7440-22-4	µg/L				
Vanadium	7440-62-2	µg/L				
Zinc	7440-66-6	µg/L				
Total Petroleum Hydrocarbons						
Diesel-range organics	DRO	µg/L				
Oil-range organics	ORO	µg/L				
Total DRO & ORO	T_DRO&ORO (U=0)	µg/L				
Total Petroleum Hydrocarbons	--	µg/L				
Polycyclic Aromatic Hydrocarbons						
Acenaphthene	83-32-9	µg/L				
Acenaphthylene	208-96-8	µg/L				
Anthracene	120-12-7	µg/L				
Benzo(a)anthracene	56-55-3	µg/L				
Benzo(a)pyrene	50-32-8	µg/L				
Benzo(b)fluoranthene	205-99-2	µg/L				
Benzo(g,h,i)perylene	191-24-2	µg/L				
Benzo(k)fluoranthene	207-08-9	µg/L				
Chrysene	218-01-9	µg/L				
cPAHs (MTCA TEQ-HalfND)	BaPEq (U=1/2)	µg/L				
cPAHs (MTCA TEQ-ZeroND)	BaPEq (U=0)	µg/L				
Dibenzo(a,h)anthracene	53-70-3	µg/L				
Fluoranthene	206-44-0	µg/L				
Fluorene	86-73-7	µg/L				
Indeno(1,2,3-c,d)pyrene	193-39-5	µg/L				
Naphthalene	91-20-3	µg/L				
Phenanthrene	85-01-8	µg/L				
Pyrene	129-00-0	µg/L				

Table 3.2
Groundwater Analytical Data

		Location Name	MW-25B		MW-26	
		Sample Name	DSA-MW25B-092688	DSA-MW25B-100488	DSA-MW26-092688	DSA-MW26-100588
		Sample Date	9/26/1988	10/4/1988	9/26/1988	10/5/1988
Analyte	**CAS No.**	**Unit**				
Semivolatile Organic Compounds						
2,3,4,6-Tetrachlorophenol	58-90-2	µg/L				
2,4,5-Trichlorophenol	95-95-4	µg/L				
2,4,6-Trichlorophenol	88-06-2	µg/L				
2,4-Dichlorophenol	120-83-2	µg/L				
2,4-Dimethylphenol	105-67-9	µg/L				
2,4-Dinitrophenol	51-28-5	µg/L				
2,6-Dichlorophenol	87-65-0	µg/L				
2-Chloronaphthalene	91-58-7	µg/L				
2-Chlorophenol	95-57-8	µg/L				
2-Methylphenol	95-48-7	µg/L				
2-Nitrophenol	88-75-5	µg/L				
3- & 4-Methylphenol	15831-10-4	µg/L				
4-Chloro-3-methylphenol	59-50-7	µg/L				
4-Nitrophenol	100-02-7	µg/L				
Bis(2-chloroethoxy)methane	111-91-1	µg/L				
Bis(2-ethylhexyl)phthalate	117-81-7	µg/L				
Butyl benzyl phthalate	85-68-7	µg/L				
Diethylphthalate	84-66-2	µg/L				
Dimethyl phthalate	131-11-3	µg/L				
Di-n-butyl phthalate	84-74-2	µg/L				
Di-n-octyl phthalate	117-84-0	µg/L				
Hexachlorobutadiene	87-68-3	µg/L				
Hexachlorocyclopentadiene	77-47-4	µg/L				
Hexachloropropene	1888-71-7	µg/L				
N-Nitrosodiphenylamine	86-30-6	µg/L				
Pentachlorophenol	87-86-5	µg/L	5.0 U	5.0 U		
Phenol	108-95-2	µg/L				
Phenols (total)	--	µg/L				
Tetrachlorophenols (total)	25167-83-3	µg/L	5.0 U	5.0 U		
Volatile Organic Compounds						
1,2,4-Trichlorobenzene	120-82-1	µg/L				
1,2-Dichlorobenzene	95-50-1	µg/L				
1,3-Dichlorobenzene	541-73-1	µg/L				
1,4-Dichlorobenzene	106-46-7	µg/L				
4-Chlorophenyl phenyl ether	7005-72-3	µg/L				
Benzene	71-43-2	µg/L				
Bis(2-chloroethyl)ether	111-44-4	µg/L				
Bis(2-chloroisopropyl)ether	39638-32-9	µg/L				
Ethylbenzene	100-41-4	µg/L				
Hexachlorobenzene	118-74-1	µg/L				
Pentachloroethane	76-01-7	µg/L				
Toluene	108-88-3	µg/L				
Xylene (total)	1330-20-7	µg/L				

Table 3.2
Groundwater Analytical Data

		Location Name	MW-25B		MW-26	
		Sample Name	DSA-MW25B-092688	DSA-MW25B-100488	DSA-MW26-092688	DSA-MW26-100588
		Sample Date	9/26/1988	10/4/1988	9/26/1988	10/5/1988
Analyte	**CAS No.**	**Unit**				
Dioxins/Furans						
2,3,7,8-TCDD	1746-01-6	µg/L				
1,2,3,7,8-PeCDD	40321-76-4	µg/L				
1,2,3,4,7,8-HxCDD	39227-28-6	µg/L				
1,2,3,6,7,8-HxCDD	57653-85-7	µg/L				
1,2,3,7,8,9-HxCDD	19408-74-3	µg/L				
1,2,3,4,6,7,8-HpCDD	35822-46-9	µg/L				
OCDD	3268-87-9	µg/L				
2,3,7,8-TCDF	51207-31-9	µg/L				
1,2,3,7,8-PeCDF	57117-41-6	µg/L				
2,3,4,7,8-PeCDF	57117-31-4	µg/L				
1,2,3,4,7,8-HxCDF	70648-26-9	µg/L				
1,2,3,6,7,8-HxCDF	57117-44-9	µg/L				
1,2,3,7,8,9-HxCDF	72918-21-9	µg/L				
2,3,4,6,7,8-HxCDF	60851-34-5	µg/L				
1,2,3,4,6,7,8-HpCDF	67562-39-4	µg/L				
1,2,3,4,7,8,9-HpCDF	55673-89-7	µg/L				
OCDF	39001-02-0	µg/L				
Dioxin/Furans (MTCA TEQ-HalfND)	DF_TEQ (U=1/2)	µg/L				
Dioxin/Furans (MTCA TEQ-ZeroND)	DF_TEQ (U=0)	µg/L				
Pesticide-Herbicides						
Dinoseb	88-85-7	µg/L				

Notes:

Blank cells are intentional.

All results presented in this table are rounded to two significant figures, with the exception of those for the dioxin/furan TEQ, which are rounded to three significant figures.

-- Not available.

Abbreviations:

°C	Degrees Celsius	µg/L	Micrograms per liter
CAS	Chemical Abstracts Service	mg-CaCO3/L	Milligrams of calcium chloride per liter
CDD	Chlorodibenzo-dioxin	MTCA	Model Toxics Control Act
CDF	Chlorodibenzofuran	OCDD	Octachlorodibenzodioxin
cPAH	Carcinogenic polycyclic hydrocarbon	OCDF	Octachlorodibenzofuran
DRO	Diesel-range organics	ORO	Oil-range organics
HpCDD	Heptachlorodibenzo-p-dioxin	PeCDD	Pentachlorodibenzo-p-dioxin
HpCDF	Heptachlorodibenzofuran	PeCDF	Pentachlorodibenzofuran
HxCDD	Hexachlorodibenzo-p-dioxin	TCDF	Tetrachlorodibenzofuran
HxCDF	Hexachlorodibenzofuran	TEQ	Toxic Equivalent
µohm/cm	Microohms per centimeter	TCDD	Tetrachlorodibenzo-p-dioxin

Qualifiers:

J	Analyte is detected and the concentration is estimated.
JM	Concentration is estimated due to poor match to standard.
U	Analyte is not detected at the associated reporting limit.
UJ	Analyte is not detected at the associated reporting limit, which is an estimate.

Table 3.3
Surface Soil Analytical Data

Terminal 7

		Location Name	SS-01	SS-02	SS-03	SS-04	SS-05	SS-06	SS-07	SS-08	SS-09	SS-10		SS-11	VI-SS-200
		Sample Name	SS1-0-0.25	SS2-0-0.25	SS3-0-0.25	SS4-0-0.25	SS5-0-0.25	SS6-0-0.25	SS7-0-0.25	SS8-0-0.25	SS9-0-0.25	SS10-0-0.25	SS10-0-0.25D	SS11-0-0.25	VI-SS-200
		Sample Date	6/10/1988	6/10/1988	6/10/1988	6/10/1988	6/10/1988	6/10/1988	6/10/1988	6/10/1988	6/10/1988	6/10/1988	6/10/1988	6/10/1988	9/22/1988
		Sample Depth	0–0.25 ft	0–0.25 ft	0–0.25 ft	0–0.25 ft	0–0.25 ft	0–0.25 ft	0–0.25 ft	0–0.25 ft	0–0.25 ft	0–0.25 ft	0–0.25 ft	0–0.25 ft	0–0.25 ft
Analyte	**CAS No.**	**Unit**													
Total Petroleum Hydrocarbons															
Total Petroleum Hydrocarbons	--	mg/kg													3,400
Polycyclic Aromatic Hydrocarbons															
Phenanthrene	85-01-8	mg/kg													
Pyrene	129-00-0	mg/kg													
Other Semivolatile Organic Compounds															
Pentachlorophenol	87-86-5	mg/kg	0.64	0.35	0.090	0.67		0.050 U	0.050 U	0.060	0.050 U	0.050 U	0.050 U	0.050 U	1.8 U
Tetrachlorophenols (total)	25167-83-3	mg/kg	0.44	0.62	0.10	0.090	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	2.2
Polychlorinated Biphenyls (PCBs)															
PCBs (Total, Aroclors)	T_PCB (U=0)	mg/kg													
Dioxins/Furans															
2,3,7,8-TCDD	1746-01-6	mg/kg													
1,2,3,7,8-PeCDD	40321-76-4	mg/kg													
1,2,3,4,7,8-HxCDD	39227-28-6	mg/kg													
1,2,3,6,7,8-HxCDD	57653-85-7	mg/kg													
1,2,3,7,8,9-HxCDD	19408-74-3	mg/kg													
1,2,3,4,6,7,8-HpCDD	35822-46-9	mg/kg													
OCDD	3268-87-9	mg/kg													
2,3,7,8-TCDF	51207-31-9	mg/kg													
1,2,3,7,8-PeCDF	57117-41-6	mg/kg													
2,3,4,7,8-PeCDF	57117-31-4	mg/kg													
1,2,3,4,7,8-HxCDF	70648-26-9	mg/kg													
1,2,3,6,7,8-HxCDF	57117-44-9	mg/kg													
1,2,3,7,8,9-HxCDF	72918-21-9	mg/kg													
2,3,4,6,7,8-HxCDF	60851-34-5	mg/kg													
1,2,3,4,6,7,8-HpCDF	67562-39-4	mg/kg													
1,2,3,4,7,8,9-HpCDF	55673-89-7	mg/kg													
OCDF	39001-02-0	mg/kg													
Dioxins/Furans (MTCA TEQ-HalfND)	DF_TEQ (U=1/2)	mg/kg													
Dioxins/Furans (MTCA TEQ-ZeroND)	DF_TEQ (U=0)	mg/kg													

Notes:

Blank cells are intentional.

All results presented in this table are rounded to two significant figures, with the exception of those for the dioxin/furan TEQ, which are rounded to three significant figures.

All results presented on a dry-weight basis.

-- Not available.

1 Historical data did not provide dry weight result, or measurement basis unknown.

Abbreviations:

CAS	Chemical Abstracts Service	HxCDD	Hexachlorodibenzo-p-dioxin	PeCDD	Pentachlorodibenzo-p-dioxin
CDD	Chlorodibenzo-dioxin	HxCDF	Hexachlorodibenzofuran	PeCDF	Pentachlorodibenzofuran
CDF	Chlorodibenzofuran	mg/kg	Milligrams per kilogram	TCDF	Tetrachlorodibenzofuran
ft	Feet	MTCA	Model Toxics Control Act	TEQ	Toxic Equivalent
HpCDD	Heptachlorodibenzo-p-dioxin	OCDD	Octachlorodibenzodioxin	TCDD	Tetrachlorodibenzo-p-dioxin
HpCDF	Heptachlorodibenzofuran	OCDF	Octachlorodibenzofuran		

Qualifiers:

J Analyte is detected and the concentration is estimated.

U Analyte is not detected at the associated reporting limit.

UJ Analyte is not detected at the associated reporting limit, which is an estimate.

Table 3.3

Surface S

			Terminal 7			Terminal 7	Terminal 7	Terminal 7			Terminal 7	Terminal 7	
Location Name			VI-SS-201	VI-SS-202	VI-SS-203	VI-SS-204	SS-02-Phase1	SS-03-Phase1	TR-02	TR-03	TR-04	TR-05	BG-01
Sample Name			VI-SS-201	VI-SS-202	VI-SS-203	VI-SS-204	SS02-0-0.25	SS03-0-0.25	TR02-0-0.25	TR03-0-0.25	TR04-0-0.25	TR05-0-0.25	BG1-0.0-0.5
Sample Date			9/22/1988	9/22/1988	9/22/1988	9/22/1988	5/10/1988	5/10/1988	5/10/1988	5/10/1988	5/10/1988	5/10/1988	6/12/1988
Sample Depth			0–0.25 ft	0–0.25 ft	0–0.25 ft	0–0.25 ft	0–0.25 ft	0–0.25 ft	0–0.25 ft	0–0.25 ft	0–0.25 ft	0–0.25 ft	0–0.5 ft
Analyte	**CAS No.**	**Unit**											
Total Petroleum Hydrocarbons													
Total Petroleum Hydrocarbons	--	mg/kg											
Polycyclic Aromatic Hydrocarbons													
Phenanthrene	85-01-8	mg/kg						2,400					
Pyrene	129-00-0	mg/kg											
Other Semivolatile Organic Compounds													
Pentachlorophenol	87-86-5	mg/kg	2.5 U	1.2 U	1.9 U	1.5 U	270						0.050 U (1)
Tetrachlorophenols (total)	25167-83-3	mg/kg	2.5 U	1.2 U	1.9 U	1.5 U	40						0.050 U (1)
Polychlorinated Biphenyls (PCBs)													
PCBs (Total, Aroclors)	T_PCB (U=0)	mg/kg							2.4 U	2.4 U	2.4 U	4.8	
Dioxins/Furans													
2,3,7,8-TCDD	1746-01-6	mg/kg											0.0000080 U
1,2,3,7,8-PeCDD	40321-76-4	mg/kg											0.000010 U
1,2,3,4,7,8-HxCDD	39227-28-6	mg/kg											0.000030 UJ
1,2,3,6,7,8-HxCDD	57653-85-7	mg/kg											0.000282
1,2,3,7,8,9-HxCDD	19408-74-3	mg/kg											0.000104
1,2,3,4,6,7,8-HpCDD	35822-46-9	mg/kg											0.0123
OCDD	3268-87-9	mg/kg											0.0815
2,3,7,8-TCDF	51207-31-9	mg/kg											0.000013
1,2,3,7,8-PeCDF	57117-41-6	mg/kg											0.0000080 U
2,3,4,7,8-PeCDF	57117-31-4	mg/kg											0.000019
1,2,3,4,7,8-HxCDF	70648-26-9	mg/kg											0.000098
1,2,3,6,7,8-HxCDF	57117-44-9	mg/kg											0.000066
1,2,3,7,8,9-HxCDF	72918-21-9	mg/kg											0.000010 U
2,3,4,6,7,8-HxCDF	60851-34-5	mg/kg											0.000116
1,2,3,4,6,7,8-HpCDF	67562-39-4	mg/kg											0.00274
1,2,3,4,7,8,9-HpCDF	55673-89-7	mg/kg											0.000192 UJ
OCDF	39001-02-0	mg/kg											0.00638
Dioxins/Furans (MTCA TEQ-HalfND)	DF_TEQ (U=1/2)	mg/kg											0.000262 J
Dioxins/Furans (MTCA TEQ-ZeroND)	DF_TEQ (U=0)	mg/kg											0.00025 J

Notes:

Blank cells are intentional.

All results presented in this table are rounded to two significant figures, with the exception of those for the dioxin/furan TEQ, which are rounded to three significant figures.

All results presented on a dry-weight basis.

-- Not available.

1 Historical data did not provide dry weight result, or measurement basis unknown.

Abbreviations:

CAS	Chemical Abstracts Service	HxCDD	Hexachlorodibenzo-p-dioxin	PeCDD	Pentachlorodibenzo-p-dioxin
CDD	Chlorodibenzo-dioxin	HxCDF	Hexachlorodibenzofuran	PeCDF	Pentachlorodibenzofuran
CDF	Chlorodibenzofuran	mg/kg	Milligrams per kilogram	TCDF	Tetrachlorodibenzofuran
ft	Feet	MTCA	Model Toxics Control Act	TEQ	Toxic Equivalent
HpCDD	Heptachlorodibenzo-p-dioxin	OCDD	Octachlorodibenzodioxin	TCDD	Tetrachlorodibenzo-p-dioxin
HpCDF	Heptachlorodibenzofuran	OCDF	Octachlorodibenzofuran		

Qualifiers:

J	Analyte is detected and the concentration is estimated.
U	Analyte is not detected at the associated reporting limit.
UJ	Analyte is not detected at the associated reporting limit, which is an estimate.

APPENDIX E

Endangered Species Act Supporting Documentation

BIOLOGICAL EVALUATION AND ESSENTIAL FISH HABITAT EVALUATION REPORT

Intermodal Handling and Transfer Facility Improvements Project
Port Angeles, Washington

May 10, 2023

Prepared for

Port of Port Angeles
338 West First Street
Port Angeles, Washington

Biological Evaluation and Essential Fish Habitat Evaluation Report
Intermodal Handling and Transfer Facility Improvements Project
Port of Port Angeles
Port Angeles, Washington

This document was prepared by, or under the direct supervision of, the technical professionals noted below.

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Project No.: 0274006.010
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LANDAU
ASSOCIATES

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EXECUTIVE SUMMARY

At the request of the Port of Port Angeles (Port), Landau Associates, Inc. (Landau) prepared this Biological Evaluation (BE) and Essential Fish Habitat (EFH) Evaluation report to determine the potential biological impacts of the Port's Intermodal Handling and Transfer Facility (IHTF) Improvements Project (Project). Federal funds are being provided from the US Maritime Administration and US Army Corps of Engineers (USACE), and a Clean Water Act/River and Harbors Act permit will be requested for the Project from the USACE, establishing a federal nexus to the Project.

The Project will improve the cargo handling infrastructure at the IHTF and includes:

1) *Cofferdam Dock Facility Improvements*
    a. Remove and replace existing retaining wall with mechanically stabilized earth wall
    b. Install fiberglass sheet pile encasement
    c. Replace structural steel waler beam
2) *IHTF Upland Site Improvements*
    a. Raise existing surface elevation and construct high-load capacity asphalt concrete surface covering 14.4 acres for operational efficiency and stormwater conveyance
    b. Construct a three-stage biofiltration facility to treat stormwater from resurfaced IHTF prior to discharge to Port Angeles Harbor.

The Port had previously submitted an application (NWS-2020-779) to the USACE for the Cofferdam Dock Facility improvements but withdrew the application. The application included a Biological Evaluation (Cofferdam BE) prepared by the Confluence Environmental Company for Section 7 Endangered Species Act consultation. This BE and EFH evaluation supplements the Cofferdam BE (Appendix A), describes the proposed Project, and documents the effect determinations to threatened or endangered species, their critical habitat, and EFH.

This BE has been prepared to facilitate review of the proposed action as required by Section 7(d) of the Endangered Species Act (ESA) of 1973, as amended (16 US Code 1531), and its implementing regulations at Title 50 Code of Federal Regulations, Part 402. This BE has been prepared to facilitate coordination between the federal action agency (the US Maritime Administration), the National Marine Fisheries Service (NMFS), and the US Fish & Wildlife Service (USFWS).

Section 7 of the ESA requires, through consultation with the USFWS and National Oceanic and Atmospheric Administration Fisheries (NOAA Fisheries), that federal actions do not jeopardize the continued existence of any threatened, endangered, or proposed species or result in the destruction or adverse modification of critical habitat.

In addition, this BE addresses the proposed action in compliance with the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), as amended by the Sustainable Fisheries Action of 1996 (Public Law 104-267). The Magnuson-Stevens Act requires federal agencies to consult with NMFS to determine whether the proposed action "may adversely affect" designated EFH for relevant federally managed commercial fish species within the proposed action area. For the purpose of the EFH evaluation, the proposed action incorporates the same Project elements for the EFH and the BE. The EFH evaluation is provided as Section 9 of this document.

This BE addresses the proposed Project impacts on listed species, including direct effects and indirect effects that may occur at a later time. The assessment is based on a review of the literature, agency consultation, review of species lists provided by USFWS and NOAA Fisheries, and review of priority habitats and species (PHS) data from the Washington Department of Fish & Wildlife (WDFW).

Species lists were obtained from the USFWS and NOAA Fisheries websites, and WDFW PHS maps were reviewed. These maps were sources of additional information about listed endangered or threatened species under the ESA in the proposed Project vicinity. Based on Landau's experience in the region and the data available from the agencies listed above, listed species that may occur in the Project's vicinity include:

- Marbled murrelet (*Brachyramphus marmoratus*)
- Coastal-Puget Sound bull trout (*Salvelinus confluentus*)
- Puget Sound Chinook salmon (*Oncorhynchus tshawytscha*)
- Hood Canal summer-run evolutionarily significant unit (ESU) chum salmon (*O. keta*)
- Puget Sound steelhead trout (*O. mykiss*)
- Yelloweye rockfish (*Sebastes ruberrimus*)
- Bocaccio rockfish (*S. paucispinis*)
- Southern distinct population segment (DPS) eulachon (*Thaleichthys pacificus*)
- Southern DPS North American green sturgeon (*Acipenser medirostris*)
- Humpback whale (*Megaptera novaeangliae*)
- Southern Resident killer whale (*Orcinus orca*)
- Leatherback sea turtle (*Dermochelys coriacea*).

This BE includes a discussion of these species, given their potential presence in the Project's action area. This BE also includes a discussion of applicable designated critical habitat for these species.

Of these species, the proposed Project "may affect, but is not likely to adversely affect" marbled murrelet, Coastal-Puget Sound bull trout, Puget Sound Chinook salmon, Hood canal summer-run chum salmon, Puget Sound steelhead trout, Southern DPS eulachon, and Southern DPS green sturgeon. The proposed Project will have "no effect" (NE) on Southern Resident killer whale, humpback whale, yelloweye rockfish, bocaccio rockfish, and leatherback sea turtle. This BE identifies "may affect, but is not likely to adversely affect" determinations on critical habitat for Puget Sound Chinook salmon, Coastal-Puget Sound bull trout, and Southern Resident killer whale, and NE determinations on critical habitats for marbled murrelet, Hood Canal summer-run chum salmon, Puget Sound steelhead trout, yelloweye rockfish, bocaccio rockfish, Southern DPS eulachon, Southern DPS green sturgeon, and leatherback sea turtle. The Project will have no permanent adverse effects on Pacific salmon, groundfish, or coastal pelagic EFH.

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LIST OF ABBREVIATIONS AND ACRONYMS

BE	biological evaluation
BFE	base flood elevation
BMP	best management practice
dBA	A-weight decibels
DPS	distinct population segment
EFH	essential fish habitat
ESA	Endangered Species Act
ESU	evolutionarily significant unit
ft	foot/feet
IHTF	Intermodal Handling and Transfer Facility
ISGP	Industrial Stormwater General Permit
Landau	Landau Associates, Inc.
µg/L	micrograms per liter
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MARAD	US Maritime Administration
MLLW	mean lower low water
NAVD88	North American Vertical Datum of 1988
NE	no effect
NGVD29	National Geodetic Vertical Datum of 1929
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
PCP	pentachlorophenol
PFMC	Pacific Fisheries Management Council
PHS	priority habitats and species
Port	Port of Port Angeles
Project	IHTF Improvements Project
RI	remedial investigation
USACE	US Army Corps of Engineers
USFWS	US Fish & Wildlife Service
WDFW	Washington Department of Fish & Wildlife
WSDOT	Washington State Department of Transportation

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1.0 INTRODUCTION

The Port of Port Angeles (Port) is proposing to improve the cargo handling infrastructure at its Intermodal Handling and Transfer Facility (IHTF) located at 1301 Marine Drive in Port Angeles (Figure 1). The existing waterfront IHTF is key in the inflow and outflow of wood fiber (whole logs and wood chips) from the sustainably managed private and public lands in Clallam and Jefferson Counties. The IHTF Improvements Project (Project) includes the following elements, which constitute the Project Area:

1) *Cofferdam Dock Facility Improvements*
    a. Remove and replace existing retaining wall with mechanically stabilized earth wall
    b. Install fiberglass sheet pile encasement
    c. Replace structural steel waler beam
2) *IHTF Upland Site Improvements*
    a. Raise existing surface elevation and construct high-load capacity asphalt concrete surface covering 14.4 acres for operational efficiency and stormwater conveyance
    b. Construct a three-stage biofiltration facility to treat stormwater from resurfaced IHTF prior to discharge to Port Angeles Harbor.

Landau Associates, Inc. (Landau) prepared this Biological Evaluation (BE) and Essential Fish Habitat (EFH) Evaluation report on behalf of the Port to determine the potential impacts of the Port's IHTF Improvement Project. Federal grant funding is provided from the US Maritime Administration (MARAD) and US Army Corps of Engineers (USACE), and permits will be required from the USACE, which establishes a federal nexus to the Project. The Port had previously submitted an application to the USACE for the Cofferdam Dock Facility improvements but withdrew the application. The application included a Biological Evaluation (Cofferdam BE; Appendix A) prepared by the Confluence Environmental Company for Section 7 Endangered Species Act (ESA) consultation. This BE and EFH evaluation supplements the Cofferdam BE (Appendix A) and describes the proposed Project and documents the effect determinations to threatened or endangered species, their critical habitat, and EFH.

Listed species and habitats known to occur or potentially occur in the Project vicinity were obtained from the US Fish & Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration (NOAA) Fisheries websites. Based on Landau's experience in the region, the Cofferdam BE (Appendix A), and the data received from the agencies noted herein, listed species that may be found within the Project Area vicinity include:

- Marbled murrelet (*Brachyramphus marmoratus*)
- Coastal-Puget Sound bull trout (*Salvelinus confluentus*)
- Puget Sound Chinook salmon (*Oncorhynchus tshawytscha*)
- Hood Canal summer-run evolutionarily significant unit (ESU) chum salmon (*O. keta)*
- Puget Sound steelhead trout (*O. mykiss*)
- Yelloweye rockfish (*Sebastes ruberrimus*)

- Bocaccio rockfish (*S. paucispinis*)
- Southern distinct population segment (DPS) eulachon (*Thaleichthys pacificus*)
- Southern DPS North American green sturgeon (*Acipenser medirostris*)
- Humpback whale (*Megaptera novaeangliae*)
- Southern Resident killer whale (*Orcinus orca*)
- Leatherback sea turtle (*Dermochelys coriacea*).

This BE includes an evaluation of potential Project impacts to these species, given their potential presence in the Project's action area. This BE also includes an evaluation of potential Project impacts to designated critical habitat in the action area for Puget Sound Chinook salmon, Coastal-Puget Sound bull trout, and Southern Resident killer whale.

2.0 PROJECT LOCATION AND DESCRIPTION

A review of relevant information regarding the proposed action is included in the following subsections. Design plans were reviewed by Landau to provide information on Project elements. The Port was consulted to provide additional detail as required that went into the development of this BE.

2.1 Project Location

The Project is located at Port-owned parcels at 1301 Marine Drive, Port Angeles, Clallam County, Washington; Township 30 North, Range 6 West (see Figure 1). The Project is located in/adjacent to the Port Angeles Harbor, a segment of Puget Sound in Hydrologic Unit Code 17110020 and Water Resource Inventory Area 18 (Elwha-Dungeness).

2.2 Site History

The Port's Cofferdam Dock Facility was first constructed in 2004 by the Washington State Department of Transportation (WSDOT) to support the Graving Dock Project, which was subsequently abandoned. The cofferdam was later transferred to the Port in 2006. The facility was initially intended to be a temporary structure but has since become a critical piece of transportation infrastructure to allow an efficient and cost-effective means of transporting logs on and off the North Olympic Peninsula by barge. Mitigation was completed in 2004 to offset anticipated impacts of the construction and operation of the previously planned Graving Dock gate. The shoreline restoration project was implemented by WSDOT, in partnership with the Port, and included the following activities at Ediz Hook:

- Restoration of 1,500 linear feet of shoreline to a natural condition
- Removing 54 creosote pilings
- Removing fill and anthropogenic debris from the beach
- Excavating the vertical face of the shoreline to establish a natural beach profile
- Restoring the beach surface
- Placing large woody debris and seeding the uplands
- Maintaining a traffic barrier to restrict human interference.

Further description of this component of the project is provided in the Cofferdam BE (Appendix A).

The IHTF (historically and still commonly referred to as the Log Yard) has long been located along the Port Angeles Waterfront. The facility has a total footprint of approximately 30 acres for cargo handling, sorting, and staging. The current surface is a mixture of gravel and deteriorated asphalt and concrete. The existing surface condition creates numerous process inefficiencies including stormwater management, grounds maintenance, and equipment life management. The Project Area footprint is the highest priority area for improvement of the Log Yard to support the weighing, sorting, and staging activities.

Given the history of industrial use, there is potential for subsurface soil contamination. The Port and the Washington State Department of Ecology developed an acceptable remedial action work plan and reached an agreement on an agreed order and a Phase 1 remedial investigation (RI) work plan. The RI will assess whether contamination at Terminals 5, 6, and 7 Uplands (the Project Area occurs within Terminal 7) is a source of contamination to Port Angeles Harbor. Based on available environmental reports and information about historical operations, release of pentachlorophenol (PCP) may have contaminated the soil and groundwater at Terminals 5, 6, and 7 Uplands. Due to its location at Terminal 7, the Project Area soil may be contaminated with petroleum and dioxins/furans from burning salt-laden hog fuel.

2.3 Project Description

This project includes the following improvements at the IHTF:

1. *Cofferdam Dock Facility Improvements*

The Cofferdam Dock Facility Improvement includes the following elements: 1) construction of a mechanically stabilized earth wall; 2) installation of fiberglass encasement sheets just waterward of the existing sheet pile bulkhead; and 3) replacement of a structural waler beam (see Appendix B for cofferdam permit drawings). Further description of this component of the project is provided in the Cofferdam BE (Appendix A).

2. *IHTF Upland Site Improvements*

The Project footprint, comprising 14.4 acres, will be regraded, and resurfaced with high-load capacity asphalt concrete. A stormwater treatment facility will also be constructed to support compliance with the Port's National Pollutant Discharge Elimination System (NPDES) Industrial Stormwater General Permit (ISGP) (see Appendix C for Upland IHTF permit drawings). Ground disturbance will be minimized by raising the ground elevation with the placement of crushed rock, installation of geogrid reinforcement, and placement of asphalt concrete pavement.

The stormwater treatment facility will be a three-stage biofiltration facility. Stage 1 is a pre-filter that will consist of a pea gravel filter medium that will be installed in three 18,000-gallon steel tanks. Stage 2 will filter stormwater through a biofiltration soil mix that will be placed in an aboveground, cast-in-place concrete retaining wall structure. Lastly, the stormwater will pass through a stage 3 polishing medium, which will similarly be installed in an aboveground, cast-in-place concrete retaining wall structure. The polishing medium will be installed later after sufficient data are collected from water quality monitoring of the inflow and outflow of the stage 2 treatment cell. Surface runoff from the IHTF will drain or sheet-flow to a pump station conveying flows to the proposed biofiltration system. From the proposed biofiltration system, treated stormwater will discharge through an existing Port-owned outfall pipe (Figure 2 and permit drawings in Appendix C). The IHTF grading plan will also include approximately 1.55 acres of additional impervious surfaces that drains to an adjacent low spot and pond. This collected stormwater will be pumped to the biofiltration treatment system if necessary during the wet-season.

The resurfacing of the Log Yard will have significant water quality benefits by reducing sediment and woody debris from becoming suspended in the runoff. These improvements will allow for routine sweeping and collection of sediment and wood debris that will significantly reduce the pollutant source that needs to be filtered out by the proposed biofiltration system prior to discharge to Port Angeles Harbor.

The upland improvements include importing clean fill material and capping the Project Area with asphalt concrete, which will encapsulate existing contaminated soil and groundwater, and mitigate contaminant mobilization risk from runoff. The proposed asphalt concrete cap is anticipated to not conflict with, but rather be a part of, the final cleanup action.

3.0 CONSTRUCTION ACTIVITIES

Project construction will occur in uplands and in-water, as described below.

3.1 Upland Work

The Project footprint, comprising 14.4 acres, will be regraded, and resurfaced with high-load capacity asphalt concrete and the construction of the stormwater biofiltration system. Ground disturbance will be minimized by raising the ground elevation with the placement of crushed rock, installation of geogrid reinforcement, and placement of asphalt concrete pavement. The stormwater biofiltration system will be constructed above grade and any excavations will be limited to maximum depths of 12 inches below ground surface. The existing storage warehouse and electrical building will be demolished and removed.

3.1.1 Floodplain Avoidance

Federal Emergency Management Agency flood insurance mapping identifies the area along the shoreline of the Project Area as occurring in the 100-year floodplain, with corresponding base flood elevation (BFE) of 8 feet (ft; NGVD29[1]; 11.3 ft mean lower low water [MLLW]). Proposed upland development at the Project Area will generally occur at elevation 12 ft (NAVD88)[2] and higher, which is above the BFE. Cofferdam Dock Facility Improvements will occur below the BFE and are not anticipated to result in loss of flood storage capacity.

3.2 In-Water Work

In-water work associated with the Project will be limited to the Cofferdam Dock Facility Improvements; a summary of in-water construction is provided in the Cofferdam BE (Appendix A).

3.3 Project Schedule

Project construction is anticipated for mid- to late 2025, dependent on receipt of Project permits/approvals.

3.4 Conservation Measures

Conservation measures associated with the cofferdam in-water efforts are provided in the Cofferdam BE (Appendix A). Upland work associated with the IHTF will include best management practices (BMPs), which will be employed during construction to limit erosion and accidental releases (i.e., implementation of Temporary Erosion and Sediment Control and Construction Stormwater Pollution Prevention Plans). Proposed fill, geogrid, and asphalt to be added across the uplands will act as a cap to prevent runoff from contacting contaminated soil and groundwater at the Project Area, thereby minimizing the risk for those contaminants to discharge to Port Angeles Harbor. Post-construction of the IHTF upland improvements, the impervious asphalt paving will also improve stormwater quality by allowing the vacuum-sweeping of wood debris and dust generated during Log Yard activities. The

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[1] NGVD29 = National Geodetic Vertical Datum of 1929

[2] NAVD88 = North American Vertical Datum of 1988

asphalt paving will also convey stormwater to the biofiltration treatment system. This system and associated post-construction stormwater control BMPs will be operated per an operational and maintenance manual in line with the 2019 Stormwater Management Manual for Western Washington and the Site’s NPDES ISGP.

3.5 Interrelated and Interdependent Actions

An interrelated action is an activity that is part of a larger action and depends on the larger action for its justification. Interdependent actions are actions that have no independent utility apart from the proposed action. No interrelated or interdependent actions are associated with the proposed Project. The Project will provide capacity for future development in the area; however, future developments are not dependent upon completion of the proposed Project.

4.0 ACTION AREA

The action area includes all terrestrial and aquatic habitats that could be directly or indirectly affected by the proposed Project. As a result, the terrestrial component would include the extent of the proposed work (including the equipment staging areas) and the attenuation limit of construction noise. The aquatic component would include the extent of potential noise and water quality impacts associated with the proposed Project. For this Project, Chapter 7 of the WSDOT Biological Assessment Preparation Manual (WSDOT 2020) was used to prepare the noise analysis. Although this manual focuses on roadway projects, it represents the best available science for project-related noise calculations relevant to the proposed Project.

4.1 Terrestrial Component

For terrestrial impacts, the action area is defined by Project-related construction and associated noise. Construction noise, as measured 50 ft from the construction equipment that will be used to implement the Project, is anticipated to be short-term, with an estimated maximum sound pressure of 94 A-weighted decibels (dBA). The Project vicinity is estimated to have an environmental noise baseline of 88 dBA (see Appendix A). The upland action area was determined by estimating the point at which Project-related construction noise attenuates to this baseline environmental background noise level. Based on the standard attenuation rates for noise associated with construction, the terrestrial action area includes the areas within an approximately 100-ft radius of the Project Area (Figure 2).

4.2 Aquatic Component

When considering the aquatic component of the action area, factors include in-water construction (including construction in the dry, intertidal areas during low tide) and the extent of turbidity caused by in-water work. The cofferdam construction includes placement of fiberglass encasement that will be pressed into the mudline, which may require a minimal amount of riprap to be shifted along the sides of the structure. Localized turbidity may occur associated with the fiberglass encasement related to disturbance of sediment and is estimated will occur within 1 ft of the in-water work area (see Appendix A).

Mixing zones and water quality criteria, based on specific waterway characteristics, are provided in Washington Administrative Code 173-201A-210 and -400. For this Project, mixing zones will extend 200 ft from the existing stormwater outfall in consideration of monitored and treated discharge from the outfall under the existing NPDES ISGP, and up to 150 ft from the cofferdam improvements in consideration of temporary turbidity impacts of construction (see Figure 2).

5.0 STATUS/PRESENCE OF LISTED SPECIES AND DESIGNATED CRITICAL HABITAT IN THE ACTION AREA

Lists of threatened and endangered species and designated critical habitats in the action area were obtained from the USFWS and NOAA Fisheries websites and are discussed below and provided in Appendix A (an updated species list from USFWS is provided in Appendix D; no changes of listings from NOAA Fisheries has occurred since preparation of the Cofferdam BE).

Species and Critical Habitat Listings

Species	Species Listing Status	Critical Habitat	Consulting Agency
Marbled murrelet (*Brachyramphus marmoratus*)	Threatened	Designated	USFWS
Yellow-billed cuckoo (*Coccyzus americanus*)	Threatened	Designated	USFWS
Short-tailed albatross (*Phoebastria =Diomedea) albatrus)*	Endangered	Not Designated	USFWS
Taylor's checkerspot (*Euphydryas editha taylori*)	Endangered	Designated	USFWS
Coastal-Puget Sound DPS bull trout (*Salvelinus confluentus*)	Threatened	Designated*	USFWS
Golden paintbrush (*Castilleja levisecta*)	Threatened	Not Designated	USFWS
Humpback whale (*Megaptera novaeangliae*)	Endangered	Not Designated	NOAA Fisheries
Southern Resident DPS killer whale (*Orcinus orca*)	Endangered	Designated*	NOAA Fisheries
Puget Sound-Georgia Basin DPS bocaccio rockfish (*Sebastes paucispinis*)	Endangered	Designated	NOAA Fisheries
Puget Sound-Georgia Basin Yelloweye rockfish (*S. ruberrimus*)	Threatened	Designated	NOAA Fisheries
Puget Sound ESU Chinook salmon (*Oncorhynchus tshawytscha*)	Threatened	Designated*	NOAA Fisheries
Puget Sound steelhead trout (*O. mykiss*)	Threatened	Designated	NOAA Fisheries
Hood Canal summer-run ESU chum salmon (*O. keta*)	Threatened	Designated	NOAA Fisheries
Southern DPS eulachon (*Thaleichthys pacificus*)	Threatened	Designated	NOAA Fisheries
Southern DPS North American green sturgeon (*Acipenser medirostris*)	Threatened	Designated	NOAA Fisheries
Leatherback sea turtle (*Dermochelys coriacea*)	Endangered	Designated	NOAA Fisheries

Notes: DPS = distinct population segment
ESU = evolutionarily significant unit
(*) Designated Critical Habitat occurs in the action area.

Discussion of these species is included in this BE given their potential presence in the action area. With the exception of the species noted below, species summaries and occurrence in the action area are provided in Appendix A:

- ***Yellow-Billed Cuckoo:*** Yellow-billed cuckoos require large tracts of willow-cottonwood or mesquite forest or woodland for nesting habitat. Foraging and stopover sites have similar characteristics but may be as small as 10 acres in size. Foraging habitat contains a dense tree canopy with high foliage volume. Yellow-billed cuckoos are considered extirpated in Washington (Seattle Audubon Society; accessed April 21, 2023). The action area does not provide suitable habitat for yellow-billed cuckoo. Therefore, it is unlikely that yellow-billed cuckoos would be present in the action area, and this species is not considered further in this BE.
- ***Short-Tailed Albatross:*** The short-tailed albatross is a rare visitor to Washington waters. It is a pelagic species and breeds on islands off Japan and in Hawaii (WDFW; accessed April 21, 2023). The action area does not provide suitable habitat for short-tailed albatross. Therefore, it is unlikely that short-tailed albatross would be present in the action area, and this species is not considered further in this BE.
- ***Taylor’s Checkerspot:*** Habitat requirements for the Taylor’s checkerspot butterfly consist of open grasslands and grass/oak woodland sites where food plants for larvae and nectar sources for adults are available. These sites include coastal and inland prairies on post-glacial, gravelly outwash and balds (WDFW; accessed April 21, 2023). The action area does not provide suitable habitat for Taylor’s checkerspot. Therefore, it is unlikely that Taylor’s checkerspot would be present in the action area, and this species is not considered further in this BE.
- ***Golden Paintbrush:*** Golden paintbrush occurs in upland prairies, on generally flat grasslands, including some that are characterized by mounded topography. The mainland population in the State of Washington occurs in gravelly, glacial outwash prairie (USFWS 2000). Other populations occur on clayey soils derived from either glacial drift or glacio-lacustrine sediments (in the northern end of the species’ historical range). The action area does not provide suitable habitat for golden paintbrush. Therefore, it is unlikely that golden paintbrush would be present in the action area, and this species is not considered further in this BE.

6.0 ENVIRONMENTAL CONDITIONS

Environmental conditions of in-water habitat are described in Appendix A. The upland cofferdam/IHTF Project Area is approximately 15 acres of industrial waterfront property. The upland is flat and has an average elevation of +14 ft MLLW and the shoreline is riprap armored along Port Angeles Harbor with a top of slope elevation of +14-ft MLLW and toe of slope at 0.0 ft MLLW. The surface condition of the upland Project Area is a mixture of unpaved gravel surface and deteriorated asphalt and concrete (see selected site photographs Appendix E). There is no vegetation in the operational upland Project Area. Along the top of the shoreline there is a 5-ft to 10-ft wide strip of herbaceous noxious weeds (Scotch broom, Himalayan blackberry, Canada thistle, and various grasses; refer to Appendix C). These noxious weeds are controlled through mechanical removal by the Port in the spring on an annual basis and the upland Project improvements do not overlap with this vegetated area. The upland component of the Project Area is an existing industrial facility at the Port; tractor trailers, heavy equipment, and machinery are in constant operation in the Project Area.

7.0 EFFECTS OF THE ACTION

Landau anticipates no direct or indirect effects on terrestrial species or any of their listed critical habitat, as neither occur within the action area. Potential direct and indirect effects on aquatic species and their listed critical habitat because of in-water work associated with the Cofferdam Dock Facility Improvements component of the Project are detailed in Appendix A.

7.1 Direct Effects

Direct effects associated with the Project include activities during construction of the Cofferdam Dock Facility Improvements to the habitat in the nearshore zone of Puget Sound and impacts to water quality. Direct effects associated with upland improvements at the IHTF are limited to water quality associated with runoff from the completed Project.

Landau's evaluation of direct effects to water quality is provided below and supplements the evaluation of effects from the Cofferdam BE (Appendix A).

7.1.1 Water Quality

Water quality effects from the completed Project include improvements related to stormwater treatment and an asphalt cap over the unpaved Log Yard with contaminated soil and groundwater.

Water quality treatment of stormwater runoff from the completed Project will be provided by a three-stage biofiltration facility. This system will improve the quality of stormwater discharge from the Project Area. The current adverse sub-lethal effect threshold in salmonids for dissolved zinc is 5.6 micrograms per liter (µg/L) over background zinc concentrations of between 3.0 µg/L and 13 µg/L (Sprague 1968 in WSDOT 2022), and the adverse sub-lethal effect threshold in salmonids for dissolved copper is 2.0 µg/L over background levels of 3.0 µg/L or less (Sandahl et al. 2007 in WSDOT 2022). The biofiltration facility is designed to treat total suspended solids, turbidity, zinc, copper, and chemical oxygen demand. Pilot testing of a similar facility at the Port found that a similar three-stage stormwater treatment system provided approximately 90 percent reduction in total copper and zinc concentrations in runoff (Kennedy/Jenks 2022).

Concentrations of 6PPD-quinone, a derivative of an antioxidant added to tires, has been determined to be lethal to coho salmon at concentrations of 0.8 to 0.16 µg/L, and may have similar effect on other salmonid species (Tian et al. 2021). In Seattle region roadway runoff, 6PPD-quinone was detected at concentrations between 0.8 and 19 µg/L, and between <0.3 and 3.2 µg/L in urban watersheds; 6PPD-quinone was not detected in pre- and post-storm samples (Tian et al. 2021). These studies were based on evaluation of inland water bodies (i.e., river, streams, and lakes) and not the marine environment. Discharge of treated stormwater from the proposed Project is directly to marine waters.

The proposed biofiltration system will treat stormwater runoff from the Project Area. The IHTF will support traffic but will not have the traffic volume of an urban roadway. In general, the overall Project Area will be paved and its use will remain as a log transfer facility. Based on the proposed operational use of this facility and vehicle activity limited to trucks (i.e., lower volume than typical roadway), expected pollutant loadings are anticipated to be much smaller for this site than a typical urban watershed. Furthermore, the stormwater system will intercept runoff for treatment during storm events prior to discharge to Port Angeles Harbor and is being designed to meet NPDES ISGP conditions and discharge limits.

As a result, it is anticipated that stormwater runoff discharged to the Port Angeles Harbor from the Project Area will be below lethal and sub-lethal concentrations for salmonids.

The Project will also provide a cap on existing contaminated soil and groundwater at the Project Area. The upland improvements will include importing clean fill material and capping the Project Area with asphalt, which will help contain existing contamination in soil and groundwater, and mitigate contaminant mobilization risk from site runoff that could otherwise discharge to Port Angeles Harbor.

7.2 Indirect Effects

Indirect effects are those impacts that are caused by or result from the proposed action and occur later in time but are still reasonably certain to occur. Three types of indirect effects are analyzed in this section:

1. Changes to ecological systems resulting in altered predator/prey relationships
2. Changes to ecological systems resulting in long-term habitat alteration
3. Anticipated changes in human activities, including changes in land use.

7.2.1 Predator/Prey Relationships

Forage fish are small, schooling fishes that are key prey items for larger predatory fish, including salmonids, in marine habitats (Penttila 2007). In Puget Sound, forage fish species, including Pacific herring, surf smelt, and Pacific sand lance, occupy every marine and estuarine nearshore habitat. Forage fish use nearshore habitats for spawning and as nursery grounds for rearing juveniles. No documented forage fish spawning areas are identified in the action area (WDFW 2021). The potential temporary Project-related turbidity effects during construction and long-term effects to forage fish populations will be insignificant. As such, listed salmonids will not be adversely affected by Project effects to forage fish populations.

Larval rockfish feed on diatoms, dinoflagellates, tintinnids, and cladocerans, and juveniles consume copepods and euphausiids of all life stages (NOAA 2010). Adult rockfish eat demersal invertebrates and small fishes, including other species of rockfish, associated with kelp beds, rocky reefs, pinnacles, and sharp drop-offs. Long-term impacts to populations of rockfish prey species resulting from the proposed Project are expected to be insignificant since their prey occupy a wide geographic range of habitats within Puget Sound and are generally absent from the action area.

Marbled murrelet prey items include invertebrates, including euphausiids, mysids, and amphipods, and small schooling fishes, such as sand lance, anchovy, herring, osmerids, and sea perch (USDA 1995). The fish portion of the diet appears to be most important in the summer and coincides with the nestling and fledgling period. The proposed Project is not expected to result in long-term impacts to murrelet prey populations since their prey items occupy a wide geographic range of habitats throughout Puget Sound.

Humpback whales are known to feed on small crustaceans (i.e., krill), copepods, and small fishes (Animal Diversity Web 2020). Populations of these prey items are not expected to be impacted in the long term as a result of Project activities.

Southern Resident killer whales depend primarily on salmonid prey items, especially Chinook salmon, within the greater Puget Sound area (Ford et al. 1998). The proposed Project is not expected to have long-term impacts to salmonid populations and, therefore, would not adversely affect Southern Resident killer whale populations within the greater Puget Sound.

7.2.2 Long-Term Habitat Alteration

The Cofferdam Dock Facility Improvements will result in relatively minor impacts to benthic habitat (see Appendix A) that are anticipated to have discountable habitat impacts. The IHTF Site Improvements do not include any activities affecting long-term habitat conditions.

7.2.3 Human Activities and Changes in Land Use

The purpose of the Project is repair/improvement of an existing industrial site and will not result in changes in land use or increase the berthing capacity of the Port.

8.0 EFFECT DETERMINATION

This section summarizes the effect determinations for the federally listed species and/or critical habitat potentially present within the action area. Effect determinations are summarized in Table 1 and consolidate determinations for the Cofferdam Dock Facility Improvements (see Appendix A) and the IHTF Site Improvements.

The effect determination to critical habitats for both Coastal-Puget Sound bull trout and Puget Sound steelhead detailed in Table 1 have been revised and updated from the Cofferdam Dock Facility Improvements BE in Appendix A.

9.0 ESSENTIAL FISH HABITAT EVALUATION

NOAA Fisheries is federally mandated under the Magnuson-Stevens Act, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), to identify EFH for all federally managed marine fish. The Magnuson-Stevens Act also mandates that all federal agencies must consult with NOAA Fisheries regarding activities proposed or authorized, funded, or undertaken by the agency that may result in an adverse effect on EFH. The Pacific Fisheries Management Council (PFMC) has designated EFH for the Pacific salmon fishery, federally managed groundfish, and coastal pelagic fisheries (PFMC 1999). The objective of the EFH evaluation is to describe potential adverse effects on designated EFH for federally managed fisheries species within the proposed action area. It also describes conservation measures that could be taken to avoid, minimize, or otherwise offset potential adverse effects to designated EFH resulting from the proposed action.

9.1 Project Description

The Port is proposing to improve the cargo handling infrastructure at the IHTF located at 1301 Marine Drive in Port Angeles (Figure 1). The existing waterfront IHTF is key in the inflow and outflow of wood fiber (whole logs and wood chips) from the sustainably managed private and public lands in Clallam and Jefferson Counties. This Project includes the following elements:

1) *Cofferdam Dock Facility Improvements – barge facility*
    a. Remove and replace existing retaining wall with mechanically stabilized earth wall
    b. Install fiberglass sheet pile encasement
    c. Replace structural steel waler beam
2) *IHTF Upland Site Improvements*
    a. Raise existing surface elevation and construct high-load capacity asphalt concrete surface covering 14.4 acres for operational efficiency and stormwater conveyance
    b. Construct a three-stage biofiltration facility to treat stormwater from resurfaced IHTF prior to discharge to Port Angeles Harbor.

The Pacific salmon fishery management unit includes Chinook salmon, coho salmon (*O. kisutch*), and pink salmon (*O. gorbuscha*). Pacific salmon fishery-designated EFH includes all streams, lakes, ponds, wetlands, and other water bodies currently or historically accessible to salmon in Washington State, except above impassable barriers. Estuarine and marine areas extend from the nearshore and tidal submerged environments within Washington territorial waters to the full extent of the exclusive economic zone (PFMC 1999).

Chinook salmon have been discussed in previous sections of this BE. Coho salmon spawn in smaller tributaries, with juvenile salmon staying in their freshwater habitat up to 18 months before migrating to the ocean. Pink salmon enter estuarine environments soon after emerging from gravel and, thus, are much younger than coho or Chinook salmon when they reach this marine environment. A detailed life history for these salmon species can be found in Page and Burr (1991). Juvenile salmon en route to ocean waters use the shallow subtidal areas of estuaries as nurseries to acclimate to the marine environment and prepare for their ocean life stage.

Groundfish, which include 83 species in the west coastal management unit, live on or near the bottom of the ocean. This unit includes skates and sharks, rockfish (55 species), flatfish (12 species), and groundfish such as lingcod (*Ophiodon elongatus*), cabezon (*Scorpaenichthys marmoratus*), and brown rockfish (*Sebastes auriculatus*). Coastal pelagics are schooling species not associated with the ocean bottom; they migrate in coastal waters. Pelagics include market squid (*Loligo opalescens*), Pacific sardine (*Sardinops sagax caerulea*), Pacific chub (*Scomber japonicus*), northern anchovy (*Engraulis mordax*), and jack mackerel (*Trachurus symmetricus*).

The EFH for groundfish and coastal pelagics is defined as those waters and substrate necessary to ensure the production needed to support a long-term sustainable fishery. The extent of EFH for these species includes those waters from the nearshore and tidal submerged environment within Washington State territorial waters to the limits of the Exclusive Economic Zone (200 miles off the Pacific Coast; PFMC 1999). Pacific groundfish species are unlikely to be found in significant numbers in the Project Area, given the habitat limitations from the altered estuarine nearshore environment and disturbance from sport and commercial in-water activities. However, some groundfish species may occasionally forage or rear in the subtidal areas near the Project Area. Groundfish EFH species most likely to be found in the vicinity of the Project Area include starry flounder (*Platichthys stellatus*), English sole (*Parophrys vetulus*), and ratfish (*Hydrolagus colliei*), most commonly associated with subtidal sand and sandy gravel substrates.

9.2 Potential Effects of the Proposed Project

Impacts to the following parameters are assessed in Appendix D of the Cofferdam BE (see Appendix A): 1) suspended sediment, 2) dissolved oxygen, 3) exposure to contaminants, and 4) benthic disturbance and habitat loss, which concludes that the Cofferdam Dock Facility Improvements component of the Project is not expected to cause adverse impacts to EFH.

Supplemental impacts as a result of the IHTF Upland Site Improvements component of the Project are limited to water quality effects associated with runoff from the completed Project. It is anticipated that stormwater runoff discharged to Port Angeles Harbor from the Project Area will be below lethal and sub-lethal concentrations for salmonids (see Section 7.1.1). Furthermore, the Project will also provide a cap on existing contaminated soil and groundwater at the Project Area. The upland improvements will include importing clean fill material and capping the Project Area with asphalt, which will help contain existing contaminated soil and groundwater and mitigate contaminant mobilization risk from site runoff that could otherwise discharge to Port Angeles Harbor. Therefore, the proposed Project will have no permanent adverse effects on Pacific salmon, groundfish, or coastal pelagic EFH.

10.0 USE OF THIS REPORT

This report has been prepared for the exclusive use of the Port of Port Angeles and applicable regulatory agencies for specific application to the Port's Intermodal Handling and Transfer Facility Improvements Project. No other party is entitled to rely on the information, conclusions, and recommendations included in this document without the express written consent of Landau. Further, the reuse of information, conclusions, and recommendations provided herein for extensions of the project or for any other project, without review and authorization by Landau, shall be at the user's sole risk. Landau warrants that within the limitations of scope, schedule, and budget, our services have been provided in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions as this project. Landau makes no other warranty, either express or implied.

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Data Source: Esri.

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Intermodal Handling and Transfer Facility Improvements Project Port of Port Angeles Port Angeles, Washington	**Vicinity Map**	Figure 1

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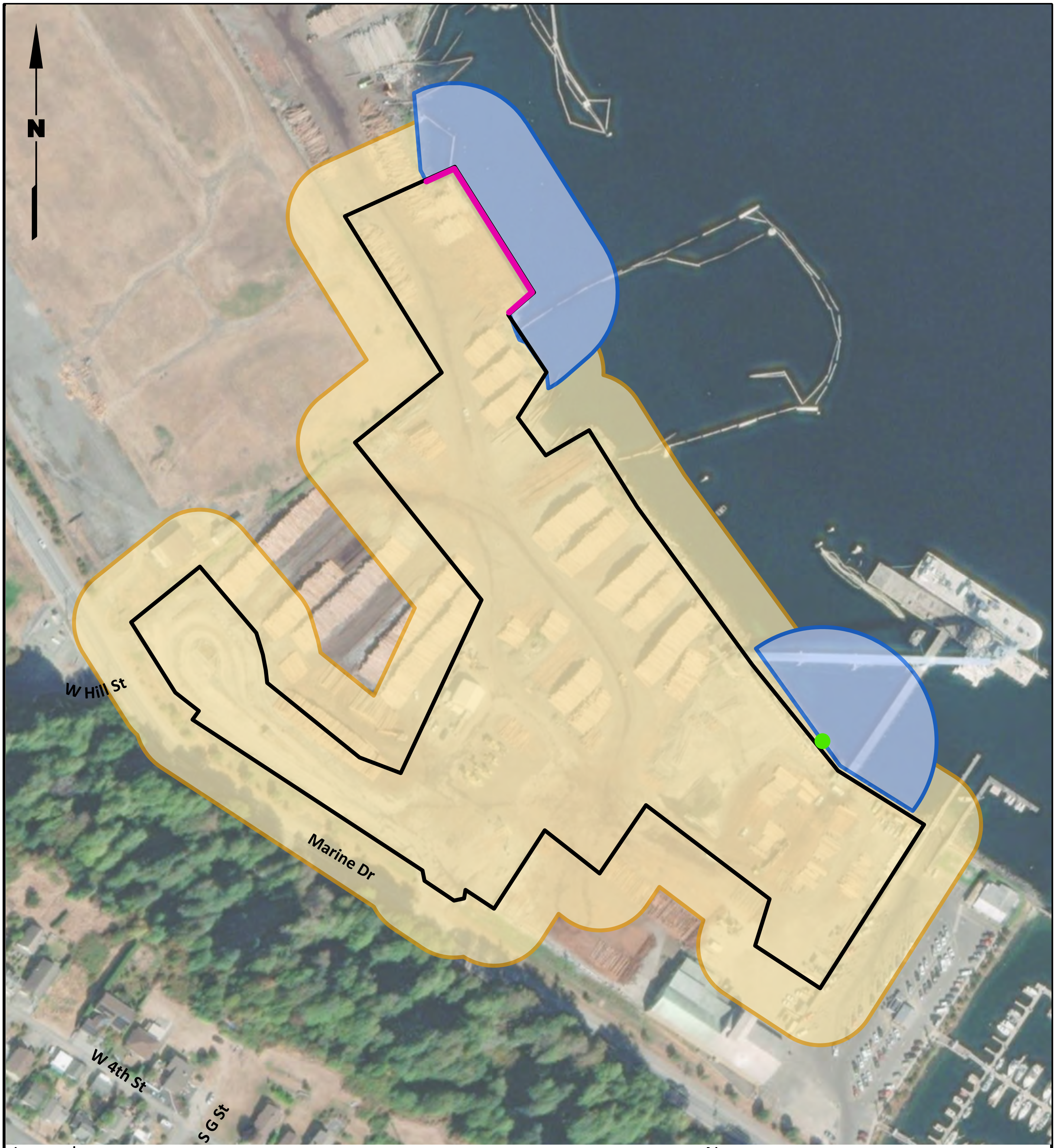

Legend

- ● Stormwater Outfall
- ━ Cofferdam
- ▭ Project Area
- 🟦 Aquatic Component of Action Area
- 🟨 Terrestrial Component of Action Area

Note

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

0 250 500

Scale in Feet

Data Source: Esri World Imagery.

Intermodal Handling and Transfer Facility
Improvements Project
Port of Port Angeles
Port Angeles, Washington

Action Area Map

Figure
2

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Table 1
Species and Critical Habitat Effect Determinations
Biological Evaluation and Essential Fish Habitat Evaluation
Port of Port Angeles Intermodal Handling and Transfer Facility Improvements Project
Port Angeles, Washington

Direct and Indirect Effects to Listed Species				Direct and Indirect Effects to Critical Habitat			
Species	**Federal Status**	**Effect Determination**	**Basis for Determination**	**Designated Critical Habitat in Action Area?**	**Physical and Biological Features**	**Effect Determination**	**Basis for Determination**
BIRDS							
Marbled murrelet (*Brachyramphus marmoratus*)	T	May Affect, Not Likely to Adversely Affect	• The vicinity of the project does not provide appropriate marbled murrelet habitat. • Marbled murrelet may occur in the vicinity during the in-water work period, but the extent of disturbance will be insignificant relative to available habitat in adjacent areas. • Turbidity is not expected to extend 1 ft beyond the cofferdam during in-water work and will be short-term in duration. • Airborne noise from the Project will attenuate to background within 100 ft of construction and will be short-term in duration.	No	N/A	NE	Designated critical habitat does not occur in the action area.
FISH							
Coastal-Puget Sound DPS bull trout (*Salvelinus confluentus*)	T	May Affect, Not Likely to Adversely Affect	• Turbidity is not expected to extend 1 ft beyond the cofferdam during in-water work and will be short-term in duration. • Work will be completed during the in-water work window. • The epoxy grout will not come into contact with the water. • All other Project activities will be performed in the dry. • Proposed stormwater treatment is anticipated to improve the quality of runoff discharge to Port Angeles Harbor from the site.	Yes	Marine Environments: • Migration habitats with minimal impediments • Abundant food base • Sufficient water quantity and temperature	May Affect, Not Likely to Adversely Affect	• Turbidity is not expected to extend 1 ft beyond the cofferdam during in-water work and will be short term in duration. • No new obstructions or degradation to shoreline processes or complexity. • No obstruction or alteration of natural cover will occur. • Water quantity, quality, and salinity conditions will not be adversely affected by the Project.
Puget Sound ESU Chinook salmon (*Oncorhynchus tshawytscha*)	T	May Affect, Not Likely to Adversely Affect	• Turbidity is not expected to extend 1 ft beyond the cofferdam during in-water work and will be short-term in duration. • Work will be completed during the in-water work window. • The epoxy grout will not come into contact with the water. • All other Project activities will be performed in the dry. • Proposed stormwater treatment is anticipated to improve the quality of runoff discharge to Port Angeles Harbor from the site.	Yes	Marine Environments: • Free of obstruction • Natural cover • Juvenile and adult forage • Water quantity, quality and salinity conditions supporting juvenile and adult physiological transitions between fresh and saltwater	May Affect, Not Likely to Adversely Affect	• Turbidity is not expected to extend 1 ft beyond the cofferdam during in-water work and will be short-term in duration. • No new obstructions to migration would occur. • No obstruction or alteration of natural cover will occur. • Water quantity, quality, and salinity conditions will not be adversely affected by the Project.
Hood Canal summer-run ESU chum salmon (*O. keta*)	T	May Affect, Not Likely to Adversely Affect	• Turbidity is not expected to extend 1 ft beyond the cofferdam during in-water work and will be short-term in duration. • Work will be completed during the in-water work window. • The epoxy grout will not come into contact with the water. • All other Project activities will be performed in the dry. • Proposed stormwater treatment is anticipated to improve the quality of runoff discharge to Port Angeles Harbor from the site.	No	N/A	NE	Designated critical habitat does not occur in the action area.

Table 1
Species and Critical Habitat Effect Determinations
Biological Evaluation and Essential Fish Habitat Evaluation
Port of Port Angeles Intermodal Handling and Transfer Facility Improvements Project
Port Angeles, Washington

Direct and Indirect Effects to Listed Species				Direct and Indirect Effects to Critical Habitat			
Species	**Federal Status**	**Effect Determination**	**Basis for Determination**	**Designated Critical Habitat in Action Area?**	**Physical and Biological Features**	**Effect Determination**	**Basis for Determination**
Puget Sound steelhead trout (*O. mykiss*)	**T**	May Affect, Not Likely to Adversely Affect	• Turbidity is not expected to extend 1 ft beyond the cofferdam during in-water work and will be short-term in duration. • Work will be completed during the in-water work window. • The epoxy grout will not come into contact with the water. • All other Project activities will be performed in the dry. • Proposed stormwater treatment is anticipated to improve the quality of runoff discharge to Port Angeles Harbor from the site.	No	N/A	NE	Designated critical habitat does not occur in the action area.
Puget Sound-Georgia Basin Yelloweye rockfish (*S. ruberrimus*)	T	No Effect	• Yelloweye rockfish will not be present in the intertidal zone in the vicinity of the project.	No	N/A	NE	Designated critical habitat does not occur in the action area.
Puget Sound-Georgia Basin DPS bocaccio rockfish (*Sebastes paucispinis*)	E	No Effect	• Bocaccio will not be present in the intertidal zone in the vicinity of the project.	No	N/A	NE	Designated critical habitat does not occur in the action area.
Southern DPS eulachon (*Thaleichthys pacificus*)	T	May Affect, Not Likely to Adversely Affect	• The vicinity of the project does not likely provide appropriate eulachon habitat. • Turbidity is not expected to extend 1 ft beyond the cofferdam during in-water work and will be short-term in duration. • Work will be completed during the in-water work window. • The epoxy grout will not come into contact with the water. • All other Project activities will be performed in the dry. • Proposed stormwater treatment is anticipated to improve the quality of runoff discharge to Port Angeles Harbor from the site.	No	N/A	NE	Designated critical habitat does not occur in the action area.
Southern DPS North American green sturgeon (*Acipenser medirostris*)	T	May Affect, Not Likely to Adversely Affect	• The vicinity of the project does not provide appropriate habitat for green sturgeon. • Green sturgeon have not been documented in Port Angeles Harbor, while they may forage in the action area, this would be a rare occurrence. • Turbidity is not expected to extend 1 ft beyond the cofferdam during in-water work and will be short-term in duration. • Work will be completed during the in-water work window. • The epoxy grout will not come into contact with the water. • All other Project activities will be performed in the dry. • Proposed stormwater treatment is anticipated to improve the quality of runoff discharge to Port Angeles Harbor from the site.	No	N/A	NE	Designated critical habitat does not occur in the action area.
MARINE MAMMALS							
Humpback whale (*Megaptera novaeangliae*)	E	No Effect	• Species is not present in the action area	N/A	N/A	N/A	There is no designated critical habitat for this species.

Table 1
Species and Critical Habitat Effect Determinations
Biological Evaluation and Essential Fish Habitat Evaluation
Port of Port Angeles Intermodal Handling and Transfer Facility Improvements Project
Port Angeles, Washington

Direct and Indirect Effects to Listed Species				Direct and Indirect Effects to Critical Habitat			
Species	**Federal Status**	**Effect Determination**	**Basis for Determination**	**Designated Critical Habitat in Action Area?**	**Physical and Biological Features**	**Effect Determination**	**Basis for Determination**
Southern Resident DPS killer whale (*Orcinus orca*)	E	No Effect	• Species is not present in the action area	Yes	Marine environments: • Water quality • Prey species • Adequate passage conditions for migration, resting, and foraging	May Affect, Not Likely to Adversely Affect	• Water quality will not be adversely affected by the Project. • Abundance and availability of prey resources will not be adversely affected by the Project. • No new obstructions to migration would occur.
MARINE REPTILES							
Leatherback sea turtle (*Dermochelys coriacea*)	E	No Effect	• Species is not present in the action area	No	N\A	NE	Designated critical habitat does not occur in the action area.

Key:
T = Threatened
E = Endangered
N/A = Not applicable

APPENDIX A

Port of Port Angeles Cofferdam Repair Project Biological Evaluation

CONFLUENCE
ENVIRONMENTAL COMPANY

Port of Port Angeles Cofferdam Repair Project
BIOLOGICAL EVALUATION

Prepared for:

Port of Port Angeles
April 2021

146 N Canal St, Suite 111 • Seattle, WA 98103 • www.confenv.com

PORT OF PORT ANGELES COFFERDAM REPAIR PROJECT BIOLOGICAL EVALUATION

Prepared for:

Port of Port Angeles
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Attn: Chris Hartman

Authored by:
Confluence Environmental Company

April 2021

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EXECUTIVE SUMMARY

The Port of Port Angeles (Port) is proposing to conduct maintenance and repair of an existing cofferdam at the Port's log yard, within Port Angeles Harbor in Clallam County, WA. Originally constructed in 2004 to support the Washington Department of Transportation's (WSDOT) Graving Dock Project, which was subsequently abandoned, the structure was acquired by the Port, filled, and brought to grade with the neighboring log yard. It has since served as a temporary barge moorage where timber products are loaded or unloaded to/from the yard. Due to years of industrial use and exposure to saltwater, the sheetpile retaining wall along the shoreline margin of the structure is currently corroding and in need of repair and maintenance to increase its functionality and service life.

The elements of the Project have been evaluated to determine how the proposed action might affect any threatened or endangered species or designated critical habitat that may be present in the action area defined for this biological evaluation (BE). This BE summarizes available information on potential effects of the project on those evolutionarily significant units (ESUs) or distinct population segments (DPSs) of species listed under the Endangered Species Act (ESA) as well as any critical habitat that may be designated within the action area. This BE addresses potential impacts to 13 ESUs/DPSs (Table ES-1): marbled murrelet (*Brachyramphus marmoratus*), Coastal-Puget Sound DPS of bull trout (*Salvelinus confluentus*), Puget Sound ESU of Chinook salmon (*Oncorhynchus tshawytscha*), Hood Canal summer-run ESU of chum salmon (*Oncorhynchus keta*), Puget Sound DPS steelhead trout (*Oncorhynchus mykiss*), Puget Sound/Georgia Basin DPS of yelloweye rockfish (*Sebastes ruberrimus*), Puget Sound/Georgia Basin DPS of bocaccio (*Sebastes paucispinis*), Southern DPS of eulachon (*Thaleichthys pacificus*), Southern DPS of North American green sturgeon (*Acipenser medirostris*), southern resident DPS killer whale (*Orcinus orca*), Central America DPS of humpback whale (*Megaptera novaeangliae*), Mexico DPS of humpback whale (*Megaptera novaeangliae*), and leatherback sea turtle (*Dermochelys coriacea*). It also addresses designated critical habitat for bull trout, Chinook salmon, steelhead, and killer whale (Table ES-1).

Potential effects of the project on ESA-listed species and designated critical habitat include changes in water quality, benthic disturbance, and airborne noise.

Table ES-1. Species and Critical Habitat Evaluated in this Biological Evaluation and Effect Determinations.

Species (Scientific Name)	Listing Date	Federal Status	Designated Critical Habitat?	Species Effect Determination	Critical Habitat Determination
Birds					
Marbled murrelet (*Brachyramphus marmoratus*)	10-01-1992 (effective 10-28-1992)	Threatened	Yes*	Not Likely to Adversely Effect	No Effect*
Fish					
Bull trout, Coastal-PS DPS (*Salvelinus confluentus*)	06-10-1998	Threatened	Yes, overlap with action area	Not Likely to Adversely Effect	Not Likely to Adversely Effect
Chinook salmon, Puget Sound ESU (*Oncorhynchus tshawytscha*)	08-02-1999	Threatened	Yes, overlap with action area	Not Likely to Adversely Effect	Not Likely to Adversely Effect
Chum salmon, Hood Canal summer-run ESU (*Oncorhynchus keta*)	08-02-1999	Threatened	Yes*	Not Likely to Adversely Effect	No Effect*
Steelhead trout, Puget Sound DPS (*Oncorhynchus mykiss*)	05-07-2007	Threatened	Yes, overlap with action area	Not Likely to Adversely Effect	Not Likely to Adversely Effect
Yelloweye rockfish, Puget Sound/Georgia Basin DPS (*Sebastes ruberrimus*)	04-28-2010	Threatened	Yes*	No Effect	No Effect*
Bocaccio rockfish, Puget Sound/Georgia Basin DPS (*Sebastes paucispinis*)	04-28-2010	Endangered	Yes*	No Effect	No Effect*
Eulachon, Southern DPS (*Thaleichthys pacificus*)	03-18-2010	Threatened	Yes*	No Effect	No Effect*
North American green sturgeon, Southern DPS (*Acipenser medirostris*)	10-09-2009	Threatened	Yes*	Not Likely to Adversely Effect	No Effect*
Marine Mammals					
Killer whale, southern resident DPS (*Orcinus orca*)	02-16-2006	Endangered	Yes, overlap with action area	Not Likely to Adversely Effect	No Effect
Humpback whale, Central America DPS (*Megaptera novaeangliae*)	12-02-1970	Endangered	None designated	Not Likely to Adversely Effect	Not Designated
Humpback whale, Mexico DPS (*Megaptera novaeangliae*)	12-02-1970	Threatened	None designated	Not Likely to Adversely Effect	Not Designated
Reptiles					
Leatherback sea turtle (*Dermochelys coriacea*)	06-02-1970	Endangered	Yes*	No Effect	No Effect*
*Critical habitat has been identified but does not occur within the proposed action area.					

1.0 PROJECT OVERVIEW

The Port of Port Angeles proposes to conduct maintenance and repair to the structure located along the shoreline at the Port's log yard in Port Angeles, WA (Figure 1). Existing backfill material supporting the structure wall is unsuitable for long-term industrial use. Proposed repair and maintenance actions include 3 primary components: (1) construction of a mechanically stabilized earth wall and improved backfill, (2) maintenance of the waterward sheetpile wall to address corrosion, and (3) repair of the waler beam/tie rods that provide structural support.

1.1 Federal Nexus

Section 7 of the Endangered Species Act (ESA) requires federal agencies to consult with the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) (hereafter known as the "Services") to ensure that their actions do not jeopardize listed species or their designated critical habitat. The federal action for this Project is the requirement of a federal permit or authorization from the U.S. Army Corps of Engineers (Corps). The Corps is the lead federal agency for this consultation. The purpose of this biological BE is to evaluate the Project to determine how it may affect any threatened or endangered species or their designated critical habitat that may occur within the action area defined for this BE in Appendices A-C. This document synthesizes available information regarding available habitat and species occurrence in the action area and evaluates the potential effects the Project might have on ESA-listed species and their critical habitat. Additionally, an assessment of the project's potential effects to Essential Fish Habitat (EFH), regulated under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and administered by NMFS, is provided in Appendix D.

1.2 Project Area and Setting

The Project is located in Clallam County, Washington, along the southwestern shoreline of Port Angeles Harbor within an existing log yard in Township 30 North, Range 6 West (Figure 1). The Port of Port Angeles owns approximately 35 acres of property in Port Angeles Harbor and manages the property for industrial, commercial, and recreational uses. The project site is located within City of Port Angeles's shoreline jurisdiction within the "Industrial, Heavy" zone. The Port's log yard is used for log processing, storage, and transport to and from vessels moored at the structure.

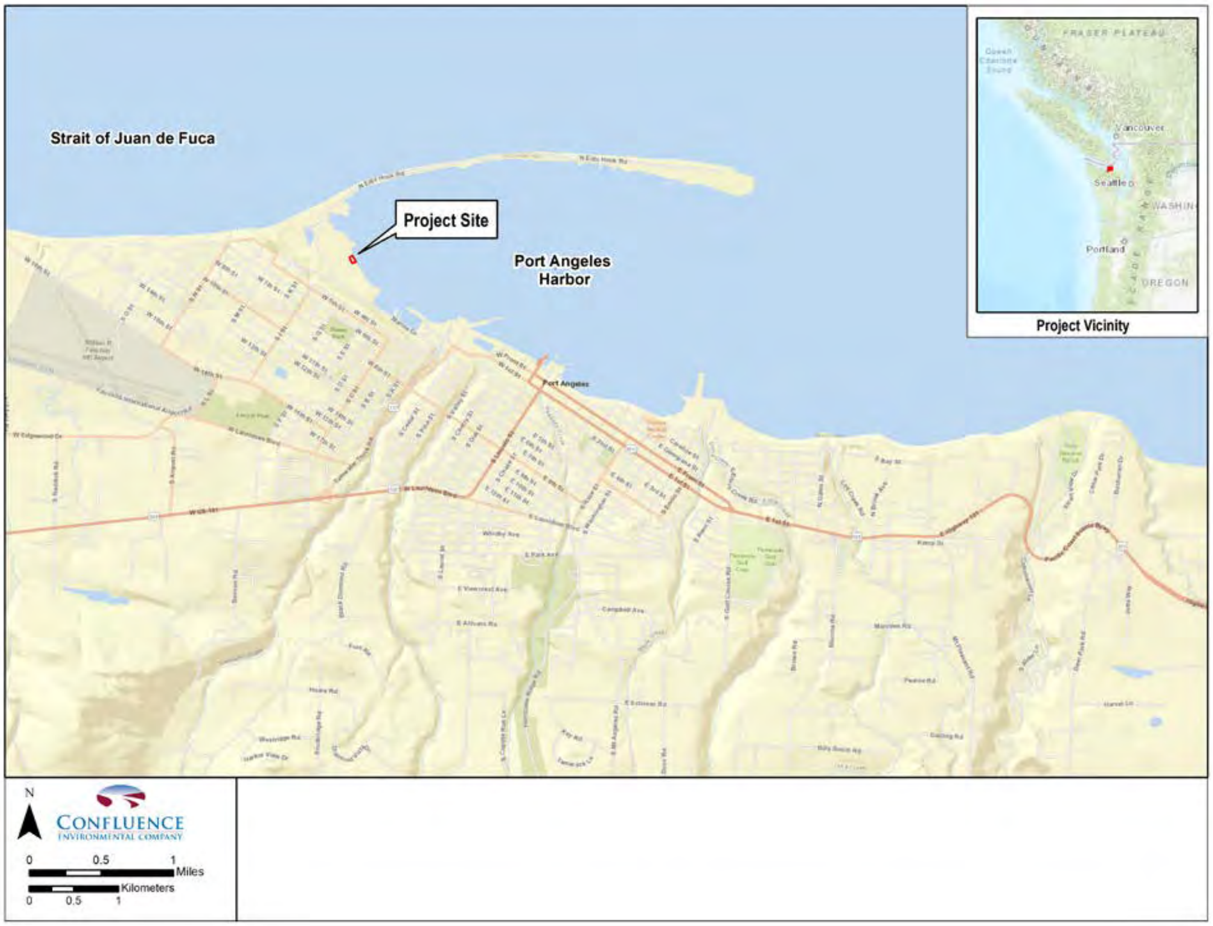

Figure 1. Project Vicinity

1.3 Project Summary

The Port proposes maintenance and repair to an existing structure that is composed of a steel sheetpile wall approximately 335 linear feet long (Figure 2) bordering the shoreline. This wall is tied back to a second, parallel sheetpile wall located approximately 30 feet landward. Tie rods connect the sheetpile walls together and are attached to a double channel waler beam above the High Tide Line (HTL[1]). Existing backfill material between the sheetpile walls consists of loose dirt fill and wood debris – material that does not provide a suitable foundation for long-term industrial use of the facility. Proposed repair and maintenance actions include 3 primary components: (1) construction of a mechanically stabilized earth wall and improved backfill, (2) maintenance of the waterward sheetpile wall to address corrosion, and (3) repair of the waler beam/tie rods that provide structural support. These components are further described in the following sections. The current

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1 For the purposes of this project, the HTL is defined as the elevation of the transition line along the waterward sheetpile wall between rust and marine growth. The HTL was determined by measuring the distance from the top of the waterward sheetpile wall to the top of marine growth (48 inches) and subtracting that value from the elevation of the sheetpile wall (11.16 feet), which puts the HTL at 7.16 feet. Mean Higher High Water (MHHW) at Port Angeles is at 7.06 feet (NOAA station #9444090), 0.1 feet below the measured HTL.

use and footprint of the structure would not change as a result of this maintenance project. Mitigation was completed in 2004 to offset anticipated impacts of the construction and operation of the previously planned Graving Dock gate. The shoreline restoration project was implemented by WSDOT, in partnership with the Port of Port Angeles, and included the following activities at Ediz Hook:

- Restoration of 1,000 linear feet of shoreline to a nature condition
- Removing 54 creosote piling
- Removing fill and anthropogenic debris from the beach
- Excavating the vertical face of the shoreline to establish a natural beach profile
- Restoring the beach surface
- Placing large woody debris and seeding the uplands
- Maintaining a traffic barrier to restrict human interference

1.3.1 Construction of a Mechanically Stabilized Earth Wall and Backfill

The existing backfill is unsuitable for long-term industrial use. To address this issue, the Port proposes to construct a mechanically stabilized earth wall behind the existing waterward sheetpile wall, which will provide the support necessary to maintain industrial use of the structure. This work will include the excavation of the material that was placed landward of the sheetpile wall in 2004, which will be stockpiled on-site for later reuse. The uppermost layer, however, is not reusable and will therefore be transported to a City of Port Angeles-approved location on-site or hauled off-site to an approved upland disposal facility. The area proposed for excavation is 60 feet wide, measured landward from the waterward sheetpile wall, and will encompass a total excavation and grading area of 16,000 square feet.

The mechanically stabilized earth wall itself will be constructed using layers of compacted gravel backfill (WSDOT standard), with sheets of geogrid reinforcement placed every 2 feet of backfill depth. The uppermost 2 feet of the structure will be surfaced with both quarry spalls and crushed surface base coarse rock to provide a solid, yet more permeable surface to improve the drainage function. The ecology blocks, which currently retain earthen material along the waterward edge of the structure, will be relocated during construction and placed directly upland of the waterward sheetpile wall, within their existing footprint. A 1-foot-wide section of free draining rock will be placed parallel and adjacent to the relocated ecology blocks along the length of the structure. To allow stormwater infiltration and drainage through the structure, weep holes will be installed through the draining rock, ecology blocks, and sheetpile wall. In response to limited on-site stormwater/drainage infrastructure, site stormwater is being addressed in a separate project, which will involve conveyance to the structure.

All of the excavation and backfill work will avoid contact with aquatic areas.

1.3.2 *Maintenance of Sheetpile Wall*

To address the corroding waterward sheetpile wall, the Port proposes to install a 1.25-inch-thick fiberglass encasement against the wall. The fiberglass encasement will be custom-fabricated to match the shape of the existing sheetpile wall. The encasement would be installed along the length and sides of the waterward sheetpile wall, which will cover an area of approximately 335 linear feet and extend approximately 6 inches below the mudline. The encasement will help prevent further corrosion of the steel, thereby prolonging the life of the structure.

The fiberglass encasement will be installed with an excavator staged in the upland log yard. To install the encasement, the excavator will set it into position and press it into the mudline, which may require a minimal amount of riprap to be shifted along the sides of the structure. The approximate 1-inch gap between the waterward sheetpile wall and the fiberglass encasement will be filled with epoxy grout, which will seal the encasement to the steel.

1.3.3 *Ancillary Maintenance and Repair Activities*

The existing waler beam on the waterward sheetpile wall is significantly corroded and, therefore, needs to be replaced. The Port is proposing to replace the existing waler with similar equipment. The tie rods that run through the waler and connect the waterward and landward sheetpile walls also require maintenance and possible replacement if the rods are corroded beyond repair. Maintenance activities will include installation of end caps, anti-corrosion wraps, and grout plugs. This work will occur during upland excavation when these structural components are exposed.

1.3.4 *Mitigation: Shoreline Restoration*

In coordination with WSDOT, the Port completed 1,500 feet of shoreline restoration as advanced mitigation for the WSDOT Graving Dock project, of which this project was an element (HPA Approval Number ST-E1558-02). This mitigation was planned in advance to serve the larger project of the WSDOT Graving Dock, which required 1,000 linear feet of shoreline restoration mitigation. The larger project was then downsized to include only the cofferdam construction elements, which are now in need of repair and maintenance. In 2003, WDFW authorized the 500 feet of excess shoreline restoration allotted to the Graving Dock Project to be banked and used as mitigation credit for any future project impacts by the Port or designee.

The initial shoreline conditions included creosote piling, a dilapidated concrete boat launch, and crumbling hard armoring structures. The shoreline restoration included the removal of the boat launch, creosote piling, manmade debris, and hard armoring elements; and the placement of clean sand, large woody debris, and vegetation mirroring conditions of adjacent beaches. Photos of the restoration site before and after are shown in Figure 2.

An additional 500 linear feet of upper intertidal shoreline restoration was banked for future use as mitigation. The banked mitigation included the removal of 54 creosote treated piling.

Advanced mitigation was implemented in 2003 for a proposed impact much greater than that of the cofferdam loading structure. That mitigation was designed to offset the effect of a modified shoreline for the lifespan of the original project. The shoreline restoration was intended to negate the effects of a much larger impact from dredging and installation of the Graving Dock gate and will offset the much smaller impacts of the continued existence of the cofferdam loading structure. The 2003 Biological Opinion acknowledges this point, stating that beach restoration provides long-term benefit to ESA-listed salmonids.

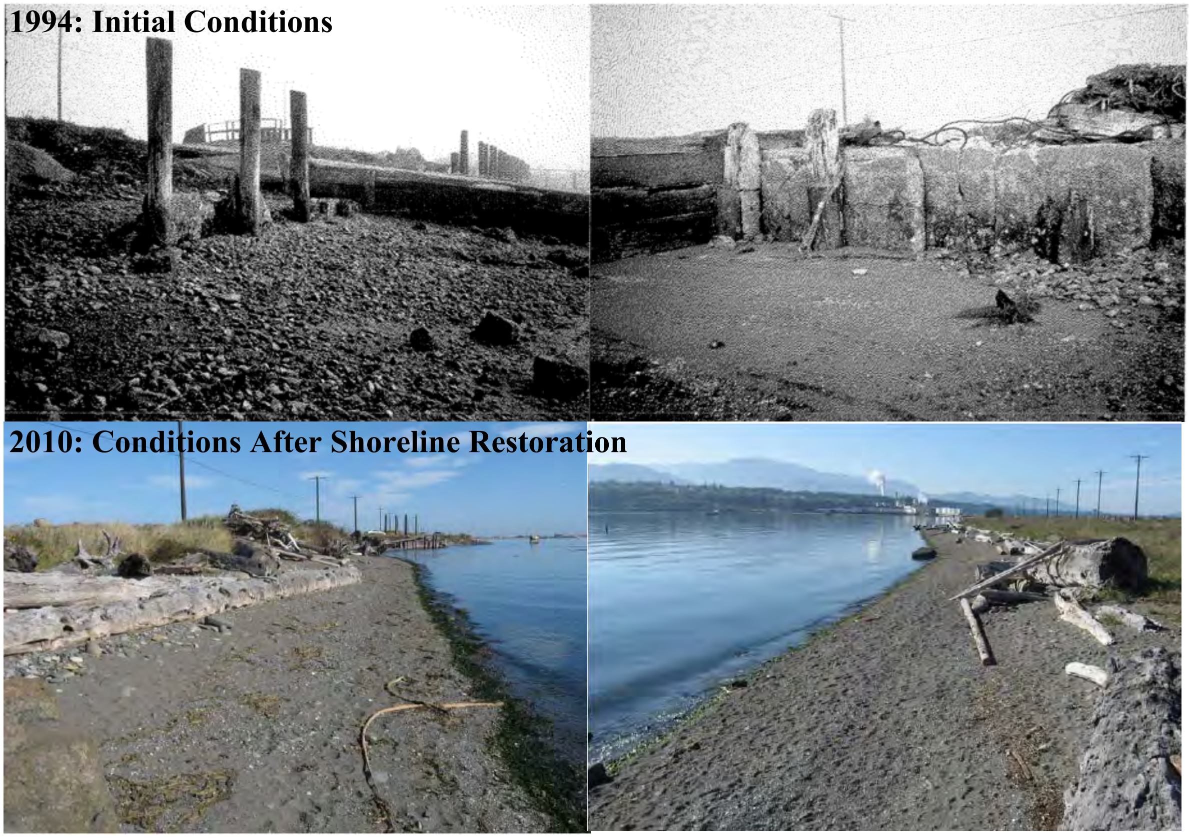

Figure 2. Shoreline Restoration (1,500 ft): Conditions Before (1994) and After (2010).

1.4 Project Timeline and Sequencing

Project construction is expected to last approximately 3 months and is proposed to begin in July of 2022 and be completed by the end of December of 2022. The following construction sequence is proposed:

- Construction will begin with excavation behind the waterward sheetpile wall to remove the structure’s base material. The area will be excavated up to 12 feet below ground surface.
- Construction will then transition to in-water work. Land-based excavators will remove the existing waler beam and install the fiberglass encasement.

- Once the encasement is installed, the small gap between it and the sheetpile wall will be dewatered using a sump pump and transported upland. The water will not be discharged directly back to the harbor, and instead will either be infiltrated on-site, beneficially reused, or hauled off-site, per the decision of the Port and its contractor.
- Grout filling will then begin with diver assistance, starting at the lowest elevation and moving upward until the top elevation of +11 feet MLLW is reached. A pump truck and hose will be positioned upland. The diver will connect the hose to pre-installed ports in the fiberglass encasement, and move from port-to-port, injecting the grout, until the uppermost elevation is reached.
- Once the fiberglass encasement has been secured to the sheetpile wall, the replacement waler beams will be installed over the tie rod ends protruding through the encasement. The end caps will be installed. These maintenance activities will occur above the HTL elevation.
- A land-based excavator or pulley system will be used in conjunction with a skiff to install the waler beams and end caps.

An upland excavator will backfill the stockpiled material into the structure's footprint to an approximate elevation of +9 feet MLLW, which will be followed by the construction of the mechanically stabilized earth wall.

1.5 Construction Staging, Access, and Demobilization

All Project related heavy equipment will be staged upland. A small dive boat and/or skiff will assist with in-water work. Access during the Project maintenance and repair activities will primarily be upland, from the Port's log yard. Project related vessels will access the site via existing boat ramps and vessel lanes at the Port. Demobilization will include removing construction BMP measures, as necessary, and site clean-up. Equipment and remaining construction materials will be transported back to their points of origin.

1.6 Conservation and Minimization Measures

The following best management practices (BMPs) will be implemented throughout the project to ensure no impacts to ESA-listed species occur. The following BMPs are proposed for the project:

- Placement of the fiberglass sheetpile encasements will be completed during the approved in-water work window for Tidal Reference Area 10 (July 16 – February 15). Any shifting of riprap necessitated by the installation of the encasement will occur in the dry.
- A temporary floating debris boom will be deployed waterward of the loading structure to capture potential debris during project construction; the debris boom will be anchored to the shore above the HTL.
- All equipment to be used for construction activities will be cleaned and inspected prior to arriving at the project site to ensure no potentially hazardous materials are introduced, no leaks are present, and the equipment is functioning properly. Should a leak be detected on

heavy equipment used for the project, the equipment will be immediately removed from areas immediately adjacent to the HTL.

- A project-specific Temporary Erosion and Sediment Control plan will be developed and implemented. Examples of applicable BMPs include, but are not limited to, the following: maintain the existing plugged catch basin, comply with measures from a project-specific stormwater pollution prevention plan, and establish a filter fabric construction fence around the site with a 4-inch by 4-inch trench and stabilized construction entrances.
- The contractor will develop and implement a Stormwater Pollution and Prevention Plan.
- Stockpiles will be mounded in a way to prevent runoff and covered in reinforced plastic sheeting.

2.0 ACTION AREA

The action area for ESA analysis is defined as "all areas to be affected directly or indirectly by the proposed action and not merely the immediate area directly adjacent to the action" (50 CFR 402.02). The action area includes the Project site and all surrounding areas where Project activities could potentially affect the environment. The extent of the action area encompasses direct and indirect effects, as well as any effects of interrelated or interdependent actions.

The action area consists of distinct Project components and the maximum extent of potential effects associated with each component. The components assessed to determine the extent of the action area include the following:

- Direct site disturbance
- Turbidity
- Airborne and underwater noise

The farthest-reaching underwater effect from the proposed Project is likely to be turbidity; thus, the in-water component of the action area is defined by the limits of turbidity. Installing the fiberglass encasement is not expected to generate turbidity plumes above the wave-influenced background levels, where the tidal water exchange ranges from 5 to 11 feet twice per day (NOAA Tide Station #9444090). It is conceivable, however, that localized turbidity could increase slightly near the base of the replacement sheetpile pieces as they are placed into the substrate. Therefore, the in-water component of the action area is set to extend 1 foot from the waterward sheetpile wall (Figure 3).

The airborne component of the action area is defined by the noise generated by the Project related heavy equipment, which includes excavators, dump trucks, and front-end loaders. The extent of airborne noise is defined as the distance from the noise source at which noise attenuates to background sound levels (WSDOT 2020). Given the Project construction activity and background noise levels, project related noise will travel is 89 feet from upland excavator operation activities before attenuating to background levels. Therefore, the airborne action area is set to extend 89 feet from repair activities.

Figure 3 provides the spatial extents of the underwater and airborne components of the action area. The detailed analysis of the Project effects, and spatial extents, is included in Section 5.

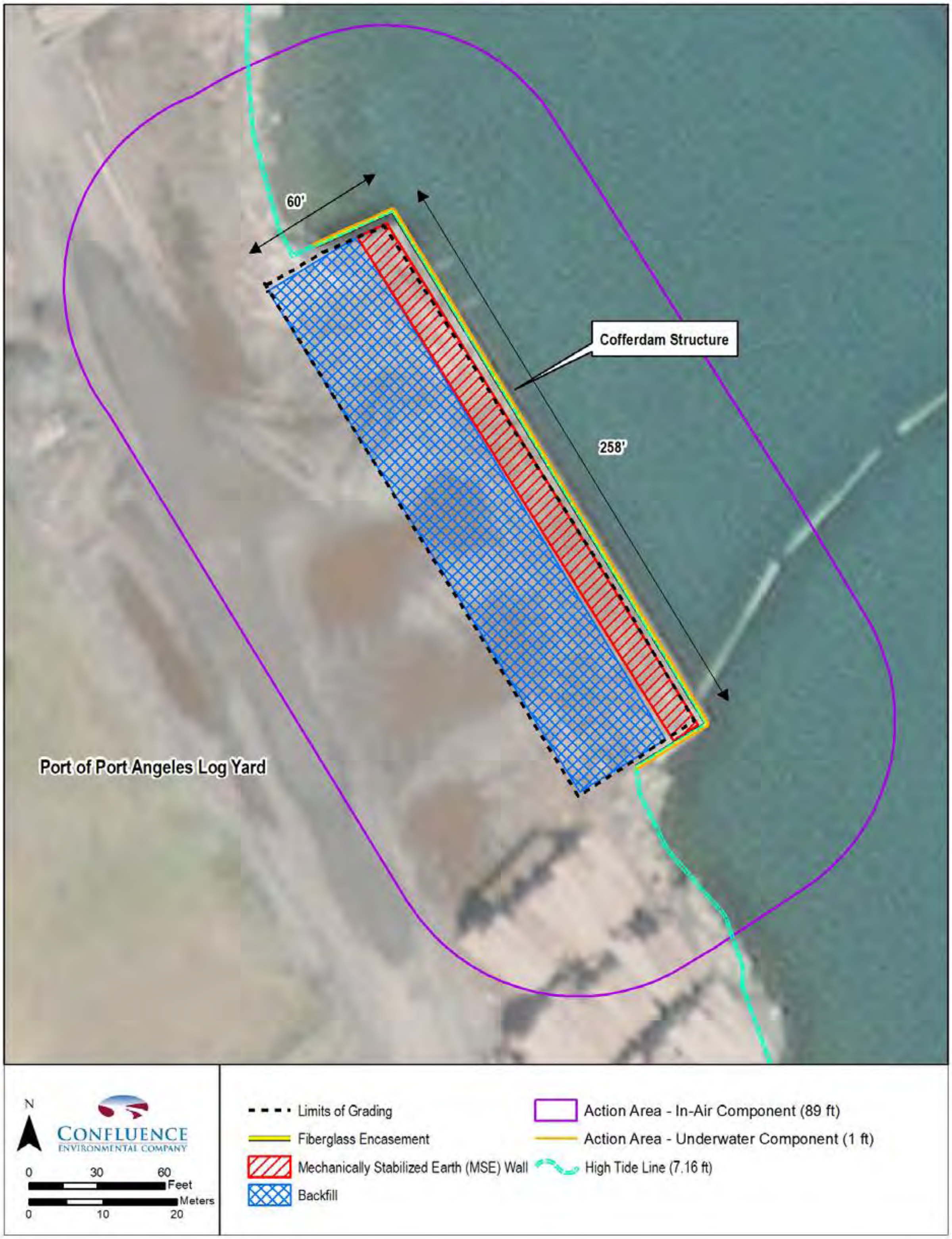

Figure 3. Action Area

3.0 FEDERALLY PROPOSED LISTED SPECIES AND CRITICAL HABITAT

This BE assesses the potential effects of the Project on listed species and designated critical habitat in the action area, and documents appropriate minimization and/or conservation measures that are included in the proposed action. A detailed Project Description is provided in Section 1.0, the action area is defined in Section 2.0, and a description of the Environmental Baseline is provided in Section 4.0.

To determine if listed species, or their critical habitat, are present near the proposed Project, Confluence consulted the threatened and endangered species lists prepared by the Services (NMFS 2021, USFWS 2021).

Based on compiled information from the Services (Appendices A-C), the ESA-listed species that may occur in the action area are provided in Table 1. Effects to designated critical habitat physical and biological features (PBFs) are also analyzed in this document. Species that are not addressed in this BA, because there is a lack of potential effects, lack of suitable habitat in the action area, or lack of documented occurrence in the action area, are listed in Appendix -Table A-2.

Several west coast ESA-listed species are or may be present in Washington but do not occur in the vicinity of the project site and are therefore not included in this analysis. These include but are not limited to: Fisher (*Pekania pennanti*), short-tailed albatross (*Phebastria albatrus*), streaked horned lark (*Eremophila alpestris strigata*), yellow-billed cuckoo (*Coccyzus americanus*), and dolly varden (*Salvelinus malma*). A complete list of species is included in Appendix A (Table A2). Due to a lack of suitable habitat within the proximity of the project site, these species will not be assessed further in this document.

Table 1. Federally Listed Species Considered within the Action Area

Species (Scientific Name)	Listing Date	Federal Status	Designated Critical Habitat?
Birds			
Marbled murrelet (*Brachyramphus marmoratus*)	10-01-1992 (effective 10-28-1992)	Threatened	Yes*
Fish			
Bull trout, Coastal-PS DPS (*Salvelinus confluentus*)	06-10-1998	Threatened	Yes, overlap with action area
Chinook salmon, Puget Sound ESU (*Oncorhynchus tshawytscha*)	08-02-1999	Threatened	Yes, overlap with action area
Chum salmon, Hood Canal summer-run ESU (*Oncorhynchus keta*)	08-02-1999	Threatened	Yes*
Steelhead trout, Puget Sound DPS (*Oncorhynchus mykiss*)	05-07-2007	Threatened	Yes, overlap with action area
Yelloweye rockfish, Puget Sound/Georgia Basin DPS (*Sebastes ruberrimus*)	04-28-2010	Threatened	Yes*
Bocaccio rockfish, Puget Sound/Georgia Basin DPS (*Sebastes paucispinis*)	04-28-2010	Endangered	Yes*
Eulachon, Southern DPS (*Thaleichthys pacificus*)	03-18-2010	Threatened	Yes*
North American green sturgeon, Southern DPS (*Acipenser medirostris*)	10-09-2009	Threatened	Yes*
Marine Mammals			
Killer whale, southern resident DPS (*Orcinus orca*)	02-16-2006	Endangered	Yes, overlap with action area
Humpback whale, Central America DPS (*Megaptera novaeangliae*)	12-02-1970	Endangered	None designated
Humpback whale, Mexico DPS (*Megaptera novaeangliae*)	12-02-1970	Threatened	None designated
Reptiles			
Leatherback sea turtle (*Dermochelys coriacea*)	06-02-1970	Endangered	Yes*
*Critical habitat has been identified but does not occur within the proposed action area.			

4.0 ENVIRONMENTAL BASELINE WITHIN THE ACTION AREA

Regulations implementing the ESA (50 CFR 402.02) define the environmental baseline as the past and present impacts of all federal, state, or private actions as well as anticipated impacts of all proposed federal projects in the action area that have undergone Section 7 consultations and the impacts of state and private actions that are contemporaneous with the consultation in progress.

This section summarizes the current conditions of the ecosystem surrounding the Project and habitat of ESA-listed species within the action area. The environmental baseline is described in terms of the habitat and food resources that might be affected and, thereby, affect listed species within the action area. Additional detail regarding the abundance, timing, and habitat requirements of ESA-listed species are provided in Appendices A - C.

4.1 Aquatic Substrate

Substrate within Port Angeles Harbor is substantially silty sand with intermixed gravels and shell hash in areas (Floyd Snider 2018). The Harbor is protected from strong currents by Ediz Hook, a large sand spit that extends from the shoreline, west of the log yard, into the Strait of Juan de Fuca to the north. By protecting the harbor from strong currents, a depositional "sink" is created in the inner harbor. This has resulted in a large proportion of fines within the generally silty/sandy substrate of the harbor. GeoSea (2009) reported fines comprised 71.1% (range 5.6% to 71.1%, mean 56%) of substrate sampled adjacent to Terminal 3, located to the east of the Project.

Port Angeles Harbor has been used heavily for over 100 years to support industrial activities. Contamination from sawmills, plywood, manufacturing, paper production, shipping and transport, boat building, bulk fuel facilities, marinas, and commercial fishing/processing have affected the aquatic substrate in the harbor which is currently ranked as an area of high concern for sediment contamination the State's Dredged Materials Management Program (DMMP) (Ecology 2012). However, analysis of surface sediment (the top 15 centimeters) collected in 2008 east of the Project site indicate no exceedances of DMMP criteria for 53 standard DMMP chemicals of concern (E&E 2008).

4.2 Aquatic Vegetation

Aquatic vegetation includes intertidal and subtidal species as well as floating and attached species. No aquatic vegetation has been identified within the Project action area. The nearest eelgrass beds are located along the southern shore of Ediz Hook, over 1 mile north of any proposed in-water work associated with the Project (Shreffler 1993; MCS Environmental 2003; Grette Associates 2012). Substrate within the action area is not appropriate attachment habitat for kelp or other attached macroalgae which require hard substrate such as bedrock or cobble.

4.3 Water Quality

Water quality in Port Angeles Harbor is generally considered good. While a number of industrial properties historically released effluents into the harbor that may have had negative effects on water quality, cleanup of those properties is being actively undertaken by the Washington State Department of Ecology (Ecology) and others. Additionally, implementation of the National Pollution Discharge Elimination System (NPDES) has reduced the amount of contamination flowing into the harbor. Ecology's water quality status report (303d list) identifies several Category 5 ratings in Port Angeles Harbor (Ecology 2021). Water in the western harbor has a Category 5 rating due to low dissolved oxygen (DO) levels; likely due to decaying wood debris in this area. Water in the southern harbor, to the east of the Project has a

Category 5 rating due to the occasional presence of enterococcus and fecal coliform bacteria from sewer overflows (Ecology 2021, U.S. Navy 2015). Port Angeles Harbor was listed on the Department of Ecology's 303(d) list of impaired waters for bacterial exceedances in 2012 (Ecology 2021).

Water quality in the harbor is strongly tied to water quality in the Strait of Juan de Fuca. A monthly comparison of water quality parameters (temperature, salinity, DO) indicate that conditions in the harbor closely match conditions of the waters of the greater Strait of Juan de Fuca. Temperatures were slightly higher in the harbor in late summer and salinity inside the harbor was higher during the winter but lower during the fall (Ebbesmeyer et al 1979). Given the proximity to the open ocean and the opportunity for thorough mixing, water quality in the Strait of Juan de Fuca is considered naturally pristine. The difference in temperature between the harbor and the Strait of Juan de Fuca can be attributed to the protection from currents afforded by Ediz Hook which increases the residence time of water in the harbor. Differences in salinity can be attributed to increased freshwater run-off in the fall due to increased precipitation.

4.4 Invertebrates, Fish, and Wildlife

4.4.1 Invertebrates

Horse clams (*Tresus nuttallii* and *Tresus capax*), mysid shrimp (*Neomysis mercedis*), anemones, sunflower sea stars (*Pycnopodia helianthoides*), mud shrimp (*Upogebia pugettensis*), hermit crab (*Paghurus* spp.), red rock crab (*Cancer productus*), and graceful crab (*Cancer gracilis*) were all observed during benthic surveys of the marina immediately to the east of the Project (Reid Middleton et al. 2004). Surveys by WDFW (2021a) indicate that Pandalid shrimp (*Pandalus spp*.), Dungeness crab (*Cancer magister*), and hard shell clam (*Mercenaria mercenaria*) "occur south of Ediz Hook and into Port Angeles." Typical of silty/muddy substrates, and piling-supported communities in the Strait of Juan de Fuca, various surveys in Port Angeles Harbor have recorded leopard dorid nudibranch (*Diaulula sandiegensis*), Monterey sea lemon nudibranch (*Archidoris montereyensis*), slender tube worms (*Phyllochaetopterus prolifica*), slender kelp crab (*Pugettia producta*), helmet crab (*Telmessus cheiragonus*), plumrose anemone (*Metridium senile*), painted anemone (*Urticina crassicornis*), leafy hornmouth snail (*Ceratostoma foliatum*), smooth pink scallop (*Chlamys rubida*), spiny pink sea star (*Pisaster brevispinus*), leather sea star (*Dermasterias imbricata*), and sunflower sea star (*Pycnopodia helianthoides*); and various species of anemones, shrimp, and jellyfish (MSC Environmental 2003; Reef.org 2015).

4.4.2 Fish

Puget Sound fishes can be broadly grouped into categories based on habitat and life history similarities: (1) anadromous fish, (2) rockfish, (3) flatfish, (4) sculpin, and (5) forage fish.

Over 50 different species of fish have been documented within Port Angeles Harbor including salmonids (e.g., salmon, steelhead trout, bull trout), numerous groundfish (e.g., Pacific cod, whiting, pollock), rockfish (e.g., copper rockfish, black rockfish), and forage fish (e.g., herring, sand lance, surf smelt). Between 2006 and 2014, Fresh (2015) conducted monthly surveys from April to September within the Harbor's nearshore aquatic areas. The most common species collected were adult and juvenile surf smelt (*Hypomesus pretiosus*) and Pacific sand lance (*Ammodytes hexapterus*). Juvenile pink salmon, juvenile English sole, and juvenile Chinook salmon were also collected in large numbers.

Only the ESA-listed fish (anadromous fish and rockfish) and forage fish, as an important salmonid and rockfish food resource, will be discussed in detail below. Other commercially important fish (e.g., flatfish, coastal pelagics, and non-ESA-listed salmonids) are discussed in the Essential Fish Habitat analysis (Appendix C).

Anadromous Fish

Anadromous fish migrate, spawn, and rear along the shorelines of the Strait of Juan de Fuca, with juveniles of various species out-migrating throughout the year. Anadromous fish with the potential to utilize the action area include salmonids, sturgeon, and eulachon.

Green Sturgeon

The North American green sturgeon southern DPS was listed under the ESA as threatened in April 2006 (NMFS 2006). This DPS includes all green sturgeon originating from the Sacramento River basin and from coastal rivers south of the Eel River in northern California

Green sturgeon utilize both freshwater and saltwater habitat. Adults live in oceanic waters, bays, and estuaries when not spawning. Green sturgeon are known to forage in estuaries and bays ranging from San Francisco Bay to British Columbia. Although spawning does not occur in tributaries to the Strait of Juan de Fuca (NMFS 2014a), green sturgeon may forage in the action area. While green sturgeon critical habitat has been designated, no critical habitat has been designated in North Bay (50 CFR 226.219; NMFS 2014a).

Subadult and adult green sturgeon make annual migrations along the coast in the spring and fall, spending winters in the marine waters north of Vancouver Island and south of southeast Alaska, and summers in coastal waters, bays, and estuaries of Washington, Oregon, and California. Sturgeon have been observed on a southward migration within the Strait of Juan de Fuca waters during summer. It is assumed that most green sturgeon migrating between Canadian and U.S. waters cross the Strait of Juan de Fuca over deep water to the west of the Strait of Juan de Fuca line (Lindley et al. 2008). There are no recorded sightings of green sturgeon within Port Angeles Harbor.

Salmonids

All species of Puget Sound salmon, listed or non-listed, are well documented within estuarine and nearshore habitat in their migrations from their natal freshwater watersheds to the ocean and back (Duffy et al. 2010).

The Puget Sound Chinook salmon (PS Chinook) evolutionarily significant unit (ESU) includes all naturally spawned populations of Chinook salmon from rivers and streams flowing into Puget Sound including the Strait of Juan de Fuca from the Elwha River, eastward, including rivers and streams flowing into Hood Canal, South Sound, North Sound, and the Strait of Georgia in Washington, as well as 26 artificial propagation programs (NMFS 2005a).

The Strait of Juan de Fuca contains 2 of 22 independent populations of Chinook identified by the Puget Sound Technical Recovery Team (PSTRT) as part of the ESU (Ruckelshaus et al. 2006). The Dungeness River and Elwha River are the nearest rivers to the action area that support independent populations.

The Elwha River population is believed to be comprised of two subpopulations: an early and a late returning run. Chinook return to the Elwha River from late spring through late-September and spawn from late-August through mid-October (Puget Sound Indian Tribes and WDFW 2004). After hatching, Chinook fry emigrate from their natal rivers and congregate in nearshore areas prior to their offshore migration to feed in open water (Nightingale and Simenstad 2001). Smaller outmigrants tend to migrate in the upper few feet of the water column along nearshore areas and use river deltas and pocket estuaries as rearing areas (Beamer et al. 2003). Larger outmigrants are not as strongly associated with the nearshore.

The Dungeness River population is comprised of a single population of native origin fish with spring/summer run timing. Chinook return to the Dungeness River in the late spring to midsummer, with spawning occurring in early August through early October. Fry emerge in the early spring with a majority emigrating to rear in the estuary during their first year of life, while remaining fry will rear in the river for a year and emigrate out as yearlings. Fish spend the first year of their life within estuarine nearshore habitat (Puget Sound Indian Tribes and WDFW 2004).

Individuals of both the Elwha and Dungeness populations likely occur in the action area. During nearshore surveys conducted from 2006 through 2014 near the action area, juvenile Chinook salmon were recorded from April to September (Fresh 2015).

The Hood Canal summer-run chum salmon ESU (HC chum) includes all naturally spawned populations of summer-run chum salmon in Hood Canal and its tributaries, as well as populations in Olympic Peninsula rivers between Hood Canal and Dungeness Bay, Washington. Eight artificial propagation programs are also considered to be part of this ESU (NMFS 2005a).

The PSTRT designated two independent populations of HC chum ESU: one that includes spawning aggregations in Hood Canal and one that includes the spawning aggregations from rivers and creeks draining into the Strait of Juan de Fuca (Ford 2011). The Strait of Juan de Fuca summer chum population is composed of five spawning aggregations (Dungeness River, Jimmycomelately Creek, Salmon Creek, Snow Creek, and Chimacum Creek). Summer chum enter the Dungeness River in late August through late October and spawn in the main channel through September. Eggs incubate in redds for 5 to 6 months and fry emerge between January and May. Typical of chum salmon, fry migrate rapidly downstream and out to the estuary and nearshore areas (NMFS 2005a). During nearshore surveys conducted from 2006 through 2014, juvenile chum salmon were recorded from April through September, with higher abundances during the spring months (April – June) (Fresh 2015). HC chum ESU likely occur in the action area.

The Puget Sound steelhead DPS (PS steelhead) includes all naturally spawned anadromous steelhead originating below natural and manmade impassable barriers from rivers flowing into Puget Sound from the Elwha River eastward, including rivers in Hood Canal, South Sound, North Sound, and the Strait of Georgia. Steelhead from six artificial propagation programs are also included.

Of the 32 independent populations of the PS steelhead DPS, 3 may occur in the vicinity of the action area. These include the Dungeness River summer/winter run, Strait of Juan de Fuca Independent Tributaries winter run, and the Elwha River winter run (PSTRT 2013). The Dungeness River summer/winter-run population spawns in the mainstem of the Dungeness and Grey Wolf rivers. Historical records indicate the presence of summer-run steelhead in the 1940s but further monitoring is needed to determine if they are still present in the basin. Within the Dungeness River, spawning typically occurs from mid-March to early June. Genetically, the Dungeness River steelhead most closely cluster with other collections from the Strait of Juan de Fuca and Elwha River populations (PSTRT 2013).

The Coastal-Puget Sound bull trout DPS was listed under the ESA as threatened in 1999 (USFWS 1999). This DPS encompasses all Pacific coast drainages within Washington, including Puget Sound.

Bull trout exhibit both resident and migratory life-history patterns. As their name implies, resident forms reside in their natal stream for the entirety of their life-cycle. Migratory forms spawn in freshwater and rear as juveniles for 1 to 4 years before migrating to saltwater. Bull trout typically spawn from August to November. Migratory bull trout may begin their migration into freshwater as early as April (USFWS 1999).

The Dungeness River and Elwha River are the only core population areas that flow into the Strait of Juan de Fuca. Bull trout distribution is patchy in these rivers, making precise population estimation difficult but bull trout populations near the action area are not large. The

Dungeness River and Elwha River support core sub-populations in the vicinity of the action area. The Dungeness River is believed to support between 500 and 1,000 adult bull trout, while snorkel surveys in 2003 documented only 31 bull trout in the Elwha River (USFWS 2008). Spawning and rearing occur in the upper portions of watershed watersheds. Adult upstream migration occurs in the fall (September to November), with peak spawning in late October. Bull trout may use the action area primarily for foraging and migration from December to August when they are not spawning in freshwater.

The Strait of Juan de Fuca and associated independent tributaries are used for foraging, migration, and overwintering (USFWS 2004) but it appears that bull trout do not heavily utilize nearshore areas of the harbor. Surveys conducted by Shaffer and Galuska (2009) and Fresh (2015) did not record any bull trout during spring and summer months of 2006 through 2014; sampling data are not available for the other months. WDFW (2018b) has documented bull trout occurrence within Ennis Creek, approximately 2 miles to the east of the action area, so they may occasionally be present within the harbor during migration to and from the Strait of Juan de Fuca.

Eulachon

The Pacific eulachon southern DPS was listed as threatened under the ESA in March 2010 (NMFS 2010). This DPS includes all eulachon originating from the Skeena River in British Columbia south to and including the Mad River in northern California. The closest population of eulachon to the action area spawn in the Elwha River (Shaffer et al. 2007).

Eulachon range from northern California to southwest and southcentral Alaska and into the southeastern Bering Sea. The Strait of Juan de Fuca lies between two of the larger eulachon spawning rivers (the Columbia and Fraser rivers). Although Puget Sound and the Strait of Juan de Fuca lack a major eulachon run (Gustafson et al. 2010), there has been a gradual increase in returns to the Elwha River, which likely reflects changes in biological status as well as improved monitoring (Gustafson et al. 2016). Eulachon are endemic to the northeastern Pacific Ocean. They inhabit the nearshore ocean waters to a depth of 1,000 feet (300 m) and spend 3 to 5 years in saltwater before returning to freshwater to spawn. Eulachon spawn in lower reaches of larger snowmelt-fed rivers in water temperatures between 39 and 50°F. Spawning occurs over sand or coarse gravel substrates and most adults die after spawning. Eggs are fertilized in the water column and sink following fertilization where they adhere to the river bottom. Eggs hatch in 20–40 days, and larvae are then carried downstream and disperse on estuarine and ocean currents. Juvenile eulachon move from shallow nearshore areas to middepth areas, and both juveniles and adults commonly forage within depths ranging from 66 to 292 feet (20 to 150 m) (NMFS 2014). Prior to dam removal, eulachon were rare in the Elwha River system for the past 60 years and only occasional spawning had been reported from February to May (Gustafson et al. 2010; Shaffer 2009)). Removal of the dam has restored eulachon habitat that was altered by the dams. In January 2015, seining surveys in the lower Elwha River estuary collected hundreds of egg-bearing and spent eulachon, indicating that local spawning was occurring (Coastal Watershed Institute 2015). Larvae and young juveniles become widely distributed in coastal waters once they enter the ocean. Larvae, measuring 1 to 1.1 inches (25–30 millimeters), have been caught via incidental plankton net catch in the Strait of Juan de Fuca on the north side of Ediz Hook, outside of the Action Area (DFO Canada 2014).

Rockfish

Based on recreational dive surveys in the harbor, the most common rockfish species observed were copper rockfish (*Sebastes caurinus*) and black rockfish (*Sebastes melanops*) (Reef.org 2015).

Habitat utilized by adult stages of the two ESA-listed rockfish species (yelloweye rockfish and bocaccio) primarily includes deep water (>151 ft) rocky substrates and/or shallower eelgrass and kelp beds (BRT 2009). Both species have been observed utilizing shallower depths and non-rocky substrates such as sand, mud, and other unconsolidated sediments (Miller and Borton 1980). Juvenile bocaccio and canary rockfish are recognized as utilizing nearshore habitat (Love et al. 1991) during early rearing stages. Use of nearshore habitat is primarily in areas with rock or cobble composition and/or kelp species. Rockfish larvae are pelagic and are found in Puget Sound and the Strait of Juan de Fuca from August through October (Greene and Godersky 2012). The action area within Port Angeles Harbor lacks the highly complex hard bottom habitat typically utilized by adult rockfish and also lacks the complex vegetative communities (e.g., kelp beds and/or eelgrass beds) and hard bottom habitat preferred by juvenile rockfishes for early rearing to adulthood. Given the lack of suitable habitat, use of the underwater portion of the action area by rockfish is highly unlikely.

Forage Fish

Forage fish are an important group of fish in the marine waters of Washington. Forage fish serve an important role as prey for a variety of marine animals, including birds, fish, and marine mammals. Pacific herring, surf smelt, and Pacific sand lance are the most common forage fish in Puget Sound. All three species are known to occur in Port Angeles Harbor (Shaffer and Galuska 2009).

Herring typically spawn in northern Puget Sound and the Strait of Juan de Fuca occurs from late January through early April (Bargmann 1998). Herring deposit their transparent eggs on intertidal and shallow subtidal eelgrass and marine algae. Although no herring spawning locations have been documented in the harbor (WDFW 2021), juvenile herring have been caught during seining just off Ediz Hook (Shaffer and Galuska 2009). No appropriate spawning habitat exists in the action area.

Surf smelt are most abundant in the Port Angeles Harbor in late spring through summer but spawn throughout the year, with the heaviest spawn occurring from mid-October through

December. Documented smelt spawning occurs along Ediz Hook (WDFW 2021). The closest documented surf smelt spawning area is a 1.2-miles-long area on the south side of Ediz Hook, approximately 0.4 miles north of the action area (WDFW 2021b).

Sand lance spawning typically occurs from early November through mid-February. They deposit eggs on a range of nearshore substrates, from soft, pure, fine sand beaches to beaches armored with gravel (Bargmann 1998). Bargmann (1998) indicates that 35 percent of all juvenile salmon diets and 60 percent of the juvenile Chinook diet, in particular, are sand lance. The closest documented sand lance spawning area is a 1,000-foot-long area on the south side of Ediz Hook, over 1.0 mile north of the action area (WDFW 2021b). Adult, juvenile, and larval sand lance are expected to be present within Port Angeles Harbor throughout the year.

4.4.3 Marine Mammals

Southern Resident Killer Whale

The Southern Resident Killer Whale DPS (SRKW) was listed under the ESA as endangered in November 2005 (NMFS 2005b). The SRKW DPS is one of three forms (Resident, Transient, and Offshore) occurring in the North Pacific. SRKW are found during the spring, summer, and fall months in the Salish Sea, which includes the inland waters of Puget Sound, the Northwest Strait, and the southern Georgia Strait. Recorded observations between 1976 and 2017 show that SRKW utilize areas of the Strait of Juan de Fuca during the summer months of June through September, peaking in March. SRKW are generally less common during the winter months (The Whale Museum 2015). Their coastal distribution during the winter is not completely confirmed, but the population has been observed south in Monterey Bay, California, and north in Chatham Strait in southeast Alaska (NMFS 2014b).

While SRKW are known to use the Strait of Juan de Fuca for feeding, mating, and migration, they are unlikely to be found in the shallow confines of the action area. SRKW are more likely to be found outside of the harbor where the water is deeper and less restricted. This preference for deeper waters is represented in the critical habitat for SKRW, which includes waters deeper than 20 ft relative to extreme high water (NOAA 2006).

Humpback Whale

According to a review of Whale Museum data, since 1976 zero humpback whale sightings have been made within a 10-mile radius from the Project action area (The Whale Museum 2021). Based on a review of the sighting data, humpback whales appear most likely to occur near the action area during the summer months.

Humpback whales are present in all the world’s oceans. The humpbacks mostly live in coastal and continental shelf waters, although they sometimes feed around seamounts and migrate through deep water. Every year they follow a regular migration route, feeding in temperate and polar climates during the summers, and mating and calving in tropical waters during the winter. Population estimates from 2006 recorded 18,000 to 20,000 whales across the entire North Pacific (WDFW 2012). The Washington coast generally hosts a small portion of humpback whales in the summer from July to September; data show there are an estimated 100 humpbacks occupying these waters annually (Douglas et al. 2008). The whales are mostly concentrated to the west and southwest of the Strait of Juan de Fuca entrance, where they spend their summers feeding (WDFW 2012). At the start of winter, the humpbacks migrate to Mexico or Central America (WDFW 2012).

The number of humpback whales potentially present within the action area are expected to be very low. Although not impossible, we do not expect humpback whales to enter the harbor far enough to be within the action area. Active vessel traffic, shallow water, and a lack of appropriate prey are anticipated to cause humpbacks to avoid the inner harbor and, thereby, the action area.

4.4.4 Birds

The marbled murrelet occurs along the Aleutian Islands and the coasts of Alaska, Washington, Oregon, and northern California (Carter and Erickson 1988). Marbled murrelets have been observed and recorded in the Strait of Juan de Fuca, and the project area is located in marbled murrelet Conservation Zone 1, Stratum 1 (Pearson et al. 2014). Within this area, the marbled murrelet population has declined at an estimated annual rate of 3.88 percent, between 2001 and 2013. The 2013 Washington At-Sea Marbled Murrelet Population Monitoring study estimated the marbled murrelet population density in Zone 1 (the Strait of Juan de Fuca and Puget Sound) at 4,395 birds with a 95% confidence interval (Pearson et al. 2014). A related study conducted in 2016 found similar results, with an estimated population of 4,600 murrelets in Zone 1 and an estimated decline of 4.94 percent per year (Lynch et al. 2017).

Marbled murrelets are anticipated to occur in or near the Project action area due to geographical proximity to both the Olympic National Park, which provides suitable forest nesting habitat, and the Strait of Juan de Fuca, which provides marine feeding habitat.

4.4.5 Reptiles

The leatherback sea turtle is the largest, deepest diving, and most migratory of the sea turtles. The leatherback sea turtle has the most extensive range of any adult turtle, found in tropical to subpolar oceans with nesting habitat on tropical beaches (NMFS 2016). Beaches suitable for leatherback nesting sites occur between 38° N and 34° S (Eckert et al. 2012) and are not located in Washington. However, leatherbacks regularly occur off the coast of Washington, especially off the mouth of the Columbia River during the summer and fall when large aggregations of jellyfish form (WDFW 2013).

The leatherback turtle is listed as endangered throughout its range. Both the western Pacific and eastern Pacific stocks of leatherback are in a continuous population decline (NMFS 2016). Over the last three generations, western Pacific stocks have decreased more than 80 percent and eastern Pacific stocks have decreased more than 97 percent. Estimates from 1996 put the remaining number at 34,500 reproductive females worldwide (Spotila et al. 2000). The most recent population estimates for the Pacific Ocean population report only approximately 3,200 individuals as of 2011 (NMFS and USFWS 2013). While occurrences of leatherback along the Washington coast may be likely, it is highly unlikely that this species will occur at the Project action area.

5.0 EFFECTS ANALYSIS

This section addresses the potential effect mechanisms of the Project to ESA-listed species in Table 1 and/or the environmental attributes and habitat qualities important to listed species (i.e., PBFs) that may be present in the action area. This section includes the direct and indirect Project-related impacts to the surrounding habitat and interrelated or independent actions. Appendix C describes designated EFH for federally managed commercial fish species, potential Project effects to EFH, and proposed conservation measures.

Presented below are discussions of the direct and indirect effects of the Project in the project and action areas, including:

- Water quality
- Airborne noise
- Benthic disturbance and habitat loss

Though many species listed in Table 1 have the potential to occur in the action area, appropriate habitat for is not found in the shallow intertidal zone adjacent to the Project site. The following species will therefore not be addressed further in this analysis: yelloweye and boccacio rockfish, green sturgeon, killer whale, humpback whale, and leatherback sea turtle.

5.1 Water Quality

Effects to water quality due to Project activities can include increased suspended sediments leading to increased turbidity, decreased DO, or resuspended toxins.

Effects to water could impact fish species within the limited aquatic portion of the action area but are not anticipated to impact marine mammals, birds, or reptiles.

5.1.1 Suspended Sediment

Water quality can be affected by increasing suspended sediment levels or re-suspending contaminated sediment. The installation of the fiberglass encasement around the waterward sheetpile wall, described in Section 1.3, is the only project element with the potential to generate turbidity. Installation will involve setting the encasement onto the mud and gently pressing the encasement 6 inches into the mudline. The installation may also include minor movement of riprap to accommodate the placement of the encasement along the sides of the structure, but that activity will be performed in the dry and therefore is not anticipated to cause turbidity. The setting and lowering of the encasement into the mud may conceivably generate turbidity, but the spatial extent of increased turbidity within the wind- and wave-swept shoreline is expected to be very limited and is not anticipated to exceed 1-foot distance. Placement of the fiberglass encasement is likely to be completed within 1 day.

Increased suspended sediment can affect salmonids by way of several mechanisms which include direct mortality, gill tissue damage, physiological stress, and behavioral changes. These potential impacts to fish species are discussed in more detail in the following sections.

Turbidity from suspended sediments additionally has the potential to interfere with murrelet foraging and has the potential to displace individuals from foraging habitats. Given that suspended sediment levels are not anticipated to extend more than 1-foot beyond the sheetpile wall, and murrelets are not likely to forage along the heavily altered Port shoreline during construction, the Project will not limit or adversely affect the foraging behavior of marbled murrelets due to water quality effects.

Direct Mortality

Direct mortality from extremely high levels of suspended sediment has been documented for juvenile salmon at levels above 6,000 milligrams per liter (mg/L) (Stober et al. 1981, Salo et al. 1980, LeGore and DesVoigne 1973). Given that suspended sediment levels generated by the project are not anticipated to rise above background levels, direct mortality is highly unlikely and is therefore considered discountable.

Gill Tissue Damage

Suspended sediment can clog fish gills, thereby decreasing their capacity for oxygen exchange. Salmonid response to suspended sediment depends on a variety of factors, including the nature of the sediment particle, the concentration of particles, water temperature, the duration of exposure, and the species and age of the fish. Servizi and Martens (1992) found that gill damage was absent in subyearling coho salmon exposed to concentrations of suspended sediments lower than 3,143 mg/L. Redding et al. (1987) also found that the appearance of gill tissue was similar for control fish and those exposed to high, medium, and low concentrations of suspended topsoil, ash, and clay. Based on these studies and the low suspended sediment levels anticipated from the project, and the ability of mobile nekton to avoid areas with less favorable conditions, fish that may occur within the action area are not expected to experience gill tissue damage as a result of the project. Additionally, the short duration of the project (i.e. one day) further reduces the potential for gill damage due to turbidity and suspended sediment.

Physiological Stress

Suspended sediments have been shown to cause stress in salmonids and other fishes, but at concentrations much higher than what would be generated by the project. Subyearling coho salmon exposed to suspended sediment concentrations above 2,000 mg/L were physiologically stressed as indicated by elevated blood plasma cortisol levels (Redding et al. 1987). Exposure to approximately 500 mg/L of suspended sediment for 2 to 8 consecutive days also caused stress, but to a much lesser degree (Redding et al. 1987, Servizi and Martens 1987). Because suspended sediment levels are not anticipated to rise above background levels and any suspended sediment generated will be temporary, physiological stress to fish that may occur within the action area due to the Project is highly unlikely and is therefore considered discountable.

Behavioral Changes

Behavioral responses to elevated levels of suspended sediment include feeding disruption and changes in migratory behavior (Servizi 1988, Martin et al. 1977). Several studies indicate that salmonid foraging behavior is impaired by high levels of suspended sediment (Bisson and Bilby 1982, Berg and Northcote 1985). Redding et al. (1987) demonstrated that yearling coho and steelhead exposed to high levels (2,000 to 3,000 mg/L) of suspended sediment did not rise to the surface to feed. Yearling coho and steelhead exposed to lower levels (400 to 600 mg/L), however, actively fed at the surface throughout the experiment. Because suspended sediment levels are not anticipated to rise above background levels, behavioral changes to fish that may occur within the action area are not expected to occur.

5.1.2 *Dissolved Oxygen*

Suspension of anoxic sediment compounds can lead to a reduction in DO levels in the water column. DO is critical for salmonids metabolic health, growth, and overall survival (Carter 2005,Kjelland et al. 2015). DO may be reduced if anoxic sediments are exposed. Because project activities do not include digging or relocation of substrates, which would be required to expose anoxic sediments, adverse effects to salmonids due to reduced DO are highly unlikely and therefore considered discountable.

5.1.3 *Contaminants*

Salmonids are vulnerable to metals as they can impair fish gill functions and affect their olfactory systems (Price 2013). In 2004, sediment sampling was conducted near the structure as part of the WSDOT’s Graving Dock project. Sampling results indicated the sediment is minimally impacted by chemical contaminants, having tested for metals, diesel-range petroleum hydrocarbons, semi-volatile organic compounds, polychlorinated biphenyls (PCBs), and dioxins/furans (Parametrix 2007). Sediment samples collected in 2017 by Floyd|Snider as part of a dredging project at Terminal 3, located within the Port, indicated all analytes were either not detected or detected at concentrations below the Dredged Material Management Program screening levels (Confluence 2018). Given that turbidity is unlikely to exceed background levels, the project is not expected to lead to the resuspension of contaminants. Furthermore, based on the above studies, any contaminants that are resuspended as a result of the project will be minimal. Thus, adverse effects to salmonids due to contaminant exposure are highly unlikely and therefore considered discountable.

5.2 Construction-Related Noise

The Project will require the use of an excavator, dump truck, and front-end loader. Additionally, a small dive boat or skiff may be used to assist in portions of the encasement installation.

5.2.1 Underwater Noise

No significant underwater sound pressure waves will be generated from the installation of the replacement cofferdam. Underwater noise resulting from Project-related activities will not exceed background levels and is therefore considered discountable.

5.2.2 Airborne Noise

Operation of the excavator, dump truck, and front-end loader will generate airborne noise. This section describes the expected effects of airborne noise from the proposed Project activities.

Sound measurements in air are reported as decibel (dB) readings, relative to a reference value of 20 microPascal (μPa), which is a measure of absolute pressure. Decibels have a logarithmic relationship to μPa. In-air noise may be frequency-weighted to approximate the human hearing and is measured on an A-weighted scale, denoted as dBA. The zero point of the A-weighted decibel scale represents the faintest sound level that humans with normal hearing can hear. Sound energy is commonly reported as sound pressure level (SPL), which is the average sound intensity for a single sound-producing event. Noise generated during construction activities is considered point-source noise and spreads spherically over distance. Construction noise is commonly measured by maximum decibel level (L_{max}), the highest value of a sound pressure over a stated time interval (WSDOT 2020).

The primary noise-producing activity during Project activities will be the operation of an excavator, dump truck, and front-end loader. The average L_{max} for this heavy equipment measured 50 feet from the source, is 87, 91, and 81 dBA, respectively (WSDOT 2020). Following the rules for decibel addition provided in the WSDOT BA Manual (2020), the concurrent operation of heavy equipment will result in a total Project related airborne noise level of 93 dBA. The same methods used to calculate Project related noise levels are used to calculate the background noise levels at the Port's log yard. Heavy equipment routinely used in the log yard generate the greatest in-air background noise source. Equipment includes excavators, front-end loaders, and long-haul trucks used to unload barges, and stockpile and transport logs. The L_{max} associated with this equipment is 87, 81, and 74, dBA respectively (WSDOT 2020). The combined background noise level is 88 dBA.

Following the methods outlined by WSDOT (WSDOT 2020), the extent of project-related airborne noise was determined using the following equation:

$$D = Do * \ 10^{((Construction\ Noise - Background\ Sound\ Level\ in\ dBA)/\alpha)}$$

Where:

D = the distance from noise source at which noise attenuates to background
Do = 50 feet (the reference measurement distance for construction equipment)
α = 20 (assumes a 6.0 dBA reduction per doubling distance over hard surface)

Given the Project specific construction and background noise levels discussed above:

$$D = 50 * 10^{((93-88/20)} = \ 89\ feet$$

The 89-foot extent of project related airborne noise is visualized in Figure 1. Marbled murrelet are the only ESA-listed species potentially present in the action area that may be impacted by noise associated with Project activities.

According to threshold distances developed in the 2015 USFWS Biological Opinion developed for WSDOT activities (USFWS 2015), nesting marbled murrelet may be disturbed by heavy construction equipment operating between 328 feet and 1,320 feet from a nest tree during nesting season (April 1 to September 23). However, the closest marbled murrelet nesting location is approximately 1.5 miles south of the action area (USFWS 2011) and is, therefore, not expected to be affected by Project activities.

Marbled murrelet may also be affected by airborne noise while foraging or moving. The threshold for masking marbled murrelet communication is an airborne noise level of 29 dBA above ambient noise level, and social foraging requires acoustic communication up to 98 feet (Teachout 2013). Additionally, when marbled murrelet hearing sensitivity is reduced, the measurable effect is referred to as threshold shift (TS). There are varying levels or degrees of TS; however, a TS ≥40 dBA is generally indicative of injury (SAIC 2012 *as cited in* USFWS 2016). The closest documented at-sea location of marbled murrelets is Ediz Hook, roughly 1.5 miles northeast of the Project site. It is unlikely that construction noise associated with the Project will result in a TS for foraging marbled murrelets.

Exposure to elevated airborne sound levels resulting from the operation of heavy equipment could result in marbled murrelets temporarily avoiding the action area. However, due to the elevated background sound levels of routine operations at the Port, it is likely marbled murrelets avoid the action area in general. Furthermore, given the ability to move away from noise, birds are not likely to experience injury or a significant disruption of normal behaviors (e.g., TS is not ≥40 dBA for marbled murrelets based on distance of observations) resulting from Project related noise. Therefore, Project related activities are not likely to effect the species.

5.3 Benthic Disturbance and Habitat Loss

The fiberglass encasement will be installed on the exterior edge of the waterward sheetpile. A 1.0-inch void will separate the fiberglass from the existing wall. Given the length of the encasement is 260 feet along the shoreline, with 30 feet on each edge (Figure 2), and assuming the encasement itself is 1.25-inches thick, the total area of lost benthic habitat will be approximately 60 square feet. Sessile, benthic, and epibenthic organisms either attached to the sheetpile wall or within the benthic footprint of the fiberglass encasement cannot move fast enough to avoid being enclosed within or crushed by the placement of the fiberglass encasement. These organisms will experience mortality. Such organisms may include polychaetes (worms), crustaceans (crabs/shrimp), mollusks (clams/oysters/mussels), cnidarians (anemones), and echinoderms (starfish/sea urchins/sand dollars). However, these species of invertebrates are adapted to the high-energy marine environment within Port Angeles Harbor and are expected to quickly recolonize the temporarily disturbed area waterward of the fiberglass encasement as well as the new encasement itself.

Because the benthic disturbance at the foot of the fiberglass encasement is outside the preferred depth range for rearing juvenile salmonids, which associate with the water surface, effects of benthic disturbance to salmonids due to benthic disturbance and habitat loss is considered discountable. Forage fish are not expected to use the action area for foraging of benthic prey.

5.4 Summary of Potential Effects

Most potential effects associated with the proposed Project will be temporary and have limited or no potential to affect the physical, chemical, or biological environment (Table 2) compared to background conditions. Temporary turbidity and airborne noise are the main impacts that have the potential to affect ESA-listed species, as discussed in Section 6.1 below.

Table 2. Summary of Direct and Indirect Effects from the Project

Effect Parameter	Construction Activity and Potential Effects Summary
Water Quality	
Suspended Sediment and Turbidity	▪ Temporary increased suspended sediments and turbidity may occur when the fiberglass encasement is installed, which would take place within the duration of 1 day. ▪ Work will occur during approved in-water work windows, between July 16 and February 15. ▪ Fiberglass encasement installation activities are expected to cause only short-term and very localized increases in suspended sediment and turbidity. ESA-listed fish may exhibit an avoidance response but given the low likelihood of exposure, the overall impact is expected to be discountable.

Effect Parameter	Construction Activity and Potential Effects Summary
Project-Related Noise	
Airborne Noise	▪ The pieces of equipment that will produce the loudest noise are the excavator (87 dBA), the dump truck (91 dBA), and the front-end loader (81 dBA), which combine to produce a total Project related airborne noise level of 93 dBA. ▪ The distance that airborne noise generated by construction actions will attenuate to background levels is approximately 89 feet. ▪ These noises have the potential to impact the foraging or movement of marbled murrelets. This is the only terrestrial ESA-listed species within the action area. ▪ Although there is the potential for masking of communication during Project activities, this potential also exists during routine Port related operations in the log yard, and it is likely marbled murrelets avoid the action area in general. Due to the relatively small shift in sound levels, and the short duration of activities, the overall impact from is expected to be discountable.
Benthic Disturbance and Habitat Loss	
Direct Loss or Disturbance	▪ Installation of the fiberglass encasement will result in a loss of 60 square feet of benthic habitat. ▪ Potential ESA-listed species prey items, including sessile, benthic, and epibenthic organisms will experience high mortality but will likely recolonize the waterward side of the encasement quickly. ▪ The impacts from benthic disturbance and habitat loss are not likely to effect ESA-listed species because the area is relatively small in size and not preferred habitat for juvenile salmonids.

5.5 Interrelated and Interdependent Actions

Interrelated actions include those that are part of a larger action and depend on the larger action for justification. Interdependent actions are those with no independent utility apart from the proposed action. There are no interrelated/interdependent actions associated with the Project.

6.0 EFFECTS DETERMINATION

The following sections provide a determination of effect for each species discussed in this BE. Each determination is based on the effect analyses presented in the previous section (Section 5).

6.1 Federally Listed Species and Critical Habitat

The proposed action will not affect the viability, persistence, or distribution of ESA-listed species potentially present in the Project or action areas. The effects of the proposed action are unlikely to impact the continuing status of the populations. There is some potential for disturbance during Project related activities, such as fiberglass encasement installation and upland operation of heavy equipment. There may also be temporary avoidance of the action area or minor behavioral shifts for the duration of the Project. However, meaningful reductions in numbers or vigor of individuals that could affect the viability, reproduction, or distribution of the listed species populations are not anticipated.

The summary of effect determinations for ESA-listed species is presented below in Table 3.

Table 3. Effects Determination to ESA-Listed Species and Critical Habitat

Direct and Indirect Effects to Listed Species				Direct and Indirect Effects to Critical Habitat			
Species	Federal Status	Effect Determination	Basis for Determination	Designated Critical Habitat?	Physical and Biological Features	Species Effect Determination	Basis for Determination
Birds							
Marbled murrelet (*Brachyramphus marmoratus*)	Threatened	Not Likely to Adversely Effect	▪ The vicinity of the project does not provide appropriate marbled murrelet habitat. ▪ Marbled murrelet may occur in the vicinity during the in-water work period, but the extent of disturbance at any given time will be insignificant relative to available habitat in adjacent areas. ▪ Turbidity is not expected to extend beyond 1 foot and will be short in duration. ▪ Airborne noise from the project will attenuate to background in 89 feet and will be short in duration.	Yes, outside of action area	▪ Individual trees with potential nesting platforms ▪ Forested areas with 0.5 mile of individual trees with potential nesting platforms	No Effect	▪ Designated critical habitat does not occur in the vicinity of the project.
Fish							
Bull trout, Coastal-Puget Sound DPS (*Salvelinus confluentus*)	Threatened	Not Likely to Adversely Effect	▪ Turbidity is not expected to extend beyond 1 foot and will be short in duration. ▪ Work will be completed during the in-water work window. ▪ The epoxy grout will not come into contact with the water. ▪ All other Project activities will be performed in the dry.	Yes, outside of action area	Marine environments: ▪ Free of obstruction ▪ Natural cover ▪ Juvenile and adult forage ▪ Cool water temperatures ▪ Water quantity, quality, and salinity conditions supporting juvenile and adult physiological transitions between fresh and saltwater	No Effect	▪ Designated critical habitat does not occur in the vicinity of the project.
Chinook salmon, Puget Sound ESU (*Oncorhynchus tshawytscha*)	Threatened	Not Likely to Adversely Effect	▪ Turbidity is not expected to extend beyond 1 foot and will be short in duration. ▪ Work will be completed during the in-water work window. ▪ The epoxy grout will not come into contact with the water. ▪ All other Project activities will be performed in the dry.	Yes, overlap with action area	Marine environments: ▪ Free of obstruction ▪ Natural cover ▪ Juvenile and adult forage ▪ Water quantity, quality, and salinity conditions supporting juvenile and adult physiological transitions between fresh and saltwater	Not Likely to Adversely Effect	▪ Turbidity is not expected to extend beyond 1 foot and will be short in duration. ▪ No new obstructions to migration would occur. ▪ No obstruction or alteration of natural cover will occur. ▪ Water quality, quantity, and salinity conditions will not be affected by the project.

Direct and Indirect Effects to Listed Species				Direct and Indirect Effects to Critical Habitat			
Species	**Federal Status**	**Effect Determination**	**Basis for Determination**	**Designated Critical Habitat?**	**Physical and Biological Features**	**Species Effect Determination**	**Basis for Determination**
Chum salmon, Hood Canal summer-run ESU (*Oncorhynchus keta*)	Threatened	Not Likely to Adversely Effect	▪ Turbidity is not expected to extend beyond 1 foot and will be short in duration. ▪ Work will be completed during the in-water work window. ▪ The epoxy grout will not come into contact with the water. ▪ All other Project activities will be performed in the dry.	Yes, outside of action area	Marine environments: ▪ Free of obstruction ▪ Natural cover ▪ Juvenile and adult forage ▪ Water quantity, quality, and salinity conditions supporting juvenile and adult physiological transitions between fresh and saltwater	No Effect	▪ Designated critical habitat does not occur in the vicinity of the project.
Steelhead trout, Puget Sound DPS (Oncorhynchus mykiss)	Threatened	Not Likely to Adversely Effect	▪ Turbidity is not expected to extend beyond 1 foot and will be short in duration. ▪ Work will be completed during the in-water work window. ▪ The epoxy grout will not come into contact with the water. ▪ All other Project activities will be performed in the dry.	Yes, overlap with action area	Marine environments: ▪ Free of obstruction ▪ Natural cover ▪ Juvenile and adult forage ▪ Water quantity, quality, and salinity conditions supporting juvenile and adult physiological transitions between fresh and saltwater	Not Likely to Adversely Effect	▪ Turbidity is not expected to extend beyond 1 foot and will be short in duration. ▪ No new obstructions to migration would occur. ▪ No obstruction or alteration of natural cover will occur. ▪ Water quality, quantity, and salinity conditions will not be affected by the project.
Yelloweye rockfish, Puget Sound/Georgia Basin DPS (*Sebastes ruberrimus*)	Threatened	No Effect	▪ Yelloweye rockfish will not be present in the intertidal zone in the vicinity of the project.	Yes, outside of action area	Marine environments: ▪ Deepwater sites that support growth, survival, and reproduction, and feeding opportunities ▪ Nearshore juvenile rearing sites with sand, rock, and cobbles to support forage and refuge	No Effect	▪ Designated critical habitat does not occur within the vicinity of the project.
Bocaccio rockfish, Puget Sound/Georgia Basin DPS (*Sebastes paucispinis*)	Endangered	No Effect	▪ Boccacio rockfish will not be present in the intertidal zone in the vicinity of the project.	Yes, outside of action area	Marine environments: ▪ Deepwater sites that support growth, survival, and reproduction, and feeding opportunities. ▪ Nearshore juvenile rearing sites with sand, rock, and cobbles to support forage and refuge	No Effect	▪ Designated critical habitat does not occur within the vicinity of the project.

Direct and Indirect Effects to Listed Species				Direct and Indirect Effects to Critical Habitat			
Species	Federal Status	Effect Determination	Basis for Determination	Designated Critical Habitat?	Physical and Biological Features	Species Effect Determination	Basis for Determination
Eulachon, Southern DPS (Thaleichthys pacificus)	Threatened	Not Likely to Adversely Effect	▪ The vicinity of the project does not likely provide appropriate eulachon habitat. ▪ Turbidity is not expected to extend beyond 1 foot and will be short in duration. ▪ Work will be completed during the in-water work window. ▪ The epoxy grout will not come into contact with the water. ▪ All other Project activities will be performed in the dry.	Yes, outside of action area	Marine Environments: ▪ Free of obstruction ▪ Natural cover ▪ Juvenile and adult forage ▪ Water quantity, quality, and salinity conditions supporting juvenile and adult physiological transitions between fresh and saltwater	No Effect	▪ Designated critical habitat does not occur in the vicinity of the project.
North American green sturgeon, Southern DPS (*Acipenser medirostris*)	Threatened	Not Likely to Adversely Effect	▪ The vicinity of the Project does not provide appropriate habitat for green sturgeon. ▪ Green sturgeon have not been documented in Port Angeles Harbor, while they may forage in the action area, this would be a rare occurrence. ▪ Turbidity is not expected to exceed background levels. ▪ Work will be completed during the in-water work window. ▪ The epoxy grout will not come into contact with the water. ▪ All other Project activities will be performed in the dry.	Yes, outside of action area	Marine environments: ▪ Migratory corridor ▪ Water quality ▪ Food resources	No Effect	▪ Designated critical habitat does not occur in the vicinity of the Project.
Marine Mammals							
Killer whale, southern resident (*Orcinus orca*)	Endangered	No Effect	▪ Killer whales will not be present in the Action Area.	Yes, overlap with action area	Marine environments: ▪ Water quality ▪ Prey species ▪ Adequate passage conditions for migration, resting, and foraging	Not Likely to Adversely Affect	▪ Water quality will not be affected by the Project. ▪ Abundance and availability of prey resources will not be affected by the Project. ▪ No new obstructions to migration would occur.
Humpback whale, Central America DPS and Mexico DPS (*Megaptera novaeangliae*)	Endangered and Threatened	No Effect	▪ Humpback whales will not be present in the Action Area	None Designated	N/A	N/A	▪ None Designated

Direct and Indirect Effects to Listed Species				Direct and Indirect Effects to Critical Habitat			
Species	Federal Status	Effect Determination	Basis for Determination	Designated Critical Habitat?	Physical and Biological Features	Species Effect Determination	Basis for Determination
Marine Reptiles							
Leatherback sea turtle (*Dermochelys coriacea*)	Endangered	No Effect	▪ Leatherback sea turtles will not be present in the Action Area.	Yes, outside of action area	Marine environments: ▪ Space for individual and population growth ▪ Food, water, air, light, minerals, and other physiological requirements ▪ Cover or shelter ▪ Breeding and rearing sites ▪ Habitats protected from disturbance	No Effect	▪ Designated critical habitat does not occur in the vicinity of the Project.

6.2 Marbled Murrelet

In-air noise thresholds for marbled murrelets have only been established for pile driving activities (WSDOT 2019). The noise generated by the Project will not approach pile driving levels, but noise generated using heavy equipment for the Project may result in marbled murrelets temporarily avoiding the action area. However, because background sound levels associated with routine operations at the Port are already elevated, it is likely marbled murrelets avoid the action area in general. Overall, the project is not anticipated to adversely affect marbled murrelets.

Turbidity from suspended sediments additionally has the potential to interfere with murrelet foraging and the potential to displace individuals from foraging habitats. Given that suspended sediment levels are not anticipated to extend more than 1-foot beyond the sheetpile wall, and murrelets are not likely to forage along the heavily altered Port shoreline, the Project will not limit or adversely affect the foraging behavior of marbled murrelets.

The Project **may affect but is not likely to adversely affect** marbled murrelets and would have **no effect** on marbled murrelet critical habitat.

6.3 Puget Sound Chinook Salmon, Hood Canal Summer Chum, Puget Sound Steelhead, Eulachon, and Puget Sound/Coastal Bull Trout

ESA-listed salmonids could be exposed to all the effects of the actions; however, the timing of salmonid use in the action area is expected to lessen the potential for exposure and the magnitude of effects, particularly for juvenile life stages.

The period of in-water work occurs from July 16 to February 15. Adult Chinook salmon migrate to nearby rivers from late spring through late September but are unlikely to transit the action area in the inner harbor. Similarly, while adult steelhead may migrate near the action area between November and April, they are unlikely to transit the action area. Adult bull trout begin their migration as early as April and typically spawn in the Dungeness and Elwha Rivers from August to November. Little is known about the present status, timing, and migration routes of Eulachon that spawn in the Elwha River but spawning typically occurs February to May, outside the in-water work window for this project. Bull trout may occur in the action area during Project activities. However, given the small footprint of the in-water work area, minimal water quality degradation, and the ability any potential salmonids to avoid the underwater component of the action area, leads to the conclusion that effects to adult salmonids will be insignificant. Juvenile Chinook, steelhead, and chum all migrate from freshwater streams from early spring through early summer outside the in-water work window, so effects to juvenile salmonids are unlikely.

If present during placement of the fiberglass encasement, individual ESA-listed salmonids may be exposed to increased levels of turbidity in the water column during and immediately following this activity. However, the probability of exposure of individuals to water quality effects is generally low, given the small area likely to be affected, the short duration of turbidity, and the location of the work within the wave-washed intertidal zone. Additionally, the work windows would mostly preclude the presence of juveniles. The limited duration and low intensity of such potential effects are discountable.

The potential for adverse effects resulting from other elements of the Project are avoided due to the following:

- Movement of riprap associated with the fiberglass encasement installation will occur in the dry and therefore will not generate suspended sediment.
- In-water noise is not anticipated as a result of the project (no impact or vibratory pile driving involved).
- Marine epoxy grout (FiveStar DP Epoxy Grout) will not come in contact with water as the gap between the existing sheetpile and the fiberglass encasement will be dewatered. Thus, the product will have no opportunity to harm salmonids or other fishes.
- No submerged aquatic vegetation or riparian vegetation is present in the vicinity of the project site.
- All backfilling activities will be performed upland using a land-based excavator. The excavator will at no point enter the water during construction.
- BMPs, described in Section 1.6, will be implemented throughout the project to help ensure no adverse effects to ESA-listed species occur.

Based on the potential for effects described above, the Project **may affect, but is not likely to adversely affect** Puget Sound Chinook salmon, Hood Canal summer chum, Puget Sound steelhead, eulachon, or Puget Sound/Coastal bull trout. The project **may affect, but is not likely to adversely affect** Puget Sound Chinook salmon and Puget Sound steelhead critical habitats; and will have **no effect** on critical habitats for Puget Sound/Coastal bull trout, Hood Canal summer chum, and eulachon.

6.4 Southern Distinct Population Segment Green Sturgeon

The southern DPS of green sturgeon have been documented in the Strait of Juan de Fuca, but are uncommon (Miller and Borton 1980; Adams et al. 2002). Adult and juvenile green sturgeon have not been documented in the Port of Port Angeles and are very unlikely to occur in the action area. If present, green sturgeon individuals exposed to the effects from this project are expected to respond in a similar manner as ESA-listed salmonids and eulachon, although the probability for exposure is considered discountable.

The project **may affect, but is not likely to adversely affect** the southern DPS of green sturgeon and would have **no effect** on their critical habitat.

6.5 Southern Resident Killer Whale

Potential effects to SRKW involves possible exposure to minor water quality degradations or disturbance caused by small craft operation monitoring construction activities.

The likelihood of SRKW occurring within a 150-foot radius of small craft monitoring construction activities is discountable given the lack of killer whale appropriate habitat in Port Angeles Harbor. Direct disturbance effects are similarly unlikely to cause alarm or displacement, because small craft used for monitoring are typically stationary or slow-moving and occur primarily in areas where the potential for SRKW occurrence is minimal at best, and marine mammals can readily avoid these small craft by a distance of 150 feet. The likelihood of SRKW occurring within the intertidal action area, where minor turbidity impacts are possible during project activities, is discountable given the depth of water at the site, and the nature of the nearshore marine habitat in Port Angeles Harbor. If SRKW were to be present in the area when small craft monitoring of construction activities is taking place, they would not experience substantial disturbance compared to background levels of vessel traffic within the harbor and could avoid the monitoring activity.

The project **may affect, but is not likely to adversely affect** SRKW and would have **no effect** on their critical habitat.

6.6 Humpback Whale

Humpback whale occurrence within Port Angeles Harbor is rare in close proximity to Port Angeles Harbor. Whales that enter the harbor could plausibly approach within 150 feet of small craft monitoring activity, but are unlikely to cause alarm or displacement, because small craft used for monitoring are typically stationary or slow-moving, and marine mammals can readily avoid these small crafts by a distance of 150 feet. The likelihood of humpback whales occurring within the intertidal action area, where minor turbidity impacts are possible during project activities, is discountable given the depth of water at the site, and the nature of the nearshore marine habitat in Port Angeles Harbor. Given the short-term effects to water quality and small craft usage, and the especially low likelihood of humpback whales coming in close proximity to the Project area, potential effects to humpback whales are considered unlikely and discountable.

The project **may affect, but is not likely to adversely** affect the Central American DPS or Mexican DPS of humpback whales. Critical habitat has not been designated for these DPSs.

6.7 Leatherback Sea Turtle

While leatherback sea turtles are occasional visitors to the continental shelf offshore of Washington’s coast, they are exceedingly rare in the Strait of Juan de Fuca. Leatherback sea turtles have not been recorded in Port Angeles Harbor and appropriate, suitable habitat is not found within or near the action area.

The project will have **no effect** on leatherback sea turtles or the critical habitat.

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Appendix A

Species Accounts

APPENDIX A – SPECIES ACCOUNTS

1.0 INTRODUCTION

This appendix provides summary tables of the ESA-listed species either addressed in or excluded from this BE along with species accounts for each of the included species. The species accounts provide an overview of species status and abundance within the Project action area and the status of designated critical habitat for each.

Based on an evaluation of the potential environmental effects of the project, this BE addresses eight fish species, two marine mammal species, one bird, and one reptile along with designated critical habitat as appropriate.

These 12 species encompass all ESA listed species that have the potential to occur in or use the action area. The list includes species with suitable habitat or known range within the action area and that could have some potential for exposure to the effects of the Project. The species and critical habitat are summarized in Table A-1. Species that are listed in the west coast region but will not be considered in this BE are summarized in Table A-2.

Table A-1: Federally Listed Species Considered within the Action Area

Species	Scientific Name	Listing Date	Federal Status	Designated Critical Habitat?
Birds				
Marbled murrelet	*Brachyramphus marmoratus*	10-01-1992 (effective 10-28-1992)	Threatened	Yes*
Fish				
Bull trout, Coastal-PS DPS	*Salvelinus confluentus*	06-10-1998	Threatened	Yes, overlap
Chinook salmon, Puget Sound ESU	*Oncorhynchus tshawytscha*	08-02-1999	Threatened	Yes, overlap
Chum salmon, Hood Canal summer-run ESU	*Oncorhynchus keta*	08-02-1999	Threatened	Yes*
Steelhead trout, Puget Sound DPS	*Oncorhynchus mykiss*	05-07-2007	Threatened	Yes, overlap
Yellow Eye rockfish, Puget Sound/Georgia Basin DPS	*Sebastes ruberrimus*	04-28-2010	Threatened	Yes*
Bocaccio rockfish, Puget Sound/Georgia Basin DPS	*Sebastes paucispinis*	04-28-2010	Endangered	Yes*
Eulachon, Southern DPS	*Thaleichthys pacificus*	03-18-2010	Threatened	Yes*
North American green sturgeon, Southern DPS	*Acipenser medirostris*	10-09-2009	Threatened	Yes*
Marine Mammals				
Killer whale, southern resident DPS	*Orcinus orca*	02-16-2006	Endangered	Yes, overlap
Humpback whale, Central America DPS	*Megaptera novaeangliae*	12-02-1970	Endangered	No
Humpback whale, Mexico DPS	*Megaptera novaeangliae*	12-02-1970	Threatened	No
Reptiles				
Leatherback sea turtle	*Dermochelys coriacea*	06-02-1970	Endangered	Yes*
*=Critical habitat has been identified but does not occur within the proposed action area. ESU= Evolutionary significant unit, DPS= Distinct population segment.				

Due to the lack of documented occurrence and the lack of suitable habitat in the action area, the proposed action will have no effect on the following species (Table A-2), and they will not be assessed further in this document.

Table A-2: Species and Critical Habitat Not Addressed Further in this Biological Evaluation

Species	Scientific Name	Listing Date	Federal Status	Designated Critical Habitat?
Birds				
Short-tailed albatross	*Phoebastria albatrus*	06-02-1970	Endangered	No
Yellow-billed cuckoo	*Coccyzus americanus*	11-03-2014	Threatened	Proposed*
Streaked horned lark	*Eremophila alpestris strigata*	11-04-2013	Threatened	Yes*
Northern spotted owl	*Strix occidentalis cuarina*	06-26-1990	Threatened	Yes*
Fish				
Chinook salmon, Upper Columbia River spring-run ESU	*Oncorhynchus tshawytscha*	08-02-1999	Endangered	Yes
Chinook salmon, Lower Columbia River ESU	*Oncorhynchus tshawytscha*	08-02-1999	Threatened	Yes
Chinook salmon, Snake River fall-run ESU	*Oncorhynchus tshawytscha*	04-22-1992	Threatened	Yes
Chinook salmon, Snake River spring/summer-run ESU	*Oncorhynchus tshawytscha*	04-22-1992	Threatened	Yes
Chinook salmon, Upper Willamette River ESU	*Oncorhynchus tshawytscha*	08-02-1999	Threatened	Yes
Chum salmon, Columbia River ESU	*Oncorhynchus keta*	08-02-1999	Threatened	Yes
Coho salmon, Lower Columbia River ESU	*Oncorhynchus kisutch*	06-28-2005	Threatened	Yes
Sockeye salmon, Lake Ozette ESU	*Oncorhynchus nerka*	03-25-1999	Threatened	Yes*
Sockeye salmon, Snake River ESU	*Oncorhynchus nerka*	01-03-1992	Endangered	Yes
Steelhead, Snake River basin DPS	*Oncorhynchus mykiss*	06-17-1998	Threatened	Yes
Steelhead, Upper Columbia River DPS	*Oncorhynchus mykiss*	06-17-1998	Threatened	Yes
Steelhead, Middle Columbia River DPS	*Oncorhynchus mykiss*	08-02-1999	Threatened	Yes
Steelhead, Lower Columbia River DPS	*Oncorhynchus mykiss*	06-07-1998	Threatened	Yes
Steelhead, Upper Willamette River DPS	*Oncorhynchus mykiss*	08-02-1999	Threatened	Yes
Marine Mammals				
Blue whale	*Balaenoptera musculus*	12-02-1970	Endangered	No
Fin whale	*Balaenoptera physalus*	12-02-1970	Endangered	No

Species	Scientific Name	Listing Date	Federal Status	Designated Critical Habitat?
Gray whale, western North Pacific DPS	*Eschrichtius robustus*	12-02-1970	Endangered	No
Guadalupe fur seal	*Arctocephalus townsendi*		Threatened	No
Northern Pacific right whale	*Eubalaena japonica*	12-02-1970	Endangered	Yes*
Sei whale	*Balaenoptera borealis*	12-02-1970	Endangered	No
Sperm whale	*Physeter macrocephalus*	12-02-1970	Endangered	No
Reptiles				
Green sea turtle, East Pacific DPS	*Chelonia mydas*	04-06-2016	Threatened	No
Olive Ridley sea turtle	*Lepidochelys olivacea*	07-28-1978	Threatened	No
Loggerhead sea turtle, North Pacific ocean DPS	*Caretta caretta*	07-28-1978	Endangered	No
Oregon spotted frog	*Rana pretiosa*	05-11-2016	Threatened	Yes*
Invertebrates				
Black abalone	*Haliotis cracherodii*	01-14-2009	Endangered	Yes*
White abalone	*Haliotis sorenseni*	05-29-2001	Endangered	No
Taylor's checkerspot butterfly	*Euphydryas editha taylori*	11-04-2013	Endangered	Yes*
*=Critical habitat has been identified but does not occur within the proposed action area. ESU= Evolutionary significant unit, DPS= Distinct population segment, SJF= Strait of Juan de Fuca, PS= Puget Sound, GB= Georgia Basin, AA= action area.				

2.0 BIRDS

The singular ESA-listed species of bird known to occur within the Project action area, the marbled murrelet, is discussed in the subsequent subsections.

2.1 Marbled Murrelet (*Brachyramphus marmoratus*)

2.1.1 Status and Abundance in the Action Area

The marbled murrelet occurs along the Aleutian Islands and the coasts of Alaska, Washington, Oregon, and northern California (Carter and Erickson 1988). Marbled murrelets have been observed and recorded in the Strait of Juan de Fuca, and the project area is located in marbled murrelet Conservation Zone 1, Stratum 1 (Pearson et al. 2014). Within this area, the marbled murrelet population has declined at an estimated annual rate of 3.88 percent, between 2001 and 2013. The 2013 Washington At-Sea Marbled Murrelet Population Monitoring study estimated the marbled murrelet population density in Zone 1 (the Strait of Juan de Fuca and Puget Sound) at 4,395 birds with a 95% confidence interval (Pearson et al. 2014). A related study conducted in 2016 found similar results, with an estimated population of 4,600 murrelets in zone 1 and an estimated decline of 4.94 percent per year (Lynch et al. 2017).

Marbled murrelets are anticipated to occur in or near the Project action area due to geographical proximity to both the Olympic National Park, which provides suitable forest nesting habitat, and the Strait of Juan de Fuca, which provides marine feeding habitat.

2.1.2 Status of Critical Habitat

The final rule designating critical habitat for the murrelet (61 FR 26256 [May 24, 1996]) became effective on June 24, 1996. The critical habitat designation includes 11 units in Washington State, including 1.2 million acres of federal land, 421,500 acres of state forest land, and 2,500 acres of private land. On July 31, 2008, the USFWS published a proposed rule to revise critical habitat for the marbled murrelet (73 FR 44678). Under the proposed rule, the USFWS removed habitat in northern California and Oregon from the 1996 designation based on new information indicating that these areas do not meet the definition of critical habitat. No murrelet critical habitat designations in Washington were identified for removal under the proposed rule. A final revised rule was published on October 4, 2011 (76 FR 61599). The 2011 murrelet critical habitat designation was reinvestigated in 2015 (8 FR 51506 [August 25, 2015]) and confirmed as adequate in 2016 (81 FR 51348 [August 4, 2016]); the current designation includes 3,698,100 acres of critical habitat in the States of Washington, Oregon, and California. No designated critical habitat is located within the action area.

Critical habitat is determined by those areas which host essential physical or biological features (PBFs), for the listed species.

Two PBFs have been identified for marbled murrelet in the final rule

PBF 1— Individual trees with potential nesting platforms.

PBF 2— Forested areas within 0.5 miles of individual trees with potential nesting platforms, and with a canopy height of at least one-half the site-potential tree height. This includes all such forest, regardless of contiguity.

3.0 FISHES

Eight ESA-listed fish species have been documented in the fresh and saltwater habitats within the Project action area. These species are discussed in the following subsections.

3.1 Bull Trout, Coastal-Puget Sound DPS (*Salvelinus confluentus*)

3.1.1 Status and Abundance in Action Area

Bull trout occur throughout the northwestern United States in the states of Washington, Oregon, Idaho, Montana, and Nevada, and throughout western Canada in the provinces of British Columbia, Alberta, Yukon, and Northwest Territories. Bull trout exhibit three distinct forms: freshwater resident, freshwater migratory, and anadromous; each of these three forms may occur in the area immediately surrounding the Project action area. In addition, amphidromous bull trout use marine waters as migratory corridors to reach seasonal habitats in non-natal watersheds to forage and possibly overwinter (Goetz 2003). Marine forage, migration, and overwintering habitat includes portions of Puget Sound, particularly the highly productive nearshore and estuarine areas, with complex habitat structures and substantial nutrient inputs (USFWS 2014). The marine nearshore and estuary habitats are key to supporting this amphidromous life history form, providing important prey such as sandlances (*Ammodytes hexapterus*), surf smelts (*Hypomesus pretiosus*), Pacific herring (*Clupea pallasi*), and shiner perch (*Cymatogaster aggregata*). These amphidromous fish typically occur in nearshore marine waters from early spring through the late fall (USFWS 2014).

Bull trout have been documented in rivers and streams directly surrounding the Project action area, including the Elwha River, Little River, Siebert Creek, Matriotti Creek, and the Dungeness River (WDFW 2021a). Bull trout are also presumed to occur in Ennis Creek and Morse Creek, which directly abut the Project action area (WDFW 2021a). In 2004 the Coastal-Puget Sound distinct population segment (DPS) of bull trout was assumed to be 16,500 adults (USFWS 2004a), and more recent reviews in 2008 and 2012 report that these populations are generally stable (USFWS 2015).

3.1.2 Status of Critical Habitat

A final rule designating critical habitat for the Klamath River and Columbia River populations of bull trout (69 FR 59996 [October 6, 2004]) went into effect on November 5, 2004. This rule set aside approximately 1,748 miles of streams and 61,235 acres of lakes and marshes for bull trout across south-eastern Washington, Oregon, Idaho, and Montana; the Costal-Puget Sound DPS was not represented in the designation. A second final rule designating critical habitat for bull trout across the continental United States (75 FR 63898 [October 18, 2010]) became effective on November 17, 2010. This rule increased the designation to 19,729 miles of streams (including 754 miles of marine shoreline) and 488,251 acres of reservoirs and lakes across the states of Washington, Oregon, Nevada, Idaho, and Montana. This designation includes the marine shoreline along the northern and western coasts of the Olympic Peninsula, including Port

Angeles, as well as the rivers surrounding the Project action area between the Elwha River and Dungeness River.

Nine PBFs have been identified for bull trout in the final rule:

PBF 1— Springs, seeps, groundwater sources, and subsurface water connectivity (hyporheic flows) to contribute to water quality and quantity and provide thermal refugia.

PBF 2 – Migration habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including but not limited to permanent, partial, intermittent, or seasonal barriers.

PBF 3 – An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.

PBF 4 – Complex river, stream, lake, reservoir, and marine shoreline aquatic environments, and processes that establish and maintain these aquatic environments, with features such as large wood, side channels, pools, undercut banks and unembedded substrates, to provide a variety of depths, gradients, velocities, and structure.

PBF 5 – Water temperatures ranging from 2°C to 15°C (36°F to 59°F), with adequate thermal refugia available for temperatures that exceed the upper end of this range. Specific temperatures within this range will depend on bull trout life-history stage and form; geography; elevation; diurnal and seasonal variation; shading, such as that provided by riparian habitat; streamflow; and local groundwater influence.

PBF 6— In spawning and rearing areas, substrate of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount of fine sediment, generally ranging in size from silt to coarse sand, embedded in larger substrates, is characteristic of these conditions. The size and amounts of fine sediment suitable to bull trout will likely vary from system to system.

PBF 7— A natural hydrograph, including peak, high, low, and base flows within historic and seasonal ranges or, if flows are controlled, minimal flow departure from a natural hydrograph.

PBF 8 – Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.

PBF 9 – Sufficiently low levels of nonnative predatory species (e.g., lake trout, walleye, northern pike, smallmouth bass); interbreeding species (e.g., brook trout [*Salvelinus fontinalis*]); or competing (e.g., brown trout [*Salmo trutta*]) species that, if present, are adequately temporally and spatially isolated from bull trout.

3.2 Chinook Salmon, Puget Sound ESU (*Oncorhynchus tshawytscha*)

3.2.1 Status and Abundance in the Action Area

Chinook salmon occur along the Northern Pacific rim from Japan to California. This anadromous fish spends the first stage of its lifecycle (three months to two years) in freshwater before migrating to the marine environment to mature. After two to four years at sea, they return to their natal streams for reproduction (NMFS 2016a). Freshwater, estuarine, and deep-water marine habitats are all utilized by this species.

The Puget Sound Chinook salmon evolutionary significant unit (ESU) is an ESA listed population comprised of many natural or wild spawning populations as well as multiple hatchery stocks. The Puget Sound ESU includes Chinook that spawn in the Elwha River and all rivers eastward, including all Chinook-baring streams that drain to the North and South Sound, Hood Canal, and the Strait of Georgia. There are over twenty artificial Chinook propagation programs that also contribute to stocks in this ESU (Ford 2011). Many of these fish stocks pass through the Strait of Juan de Fuca during their anadromous lifecycle.

The status of the Puget Sound populations is based on their abundance, productivity, diversity, and spatial structure, but substantial development in the basin has degraded their spawning and rearing habitat. Most Puget Sound Chinook stocks are consistently below the spawner-recruit levels outlined for recovery by the Puget Sound Technical Recovery Team (Ford et al. 2010). In the five-year interval from 2005 to 2009, natural Puget Sound Chinook fish escapement abundance was approximately 37,400 individuals, with distinct population abundances ranging from 81 individuals in the Mid-Hood Canal population to 10,345 individuals in the upper Skagit population (Ford et al. 2010). Due to the wide variation in population escapement levels, no overarching population trend for the ESU can be discerned.

Juvenile Chinook salmon are known to use both nearshore and mid-water habitats throughout the Puget Sound during early marine rearing and migration between the months of April and July; out-migrating juvenile salmonids have been documented within the vicinity of Ediz Hook and the Project action area (USACE 2011). However, available evidence indicates that juvenile Chinook from populations throughout the ESU could potentially occur in the action area in limited numbers over broader periods. For example, Fresh (2006) studied marine habitat utilization by Chinook salmon and found rearing juveniles as early as December (immediately post-hatch) and as late as October, with peak abundance in June and July. Fresh also noted that once juvenile Chinook enter the Puget sound from their natal estuaries, they distribute broadly and may be found at any given stretch of shoreline during the year (2006). This wide variation in hatching and estuary/delta residence time suggests that juvenile Chinook from populations throughout the ESU may occur in the action area at any time of year.

Fresh (2006) additionally noted that juveniles were typically found in nearshore habitats during early marine rearing and tended to move offshore into deeper water as they increased in size. Adult Chinook salmon are light sensitive and tend to use deep water habitats between 50 and 100 feet or greater during daylight hours (70 FR 52680).

Puget Sound Chinook salmon run in spring, summer, and fall. Immediately surrounding the Project action area, Spring Chinook runs are documented as present in the lower reaches of the Elwha River and as spawning in the Dungeness River. Fall Chinook runs are documented as present in the Ennis Creek and Dungeness River and as spawning in the Elwha River and Morse Creek (WDFW 2021a).

3.2.2 Status of Critical Habitat

NMFS published the final rule designating critical habitat for Puget Sound Chinook salmon in September 2005 (70 FR 52630). The rule identifies the fresh, nearshore, and marine waters of Puget Sound designated as critical habitat for Chinook salmon; the Project action area exists within the designated critical habitat for Puget Sound Chinook. Critical habitat designations are based on the presence of PBFs that are essential to supporting one or more life stages of the species and that contain physical or biological features essential to the conservation of the species.

Six PBFs have been identified for Puget Sound Chinook in the final rule:

PBF 1— Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development.

PBF 2— Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.

PBF 3— Freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

PBF 5— Nearshore marine areas free of obstruction with water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation; and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels.

PBF 6— Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation.

3.3 Chum Salmon, Hood Canal Summer-Run ESU (*Oncorhynchus keta*)

3.3.1 Status and Abundance in the Action Area

Chum salmon occur along the northern Pacific rim from northern Japan to Northern California and as far north as the Beaufort Sea (NMFS 2017a). This salmonid species exhibits an anadromous lifecycle, beginning life in spring in freshwater streams before making an immediate migrating to the ocean. After one to three years feeding in the ocean, chum salmon return to their natal freshwater streams in summer, fall, or winter for reproduction (WDFW5 2021). In Washington state, chum salmon run in those three seasons throughout the Puget Sound, Olympic Peninsula, and Columbia River (WDFW 2021). The threatened Hood Canal summer-run ESU of Chum salmon has been documented as present or spawning throughout the Hood Canal and southern Sound in low-elevation river reaches near the coast (WDFW 2021). The range of the Hood Canal summer-run ESU extends north to the Dungeness River on the Strait of Juan de Fuca. Several species of out migrating juvenile salmonids, including chum, use near-shore waters in the vicinity of Ediz Hook and the Project action area; the peak migration period occurs between March 15 and June 15 (USACE 2011). Recent population estimates show an upward trend, with 14,727 spawning Hood Canal summer-run chum recorded in 2013 for the Strait of Juan de Fuca subpopulation, and a yearly average of 7,401 spawners in this subpopulation between 2003 and 2013 (NMFS 2013). The Hood Canal subpopulation reached 22,618 spawning adult chum salmon in 2013, with a yearly average of 22,843 spawners between 2003 and 2013 (NMFS 2013).

Both the Hood Canal and Strait of Juan de Fuca subpopulations access the Northern Puget Sound and Strait of Juan de Fuca during their anadromous lifecycle, and hospitable near-shore estuarine and marine conditions are key for this species' survival, especially as juvenile chum salmon immediately migrate to saltwater after hatching. For these reasons, chum salmon are anticipated to occur in the Project action area.

3.3.2 Status of Critical Habitat

The final rule designating Hood Canal summer-run chum salmon ESU critical habitat (65 FR 7764 [February 16, 2000]) became effective March 17, 2000. This rule includes a specific designation for the Hood Canal summer-run ESU, including Dungeness Bay and its associated tributaries. The final rule does not specify the exact acreage of the critical habitat nor any PBFs that are associated with the designation.

There is no overlap of Hood Canal summer-run chum salmon critical habitat at the Project action area.

3.4 Steelhead Trout, Puget Sound DPS (*Oncorhynchus mykiss*)

3.4.1 Status and Abundance in the Action Area

Steelhead trout occur along the northern Pacific rim from the Kamchatka Peninsula in eastern Russia to southern California in the western United States. Their range stretches along the Aleutian Island archipelago, mainland Alaska, Washington State, Oregon, and California, as well as the Canadian province of British Columbia. Additionally, their freshwater habitat spans the state of Washington and eastward into Idaho (NMFS 2016b). Steelhead have both an anadromous form (steelhead trout) and an entirely freshwater form (rainbow trout) (NMFS 2016b). Anadromous steelhead exhibit iteroparity, spawning in the spring over multiple years. Puget Sound DPS steelhead run in summer and winter depending on how far inland they must travel to reach their natal streams (WDFW 2021c). Fry hatch in summer and may remain in freshwater for three years before migrating to saltwater (WDFW 2021c).

Steelhead of the Puget Sound DPS are divided into three major population groups (MPG)—the Central and South Puget Sound MPG, Hood Canal and Strait of Juan de Fuca MPG, and Northern Cascade MPG (NMFS 2013). Each MPG is further divided into populations. The Hood Canal and Strait of Juan de Fuca MPG is comprised on eight populations: Dungeness River summer/winter-runs, east Hood Canal tributaries winter-run, Elwha River winter-run, Sequim/Discovery Bays tributaries winter-run, Skokomish River winter-run, south Hood Canal tributaries winter-run, Strait of Juan de Fuca tributaries winter-run, and west Hood Canal tributaries winter-run (NMFS 2013). While all MPG and populations of Steelhead in the Puget Sound region may at some time in their lifecycle use the Strait of Juan de Fuca, the nearshore and upland Project action area is most intimately accessed by the Hood Canal and Strait of Juan de Fuca MPG.

Spawner return quantity estimates from 2000 to 2015 show an average of 152 returning adult steelhead per year across all Hood Canal and Strait of Juan de Fuca MPG populations (NMFS 2013). By the same metrics, the Dungeness River summer/winter-runs averaged 42 returning spawners, the Elwha River winter-run averaged 207 returning spawners, the Sequim/Discovery Bays tributaries winter-run averaged 43 returning spawners, and the Strait of Juan de Fuca tributaries winter-run averaged 151 returning spawners (NMFS 2013). Averaged trends for all Puget Sound steelhead show that population sizes are declining by three to ten percent annually (NMFS 2011a). Most populations in this DPS remain at moderate to high risk of extinction in the next hundred years (NMFS 2011a).

3.4.2 Status of Critical Habitat

Critical habitat was first designated for nine steelhead ESUs not including the Puget Sound steelhead DPS on March 17, 2000 (65 FR 7764 [February 16, 2000]). The final rule designating Puget Sound steelhead DPS critical habitat (81 FR 9252 [February 24, 2016]) became effective on March 25, 2016. This ruling appoints 2,031 miles of streams in the Puget Sound region to steelhead critical habitat, of which approximately 15.5 percent is federal land, 3.8 percent is state land, and 80.7 percent is in private ownership. The Project action area falls within the Dungeness-Elwha Sub-basin (#17110020) critical habitat designation.

Critical habitat designations are based on the presence of PBFs that are essential to supporting one or more life stages of the species and that contain physical or biological features essential to the conservation of the species. Of the six PBFs outlined in this final rule, PBF 1, 2, 3, 5, and 6 occur in or immediately near the project action area.

Six PBFs have been designated for Puget Sound steelhead, including:

PBF 1— Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development.

PBF 2— Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.

PBF 3— Freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

PBF 5-- Nearshore marine areas free of obstruction with water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation; and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels.

PBF 6— Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation.

3.5 Rockfish, Puget Sound/Georgia Basin DPS (*Sebastes spp.*)

This section discusses the status of both yelloweye rockfish (*Sebastes ruberrimus*, Puget Sound/Georgia Basin DPS) and bocaccio rockfish (*Sebastes paucispinis*, Puget Sound/Georgia Basin DPS) due to the similarities in their life histories and habitats.

3.5.1 Status and Abundance in the Action Area

Yelloweye and bocaccio rockfish occur along the western coast of North America from Baja California, Mexico to the Aleutian Island archipelago (NMFS 2017b). Juvenile rockfish are typically found in shallow waters, and adult rockfish move into deeper waters with age. All species show site fidelity for rocky outcrops and bottoms (NMFS 2017b). Rockfish presence in and near the Project action area is most likely to consist of either larval or juvenile life stages that originate from nearby preferred habitats. Rockfish fertilize their eggs internally and the young are extruded as larvae, which exhibit a pelagic distribution, and often found near the surface of open water (Love et al. 2002). In these near-surface areas, larval rockfish are passively distributed by currents and wind. However, the relatively protected waters of Puget Sound may restrict the larval life stages from dispersing a substantial distance from their natal areas (NMFS 2010a). Larvae and small juvenile rockfish may remain in open water for several months, being passively dispersed by tidal and wind-driven currents. If present, these younger life stages may settle in shallow water habitat before moving to deeper habitat areas as they grow.

Recent abundance data from a 2013 study in the northern Strait of Juan de Fuca in the San Juan Island area reported approximate populations of 47,407 yelloweye rockfish and 4,606 bocaccio (Tonnes et al. 2016). Population modeling assessments from 2016 found that from 1977 to 2014, total rockfish populations in the Puget Sound are declining at a rate of 3.1 to 3.8 percent per year for an overall decline of 69 to 76 percent in that time (Tonnes et al. 2016).

The WDFW Washington State Sport Catch Report for 2014 recorded twelve yelloweye rockfish encounters and no bocaccio encounters in the Strait of Juan de Fuca (Kraig and Scalici 2016). The 2015 Sport Catch Report recorded no yelloweye rockfish encounters and only five bocaccio encounters in the Strait of Juan de Fuca (Kraig and Scalici 2017). While the marine habitat areas within the Project action area do not provide the deep-water rocky outcrops and reefs preferred by rockfish, stocks are present in the Strait of Juan de Fuca. Status of Critical Habitat

The final rule designating critical habitat for the yelloweye and bocaccio rockfish in Puget Sound (79 FR 68042 [November 13, 2014]) became effective on February 11, 2015. This rule includes 590.4 square miles of nearshore habitat and 414.1 square miles of deep-water habitat for Puget Sound rockfish species. The range of the critical habitat extends throughout the north, east, and southern portions of the Puget Sound, but is truncated to the west at Green Point, between the Dungeness Valley and the Port of Port Angeles. No PBFs are outlined in this final rule for these species of rockfish. There is no overlap between the Project action area and the designated critical habitat.

3.6 Eulachon, Southern DPS (*Thaleichthys pacificus*)

3.6.1 Status and Abundance in the Action Area

Eulachon are endemic to the eastern Pacific Ocean, ranging from northern California to southwest Alaska and into the southeastern Bering Sea. In the continental United States, most eulachon originate in the Columbia River basin. Other areas in the United States where eulachon have been documented are the Sacramento River, Russian River, Humboldt Bay, and the Klamath River in California; the Rogue River and Umpqua River in Oregon; and in coastal rivers and tributaries of Puget Sound, Washington (Gustafson et al. 2010). Eulachon exhibit an anadromous life history, and usually spawn between the ages of two and five (Gustafson 2016). Spawner return is dependent on river water temperatures and typically spawning occurs between December and June. After three to eight weeks, the eggs hatch larval eulachon, which are transported downstream to saltwater. The juveniles develop and disperse into nearshore environments in their first year (Gustafson 2016).

While population and abundance data are limited for the Puget Sound region overall, eulachon runs in individual rivers has been documented. In the Elwha River eulachon were common until 1970; in the late 2000’s, less than a few dozen eulachon were reported. More concrete observations have been made in recent years, including a record of over one hundred eulachon during two distinct runs (January and April) in 2012. In January of 2015, hundreds of eulachon were documented in the lower estuary (Gustafson 2016). General trends from these more recent findings show that eulachon spawner abundance has increased since the species’s listing in 2010 (Gustafson 2016).

3.6.2 Status of Critical Habitat

The final rule designating critical habitat for eulachon (76 FR 65324 [October 20, 2011]) became effective on December 19, 2011. This designation is comprised of sixteen specific habitat areas in the states of Washington, Oregon, and California. The eulachon critical habitat totals 335 miles of habitat, including freshwater streams and their associated estuaries. The lower reaches of the Elwha River on the Olympic Peninsula are included in eulachon critical habitat, although no critical habitat is designated within the Project action area.

Three PBFs have been designated for eulachon, including:

PBF 1— Freshwater spawning and incubation sites with water flow, quality and temperature conditions and substrate supporting spawning and incubation, and with migratory access for adults and juveniles.

PBF 2— Freshwater and estuarine migration corridors associated with spawning and incubation sites that are free of obstruction and with water flow, quality and temperature conditions supporting larval and adult mobility, and with abundant prey items supporting larval feeding after the yolk sac is depleted.

PBF 3— Nearshore and offshore marine foraging habitat with water quality and available prey, supporting juveniles and adult survival. Eulachon prey on a wide variety of species including crustaceans such as copepods and euphausiids, unidentified malacostracans, cumaceans mysids, barnacle larvae, and worm larvae.

3.7 North American Green Sturgeon, Southern DPS (*Acipenser medirostris*)

3.7.1 Status and Abundance in the Action Area

North American green sturgeon occur along the west coast of North America from central California to southern British Columbia. Isolated extant patches also occur in central and northern British Columbia and southern Alaska (St. Pierre and Campbell 2006). Adult and subadult green sturgeon spend the majority of their life in the marine environment. The southern DPS green sturgeon tend to concentrate in coastal estuaries and bays in summer and fall, including the Columbia River Estuary, Grays Harbor, and Willapa Bay (NMFS 2015); this DPS has also been observed in high numbers off the coast of Vancouver Island, British Columbia in winter and spring (NMFS 2021).

Green sturgeon are a long-lived, anadromous species that reach maturity around fifteen years old and reproduce every three to five years (NMFS 2015, NMFS 2021). During spawning years, the southern DPS green sturgeon spawn primarily in the Sacramento River in California in summer and fall (NMFS 2015, NMFS 2021). Spawning adults enter the Sacramento River between late winter and early spring, spawn in summer, and re-enter the ocean in fall. Post-hatch larvae migrate to the San Joaquin Delta estuary where they rear for several years before moving out to the ocean (NMFS 2015, NMFS 2021).

Abundance and demographic studies conducted since 2006 have shed new light on North American green sturgeon southern DPS population sizes. Larval green sturgeon counts on the upper Sacramento River recorded 7,500 individuals from 1994 to 2011, with 3,700 of those individuals counted in 2011 alone (NMFS 2015). A kinship analysis using genetic analyses to estimate southern DPS spawners in the upper Sacramento River indicated approximately ten to twenty-eight individuals successfully reproduced annually (NMFS32015). Population surveys conducted by WDFW and ODFW in 2014 estimated a population of approximately 40,000 sub-adult and adult green sturgeon in Willapa Bay, Grays Harbor, and the Columbia River (NMFS 2015). Of those 40,000 individuals, approximately 60% are southern DPS green sturgeon, based on genetic information (NMFS 2015).

Within the Strait of Juan de Fuca and Puget Sound, recent observations of green sturgeon are fewer than along the coast, and sightings are mainly based on fishery self-reporting and anecdotal evidence (NMFS 2015). In the Puget Sound and Washington coast, no green sturgeon were reported by recreational fisheries since 2007 (NMFS 2015) although acoustic tagging surveys have detected southern DPS green sturgeon in the Strait of Juan de Fuca, Puget Sound, Rosario Strait, and western Vancouver Island (NMFS 2009, NMFS 2005b).

3.7.2 Status of Critical Habitat

The final rule designating critical habitat for the North American green sturgeon southern DPS (74 FR 52300 [October 9, 2009]) became effective November 9, 2009. This rule totals approximately 320 miles of freshwater river habitat, 897 square miles of estuary habitat in the Sacramento-San Joaquin Delta, and 135 square miles of habitat within the Yolo and Sutter bypasses on the Sacramento River. This designation also includes 1,017 square miles of coastal bays and estuaries in the Puget Sound and 522 square miles of coastal marine waters in the Strait of Juan de Fuca (NMFS 2009).

As green sturgeon occupy different systems according to their life stage, the PBFs included in the final rule are broken into groups for freshwater, estuarine, and nearshore marine waters.

The following lists the PBF requirements in greater depth:

Puget Sound

PBF 1— Food resources. Abundant prey items within estuarine habitats and substrates for juvenile, subadult, and adult life stages. Prey species for juvenile, subadult, and adult green sturgeon within bays and estuaries primarily consist of benthic invertebrates and fishes, including crangonid shrimp, burrowing thalassinidean shrimp (particularly the burrowing ghost shrimp), amphipods, isopods, clams, annelid worms, crabs, sand lances, and anchovies.

PBF 3— Water quality. Water quality, including temperature, salinity, oxygen content, and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages.

PBF 4—Migratory corridor. A migratory pathway necessary for the safe and timely passage of Southern DPS fish within estuarine habitats and between estuarine and riverine or marine habitats.

PBF 6—Sediment quality. Sediment quality (i.e., chemical characteristics) necessary for normal behavior, growth, and viability of all life stages. This includes sediments free of elevated levels of contaminants (e.g., selenium, PAHs, and pesticides) that can cause adverse effects on all life stages of green sturgeon (see description of ''Sediment quality'' for riverine habitats above)

Strait of Juan de Fuca

PBF 1— Migratory corridor. A migratory pathway necessary for the safe and timely passage of Southern DPS fish within marine and between estuarine and marine habitats.

PBF 2— Water quality. Coastal marine waters with adequate dissolved oxygen levels and acceptably low levels of contaminants (e.g., pesticides, PAHs, heavy metals that may disrupt the normal behavior, growth, and viability of subadult and adult green sturgeon).

PBF 3— Food resources. Abundant prey items for subadults and adults, which may include benthic invertebrates and fish.

As the critical habitat designation overlaps the Project action area, this designation must be considered for this Project.

4.0 MARINE MAMMALS

Two ESA-listed species of whales are known to occur within the marine waters of the action area and are discussed in the subsequent subsections.

4.1 Killer Whale, Southern Resident DPS (*Orcinus orca*)

4.1.1 Status and Abundance in the Action Area

While both resident and transient forms of killer whales occur in Puget Sound and Strait of Juan de Fuca, resident whales of the Southern Resident killer whale (SRKW) DPS are most commonly observed in Puget Sound (Wiles 2016). The SRKW DPS is known to occupy the marine waters near the action area at variable times of the year. This group consists of three pods (J, K, and L) and is considered a stock under the Marine Mammal Protection Act. Whales of the J pod are seen year-round in the inland waterways of Puget Sound, the Strait of Juan de Fuca, and the Strait of Georgia (Wiles 2016; NMFS 2008). From late spring through midwinter, the K and L pods are also present in these waters. Individuals from all three pods have also been seen, albeit infrequently, at all times of the year in coastal waters from central California north to Vancouver Island (Ford et al. 2000; NMFS 2008). Whales of the SRKW DPS tend to remain outside of relatively confined bays or shallow water areas as they move through the central Puget Sound area. This population is genetically isolated and rarely interbreeds with other killer whale populations (Hoelzel et al. 1998). Whales of the SRKW DPS also differ behaviorally from transient killer whales in that they rely almost exclusively on fish as a food source. Observations in northern Puget Sound indicate that salmon are preferred prey for killer whales, representing over 96 percent of the prey during the summer and fall (Ford and Ellis 2005). This study also indicated that Chinook salmon constitute over 70 percent of the identified salmonids taken in the summer and fall, although extensive feeding on chum salmon was also observed in the fall. While salmon appear to be a preferred prey item, 22 other species of fish and 1 species of squid (*Gonatopsis borealis*) are known to be eaten (Ford et al. 1998; 2000). Species such as rockfish (*Sebastes spp*.), Pacific halibut (*Hippoglossus stenolepis*), a number of flatfish, lingcod (*Ophiodon elongatus*), and greenling (*Hexagrammos spp*.) are likely consumed regularly by SRKWs (Ford et al. 1998).

From late spring to fall, most whales of the SRKW DPS can be found in the waters around the San Juan Islands, including Haro Strait, Boundary Passage, and the northeastern portion of the Strait of Juan de Fuca (Ford et al. 2000; Krahn et al. 2004). During this period, whales are also present in smaller numbers in Rosario Strait, the interior waters of the San Juan Islands, the southern portions of Georgia Strait and the Strait of Juan de Fuca, Admiralty Inlet, Puget Sound, and the outer coast. Individuals or groups from this population may also be seen at various locations in central Puget Sound each summer, typically for periods of a few days, but occasionally remaining in the area for more than a month. During early autumn, SRKW pods (especially the J pod) expand their movements into Puget Sound, likely to feed on returning adult chum and Chinook salmon (Osborne 1999). Considerably less is known about the wintertime movements of this stock. Whales from the J pod are commonly sighted in inshore waters in winter, while the K and L pods apparently spend more time offshore (Ford et al. 2000; Krahn et al. 2004).

The Whale Museum in Friday Harbor manages a long-term database of SRKW sightings and geospatial locations in inland waters of Washington (The Whale Museum 2021). The data are largely opportunistic sightings from a variety of sources. Nevertheless, the animals are highly visible in inland waters and are widely followed by the interested public and research community. The Whale Museum reviews each sighting report and report context to include only reports of whales from the SRKW DPS. Transient whales, northern residents, and offshore whales are excluded. The data set does not account for level of observation effort by season or location; however, it is the most comprehensive long-term data set available to evaluate broad-scale habitat use by SRKWs in inland waters. For these reasons, NMFS relies on the number of past sightings to assess the likelihood of SRKW presence in a project area during a given month

(NMFS 2010b). Within a ten-mile radius from the Project action area, there have been zero SRKW DPS sightings in the last 5 years, between January 1, 2016 and April 2021 (The Whale Museum 2021). The population size of the SRKW DPS has fluctuated over the last four decades since their listing in 1973, with the most recent count in February of 2021 recording 75 SRKW in the Salish Sea (The Whale Museum 2021).

Based on a review of Whale Museum data from SRKWs are most likely to occur near the action area during late summer, fall, and winter. Guidance from the NMFS Northwest Region office defines SRKWs as extremely unlikely to occur in a particular area during a particular month if the Whale Museum data set includes a total of fewer than six sightings in that area during that month. However, SRKWs can be present within the marine waters near the action area at any time of the year.

4.1.2 Status of Critical Habitat

The final rule designating critical habitat for the SRKW DPS (71 FR 69054 [November 29, 2006]) became effective on December 29, 2006. This habitat is divided into three areas: the summer core area in Haro Strait and waters surrounding the San Juan Islands, the Puget Sound, and the Strait of Juan de Fuca. The designation includes a total of 2,560 square miles of marine habitat. Waters less than twenty feet deep relative to extreme high water are not considered to be within the geographical area occupied by SRKWs and are not included in the critical habitat designation. This final rule defines three PBFs for the SRKW DPS, which are as follows:

PBF 1—Water quality to support growth and development.

PBF 2— Prey species of sufficient quantity, quality and availability to support individual growth, reproduction and development, as well as overall population growth.

PBF 3— Passage conditions to allow for migration, resting, and foraging.

4.2 Humpback Whale, Mexico and Central America DPS (*Megaptera novaeangliae*)

4.2.1 Status and Abundance in the Action Area

Humpback whales are present in all the world’s oceans. The humpbacks mostly live in coastal and continental shelf waters, although they sometimes feed around seamounts and migrate through deep water. Every year, they follow a regular migration route, feeding in temperate and polar climates during the summers, and mating and calving in tropical waters during the winter. Population estimates from 2006 recorded 18,000 to 20,000 whales across the entire North Pacific (WDFW 2012). The Washington coast generally hosts a small portion of humpback whales in the summer from July to September; data show there are an estimated 100 humpbacks occupying these waters annually (Douglas et al. 2008). The whales are mostly concentrated to the west and southwest of the Strait of Juan de Fuca entrance, where they spend their summers feeding (WDFW 2012). At the start of winter, the humpbacks migrate to Mexico or Central America (WDFW 2012).

Humpback whale minimum population size in 2016 was estimated to be no less than 1,876 individuals (NMFS 2016c). Population growth rates are variable across different stocks of humpback, but a general trend of six to seven percent growth is evident for the California/Oregon/Washington stock (NMFS 2016c). According to a review of Whale Museum data since 1976, only three humpback whale sightings have been made within a ten-mile radius from the Project action area (The Whale Museum 2021). Based on a review of the sighting data, humpback whales appear most likely to occur near the action area during the summer months.

4.2.2 Status of Critical Habitat

Critical habitat for humpback whales has not been designated or proposed at this time.

5.0 REPTILES

Four marine reptile species are known to at least occasionally occur in Washington's coastal waters. These include the leatherback (*Dermochelys coriacea*), loggerhead (*Caretta caretta*), green (*Chelonia mydas*), and olive ridley (*Lepidochelys olivacea*) sea turtles. Of these only the leatherback has a critical area designation in Washington State and is known to occur within the marine waters near the action area. This species is discussed in the subsequent subsections.

5.1 Leatherback Sea Turtle (*Dermochelys coriacea*)

5.1.1 Status and Abundance in the Action Area

The leatherback sea turtle is the largest, deepest diving, and most migratory of the sea turtles. The leatherback sea turtle has the most extensive range of any adult turtle, found in tropical to subpolar oceans with nesting habitat on tropical beaches (NMFS 2016d). Beaches suitable for leatherback nesting sites occur between 38° N and 34° S (Eckert et al. 2012) and are not located in Washington. However, leatherbacks regularly occur off the coast of Washington, especially off the mouth of the Columbia River during the summer and fall when large aggregations of jellyfish form (WDFW 2013).

The leatherback turtle is listed as endangered throughout its range. Both the western Pacific and eastern Pacific stocks of leatherback are in a continuous population decline (NMFS 2016d). Over the last three generations, western Pacific stocks have decreased more than 80 percent and eastern Pacific stocks have decreased more than 97 percent. Estimates from 1996 put the remaining number at 34,500 reproductive females worldwide (Spotila et al. 2000). The most recent population estimates for the Pacific Ocean population report only approximately 3,200 individuals as of 2011 (NMFS and USFWS 2013). While occurrences of leatherback along the Washington coast may be likely, it is highly unlikely that this species will occur at the Project action area.

5.1.2 Status of Critical Habitat

The first final rule designating critical habitat for the leatherback turtle (44 FR 17710 [March 23, 1979) became effective on March 31, 1979. This rule secured a critical habitat designation for waters adjacent to the U.S. Virgin Islands. A second final rule became effective on February 27, 2012 (77 FR 4170 [January 26, 2012]). The new rule designated critical habitat for the Pacific coast, including Washington, but this designation does not extend into the Strait of Juan de Fuca or Puget Sound (NMFS$_5$ 2016). The designated areas comprise approximately 41,914 square miles of marine habitat and include waters from the ocean surface down to a maximum depth of 80 m. In this final rule only one PBF had been identified as essential for the conservation of leatherbacks in marine waters off the U.S. west coast:

PBF 1—The occurrence of prey species, primarily *scyphomedusae* of the order *Semaeostomeae* (*Chrysaora, Aurelia, Phacellophora,* and *Cyanea*) of sufficient condition, distribution, diversity, and abundance and density necessary to support individual as well as population growth, reproduction, and development.

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Appendix B

Species List

APPENDIX B – SPECIES LISTS

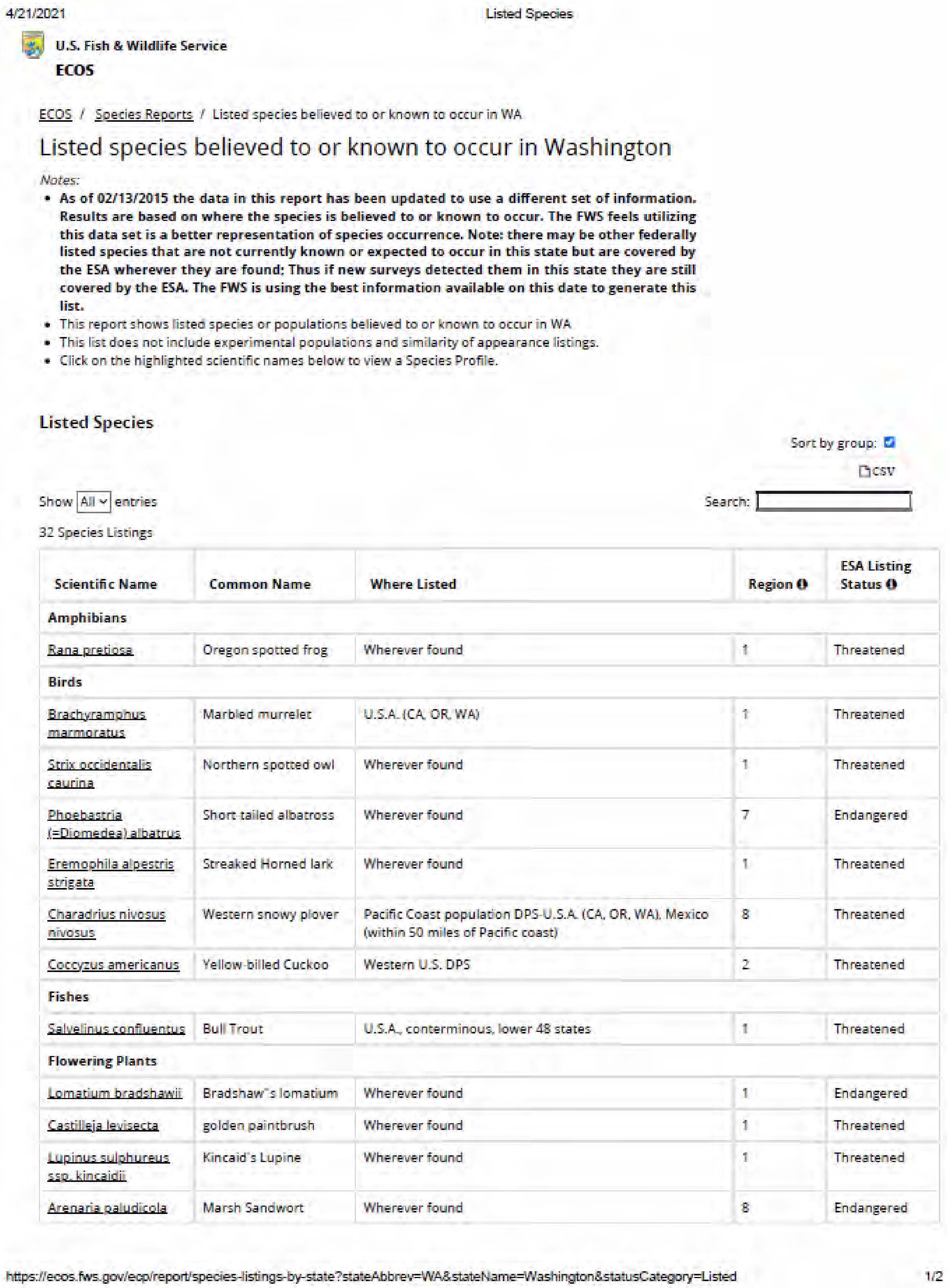
This appendix summarizes the ESA-listed species documented for Washington State and the Project action area in Clallam County. The species lists were obtained directly from the services websites as noted below and compiled herein.

- USFWS listed species information was obtained from the USFWS Environmental Conservation Online System website on April 21, 2021: https://ecos.fws.gov/ecp/report/species-listings-by-state?stateAbbrev=WA&stateName=Washington&statusCategory=Listed
  The species identified by the USFWS are those ESA listed species that are known to occur or have the potential to occur in the state of Washington.

- Project action area-specific species list information was obtained from the USFWS Information for Planning and Consultation (IPaC) web site on April 21, 2021: https://ecos.fws.gov/ipac/
  The species identified by the USFWS IPaC are those that are known to occur or have the potential to occur in the designated Project action area.

- NMFS listed species and designated critical habitat information was obtained from the West Coast Region website on April 21, 2021: https://www.fisheries.noaa.gov/species-directory/threatened-endangered?title=&species_category=any&species_status=any&regions=1000001126&items_per_page=all&sort=
  The species identified on the NMFS website are known to occur or have the potential to occur in Washington State and adjacent waters, including the action area.

Critical habitat maps and species range maps are also provided in this appendix.



4/21/2021 Listed Species

U.S. Fish & Wildlife Service
ECOS

ECOS / Species Reports / Listed species believed to or known to occur in WA

Listed species believed to or known to occur in Washington

Notes:

- **As of 02/13/2015 the data in this report has been updated to use a different set of information. Results are based on where the species is believed to or known to occur. The FWS feels utilizing this data set is a better representation of species occurrence. Note: there may be other federally listed species that are not currently known or expected to occur in this state but are covered by the ESA wherever they are found; Thus if new surveys detected them in this state they are still covered by the ESA. The FWS is using the best information available on this date to generate this list.**
- This report shows listed species or populations believed to or known to occur in WA
- This list does not include experimental populations and similarity of appearance listings.
- Click on the highlighted scientific names below to view a Species Profile.

Listed Species

Sort by group: ☑

CSV

Show All entries

Search:

32 Species Listings

Scientific Name	Common Name	Where Listed	Region	ESA Listing Status
Amphibians				
Rana pretiosa	Oregon spotted frog	Wherever found	1	Threatened
Birds				
Brachyramphus marmoratus	Marbled murrelet	U.S.A. (CA, OR, WA)	1	Threatened
Strix occidentalis caurina	Northern spotted owl	Wherever found	1	Threatened
Phoebastria (=Diomedea) albatrus	Short tailed albatross	Wherever found	7	Endangered
Eremophila alpestris strigata	Streaked Horned lark	Wherever found	1	Threatened
Charadrius nivosus nivosus	Western snowy plover	Pacific Coast population DPS-U.S.A. (CA, OR, WA), Mexico (within 50 miles of Pacific coast)	8	Threatened
Coccyzus americanus	Yellow-billed Cuckoo	Western U.S. DPS	2	Threatened
Fishes				
Salvelinus confluentus	Bull Trout	U.S.A., conterminous, lower 48 states	1	Threatened
Flowering Plants				
Lomatium bradshawii	Bradshaw"s lomatium	Wherever found	1	Endangered
Castilleja levisecta	golden paintbrush	Wherever found	1	Threatened
Lupinus sulphureus ssp. kincaidii	Kincaid's Lupine	Wherever found	1	Threatened
Arenaria paludicola	Marsh Sandwort	Wherever found	8	Endangered

https://ecos.fws.gov/ecp/report/species-listings-by-state?stateAbbrev=WA&stateName=Washington&statusCategory=Listed 1/2

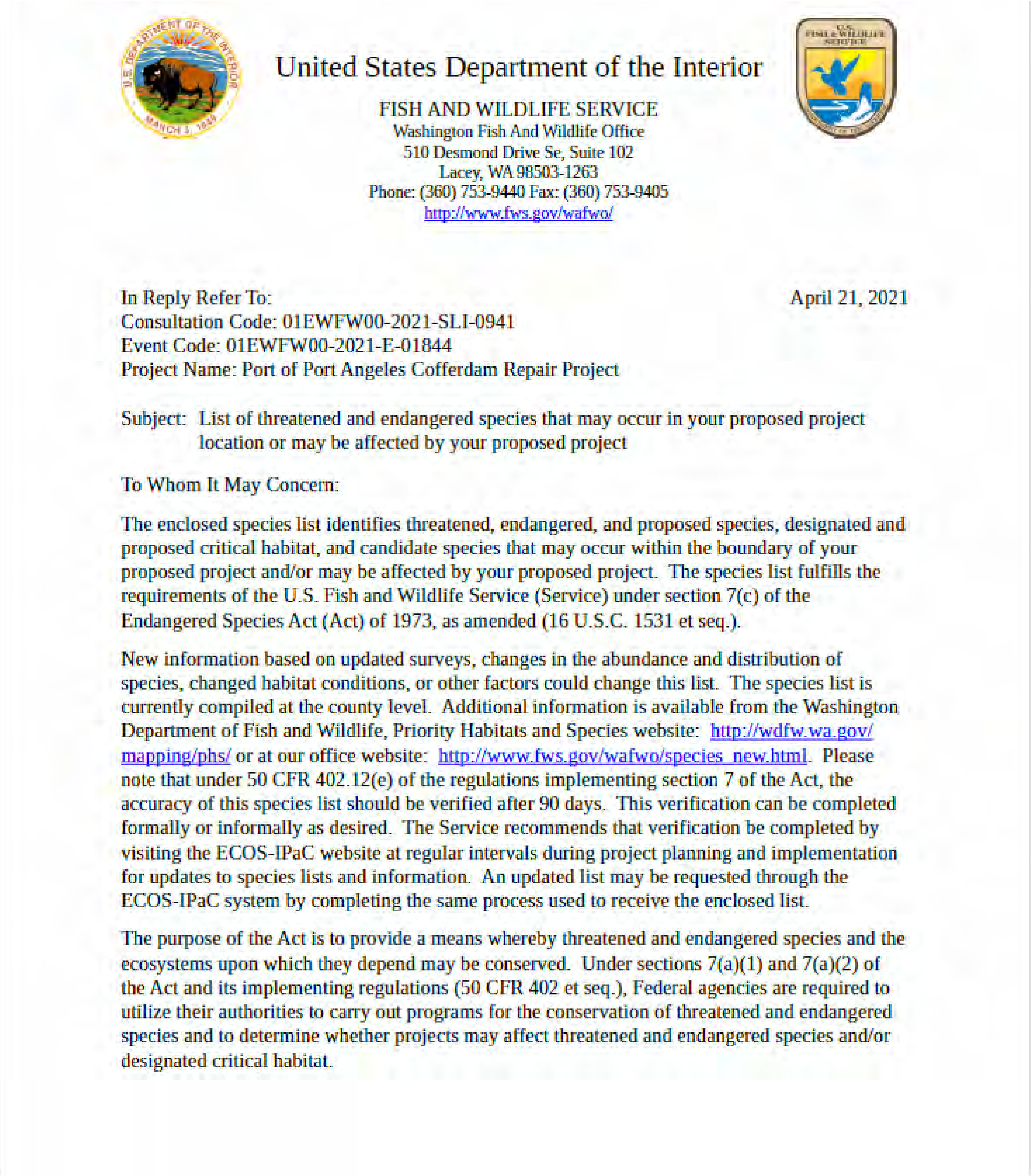
4/21/2021 Listed Species

Scientific Name	Common Name	Where Listed	Region ❶	ESA Listing Status ❶
Sidalcea nelsoniana	Nelson's checker-mallow	Wherever found	1	Threatened
Hackelia venusta	Showy stickseed	Wherever found	1	Endangered
Silene spaldingii	Spalding's Catchfly	Wherever found	1	Threatened
Eriogonum codium	Umtanum desert buckwheat	Wherever found	1	Threatened
Spiranthes diluvialis	Ute ladies'-tresses	Wherever found	6	Threatened
Howellia aquatilis	Water howellia		6	Threatened
Sidalcea oregana var. calva	Wenatchee Mountains checkermallow	Wherever found	1	Endangered
Physaria douglasii ssp. tuplashensis	White Bluffs bladderpod	Wherever found	1	Threatened
Insects				
Euchloe ausonides insulanus	Island marble Butterfly	Wherever found	1	Endangered
Euphydryas editha taylori	Taylor's (=whulge) Checkerspot	Wherever found	1	Endangered
Mammals				
Lynx canadensis	Canada Lynx	Wherever Found in Contiguous U.S.	6	Threatened
Brachylagus idahoensis	Columbia Basin Pygmy Rabbit	Columbia Basin DPS	1	Endangered
Odocoileus virginianus leucurus	Columbian white-tailed deer	Columbia River DPS	1	Threatened
Ursus arctos horribilis	Grizzly bear	U.S.A., conterminous (lower 48) States, except where listed as an experimental population	6	Threatened
Thomomys mazama pugetensis	Olympia pocket gopher	Wherever found	1	Threatened
Thomomys mazama glacialis	Roy Prairie pocket gopher	Wherever found	1	Threatened
Rangifer tarandus ssp. caribou	Southern Mountain Caribou DPS	Southern Mountain DPS	1	Endangered
Thomomys mazama tumuli	Tenino pocket gopher	Wherever found	1	Threatened
Thomomys mazama yelmensis	Yelm pocket gopher	Wherever found	1	Threatened
Reptiles				
Dermochelys coriacea	Leatherback sea turtle	Wherever found	4	Endangered

Showing 1 to 32 of 32 entries

Previous 1 Next

https://ecos.fws.gov/ecp/report/species-listings-by-state?stateAbbrev=WA&stateName=Washington&statusCategory=Listed 2/2



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
http://www.fws.gov/wafwo/

In Reply Refer To:
Consultation Code: 01EWFW00-2021-SLI-0941
Event Code: 01EWFW00-2021-E-01844
Project Name: Port of Port Angeles Cofferdam Repair Project

April 21, 2021

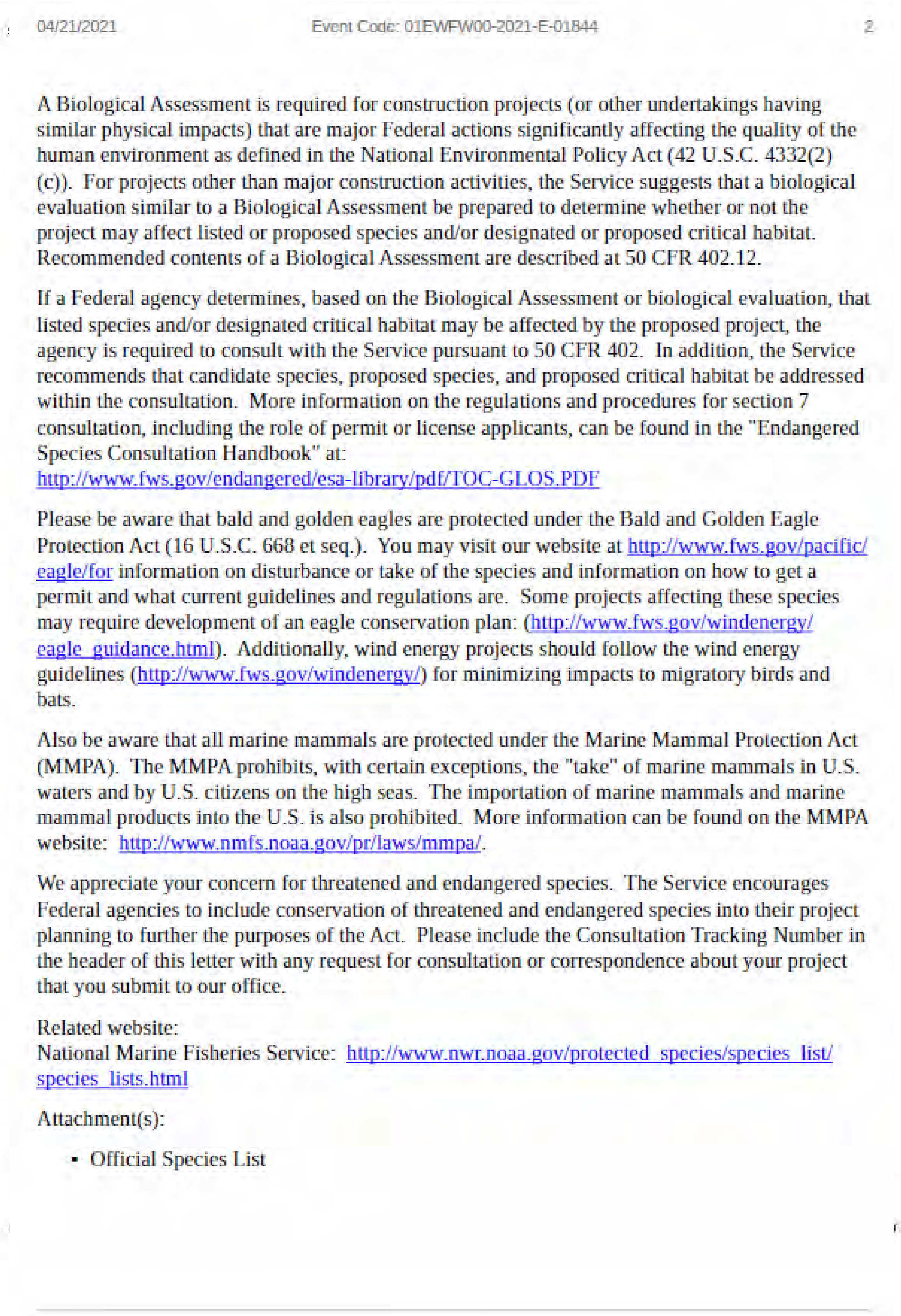
Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, and proposed species, designated and proposed critical habitat, and candidate species 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. The species list is currently compiled at the county level. Additional information is available from the Washington Department of Fish and Wildlife, Priority Habitats and Species website: http://wdfw.wa.gov/mapping/phs/ or at our office website: http://www.fws.gov/wafwo/species_new.html. 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 ECOS-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 ECOS-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 or not 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:
http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.). You may visit our website at http://www.fws.gov/pacific/eagle/for information on disturbance or take of the species and information on how to get a permit and what current guidelines and regulations are. Some projects affecting these species may require development of an eagle conservation plan: (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

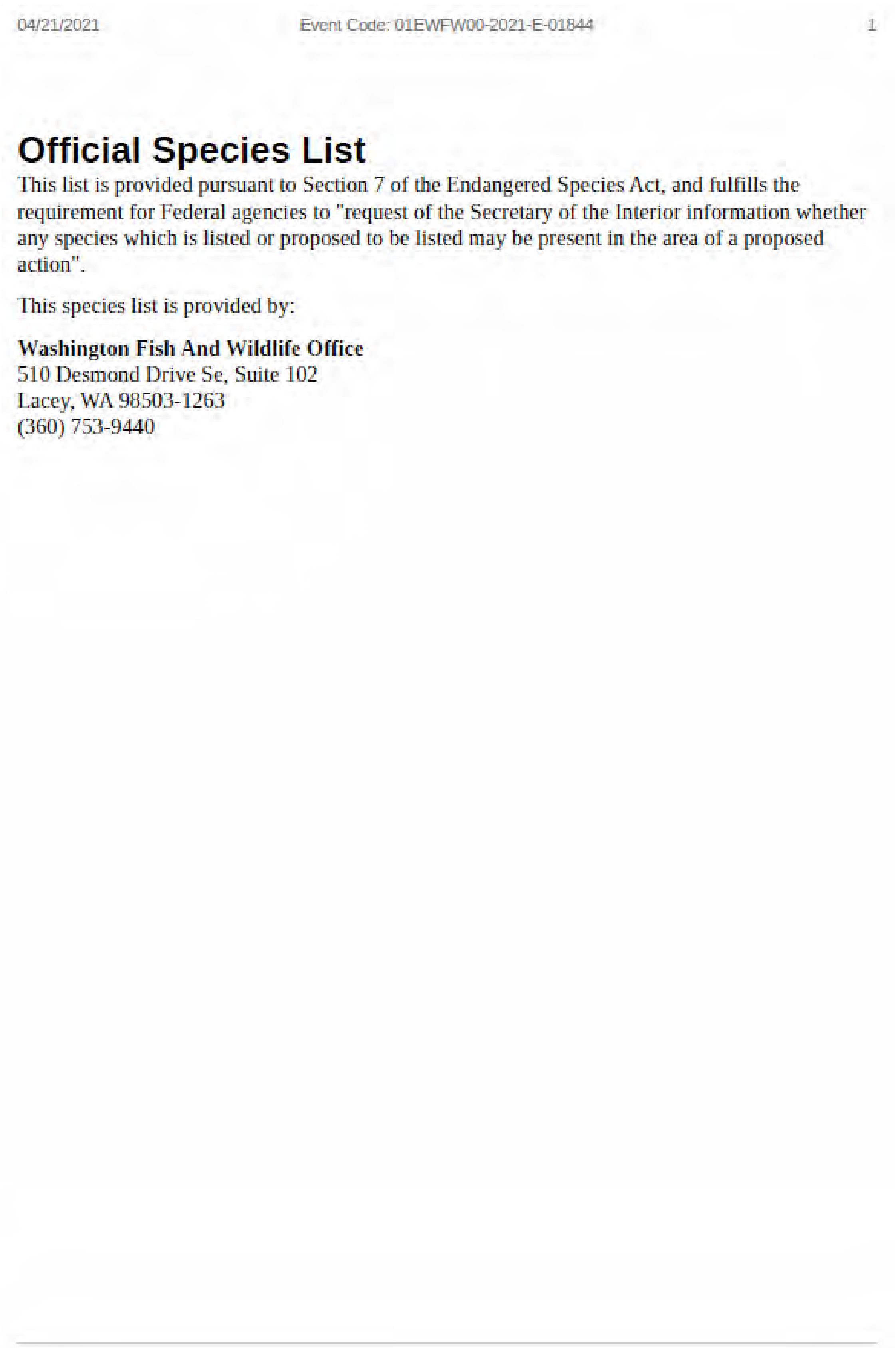
Also be aware that all marine mammals are protected under the Marine Mammal Protection Act (MMPA). The MMPA prohibits, with certain exceptions, the "take" of marine mammals in U.S. waters and by U.S. citizens on the high seas. The importation of marine mammals and marine mammal products into the U.S. is also prohibited. More information can be found on the MMPA website: http://www.nmfs.noaa.gov/pr/laws/mmpa/.

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 Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Related website:
National Marine Fisheries Service: http://www.nwr.noaa.gov/protected_species/species_list/species_lists.html

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

Consultation Code: 01EWFW00-2021-SLI-0941

Event Code: 01EWFW00-2021-E-01844

Project Name: Port of Port Angeles Cofferdam Repair Project

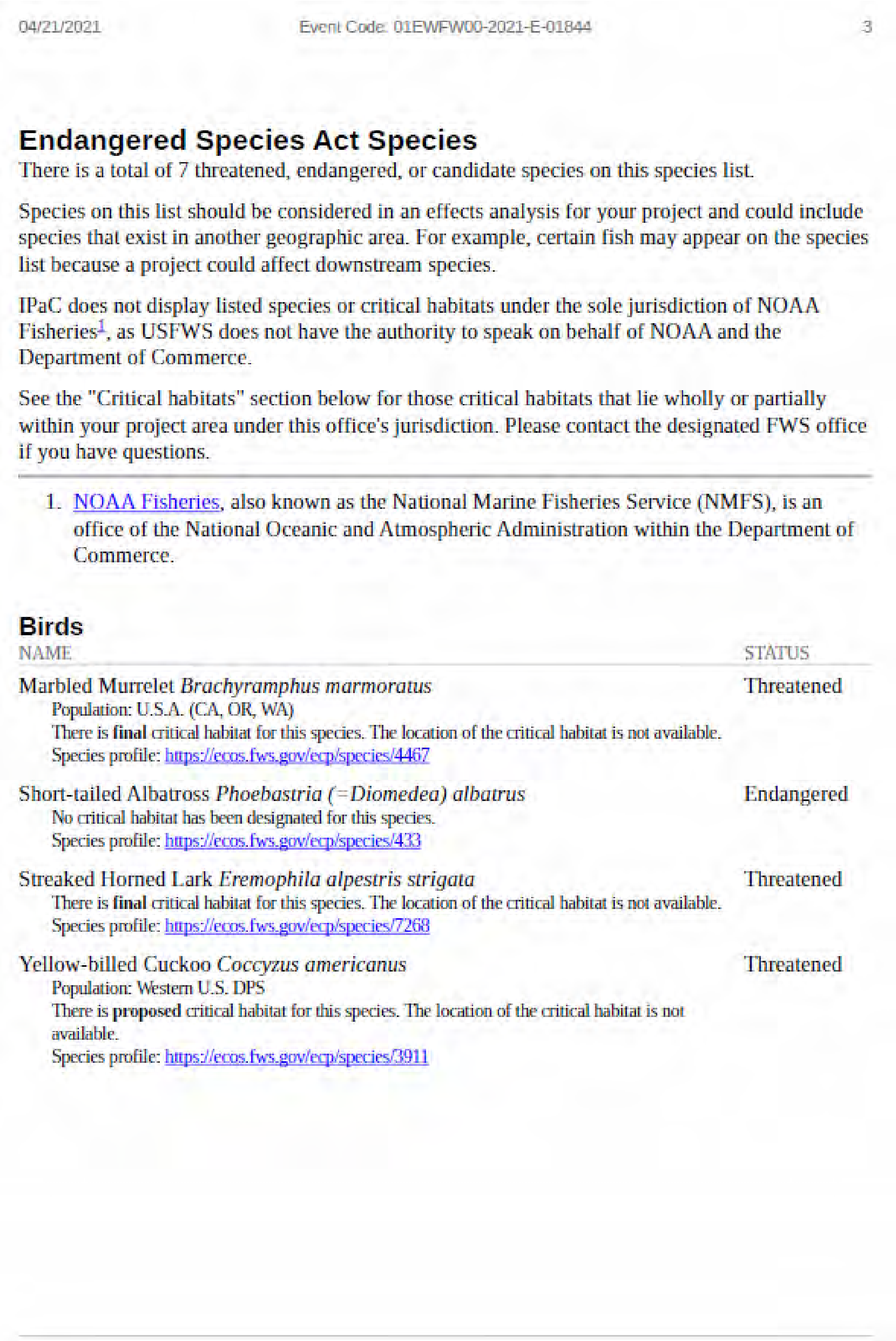
Project Type: ** OTHER **

Project Description: The Port of Port Angeles is proposing the repair and maintenance of an existing cofferdam loading structure at the Port's log yard. The project will involve minimal in-water work and will only expand the existing footprint of the structure by 2.25 inches.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@48.130794949999995,-123.46047948288651,14z

Counties: Clallam County, Washington



Endangered Species Act Species

There is a total of 7 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 Fisheries[1], 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.

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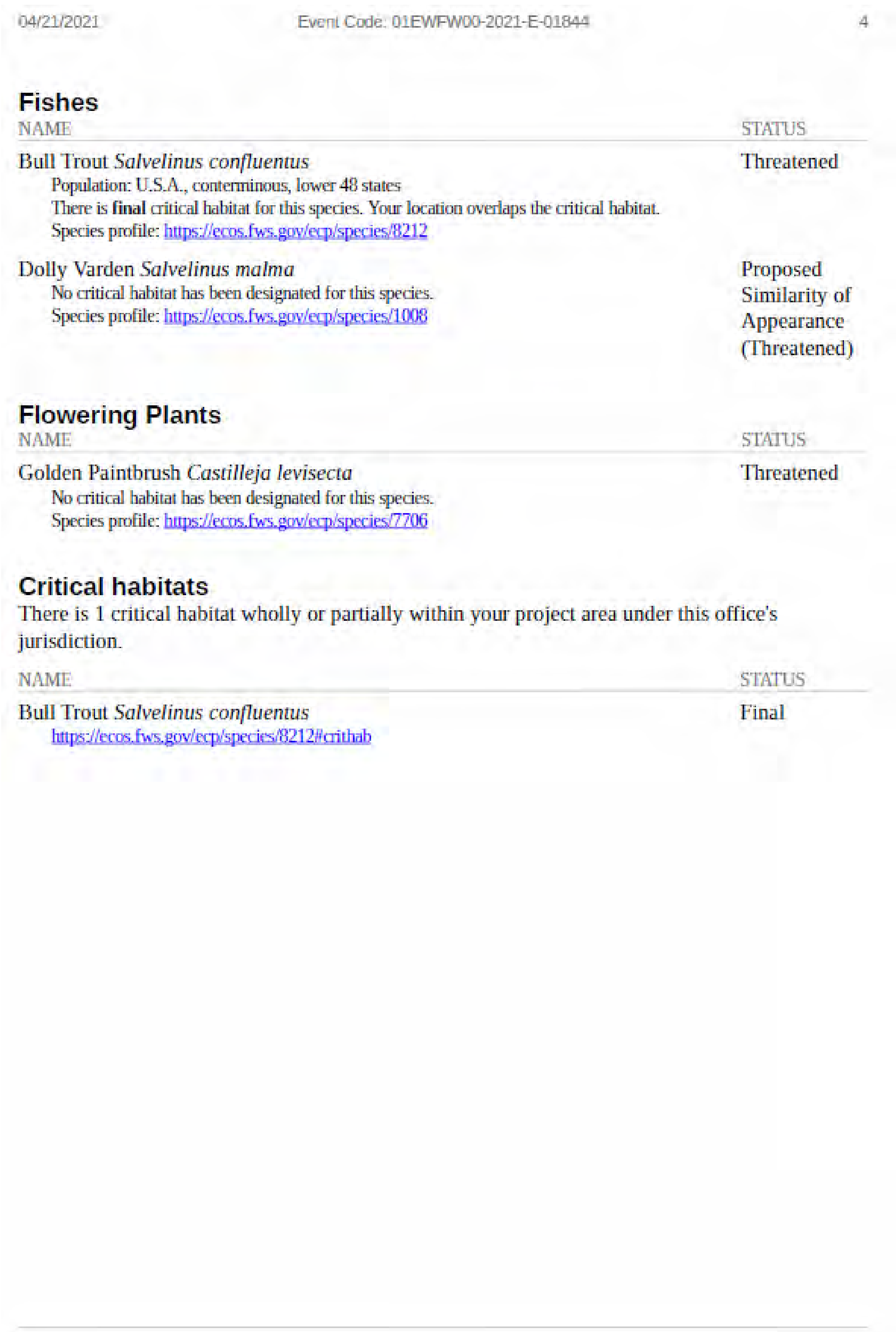
1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Birds

NAME	STATUS
Marbled Murrelet *Brachyramphus marmoratus* Population: U.S.A. (CA, OR, WA) There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/4467	Threatened
Short-tailed Albatross *Phoebastria (=Diomedea) albatrus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/433	Endangered
Streaked Horned Lark *Eremophila alpestris strigata* There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/7268	Threatened
Yellow-billed Cuckoo *Coccyzus americanus* Population: Western U.S. DPS There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/3911	Threatened



Fishes

NAME	STATUS
Bull Trout *Salvelinus confluentus* Population: U.S.A., conterminous, lower 48 states There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8212	Threatened
Dolly Varden *Salvelinus malma* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1008	Proposed Similarity of Appearance (Threatened)

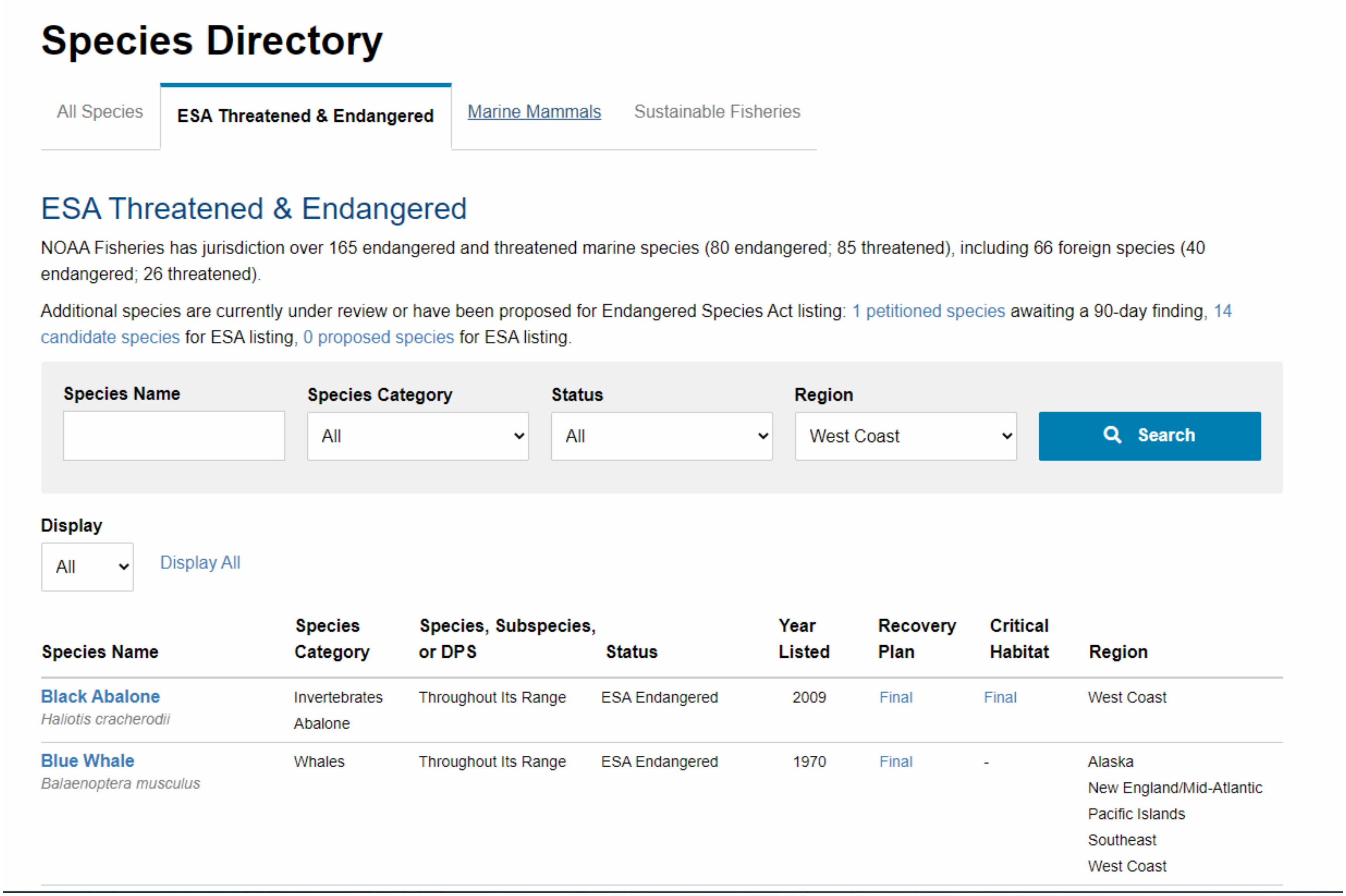
Flowering Plants

NAME	STATUS
Golden Paintbrush *Castilleja levisecta* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7706	Threatened

Critical habitats

There is 1 critical habitat wholly or partially within your project area under this office's jurisdiction.

NAME	STATUS
Bull Trout *Salvelinus confluentus* https://ecos.fws.gov/ecp/species/8212#crithab	Final



Species Directory

ESA Threatened & Endangered

NOAA Fisheries has jurisdiction over 165 endangered and threatened marine species (80 endangered; 85 threatened), including 66 foreign species (40 endangered; 26 threatened).

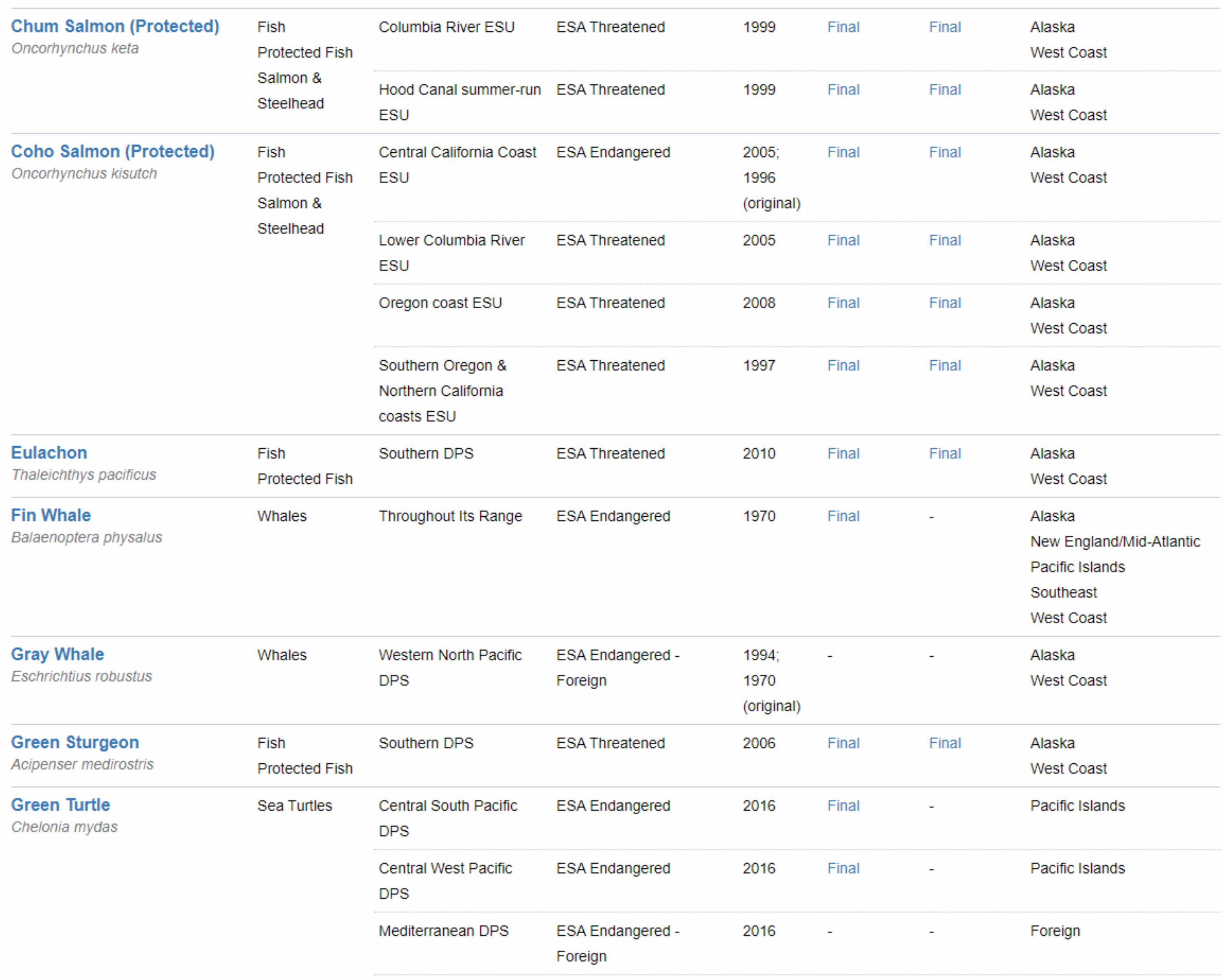
Additional species are currently under review or have been proposed for Endangered Species Act listing: 1 petitioned species awaiting a 90-day finding, 14 candidate species for ESA listing, 0 proposed species for ESA listing.

Species Name:
Species Category: All
Status: All
Region: West Coast

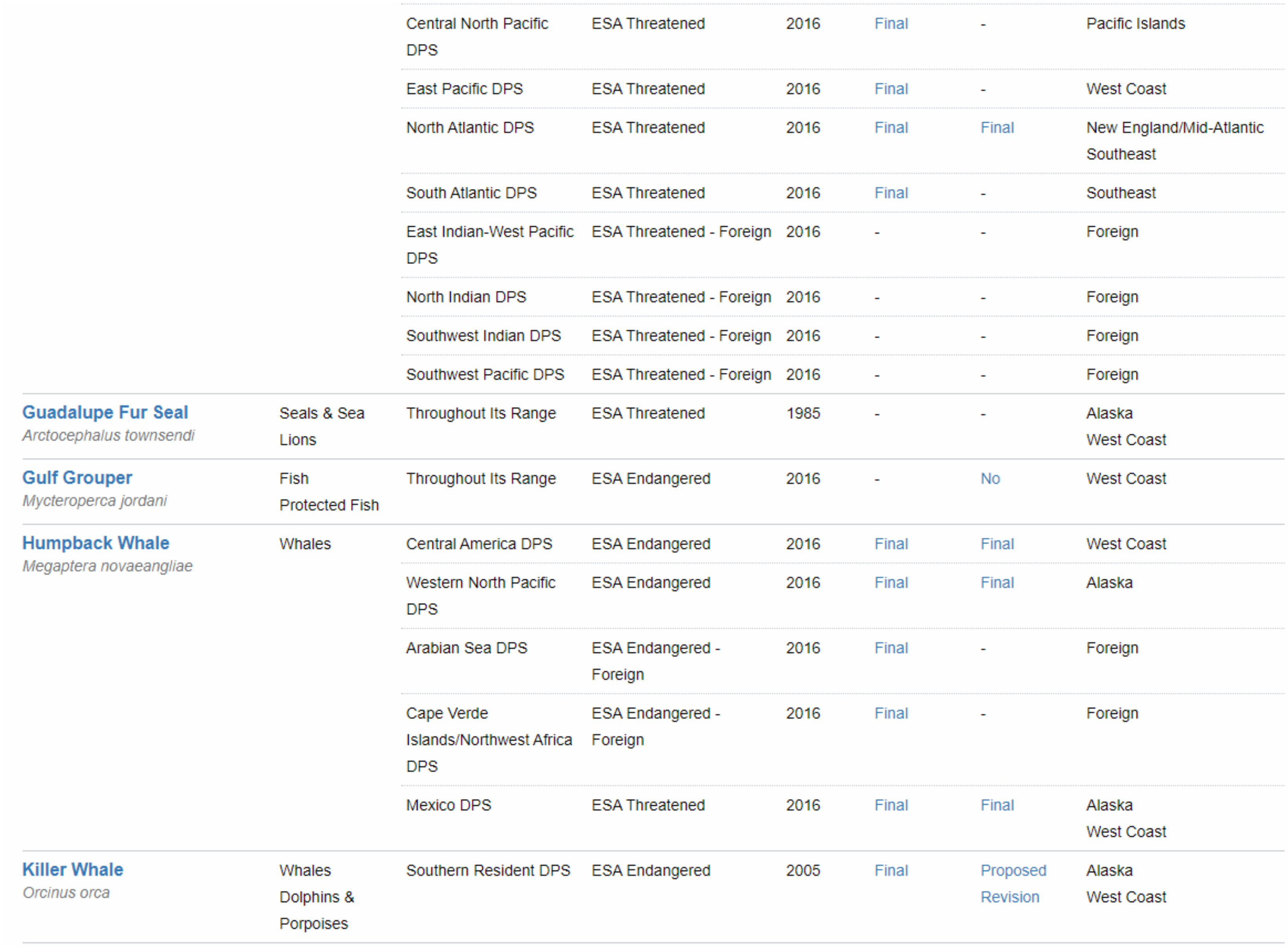
Display: All

Species Name	Species Category	Species, Subspecies, or DPS	Status	Year Listed	Recovery Plan	Critical Habitat	Region
Black Abalone *Haliotis cracherodii*	Invertebrates Abalone	Throughout Its Range	ESA Endangered	2009	Final	Final	West Coast
Blue Whale *Balaenoptera musculus*	Whales	Throughout Its Range	ESA Endangered	1970	Final	-	Alaska New England/Mid-Atlantic Pacific Islands Southeast West Coast

Chinook Salmon (Protected) *Oncorhynchus tshawytscha*	Fish Protected Fish Salmon & Steelhead	Sacramento River winter-run	ESA Endangered	1994	Final	Final	Alaska West Coast
		Upper Columbia River spring-run	ESA Endangered	1999	Final	Final	Alaska West Coast
		California coastal	ESA Threatened	1999	Final	Final	Alaska West Coast
		Central Valley spring-run	ESA Threatened	1999	Final	Final	Alaska West Coast
		Lower Columbia River	ESA Threatened	1999	Final	Final	Alaska West Coast
		Puget Sound	ESA Threatened	1999	Final	Final	Alaska West Coast
		Snake River fall-run	ESA Threatened	1992	Final	Final	Alaska West Coast
		Snake River spring/summer-run	ESA Threatened	1992	Final	Final	Alaska West Coast
		Upper Willamette River	ESA Threatened	2005	Final	Final	Alaska West Coast
		Upper Klamath-Trinity River	ESA Candidate	-	-	-	Alaska West Coast
		Oregon Coast spring-run	ESA Candidate	-	-	-	West Coast
		Southern Oregon and Northern California Coastal spring-run	ESA Candidate	-	-	-	-
		Central Valley spring-run in the San Joaquin River XN	ESA Experimental Population	-	-	-	Alaska West Coast
		Upper Columbia River spring-run in the Okanogan River subbasin XN	ESA Experimental Population	-	-	-	Alaska West Coast



Chum Salmon (Protected) *Oncorhynchus keta*	Fish Protected Fish Salmon & Steelhead	Columbia River ESU	ESA Threatened	1999	Final	Final	Alaska West Coast
		Hood Canal summer-run ESU	ESA Threatened	1999	Final	Final	Alaska West Coast
Coho Salmon (Protected) *Oncorhynchus kisutch*	Fish Protected Fish Salmon & Steelhead	Central California Coast ESU	ESA Endangered	2005; 1996 (original)	Final	Final	Alaska West Coast
		Lower Columbia River ESU	ESA Threatened	2005	Final	Final	Alaska West Coast
		Oregon coast ESU	ESA Threatened	2008	Final	Final	Alaska West Coast
		Southern Oregon & Northern California coasts ESU	ESA Threatened	1997	Final	Final	Alaska West Coast
Eulachon *Thaleichthys pacificus*	Fish Protected Fish	Southern DPS	ESA Threatened	2010	Final	Final	Alaska West Coast
Fin Whale *Balaenoptera physalus*	Whales	Throughout Its Range	ESA Endangered	1970	Final	-	Alaska New England/Mid-Atlantic Pacific Islands Southeast West Coast
Gray Whale *Eschrichtius robustus*	Whales	Western North Pacific DPS	ESA Endangered - Foreign	1994; 1970 (original)	-	-	Alaska West Coast
Green Sturgeon *Acipenser medirostris*	Fish Protected Fish	Southern DPS	ESA Threatened	2006	Final	Final	Alaska West Coast
Green Turtle *Chelonia mydas*	Sea Turtles	Central South Pacific DPS	ESA Endangered	2016	Final	-	Pacific Islands
		Central West Pacific DPS	ESA Endangered	2016	Final	-	Pacific Islands
		Mediterranean DPS	ESA Endangered - Foreign	2016	-	-	Foreign



		Central North Pacific DPS	ESA Threatened	2016	Final	-	Pacific Islands
		East Pacific DPS	ESA Threatened	2016	Final	-	West Coast
		North Atlantic DPS	ESA Threatened	2016	Final	Final	New England/Mid-Atlantic Southeast
		South Atlantic DPS	ESA Threatened	2016	Final	-	Southeast
		East Indian-West Pacific DPS	ESA Threatened - Foreign	2016	-	-	Foreign
		North Indian DPS	ESA Threatened - Foreign	2016	-	-	Foreign
		Southwest Indian DPS	ESA Threatened - Foreign	2016	-	-	Foreign
		Southwest Pacific DPS	ESA Threatened - Foreign	2016	-	-	Foreign
Guadalupe Fur Seal *Arctocephalus townsendi*	Seals & Sea Lions	Throughout Its Range	ESA Threatened	1985	-	-	Alaska West Coast
Gulf Grouper *Mycteroperca jordani*	Fish Protected Fish	Throughout Its Range	ESA Endangered	2016	-	No	West Coast
Humpback Whale *Megaptera novaeangliae*	Whales	Central America DPS	ESA Endangered	2016	Final	Final	West Coast
		Western North Pacific DPS	ESA Endangered	2016	Final	Final	Alaska
		Arabian Sea DPS	ESA Endangered - Foreign	2016	Final	-	Foreign
		Cape Verde Islands/Northwest Africa DPS	ESA Endangered - Foreign	2016	Final	-	Foreign
		Mexico DPS	ESA Threatened	2016	Final	Final	Alaska West Coast
Killer Whale *Orcinus orca*	Whales Dolphins & Porpoises	Southern Resident DPS	ESA Endangered	2005	Final	Proposed Revision	Alaska West Coast

Leatherback Turtle *Dermochelys coriacea*	Sea Turtles	Throughout Its Range	ESA Endangered	1970	Final	Final (U.S. Caribbean) Final (U.S. West Coast)	New England/Mid-Atlantic Pacific Islands Southeast West Coast Foreign
Loggerhead Turtle *Caretta caretta*	Sea Turtles	North Pacific Ocean DPS	ESA Endangered	2011	Final	No	Pacific Islands West Coast
		Mediterranean Sea DPS	ESA Endangered - Foreign	2011	-	-	Foreign
		Northeast Atlantic Ocean DPS	ESA Endangered - Foreign	2011	-	-	Foreign
		North Indian Ocean DPS	ESA Endangered - Foreign	2011	-	-	Foreign
		South Pacific Ocean DPS	ESA Endangered - Foreign	2011	-	-	Foreign
		Northwest Atlantic Ocean DPS	ESA Threatened	2011	Final	Final	New England/Mid-Atlantic Southeast
		South Atlantic Ocean DPS	ESA Threatened - Foreign	2011	-	-	Foreign
		Southeast Indo-Pacific Ocean DPS	ESA Threatened - Foreign	2011	-	-	Foreign
		Southwest Indian Ocean DPS	ESA Threatened - Foreign	2011	-	-	Foreign
North Pacific Right Whale *Eubalaena japonica*	Whales	Throughout Its Range	ESA Endangered	2008; 1970 (original)	Final	Final	Alaska West Coast
Oceanic Whitetip Shark *Carcharhinus longimanus*	Fish Protected Fish Highly Migratory Fish Sharks	Throughout Its Range	ESA Threatened	2018	Under Development	Not Prudent	New England/Mid-Atlantic Pacific Islands Southeast West Coast

Olive Ridley Turtle *Lepidochelys olivacea*	Sea Turtles	Mexico's Pacific coast breeding populations	ESA Endangered	1978	Final	-	Foreign
		All other populations	ESA Threatened	-	-	-	Pacific Islands Southeast West Coast Foreign
Scalloped Hammerhead Shark *Sphyrna lewini*	Fish Protected Fish Highly Migratory Fish Sharks	Eastern Pacific DPS	ESA Endangered	2014	-	No	West Coast
		Eastern Atlantic DPS	ESA Endangered - Foreign	2014	-	-	Foreign
		Central & Southwest Atlantic DPS	ESA Threatened	2014	-	No	Southeast
		Indo-West Pacific DPS	ESA Threatened	2014	-	No	Pacific Islands
Sei Whale *Balaenoptera borealis*	Whales	Throughout Its Range	ESA Endangered	1970	Final	-	Alaska New England/Mid-Atlantic Pacific Islands Southeast West Coast
Sockeye Salmon (Protected) *Oncorhynchus nerka*	Fish Protected Fish Salmon & Steelhead	Snake River ESU	ESA Endangered	1991	Final	Final	Alaska West Coast
		Ozette Lake ESU	ESA Threatened	1999	Final	Final	Alaska West Coast
Sperm Whale *Physeter macrocephalus*	Whales	Throughout Its Range	ESA Endangered	1970	Final	-	Alaska New England/Mid-Atlantic Pacific Islands Southeast West Coast
Steelhead Trout *Oncorhynchus mykiss*	Fish Protected Fish Salmon & Steelhead	Southern California DPS	ESA Endangered	1997	Final	Final	Alaska West Coast
		California Central Valley DPS	ESA Threatened	1998	Final	Final	Alaska West Coast
		Central California Coast DPS	ESA Threatened	1997	Final	Final	Alaska West Coast

		Lower Columbia River DPS	ESA Threatened	1998	Final	Final	Alaska West Coast
		Middle Columbia River	ESA Threatened	1999	Final	Final	Alaska West Coast
		Northern California DPS	ESA Threatened	2000	Final	Final	Alaska West Coast
		Puget Sound DPS	ESA Threatened	2007	Final	Final	Alaska West Coast
		Snake River Basin DPS	ESA Threatened	2006	Final	Final	Alaska West Coast
		South-Central California Coast DPS	ESA Threatened	1997	Final	Final	Alaska West Coast
		Upper Columbia River DPS	ESA Threatened	2006; 1997 (original)	Final	Final	Alaska West Coast
		Upper Willamette River DPS	ESA Threatened	1999	Final	Final	Alaska West Coast
		Middle Columbia River XN	ESA Experimental Population	-	-	-	Alaska West Coast
Steller Sea Lion *Eumetopias jubatus*	Seals & Sea Lions	Western DPS	ESA Endangered	1997; 1990 (original)	Final	Final	Alaska West Coast
White Abalone *Haliotis sorenseni*	Invertebrates Abalone	Throughout Its Range	ESA Endangered	2001	Final	Not Prudent	West Coast
Yelloweye Rockfish *Sebastes ruberrimus*	Fish Protected Fish	Puget Sound/ Georgia Basin DPS	ESA Threatened	2010	Final	Final	Alaska West Coast

Washington State's Threatened & Endangered Species

As Regulated by the USFWS and NOAA Fisheries

Updated April 13, 2018

Endangered (15)

Bradshaw's Desert-parsley *(Lomatium bradshawii)*
Georgia Basin DPS Bocaccio Rockfish (*Sebastes paucispinis*)
Gray wolf *(Canis lupus)* (Northern Rocky Mt. DPS delisted May 2011)
Humpback Whale *(Megaptera novaeangliae)*
Leatherback Sea Turtle *(Dermochelys coriacea)*
Loggerhead Sea Turtle, North Pacific DPS *(Caretta caretta)* Revised in 2011
Marsh Sandwort *(Arenaria paludicola)*
Pygmy Rabbit *(Brachylagus idahoensis)*
Short-tailed Albatross *(Phoebastria albatrus)*
Showy Stickseed *(Hackelia venusta)*
Snake River ESU Sockeye Salmon *(Oncorhynchus nerka)*
Southern Resident Killer Whale (*Orcinus orca*)
Taylor's Checkerspot Butterfly *(Euphydryas editha taylori)*
Upper Columbia River spring-run ESU Chinook Salmon *(O. tshawytscha)*
Wenatchee Mountains Checkermallow *(Sidalcea oregana* var. *calva)*
Woodland Caribou *(Rangifer tarandus caribou)*

Designated Critical Habitat (37)

Canada Lynx (revised 2014)
Coastal-Puget Sound DPS Bull trout
Columbia River ESU Chum Salmon
Columbia River DPS Bull trout
Hood Canal summer-run ESU Chum Salmon
Kincaid's Lupine
Leatherback Sea Turtle
Lower Columbia River DPS Steelhead
Lower Columbia River ESU Chinook Salmon
Marbled Murrelet (revised in 2011)
Northern Spotted Owl (revised in 2012)
Oregon spotted frog
Middle Columbia River DPS Steelhead
Ozette Lake ESU Sockeye Salmon
Pacific Coast DPS Western Snowy Plover (revised 6/19/12)
Puget Sound ESU Chinook Salmon
Snake River Basin DPS Steelhead
Snake River ESU Sockeye Salmon
Snake River fall-run ESU Chinook Salmon
Snake River spring/summer-run ESU Chinook Salmon
Southern DPS North American Green Sturgeon
Southern DPS Eulachon
Southern Resident Killer Whale
Streaked horned lark
Taylor's checkerspot butterfly
Umtanum Desert Buckwheat
White Bluffs Baldderpod
Upper Columbia River DPS Steelhead
Upper Columbia River spring-run ESU Chinook
Upper Willamette River DPS Steelhead
Upper Willamette River ESU Chinook Salmon
Wenatchee Mountains Checkermallow
Woodland Caribou
Western (Mazama) Pocket Gopher
Puget Sound Rockfish (Bocaccio and yelloweye rockfish)
Lower Columbia River ESU Coho Salmon
Puget Sound DPS Steelhead

Proposed Critical Habitat (0)

Threatened (41)

Bull trout – Columbia River DPS *(Salvelinus confluentus)*
Bull trout – Coastal-Puget Sound DPS *(S. confluentus)*
Canada Lynx *(Lynx canadensis)*
Columbian White-tailed Deer *(Odocoileus virginianus leucurus)*
Columbia River ESU Chum Salmon *(Oncorhynchus keta)*
Georgia Basin DPS Yelloweye Rockfish (*S. ruberrimus*)
Golden Paintbrush *(Castilleja levisecta)*
Green Sea Turtle *(Chelonia mydas)*
Grizzly Bear *(Ursus arctos = U. a. horribilis)*
Hood Canal summer-run ESU Chum Salmon *(O. keta)*
Kincaid's Lupine *(Lupinus sulphureus kincaidii)*
Lower Columbia River ESU Chinook Salmon *(O. tshawytscha)*
Lower Columbia River ESU Coho Salmon *(Oncorhynchus kisutch)*
Lower Columbia River DPS Steelhead *(O. mykiss)*
Marbled Murrelet *(Brachyramphus marmoratus)*
Middle Columbia River DPS Steelhead *(O. mykiss)*
Nelson's Checkermallow *(Sidalcea nelsoniana)*
Northern Spotted Owl *(Strix occidentalis caurina)*
Olive Ridley Sea Turtle *(Lepidochelys olivacea)*
Oregon Silverspot Butterfly *(Speyeria zerene hippolyta)*
Ozette Lake ESU Sockeye Salmon *(O. nerka)*
Puget Sound ESU Chinook Salmon *(O. tshawytscha)*
Puget Sound DPS Steelhead (*O. mykiss*)
Snake River fall-run ESU Chinook Salmon *(O. tshawytscha)*
Snake River spring/summer-run ESU Chinook Salmon *(O. tshawytscha)*
Snake River Basin DPS Steelhead *(O. mykiss)*
Southern DPS North American Green Sturgeon (*Acipenser medirostris*)
Southern DPS of Pacific Eulachon (*Thaleichthys pacificus*)
Spalding's Catchfly *(Silene spaldingii)*
Streaked Horned Lark *(Eremophila alestris strigata)*
Umtanum Desert Buckwheat *(Eriogonum codium)*
Upper Columbia River DPS Steelhead *(O. mykiss)*
Upper Willamette River ESU Chinook Salmon *(O. tshawytscha)*
Upper Willamette River DPS Steelhead *(O. mykiss)*
Ute ladies'-tresses *(Spiranthes diluvialis)*
Water Howellia *(Howellia aquatilis)*
Western Snowy Plover *(Charadrius alexandrinus nivosus)*
White Bluffs Baldderpod *(Physaria tuplashensis)*
Oregon Spotted frog *(Rana pretiosa)*
Yellow-billed Cuckoo *(Coccyzus americanus)*
Western (Mazama) Pocket Gopher *(Thomomys mazama)*

Proposed Species (2)

Dolly Varden (*Salvelins malma*) (This species is proposed for listing under the ESA "Similarity of Appearance" provision, section 4(e). However, WSDOT does not address this species in Biological Assessments)

Island Marble Butterfly (*Euchloe ausonides insulanus*) proposed endangered

Candidate (1)

Wolverine (Gulo gulo luscus)

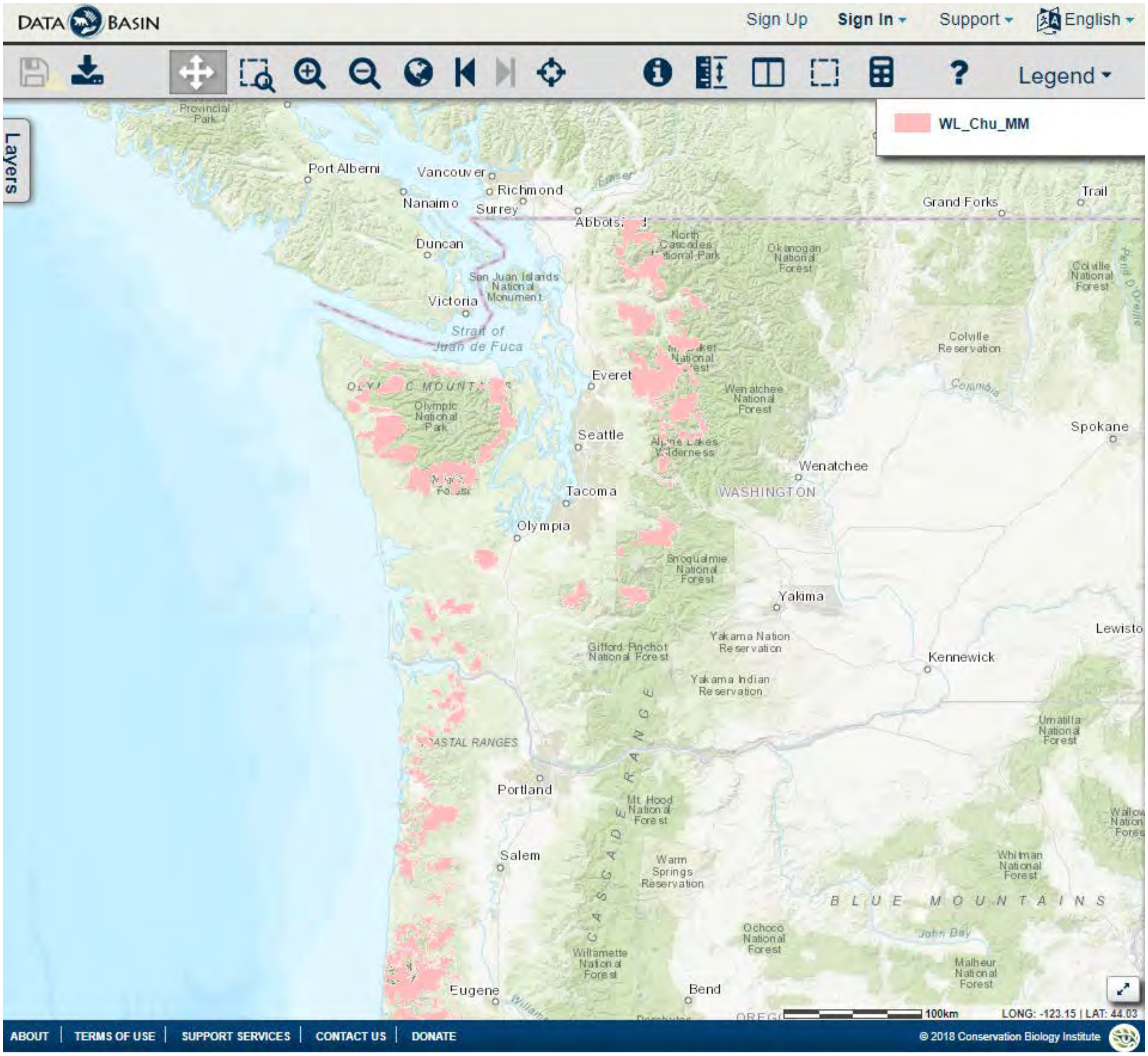
ESU = *Evolutionarily Significant Unit*
DPS = *Distinct Population Segment*

Washington State Department of Transportation

Bold = USFWS Jurisdiction
Non-bold = NOAA Fisheries Jurisdiction

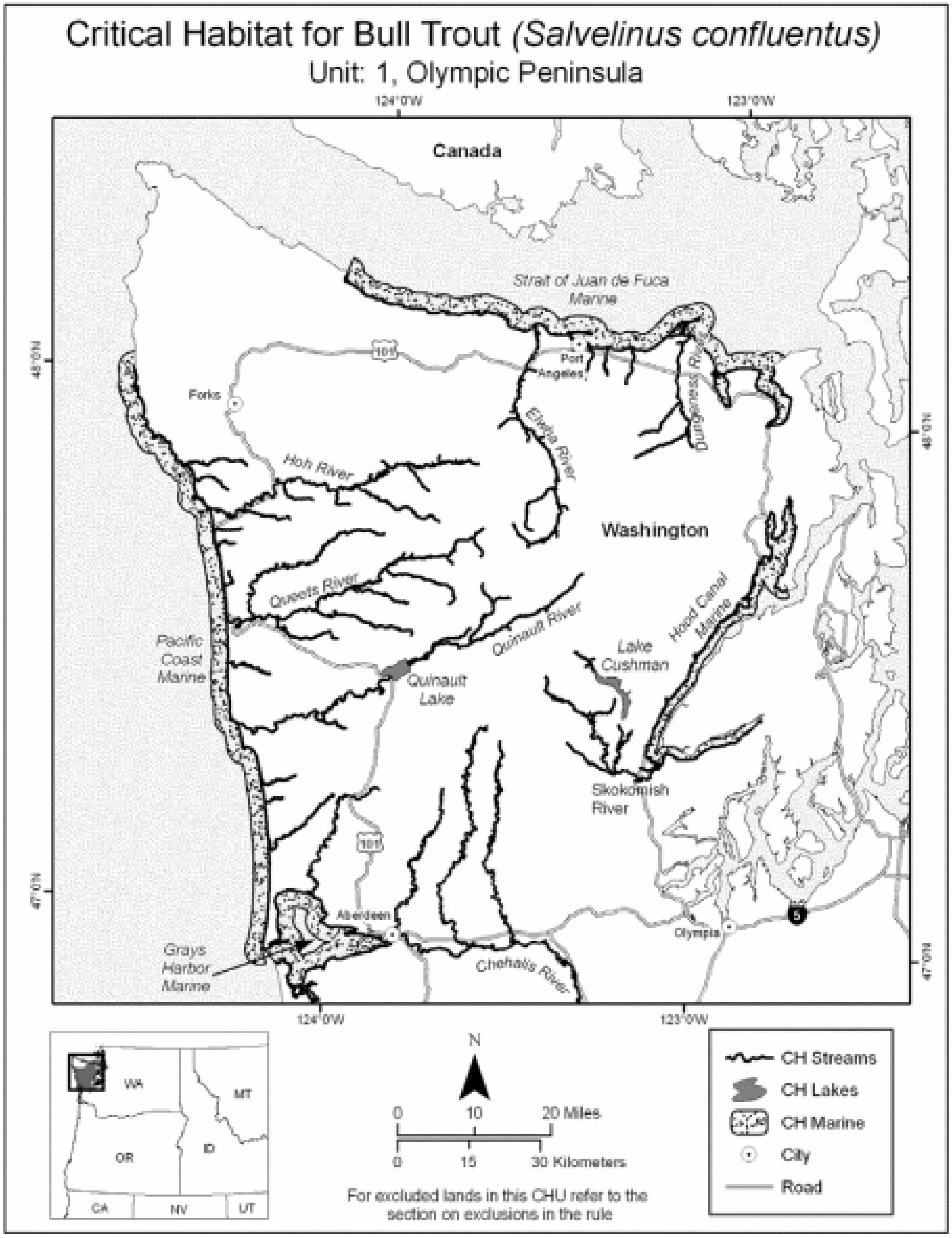
Critical Habitat Maps

Figure B-1 Marbled Murrelet (*Brachyramphus marmoratus*) designated critical habitat in Washington State.



Wolf, J. 2012. *Critical Habitat Units for Northern Spotted Owl and Marbled Murrelet* webpage. Data Basin, February 2, 2012. Retrieved on April 7, 2021 from [https://databasin.org/datasets/d15113e3006042bc87714ba557364bc9].

Figure B-2. Bull Trout, Coastal-Puget Sound DPS (*Salvelinus confluentus*) designated critical habitat in Washington State.



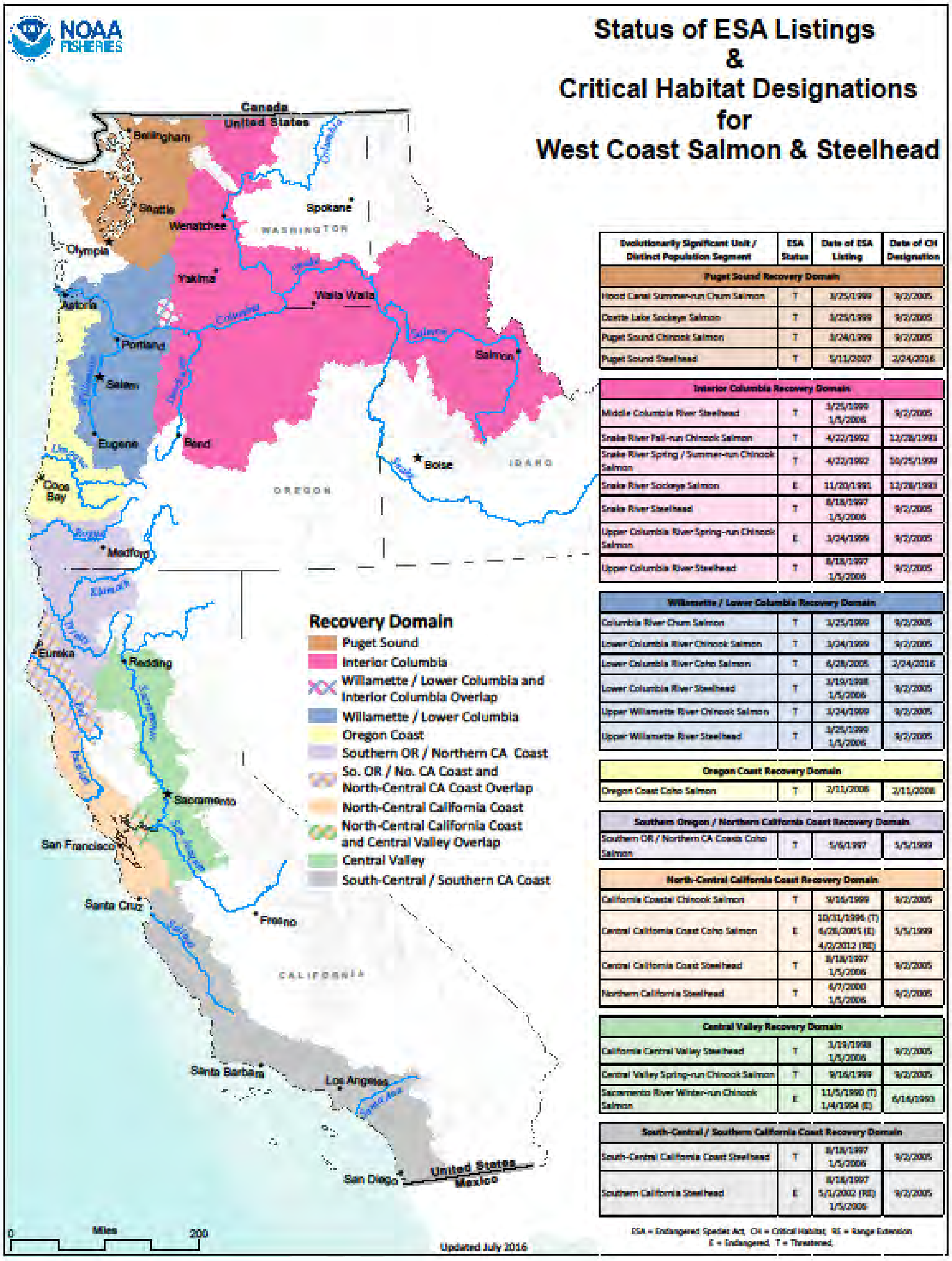
Critical Habitat for Bull Trout *(Salvelinus confluentus)*

Unit: 1, Olympic Peninsula

For excluded lands in this CHU refer to the section on exclusions in the rule

USFWS. 2010. Endangered and Threatened Wildlife and Plants; Revised Designation of Critical Habitat for Bull Trout in the Conterminous United States, Final Rule. October 18, 2010. Federal; Register 75(200):63898-64070.

Figure B-3. Critical habitat designations for West Coast salmon and steelhead.

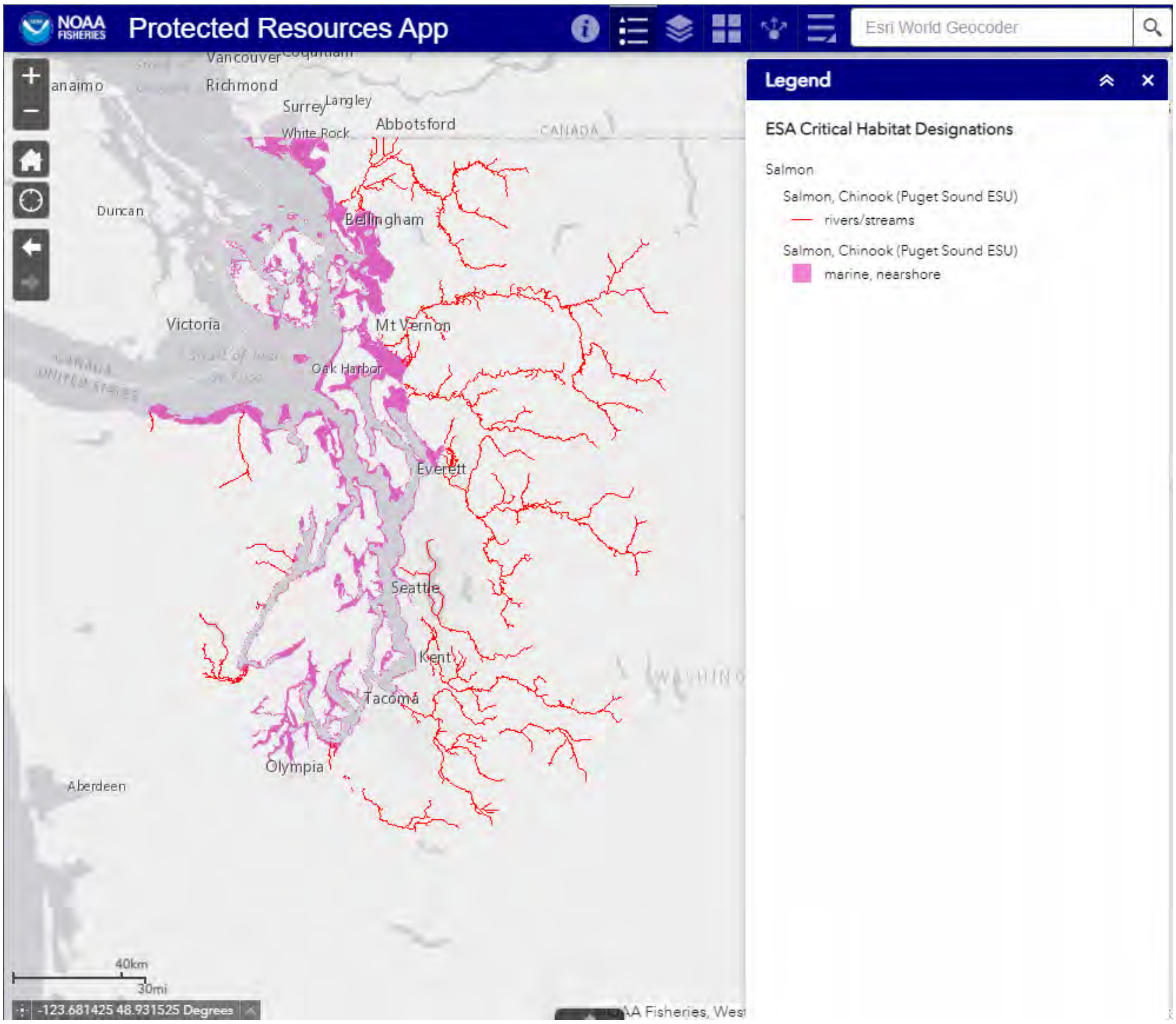


Evolutionarily Significant Unit / Distinct Population Segment	ESA Status	Date of ESA Listing	Date of CH Designation
Puget Sound Recovery Domain			
Hood Canal Summer-run Chum Salmon	T	3/25/1999	9/2/2005
Ozette Lake Sockeye Salmon	T	3/25/1999	9/2/2005
Puget Sound Chinook Salmon	T	3/24/1999	9/2/2005
Puget Sound Steelhead	T	5/11/2007	2/24/2016
Interior Columbia Recovery Domain			
Middle Columbia River Steelhead	T	3/25/1999 1/5/2006	9/2/2005
Snake River Fall-run Chinook Salmon	T	4/22/1992	12/28/1993
Snake River Spring / Summer-run Chinook Salmon	T	4/22/1992	10/25/1999
Snake River Sockeye Salmon	E	11/20/1991	12/28/1993
Snake River Steelhead	T	8/18/1997 1/5/2006	9/2/2005
Upper Columbia River Spring-run Chinook Salmon	E	3/24/1999	9/2/2005
Upper Columbia River Steelhead	T	8/18/1997 1/5/2006	9/2/2005
Willamette / Lower Columbia Recovery Domain			
Columbia River Chum Salmon	T	3/25/1999	9/2/2005
Lower Columbia River Chinook Salmon	T	3/24/1999	9/2/2005
Lower Columbia River Coho Salmon	T	6/28/2005	2/24/2016
Lower Columbia River Steelhead	T	3/19/1998 1/5/2006	9/2/2005
Upper Willamette River Chinook Salmon	T	3/24/1999	9/2/2005
Upper Willamette River Steelhead	T	3/25/1999 1/5/2006	9/2/2005
Oregon Coast Recovery Domain			
Oregon Coast Coho Salmon	T	2/11/2008	2/11/2008
Southern Oregon / Northern California Coast Recovery Domain			
Southern OR / Northern CA Coasts Coho Salmon	T	5/6/1997	5/5/1999
North-Central California Coast Recovery Domain			
California Coastal Chinook Salmon	T	9/16/1999	9/2/2005
Central California Coast Coho Salmon	E	10/31/1996 (T) 6/28/2005 (E) 4/2/2012 (RE)	5/5/1999
Central California Coast Steelhead	T	8/18/1997 1/5/2006	9/2/2005
Northern California Steelhead	T	6/7/2000 1/5/2006	9/2/2005
Central Valley Recovery Domain			
California Central Valley Steelhead	T	3/19/1998 1/5/2006	9/2/2005
Central Valley Spring-run Chinook Salmon	T	9/16/1999	9/2/2005
Sacramento River Winter-run Chinook Salmon	E	11/5/1990 (T) 1/4/1994 (E)	6/16/1993
South-Central / Southern California Coast Recovery Domain			
South-Central California Coast Steelhead	T	8/18/1997 1/5/2006	9/2/2005
Southern California Steelhead	E	8/18/1997 5/1/2002 (RE) 1/5/2006	9/2/2005

ESA = Endangered Species Act, CH = Critical Habitat, RE = Range Extension
E = Endangered, T = Threatened

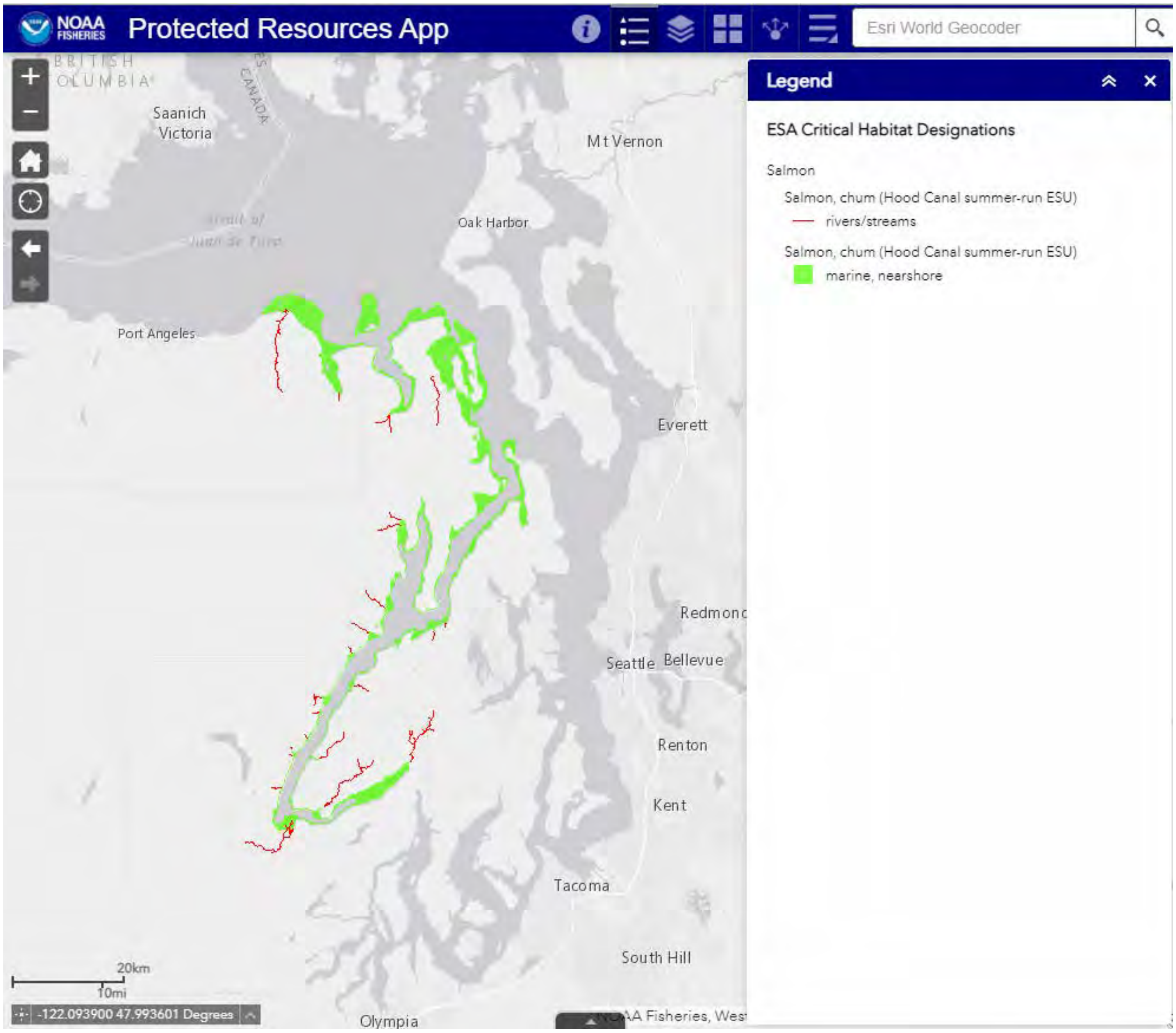
NMFS. 2018. *Salmon & Steelhead, West Coast Salmon & Steelhead Listings* website. National Oceanic and Atmospheric Administration. Retrieved April 7, 2021 from [http://www.westcoast.fisheries.noaa.gov/protected_species/salmon_steelhead/salmon_and_steelhead_listings/salmon_and_steelhead_listings.html].

Figure B-4. Chinook salmon, Puget Sound ESU (*Oncorhynchus tshawytscha*) designated critical habitat in Washington State.



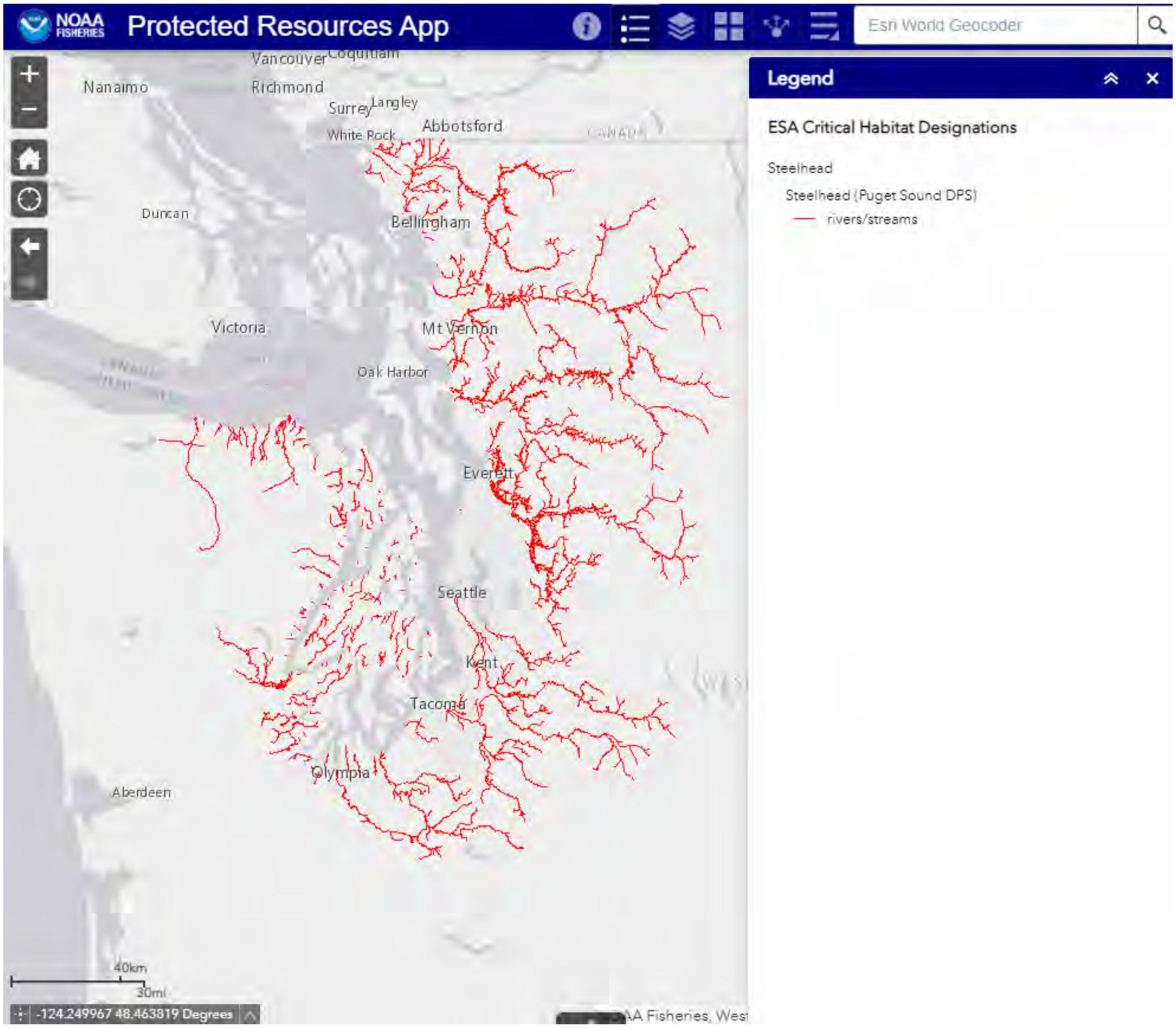
NMFS. 2021. NOAA Fisheries Protected Resource App (v1.0). Chinook salmon, Puget Sound ESU Critical Habitat. National Oceanic and Atmospheric Administration. Retrieved April 7, 2021 from [https://www.webapps.nwfsc.noaa.gov/portal/apps/webappviewer/index.html?id=7514c715b8594944a6e468dd25aaacc9&extent=-13831137.3303%2C5813189.3898%2C-13222698.5851%2C6319508.2652%2C102100].

Figure B-5. Chum salmon, Hood Canal summer-run ESU (*Oncorhynchus keta*) designated critical habitat nearest the Project action area.



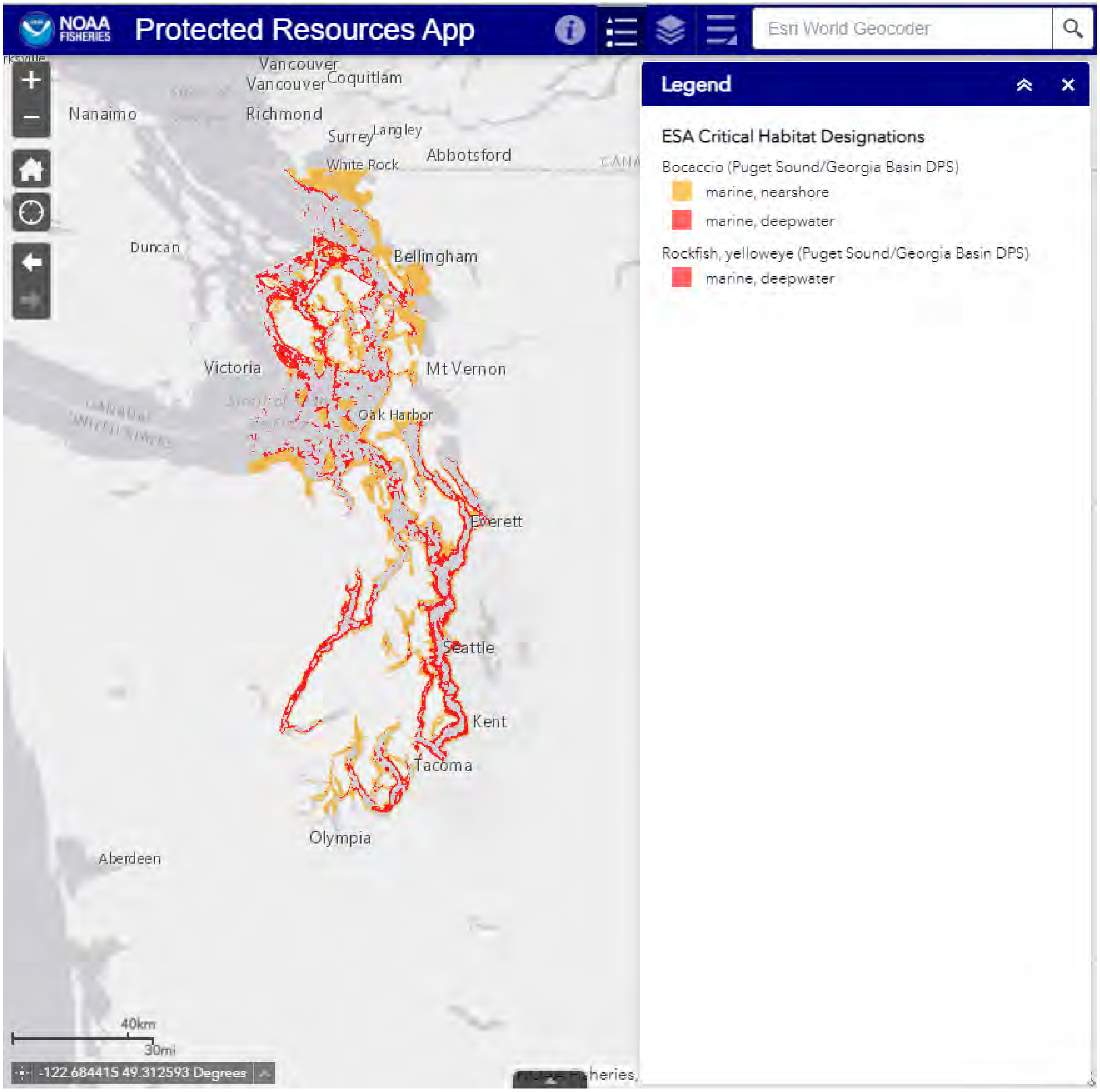
NMFS. 2021. NOAA Fisheries Protected Resource App (v1.0). Chum salmon, Hood Canal summer-run ESU Critical Habitat. National Oceanic and Atmospheric Administration. Retrieved April 7, 2021 from [https://www.webapps.nwfsc.noaa.gov/portal/apps/webappviewer/index.html?id=7514c715b8594944a6e468dd25aaacc9&extent=-13854679.935%2C5815023.8785%2C-13246241.1898%2C6321342.7539%2C102100].

Figure B-6. Steelhead trout, Puget Sound DPS (*Oncorhynchus mykiss*) designated critical habitat in Washington State.



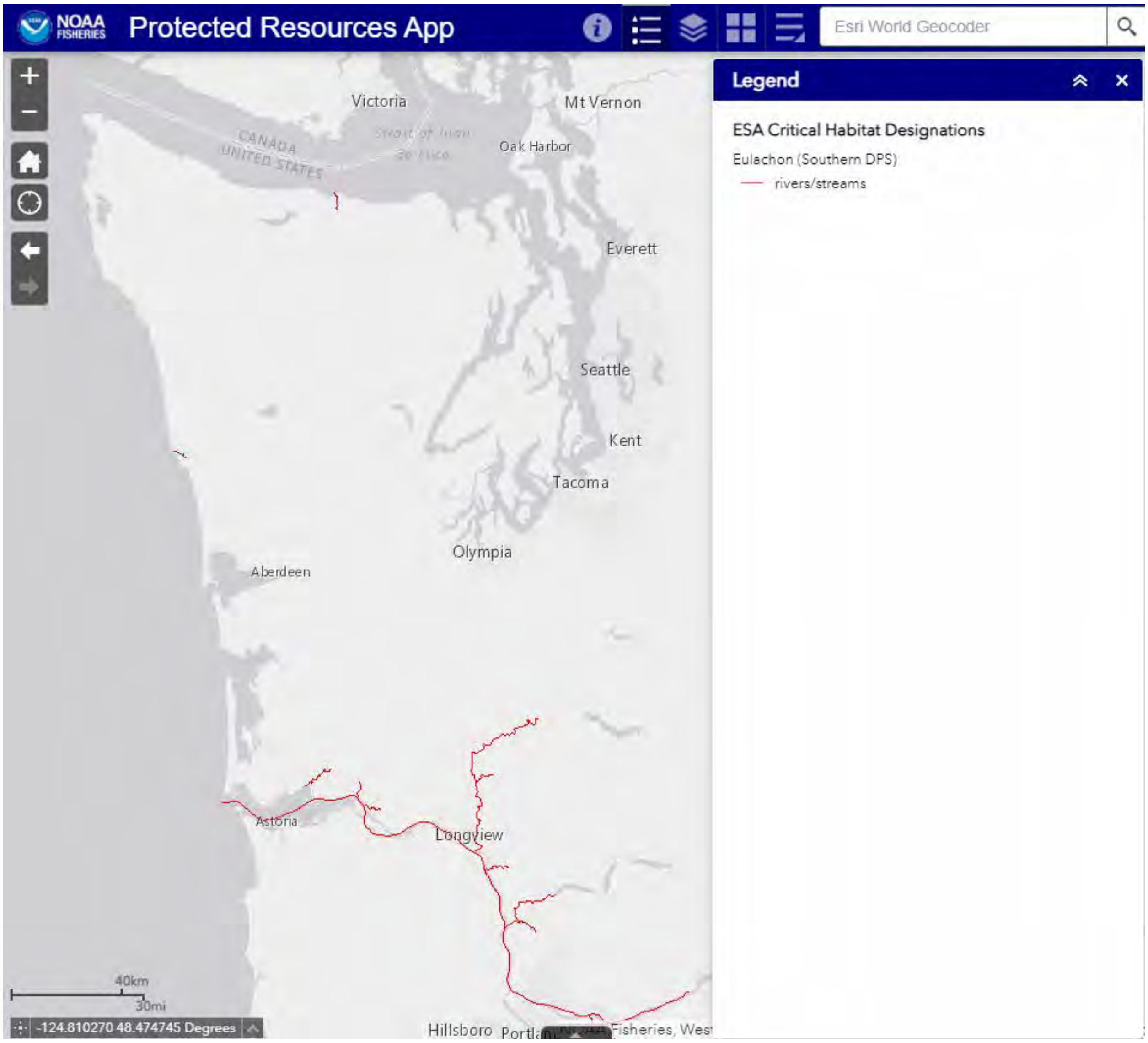
NMFS. 2021. NOAA Fisheries Protected Resource App (v1.0). Steelhead trout, Puget Sound DPS Critical Habitat. National Oceanic and Atmospheric Administration. Retrieved April 7, 2021 from [https://www.webapps.nwfsc.noaa.gov/portal/apps/webappviewer/index.html?id=7514c715b8594944a6e468dd25aaacc9&extent=-13779771.6473%2C5945884.0709%2C-13475552.2747%2C6199043.5086%2C102100].

Figure B-7. Yelloweye rockfish, Puget Sound/Georgia Basin DPS (*Sebastes ruberrimus*) and Bocaccio rockfish, Puget Sound/ Georgia Basin DPS (*Sebastes paucispinis*) designated critical habitat in Washington State.



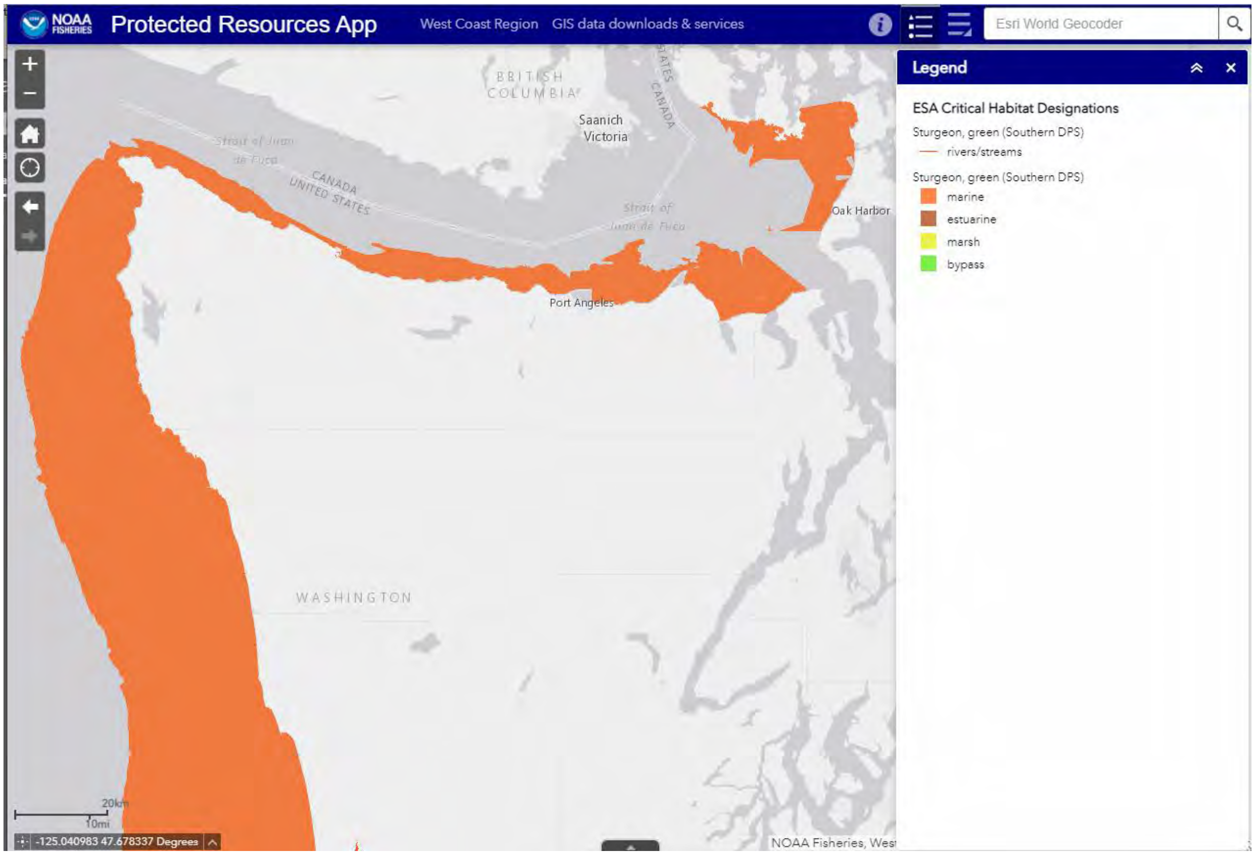
NMFS. 2021. NOAA Fisheries Protected Resource App (v1.0). Yelloweye rockfish, Puget Sound/Georgia Basin DPS and Bocaccio rockfish, Puget Sound/ Georgia Basin DPS Critical Habitat. National Oceanic and Atmospheric Administration. Retrieved April 7, 2021 from [https://www.webapps.nwfsc.noaa.gov/portal/apps/webappviewer/index.html?id=7514c715b8594944a6e468dd25aaacc9&extent=-13844895.9954%2C5824807.8181%2C-13309836.7974%2C6331126.6935%2C102100].

Figure B-8. Eulachon, Southern DPS (*Thaleichthys pacificus*) designated critical habitat in Washington State.



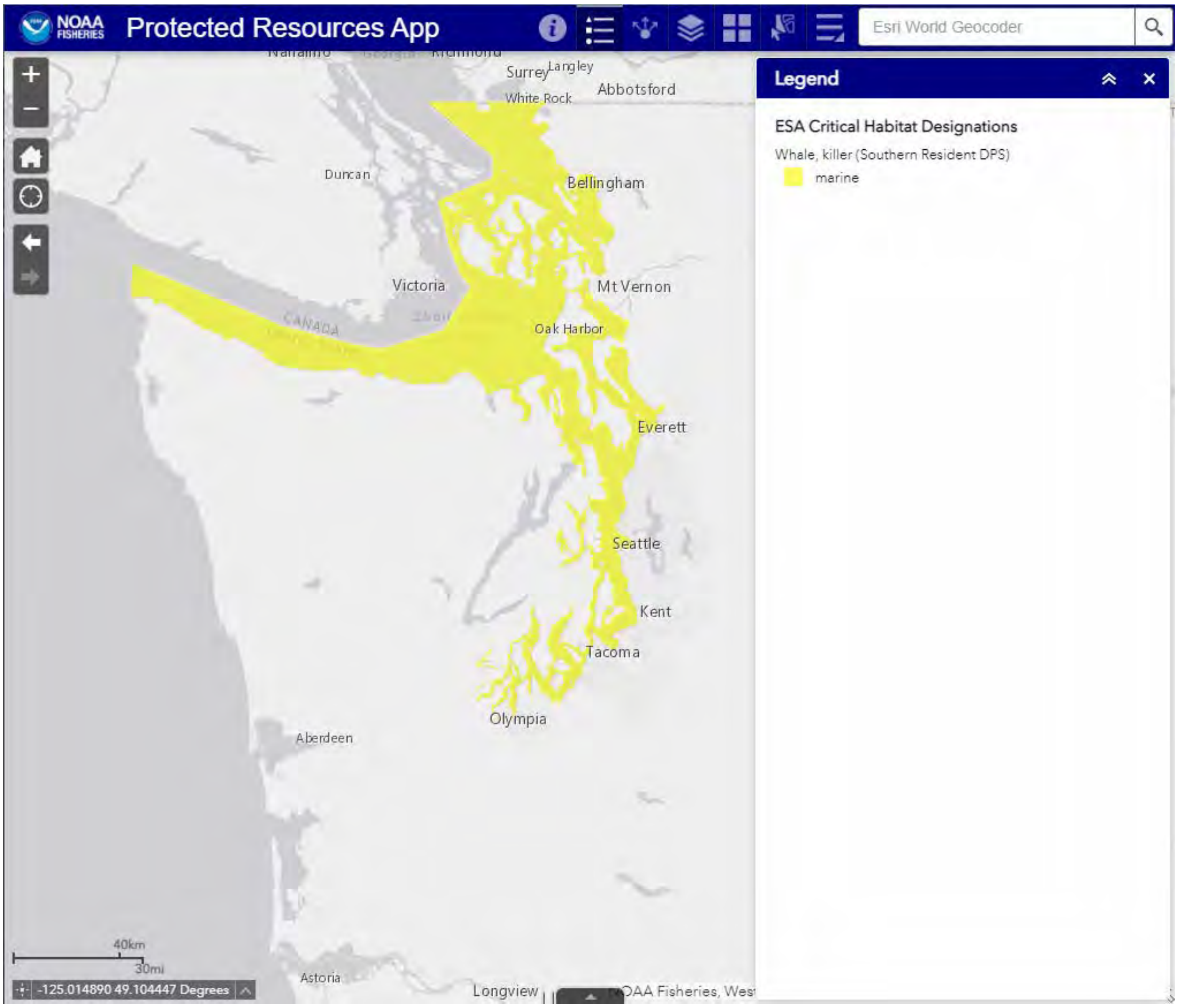
NMFS. 2021. NOAA Fisheries Protected Resource App (v1.0). Eulachon, Southern DPS Critical Habitat. National Oceanic and Atmospheric Administration. Retrieved April 7, 2021 from [https://www.webapps.nwfsc.noaa.gov/portal/apps/webappviewer/index.html?id=7514c715b8594944a6e468dd25aaacc9&extent=-13925002.001%2C5697005.1068%2C-13339188.6162%2C6203323.9822%2C102100].

Figure B-9. North American green sturgeon, Southern DPS (*Acipenser medirostris*) designated critical habitat nearest the Project action area.



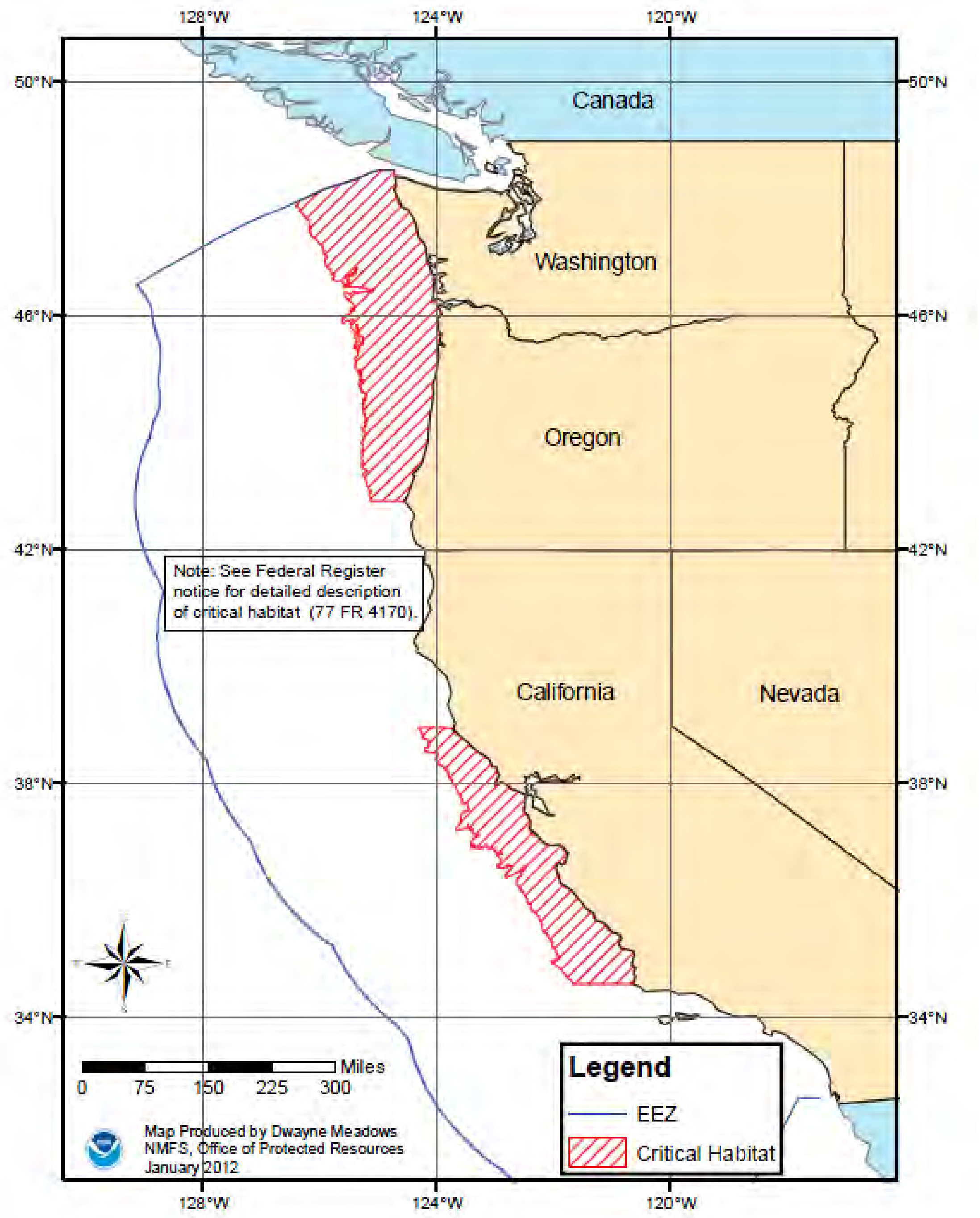
NMFS. 2021. NOAA Fisheries Protected Resource App (v1.0). North American green sturgeon, Southern DPS Critical Habitat. National Oceanic and Atmospheric Administration. Retrieved April 7, 2021 from [https://www.webapps.nwfsc.noaa.gov/portal/apps/webappviewer/index.html?id=7514c715b8594944a6e468dd25aaacc9&extent=-13919498.535%2C5953833.5219%2C-13530281.1869%2C6206992.9596%2C102100].

Figure B-10. Killer whale, Southern resident DPS (*Orcinus orca*) designated critical habitat in Washington State.



NMFS. 2021. NOAA Fisheries Protected Resource App (v1.0). Killer whale, Southern resident DPS Critical Habitat. National Oceanic and Atmospheric Administration. Retrieved April 7, 2021 from [https://www.webapps.nwfsc.noaa.gov/portal/apps/webappviewer/index.html?id=7514c715b8594944a6e468dd25aaacc9&extent=-13952672.2053%2C5796067.4955%2C-13330780.5431%2C6302386.3709%2C102100].

Figure B-11
Leatherback sea turtle (*Dermochelys coriacea*) designated critical habitat.



NMFS. 2012. Endangered and Threatened Species: Final Rule to Revise the Critical Habitat Designation for the Endangered Leatherback Sea Turtle, Final Rule. January 26, 2012. Federal Register 77(17)4170-4201.

Appendix C

Species Life History

APPENDIX C – SPECIES LIFE HISTORY

This appendix is a summary of the profiles and life histories of the ESA-listed species addressed in this BE. The species information was obtained directly from the services websites as noted below and compiled herein.

- NMFS listed species information was obtained from the Office of Protected Resources website: https://www.fisheries.noaa.gov/species-directory/threatened-endangered. Accessed on April 7, 2021.

- USFWS listed species information was obtained from the Washington Fish and Wildlife Office website: https://www.fws.gov/wafwo/promo.cfm?id=177175754. Accessed on April 7, 2021.

U.S. Fish & Wildlife Service

Washington Fish and Wildlife Office

Working with you to conserve the natural resources of Washington

FOLLOW THE FWS ONLINE

Bull Trout

Scientific Name: Salvelinus confluentus

Status: Threatened

Critical Habitat: Designated

Listing Activity: Bull trout were listed as threatened throughout Washington in November 1999 and critical habitat was designated in 2005. In January 2010, the USFWS proposed a revision of critical habitat. On September 3, 2014, the USFWS announced a Revised Draft Recovery Plan, updating the recovery criteria proposed in the 2002 and 2004 draft recovery plans.

Background

Bull trout are members of the salmonid family known as char. Bull trout, Dolly Varden and lake trout are all species of char native to parts of the northwest. Char are distributed farther north than any other group of freshwater fish except the Alaskan blackfish and are well adapted for life in very cold water.

Historical Status and Current Trends

Bull trout are native throughout the Pacific Northwest. In Washington, bull trout were historically found in major tributaries to the Columbia River on the eastside of the Cascades; major westside tributaries on the westside of the Cascades flowing into Puget Sound; and major tributaries to the Olympic Mountains flowing into Hood Canal, Strait of Juan de Fuca, and the Pacific Ocean. Anadromous bull trout can occasionally be found in smaller streams flowing into saltwater to search for food and overwinter.

Bull trout are vulnerable to many of the same threats that have reduced salmon populations. Due to their need for very cold waters and a long incubation time, bull trout are more sensitive to increased water temperatures, poor water quality and degraded stream habitat than many other salmonids. Further threats to bull trout include hybridization and competition with non-native brook trout (another species of char), non-native brown trout and introduced lake trout, overfishing, poaching, and man-made structures that block migration.

In many areas, continued survival of the species is threatened by a combination of factors rather than one major problem. For example, past and continuing land management activities have degraded stream habitat, especially along larger river systems and streams located in valley bottoms. Degraded conditions have severely reduced or eliminated migratory bull trout as water temperature, stream flow and other water quality parameters fall below the range of conditions which these fish can tolerate. In some watersheds, remaining bull trout are smaller, resident fish, isolated in headwater streams. Brook trout, introduced throughout much of the range of bull trout, easily hybridize with them, producing sterile offspring. Brook trout reproduce earlier and at a higher rate than bull trout so bull trout populations are often supplanted by these non-natives. Dams and other in-stream structures also affect bull trout by blocking migration routes, altering water temperatures and killing fish as they pass through and over dams or are trapped in irrigation and other diversion structures.

Habitat

Bull trout are seldom found in waters where temperatures are warmer than 59º to 64º F. Besides very cold water, bull trout require stable stream channels, clean spawning gravel, complex and diverse cover, and unblocked migration routes.

Life History

Small bull trout eat terrestrial and aquatic insects but shift to preying on other fish as they grow larger. Large bull trout are primarily fish predators. Bull trout evolved with whitefish, sculpins and other trout and use all of them as food sources. In western Washington, small saltwater fish (surf smelt, herring, and sandlance) are an important food source for the anadromous form of bull trout that is unique to this area. Like salmon and steelhead, the anadromous form of bull trout enters saltwater for part of its life history, returning to freshwater to spawn. Adult bull trout are usually small, but can grow to as much as 36 inches in length and weigh up to 32 pounds. Bull trout reach sexual maturity at between four and seven years of age and are known to live as long as 12 years. They spawn in the fall after temperatures drop below 48 º F, in streams with abundant cold, unpolluted water, clean gravel and cobble substrate, and gentle stream slopes. Many spawning areas are associated with cold water springs or areas where stream flow is influenced by groundwater. Bull trout eggs require a long incubation period compared to other salmon and trout, hatching in late winter or early spring. Fry may remain in the stream gravels for up to three weeks before emerging.

Bull trout may be either resident or migratory. Resident fish live for their entire life near areas where they were spawned. Migratory fish are usually spawned in small headwater streams, and then migrate to larger streams, rivers, lakes, reservoirs or saltwater where they grow to maturity. Smaller resident fish remain near the areas where they were spawned while larger, migratory, fish will move considerable distances to spawn when habitat conditions allow. For instance, bull trout in Montana's Flathead Lake have been known to migrate up to 250 kilometers (150 miles) to spawn.

Conservation Measures

Many of the same management actions that are being done to protect other declining salmonids may also help bull trout. Stream and habitat protection and restoration, reduction of siltation from roads and other erosion sites and modification of land use practices to improve water quality and temperature are all important. Several state agencies have also enacted regulations reducing or prohibiting bull trout harvest. States have also adopted conservation plans to help bull trout populations recover.

References and Links

U.S. Fish and Wildlife Service. 1999. Determination of threatened status for bull trout in the coterminous United States. Federal Register (64):58910-58933 (http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=1999_register&docid=fr01no99-13).

All Region 1 bull trout related info: U.S. Fish and Wildlife Service Region 1 (https://www.fws.gov/pacific/bulltrout/)

Chinook Salmon (Protected)

Chinook Salmon (Protected)

Oncorhynchus tshawytscha

Protected Status

ESA ENDANGERED
Sacramento River winter-run

ESA ENDANGERED
Upper Columbia River spring-run

ESA THREATENED
California coastal

ESA THREATENED
Central Valley spring-run

ESA THREATENED
Lower Columbia River

ESA THREATENED
Puget Sound

ESA THREATENED
Snake River fall-run

ESA THREATENED
Snake River spring/summer-run

ESA THREATENED
Upper Willamette River

ESA CANDIDATE
Upper Klamath-Trinity River

ESA CANDIDATE
Oregon Coast spring-run

ESA CANDIDATE
Southern Oregon and Northern California Coastal spring-run

ESA EXPERIMENTAL POPULATION
Central Valley spring-run in the San Joaquin River XN

ESA EXPERIMENTAL POPULATION
Upper Columbia River spring-run in the Okanogan River subbasin XN

Quick Facts

WEIGHT	40 pounds, but can be up to 120 pounds
LIFESPAN	Up to 6 years
LENGTH	3 feet

THREATS	Habitat impediments (dams), Habitat degradation, Habitat loss, Commercial and recreational fishing, Climate change
REGION	West Coast

About The Species

Chinook salmon are anadromous fish, which means they can live in both fresh and saltwater. Chinook salmon have a relatively complex life history that includes spawning and juvenile rearing in rivers followed by migrating to saltwater to feed, grow, and mature before returning to freshwater to spawn. They are vulnerable to many stressors and threats including blocked access to spawning grounds and habitat degradation caused by dams and culverts. Two species of chinook salmon are listed as endangered under the Endangered Species Act, seven species are listed as threatened under the ESA, and one species is a candidate for listing under the ESA.

The Sacramento River Winter-run Chinook is one of NOAA Fisheries' Species in the Spotlight.

NOAA Fisheries is committed to conserving and protecting chinook salmon. Our scientists and partners use a variety of innovative techniques to study, learn more about, and protect this species.

Protected Status

ESA Endangered

1 evolutionarily significant unit

- Sacramento River winter-run

ESA Endangered

1 evolutionarily significant unit

- Upper Columbia River spring-run

ESA Threatened

1 evolutionarily significant unit

- California coastal

ESA Threatened

1 evolutionarily significant unit

- Central Valley spring-run

ESA Threatened

1 evolutionarily significant unit

- Lower Columbia River

ESA Threatened

1 evolutionarily significant unit

- Puget Sound

ESA Threatened

1 evolutionarily significant unit

- Snake River fall-run

ESA Threatened

1 evolutionarily significant unit

- Snake River spring/summer-run

ESA Threatened

1 evolutionarily significant unit

- Upper Willamette River

ESA Candidate

1 evolutionarily significant unit

- Upper Klamath-Trinity River

ESA Candidate

- Oregon Coast spring-run

ESA Candidate

1 evolutionarily significant unit

- Southern Oregon and Northern California Coastal spring-run

ESA Experimental Population

1 evolutionarily significant unit

- Central Valley spring-run in the San Joaquin River XN

ESA Experimental Population

1 evolutionarily significant unit

- Upper Columbia River spring-run in the Okanogan River subbasin XN

Scientific Classification

Kingdom	Animalia
Phylum	Chordata
Class	Actinopterygii
Order	Salmoniformes
Family	Salmonidae
Genus	*Oncorhynchus*
Species	*O. tshawytscha*

In the Spotlight

Sacramento River Winter-Run Chinook

Chinook Salmon

Chinook Salmon

Oncorhynchus tshawytscha

Also Known As

King salmon, Spring salmon, Tyee, Winter, Quinnat, Blackmouth

Quick Facts

REGION	Alaska, West Coast

FISHWATCH
U.S. SEAFOOD FACTS

About The Species

U.S. wild-caught Chinook salmon is a smart seafood choice because it is sustainably managed and responsibly harvested under U.S. regulations.

NOAA Fisheries works in cooperation with federal, state, tribal, and Canadian officials to manage these commercial, recreational, and tribal harvest of salmon and steelhead in ocean and inland waters of the West Coast and Alaska. To learn more about management of these fisheries, visit our West Coast and Alaska fisheries management pages.

However, some Chinook salmon are also protected under the Endangered Species Act. Learn more about protected Chinook salmon.

Population Level
There are numerous stocks of Chinook salmon. Some are above target population levels, others below. Some are wild and some are hatchery-raised, but all are managed using strict regulations to balance the needs of people and other marine life.

Fishing Status
Managers set fishing rates to avoid jeopardizing the survival and recovery of Chinook salmon stocks that are below their target levels.

Habitat Impacts
Fishing gear used to catch Chinook salmon rarely contacts the ocean floor and has little impact on habitat. In the U.S., the key habitat issue for salmon recovery is restoring quality salmon habitat that once supported robust and thriving salmon runs.

Bycatch
Regulations are in place to minimize bycatch.

Status

- Alaska:
    - In Alaska, the status of Chinook salmon stocks varies.
    - Some stocks are in decline, while others are steady or increasing.
    - None are listed under the Endangered Species Act (ESA).
    - According to the 2017 stock assessment, the Eastern North Pacific Far North Migrating stock is not overfished and not subject to overfishing. Summary stock assessment information can be found on Stock SMART.
- West Coast:
    - The status of Chinook stocks in California and the Pacific Northwest varies.
    - Some stocks are in decline, while others are steady or increasing.
    - As of 2020, two populations of Chinook salmon are listed as endangered, and seven are listed as threatened under the ESA.
    - Summary 2020 stock assessment information for all West Coast Chinook salmon stocks can be found on Stock SMART.
- Populations are affected by:
    - Changes in ocean and climatic conditions.
    - Habitat loss from dam construction and urban development.
    - Degraded water quality from agricultural and logging practices.
- Population conservation efforts include:
    - Captive-rearing in hatcheries.
    - Removal and modification of dams that obstruct salmon migration.

    - Restoration of degraded habitat.
    - Acquisition of key habitat.
    - Improvements to water quality and instream flow.
- The Pacific Coastal Salmon Recovery Fund supports the restoration of salmon species.

Appearance

- When they're in the ocean, Chinook salmon are blue-green on the back and top of the head with silvery sides and white bellies.
- They have black spots on the upper half of the body and on both lobes of the tail fin.
- Chinook salmon also have a black pigment along the gum line, thus the nickname "blackmouth."
- In fresh water, when they are about to spawn, Chinook change to olive brown, red, or purplish. This color change is particularly evident in males.
- Spawning adult males can be distinguished by their hooked upper jaw.
- Females can be distinguished by a torpedo-shaped body, robust mid-section, and blunt nose.
- Juveniles in fresh water (fry) have well-developed parr marks on their sides (the pattern of vertical bars and spots useful for camouflage).
- Before juveniles migrate to the sea, they lose their parr marks and gain the dark back and light belly characteristic of fish living in open water.

Biology

- Chinook salmon are anadromous—they hatch in freshwater streams and rivers then migrate out to the saltwater environment of the ocean to feed and grow.
- Chinook salmon are the largest of the Pacific salmon, hence the name “king salmon.”
- They can grow as long as 4.9 feet and up to 129 pounds, but typical length and weight of mature fish are about 3 feet and 30 pounds.
- They spend a few years feeding in the ocean, then return to their natal streams or rivers to spawn, generally in summer or early fall.
- Chinook salmon sexually mature between the ages of 2 and 7 but are typically 3 or 4 years old when they return to spawn.
- Chinook dig out gravel nests (redds) on stream bottoms where they lay their eggs.
- All Chinook salmon die after spawning.
- Young Chinook salmon feed on terrestrial and aquatic insects, amphipods, and other crustaceans.
- Older Chinook primarily feed on other fish.
- Fish (such as whiting and mackerel) and birds eat juvenile Chinook salmon.
- Marine mammals, such as orcas and sea lions, and sharks eat adult salmon.
- Salmon are also primary prey for Southern Resident killer whales, an endangered species.
- After salmon spawn and die, salmon carcasses are a valuable source of energy and nutrients to the river ecosystem. Carcasses have been shown to improve newly hatched salmon growth and survival by contributing nitrogen and phosphorous compounds to streams.

Where They Live

- In North America, Chinook salmon range from the Monterey Bay area of California to the Chukchi Sea area of Alaska.

Management

- NOAA Fisheries and the Pacific Fishery Management Council manage Chinook salmon on the West Coast.
- Managed under the Pacific Coast Salmon Plan:
    - Every year, the council reviews reports of the previous fishing season and current estimates of salmon abundance. Using this information, they make recommendations for management of the upcoming fishing season.

  - Their general goal is to allow fishermen to harvest the maximum amount of salmon that will support the fishery while preventing overharvest of the resource and ensuring that salmon populations with low abundance can rebuild.
  - Specific management measures vary year to year depending on current salmon abundance, and include size limits, season length, quotas, and gear restrictions.
  - Management of Chinook salmon must also comply with laws such as the Endangered Species Act. One of the threats to recovery of endangered Southern Resident killer whales on the West Coast is the availability of their preferred prey, Chinook salmon. Every year the fishery management council considers the prey needs of this endangered population before setting commercial fishing catch limits for Chinook. Read more
  - Final recommendations are implemented by NOAA Fisheries. Check here for the current season's management. State and tribal managers use council management recommendations to shape their policies for inland fisheries, to ensure that conservation objectives are met.
- NOAA Fisheries and the North Pacific Fishery Management Council manage Chinook salmon in Alaska.
- Managed under the Fishery Management Plan for Salmon Fisheries in the EEZ off the Coast of Alaska:
  - All management of the salmon fisheries in federal waters is delegated to the State of Alaska, which is also responsible for managing the commercial, recreational, and subsistence fisheries for salmon in state waters. This ensures that management is consistent throughout salmon's range.
    - Managers regulate the fishery based on escapement goals to ensure harvests are sustainable. They want enough salmon to be able to escape the fishery and return to fresh water to spawn and replenish the population.
    - Salmon fishery management largely relies on in-season assessment of how many salmon return to fresh water to spawn.
    - Managers set harvest levels based on these returns. When abundance is high and the number of fish returning is much higher than that needed to meet escapement goals, harvest levels are set higher.
    - In years of low abundance, harvest levels are lowered.
  - During the fishing season, scientists monitor catch and escapement, comparing current returns with those from previous years, to keep an eye on abundance and actively manage the fishery.
- Off the West Coast and in Alaska, the Pacific Salmon Treaty and the Pacific Salmon Commission help coordinate management, research, and enhancement of shared U.S. and international salmon stocks, including Chinook.

Recreational Fishing Regulations

Commercial Fishing Regulations

Subsistence Fishing Regulations

Science Overview

NOAA Fisheries conducts various research activities on the biology, behavior, and ecology of chinook salmon. The results of this research are used to inform management decisions for this species.

Dive Deeper Into Our Research

Chinook Salmon in Alaska

Our work to forecast salmon harvests, assess the impact of commercial fisheries on salmon, and evaluate how salmon populations respond to environmental changes enable us to estimate abundance and trends for chinook salmon in Alaska.

Chum Salmon (Protected)

Chum Salmon (Protected)

Oncorhynchus keta

Protected Status

ESA THREATENED

Columbia River ESU

ESA THREATENED

Hood Canal summer-run ESU

Quick Facts

WEIGHT	8 to 15 pounds on average, but can weight up to 45 pounds
LIFESPAN	About 4 years
LENGTH	Up to 3.6 feet
THREATS	Habitat impediments (dams), Habitat loss, Habitat degradation, Commercial and recreational fishing, Climate change
REGION	West Coast

About The Species

Chum salmon may historically have been the most abundant of all Pacific salmonids. They are an anadromous fish, which means they can live in both fresh and saltwater. Chum salmon have a relatively complex life history that includes spawning and juvenile rearing in rivers followed by migrating to saltwater to feed, grow, and mature before returning to freshwater to spawn. They are vulnerable to many stressors and threats including blocked access to spawning grounds and habitat degradation caused by dams and culverts. Two evolutionary significant units of chum salmon are listed as threatened under the Endangered Species Act.

NOAA Fisheries is committed to conserving and protecting chum salmon. Our scientists and partners use a variety of innovative techniques to study, learn more about, and protect this species.

Learn more about chum salmon ›

Protected Status

ESA Threatened

1 evolutionarily significant unit

- Columbia River ESU

ESA Threatened

1 evolutionarily significant unit

- Hood Canal summer-run ESU

Scientific Classification

Kingdom	Animalia
Phylum	Chordata
Class	Osteichthyes
Order	Salmoniformes
Family	Salmonidae
Genus	*Oncorhynchus*
Species	*keta*

In the Spotlight

Management Overview

We listed the Columbia River and Hood Canal summer-run ESUs as threatened under the Endangered Species Act in 1999.

Learn more about the regulatory history of chum salmon ›

Key Actions and Documents

Actions & Documents Incidental Take

Dungeness Hatcheries Plans

NOAA Fisheries is making available for public review its Proposed Evaluation and Pending Determination (PEPD) analyzing effects of our proposed determination on three hatchery programs currently

Chum Salmon

Chum Salmon

Oncorhynchus keta

Also Known As

Salmon, Chum, Keta, Dog salmon, Calico salmon, Chub

Quick Facts

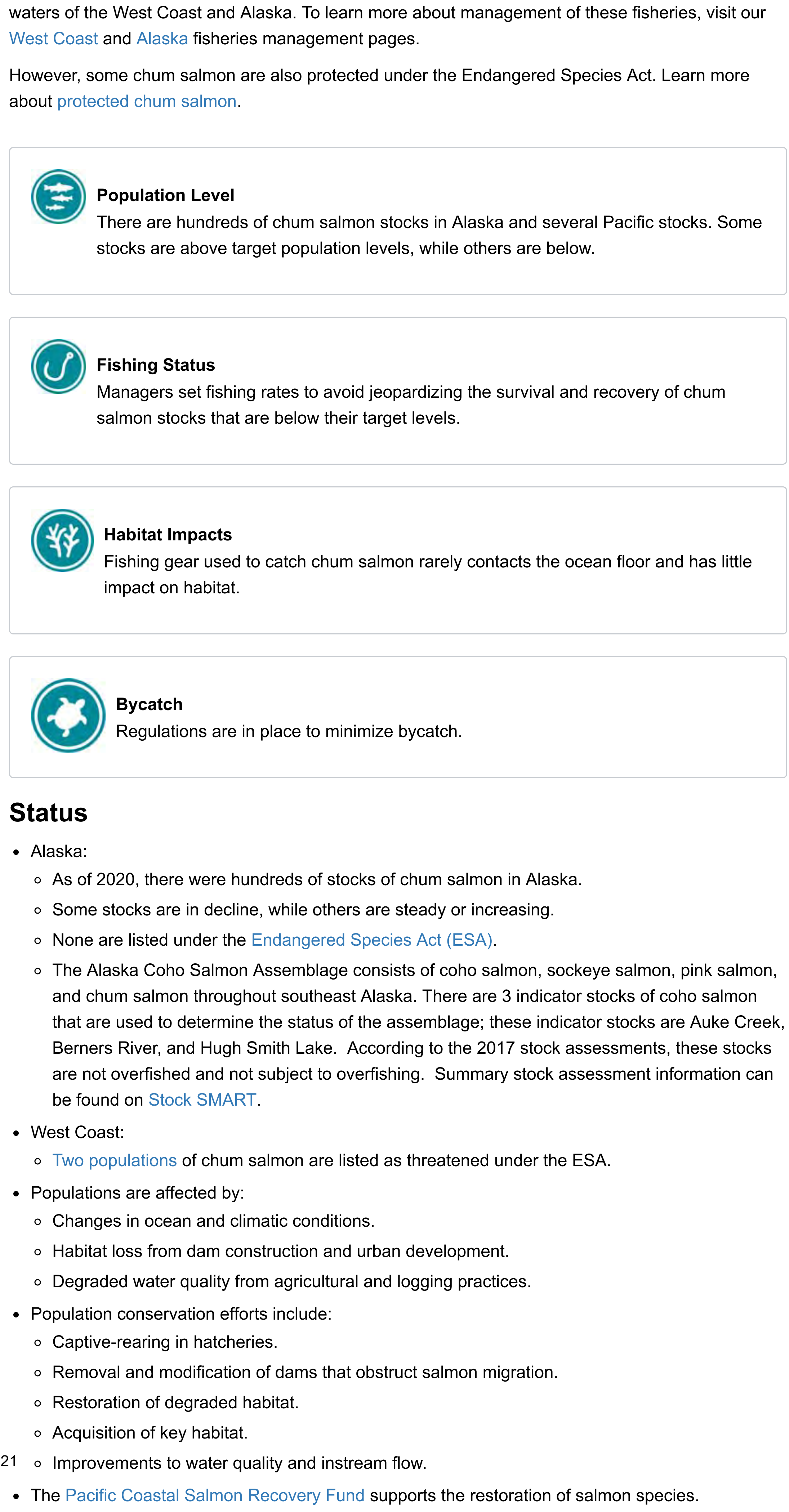
REGION	Alaska, West Coast

FISHWATCH U.S. SEAFOOD FACTS

About The Species

U.S. wild-caught chum salmon is a smart seafood choice because it is sustainably managed and responsibly harvested under U.S. regulations.

NOAA Fisheries works in cooperation with federal, state, tribal, and Canadian officials to manage these commercial, recreational, and tribal harvest of salmon and steelhead in ocean and inland



waters of the West Coast and Alaska. To learn more about management of these fisheries, visit our West Coast and Alaska fisheries management pages.

However, some chum salmon are also protected under the Endangered Species Act. Learn more about protected chum salmon.

Population Level
There are hundreds of chum salmon stocks in Alaska and several Pacific stocks. Some stocks are above target population levels, while others are below.

Fishing Status
Managers set fishing rates to avoid jeopardizing the survival and recovery of chum salmon stocks that are below their target levels.

Habitat Impacts
Fishing gear used to catch chum salmon rarely contacts the ocean floor and has little impact on habitat.

Bycatch
Regulations are in place to minimize bycatch.

Status

- Alaska:
  - As of 2020, there were hundreds of stocks of chum salmon in Alaska.
  - Some stocks are in decline, while others are steady or increasing.
  - None are listed under the Endangered Species Act (ESA).
  - The Alaska Coho Salmon Assemblage consists of coho salmon, sockeye salmon, pink salmon, and chum salmon throughout southeast Alaska. There are 3 indicator stocks of coho salmon that are used to determine the status of the assemblage; these indicator stocks are Auke Creek, Berners River, and Hugh Smith Lake. According to the 2017 stock assessments, these stocks are not overfished and not subject to overfishing. Summary stock assessment information can be found on Stock SMART.
- West Coast:
  - Two populations of chum salmon are listed as threatened under the ESA.
- Populations are affected by:
  - Changes in ocean and climatic conditions.
  - Habitat loss from dam construction and urban development.
  - Degraded water quality from agricultural and logging practices.
- Population conservation efforts include:
  - Captive-rearing in hatcheries.
  - Removal and modification of dams that obstruct salmon migration.
  - Restoration of degraded habitat.
  - Acquisition of key habitat.
  - Improvements to water quality and instream flow.
- The Pacific Coastal Salmon Recovery Fund supports the restoration of salmon species.

Appearance

- Chum salmon is one of the largest species of Pacific salmon, second only to Chinook salmon in size.
- When in the ocean, chum salmon are metallic greenish-blue along the back with black speckles, similar to both sockeye and coho salmon.
- As they enter fresh water, their appearance changes dramatically.
    - Both sexes develop a tiger stripe pattern of bold red and black stripes.
    - Males develop enormous canine-like fangs and their bodies have a striking calico pattern, with the front two-thirds of the flank marked by a bold, jagged, reddish line and the back third by a jagged black line.
    - Spawning females are less flamboyantly colored and do not have fangs.
- When juvenile chum salmon are about to migrate to sea, they lose their parr marks (vertical bars and spots useful for camouflage) and gain the dark back and light belly of fish living in open water.

Biology

- Chum salmon are anadromous—they hatch in fresh water streams and rivers then migrate out to the saltwater environment of the ocean to feed and grow.
- Chum salmon do not reside in fresh water for an extended period (unlike coho, Chinook, and sockeye salmon).
- They can grow up to 3.6 feet and 30 to 35 pounds, but their average weight is 8 to 15 pounds.
- Young chum salmon (fry) typically migrate directly to estuarine and marine waters soon after they are born.
- As they grow larger, they migrate offshore across the North Pacific Ocean.
- As they approach sexual maturity, they migrate back into coastal waters and return to the fresh water area where they were born to spawn.
- They typically spawn between the ages of 3 and 6.
- They spawn from late summer to March, with peak spawning concentrated in early winter when the river flows are high.
- They usually nest in areas in the lowermost reaches of rivers and streams, within 60 miles of the ocean.
- They prefer to nest in areas with upwelling currents to provide oxygen for their developing embryos, and they cover their nests (redds) with gravel.
- In North America, female chum salmon typically have 2,000 to 4,000 eggs.
- All chum salmon die after they spawn.
- Young chum salmon feed on insects as they migrate downriver and on insects and marine invertebrates in estuaries and near-shore marine habitats.
- Adults eat copepods, fishes, mollusks, squid, and tunicates.
- Various fish and birds prey on juvenile chum salmon. Sharks, sea lions and seals, and orcas eat adult chum salmon.
- After salmon spawn and die, salmon carcasses are a valuable source of energy and nutrients to the river ecosystem. Carcasses have been shown to improve newly hatched salmon growth and survival by contributing nitrogen and phosphorous compounds to streams.

Where They Live

- Chum salmon are the most widely distributed of all the Pacific salmon.
- They are found throughout the North Pacific Ocean and range from the Arctic coast of Canada and throughout the northern coastal regions of North America and Asia.
- In the United States, chum salmon are found throughout Alaska and as far south as Yaquina Bay, Oregon, on the West Coast.

Management

- NOAA Fisheries and the Pacific Fishery Management Council manage chum salmon on the West Coast.

- Managed under the Pacific Coast Salmon Plan:
  - All Pacific salmon species fall under the jurisdiction of this plan, although it currently only provides fishery management objectives for Chinook, coho, pink, and any salmon species listed under the Endangered Species Act.
  - There are no directed fisheries for chum salmon in federal waters in this area, and chum salmon are rarely caught in the fisheries managed by the council.
  - Chum salmon are caught primarily in inland waters (such as Puget Sound and Hood Canal) where fisheries are managed to ensure that conservation objectives are met.
- NOAA Fisheries and the North Pacific Fishery Management Council manage chum salmon in Alaska.
- Managed under the Fishery Management Plan for Salmon Fisheries in the EEZ off the Coast of Alaska:
  - All management of the salmon fisheries in federal waters is delegated to the State of Alaska, which is also responsible for managing the commercial, recreational, and subsistence fisheries for salmon in state waters. This ensures that management is consistent throughout salmon's range.
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    - In years of low abundance, harvest levels are lowered.
  - During the fishing season, scientists monitor catch and escapement, comparing current returns with those from previous years, to keep an eye on abundance and actively manage the fishery.
- Off the West Coast and in Alaska, the Pacific Salmon Treaty and the Pacific Salmon Commission help coordinate management, research, and enhancement of shared U.S. and international salmon stocks, including chum.//

Recreational Fishing Regulations

Commercial Fishing Regulations

Subsistence Fishing Regulations

Science Overview

NOAA Fisheries conducts various research activities on the biology, behavior, and ecology of chum salmon. The results of this research are used to inform management decisions for this species.

Dive Deeper Into Our Research

Chum Salmon in Alaska

Our work to forecast salmon harvests, assess the impact of commercial fisheries on salmon, and evaluate how salmon populations respond to environmental changes enable us to estimate abundance and trends for chum salmon in Alaska.

Learn More >

Steelhead Trout

Steelhead Trout

Oncorhynchus mykiss

Protected Status

ESA ENDANGERED
Southern California DPS

ESA THREATENED
California Central Valley DPS

ESA THREATENED
Central California Coast DPS

ESA THREATENED
Lower Columbia River DPS

ESA THREATENED
Middle Columbia River

ESA THREATENED
Northern California DPS

ESA THREATENED
Puget Sound DPS

ESA THREATENED
Snake River Basin DPS

ESA THREATENED
South-Central California Coast DPS

ESA THREATENED
Upper Columbia River DPS

ESA THREATENED
Upper Willamette River DPS

ESA EXPERIMENTAL POPULATION
Middle Columbia River XN

Quick Facts

WEIGHT	Up to 55 pounds
LIFESPAN	Up to 11 years
LENGTH	Up to 45 inches
THREATS	Habitat impediments (dams), Habitat degradation, Habitat loss, Commercial and recreational fishing, Climate change
REGION	Alaska, West Coast

About The Species

Steelhead trout are a unique species. Individuals develop differently depending on their environment. All steelhead trout hatch in gravel-bottomed, fast-flowing, well-oxygenated rivers and streams. Some stay in fresh water all their lives, and are called rainbow trout. Steelhead trout that migrate to the ocean typically grow larger than the ones that stay in freshwater. They then return to freshwater to spawn. Steelhead trout are vulnerable to many stressors and threats including blocked access to spawning grounds and habitat degradation caused by dams and culverts.

One distinct population segment is listed as endangered under the Endangered Species Act, and 10 DPS and 1 experimental non-essential population are listed as threatened.

NOAA Fisheries is committed to conserving and protecting steelhead trout. Our scientists and partners use a variety of innovative techniques to study, learn more about, and protect this species.

Protected Status

ESA Endangered

- Southern California DPS

ESA Threatened

- California Central Valley DPS

ESA Threatened

- Central California Coast DPS

ESA Threatened

- Lower Columbia River DPS

ESA Threatened

- Middle Columbia River

ESA Threatened

- Northern California DPS

ESA Threatened

- Puget Sound DPS

ESA Threatened

- Snake River Basin DPS

ESA Threatened

- South-Central California Coast DPS

ESA Threatened

- Upper Columbia River DPS

ESA Threatened

- Upper Willamette River DPS

ESA Experimental Population

- Middle Columbia River XN

Scientific Classification

Kingdom	Animalia
Phylum	Chordata
Class	Osteichthyes
Order	Salmoniformes
Family	Salmonidae
Genus	*Oncorhynchus*
Species	*Oncorhynchus mykiss*

In the Spotlight

Management Overview

Throughout the West Coast, 11 species of steelhead are protected under the Endangered Species Act. The West Coast Region works with its partners to protect, conserve, and recover steelhead by addressing the threats these animals face and by restoring the habitat on which they depend.

Steelhead distinct population segments

- Puget Sound steelhead
- Upper Columbia River steelhead
- Snake River Basin steelhead
- Middle Columbia River steelhead
- Upper Willamette River steelhead
- Lower Columbia River steelhead
- Northern California Coast steelhead
- California Central Valley steelhead
- Central California Coast steelhead
- South Central California Coast steelhead
- Southern California Coast Steelhead

Learn more about the regulatory history of steelhead trout ›

Recovery Planning and Implementation

Species Recovery Contacts

Central California Coast Steelhead DPS

Erin Seghesio, Recovery Coordinator

Yelloweye Rockfish

Yelloweye Rockfish

Sebastes ruberrimus

Protected Status

ESA THREATENED

Puget Sound/ Georgia Basin DPS

Quick Facts

WEIGHT	40 pounds
LIFESPAN	Up to 150 years
LENGTH	Up to 3.5 feet
THREATS	Overfishing, Bycatch, Habitat degradation, Derelict fishing gear
REGION	Alaska, West Coast

About The Species

Yelloweye rockfish are among the longest lived of rockfishes, with a maximum age of up 150 years reported. This species is slow growing and late to mature. Although conservation measures like fishing bans have been put in place in Puget Sound, recovery from threats such as past overfishing and continued bycatch will take many years due to the life history of yelloweye rockfish. The Puget Sound/Georgia Basin distinct population segment (DPS) in Washington State is listed as threatened under the Endangered Species Act (ESA).

Non-ESA listed populations of yelloweye rockfish are harvested in commercial and recreational fisheries off the West Coast and Alaska. Fisheries harvest of yelloweye rockfish is managed under the following Fishery Management Plans (FMPs):

- Pacific Coast Groundfish FMP
- Groundfish of the Gulf of Alaska FMP
- Groundfish of the Bering Sea and Aleutian Islands FMP

Learn more about the Pacific Coast Groundfish Fishery off the West Coast ›

Learn more about stock assessments for yelloweye rockfish off the West Coast

Status

NOAA Fisheries is committed to conserving and protecting yelloweye rockfish. Our scientists and partners use a variety of innovative techniques to study, learn more about, and protect this species.

Find rockfish status reviews ›

Protected Status

ESA Threatened

1 distinct population segment

- Puget Sound/ Georgia Basin DPS

Threats

Yelloweye rockfish were once part of a vibrant recreational and commercial groundfish fishery in Puget Sound. Because all rockfish species are an important part of the food web, actions to support rockfish recovery would benefit the Puget Sound ecosystem. For instance, larval rockfish are a food source for juvenile salmon and other marine fish and seabirds.

Many rockfish species do not begin to reproduce until they are 5-20 years old, their recruitment varies from year to year, and reproductive success occurs at the right combination of temperature, food supply, and upwelling intensity. Therefore, these species are very susceptible to overfishing and habitat degradation.

Washington State has closed many commercial fisheries that caught rockfishes incidentally, and there is no direct commercial harvest of them in Puget Sound. Recreationally, targeting or retaining any species of rockfish in Puget Sound waters east of the Port Angeles area is not allowed.

Through work with our partners, we have supported a number of rockfish recovery actions, including derelict fishing gear surveys (PDF, 19 pages) and prevention (PDF, 15 pages) efforts, kelp conservation and recovery, the distribution of descending devices to recreational anglers, unique habitat and fish surveys, and the development of outreach materials.

Scientific Classification

Kingdom	Animalia
Phylum	Chordata
Class	Actinopterygii
Order	Scorpaeniformes
Family	Sebastidae
Genus	*Sebastes*
Species	*ruberrimus*

In the Spotlight

Management Overview

The Puget Sound/Georgia Basin DPS of yelloweye rockfish in Washington State is listed as threatened under the Endangered Species Act. NOAA Fisheries is committed to conserving and protecting the yelloweye rockfish. Our scientists and partners use a variety of innovative techniques to study, learn more about, and protect this species.

Recovery Planning and Implementation

Recovery Plan

This recovery plan outlines actions and research for the conservation and survival of threatened yelloweye rockfish and endangered bocaccio using the best available science per the requirements of the Endangered Species Act (ESA).

- Yelloweye and Bocaccio Rockfish Recovery Plan
- Recovery Plan Fact Sheet & Frequently Asked Questions (PDF, 4 pages)
- Remotely Operated Vehicle Surveys
- Collaborative Genetic Research

Kelp Conservation and Recovery Plan

Kelp is a vital habitat for rockfish and numerous additional species including forage fish, invertebrates, birds, and salmon. We are partnering with the Northwest Straits Initiative to develop a Kelp Conservation and Recovery Plan.

Learn more about kelp conservation ›

Conservation Efforts

Washington Department of Fish and Wildlife Permit Applications

The Washington Department of Fish and Wildlife (WDFW) submitted applications to us for four scientific research permits and one incidental take permit under the Endangered Species Act. WDFW prepared a conservation plan to minimize and mitigate effects on listed species. The permit applications are related to scientific research and fisheries management measures in Puget Sound/Georgia Basin, potentially affecting nine ESA-listed fish populations, including yelloweye rockfish. Following a public comment period, we released the final documents on WDFW's permit applications on November 6, 2012.

For more information, see the materials below or contact Dan Tonnes, 206-526â□□4643.

- ESA Section 10 Incidental take Permit (PDF, 6 pages)
- Final Environmental Assessment (PDF, 145 pages)
- WDFW Proposed Fishery Conservation Plan (PDF, 83 pages)
- WDFW ESA Section 10 Incidental Take Permit Application (PDF, 18 pages)
- WDFW Final Environmental Impact Statement

Salish Sea Rockfish Recovery Workshop, June 2011

The Rockfish Recovery in the Salish Sea: Research and Management Priorities Workshop on June 28-29, 2011 brought together scientists, managers, and industry professionals. Their focus was on recent and on-going research and recovery efforts of rockfish and their habitats in the Salish Sea to enable further collaboration. This workshop specifically focused on rockfish in the Salish Sea because of its unique and diverse habitats and its complex socioeconomic dynamics that influence rockfish research and recovery measures.

View presentations from the workshop ›

Critical Habitat for Puget Sound/Georgia Basin Rockfish

In 2014, NOAA Fisheries issued a final rule to designate critical habitat for three species of rockfish listed under the Endangered Species Act (ESA):

- The threatened yelloweye rockfish (*Sebastes ruberrimus*) Distinct Population Segment (DPS).
- The threatened canary rockfish (*S. pinniger*) DPS.
- The endangered bocaccio (*S. paucispinus*) DPS (listed rockfish) pursuant to section 4 of the ESA.

Learn more about the critical habitat designation for Puget Sound/Georgia Basin Rockfish ›

Stewardship Resources

- Fishing & Barotrauma
- Report Sightings Of Derelict Fishing Gear
- Rockfish Barotrauma Video
- Species Identification Guide
- Rockfish Matching Game
- Pacific Northwest Coloring and Activity Book (Northwest Fisheries Science Center)

Regulatory History

In February 1999, we received a petition from Mr. Sam Wright of Olympia, Washington to list 18 species of marine fishes in Puget Sound, including this species, under the ESA. On June 21, 1999, we found that there was insufficient information concerning stock structure, status, and trends for this species to suggest that listing this species may be warranted (64 FR 33037).

On April 9, 2007, we received a petition from Mr. Sam Wright (Olympia, Washington) to list "distinct population segments (DPSs)" of yelloweye rockfish, and 4 other rockfishes in Puget Sound, as endangered or threatened species under the ESA and to designate critical habitat. We found that this petition also did not present substantial scientific or commercial information to suggest that the petitioned actions may be warranted (72 FR 56986; October 5, 2007). On October 29, 2007, we received a letter from Mr. Wright presenting information that was not included in the April 2007 petition, and requesting reconsideration of the decision not to initiate a review of the species' status. We considered the supplemental information as a new petition and concluded that there was enough information in this new petition to warrant conducting status reviews of these rockfishes. We completed the status review in December 2010.

In April 2010, we listed the Puget Sound/ Georgia Basin DPS as threatened under the ESA.

Key Actions and Documents

Actions & Documents Incidental Take

Initiation of 5-Year Reviews for Eulachon, Yelloweye Rockfish, Bocaccio, and Green Sturgeon

We, NMFS, are announcing 5-year reviews of four species listed under the Endangered Species Act (ESA) of 1973, as amended. The four distinct population segments (DPSs) included in this notice are the southern DPS of eulachon (Thaleichthys pacificus),…

› Notice of initiation of 5-year reviews; request for information (03/05/2020, 85…

Information Gathering , West Coast

PUBLISHED

March 5, 2020

Removal of the Puget Sound/Georgia Basin Canary Rockfish DPS From the Federal List of Threatened and Endangered Species; and Update and Amendment to

We, NMFS, are issuing a final rule to remove the Puget Sound/Georgia Basin canary rockfish (Sebastes pinniger) Distinct Population Segment (DPS) from the Federal List of Threatened and Endangered Species and remove its critical habitat designation. We…

› Final Rule (82 FR 7711, 01/23/2017)

Final Rule , Alaska, West Coast

EFFECTIVE

March 24, 2017

Draft Recovery Plan for Puget Sound/Georgia Basin Yelloweye Rockfish and Bocaccio

The National Marine Fisheries Service (NMFS) announces the availability of the Puget Sound/Georgia Basin Yelloweye rockfish (Sebastes ruberrimus) and Bocaccio (S. paucispinis) Draft Recovery Plan (Plan) for public review. NMFS is soliciting review and…

› Notice of availability; request for comments (81 FR 54556, 08/16/2016)

Notice , Alaska, West Coast

PUBLISHED

August 16, 2016

Removal of the Puget Sound/Georgia Basin DPS of Canary Rockfish From the Federal List of Threatened and Endangered Species; Update and Amend the

We, NMFS, are issuing a proposed rule to remove the Puget Sound/Georgia Basin canary rockfish (Sebastes pinniger) Distinct Population Segment (DPS) from the Federal List of Threatened and Endangered Species and remove its critical habitat designation as…

› Proposed rule; request for comments (81 FR 43979, 07/06/2016)

Proposed Rule , Alaska, West Coast

PUBLISHED

July 6, 2016

1 2 »

Science Overview

Bocaccio (Protected)

Bocaccio (Protected)

Sebastes paucispinis

Also Known As

Bocaccio, Rock Salmon, Salmon Rockfish, Pacific Red Snapper, Pacific Snapper, Oregon Red Snapper, Oregon Snapper, Longjaw, Merou, Jack, Snapper, Rock Cod, Rockfish

Protected Status

ESA ENDANGERED

Puget Sound/Georgia Basin DPS

Quick Facts

WEIGHT	Up to 21 pounds
LIFESPAN	Approximately 50 years
LENGTH	Up to 3 feet
THREATS	Fishing, Habitat degradation and loss of bull kelp habitat, Bycatch, Derelict fishing gear
REGION	Alaska, West Coast

About The Species

Bocaccio are large Pacific coast rockfish that are slow-growing, late to mature, and long-lived. They range from Punta Blanca, Baja California, to the Gulf of Alaska off Krozoff and the Kodiak Islands, but are most common between Oregon and northern Baja California. Having struggled to recover from overfishing, the Puget Sound/Georgia Basin distinct population segment (DPS) of bocaccio is listed as endangered under the Endangered Species Act.

Non-ESA listed populations of bocaccio are harvested in commercial and recreational fisheries.

Learn about bocaccio fisheries off the U.S. West Coast and Alaska

Status

NOAA Fisheries is committed to conserving and protecting the Puget Sound/Georgia Basin DPS of bocaccio. Our scientists and partners use a variety of innovative techniques to study, learn more about, and protect this species.

Find bocaccio status reviews

Protected Status

ESA Endangered

1 distinct population segment

- Puget Sound/Georgia Basin DPS

Threats

Bocaccio were once part of a vibrant recreational and commercial groundfish fishery in Puget Sound. Because all rockfish species are an important part of the food web, actions to support rockfish recovery would benefit the Puget Sound ecosystem. For instance, larval rockfish are a food source for juvenile salmon and other marine fish and seabirds.

Rockfish are vulnerable to overfishing because many species do not begin to reproduce until they are 5-20 years old, and very few of their young survive to adulthood. Bocaccio can live over 50 years, and yelloweye rockfish approach up to 150 years. These traits make them susceptible to overfishing and habitat degradation.

Washington State has closed many commercial fisheries that caught rockfish incidentally, and there is no direct commercial harvest of them in Puget Sound. Recreationally, targeting or retaining any species of rockfish in Puget Sound waters east of the Port Angeles area is not allowed.

Through work with our partners, we have supported a number of rockfish recovery actions, including derelict fishing gear surveys (PDF, 19 pages) and prevention (PDF, 15 pages) efforts, kelp conservation and recovery, the distribution of descending devices to recreational anglers, unique habitat and fish surveys, and the development of outreach materials.

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Kingdom	Animalia
Phylum	Chordata
Class	Actinopterygii
Order	Scorpaeniformes
Family	Sebastidae
Genus	*Sebastes*
Species	*paucispinus*

In the Spotlight

Management Overview

The Puget Sound/Georgia Basin distinct population segment of bocaccio is listed as endangered under the Endangered Species Act. NOAA Fisheries is committed to conserving and protecting the bocaccio. Our scientists and partners use a variety of innovative techniques to study, learn more about, and protect this species.

Recovery Planning and Implementation

Recovery Plan

This recovery plan outlines actions and research for the conservation and survival of threatened yelloweye rockfish and endangered bocaccio using the best available science per the requirements of the Endangered Species Act (ESA).

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View presentations from the workshop ›

Critical Habitat for Puget Sound/Georgia Basin Rockfish

In 2014, NOAA Fisheries issued a final rule to designate critical habitat for three species of rockfish listed under the Endangered Species Act (ESA):

- The threatened yelloweye rockfish (*Sebastes ruberrimus*) Distinct Population Segment (DPS).
- The threatened canary rockfish (*S. pinniger*) DPS.
- The endangered bocaccio (S. paucispinus) DPS (listed rockfish) pursuant to section 4 of the ESA.

Learn more about the critical habitat designation for Puget Sound/Georgia Basin Rockfish ›

Stewardship Resources

- Fishing & Barotrauma
- Report Sightings Of Derelict Fishing Gea
- Rockfish Barotrauma Video
- Species Identification Guide
- Rockfish Matching Game
- Pacific Northwest Coloring and Activity Book (Northwest Fisheries Science Center)

Key Actions and Documents

Actions & Documents Incidental Take

Initiation of 5-Year Reviews for Eulachon, Yelloweye Rockfish, Bocaccio, and Green Sturgeon

We, NMFS, are announcing 5-year reviews of four species listed under the Endangered Species Act (ESA) of 1973, as amended. The four distinct population segments (DPSs) included in this notice are the southern DPS of eulachon (Thaleichthys pacificus),…

› Notice of initiation of 5-year reviews; request for information (03/05/2020, 85…

Information Gathering , West Coast

PUBLISHED

March 5, 2020

Removal of the Puget Sound/Georgia Basin Canary Rockfish DPS From the Federal List of Threatened and Endangered Species; and Update and

Bocaccio

Bocaccio

Sebastes paucispinis

Also Known As

Bocaccio, Rock Salmon, Salmon Rockfish, Pacific Red Snapper, Pacific Snapper, Oregon Red Snapper, Oregon Snapper, Longjaw, Merou, Jack, Snapper, Rock Cod, Rockfish

Quick Facts

WEIGHT	Up to 21 pounds
LIFESPAN	Approximately 50 years
LENGTH	Up to 3 feet
THREATS	Fishing, Habitat degradation and loss of bull kelp habitat, Bycatch, Derelict fishing gear
REGION	Alaska, West Coast

FISHWATCH U.S. SEAFOOD FACTS

About The Species

Bocaccio are large Pacific coast rockfish that are slow-growing, late to mature, and long-lived. They range from Punta Blanca, Baja California, to the Gulf of Alaska off Krozoff and the Kodiak Islands, but are most common between Oregon and northern Baja California. Having struggled to recover from overfishing, the Puget Sound/Georgia Basin distinct population segment of bocaccio is listed as endangered under the Endangered Species Act. Non-ESA listed populations of bocaccio are harvested in commercial and recreational fisheries off the West Coast and Alaska.

Learn about the Pacific Coast Groundfish Fishery off the West Coast ›

Learn about the ESA-protected population of bocaccio ›

Population Level
Above target population level.

Fishing Status
At recommended levels.

Habitat Impacts
Area closures and gear restrictions protect sensitive rocky, cold-water coral and sponge habitats from bottom trawl gear.

Bycatch
Regulations are in place to minimize bycatch.

Status

- There are three stocks of bocaccio: southern Pacific coast, one stock contained in a stock complex along the northern Pacific coast, and one stock contained in a stock complex in the Gulf of Alaska. According to the most recent stock assessments:
    - The southern Pacific coast stock is not overfished (2017 stock assessment) and not subject to overfishing based on 2018 catch data. Summary stock assessment information can be found on Stock SMART. This stock had been overfished and was successfully rebuilt in 2017.
    - The population status of the Minor Shelf Rockfish North Complex, which includes northern Pacific coast bocaccio, is unknown. The complex has not been assessed, but according to 2018 catch data, the complex is not subject to overfishing.
    - The population status of the Gulf of Alaska Other Rockfish Complex, which includes bocaccio, is unknown. The complex has not been assessed, but according to 2020 catch data, the complex is not subject to overfishing.

Appearance

- Bocaccio can grow up to three feet long and weigh up to 21 pounds.
- They are identifiable based on their long jaw, which extends to or past the eye socket.

- Young bocaccio are light bronze with small brown spots along their sides. As they grow older, they lose their spots and darken.
- Adult bocaccio have backs that are olive, burnt-orange or brown as adults. They have pink and red stomachs.

Biology

- Bocaccio is a species of rockfish. Rockfishes are unusual among the bony fishes in that fertilization and embryo development is internal and female rockfish give birth to live larval young.
- Like most other species of rockfish, bocaccio are long-lived. Bocaccio mature and begin to reproduce between ages 4 and 7 years old, and they can live to be 50 years old.
- Bocaccio larvae are opportunistic feeders. Early on, larvae mostly eat copepod nauplii and eat some invertebrate eggs. As they grow, larvae start eating copepodites, adult copepods, and euphausiids.
- Within the first year of their lives, bocaccio begin foraging on other young fishes.
- Adult bocaccio mostly eat fish. Their preferred meal is other rockfishes, but they will also eat sablefish, anchovies, lantern fish and squid.
- Female bocaccio may spawn one to three times per season. They are highly fecund for rockfish and have been recorded with anywhere from 290 thousand up to 1.9 million eggs in the ovaries at one time.
- In the Southern California Bight, Bocaccio spawn from October to July, peaking in January. Off central and northern California, Bocaccio spawn from January to May and peak in February.

Where They Live

- Bocaccio are found between Punta Blanca, Baja California, and the Gulf of Alaska off Krozoff and Kodiak Islands. Within this range, bocaccio is most common between Oregon and northern Baja California.
- There are two partially isolated populations; one southern population centered in California, and one northern population centered in British Columbia.

Management

- NOAA Fisheries and the Pacific Fishery Management Council manage the bocaccio fishery on the West Coast.
    - Along the southern Pacific coast, bocaccio are managed as a single stock. Along the northern Pacific coast, they are managed as part of the northern Pacific coast minor shelf rockfish complex.
- Managed under the Pacific Coast Groundfish Fishery Management Plan:
    - Permits and limited entry to the fishery.
    - Limit on how much may be harvested in one fishing trip.
    - Certain seasons and areas are closed to fishing.
    - Gear restrictions help reduce bycatch and impacts on habitat.
    - A trawl rationalization catch share program that includes:
    - Catch limits based on the population status of each fish stock and divided into shares that are allocated to individual fishermen or groups.
    - Provisions that allow fishermen to decide how and when to catch their share.
- NOAA Fisheries and the North Pacific Fishery Management Council manage the bocaccio fishery in the Gulf of Alaska. Bocaccio are managed as part of the other rockfish complex.
- Managed under the Fishery Management Plan for Groundfish of the Gulf of Alaska:
    - There is no directed fishing for this species in Alaska, and only minor amounts are landed incidentally in other fisheries.
    - Permits are required.
    - Bottom contact gear is prohibited in the Gulf of Alaska Coral and Alaska Seamount Habitat Protection Areas to protect sensitive habitat.
    - Gear restrictions help reduce bycatch.

  - Annual catch limits are in place to prevent overfishing.
- Managed under the Bering Sea/Aleutian Islands Groundfish Fishery Management Plan. Bocaccio are managed as part of the other rockfish complex, but they are not present in significant numbers.

Recreational Fishing Regulations

Commercial Fishing Regulations

Subsistence Fishing Regulations

Management Overview

Commercial and recreational harvest of bocaccio is managed under the following fishery management plans:

- Pacific Coast Groundfish FMP
- Groundfish of the Gulf of Alaska FMP
- Groundfish of the Bering Sea and Aleutian Islands FMP

Science Overview

Eulachon

Eulachon

Thaleichthys pacificus

Protected Status

ESA THREATENED
Southern DPS

Quick Facts

WEIGHT	2.5 ounces
LIFESPAN	Unknown
LENGTH	8.5 inches
THREATS	Habitat degradation, Habitat impediments, Fisheries interaction and bycatch, Water pollution
REGION	Alaska, West Coast

About The Species

Eulachon are an anadromous (moving between freshwater and saltwater) smelt in the family Osmeridae. The binomial species name is derived from Greek roots; thaleia meaning rich, ichthys meaning fish, and pacificus meaning of the Pacific.

Eulachon are found from northern California to southwest Alaska. The southern distinct population segment (DPS) is listed as threatened under the Endangered Species Act.

Eulachon have many other names—smelt, hooligan, oolichan, and fathom fish. First Nations people called eulachon "salvation" fish because the return of spawning runs to coastal rivers meant the difference between life and starvation after a hard winter. Native people continue to fish for eulachon by traditional methods for use as an important subsistence food and medicine.

Adult eulachon typically spawn at age 2-5 years in the lower portions of rivers. Many rivers within the range of eulachon have consistent yearly spawning runs; however, eulachon may appear in other rivers only on an irregular or occasional basis. The spawning migration usually occurs between December and June.

NOAA Fisheries is committed to conserving and protecting eulachon. Our scientists and partners use a variety of innovative techniques to study, learn more about, and protect this species.

Protected Status

ESA Threatened

- Southern DPS

Scientific Classification

Kingdom	Animalia
Phylum	Chordata
Class	Actinopterygii
Order	Osmeriformes
Family	Osmeridae
Genus	*Thaleichthys*
Species	*pacificus*

In the Spotlight

Management Overview

We listed the southern DPS of eulachon as threatened under the Endangered Species Act in 2010.

Recovery Planning and Implementation

September 2017: Final Recovery Plan for the Southern distinct population segment (DPS) of Eulachon (PDF, 132 pages).

October 20, 2016: Draft Eulachon Recovery Plan (PDF, 120 pages).

October 20, 2016: Notice of Availability of Draft Eulachon Recovery Plan (81 FR 72572, 10/20/2016)

July 3, 2013: Notice of Intent to Prepare a Recovery Plan for the Southern DPS of Eulachon (78 FR 40104, 07/03/2013).

June 21, 2013: Recovery Plan Outline for the Southern DPS of Eulachon (PDF, 27 pages).

Conservation Efforts

Critical habitat

NOAA Fisheries listed the southern DPS of Pacific eulachon as threatened under the ESA in 2010 and designated critical habitat in 2011.

Though the designation applies only to eulachon, this critical habitat will provide benefits to other listed species, including salmon, steelhead, bull trout, and green sturgeon.

The designation covers 16 creeks and rivers within Washington, Oregon, and California. The total number of stream miles included in this designation is 335 (539 km). The Federal Register notice has information describing specific creeks and rivers (including latitude and longitude identifiers) and maps of the areas designated.

Excluded Areas

The ESA gives the Secretary of Commerce discretion to exclude areas from designation if he determines that the benefits of exclusion outweigh the benefits of designation. We have excluded areas that overlap with Native American tribal lands. These areas are excluded because of the unique trust relationship between tribes and the federal government, the federal emphasis on respect for tribal sovereignty and self-governance, and the importance of tribal participation in numerous activities aimed at conserving eulachon. These exclusions consist of portions of the Klamath, Quinault, and Elwha Rivers in California and Washington.

More Information

- News release
- Designation of Critical Habitat for Southern DPS of Eulachon
- Eulachon critical habitat maps and GIS data
- References for eulachon critical habitat (PDF, 12 pages)

The analysis supporting the final rule is explained in detail in several accompanying documents. They include:

- A biological report describing how we mapped fish distribution, determined which areas meet the definition of critical habitat, and rated the conservation value of different areas: Critical Habitat for the Southern Distinct Population Segment of Eulachon: Biological Report (PDF, 59 pages).
- An economics report describing how we estimated the economic impact of this proposal on different areas: Economic Analysis of Critical Habitat for the Southern Distinct Population Segment of Eulachon (PDF, 103 pages).
- A report describing how we weighed the benefits of exclusion versus the benefits of designation, to recommend the exclusion of particular areas: Designation of Critical Habitat for the Southern Distinct Population Segment of Eulachon: Section 4(b)(2) Report (PDF, 42 pages).

Resources

Washington Department of Fish and Wildlife

Oregon Department of Fish and Wildlife

- Publications

California Department of Fish and Wildlife

Department of Fisheries and Oceans, Canada

- Studies of Eulachon Smelt in OR and WA, 2014 (PDF, 168 pages)

Eulachon Newsletters

- September 2014 Eulachon Newsletter (PDF, 2 pages)
- December 2014 Eulachon Newsletter (PDF, 3 pages)
- July 2015 Eulachon Newsletter (PDF, 2 pages)
- December 2015 Eulachon Newsletter (PDF, 3 pages)

Biological Opinions

Listing Information

- ESA Listing Status Threatened
- Endangered and Threatened Wildlife; Final Rule to Revise the Code of Federal Regulations for Species under the Jurisdiction of the National Marine Fisheries Service
- 2016 5-Year Review Summary and Evaluation
- 2016 Status Review Update (PDF, 121 pages)
- 2010 Eulachon Status Review
- 2008 Eulachon Status Review (PDF, 229 pages)

Key Actions and Documents

Actions & Documents

Incidental Take

Green Sturgeon

Green Sturgeon

Acipenser medirostris

Protected Status

ESA THREATENED
Southern DPS

CITES APPENDIX II
Throughout Its Range

Quick Facts

WEIGHT	Up to 350 pounds
LIFESPAN	60 to 70 years
LENGTH	Average 4.5 to 6.5 feet
THREATS	Habitat impediments (dams), Habitat degradation, Habitat loss, Bycatch, Chemical contaminants, Climate change
REGION	Alaska, West Coast

About The Species

Green sturgeon are an anadromous fish, which means they can live in both fresh and saltwater. They have a relatively complex life history that includes spawning and juvenile rearing in rivers followed by migrating to saltwater to feed, grow, and mature before returning to freshwater to spawn. They are a long-lived, slow-growing fish. They are vulnerable to many stressors and threats including blocked access to spawning grounds and habitat degradation caused by dams and culverts. The southern distinct population segment is listed as threatened under the Endangered Species Act.

NOAA Fisheries is committed to conserving and protecting green sturgeon. Our scientists and partners use a variety of innovative techniques to study, learn more about, and protect this species.

Status

Twenty-seven species of sturgeon can be found in temperate waters of the Northern Hemisphere. Two of them reside on the West Coast of North America: the green sturgeon (Acipenser medirostris) and the white sturgeon (Acipenser transmontanus).

NOAA Fisheries received a petition in June 2001 from several environmental organizations requesting that the agency list the North American green sturgeon under the Endangered Species Act. On April 7, 2006, we listed the southern distinct population segment, or sDPS, of North American green sturgeon as threatened under the ESA. Critical habitat was designated on October 9, 2009. On June 2, 2010, NOAA Fisheries published final ESA protective regulations 4(d) for the southern distinct population segment of North American green sturgeon. We released a final environmental assessment analyzing the environmental impacts of these ESA Section 4(d) rules.

Protected Status

ESA Threatened

- Southern DPS

CITES Appendix II

- Throughout Its Range

Behavior and Diet

Sturgeons are most closely related to paddlefish, reedfish, and numerous fossil groups within the infraclass Chondostei. These are primary cartilaginous fish with some degree of bony structures (ossification). They are not ancestral to modern bony fishes but represent a highly specialized and successful offshoot of ancestral Chondosteans. Their skeletons are composed of cartilage, and they have a series of external bony plates called scutes along their backs and sides.

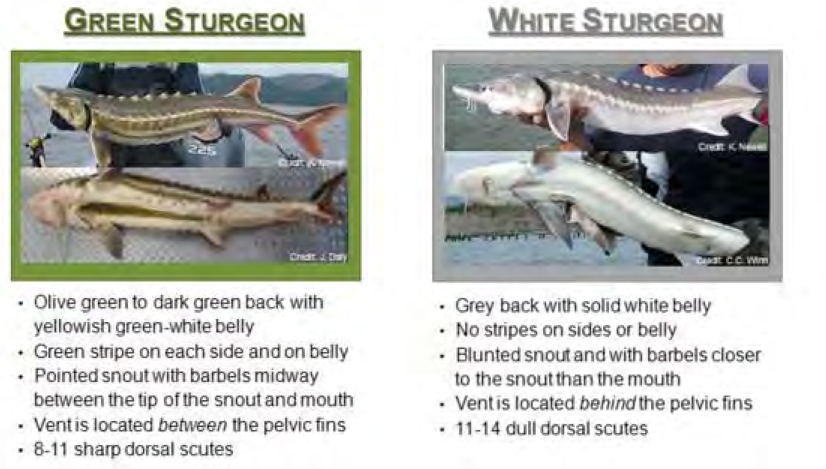
Sturgeon are often likened to sharks because of the many features they share, including:

- Spiracles.
- Heterocercal tails.
- Fin and jaw structure.
- Spiral valve.
- Ampullae of Lorenzini (special sensing organs forming a network of jelly-filled pores). These unique sensory organs allow them to detect electrical signals given off by prey in murky waters and substrates.

Sturgeon do not have teeth. Instead, they use their long, flexible "lips" (i.e., protrusible jaw) to suck up food from the bottom.

Identification Guide (PDF, 1 page)

Green sturgeon were first described in San Francisco Bay in 1857. Like most sturgeon, they are anadromous but tend to spend more time in the ocean than most species. They can be found from Alaska to Mexico but are most commonly encountered north of Point Conception, California. They differ from white sturgeon in their olive green coloration, barbell placement, vent placement, differences in number and sharpness of scutes, and presence of an additional scute behind the dorsal and anal fins.



GREEN STURGEON

- Olive green to dark green back with yellowish green-white belly
- Green stripe on each side and on belly
- Pointed snout with barbels midway between the tip of the snout and mouth
- Vent is located *between* the pelvic fins
- 8-11 sharp dorsal scutes

WHITE STURGEON

- Grey back with solid white belly
- No stripes on sides or belly
- Blunted snout and with barbels closer to the snout than the mouth
- Vent is located *behind* the pelvic fins
- 11-14 dull dorsal scutes

Lifespan & Reproduction

Green sturgeon reach maturity around age 15 and can live to be 70 years old. Unlike salmon, they may spawn several times during their long lives, returning to their natal rivers every 3–5 years. By comparing the DNA and movement patterns of tagged fish, researchers identified two genetically distinct population segments of green sturgeon. Although these fish may look identical, their genetic makeup is very different. This distinction allows NOAA Fisheries and other agencies to manage populations more effectively and helps preserve diversity.

Fish that spawn in the Klamath and Eel River in Northern California and the Rogue River in Oregon belong to the Northern DPS (nDPS). NOAA Fisheries lists them as a Species of Concern. Fish that spawn in the Sacramento, Feather, and Yuba River in California belong to the federally threatened southern DPS (sDPS).

During spawning runs, adult sDPS fish enter San Francisco Bay between mid-February and early May and migrate rapidly up the Sacramento River. Spawning occurs in cool sections of the upper Sacramento River where there are deep, turbulent flows and clean, hard substrate. In the autumn, these post-spawn adults move back down the river and re-enter the ocean. After hatching, larvae and juveniles migrate downstream toward the Sacramento-San Joaquin Delta and estuary. After rearing in the delta and estuary for a few years, they move out to the ocean. As adults, both population segments of green sturgeon migrate seasonally along the West Coast. They congregate in bays and estuaries in Washington, Oregon, and California during the summer and fall months. During winter and spring months they congregate off of the northern Vancouver Island in British Columbia, Canada.

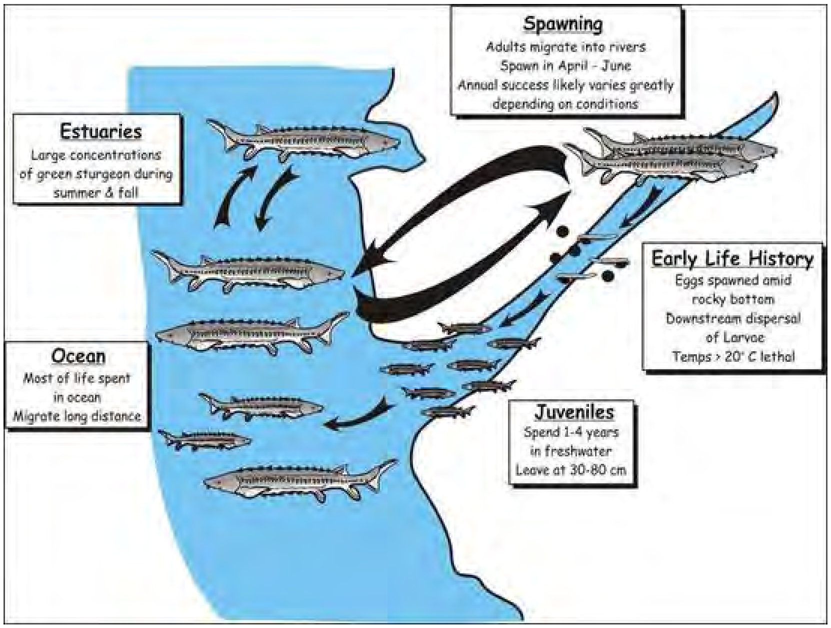


Figure Adapted from Beamesderfer et al. 2007

Threats

Green sturgeon populations successfully persisted throughout North America for 200 million years. They are thought to have experienced a precipitous decline during the past century. Harvest of adults likely resulted in direct declines in abundance and destruction of spawning and rearing habitats led to reduced population sizes and resilience. There are now regulations prohibiting harvest or take in effect. The most significant threats to green sturgeon likely relate to loss and inaccessibility of available spawning habitat. Much of this is driven by competing water resource needs between humans and fish.

Dams, altered flows, and entrapment in water diversions can impede or inhibit their migration. Other threats to the survival and recovery of this ancient fish include:

- Insufficient freshwater flow rates in spawning areas
- Contaminants.
- Fisheries bycatch.
- Poaching.
- Invasive species.
- Impassable barriers.
- Unfavorable water conditions.

Improved Passage and Barrier Removal

An important step in barrier removal was the decommissioning of the Red Bluff Diversion Dam (rkm 391 on the Sacramento River) in 2013. With the permanent raising of the gates, passage to spawning grounds is now accessible for adult sDPS green sturgeon. Larvae and juvenile sDPS green sturgeon have been collected by USFWS Red Bluff every year since the dam was decommissioned. USFWS Red Bluff tags juvenile sDPS green sturgeon in the fall to understand juvenile migration rates from the Sacramento River into the Sacramento-San Joaquin Delta.

View the story map.

In 2019, the California Department of Water Resources (DWR) improved fish passage for salmonids and sturgeon entering the Yolo Bypass from the Sacramento and Feather rivers. The improved Fremont Weir fish passage facility allows for the volitional passage of adult sturgeon onto the Yolo Bypass during weir overtopping events. California DWR is continuing to improve fish passage and increase floodplain rearing habitat in the Yolo Bypass.

View the Fremont Weir Adult Fish Passage Project video on YouTube.

Scientific Classification

Kingdom	Animalia
Phylum	Chordata
Class	Osteichthyes
Order	Acipenseriformes
Family	Acipenseridae
Genus	*Acipenser*
Species	*medirostris*

In the Spotlight

Management Overview

Regulations prohibit the retention of green sturgeon in both recreation and commercial fisheries throughout California, Oregon, Washington, and British Columbia. These regulations represent a significant reduction in the risk of loss of green sturgeon to fishing activities and are expected to have a substantial conservation impact.

Recent research efforts have focused on monitoring early life history stages and estimating adult abundance to better evaluate overall species status. We are also seeking increased understanding of the impacts of contaminant exposure, ocean energy projects, predation by native and non-native species, foraging and feeding behavior, and baseline population data. Green sturgeon recovery depends on the commitment to a sound ecosystem conservation plan.

Critical Habitat

On October 9, 2009, NOAA Fisheries designated final critical habitat for North American green sturgeon sDPS.

In freshwater, the designated critical habitats are:

- Mainstream Sacramento River downstream of Keswick Dam (including the Yolo and Sutter bypasses).
- Feather River below Oroville Dam.
- Yuba River below Daguerre Point Dam.
- Sacramento-San Joaquin Delta.

In marine waters, the designated critical habitats are:

- Areas 60 fathom (110 meters) depth isobath from Monterey Bay to the U.S.-Canada border.

In coastal bays and estuaries, the designated critical habitats are:

- San Francisco Bay Estuary and Humboldt Bay in California.
- Coos, Winchester, Yaquina, and Nehalem bays in Oregon.
- Willapa Bay and Grays Harbor in Washington.
- Lower Columbia River Estuary from the mouth to rkm 74.

Critical Habitat Designation

- News release
- Federal Register Notice
- Biological Analysis (PDF, 144 pages)
- Economic Analysis (PDF, 220 pages)
- ESA Section 4(2)d Report (PDF, 58 pages)
- References for Green Sturgeon sDPS Critical Habitat (PDF, 11 pages)

Final Recovery Plan, August 2018

- Final sDPS Green Sturgeon Recovery Plan (PDF, 95 pages)
- Appendix A - Final sDPS Green Sturgeon Recovery Plan (PDF, 25 pages)

Draft Recovery Plan, January 2018

- Federal Register Notice Requesting Comments on Draft sDPS Green Sturgeon Recovery Plan

ESA Listing

- Federal Register Notice, April 7, 2006, Southern DPS
  - Updated April 14, 2014
- References for Final Rule Listing, Southern DPS (PDF, 4 pages)
- Final Green Sturgeon Listing Q & A (PDF, 4 pages)

Key Actions and Documents

Actions & Documents Incidental Take

Killer Whale

Killer Whale

Orcinus orca

Protected Status

ESA ENDANGERED
Southern Resident DPS

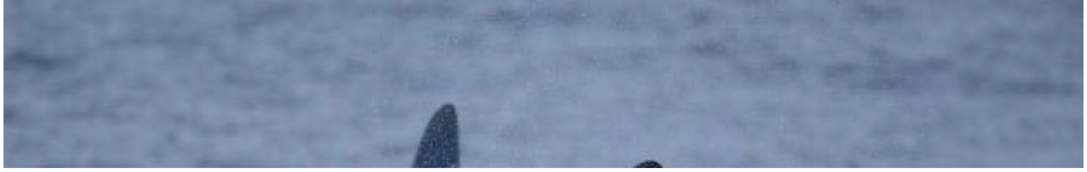
CITES APPENDIX II
Throughout its Range

MMPA PROTECTED
Throughout its Range

MMPA DEPLETED
AT1 Transient stock

Quick Facts

WEIGHT	Up to 11 tons
LIFESPAN	30 to 90 years
LENGTH	Up to 32 feet
THREATS	Food limitations, Entanglement, Chemical contaminants, Disturbance from vessel traffic and noise, Oil spills
REGION	Alaska, New England/Mid-Atlantic, Pacific Islands, Southeast, West Coast



Pod of killer whales - Photo credit: NOAA Fisheries

About The Species

The killer whale, also known as orca, is the ocean's top predator. It is the largest member of the Delphinidae family, or dolphins. Members of this family include all dolphin species, as well as other larger species such as long-finned pilot whales and short-finned pilot whales, whose common names also contain "whale" instead of "dolphin."

Found in every ocean in the world, they are the most widely distributed of all cetaceans (whales and dolphins). Scientific studies have revealed many different populations with several distinct ecotypes (or forms) of killer whales worldwide—some of which may be different species or subspecies. They are one of the most recognizable marine mammals, with their distinctive black and white bodies. Globally, killer whales occur in a wide range of habitats, in both open seas and coastal waters. Taken as a whole, the species has the most varied diet of all cetaceans, but different populations are usually specialized in their foraging behavior and diet. They often use a coordinated hunting strategy, working as a team like a pack of wolves.

Hunters and fishermen once targeted killer whales. As a result, historical threats to killer whales included commercial hunting and culling to protect fisheries from killer whales. In addition, although live capture of killer whales for aquarium display and marine parks no longer occurs in the United States, it continues to remain a threat globally. Today, some killer whale populations face many other threats, including food limitations, chemical contaminants, and disturbances from vessel traffic and sound. Efforts to establish critical habitat, set protective regulations, and restore prey stocks are essential to conservation, especially for the endangered Southern Resident killer whale population.

All killer whale populations are protected under the Marine Mammal Protection Act. Only two populations receive additional special protections under federal law:

- Southern Resident Distinct Population Segment (DPS) (listed as endangered under the Endangered Species Act).
- AT1 Transient stock (designated as depleted under the MMPA).

Southern Resident killer whales are the only endangered population of killer whales in the United States, ranging from central California to southeast Alaska. Long-term commitments across state and international borders are needed to stabilize the Southern Resident population and prevent their extinction. The Southern Resident killer whale is one of NOAA Fisheries' Species in the Spotlight. This initiative includes animals considered most at risk for extinction and prioritizes recovery efforts.

NOAA Fisheries is committed to the conservation of killer whales and the protection and recovery of endangered populations. Our scientists and partners use a variety of innovative techniques to study and protect them. We also work with our partners to develop regulations and management plans that protect killer whales and their food sources, decrease contaminants in oceans, reduce ocean noise, and raise awareness about the whales and the actions people can take to support their recovery.

Status

Several different populations and ecotypes of killer whales are found throughout the world. NOAA Fisheries estimates population size in our stock assessment reports. It is estimated that there are around 50,000 killer whales globally. Approximately 2,500 killer whales live in the eastern North Pacific Ocean—home to the most well-studied killer whale populations.

In recent decades, several populations of killer whales have declined and some have become endangered. The population of AT1 Transients, a stock of Transient killer whales in the eastern North Pacific, has been reduced from 22 to 7 whales since the 1989 *Exxon Valdez* oil spill. In 2004, NOAA Fisheries designated this stock as depleted under the MMPA based on the results of the status review (PDF, 25 pages).

Scientists estimate the minimum historical population size of Southern Residents in the eastern North Pacific was about 140 animals. Following live-capture in the 1960s for use in marine mammal parks, 71 animals remained in 1974. Although there was some growth in the population in the 1970s and 1980s, with a peak of 98 animals in 1995, the population experienced a decline of almost 20 percent in the late 1990s, leaving 80 whales in 2001. The 2020 population census counted only 72 whales, and three new calves have been born following the census bringing the total of this struggling population to 75. In 2003, NOAA Fisheries began a research and conservation program with congressional funding to address the dwindling population. Southern Residents were listed as Endangered in 2005 under the ESA and a recovery plan (PDF, 1.7MB) was completed in 2008.

Learn more about the different populations and social organization of killer whales ›

Protected Status

ESA Endangered

1 distinct population segment

- Southern Resident DPS

CITES Appendix II

- Throughout its Range

MMPA Protected

- Throughout its Range

MMPA Depleted

1 stock

- AT1 Transient stock

Appearance

Killer whales are mostly black on top with white undersides and white patches near the eyes. They also have a gray or white saddle patch behind the dorsal fin. These markings vary widely between individuals and populations. Adult males develop disproportionately larger pectoral flippers, dorsal fins, tail flukes, and girths than females.

Learn more about the physical features of various populations of killer whales (PDF, 1 page) ›

Behavior and Diet

Killer whales are highly social, and most live in social groups called pods (groups of maternally related individuals seen together more than half the time). Individual whales tend to stay in their natalpods. Pods typically consist of a few to 20 or more animals, and larger groups sometimes form for temporary social interactions, mating, or seasonal concentrations of prey.

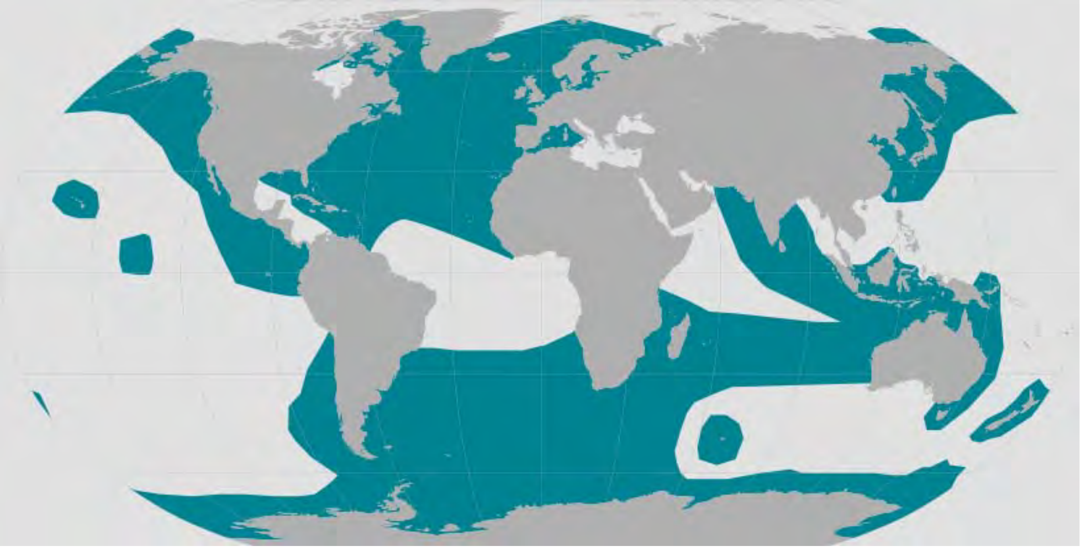
Killer whales rely on underwater sound to feed, communicate, and navigate. Pod members communicate with each other through clicks, whistles, and pulsed calls. Each pod in the eastern North Pacific possesses a unique set of calls that are learned and culturally transmitted among individuals. These calls maintain group cohesion and serve as family badges.

Although the diet of killer whales depends to some extent on what is available where they live, it is primarily determined by the culture (i.e., learned hunting tactics) of each ecotype. For example, one ecotype of killer whales in the U.S. Pacific Northwest (called Residents) exclusively eats fish, mainly salmon, and another ecotype in the same area (Transients, or Bigg's killer whales) primarily eats marine mammals and squid.

Killer whales often use a coordinated hunting strategy and work as a team to catch prey. They are considered an apex predator, eating at the top of the food web.

Where They Live

Killer whales are found in all oceans. While they are most abundant in colder waters like Antarctica, Norway, and Alaska, they are also found in tropical and subtropical waters. The most well-studied killer whale populations occur in the eastern North Pacific Ocean. Resident killer whales have been seen from California to Russia. Offshore killer whales have the largest range of any community, and often occur more than 9 miles offshore. They are not, however, exclusively "offshore", as they are sometimes seen in coastal nearshore waters. Transient killer whales also occur throughout the eastern North Pacific, and are often seen in coastal waters. Their habitat sometimes overlaps with Resident and Offshore killer whales.



Lifespan & Reproduction

The average lifespan for male killer whales is about 30 years, but they can live up to at least 60 years. Females typically live about 50 years, but can live up to at least 90 years in the wild.

Females reach sexual maturity when they are between 10 and 13 years old. They are typically pregnant for 15 to 18 months and give birth to a single calf. Calves nurse exclusively for at least a year, but remain in close association with their mother for the first two years. There is no distinct calving season, so birth can take place in any month. The birth rate for killer whales is not well understood. In some populations, birth rate is estimated at every 5 years for an average period of 25 years. Killer whales, beluga whales, narwhals, short-finned pilot whales, and humans are the only known species that go through menopause.

Threats

Lack of Food

Overfishing and habitat loss have decreased the amount of prey available to some killer whales. Without enough prey, killer whales might experience decreased reproductive rates and increased mortality rates. This threat is especially important for Southern Resident killer whales because some populations of their preferred prey, Chinook salmon, are also threatened or endangered.

Contaminants

Contaminants enter ocean waters and sediments from many sources, such as wastewater treatment plants, sewer outfalls, and pesticide application. Once in the environment, these substances move up the food web and accumulate in top predators, such as killer whales because of their long lifespan, position at the top of the food chain, and blubber stores. These contaminants can harm killer whales' immune and reproductive systems.

Despite modern pollution controls, chemical contamination through the food web continues to threaten killer whales. These controls have reduced, but not eliminated, many contaminants in the environment. Additionally, some of these contaminants persist in the marine environment for decades and continue to threaten marine life.

Oil Spills

The 1989 *Exxon Valdez* oil spill in Prince William Sound, Alaska, was strongly correlated with the direct loss of individual killer whales. However, oil spills can also have an indirect impact on killer whales by affecting the abundance of prey species. In addition, the bioaccumulation of certain contaminants, like those found in oil, such as polychlorinated biphenyls (PCBs) in the food web can be seen in apex predators like killer whales—and particularly among the transient population.

Disturbance from Vessels and Sound

When vessels are present, killer whales hunt less and travel more. Noise interference from vessels, as well as from industrial and military activities, interrupts killer whales' ability to use sound, which in turn disturbs their feeding, communication, and orientation. Increased vessel noise causes Southern Resident killer whales to call louder, expending more energy in the process.

Scientific Classification

Kingdom	Animalia
Phylum	Chordata
Class	Mammalia
Order	Cetacea
Family	Delphinidae
Genus	*Orcinus*
Species	*orca*

What We Do

Conservation & Management

NOAA Fisheries is committed to the protection and recovery of all killer whales. We have focused our conservation efforts to help rebuild endangered and depleted populations on the West Coast and Alaska. Targeted management actions taken to secure protections for these whales and their habitat include:

- Critical habitat designation.
- Minimizing whale watching harassment and reducing vessel impacts.
- Coastwide efforts to implement salmon recovery actions.
- Collaboration with partners on mitigating contaminants.
- Preventing oil spills and improving response preparation.

Learn more about our conservation efforts ›

Science

Our research projects have discovered new aspects of killer whale biology, behavior, and ecology and helped us better understand the threats killer whales' face. This research is especially important in rebuilding endangered and depleted populations and informing management decisions. Our work includes:

- Satellite tagging and tracking.
- Collecting prey and fecal samples to learn about diet and health.
- Aerial photogrammetry to assess body condition and reproduction.
- Measuring the response of animals to sound using digital acoustic recording tags.
- Measuring pollutant transfer from mothers to offspring.
- Measuring energy costs to generate sounds.

Learn more about our research ›

How You Can Help

Choose Land-Based Whale Watching

Viewing whales from shore decreases the number of boats on the water, which reduces underwater noise that can disturb killer whales.

The **Whale Trail** includes many land-based observation sites where you can view and learn about killer whales and other marine mammals. Sites are available in British Columbia, Washington, Oregon, and California.

Humpback Whale

Humpback Whale

Megaptera novaeangliae

Protected Status

ESA ENDANGERED
Central America DPS

ESA ENDANGERED
Western North Pacific DPS

ESA ENDANGERED - FOREIGN
Arabian Sea DPS

ESA ENDANGERED - FOREIGN
Cape Verde Islands/Northwest Africa DPS

ESA THREATENED
Mexico DPS

CITES APPENDIX I
Throughout Its Range

MMPA PROTECTED
Throughout Its Range

MMPA DEPLETED
Western North Pacific stock

MMPA DEPLETED
Central North Pacific stock

MMPA DEPLETED
California/Oregon/Washington stock

Quick Facts

WEIGHT	Up to approximately 40 tons
LIFESPAN	About 80 to 90 years
LENGTH	Up to approximately 60 feet
THREATS	Entanglement in fishing gear, Vessel strikes, Vessel-based harassment, Underwater noise
REGION	Alaska, New England/Mid-Atlantic, Pacific Islands, Southeast, West Coast, Foreign

About The Species

Before a final moratorium on commercial whaling in 1985, all populations of humpback whales were greatly reduced, most by more than 95 percent. The species is increasing in abundance throughout much of its range but faces threats from entanglement in fishing gear, vessel strikes, vessel-based harassment, and underwater noise..

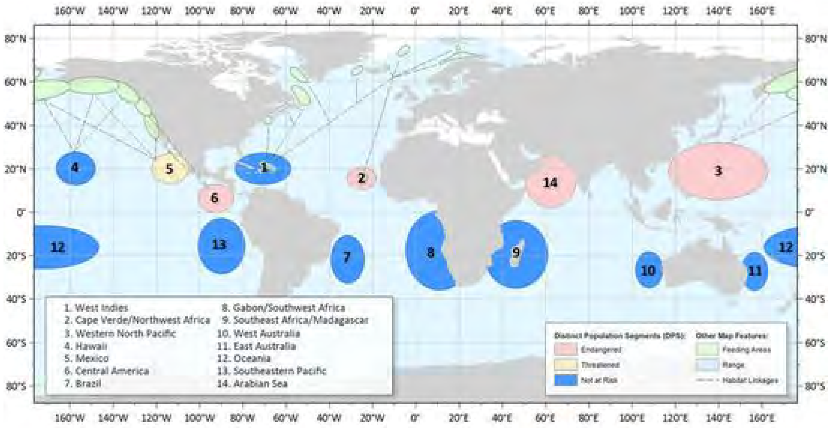
Humpback whales live in all oceans around the world. They travel great distances every year and have one of the longest migrations of any mammal on the planet. Some populations swim 5,000 miles from tropical breeding grounds to colder, more productive feeding grounds. Humpback whales feed on shrimp-like crustaceans (krill) and small fish, straining huge volumes of ocean water through their baleen plates, which act like a sieve.

The humpback whale gets its common name from the distinctive hump on its back. Its long pectoral fins inspired its scientific name, *Megaptera*, which means “big-winged” and *novaeangliae*, which means “New England,” in reference to the location where European whalers first encountered them. Humpback whales are a favorite of whale watchers—they are often active, jumping out of the water and slapping the surface with their pectoral fins or tails.

NOAA Fisheries is dedicated to the conservation of humpback whales. Our scientists use a variety of innovative techniques to study, protect, and disentangle humpback whales. We also work with our partners to ensure that regulations and management plans are in place to reduce entanglement in fishing gear, create safer shipping lanes, and protect habitats.

Status

Commercial whaling severely reduced humpback whale numbers from historical levels. The United States listed all humpback whales as endangered under the Endangered Species Conservation Act in 1970, and then under the Endangered Species Act in 1973. NOAA Fisheries worked worldwide to identify and apply protections for humpback whales. The International Whaling Commission’s final whaling moratorium on commercial harvest, in effect since 1985, played a major role in the recovery of humpback whales. Currently, 4 out of the 14 distinct population segments are still protected as endangered, and 1is listed as threatened (81 FR 62259, September 2016).



Map showing locations of the 14 distinct population segments of humpback whales worldwide.

Broad habitat areas and long migrations make it difficult to estimate population size. Of the 14 distinct populations, only 2 are estimated to number fewer than 2,000 individuals. Some populations (such as those off eastern and western Australia and eastern South America) are believed to number in excess of 20,000 animals—a remarkable recovery given that the same populations were almost eradicated by whaling in the early to mid 20th century. By contrast, the smallest known population is the one inhabiting the Arabian Sea year-round, with 80-100 individuals.

Three humpback whale stocks in U.S. waters are designated as depleted under the Marine Mammal Protection Act (see annual stock assessment report).

Protected Status

ESA Endangered

- Central America DPS

ESA Endangered

- Western North Pacific DPS

ESA Endangered - Foreign

- Arabian Sea DPS

ESA Endangered - Foreign

- Cape Verde Islands/Northwest Africa DPS

ESA Threatened

- Mexico DPS

CITES Appendix I

- Throughout Its Range

MMPA Protected

- Throughout Its Range

MMPA Depleted

- Western North Pacific stock

MMPA Depleted

- Central North Pacific stock

MMPA Depleted

- California/Oregon/Washington stock

Appearance

Humpback whales' bodies are primarily black, but individuals have different amounts of white on their pectoral fins, bellies, and the undersides of their flukes (tails). Southern Hemisphere humpback whales tend to have more white markings, particularly on their flanks and bellies than do Northern Hemisphere humpback whales.

Humpback whale flukes can be up to 18 feet wide—they are serrated along the trailing edge, and pointed at the tips. Tail fluke pigmentation patterns, in combination with varying shapes and sizes of whales' flukes and/or prominent scars, are unique to each animal. They are distinctive enough to be used as "fingerprints" to identify individuals.

When photographed, scientists can often identify individual whales - a process called photo-identification - and catalog occurrences of individual whales and use this information to track them over time.

Behavior and Diet

Humpback whales are a favorite of whale-watchers, as they can be found close to shore and often display activities near the surface, such as breaching (jumping out of the water) or slapping the surface with their pectoral fins and tails.

During the warmer months (and occasionally into cooler months), humpback whales spend most of their time feeding and building up fat stores (blubber) to sustain them throughout the winter. Humpback whales filter-feed on small crustaceans (mostly krill) and small fish, consuming up to 2,000 pounds of food per day. Humpback whales use several techniques to help them herd, corral, and disorient prey and that can include using bubbles, sounds, the seafloor, and even their pectoral fins. One specific feeding method, called "bubble net feeding," involves using curtains of air bubbles to condense prey. Once the fish are corralled, they are pushed toward the surface and engulfed as the whales lunge upward through the circular bubble net. Different groups of humpback whales use other bubble structures in similar ways, though there appears to be some regional specialization in bubble-feeding behaviors among populations.

Where They Live

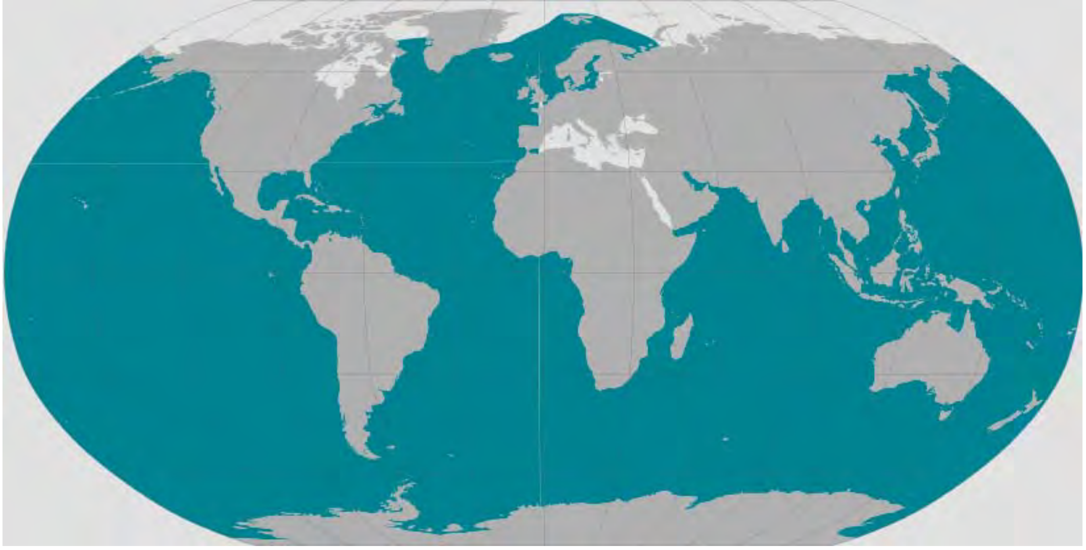
Humpback whales live throughout the world's major oceans. They can travel great distances during their seasonal migration with some animals migrating 5,000 miles between high-latitude r feeding grounds and winter mating and calving areas in tropical waters. In the North Pacific, some humpback whales migrate from Alaska to Hawaiʻi—they can complete the 3,000 mile trip in as few as 28 days. While calving, they prefer shallow, warm waters commonly near offshore reef systems or shores. Humpback whale feeding grounds are generally in cold, productive waters.

At least four humpback whale populations occur in the North Pacific:

- The Mexico population, which breeds along the Pacific coast of Mexico and the Revillagigedo Islands, transits the Baja California Peninsula, and feeds across a broad range from California to the Aleutian Islands,Alaska.
- The Central America population, which breeds along the Pacific coast of Central America, including off Costa Rica, Panama, Guatemala, El Salvador, Honduras, and Nicaragua, and feeds off the West Coast of the United States and southern British Columbia.
- The Hawaiʻi population, which breeds in the main Hawaiian Islands and feeds in most of the known feeding grounds in the North Pacific, including the Aleutian Islands/ Bering Sea, Gulf of Alaska, Southeast Alaska, and northern British Columbia.
- The Western North Pacific population, which breeds in the areas of Okinawa, Japan, and the Philippines, and feeds in the northern Pacific, primarily in the West Bering Sea and off the Russian coast and the Aleutian Islands. There is also evidence for the existence of a lesser-known breeding area in the western North Pacific.

In the North Atlantic, two populations of humpback whales feed during spring, summer, and fall throughout a range that extends across the Atlantic Ocean from the Gulf of Maine to Norway. These two populations migrate south during the winter to calve and mate in the West Indies and Cape Verde (off the coast of Africa), and possibly in other areas.

Seven populations of humpback whales are found in the Southern Hemisphere, all of which feed in Antarctic or sub-Antarctic waters.



Lifespan & Reproduction

Humpback whales are estimated to live approximately 80 to 90 years.

They migrate to lower latitudes for breeding. During this time, males exhibit competitive behavior around females and can be aggressive toward each other, sometimes causing bloody injuries. While breeding hasn't been directly observed, it is believed that males are competing for access to females. Males also sing complex songs for hours that can be heard 20 miles away—the low-frequency portions of the song are audible much farther in deep water.

Humpback whales reach sexual maturity between the ages of 4 and 10 years. Females produce a single calf every 2 to 3 years on average, although annual calving has been documented in some individuals. Calves are born after an 11-month gestation, and measure about13 to 16 feet in length. Calves stay near their mothers for up to 1 year before weaning. Mothers are protective of their calves, swimming closely and often touching them with their flippers. While calves are not believed to maintain long-term associations with their mothers, they are more likely to be found in the same feeding and breeding areas as their mothers.

Threats

Vessel Strikes

Inadvertent vessel strikes can injure or kill humpback whales. Humpback whales are vulnerable to vessel strikes throughout their range, but the risk is much higher in coastal areas with heavier ship traffic.

Entanglement

Humpback whales can become entangled by many different gear types, including moorings, traps, pots, or gillnets. Once entangled, if they are able to move the gear, the whale may drag and swim with attached gear for long distances, ultimately resulting in fatigue, compromised feeding ability, or severe injury, which may lead to reduced reproductive success or even death. There is evidence to suggest that most humpback whales experience entanglement over the course of their lives but are often able to shed the gear on their own. However, the portion of whales that become entangled and do not survive is unknown.

Vessel-Based Harassment

Whale watching vessels, recreational boats, and other vessels may cause stress and behavioral changes in humpback whales. Because humpback whales are often found close to shore and generally surface in an active state, they tend to be popular whale watching attractions. There are several areas within the United States where humpback whales are the central attraction for the whale watching industry, including the Gulf of Maine (particularly within the Stellwagen Bank National Marine Sanctuary), California, Alaska (particularly southeast Alaska), and the Hawaiian Islands.

Scientific Classification

Kingdom	Animalia

Phylum	Chordata
Class	Mammalia
Order	Cetacea
Family	Balaenopteridae
Genus	*Megaptera*
Species	*novaeangliae*

What We Do

Conservation & Management

We are committed to protecting and recovering humpback whales through implementation of various conservation, regulatory, and enforcement measures. Our work includes:

- Reducing the risk of entanglement in fishing gear.
- Developing methods to reduce vessel strikes.
- Responding to dead, injured, or entangled humpback whales.
- Educating the whale watching/tourism industry and vessel operators on responsible viewing of humpback whales.
- Partnering to implement the Whale SENSE program, a whale watching stewardship, education, and recognition program to increase wildlife viewing standards.

Learn more about our conservation efforts

Science

We conduct various research activities on the biology, behavior, and ecology of humpback whales. The results of this research are used to inform management decisions and enhance recovery efforts for this ecologically, economically, and socially important species that is endangered in certain areas. Our work includes:

- Monitoring humpback whale abundance and mortality in U.S. waters.
- Studying humpback whale population structure.
- Collaborating with international scientists to track the movements and behavior of humpback whales as they migrate across international boundaries.

Learn more about our research

How You Can Help

Keep Your Distance

Be responsible when viewing marine life in the wild. Observe all larger whales from a safe distance of at least 100 yards by sea or land.

In Hawaiʻi and Alaska, it is illegal to approach a humpback whale within 100 yards, by land or sea. It is also illegal to approach humpback whales in Hawaiʻi within 1,000 feet (333 yards) by air.

Learn more about our marine life viewing guidelines >

Report Marine Life in Distress

Report a sick, injured, entangled, stranded, or dead animal to make sure professional responders and scientists know about it and can take appropriate action. Numerous organizations around the country are trained and ready to respond. Never approach or try to save an injured or entangled animal yourself—it can be dangerous to both the animal and you.

Learn who you should contact when you encounter a stranded or injured marine animal >

Leatherback Turtle

Leatherback Turtle

Dermochelys coriacea

Protected Status

ESA ENDANGERED

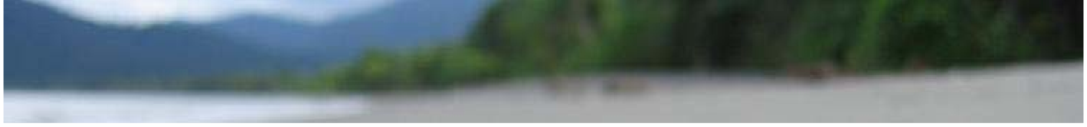
Throughout Its Range

CITES APPENDIX I

Throughout Its Range

Quick Facts

WEIGHT	Adult: 750 to 1,000 pounds
LIFESPAN	Unknown, but estimated to be 50 years or more
LENGTH	Adult: 5 to 6 feet
THREATS	Bycatch in fishing gear, direct harvest of turtles and eggs, loss and degradation of nesting and foraging habitat, vessel strikes, ocean pollution/marine debris, climate change
REGION	Alaska, New England/Mid-Atlantic, Pacific Islands, Southeast, West Coast, Foreign



Leatherback turtle hatchling on beach - Credit: NOAA Fisheries

About The Species

The leatherback sea turtle is the largest turtle in the world. They are the only species of sea turtle that lack scales and a hard shell. They are named for their tough rubbery skin and have existed in their current form since the age of the dinosaurs. Leatherbacks are highly migratory, some swimming over 10,000 miles a year between nesting and foraging grounds. They are also accomplished divers with the deepest recorded dive reaching nearly 4,000 feet—deeper than most marine mammals.

The leatherback turtle has the widest global distribution of any reptile, with nesting mainly on tropical or subtropical beaches. Once prevalent in every ocean except the Arctic and Antarctic, the leatherback population is rapidly declining in many parts of the world. They face threats on both nesting beaches and in the marine environment. The greatest of these threats worldwide are incidental capture in fishing gear (or bycatch), hunting of turtles, and collection of eggs for human consumption. The Pacific leatherback turtle populations are most at-risk of extinction. Pacific leatherbacks are one of nine ESA-listed species identified in NOAA’s Species in the Spotlight initiative. Through this initiative, NOAA Fisheries has made it a priority to focus recovery efforts on stabilizing and recovering Pacific leatherback populations in order to prevent their extinction.

NOAA Fisheries and our partners are dedicated to conserving and recovering leatherback turtle populations worldwide. We use a variety of innovative techniques to study, protect, and recover this endangered species. We engage our partners as we develop regulations and recovery plans that foster the conservation and recovery of leatherbacks and their habitats, and we fund research, monitoring, and conservation projects to implement priorities outlined in recovery plans.

Status

The leatherback sea turtle is listed as endangered under the Endangered Species Act. It is estimated that the global population has declined 40 percent over the past three generations. Leatherback nesting in Malaysia has essentially disappeared, declining from about 10,000 nests in 1953 to only one or two nests per year since 2003.

The Pacific leatherback turtle populations are most at-risk for extinction as evidenced by ongoing precipitous declines in nesting through their range. Primary nesting habitats of the Eastern Pacific leatherback turtle population are in Mexico and Costa Rica, with some isolated nesting in Panama and Nicaragua. Over the last three generations, nesting in this region has declined by over 90 percent. In the Western Pacific, the largest remaining nesting population, which accounts for 75 percent of the Western Pacific population, occurs in Papua Barat, Indonesia and has also declined by over 80 percent.

In the Northwest Atlantic,leatherback nesting was increasing; however, there have been significant decreases in recent years at numerous locations, including on the Atlantic coast of Florida, which is one of the main nesting areas in the continental United States. Large but potentially declining nesting populations also occur in the eastern Atlantic, along the west African coastline, but uncertainty in the data limits our understanding of the trends at many of those nesting beaches.

The 2020 Status Review of the leatherback sea turtle under the ESA provides additional information on abundance and population trends.

Protected Status

ESA Endangered

- Throughout Its Range

CITES Appendix I

- Throughout Its Range

Appearance

The leatherback is the largest turtle in the world, and has a primarily black, rubbery skin with pinkish-white coloring on its underside. They are the only species of sea turtle that lack scales. Their shell (carapace) consists of small, interlocking dermal bones beneath the skin that overlie a supportive layer of connective tissue and fat and the deeper skeleton. Their carapace has seven ridges along its length and tapers to a blunt point. Their front flippers are proportionally longer than in other sea turtles and their back flippers are paddle-shaped. Both their rigid carapace and their large flippers make the leatherback uniquely equipped for long distance foraging migrations.

Behavior and Diet

Leatherback sea turtles undertake the longest migrations between breeding and feeding areas of any sea turtle, some averaging 3,700 miles each way. They spend most of their lives in the ocean, but females leave the water to lay eggs. Leatherbacks are strong swimmers and can dive to depths of approximately 4,000 feet—deeper than any other turtle—and can stay down for up to 85 minutes.

Leatherbacks lack the crushing chewing plates characteristic of other sea turtles that feed on hard-bodied prey. Instead, they have pointed tooth-like cusps and sharp-edged jaws that are perfectly adapted for a diet of soft-bodied open ocean prey, such as jellyfish and salps. A leatherback's mouth and throat also have backward-pointing spines that help retain gelatinous prey.

Where They Live

Leatherbacks occur in the Atlantic, Pacific, and Indian Oceans. Nesting beaches are primarily located in tropical latitudes around the world. Globally, the largest remaining nesting aggregations are found in Trinidad and Tobago, West-Indies (Northwest Atlantic) and Gabon, Africa (Southeast Atlantic).

Leatherbacks occupy U.S. waters in the Northwest Atlantic, West Pacific and East Pacific. Within the United States, the majority of nesting occurs in Florida, Puerto Rico and the U.S. Virgin Islands. Leatherbacks have been satellite tagged at sea on foraging grounds off Nova Scotia, Canada and tracked to nesting beaches in the Caribbean. Western Pacific leatherbacks feed off the Pacific coast of North America, and migrate across the Pacific to nest in Indonesia, Papua New Guinea, and the Solomon Islands. Eastern Pacific leatherbacks, on the other hand, nest along the Pacific coast of Mexico and Costa Rica, and forage in the south-central and eastern tropical Pacific Ocean.

Lifespan & Reproduction

Leatherback turtles grow faster than hard-shelled turtles. However, there is uncertainty in the age that they reach sexual maturity. Average estimates range from 9 to 20 years of age. Likewise, little is known about their life expectancy, but they are likely long-lived, with longevity estimates of 45-50 years or more.

Female leatherbacks nest at night on tropical and subtropical beaches. They dig a large body pit to lay their eggs in deep egg chambers/nests. A nesting leatherback will disturb a huge area on the beach and leave behind long, circling tracks. In the United States and Caribbean, the nesting season lasts from March to July. Satellite tagging studies of leatherbacks from the Western Pacific indicate that turtles that nest during different times of the year have different migration patterns. Summer nesting turtles (July through September) have tropical and temperate northern hemisphere foraging regions, while winter (November through February) nesters traverse to tropical waters and temperate regions of the southern hemisphere. Female leatherbacks return to nest every 2 to 4 years. Leatherbacks nest several times during a nesting season, typically at 8- to 12-day intervals and lay clutches of approximately 100 eggs. The eggs incubate approximately two months before leatherback hatchlings emerge from the nest.

Threats

Bycatch in Fishing Gear

The primary threat to sea turtles is their unintended capture in fishing gear which can result in drowning or cause injuries that lead to death or debilitation (for example, swallowing hooks, or flipper entanglement). The term for this unintended capture is bycatch. Sea turtle bycatch is a worldwide problem. The primary types of gear that result in leatherback turtle bycatch include gillnets, trawls, longlines, and vertical lines attached to pot/traps.

Direct Harvest of Turtles and Eggs

Historically, sea turtles including leatherbacks were killed for their meat, and their eggs were collected for consumption. Presently, leatherback turtles are protected in many countries, but in some places the killing of leatherbacks and collection of eggs continue.

Loss and Degradation of Nesting Habitat

Coastal development and rising seas from climate change are leading to the loss of nesting beach habitat for leatherback turtles. Human-related changes associated with coastal development include beachfront lighting, shoreline armoring, and beach driving. Shoreline hardening or armoring (e.g., sea walls) can result in the complete loss of dry sand suitable for successful nesting. Artificial lighting on and near nesting beaches can deter nesting females from coming ashore to nest and can disorient hatchlings trying to find the sea after emerging from their nests.

Vessel Strikes

Various types of watercraft can strike leatherback turtles when they are at or near the surface, resulting in injury or death. Vessel strikes are a major threat near ports and waterways and adjacent to highly developed coastlines and are a significant cause of leatherback strandings in the eastern U.S.

Ocean Pollution/Marine Debris

Increasing pollution of nearshore and offshore marine habitats threatens all sea turtles and degrades their habitats. The Deepwater Horizon oil spill was the largest offshore oil spill in U.S. history and affected nesting (including nesting females, eggs, and hatchlings), small juvenile, large juvenile, and adult sea turtles throughout the Gulf of Mexico. Ingestion of marine debris is another threat to all species of sea turtlesLeatherback turtles may ingest marine debris such as fishing line, balloons, plastic bags, floating tar or oil, and other materials discarded by humans which they can mistake for food. They may also become entangled in marine debris, including lost or discarded fishing gear, and can be killed or seriously injured.

Climate Change

For all sea turtles, a warming climate is likely to result in changes in beach morphology and higher sand temperatures, which can be lethal to eggs or alter the ratio of male and female hatchlings produced. Rising seas and storm events cause beach erosion, which may flood nests or wash them away. Changes in the temperature of the marine environment are likely to alter the abundance and distribution of food resources, leading to a shift in the migratory and foraging range and nesting season of leatherbacks.

Scientific Classification

Kingdom	Animalia
Phylum	Chordata
Class	Reptilia
Order	Testudines

Family	Dermochelyidae
Genus	*Dermochelys*
Species	*coriacea*

What We Do

Conservation & Management

Since 1977, NOAA Fisheries and the U.S. Fish and Wildlife Service (U.S. FWS) have shared jurisdiction of sea turtles under the ESA. A Memorandum of Understanding outlines our specific roles, NOAA Fisheries leads the conservation and recovery efforts for sea turtles in the marine environment, and the U.S. FWS leads the conservation and recovery efforts for sea turtles on nesting beaches.

We are committed to the protection and conservation of leatherback turtles by:

- Working with partners to ensure compliance with national, state, and U.S. territory laws to protect sea turtles.
- Cooperating with international partners to implement conservation measures and establish agreements, such as international treaties that protect sea turtles.
- Researching, developing, and implementing changes to fishing gear practices and/or fishing gear modifications (e.g., turtle excluder devices (TEDs) for trawls, large circle hooks in longline fisheries to decrease the frequency of capture or severe injuries) and spatial or temporal closures to reduce bycatch.
- Designating critical habitat areas essential for the conservation of leatherback turtles.
- Protecting and monitoring leatherback turtles in the marine environment and on nesting beaches.
- Conducting research on threats and developing conservation measures that reduce threats and promote recovery.
- Collecting information on the species biology and ecology to better inform conservation management strategies and to assess progress toward recovery.
- Conducting and supporting education and outreach efforts to the general public by raising awareness on threats to sea turtles, highlighting the importance of sea turtle conservation, and sharing ways people can help sea turtles.

Science

We conduct various research activities on the biology, behavior, and ecology of leatherback sea turtles. The results of this research are used to evaluate population trends, inform conservation management strategies, and to assess progress toward recovery for this imperiled species. Our work includes:

- Monitoring populations through vessel-based or aerial surveys, nesting beach studies, satellite tracking, genetics, and mark-recapture (flipper tagging) studies.
- Studying foraging and reproductive behavior to understand demographics, physiology, habitat use, and resource requirements.
- Tracking individuals over time to understand important aspects of their life history such as growth and age to maturity.
- Evaluating life history and population health information from stranding and fisheries bycatch datasets.
- Understanding impacts of change in environmental and ocean conditions on sea turtle abundance, distribution, and demographics.
- Estimating population abundance and analyzing trends.
- Monitoring fisheries impacts and designing fishing gear to minimize bycatch during commercial and recreational fishing operations.
- Capacity building and training to share the latest scientific techniques and tools to monitor sea turtle populations globally.

Learn more about our research ›

Appendix D

Essential Fish Habitat Assessment

APPENDIX D:
PORT OF PORT ANGELES COFFERDAM REPAIR PROJECT ESSENTIAL FISH HABITAT ASSESSMENT

Prepared by:

Confluence Environmental Company
April 2021

TABLE OF CONTENTS

ACTION AGENCY

U.S. Army Corps of Engineers, Seattle District

LOCATION

Port Angeles, Washington

PROJECT NAME

Port of Port Angeles Cofferdam Repair Project

1.0 ESSENTIAL FISH HABITAT BACKGROUND

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires federal agencies to consult with the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS) on activities that may adversely affect Essential Fish Habitat (EFH). EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (NMFS 1999). For interpreting this definition, the following terms apply:

- Waters—includes aquatic areas and their associated physical, chemical, and biological properties used by fish. Where appropriate, waters may include aquatic areas historically used by fish.
- Substrate—includes sediment, hard bottom, structures underlying the waters, and associated biological communities
- Necessary—means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem
- Spawning, breeding, feeding, or growth to maturity—includes a species' full lifecycle (50 CFR 600.110)
- Adverse effect—means any impact that reduces the quality and/or quantity of EFH, and may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey or reduction in species fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810).

This assessment evaluates the impacts of the proposed action to determine whether it "may adversely affect" designated EFH for federally managed fisheries species in the proposed action area. The Port of Port Angeles Cofferdam Maintenance biological evaluation (BE) details conservation measures associated with the project intended to avoid, minimize, or otherwise offset potential adverse effects of the proposed action on critical habitat for species listed under the Endangered Species Act (ESA), which also includes habitat designated as EFH.

2.0 IDENTIFICATION OF EFH

Under the MSA, the Pacific Fisheries Management Council (PFMC) has designated EFH for federally managed fisheries within the waters of Washington, Oregon, and California. Detailed description and identification of EFH are contained in the fishery management plans for groundfish (PFMC 1998a), coastal pelagic species (PFMC 1998b), and Pacific salmon (PFMC 1999).

Designated EFH for groundfish and coastal pelagic species encompasses all waters along the coasts of Washington, Oregon, and California that are seaward from the mean high water line, including the upriver extent of saltwater intrusion in river mouths to the boundary of the U. S. economic zone, approximately 230 miles (370.4 km) offshore (PFMC 1998a,b).

Designated EFH for salmonid species within marine water extends from the nearshore and tidal submerged environments within state territorial waters out to the full extent of the exclusive economic zone offshore of Washington, Oregon, and California, north of Point Conception to the Canadian border (PFMC 1999).

Groundfish, coastal pelagic, and salmonid fish species that could have designated EFH in the action area are listed in Table D-1. Assessment of the impacts on species that may occur in the action area is based on life-history stages described in Casillas et al. (1998) and PFMC (1998b, 1999, 2014, 2020).

Table D-1 Species of Fish with Designated Essential Fish Habitat in the action area

Common Name	Scientific Name	Common Name	Scientific Name
Groundfish		Groundfish (cont.)	
arrowtooth flounder	*Atheresthes stomias*	Pacific sanddab	*Citharichthys sordidus*
big skate	*Raja binoculata*	petrale sole	*Eopsetta jordani*
black rockfish	*Sebastes melanops*	quillback rockfish	*Sebastes maliger*
bocaccio	*Sebastes paucispinis*	ratfish	*Hydrolagus colliei*
brown rockfish	*Sebastes auriculatus*	redbanded rockfish	*Sebastes babcocki*
butter sole	*Isopsetta isolepis*	redstripe rockfish	*Sebastes proriger*
cabezon	*Scorpaenichthys marmoratus*	rex sole	*Glyptocephalus zachirus*
California skate	*Raja inornata*	rock sole	*Lepidopsetta bilineata*
canary rockfish	*Sebastes pinniger*	rosethorn rockfish	*Sebastes helvomaculatus*
China rockfish	*Sebastes nebulosus*	rosy rockfish	*Sebastes rosaceus*
copper rockfish	*Sebastes caurinus*	rougheye rockfish	*Sebastes aleutianus*
curlfin sole	*Pleuronichthys decurrens*	sablefish	*Anoplopoma fimbria*
darkblotch rockfish	*Sebastes crameri*	sand sole	*Psettichthys melanostictus*
Dover sole	*Microstomus pacificus*	sharpchin rockfish	*Sebastes zacentrus*
English sole	*Parophrys vetulus*	shortspine thornyhead	*Sebastolobus alascanus*
flathead sole	*Hippoglossoides elassodon*	spiny dogfish	*Squalus acanthias*

greenstriped rockfish	*Sebastes elongatus*	splitnose rockfish	*Sebastes diploproa*
hake	*Merluccius productus*	starry flounder	*Platichthys stellatus*
kelp greenling	*Hexagrammos decagrammus*	stripetail rockfish	*Sebastes saxicola*
lingcod	*Ophiodon elongatus*	tiger rockfish	*Sebastes nigrocinctus*
longnose skate	*Raja rhina*	vermilion rockfish	*Sebastes miniatus*
Pacific cod	*Gadus macrocephalus*	yelloweye rockfish	*Sebastes ruberrimus*
Pacific ocean perch	*Sebastes alutus*	yellowtail rockfish	*Sebastes flavidus*
Coastal Pelagic		Salmonid Species	
market squid	*Doryteuthis opalescens*	Chinook salmon	*Oncorhynchus tshawytscha*
northern anchovy	*Engraulis mordax*	coho salmon	*Oncorhynchus kisutch*
jack mackerel	*Trachurus symmetricus*	pink salmon	*Oncorhynchus gorbuscha*
Pacific mackerel	*Scomber japonicus*		
Pacific sardine	*Sardinops sagax*		

3.0 SPECIES IN THE ACTION AREA

The following discussion includes the species (by major group) with designated EFH that are likely to occur in the proposed action area.

3.1 Groundfish

Groundfish species most likely to occur in the action area include rockfish and flatfish. Rockfish are considered to have a "vulnerable" status in Puget Sound (Bargmann et al. 2011). Although the two ESA-listed species discussed in the BE are part of the deepwater assemblage, there are species of rockfish in the nearshore assemblage that live in close association with rocky habitats at depths less than 120 feet. These species include copper, brown, and quillback rockfish (Bargmann et al. 2011).

Flatfish may be present within the action area. There is potential habitat for flatfish species that spawn and rear in shallow sand and mud habitat (e.g., English sole, starry flounder, and Pacific sanddab). According to Palsson (2001), starry flounder, English sole and dover sole were increasing in North Puget Sound. In a Seafood Watch report for Pacific flatfishes (Roberts and Stevens 2009), populations of English sole, Pacific sanddab, and sand sole had a conservation rating of "inherently resilient" compared to starry flounder and rock sole that were identified as "inherently neutral."

3.2 Coastal Pelagic Species

Because of the similarities in life history and habitat requirements, analysis of EFH for coastal pelagic species will treat all four finfish species (northern anchovy, jack mackerel, Pacific mackerel, and Pacific sardine) and one invertebrate species (market squid) as a single complex. These fish and market squid are limited to waters above the thermocline where sea surface temperatures range between 10 and 26 degrees centigrade, which varies seasonally and annually (PFMC 2014). Northern anchovy is a pelagic schooling fish that utilizes open water for broadcast spawning during late spring and summer months (Penttila 2007). Penttila (2007) noted that northern anchovy uses nearshore habitats during other parts of their life histories. For example, young-of-the-year anchovies occur in the nearshore zone in the summer, presumably to feed on plankton. The abundance of anchovies in Washington is unknown; however, there are some indications that the population may have declined since the 1980s (Bargmann 1998). Although market squid are found in the Port Angeles Harbor, they reside in waters deeper than the intertidal habitat within the Project action area. Coastal pelagics are schooling fish not associated with the ocean bottom that migrate in coastal waters. These species are primarily associated with the open ocean and coastal waters (PFMC 1998b), and are not likely to occur within the project area.

3.3 Salmonid Species

WDFW (2016) identified five distinct stocks of salmonids that have designated EFH in the Strait of Juan de Fuca: Chinook, coho, and pink salmon. As discussed in the BE, nearby streams that have documented presence of Chinook salmon include Ennis Creek, Morse Creek, the Dungeness River, and the Elwha River. Pink and coho salmon also have documented spawning habitat in the same watershed. Sockeye and chum salmon have been documented spawning in the same watershed; however, EFH has not yet been designated for these species by the PFMC.

4.0 DESCRIPTION OF THE PROPOSED ACTION

The Port proposes maintenance and repair to an existing structure that is composed of a steel sheetpile wall approximately 335 linear feet long (Figure 2) bordering the shoreline. This wall is tied back to a second, parallel sheetpile wall located approximately 30 feet landward. Tie rods connect the sheetpile walls together and are attached to a double channel waler beam above the High Tide Line (HTL[1]). Existing backfill material between the sheetpile walls consists of loose dirt fill and wood debris – material that does not provide a suitable foundation for long-term industrial use of the facility. Proposed repair and maintenance actions include 3 primary components: (1) construction of a mechanically stabilized earth wall and improved backfill, (2) maintenance of the waterward sheetpile wall to address corrosion, and (3) repair of the waler beam/tie rods that provide structural support. These components are further described in the following sections. Mitigation was completed in 2004 to offset anticipated impacts of the construction and operation of the previously planned Graving Dock gate. The shoreline restoration project was implemented by WSDOT, in partnership with the Port of Port Angeles, and included the following activities at Ediz Hook:

- Restoration of 1,000 linear feet of shoreline to a nature condition
- Removing fill and anthropogenic debris from the beach

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[1] For the purposes of this project, the HTL is defined as the elevation of the transition line along the waterward sheetpile wall between rust and marine growth. The HTL was determined by measuring the distance from the top of the waterward sheetpile wall to the top of marine growth (48 inches) and subtracting that value from the elevation of the sheetpile wall (11.16 feet), which puts the HTL at 7.16 feet. Mean Higher High Water (MHHW) at Port Angeles is at 7.06 feet (NOAA station #9444090), 0.1 feet below the measured HTL.

- Removing 54 creosote piling
- Excavating the vertical face of the shoreline to establish a natural beach profile
- Restoring the beach surface
- Placing large woody debris and seeding the uplands
- Maintaining a traffic barrier to restrict human interference

The Project action area is shown below in Figure D-1. A more detailed description of the proposed project is provided in the BE.

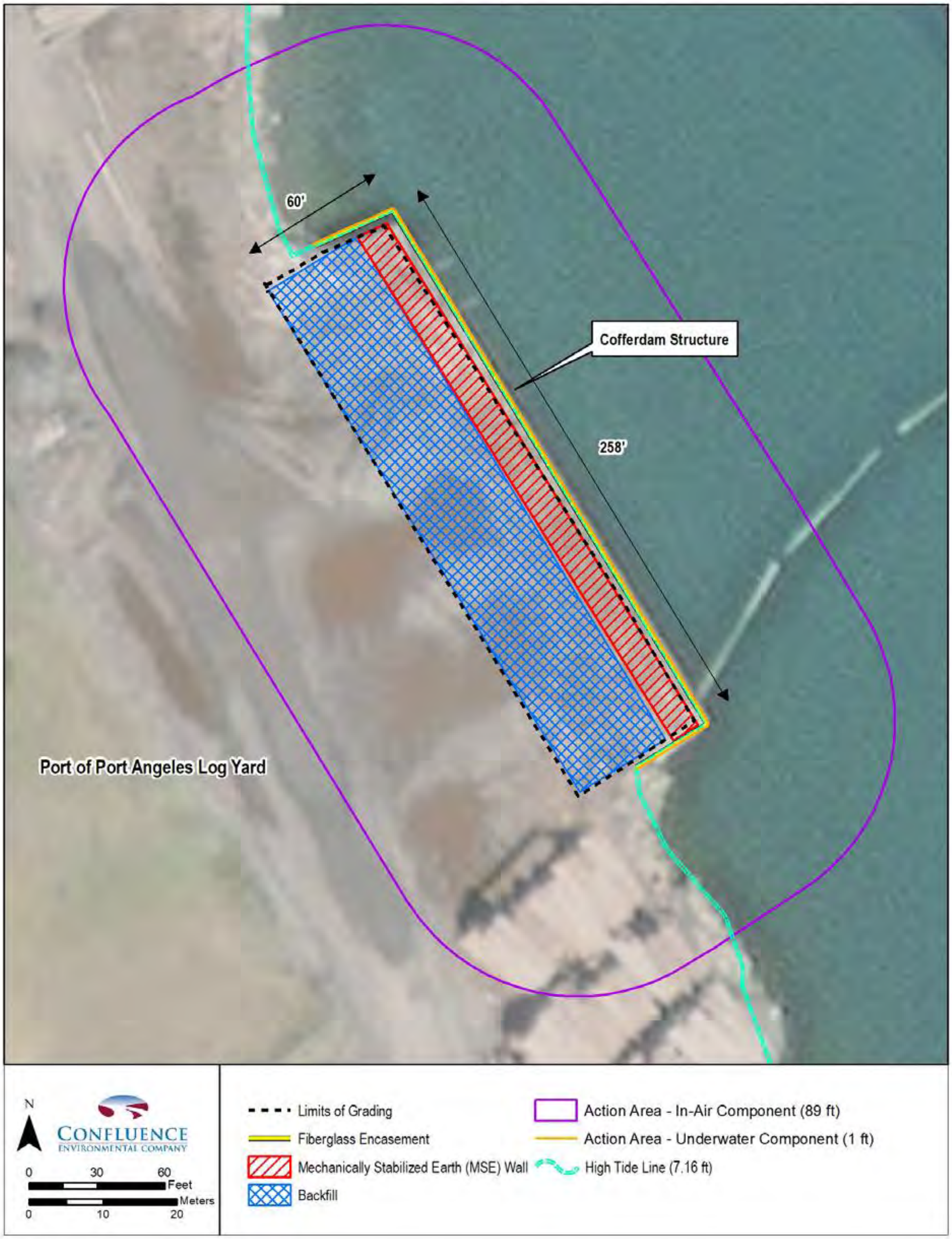

Figure D-1. Action Area

5.0 EFH CONSERVATION MEASURES

Section 1.6 of the BE details the conservation measures implemented by the project. In summary, these include the following:

- Placement of the fiberglass sheetpile encasements will be completed during the approved in-water work window for Tidal Reference Area 10 (July 16 – February 15). Any shifting of riprap necessitated by the installation of the encasement will occur in the dry.
- A temporary floating debris boom will be deployed waterward of the loading structure to capture potential debris during project construction; the debris boom will be anchored to the shore above the HTL.
- All equipment to be used for construction activities will be cleaned and inspected prior to arriving at the project site to ensure no potentially hazardous materials are introduced, no leaks are present, and the equipment is functioning properly. Should a leak be detected on heavy equipment used for the project, the equipment will be immediately removed from areas immediately adjacent to the HTL.
- A project-specific Temporary Erosion and Sediment Control plan will be developed and implemented. Examples of applicable BMPs include, but are not limited to, the following: maintain the existing plugged catch basin, comply with measures from a project-specific stormwater pollution prevention plan, and establish a filter fabric construction fence around the site with a 4-inch by 4-inch trench and stabilized construction entrances.
- The contractor will develop and implement a Stormwater Pollution and Prevention Plan.
- Stockpiles will be mounded in a way to prevent runoff and covered in reinforced plastic sheeting.

Implementation of these conservation measures would avoid and minimize potential adverse effects of the proposed action.

6.0 POTENTIAL EFFECTS OF THE PROPOSED ACTION

Section 5.0 of the BE describes, in detail, the potential impacts to the water and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. Impacts to the following parameters are assessed: (1) suspended sediment, (2) dissolved oxygen, (3) exposure to contaminants, and (4) benthic disturbance and habitat loss.

6.1 Groundfish Species

During construction, dredging may affect EFH of groundfish species. Effects could be caused by:

- Habitat loss – The fiberglass encasement will be installed on the exterior edge of the waterward sheetpile. A 1.0-inch void will separate the fiberglass from the existing wall. Given the length of the encasement is 260 feet along the shoreline, with 30 feet on each edge (Figure D-1), and assuming the encasement itself is 1.25-inches thick, the total area of benthic habitat lost will be approximately 60 square feet.

- Increased turbidity – The installation of the fiberglass encasement around the waterward sheetpile wall is the only project element with the potential to generate turbidity. Installation will involve setting the encasement onto the mud and gently pressing the encasement 6 inches into the mudline. This action may conceivably generate turbidity, but the spatial extent of increased turbidity within the intertidal of the windswept shoreline is expected to be very limited and is not estimated to exceed 1-foot distance. Placement of the fiberglass encasement is likely to be completed within 1 day. Suspended sediment in sufficient concentrations can adversely affect designated EFH by reducing the foraging capabilities of fish due to reduced visibility, and reduced oxygen intake due to clogging of gills. Fish in the action area may exhibit an avoidance response, but given the low likelihood of exposure and the maximum 1 foot width of impact within the 322 square feet of are potentially impacted by turbidity, the overall impact is expected to be discountable.

- Reduced prey resources – The installation of the fiberglass encasement will remove and disturb the epibenthic and benthic fauna within the aquatic portion of the action area and may affect foraging opportunities for groundfish species. Even though there will be removal of prey, vertebrate prey (e.g., forage fish) will re-colonize the area immediately upon cessation of dredging, while invertebrate prey (e.g., worms, clams) will take longer to recolonize since they will need to recolonize via settlement of early life stages. Recolonization of the vertical hardbottom and disturbed sediments adjacent to the encasement by infauna and epifauna has been shown to be complete within 6 months after dredging, which is a much higher magnitude of disturbance than the Project (Desprez 2000).

While the installation of the fiberglass encasement may adversely affect EFH for groundfish species because the removal of sediment would constitute a detectable effect to EFH, the project footprint is very small compared to the surrounding in-water available habitat and the duration of the impact will be limited to a single day. In addition, implementation of the conservation measures described in Section 5.0, above, are designed to mitigate the adverse effects caused by the Project.

6.2 Coastal Pelagic Species

During construction, dredging may affect EFH of coastal pelagic species. Effects could be caused by:

- Increased turbidity – The installation of the fiberglass encasement around the waterward sheetpile wall is the only project element with the potential to generate turbidity. As stated above, this is expected to only occur in the immediate vicinity of the encasement installation. Turbidity would not persist beyond the construction period.

While the installation of the fiberglass encasement may adversely affect EFH for coastal pelagic species because the removal of sediment would constitute a detectable effect to EFH, the project footprint is very small compared to the surrounding in-water available habitat and the duration of the impact will be limited to a single day. In addition, implementation of the conservation measures described in Section 5.0, above, are designed to mitigate the adverse effects caused by the Project.

6.3 Salmonid Species

Chinook, coho, and pink salmon EFH are managed by the Pacific Fishery Management Council and may be present in the action area. Of these three species, the BA details the potential effects of the project to Chinook salmon. The effects analysis for Chinook salmon described in the BE provides a surrogate for analyzing potential impacts to other salmonids with designated EHF. That is, the effects to Chinook salmon habitat from the proposed project would have similar impacts to coho and pink salmon EFH. During construction, dredging may affect EFH of salmonid species. Effects could be caused by:

- Increased turbidity – The installation of the fiberglass encasement around the waterward sheetpile wall is the only project element with the potential to generate turbidity. As stated above, this is expected to only occur in the immediate vicinity of the encasement installation. Turbidity would not persist beyond the construction period.

While the installation of the fiberglass encasement may adversely affect EFH for coastal pelagic species because the removal of sediment would constitute a detectable effect to EFH, the project footprint is very small compared to the surrounding in-water available habitat and the duration of the impact will be limited to a single day. In addition, implementation of the conservation measures described in Section 5.0, above, are designed to mitigate the adverse effects caused by the Project.

7.0 Conclusion

With the implementation of the proposed conservation measures, the proposed activity is not expected to cause adverse impacts to EFH and will not reduce the overall value of the EFH of managed groundfish, coastal pelagic, or salmonid species.

8.0 REFERENCES

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CONFLUENCE
ENVIRONMENTAL COMPANY

APPENDIX B

Cofferdam Facility Improvement Plans

Notes:
- Parcel data obtained from Clallum County.
- Aerial imagery obtained from Esri, accessed 2020.
- Inset basemap tiles by Stamen Design, under CC BY 3.0. Data by OpenStreetMap, under ODbL.

IN: STRAIGHT OF JUAN DE FUCA

AT: PORT OF PORT ANGELES COFFERDAM

CITY: PORT ANGELES **COUNTY:** CLALLAM

STATE: WASHINGTON **PARCEL:** 063099190035

APPLICATION BY: PORT OF PORT ANGELES

REFERENCE NO: NWS-2020-779

PURPOSE: PROVIDE MAINTENANCE AND REPAIRS TO EXISTING COFFFERDAM STRUCTURE AT THE PORT OF PORT ANGELES LOG YARD FACILITY

SECTION: S4 **LATITUDE:** 48° 7' 42.49" N

TOWNSHIP: 30N **LONGITUDE:** 123° 28' 26.4" W

RANGE: 6W **DATUM:** MLLW = 0.00'

PORT OF PORT ANGELES COFFERDAM

LOADING STRUCTURE MAINTENANCE AND REPAIR PROJECT

VICINITY MAP

DATE: 10/06/2020

SHEET: 1 of 14

I:\GIS\Projects\KPFF-POPA Cofferdam\MXD\Cofferdam Loading Structure Improvement Project\Sheet 1 of 11 - Vicinity Map.mxd
4/7/2020

BMPs FOR IMPLEMENTATION DURING CONSTRUCTION

CONTRACTOR SHALL PROTECT-IN-PLACE ALL STRUCTURES, UTILITIES AND OBJECTS NOT IDENTIFIED AS BEING DEMOLISHED ON THE PLANS. ANY DAMAGE TO ITEMS NOT BEING DEMOLISHED SHALL BE REPAIRED BY THE CONTRACTOR AT THEIR EXPENSE.

CONTRACTOR SHALL IMPLEMENT THE FOLLOWING BMPS AND COMPLY WITH ALL PERMIT CONDITIONS PRIOR TO CONSTRUCTION.

1. ALL EQUIPMENT THAT WILL OPERATE OVERWATER WILL BE CLEANED OF ACCUMULATED GREASE, OIL, OR MUD. ALL LEAKS WILL BE REPAIRED PRIOR TO ARRIVING ON-SITE. EQUIPMENT WILL BE INSPECTED DAILY FOR LEAKS, ACCUMULATIONS OF GREASE, AND THE LIKE, AND ANY IDENTIFIED PROBLEMS WILL BE FIXED BEFORE OPERATING OVER WATER.
2. CONTRACTOR WILL HAVE EMERGENCY SPILL EQUIPMENT AVAILABLE WHENEVER WORKING IN OR NEAR THE WATER.
3. CONTRACTOR SHALL IMPLEMENT ALL BMPS NECESSARY TO PREVENT WORK MATERIALS OR DEBRIS FROM ENTERING THE WATER.
4. ANY MATERIALS DROPPED INTO THE WATER WOULD IMMEDIATELY BE PICKED UP BY THE CONTRACTOR.
5. SURFACE PREPARATION AREA WILL BE CONTAINED TO PREVENT DUST AND ABRASIVE MATERIAL FROM ENTERING THE SURROUNDING ENVIRONMENT.

SURVEY CONTROL

EXISTING CONDITIONS SURVEY PROVIDED BY ZENOVIC AND ASSOCIATES DATED DECEMBER 19TH, 2018.

HORIZONTAL DATUM = NORTH AMERICAN VERTICAL DATUM OF 1983 (91 ADJUSTMENT)

VERTICAL DATUM IS MLLW = 0 (NAVD88:+0.42)

HIGH TIDE LINE:

FOR THE PURPOSE OF THIS PROJECT, THE HTL IS DEFINED AS THE HIGHEST ASTRONOMICAL TIDE (HAT) WHICH IS 9.06 FT MLLW (NOAA STATION #9444090).

MEAN HIGH WATER (MHW) = 6.51' (NAVD88;+0.42)

ABBREVIATIONS

ANCH	ANCHOR
ARCH	ARCHITECTURAL
BLDG	BUILDING
BLKG	BLOCKING
BM	BEAM
CAP	CAPACITY
CIP	CAST IN PLACE
CL	CENTERLINE
CLG	CEILING
CMU	CONCRETE MASONRY UNIT
CONC	CONCRETE
CONST	CONSTRUCTION
CONT	CONTINUOUS
COORD	COORDINATE
CY	CUBIC YARD
DBL	DOUBLE
DEMO	DEMOLISH
DET	DETAIL
DIA	DIAMETER
DIAG	DIAGONAL
DOE	DEPARTMENT OF ECOLOGY
DWG	DRAWING
EA	EACH
EL	ELEVATION
ELECT	ELECTRICAL
EQUIP	EQUIPMENT
EXIST	EXISTING
EXP	EXPANSION
EXT	EXTERIOR
FT	FEET
FTG	FOOTING
GA	GAUGE
GALV	GALVANIZED
GEN	GENERAL
GOVT	GOVERNMENT
GR	GRADE
HAT	HIGHEST ASTRONOMICAL TIDE
HORIZ	HORIZONTAL
HP	HIGH POINT
HTL	HIGH TIDE LINE
IBC	INTERNATIONAL BUILDING CODE
IE	INVERT ELEVATION
IN	INCH
INFO	INFORMATION
ISGP	INDUSTRIAL STORMWATER GENERAL PERMIT
JST	JOIST
JT	JOINT
K	KIP (1,000 LBS.)
KSF	KIPS PER SQUARE FOOT
LF	LINEAL FOOT
MAX	MAXIMUM
MECH	MECHANICAL
MIN	MINIMUM
MISC	MISCELLANEOUS
NTS	NOT TO SCALE
OC	ON CENTER
PL	PROPERTY LINE
PT	POINT
R	RADIUS
SECT	SECTION
SHT	SHEET
SIM	SIMILAR
SPEC	SPECIFICATION
STD	STANDARD
STRUCT	STRUCTURAL
SWMMWW	STORMWATER MANAGEMENT MANUAL FOR WESTERN WASHINGTON
SWPPP	STORMWATER POLLUTION PREVENTION PLAN
TBD	TO BE DETERMINED
THRU	THROUGH
TYP	TYPICAL
VERT	VERTICAL
WL	WATER LINE
WP	WORK POINT

SHEET NO.	DESCRIPTION
01	VICINITY MAP
02	SHEET INDEX, GENERAL NOTES AND ABBREVIATIONS
03	EXISTING SITE PLAN
04	TESC PLAN
05	TESC DETAILS
06	DEMOLITION AND EXCAVATION PLAN AND SECTION
07	GRADING PLAN
08	GRADING SECTION
09	STRUCTURAL PLAN
10	TYPICAL SECTION AND DETAILS
11	FIBERGLASS ENCASEMENT DETAILS

IN: STRAIT OF JUAN DE FUCA

AT: PORT OF PORT ANGELES COFFERDAM

CITY: PORT ANGELES COUNTY: CLALLUM

STATE: WASHINGTON PARCEL #: 063099190035

APPLICATION BY: PORT OF PORT ANGELES

REFERENCE NO: NWS-2020-779

PURPOSE: PROVIDE MAINTENANCE AND REPAIRS TO EXISTING COFFERDAM STRUCTURE AT THE PORT OF PORT ANGELES LOG YARD FACILITY

SECTION: NW 4 LAT: 48° 7' 42.49" N

TOWNSHIP: 31N LONG: 123° 28' 26.4" W

RANGE: 6W DATUM: MLLW = 0.00'

PORT OF PORT ANGELES COFFERDAM

LOADING STRUCTURE MAINTENANCE AND REPAIR PROJECT

SHEET INDEX, GENERAL NOTES, AND ABBREVIATIONS

DATE: 10/6/2020

SHEET: 02 OF 14

Plotted: Oct 04, 2020 - 4:44pm jhollenbach Layout: 1800020_G1.0
M:\2018\1800020 POPA Conditions Assessment\Drawings\Exhibits\2020-10-02 JARPA - 8.5x11\02_GenNotes&Abbrev.dwg

SURVEY NOTES:

1. BASIS OF BEARINGS: NAD 83 (1991 ADJUSTMENT) PER MEASUREMENTS MADE TO MONUMENTS SHOWN ON VOLUME 34 OF SURVEYS, PAGE 22, RECORDS OF CLALLAM COUNTY, WASHINGTON.
2. VERTICAL DATUM: MLLW, BASED ON THE ABOVE CITED MEASUREMENTS AND CONVERTED FROM NAVD 88 USING THE TIDAL DATUM FOR PORT ANGELES (STATION 9444090) AS PROVIDED AT "WWW.TIDESANDCURRENTS.NOAA.GOV". MLLW ELEVATION AT PORT ANGELES (STATION 9444090) = –0.42 FEET (NAVD 88).
3. TIDE LEVELS:

A.	HAT	9.06'
B.	MHHW	7.06'
C.	MHW	6.51'
D.	MLLW	0.00'

4. THE SUBJECT LANDS ARE USED AS A LOG PROCESSING AND STORAGE YARD. CONDITIONS AND GRADES ARE SUBJECT TO FREQUENT CHANGES.
5. SURVEY SHOWN PERFORMED BY ZENOVIC AND ASSOCIATES IN DECEMBER 2018.
6. BATHYMETRY SHOWN PERFORMED BY SUNCHASERS IN MAY 2010.
7. UNDERGROUND UTILITIES SHOWN HEREON ARE BASED ON OBSERVED FIELD EVIDENCE, CITY OF PORT ANGELES GIS MAPPING, AND DRAWINGS PROVIDED BY THE PORT OF PORT ANGELES. ADDITIONAL UTILITY ROUTES AND ALIGNMENTS MAY EXIST. ZENOVIC AND ASSOCIATES IS NOT TO BE HELD LIABLE FOR THE ACCURACY AND/OR THE COMPLETENESS OF THE UNDERGROUND UTILITIES SHOWN HEREON.
8. GEOTECHNICAL TEST PITS WERE DUG IN 2019 AS PART OF PROJECT DESIGN. THE TEST PITS WERE OBSERVED BY AN ARCHAEOLOGIST; NO PRECONTACT ARCHEOLOGICAL MATERIALS WERE DISCOVERED.

EXISTING SITE PLAN

SCALE: 1" = 60'

0 30 60 90
SCALE IN FEET

LEGEND:

—15—	GRADE CONTOUR
——	STORM DRAIN
—X—X—X—X—	FENCE
○	PLUGGED CATCH BASIN
⊞	TEST PIT

IN: STRAIT OF JUAN DE FUCA
AT: PORT OF PORT ANGELES COFFERDAM
CITY: PORT ANGELES COUNTY: CLALLAM
STATE: WASHINGTON PARCEL #: 063099190035
APPLICATION BY: PORT OF PORT ANGELES
REFERENCE NO: NWS-2020-779

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TOWNSHIP: 31N LONG: 123° 28' 26.4" W
RANGE: 6W DATUM: MLLW = 0.00'

PORT OF PORT ANGELES COFFERDAM

LOADING STRUCTURE MAINTENANCE AND REPAIR PROJECT

EXISTING SITE PLAN

DATE: 10/6/2020

SHEET: 03 OF 14

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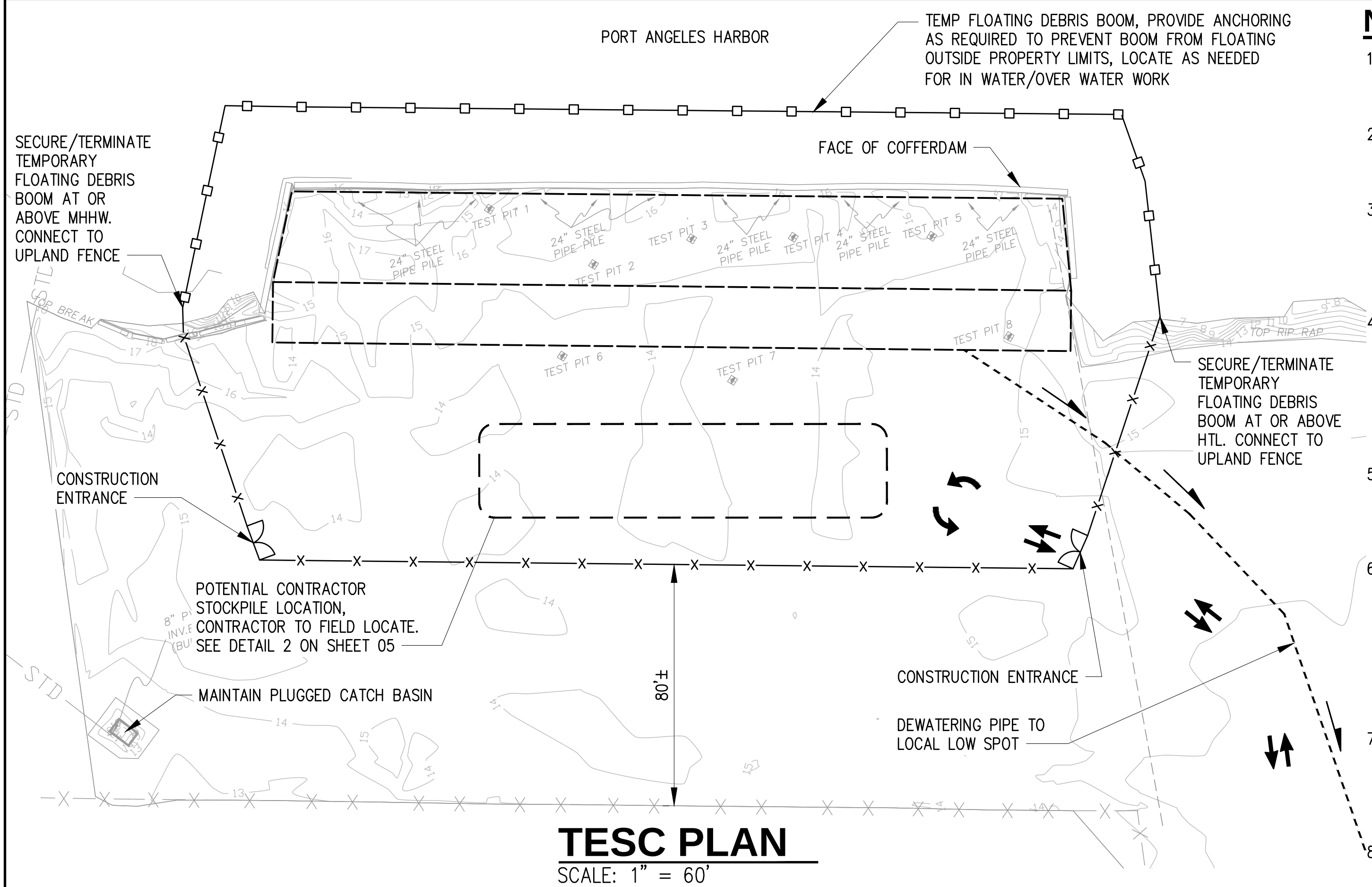


TESC PLAN

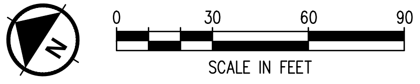
SCALE: 1" = 60'

LEGEND:

—□——□——□—	TEMPORARY FLOATING DEBRIS BOOM (1/05)	— — — —	STOCKPILE AREA BOUNDARY
—x——x——x—	TEMPORARY CONSTRUCTION FENCE (3/05)	- - - - - - - - -	DEWATERING PIPE
◠◠	CONSTRUCTION ENTRANCE	➡	VEHICLE ROUTING
——— ——— ———	STRUCTURAL WORK LIMITS		

NOTES:

1. CONTRACTOR TO MAINTAIN PLUGGED CATCH BASINS, NOTE THAT NO STORM DRAINAGE FROM WITHIN PROJECT LIMITS SHALL DRAIN TO THE PORT DRAINAGE SYSTEM.
2. THE CONTRACTOR SHALL COMPLY WITH, MAINTAIN, AND MODIFY AS NEEDED THE APPROVED CONSTRUCTION SWPPP IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
3. THE IMPLEMENTATION OF THESE TESC PLANS AND CONSTRUCTION, MAINTENANCE, REPLACEMENT AND UPGRADING OF THESE FACILITIES IS THE RESPONSIBILITY OF THE CONTRACTOR UNTIL ALL CONSTRUCTION IS COMPLETED AND APPROVED.
4. THE TESC FACILITIES SHOWN ON THIS PLAN ARE THE MINIMUM REQUIREMENTS ANTICIPATED FOR SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE TESC FACILITIES SHALL BE UPGRADED AS NEEDED FOR UNEXPECTED STORM EVENTS AND TO ENSURE THAT SEDIMENT AND SEDIMENT-LADEN WATER DOES NOT LEAVE THE SITE.
5. ON-SITE EROSION CONTROL MEASURES SHALL BE INSTALLED PRIOR TO THE START OF WORK AND SHALL BE MAINTAINED DURING AND AFTER EXCAVATION AND GRADING OPERATIONS TO THE APPROVAL OF THE PORT.
6. THE TESC FACILITIES SHALL BE INSPECTED DAILY BY THE CONTRACTOR AND MAINTAINED AS NECESSARY TO ENSURE THEIR CONTINUED FUNCTION. DAILY INSPECTION REPORTS MUST BE REVIEWED BY THE CONTRACTOR, SIGNED AND MADE AVAILABLE TO THE PORT, CITY AND ANY OTHER ENVIRONMENTAL AUTHORITIES AT ALL TIMES. A COPY OF ALL INSPECTION RECORDS SHALL BE KEPT ON SITE.
7. THE TEMPORARY FLOATING DEBRIS BOOM SHALL BE INSTALLED AT THE START OF WORK AND MAINTAINED, UPGRADED, REPAIRED OR REPLACED THE ENTIRE CONSTRUCTION PERIOD UNTIL ALL CONSTRUCTION IS COMPLETED AND APPROVED.
8. CONTRACTOR SHALL PROVIDE ALL PUMPS, TANKS, SHORING, LABOR, AND EQUIPMENT NECESSARY TO ADEQUATELY DEWATER AND STABILIZE EXCAVATIONS SEE GEOTECHNICAL REPORT FOR ANTICIPATED GROUNDWATER ELEVATIONS.



IN: STRAIT OF JUAN DE FUCA

AT: PORT OF PORT ANGELES COFFERDAM

CITY: PORT ANGELES COUNTY: CLALLUM

STATE: WASHINGTON PARCEL #: 063099190035

APPLICATION BY: PORT OF PORT ANGELES

REFERENCE NO: NWS-2020-779

PURPOSE: PROVIDE MAINTENANCE AND REPAIRS TO EXISTING COFFERDAM STRUCTURE AT THE PORT OF PORT ANGELES LOG YARD FACILITY

SECTION: NW 4 LAT: 48° 7' 42.49" N

TOWNSHIP: 31N LONG: 123° 28' 26.4" W

RANGE: 6W DATUM: MLLW = 0.00'

PORT OF PORT ANGELES COFFERDAM

LOADING STRUCTURE MAINTENANCE AND REPAIR PROJECT

TESC PLAN

DATE: 10/6/2020

SHEET: 04 OF 14

Plotted: Oct 04, 2020 – 4:48pm jhollenbach Layout: 1800020_G3.0
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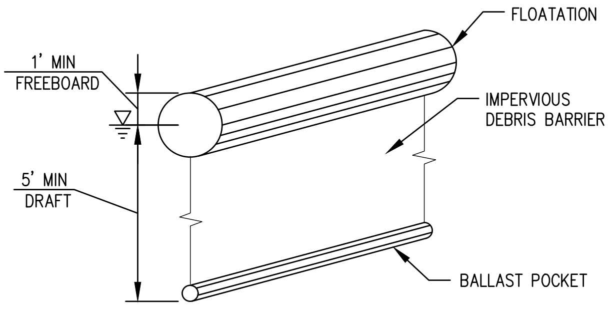
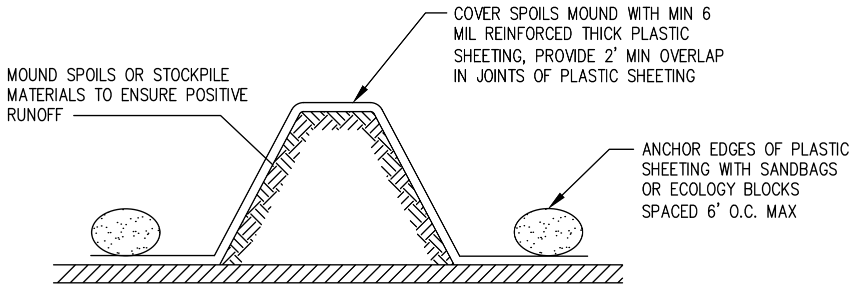
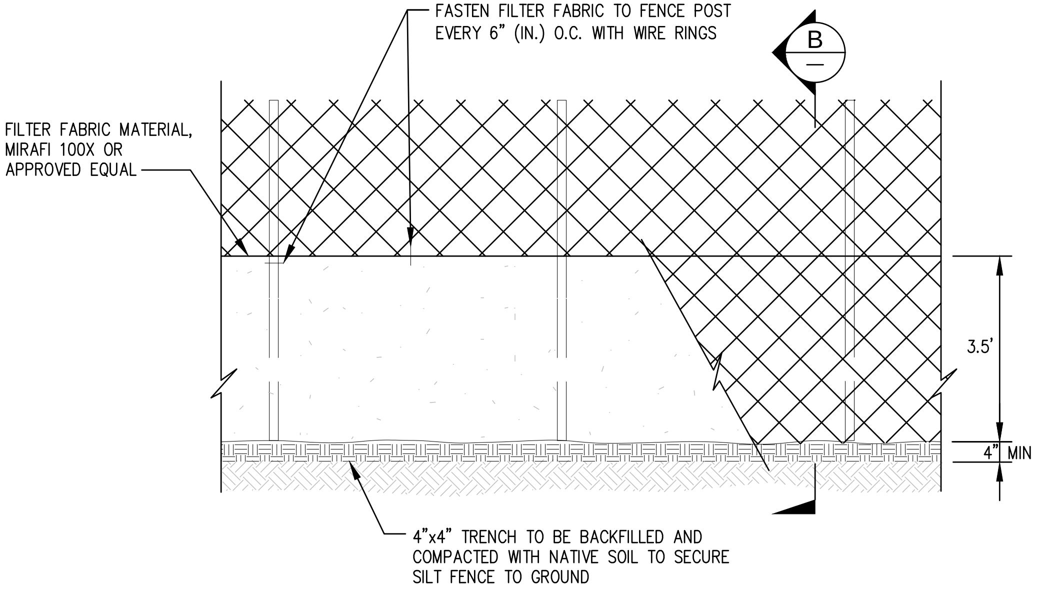
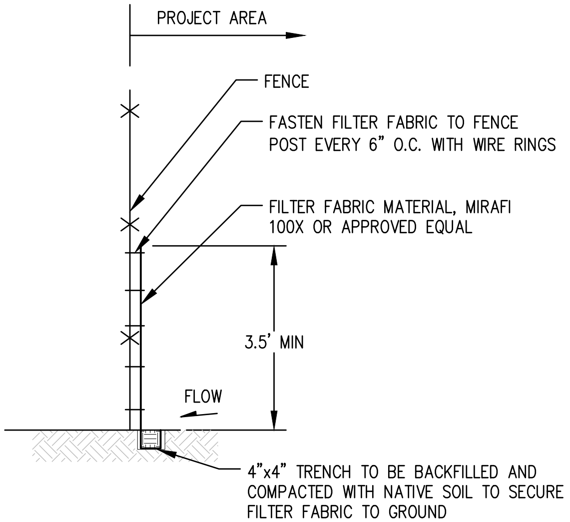


1 DEBRIS BOOM
04
NTS



2 STOCKPILE PROTECTION DETAIL
04
NTS





SECTION B

3 CONSTRUCTION FENCE
04
NTS

IN: STRAIT OF JUAN DE FUCA
AT: PORT OF PORT ANGELES COFFERDAM
CITY: PORT ANGELES COUNTY: CLALLUM
STATE: WASHINGTON PARCEL #: 063099190035
APPLICATION BY: PORT OF PORT ANGELES
REFERENCE NO: NWS-2020-779

PURPOSE: PROVIDE MAINTENANCE AND REPAIRS TO EXISTING COFFERDAM STRUCTURE AT THE PORT OF PORT ANGELES LOG YARD FACILITY

SECTION: NW 4	LAT: 48° 7' 42.49" N
TOWNSHIP: 31N	LONG: 123° 28' 26.4" W
RANGE: 6W	DATUM: MLLW = 0.00'

PORT OF PORT ANGELES COFFERDAM

LOADING STRUCTURE MAINTENANCE AND REPAIR PROJECT

TESC DETAILS

DATE: 10/6/2020

SHEET: 05 OF 14

Plotted: Oct 05, 2020 – 7:13pm jhollenbach Layout: 1800020_G3.1
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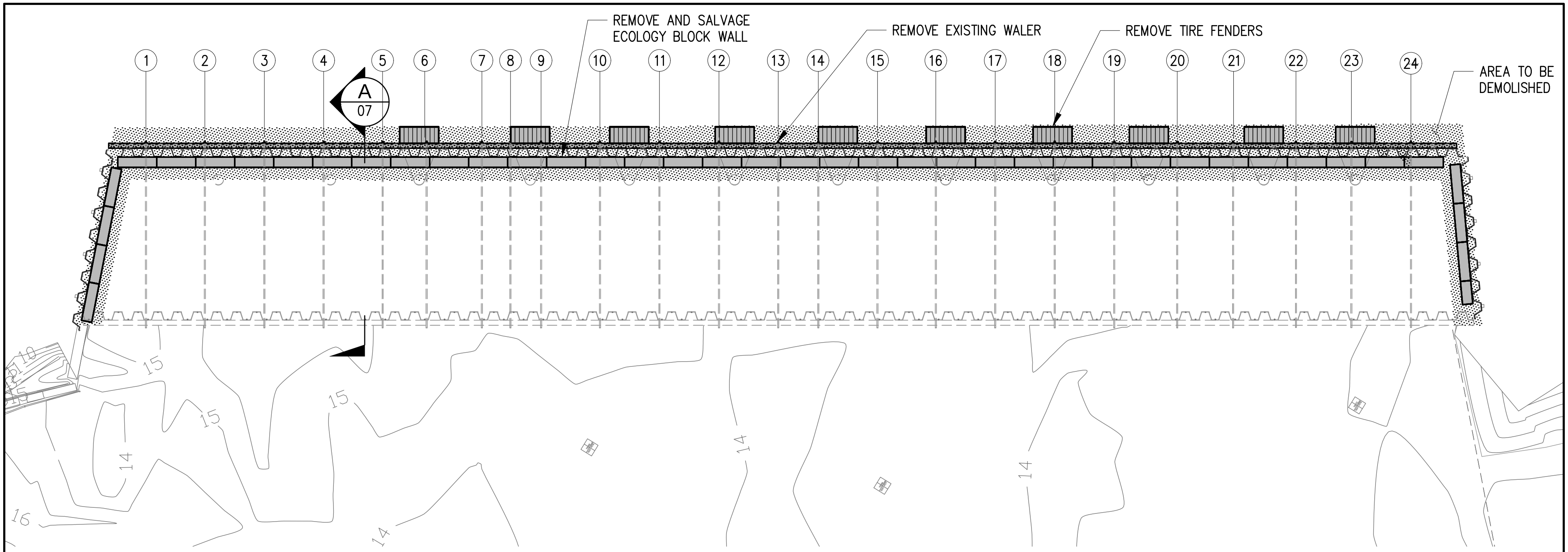
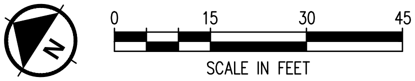


DEMOLITION AND EXCAVATION PLAN

SCALE: 1" = 30'



NOTES

1. CONTRACTOR TO DETERMINE LAYBACK SLOPE AS NEEDED FOR WORK. 2:1 BACKSLOPE SHOWN IS MAXIMUM BACKSLOPE ANTICIPATED.

LEGEND

▨	AREA OF DEMOLITION WORK
▩	REMOVE

IN: STRAIT OF JUAN DE FUCA

AT: PORT OF PORT ANGELES COFFERDAM

CITY: PORT ANGELES COUNTY: CLALLUM

STATE: WASHINGTON PARCEL #: 063099190035

APPLICATION BY: PORT OF PORT ANGELES

REFERENCE NO: NWS-2020-779

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TOWNSHIP: 31N LONG: 123° 28' 26.4" W

RANGE: 6W DATUM: MLLW = 0.00'

PORT OF PORT ANGELES COFFERDAM

LOADING STRUCTURE MAINTENANCE AND REPAIR PROJECT

DEMOLITION AND
EXCAVATION PLAN

DATE: 10/6/2020

SHEET: 06 OF 14

Plotted: Oct 04, 2020 – 5:13pm jhollenbach Layout: Demo&Exca Plan
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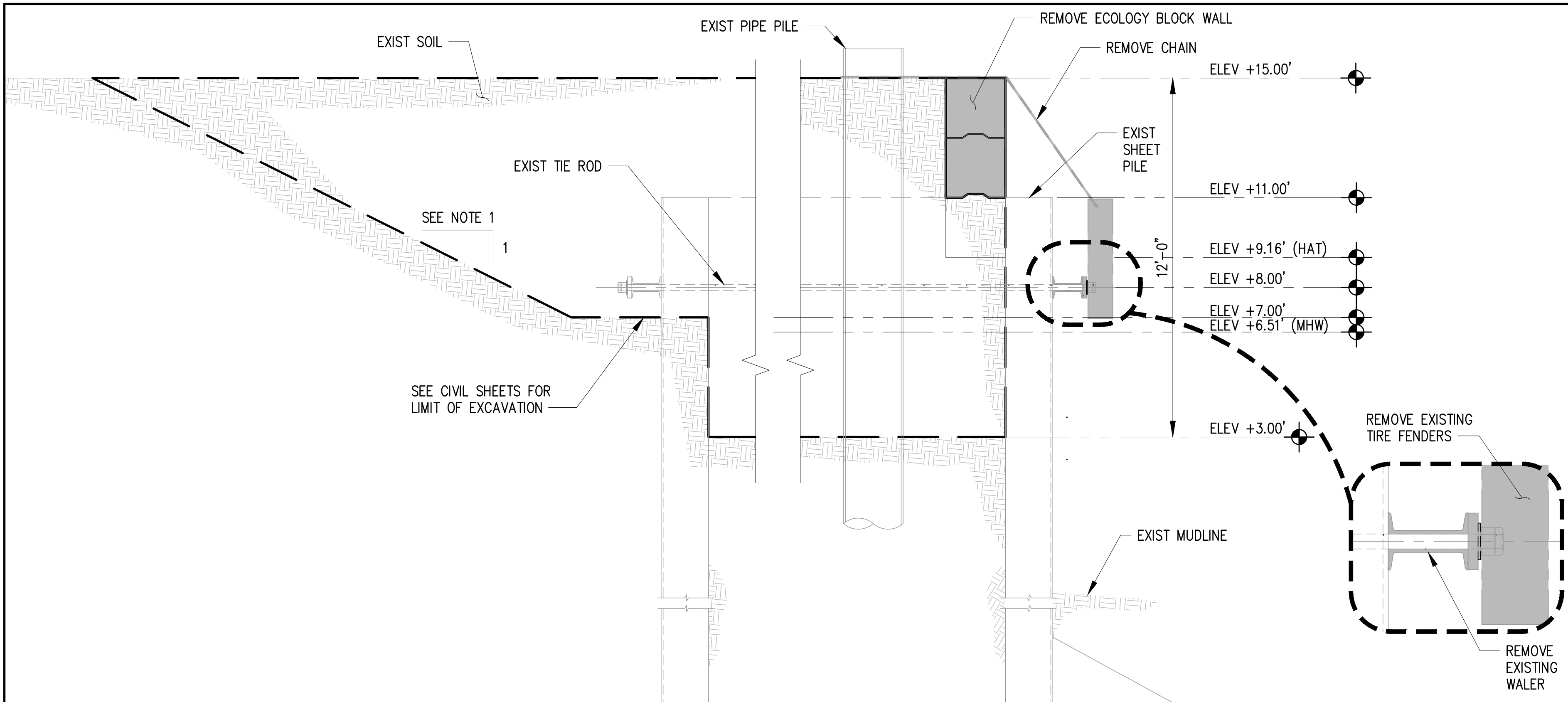

A
06

TYPICAL SECTION

SCALE: 3/16" = 1'-0"

0 1 2 4 8
SCALE IN FEET

NOTES

1. CONTRACTOR TO DETERMINE LAYBACK SLOPE AS NEEDED FOR WORK. 2:1 BACKSLOPE SHOWN IS MAXIMUM BACKSLOPE ANTICIPATED.

LEGEND

— — AREA OF WORK

▨ REMOVE

IN: STRAIT OF JUAN DE FUCA

AT: PORT OF PORT ANGELES COFFERDAM

CITY: PORT ANGELES COUNTY: CLALLUM

STATE: WASHINGTON PARCEL #: 063099190035

APPLICATION BY: PORT OF PORT ANGELES

REFERENCE NO: NWS-2020-779

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RANGE: 6W DATUM: MLLW = 0.00'

PORT OF PORT ANGELES COFFERDAM

LOADING STRUCTURE MAINTENANCE AND REPAIR PROJECT

DEMOLITION AND
EXCAVATION SECTION

DATE: 10/6/2020

SHEET: 07 OF 14

Plotted: Oct 04, 2020 - 6:25pm jhollenbach Layout: Demo & Exca Section
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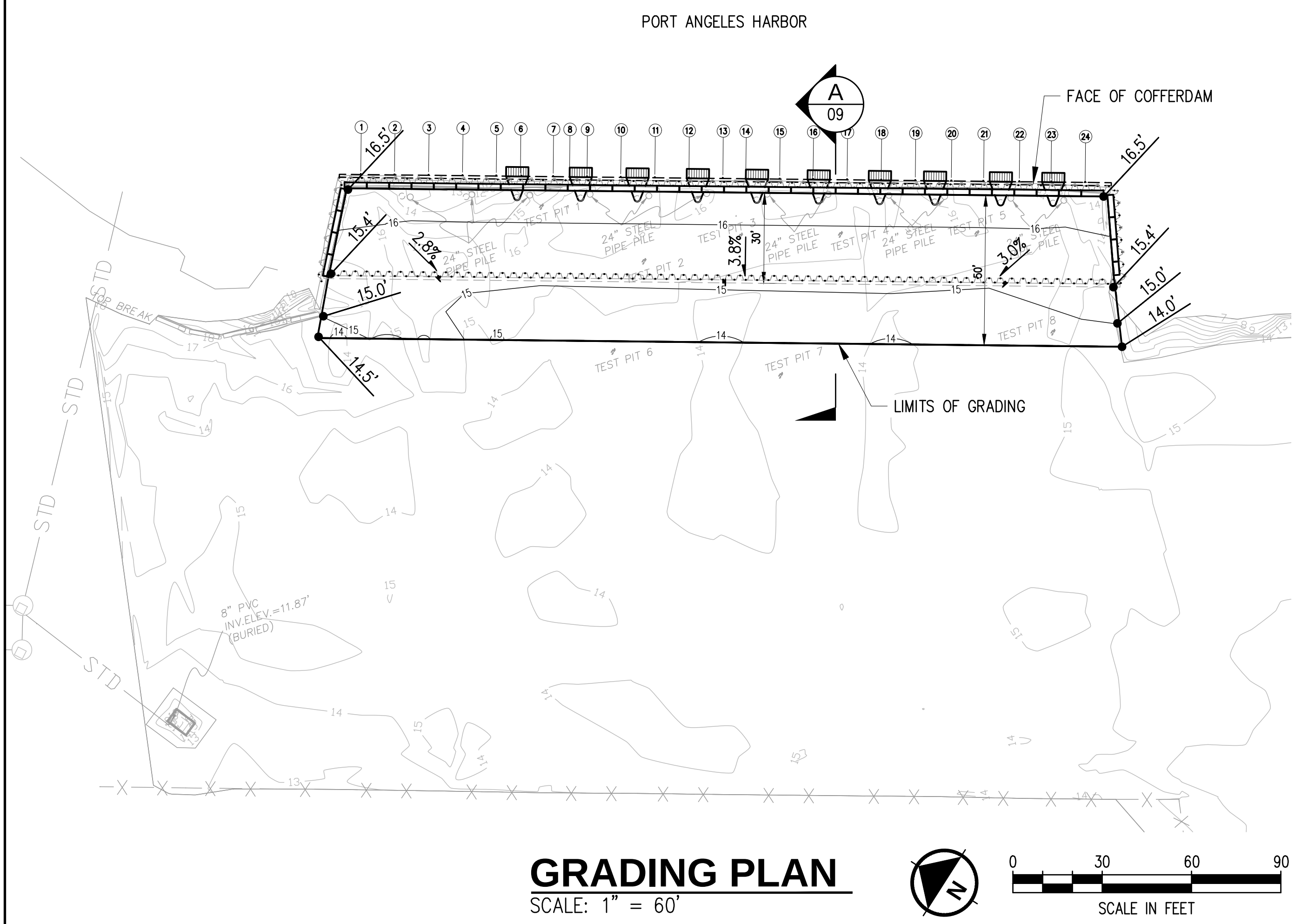

GRADING PLAN

SCALE: 1" = 60'

NOTES:

1. ALL SPOT ELEVATIONS REPRESENT TOP OF GRADING.
2. STRAIGHT GRADES SHALL BE MAINTAINED BETWEEN SPOT ELEVATIONS UNLESS OTHERWISE NOTED.
3. ALL AREAS DISTURBED OR OVER-EXCAVATED DURING CONSTRUCTION SHALL BE COMPACTED PER SPECIFICATIONS.
4. CONTRACTOR SHALL FOLLOW THE WSDOT SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION (2018).
5. CONTRACTOR SHALL PROVIDE THE STORMWATER POLLUTION PREVENTION PLAN (SWPPP).

LEGEND:

15	EXISTING GRADE CONTOUR
15	PROPOSED GRADE CONTOUR
— ··· —	FLOW LINE
—	LIMITS OF GRADING
STD	EXISTING STORM DRAIN
0.7%	FLOW DIRECTION
●—	SPOT ELEVATION
①	TIE ROD GRID

IN: STRAIT OF JUAN DE FUCA

AT: PORT OF PORT ANGELES COFFERDAM

CITY: PORT ANGELES COUNTY: CLALLUM

STATE: WASHINGTON PARCEL #: 063099190035

APPLICATION BY: PORT OF PORT ANGELES

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RANGE: 6W DATUM: MLLW = 0.00'

PORT OF PORT ANGELES COFFERDAM

LOADING STRUCTURE MAINTENANCE AND REPAIR PROJECT

GRADING PLAN

DATE: 10/6/2020

SHEET: 08 OF 14

Plotted: Oct 05, 2020 – 3:31pm jhollenbach Layout: GradingPlan
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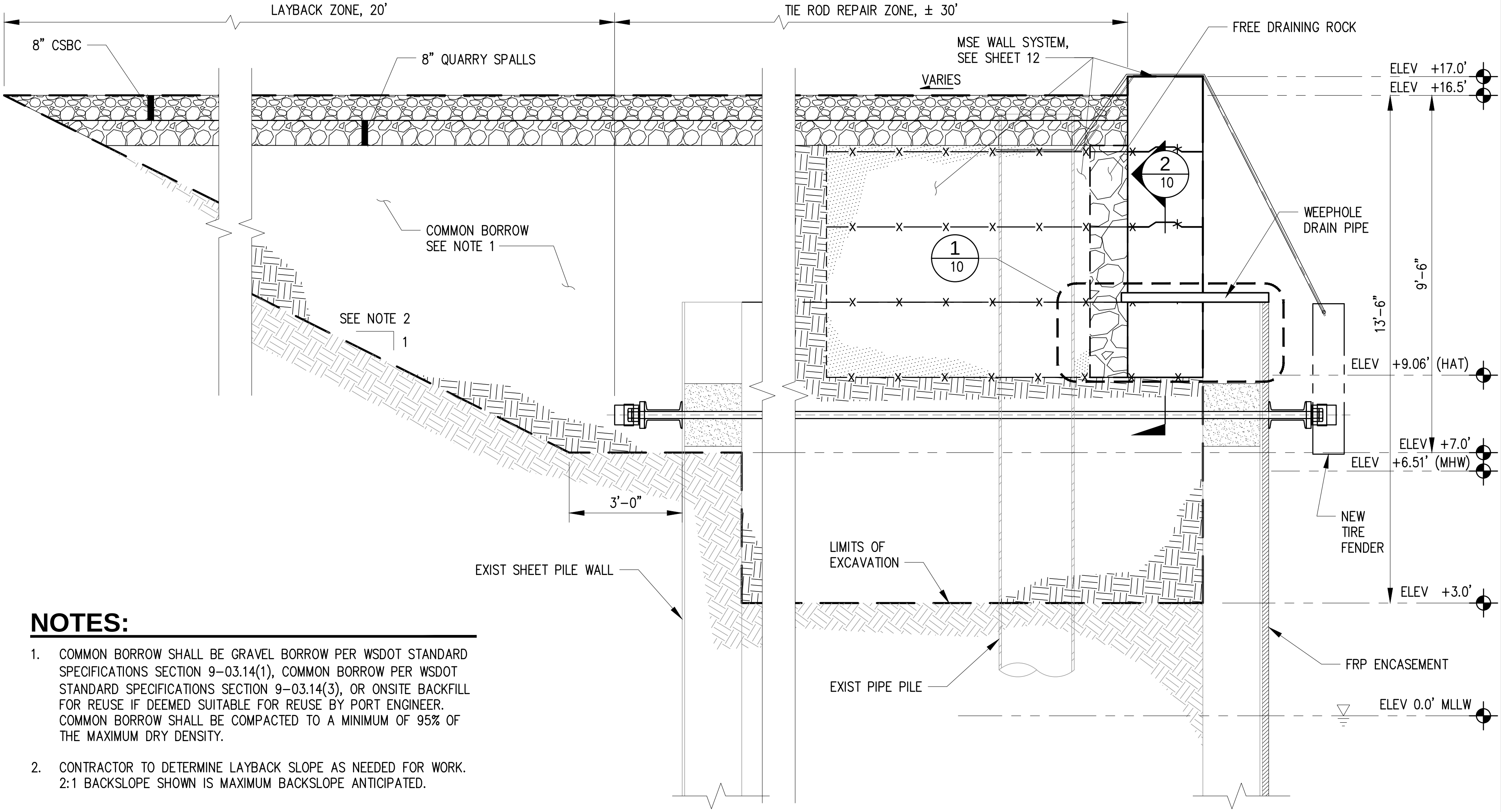

NOTES:

1. COMMON BORROW SHALL BE GRAVEL BORROW PER WSDOT STANDARD SPECIFICATIONS SECTION 9-03.14(1), COMMON BORROW PER WSDOT STANDARD SPECIFICATIONS SECTION 9-03.14(3), OR ONSITE BACKFILL FOR REUSE IF DEEMED SUITABLE FOR REUSE BY PORT ENGINEER. COMMON BORROW SHALL BE COMPACTED TO A MINIMUM OF 95% OF THE MAXIMUM DRY DENSITY.

2. CONTRACTOR TO DETERMINE LAYBACK SLOPE AS NEEDED FOR WORK. 2:1 BACKSLOPE SHOWN IS MAXIMUM BACKSLOPE ANTICIPATED.

A
08

TYPICAL GRADING SECTION

SCALE: 1/4" = 1'-0"

IN: STRAIT OF JUAN DE FUCA
AT: PORT OF PORT ANGELES COFFERDAM
CITY: PORT ANGELES COUNTY: CLALLUM
STATE: WASHINGTON PARCEL #: 063099190035
APPLICATION BY: PORT OF PORT ANGELES
REFERENCE NO: NWS-2020-779

PURPOSE: PROVIDE MAINTENANCE AND REPAIRS TO EXISTING COFFERDAM STRUCTURE AT THE PORT OF PORT ANGELES LOG YARD FACILITY

SECTION: NW 4
TOWNSHIP: 31N
RANGE: 6W

LAT: 48° 7' 42.49" N
LONG: 123° 28' 26.4" W
DATUM: MLLW = 0.00'

PORT OF PORT ANGELES COFFERDAM

LOADING STRUCTURE MAINTENANCE AND REPAIR PROJECT

TYPICAL GRADING SECTION

DATE: 10/6/2020

SHEET: 09 OF 14

Plotted: Oct 06, 2020 – 4:52pm jhollenbach Layout: GradingSection
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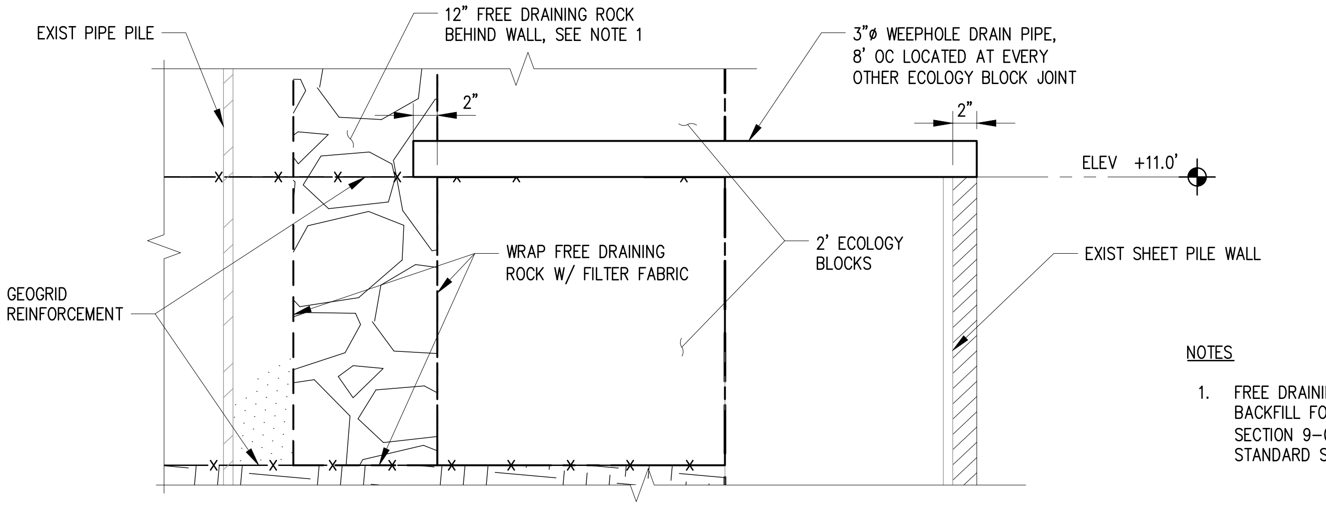
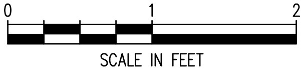


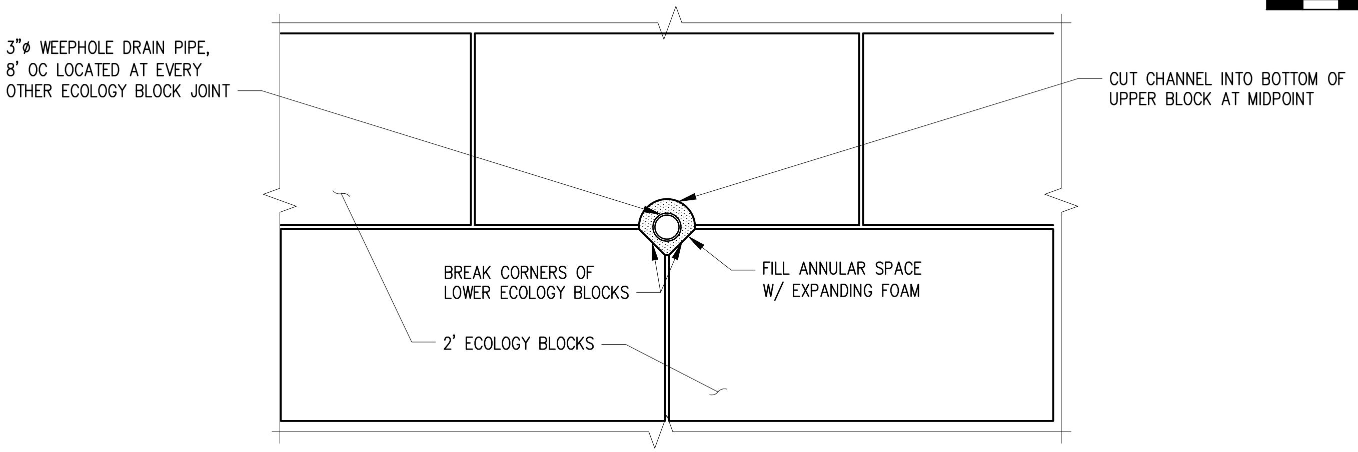
NOTES

1. FREE DRAINING ROCK SHALL BE GRAVEL BACKFILL FOR WALLS, AS DEFINED BY SECTION 9-03.12(2) IN THE WSDOT STANDARD SPECIFICATIONS..

1/09 FREE DRAINING ROCK AND WEEPHOLE DRAIN PILE DETAIL

SCALE: 3/4" = 1'-0"





2/09 WEEPING DRAIN PILE AT ECOLOGY BLOCK JOINT DETAIL

NTS

IN: STRAIT OF JUAN DE FUCA
AT: PORT OF PORT ANGELES COFFERDAM
CITY: PORT ANGELES COUNTY: CLALLUM
STATE: WASHINGTON PARCEL #: 063099190035
APPLICATION BY: PORT OF PORT ANGELES
REFERENCE NO: NWS-2020-779

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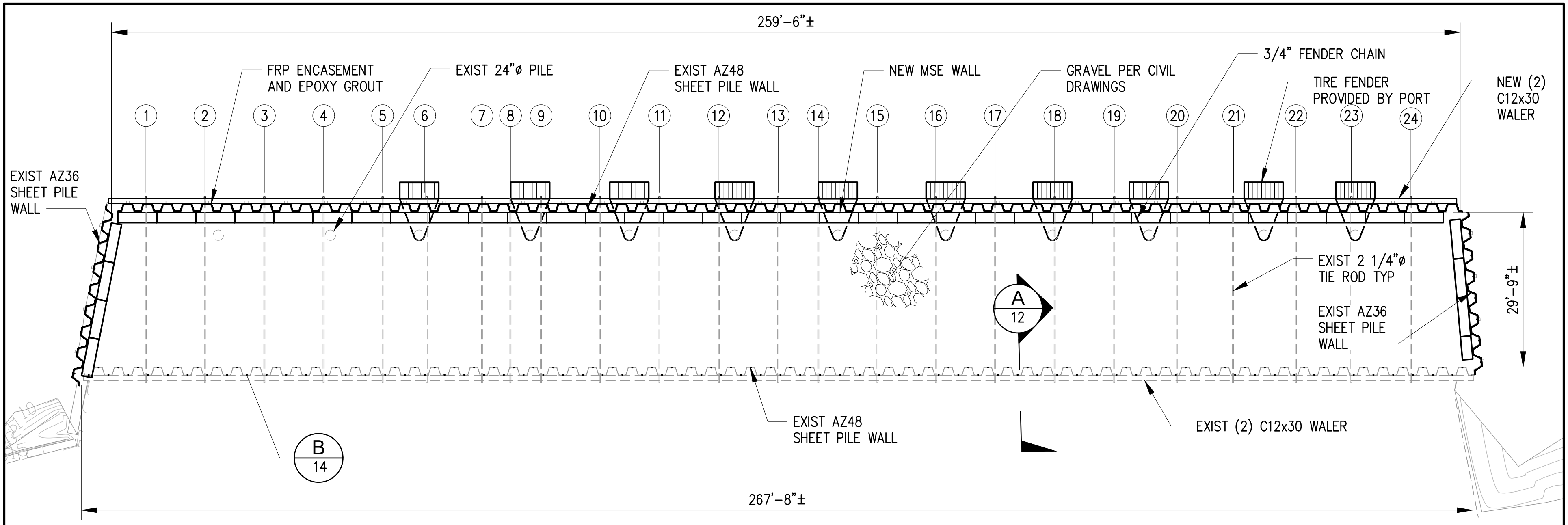
TOWNSHIP: 31N LONG: 123° 28' 26.4" W
RANGE: 6W DATUM: MLLW = 0.00'

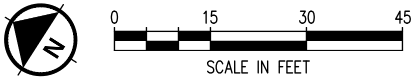
PORT OF PORT ANGELES COFFERDAM
LOADING STRUCTURE MAINTENANCE AND REPAIR PROJECT

GRADING DETAILS
DATE: 10/6/2020
SHEET: 10 OF 14



STRUCTURAL PLAN

SCALE: 1" = 30'



IN: STRAIT OF JUAN DE FUCA

AT: PORT OF PORT ANGELES COFFERDAM

CITY: PORT ANGELES COUNTY: CLALLUM

STATE: WASHINGTON PARCEL #: 063099190035

APPLICATION BY: PORT OF PORT ANGELES

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RANGE: 6W DATUM: MLLW = 0.00'

PORT OF PORT ANGELES COFFERDAM

LOADING STRUCTURE MAINTENANCE AND REPAIR PROJECT

STRUCTURAL PLAN

DATE: 10/6/2020

SHEET: 11 OF 14

Plotted: Oct 05, 2020 – 7:03pm jhollenbach Layout: StructuralPlan
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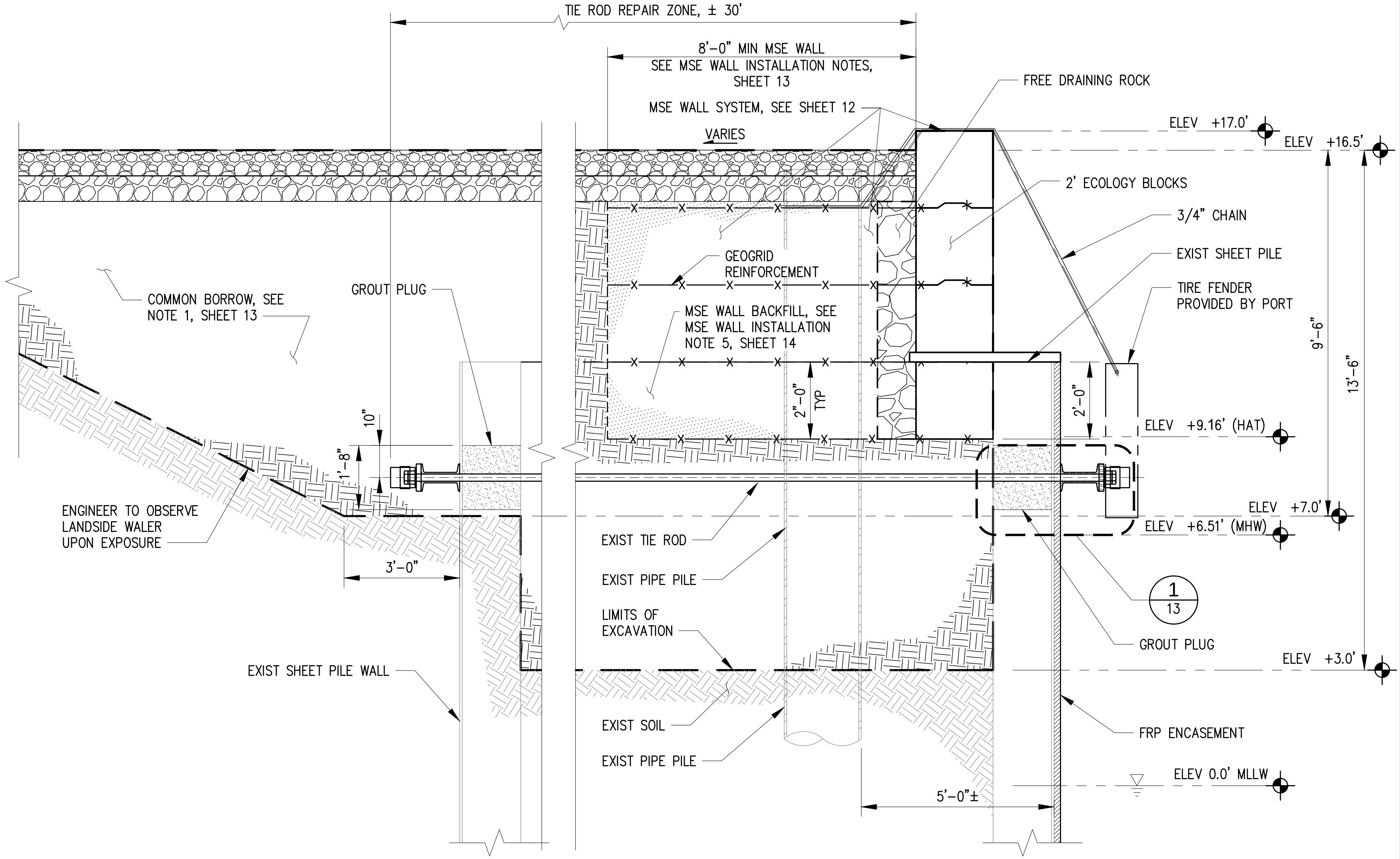

A
XX

TYPICAL SECTION AT TIE ROD

SCALE: 1/4" = 1'-0"

0 1 2 4 6
SCALE IN FEET

IN: STRAIT OF JUAN DE FUCA

AT: PORT OF PORT ANGELES COFFERDAM

CITY: PORT ANGELES COUNTY: CLALLUM

STATE: WASHINGTON PARCEL #: 063099190035

APPLICATION BY: PORT OF PORT ANGELES

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RANGE: 6W DATUM: MLLW = 0.00'

PORT OF PORT ANGELES COFFERDAM

LOADING STRUCTURE MAINTENANCE AND REPAIR PROJECT

TYPICAL SECTION

DATE: 10/6/2020

SHEET: 12 OF 14

Plotted: Oct 07, 2020 - 4:31pm jhollenbach Layout: 1800020_S3.0
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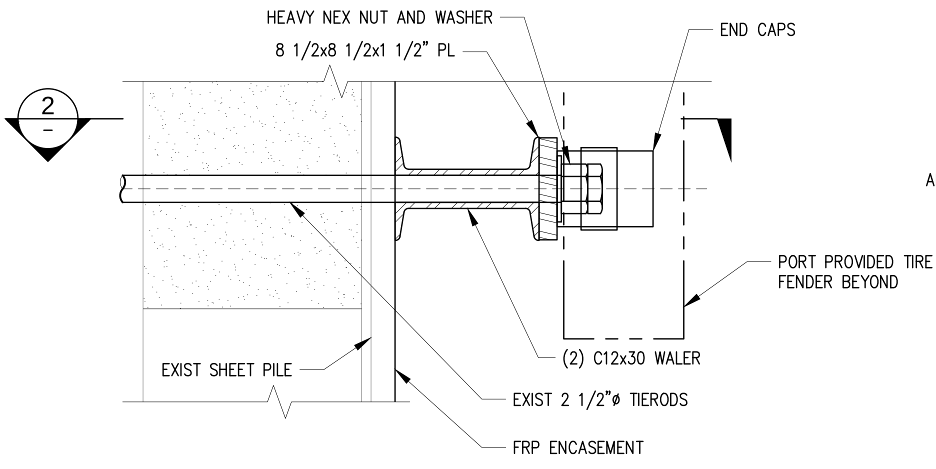
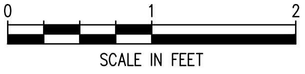
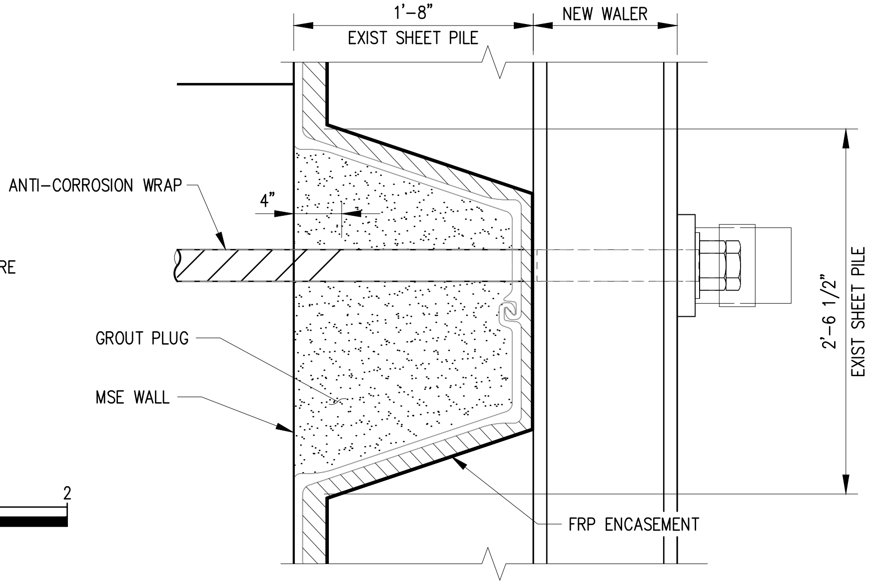


1/12 DETAIL

SCALE: 3/4" = 1'-0"





2/– TIE ROD ENCAPSULATION DETAIL EACH SIDE

SCALE: 3/4" = 1'-0"

NOTES

WATERSIDE WALER REPLACEMENT–CONSTRUCTION SEQUENCE REQUIREMENTS; MEANS AND METHOD TO BE DETERMINED BY CONTRACTOR:

1. LANDSIDE EXCAVATION DOWN TO ELEVATION +3.00' MIN BEFORE REMOVING WALER.
2. ENGINEER TO OBSERVE LANDSIDE WALER. CONTRACTOR TO NOTIFY ENGINEER WHEN WALER IS AVAILABLE FOR OBSERVATION.
3. REMOVE AND REPLACE WALER WITH (2) C12x30 WALER BEAMS.
4. APPLY TRENTON PILE PRIMER, WAX TAPE #2, AND MC0110 OUTER WRAP OR BETTER ON ALL EXIST TIE RODS.
5. REPLACE WASHER AND NUT ON TIE ROD END AND TIGHTEN UNTIL WALL IS PLUMB. BEGIN BACK FILLING.
6. INSTALL A 20" GROUT PLUG CENTERED ABOUT THE TIE ROD ON LANDSIDE AND WATERSIDE.
7. MONITOR WALL FOR PLUMBNESS AND CONTINUALLY ADJUST TIE ROD NUT ASSEMBLY TO ENSURE WALL IS PLUMB DURING BACKFILL OPERATION.
8. ENCAPSULATE WATERSIDE AND LANDSIDE TIE ROD ENDS USING WILLIAMS FORM GREASE FILLED FIBER REINFORCED NYLON END CAPS OR BETTER.

MSE WALL INSTALLATION NOTES

1. MSE WALL SHALL BEGIN APPROXIMATELY 2 FT BELOW TOP OF EXIST SHEET PILE.
2. REUSE EXIST ECOLOGY BLOCKS OR PURCHASE NEW ECOLOGY BLOCKS AT CONTRACTOR'S OPTION.
3. GEOGRID REINFORCEMENT SHALL CONFORM TO WSDOT STANDARD SPECS AND HAVE A MINIMUM ULTIMATE TENSILE STRENGTH OF 5,500 POUNDS PER FOOT.
4. GEOGRID SHALL BE INSTALLED IN CONTINUOUS SHEETS AT A VERTICAL SPACING OF 2 FEET. MANUFACTURER SHALL DESIGN AND SUBMIT SHOP DRAWINGS OF CONNECTION OF GEOTEXTILE BETWEEN ECOLOGY BLOCKS PRIOR TO INSTALLATION.
5. MSE WALL BACKFILL SHALL BE GRAVEL BORROW BACKFILL, AS DEFINED BY WSDOT STANDARD SPECIFICATIONS SECTION 9–03.14(1), COMPACTED TO A MINIMUM OF 95% OF THE MAXIMUM DRY DENSITY AS DEFINED BY THE MODIFIED PROCTOR TEST, ASTM D1557.
6. MSE SUBGRADE SHALL BE COMPACTED TO A FIRM AND UNYIELDING SURFACE AND SHOULD BE OBSERVED AND APPROVED BY A QUALIFIED GEOTECHNICAL ENGINEER.

IN: STRAIT OF JUAN DE FUCA

AT: PORT OF PORT ANGELES COFFERDAM

CITY: PORT ANGELES COUNTY: CLALLUM

STATE: WASHINGTON PARCEL #: 063099190035

APPLICATION BY: PORT OF PORT ANGELES

REFERENCE NO: NWS-2020-779

PURPOSE: PROVIDE MAINTENANCE AND REPAIRS TO EXISTING COFFERDAM STRUCTURE AT THE PORT OF PORT ANGELES LOG YARD FACILITY

SECTION: NW 4 LAT: 48° 7' 42.49" N

TOWNSHIP: 31N LONG: 123° 28' 26.4" W

RANGE: 6W DATUM: MLLW = 0.00'

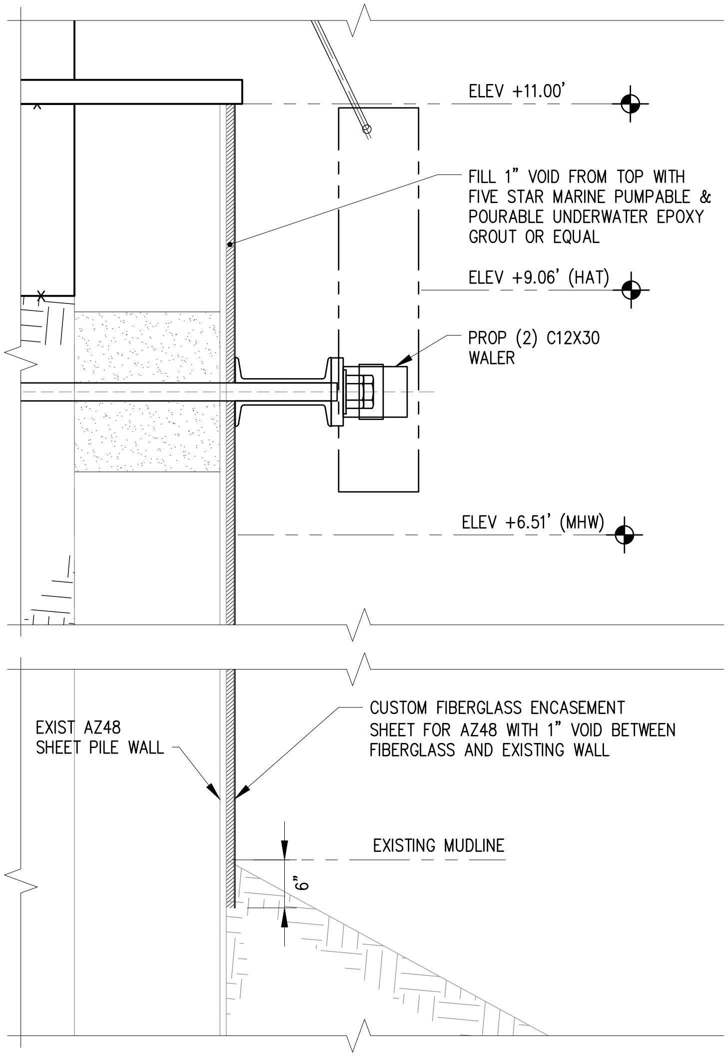
PORT OF PORT ANGELES COFFERDAM

LOADING STRUCTURE MAINTENANCE AND REPAIR PROJECT

DETAILS AND NOTES

DATE: 10/6/2020

SHEET: 13 OF 14



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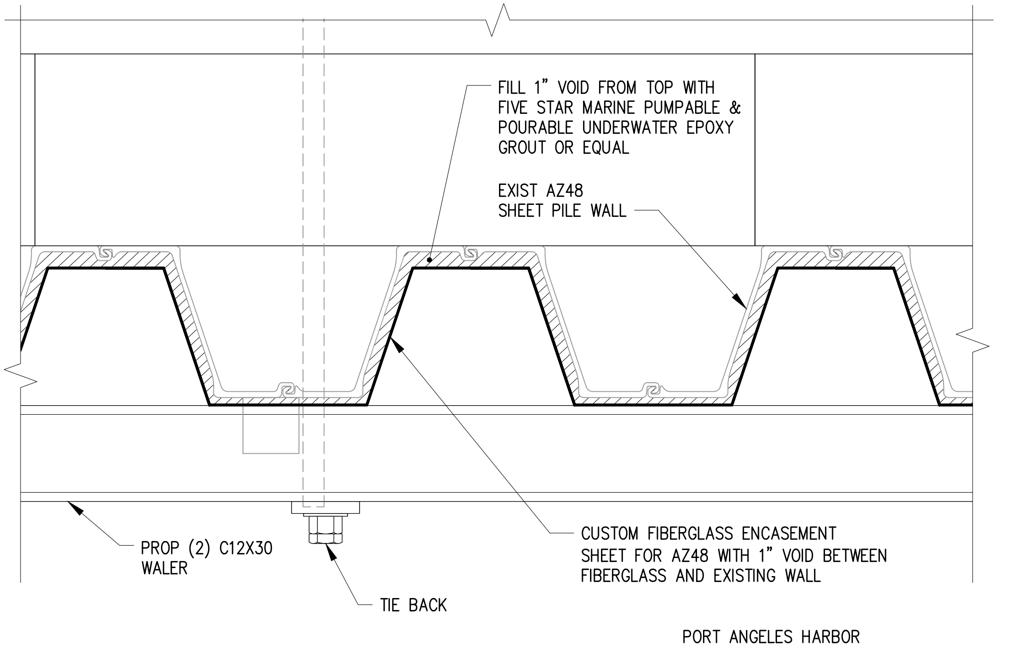
SECTION - FRP ENCASEMENT

SCALE: 1/2" = 1'-0"



1
XX

DETAIL - FRP ENCASEMENT

SCALE: 1/2" = 1'-0"

0 1 2 3
SCALE IN FEET

IN: STRAIT OF JUAN DE FUCA

AT: PORT OF PORT ANGELES COFFERDAM

CITY: PORT ANGELES COUNTY: CLALLUM

STATE: WASHINGTON PARCEL #: 063099190035

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PORT OF PORT ANGELES COFFERDAM

LOADING STRUCTURE MAINTENANCE AND REPAIR PROJECT

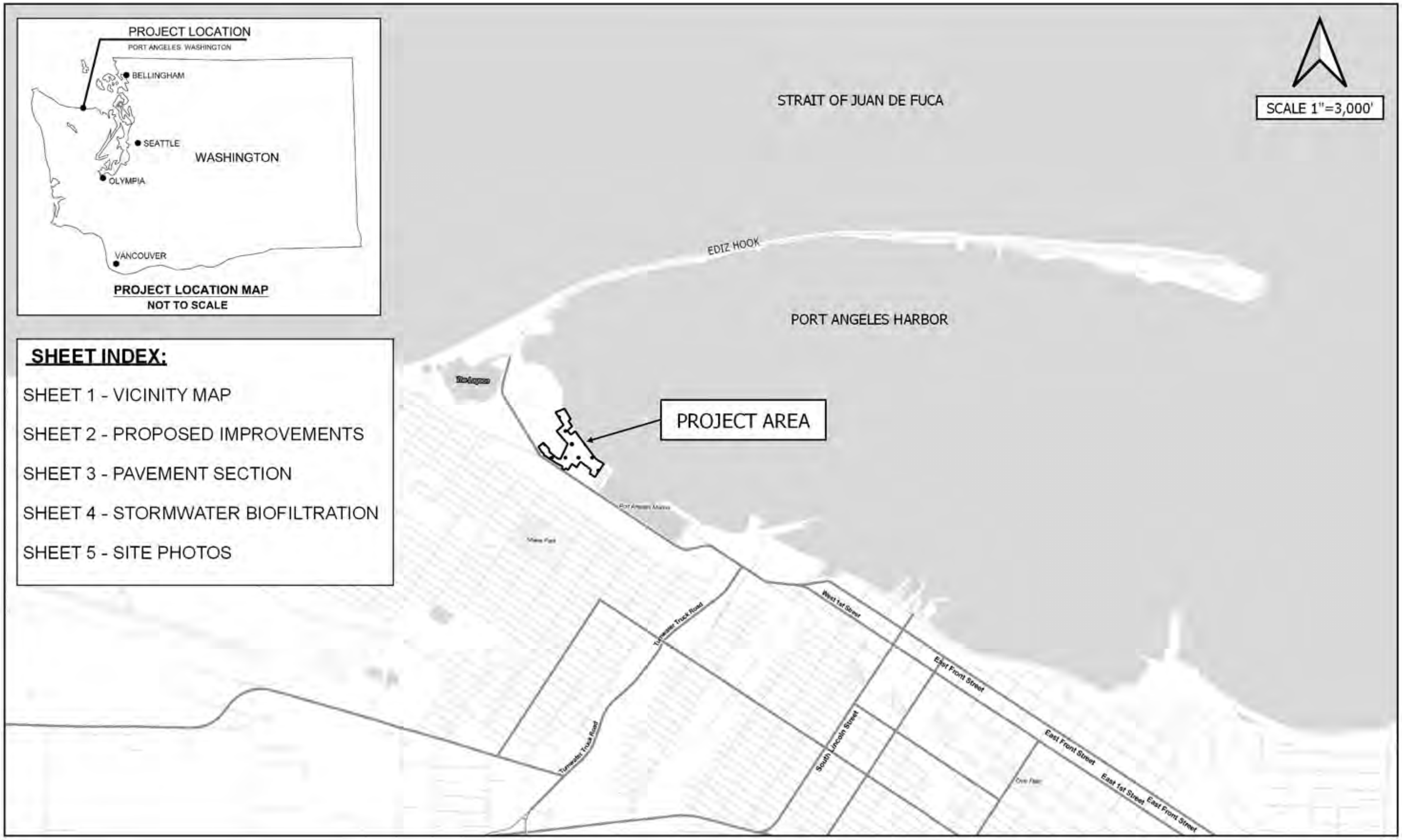
FIBERGLASS ENCASEMENT DETAILS

DATE: 10/6/2020

SHEET: 14 OF 14

APPENDIX C

Intermodal Handling and Transfer Facility Phase 1 Improvement Plans



SHEET INDEX:

SHEET 1 - VICINITY MAP
SHEET 2 - PROPOSED IMPROVEMENTS
SHEET 3 - PAVEMENT SECTION
SHEET 4 - STORMWATER BIOFILTRATION
SHEET 5 - SITE PHOTOS

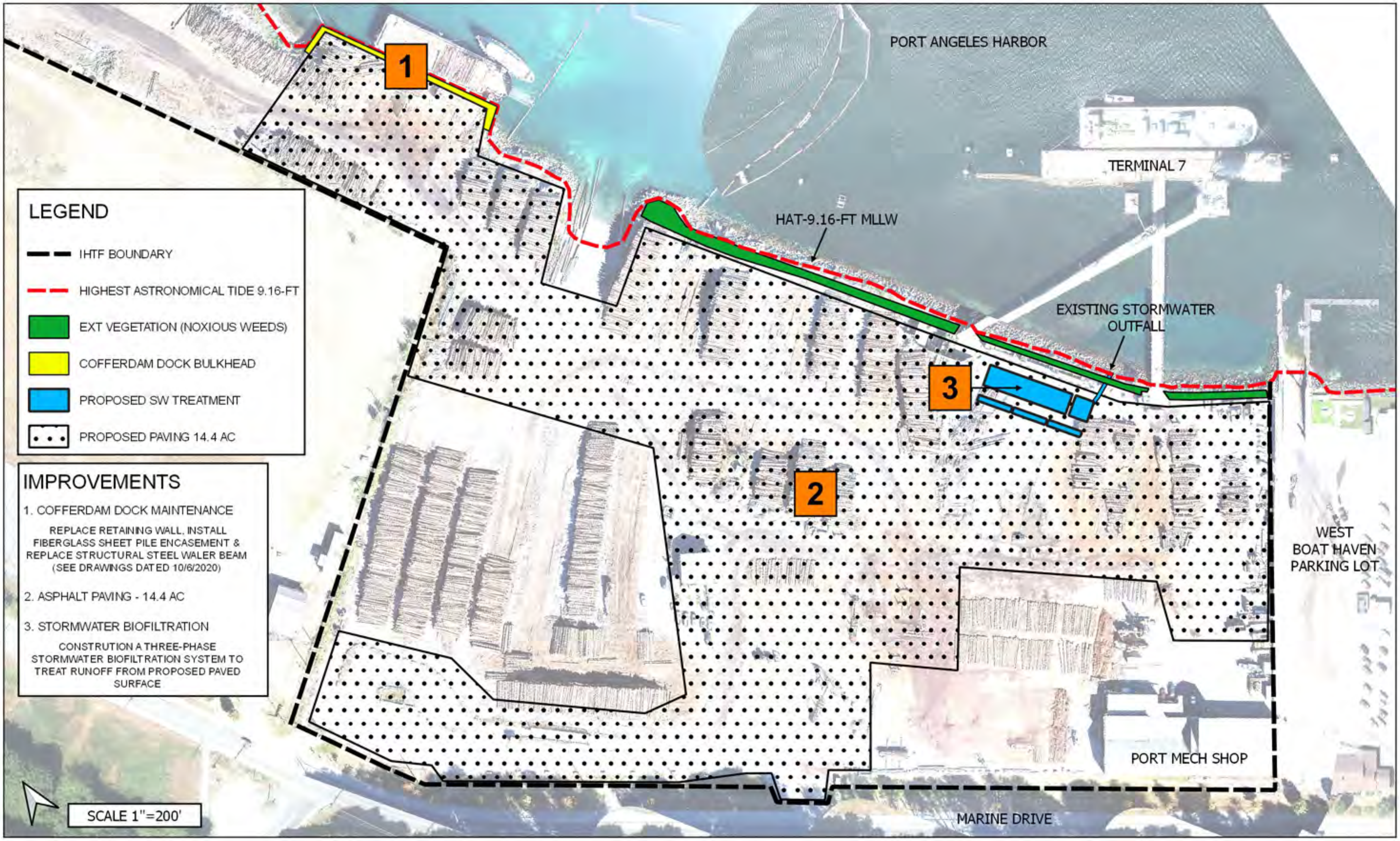
IN: ADJACENT TO PORT ANGELES HARBOR
AT: PORT OF PORT ANGELES LOG YARD, 1301 MARINE DRIVE
CITY: PORT ANGELES **COUNTY:** CLALLAM
STATE: WASHINGTON
APPLICATION BY: PORT OF PORT ANGELES
REFERENCE NO:

PURPOSE: IMPROVE CARGO HANDLING INFRASTRUCTURE AT IHTF THAT INCLUDES MAINTENANCE TO COFFERDAM DOCK, ASPHALT PAVING OF 14.4-ACRES AND CONSTRUCTION OF STORMWATER TREATMENT SYSTEM
SECTION: NW 4 **LAT:** 48.130634 N
TOWNSHIP: 30 N **LONG:** -123.460395 W
RANGE: 6 W **DATUM:** MLLW = 0.0'

INTERMODAL HANDLING AND TRANSFER FACILITY (IHTF) IMPROVEMENTS PROJECT

VICINITY MAP

DATE: 4/27/2023
SHEET: 01 OF 05



LEGEND

- — — IHTF BOUNDARY
- — — HIGHEST ASTRONOMICAL TIDE 9.16-FT
- 🟩 EXT VEGETATION (NOXIOUS WEEDS)
- 🟨 COFFERDAM DOCK BULKHEAD
- 🟦 PROPOSED SW TREATMENT
- ▨ PROPOSED PAVING 14.4 AC

IMPROVEMENTS

1. COFFERDAM DOCK MAINTENANCE

REPLACE RETAINING WALL, INSTALL FIBERGLASS SHEET PILE ENCASEMENT & REPLACE STRUCTURAL STEEL WALER BEAM (SEE DRAWINGS DATED 10/6/2020)

2. ASPHALT PAVING - 14.4 AC

3. STORMWATER BIOFILTRATION

CONSTRUTION A THREE-PHASE STORMWATER BIOFILTRATION SYSTEM TO TREAT RUNOFF FROM PROPOSED PAVED SURFACE

IN: ADJACENT TO PORT ANGELES HARBOR

AT: PORT OF PORT ANGELES LOG YARD, 1301 MARINE DRIVE

CITY: PORT ANGELES **COUNTY:** CLALLAM

STATE: WASHINGTON

APPLICATION BY: PORT OF PORT ANGELES

REFERENCE NO:

PURPOSE: IMPROVE CARGO HANDLING INFRASTRUCTURE AT IHTF THAT INCLUDES MAINTENANCE TO COFFERDAM DOCK, ASPHALT PAVING OF 14.4-ACRES AND CONSTRUCTION OF STORMWATER TREATMENT SYSTEM

SECTION: NW 4 **LAT:** 48.130634 N

TOWNSHIP: 30 N **LONG:** -123.460395 W

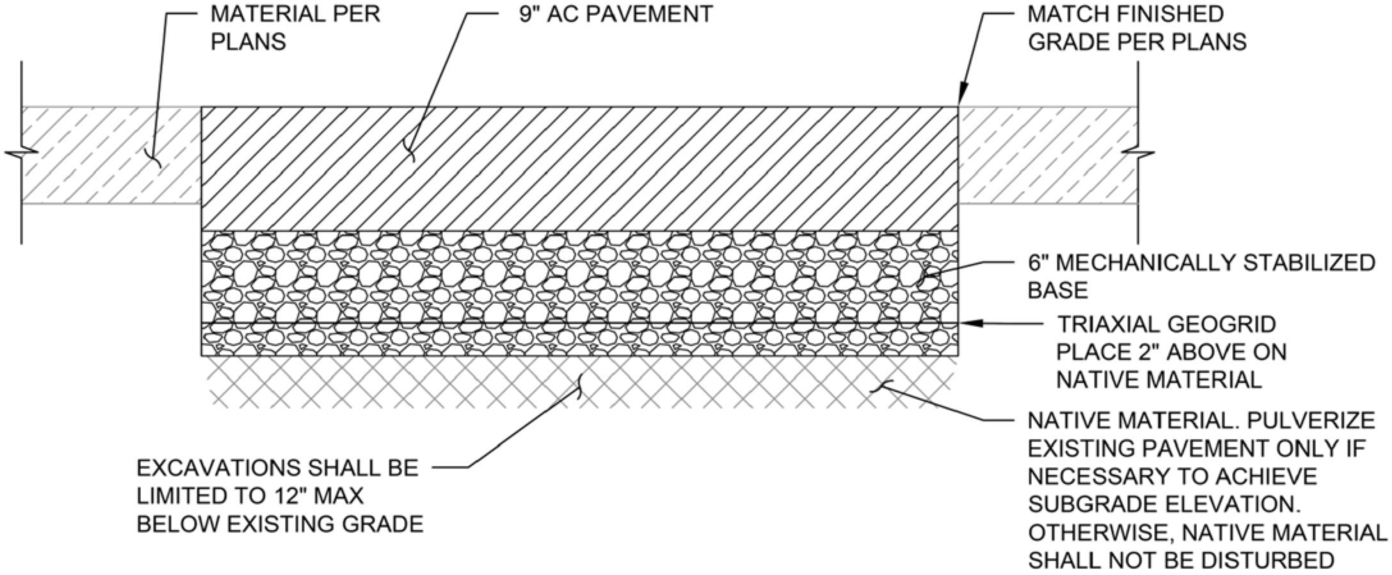
RANGE: 6 W **DATUM:** MLLW = 0.0'

INTERMODAL HANDLING AND TRANSFER FACILITY (IHTF) IMPROVEMENTS PROJECT

PROPOSED IMPROVEMENTS

DATE: 4/27/2023

SHEET: 02 OF 03



TYPICAL PAVEMENT SECTION - NTS

IN: ADJACENT TO PORT ANGELES HARBOR
AT: PORT OF PORT ANGELES LOG YARD, 1301 MARINE DRIVE
CITY: PORT ANGELES **COUNTY:** CLALLAM
STATE: WASHINGTON
APPLICATION BY: PORT OF PORT ANGELES
REFERENCE NO:

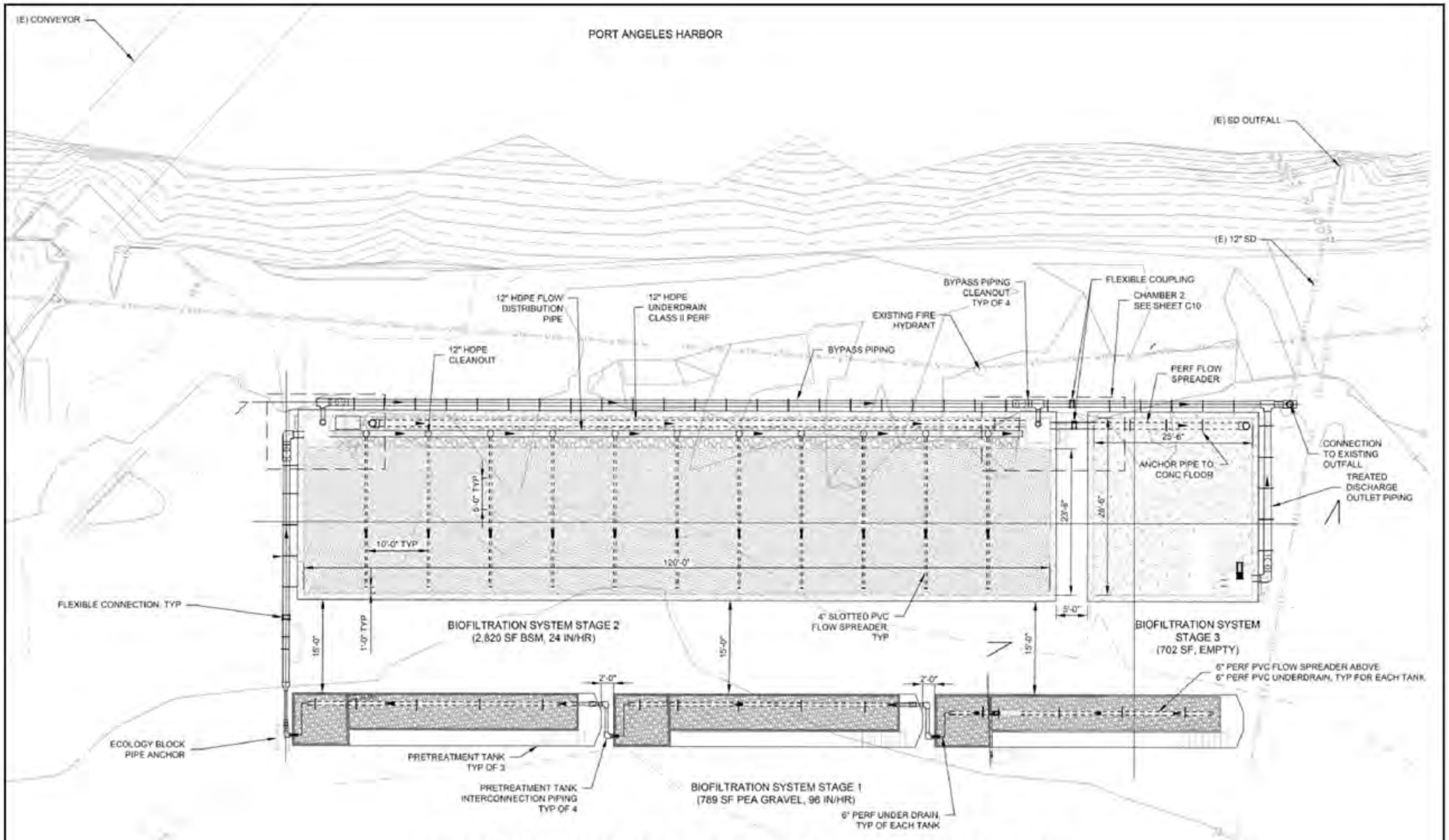
PURPOSE: IMPROVE CARGO HANDLING INFRASTRUCTURE AT IHTF THAT INCLUDES MAINTENANCE TO COFFERDAM DOCK, ASPHALT PAVING OF 14.4-ACRES AND CONSTRUCTION OF STORMWATER TREATMENT SYSTEM

SECTION: NW 4
TOWNSHIP: 30 N
RANGE: 6 W
LAT: 48.130634 N
LONG: -123.460395 W
DATUM: MLLW = 0.0'

INTERMODAL HANDLING AND TRANSFER FACILITY (IHTF) IMPROVEMENTS PROJECT

PAVEMENT SECTION

DATE: 4/27/2023
SHEET: 03 OF 05



STORMWATER BIOFILTRATION SYSTEM

5 10 20 30
1"=10'

▨ PEA GRAVEL
▨ BIOFILTRATION SOIL
☐ CONCRETE (EMPTY TANK)

IN: ADJACENT TO PORT ANGELES HARBOR
AT: PORT OF PORT ANGELES LOG YARD, 1301 MARINE DRIVE
CITY: PORT ANGELES **COUNTY:** CLALLAM
STATE: WASHINGTON
APPLICATION BY: PORT OF PORT ANGELES
REFERENCE NO:

PURPOSE: IMPROVE CARGO HANDLING INFRASTRUCTURE AT IHTF THAT INCLUDES MAINTENANCE TO COFFERDAM DOCK, ASPHALT PAVING OF 14.4-ACRES AND CONSTRUCTION OF STORMWATER TREATMENT SYSTEM

SECTION: NW 4
TOWNSHIP: 30 N
RANGE: 6 W
LAT: 48.130634 N
LONG: -123.460395 W
DATUM: MLLW = 0.0'

INTERMODAL HANDLING AND TRANSFER FACILITY (IHTF) IMPROVEMENTS PROJECT

STORMWATER BIOFILTRATION SYSTEM

DATE: 4/27/2023
SHEET: 04 OF 05

PHOTO1 - LOOKING WEST AT PROJECT AREA

PHOTO 4 - EXISTING SITE SURFACE

PHOTO 5 - EXISTING SITE SURFACE

PHOTO 2 - LOOKING SOUTH AT PROJECT AREA

PHOTO 3 - LOOKING SOUTH AT COFFER DAM DOCK

IN: ADJACENT TO PORT ANGELES HARBOR

AT: PORT OF PORT ANGELES LOG YARD, 1301 MARINE DRIVE

CITY: PORT ANGELES **COUNTY:** CLALLAM

STATE: WASHINGTON

APPLICATION BY: PORT OF PORT ANGELES

REFERENCE NO:

PURPOSE: IMPROVE CARGO HANDLING INFRASTRUCTURE AT IHTF THAT INCLUDES MAINTENANCE TO COFFERDAM DOCK, ASPHALT PAVING OF 14.4-ACRES AND CONSTRUCTION OF STORMWATER TREATMENT SYSTEM

SECTION: NW 4 **LAT:** 48.130634 N

TOWNSHIP: 30 N **LONG:** -123.460395 W

RANGE: 6 W **DATUM:** MLLW = 0.0'

INTERMODAL HANDLING AND TRANSFER FACILITY (IHTF) IMPROVEMENTS PROJECT

SITE PHOTOS

DATE: 4/27/2023

SHEET: 05 OF 05

APPENDIX D

Updated Species List

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: 11/25/2024 19:57:05 UTC
Project Code: 2025-0024122
Project Name: Port of Port Angeles Intermodal Handling and Transfer Facility Improvements 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:	2025-0024122
Project Name:	Port of Port Angeles Intermodal Handling and Transfer Facility Improvements Project
Project Type:	Port Operations
Project Description:	The Port of Port Angeles (Port) is proposing to improve the cargo handling infrastructure at its Intermodal Handling and Transfer Facility (IHTF) located at 1301 Marine Drive in Port Angeles. The existing waterfront IHTF is key in the inflow and outflow of wood fiber (whole logs and wood chips) from the sustainably managed private and public lands in Clallam and Jefferson Counties. The IHTF Improvements Project (Project) includes the following elements, which constitute the Project Area: 1. Cofferdam Dock Facility Improvements - The Cofferdam Dock Facility Improvement includes the following elements: 1) construction of a mechanically stabilized earth wall; 2) installation of fiberglass encasement sheets just waterward of the existing sheet pile bulkhead; and 3) replacement of a structural waler beam. 2. IHTF Phase 1Upland Site Improvements - The Project footprint, comprising approximlety 12 acres, will be regraded, and resurfaced with high-load capacity asphalt concrete. A stormwater treatment facility will also be constructed to support compliance with the Port's NPDES Industrial Stormwater General Permit (ISGP). Ground disturbance will be minimized by raising the ground elevation with the placement of crushed rock, installation of geogrid reinforcement, and placement of asphalt concrete pavement.

Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@48.128928,-123.4602869542968,14z

Counties: Clallam County, Washington

ENDANGERED SPECIES ACT SPECIES

There is a total of 7 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 Fisheries[1], 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.

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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.

BIRDS

NAME	STATUS
Marbled Murrelet *Brachyramphus marmoratus* 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
Short-tailed Albatross *Phoebastria (=Diomedea) albatrus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/433	Endangered
Yellow-billed Cuckoo *Coccyzus americanus* 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 *Actinemys marmorata* 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 *Salvelinus confluentus* Population: U.S.A., coterminous, lower 48 states There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8212	Threatened
Dolly Varden *Salvelinus malma* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1008	Proposed Similarity of Appearance (Threatened)

INSECTS

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

CRITICAL HABITATS

There is 1 critical habitat wholly or partially within your project area under this office's jurisdiction.

NAME	STATUS
Bull Trout *Salvelinus confluentus* https://ecos.fws.gov/ecp/species/8212#crithab	Final

IPAC USER CONTACT INFORMATION

Agency:	Port Angeles city
Name:	Jesse Waknitz
Address:	338 W. First Street
City:	Port Angeles
State:	WA
Zip:	98362
Email	jessew@portofpa.com
Phone:	3604601364

LEAD AGENCY CONTACT INFORMATION

Lead Agency:	Department of Transportation
Name:	Kristine Gilson
Email:	kristine.gilson@dot.gov
Phone:	2023361939

You have indicated that your project falls under or receives funding through the following special project authorities:

- BIPARTISAN INFRASTRUCTURE LAW (BIL) (OTHER)

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: May 01, 2023
Project Code: 2023-0076011
Project Name: Port of Port Angeles Intermodal Handling and Transfer Facility Improvements 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 ECOS-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 ECOS-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.

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http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.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/birds/policies-and-regulations.php.

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/birds/bird-enthusiasts/threats-to-birds.php.

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/birds/policies-and-regulations/executive-orders/e0-13186.php.

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:	2023-0076011
Project Name:	Port of Port Angeles Intermodal Handling and Transfer Facility Improvements Project
Project Type:	Bulkhead - Maintenance/Modification
Project Description:	The Port of Port Angeles (Port) is proposing to improve the cargo handling infrastructure at its Intermodal Handling and Transfer Facility (IHTF) located at 1301 Marine Drive in Port Angeles. The existing waterfront IHTF is key in the inflow and outflow of wood fiber (whole logs and wood chips) from the sustainably managed private and public lands in Clallam and Jefferson Counties. The IHTF Improvements Project (Project) includes the following elements, which constitute the Project Area: 1. Cofferdam Dock Facility Improvements - The Cofferdam Dock Facility Improvement includes the following elements: 1) construction of a mechanically stabilized earth wall; 2) installation of fiberglass encasement sheets just waterward of the existing sheet pile bulkhead; and 3) replacement of a structural waler beam. 2. IHTF Phase 1Upland Site Improvements - The Project footprint, comprising 14.4 acres, will be regraded, and resurfaced with high-load capacity asphalt concrete. A stormwater treatment facility will also be constructed to support compliance with the Port's NPDES Industrial Stormwater General Permit (ISGP). Ground disturbance will be minimized by raising the ground elevation with the placement of crushed rock, installation of geogrid reinforcement, and placement of asphalt concrete pavement.

Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@48.1292833,-123.45970168966363,14z

Counties: Clallam County, Washington

ENDANGERED SPECIES ACT SPECIES

There is a total of 7 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 Fisheries[1], 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.

BIRDS

NAME	STATUS
Marbled Murrelet *Brachyramphus marmoratus* 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
Short-tailed Albatross *Phoebastria (=Diomedea) albatrus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/433	Endangered
Yellow-billed Cuckoo *Coccyzus americanus* 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

FISHES

NAME	STATUS
Bull Trout *Salvelinus confluentus* Population: U.S.A., conterminous, lower 48 states There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8212	Threatened
Dolly Varden *Salvelinus malma* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1008	Proposed Similarity of Appearance (Threatened)

INSECTS

NAME	STATUS
Taylor's (=whulge) Checkerspot *Euphydryas editha taylori* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5907	Endangered

FLOWERING PLANTS

NAME	STATUS
Golden Paintbrush *Castilleja levisecta* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7706	Threatened

CRITICAL HABITATS

There is 1 critical habitat wholly or partially within your project area under this office's jurisdiction.

NAME	STATUS
Bull Trout *Salvelinus confluentus* https://ecos.fws.gov/ecp/species/8212#crithab	Final

IPAC USER CONTACT INFORMATION

Agency: Landau Associates
Name: Steven Quarterman
Address: Landau Associates
Address Line 2: 155 NE 100th Street, Suite 302
City: Seattle
State: WA
Zip: 98125
Email squarterman@landauinc.com
Phone: 4253290321

LEAD AGENCY CONTACT INFORMATION

Lead Agency: United States Maritime Administration

APPENDIX E

Selected Site Photographs

1. Barge unloading at cofferdam.

2. Existing surface conditions typical during winter months.

3. Area upland of cofferdam.

U.S. Department
of Transportation

**Maritime
Administration**

1200 New Jersey Avenue, SE
Washington, DC 20590

May 15, 2023

VIA ELECTRONIC MAIL

National Marine Fisheries Service
Oregon & Washington Coastal Area Office
Email: owco.wa.consultationrequest@noaa.gov

U.S. Fish and Wildlife Service
Washington Fish and Wildlife Office
Email: WashingtonFWO@fws.gov

RE: U.S. Department Transportation Maritime Administration
Informal Consultation Request
Port of Port Angeles, Intermodal Handling & Transfer Facility, Port Infrastructure Development
Program Grant No. 693JF72344020

To whom it may concern:

The U.S. Department of Transportation (DOT) Maritime Administration (MARAD) awarded funds to the Port of Port Angeles (Port) under the Port Infrastructure Development Program (PIDP) for improvements to the Port's Intermodal Handling & Transfer Facility (IHTF). The project is located in Port Angeles, Clallam County, Washington. The project location is entirely within an industrial property owned by the Port along the shoreline of Port Angeles Harbor. The property contains an existing full-service facility for all timber products including cargo loading, storage, roll-out, sorting, and transport.

The improvements to the IHTF include:

1) Cofferdam Dock Facility Improvements
    a. Remove and replace existing retaining wall with mechanically stabilized earth wall
    b. Install fiberglass sheet pile encasement
    c. Replace structural steel waler beam
2) IHTF Upland Site Improvements
    a. Raise existing surface elevation and construct high-load capacity asphalt concrete surface covering 14.4 acres for operational efficiency and stormwater conveyance.
    b. Construct a 3-stage biofiltration facility to treat stormwater from resurfaced IHTF prior to discharge to Port Angeles Harbor.

Please find attached the Biological Evaluation for the project conducted by Landau Associates and dated May 5, 2023. The conclusions found that the project may affect, but is not likely to adversely affect, the following species:

- Salmonids (Chinook and Chum salmon, bull trout, and steelhead trout) or their designated habitat
- Marbled murrelet
- Eulachon
- North American green sturgeon

- Southern resident killer whale critical habitat

Proposed and existing mitigation implemented for this project is detailed in the BE and include 1,500 linear feet of beach restoration on Ediz Hook completed for the Cofferdam Project and the water quality improvements resulting from proposed stormwater treatment at the project site.

In accordance with the Essential Fish Habitat (EFH) requirements of the Magnuson-Stevens Fishery Conservation and Management Act, the BE has determined that the proposed project is not likely to adversely affect EFH utilized by Pacific salmon, groundfish, and coastal pelagic species in Washington waters. An assessment of potential impacts to EFH is included with the BE.

This letter notifies you that for the purposes of this project, MARAD has authorized Port of Port Angeles (Port) to consult with your agency on our behalf. And please note that for Cofferdam Dock improvement portion of this project, ESA Section 7 consultation with the USACE as lead agency under NWS-2020-779 was initiated. Under this consultation the Services assigned the following reference numbers, INQ-2021-00094 and 01EWFW00-2021-I-1207. This USACE consultation request was withdrawn in December 2022 when MARAD grant funding was awarded for the project.

We ask for your concurrence on these findings and determination. The BE contains information on the proposed project. If further information is required, please contact Mr. Jesse Waknitz, Environmental Manager for the Port at jessew@portofpa.com or (360) 417-3452 (direct).

Sincerely,

Kris Gilson, REM, CHMM
Director
Office of Environmental Compliance
202.366.1939
kristine.gilson@dot.gov

Attachments: 1. Biological Evaluation and Essential Fish Habitat Evaluation Report for the Intermodal Handling and Transfer Facility Improvements Project, Port Angeles, WA, by Landau Associates, May 10, 2023.

From: Gilson, Kristine (MARAD)
To: Sara Tilley - NOAA Affiliate
Cc: Jesse Waknitz
Subject: P22 Port of Port Angeles consultation request (WCRO-2023-00672)
Date: Saturday, August 12, 2023 6:11:20 AM

Good morning,

With this email, MARAD requests to initiate formal consultation with the National Marine Fisheries Service (NMFS) under the provisions of Section 7 of the Endangered Species Act of 1973, as amended (ESA), related to WCRO-2023-00672 - Port of Port Angeles IHTF Improvements. This formal consultation request makes the following determinations not included in MARAD’s informal consultation request letter (Dated 5/15/2023):

- Likely to adversely affect for PS Chinook and their designated critical habitat, PS steelhead, Hood Canal summer-run chum, North American green sturgeon (southern DPS), and the designated critical habitat of Southern Resident Killer Whale.

- Not likely to adversely affect for Southern Resident Killer Whale, humpback whale (Mexico and Central America DPS), and eulachon (southern DPS).

If you have additional questions or comments, feel free to contact Jesse Waknitz, Environmental Manager at 360.460.1364 or via email at jessew@portofpa.com. I am also available if needed, however, we have previously delegated the port to consult on our behalf. Thanks.

Kris Gilson, REM, CHMM
Director
Office of Environmental Compliance, MAR-410.1
Maritime Administration
US Department of Transportation
Southeast Federal Center, West Bldg
1200 New Jersey Ave SE
Mail Drop #1
Washington, DC 20590
Phone 202-366-1939
Cell 202-603-2402
kristine.gilson@dot.gov

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Washington Fish and Wildlife Office
510 Desmond Dr. S.E., Suite 102
Lacey, Washington 98503

In Reply Refer to:
FWS/R1/2023-0076011

Kristine Gilson, Office of Environmental Compliance
U.S. Department of Transportation, Maritime Administration
ATTN: Jesse Waknitz
1200 New Jersey Avenue, SE
Washington, D.C., 20590

Dear Ms. Gilson:

Subject: Port of Port Angeles Intermodal Handling and Transfer Facility Improvements

This letter is in response to your May 15, 2023 request for our concurrence with your determination that your proposed action in the Port of Port Angeles (Port), Clallam County, Washington, "may affect, but is not likely to adversely affect" federally listed species. We received your letter, Biological Evaluation, project design drawings, and other supplemental materials providing information in support of "may affect, not likely to adversely affect" determinations, on May 17, 2023.

Specifically, you requested informal consultation pursuant to section 7(a)(2) of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (ESA) for the following federally listed species and designated critical habitat: marbled murrelet (*Brachyramphus marmoratus*), bull trout (*Salvelinus confluentus*) and designated critical habitat for the bull trout.

The U.S. Department of Transportation Maritime Administration (MARAD) has determined that the action will have "no effect" on additional listed species and designated critical habitat. The determination of "no effect" to listed resources rests with the action agency. The U.S. Fish and Wildlife Service (Service) has no regulatory or statutory authority for concurring with "no effect" determinations, and no consultation with the Service is required. We recommend that the action agency document their analysis on effects to listed species and maintain that documentation as part of the project file.

PACIFIC REGION 1

IDAHO, OREGON*, WASHINGTON,
AMERICAN SAMOA, GUAM, HAWAII, NORTHERN MARIANA ISLANDS

*PARTIAL

Project Description:

The MARAD proposes to authorize the Port of Port Angeles (Port) to perform upgrades to its cofferdam dock facility and install stormwater treatment on the adjacent Intermodal Handling and Transfer Facility (IHTF) located on in Port Angeles Waterfront in Port Angeles, Washington. The Port's Cofferdam Dock Facility was constructed in 2004 by the Washington State Department of Transportation (WSDOT) to support its Graving Dock Project. The Graving Dock Project was subsequently abandoned and ownership of the IHTF and Cofferdam Dock Facility were transferred to the Port in 2006. This cofferdam dock has since served as a temporary barge moorage for the loading and unloading of timber products. The sheetpile retaining wall along the shoreline margin of the cofferdam is currently corroding due to years of heavy industrial use and saltwater exposure. The Port of Port Angeles Intermodal Handling and Transfer Facility Improvement Project (Project) proposes to conduct maintenance and repair activities to the cofferdam structure, install a three-stage biofiltration facility to treat stormwater from the IHTF structure, and raise the surface elevation and repave 14.4 acres of the IHTF to improve operational efficiency and stormwater conveyance.

The existing Cofferdam Dock Facility is composed of a steel sheetpile wall running approximately 335 linear ft along the shoreline of Port Angeles Harbor. This sheetpile wall is tied back to a second, parallel sheetpile wall located approximately 30 ft (ft) landward. These sheetpile walls are connected by tie rods attached to a double channel waler beam above the High Tide Line and backfill between these walls consists of loose dirt fill and wood debris. Repairs to the Cofferdam Dock Facility will include the following components: constructing a mechanically stabilized earth (MSE) wall and backfilling the area with more structurally sound material, installing a 1.25-inch thick fiberglass encasement against the waterward sheetpile wall to address corrosion, and repairing the waler beams and tie rods connecting these walls to provide structural support.

Cofferdam Dock Facility upgrades will be performed utilizing excavators, dump trucks, and similar construction equipment. The Port or its contractor will excavate approximately 16,000 square ft of existing backfill material to a depth of 12 ft below ground surface. The removed material will be stockpiled onsite for future use or transported offsite to an approved upland disposal facility if it is unsuitable for reuse. Once excavation is complete, in-water work will begin by removing the existing waler beam and installing the fiberglass encasement using land-based excavators. Once the encasement has been installed, the gap between the encasement and the existing sheetpile wall will be dewatered and divers will connect the structures using grout. Once the fiberglass encasement has been secured, the replacement waler beams and end caps will be installed, backfill material will be placed to an elevation of +9 ft mean lower low water , and the MSE wall will be constructed. The MSE wall will be constructed using layers of compacted gravel (WSDOT standard) with sheets of geogrid reinforcement, quarry spalls, crushed surface base coarse rock, ecology blocks, and a 1-foot wide section of free draining rock to allow for stormwater infiltration and drainage.

The existing IHTF site is comprised of 30 acres of upland structure used for cargo handling, sorting, and staging. The current surface is a mixture of gravel and deteriorated asphalt and concrete, which has proven insufficient at addressing stormwater management, grounds maintenance, and equipment upkeep. The proposed upland repairs include the regrading and resurfacing of 14.4 acres of the IHTF with high-load capacity asphalt concrete. A three-stage biofiltration stormwater treatment facility will be constructed in this area to bring the Port into compliance with its National Pollutant Discharge Elimination System Industrial Stormwater General Permit. Stage 1 of the treatment facility will consist of a pea gravel filter medium that will be installed in three 18,000-gallon steel tanks. Stage 2 will filter stormwater through a biofiltration soil mix that will be placed in an aboveground, cast-in-place concrete retaining wall structure. Finally, stage 3 will include a polishing medium. Once this system has been installed, surface runoff from the IHTF will drain or sheet-flow into a pump station conveying flows into the biofiltration system and once treated, will discharge through an existing outfall pipe. These stormwater treatment upgrades will reduce the suspension of sediment and woody debris in runoff and improve the water quality of discharges into Port Angeles Harbor within the Puget Sound.

The applicant estimates that construction will begin in the summer of 2025 pending receipt of all necessary permits. In-water work will be performed consistent with allowable windows established by regulatory agencies to minimize potential disturbance of sensitive fish and wildlife species. Within Port Angeles Harbor, these work windows are expected to occur between July 15 and February 15. Upland improvements to the IHTF are expected to continue after February 15 into the Spring of 2026.

Sufficient information has been provided to determine the effects of the proposed action and to conclude whether it would adversely affect federally listed species and/or designated critical habitat. Our concurrence is based on information provided by the action agency, best available science, and complete and successful implementation of the conservation measures included by the action agency.

EFFECTS SPECIFIC TO MARBLED MURRELET AND BULL TROUT

The proposed action is located at an existing industrialized site and adjacent portions of Port Angeles Harbor. Much of the adjacent shoreline is highly modified, though there are more intact portions of natural shoreline along Ediz Hook. Industrialized waterfronts, over-steepened and armored banks, bulkheads, extensive operational and derelict overwater structures, sparse or nonexistent shoreline vegetation, and degraded sediment and water quality contribute to the low function of marine shoreline habitat conditions at the Project location.

Port Angeles Harbor is listed on the State of Washington’s 303(d) list of impaired waterbodies for bacteria exceedances. It has also been designated as impaired due to exceedances of several contaminants including mercury, polychlorinated biphenyls, and polycyclic aromatic hydrocarbons. The Project action area lies within the limits of the Washington State Department of Ecology’s Western Port Angeles Harbor Study Area, which is currently undergoing a Remedial Investigation/Feasibility Study to explore cleanup options.

The proposed action area provides functional but degraded marine foraging and loafing habitat for marbled murrelets. Natural forms of intertidal and subtidal habitat complexity are almost completely absent along the shoreline within the action area, though they are more intact along Ediz Hook. Although the baseline environmental conditions at the site are highly degraded, the action area is known to support moderate to high concentrations of marbled murrelets during both summer and winter months. Based upon location and baseline environmental conditions, we expect that marbled murrelets use the nearshore waters of Port Angeles Harbor regularly and in moderate numbers.

The Strait of Juan de Fuca, including Port Angeles Harbor, provides essential foraging, migrating, and overwintering (FMO) habitat for anadromous adult and subadult bull trout. The Strait of Juan de Fuca provides habitats that are crucial for maintaining bull trout life history diversity and access to productive foraging areas. Port Angeles Harbor is located between two of the Olympic Peninsula's larger and more robust bull trout core areas (i.e., the Elwha and Dungeness River bull trout core areas). Bull trout have also been documented in some of the Strait's minor tributaries close to Port Angeles, including Ennis, Bell, Siebert, and Morse Creeks. Based on these observations and the recent removal of the dams on the Elwha River, presence in the action area is probably least likely between October and February, when most mature bull trout have returned to their natal waters to spawn and overwinter. Based upon location and baseline environmental conditions, we expect that bull trout use the action area regularly and in low or moderate numbers.

Temporary exposures resulting in injury or mortality to marbled murrelets or bull trout are extremely unlikely, and therefore considered discountable. No vibratory or impact pile driving or proofing is proposed. Elevated in-air and underwater sound caused by the placement of the fiberglass encasement by an excavator will be limited in intensity, duration, and physical extent. In-air sound levels sufficient to mask marbled murrelet vocalizations and disrupt normal behaviors (i.e., the ability to feed, move, and/or shelter) will extend less than 100 ft The Service concludes that the foreseeable temporary exposures and effects to marbled murrelets are unlikely to elicit anything more than a mild behavioral response. The Service also concludes that the foreseeable temporary exposures and effects to bull trout are unlikely to elicit anything more than a mild behavioral response. Therefore, temporary exposures and effects to both species are considered insignificant.

The proposed action will have unavoidable impacts to substrates, benthos, and water quality, and construction activities will result in measurable temporary disturbance due to the installation of the fiberglass encasement. This localized turbidity may extend up to 150 ft from the fiberglass encasement and up to 200 ft from the existing stormwater outfall, per the mixing zones outlined in Washington Administrative Codes 173-201A-210 and 173-201A-400. These impacts will not extend to the eelgrass beds or forage fish spawning habitat documented along Ediz Hook and within Port Angeles Harbor. Any temporary impacts to water quality will be limited in intensity, duration, and physical extent.

The proposed action will result in little change to the features and footprint of existing in-water structures and will provide measurable long-term benefits in the form of improved source control and treatment of industrial site stormwater runoff. The effects of the proposed action, temporary and permanent, will not prevent marbled murrelets or bull trout from successfully foraging in the action area. The proposed action will have no measurable effects, or will have only measurable beneficial effects, to the marbled murrelet, bull trout, their habitat, and prey resources. The Service concludes that the direct and indirect, long-term effects of the proposed action are therefore considered insignificant.

EFFECTS TO BULL TROUT DESIGNATED CRITICAL HABITAT

The Final rule designating bull trout critical habitat (75 FR 63898 [October 18, 2010]) identifies nine Primary Constituent Elements (PCEs) essential for the conservation of the species. The 2010 designation of critical habitat for bull trout uses the term PCE. The new critical habitat regulations (81 FR 7214) replace this term with physical or biological features (PBFs). This shift in terminology does not change the approach used in conducting our analyses, whether the original designation identified PCEs, PBFs, or essential features. In this letter, the term PCE is synonymous with PBF or essential features of critical habitat.

The Strait of Juan de Fuca, including Port of Port Angeles Harbor, has been designated as critical habitat for the bull trout and provides essential FMO habitat. The Strait of Juan de Fuca also provides essential migratory habitat for several anadromous salmonids and is therefore also essential to maintaining the bull trout prey base.

The proposed action may affect the PCEs listed below. However, the action’s unavoidable impacts to FMO habitat, and the PCEs of the designated bull trout critical habitat, are limited in physical extent and/or duration, and are therefore considered insignificant.

PCE 1: *Springs, seeps, groundwater sources, and subsurface water connectivity (hyporheic flows) to contribute to water quality and quantity and to provide thermal refugia.*

The action will have no effect on this PCE.

PCE 2: *Migration habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including but not limited to permanent, partial, intermittent, or seasonal barriers.*

The action may temporarily introduce an impediment or barrier within migration habitat; i.e., elevated turbidity associated with placement of the fiberglass encasement. These effects will be limited in physical extent, limited in duration, and intermittent. The Port and their contractor(s) will utilize an excavator to place the fiberglass encasement into the mudline. No vibratory or impact pile drivers will be used and associated in-water work, such as the shifting of riprap, will occur in the dry to the maximum practicable extent. Furthermore, once the Project has been completed, the stormwater treatment upgrades will result in beneficial effects to the condition of this PCE due to water quality improvements. The action's foreseeable, persistent, and long-term effects are insignificant. With full and successful implementation of the proposed conservation measures, effects to this PCE are considered insignificant.

PCE 3: *An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.*

The Port's facilities are substantially developed and support a variety of commercial and industrial activities. The shoreline is mostly or completely developed, and there is little functioning riparian vegetation. Current baseline conditions are substantially degraded, and habitat functions (e.g., prey base support) are impaired. The proposed action would not substantially extend impacts beyond the existing footprint, as the fiberglass encasement will be flush with the existing sheetpile wall and is only 1.25-inch thick. Furthermore, the turbidity generated from in-water work will not extend to the higher quality forage habitat along Ediz Hook. We expect that the proposed action will not further degrade or extend impacts into unaltered areas of designated critical habitat for bull trout and will not measurably reduce bull trout prey and the bull trout prey base; therefore, effects to this PCE are considered insignificant.

PCE 4: *Complex river, stream, lake, reservoir, and marine shoreline aquatic environments, and processes that establish and maintain these aquatic environments, with features such as large wood, side channels, pools, undercut banks, and unembedded substrates to provide a variety of depths, gradients, velocities, and structure.*

Port Angeles Harbor within the action area is substantially developed and supports a variety of commercial and industrial activities. The shoreline of the Port Angeles Waterfront is mostly or completely developed and there is little functioning riparian vegetation, though nearshore habitat on the adjacent Ediz Hook is more functional. Current baseline conditions are substantially degraded and habitat functions are impaired. The proposed action would not significantly extend impacts beyond the existing footprint of the Cofferdam Dock Facility's sheetpile wall, as the new fiberglass encasement will extend 1.25 inches further waterward. We expect that the proposed action will not further degrade or remove features of this aquatic environment beyond the baseline environmental conditions; therefore, effects to this PCE are considered insignificant.

PCE 5: *Water temperatures ranging from 2 to 15 °C (36 to 49 °F), with adequate thermal refugia available for temperatures that exceed the upper end of this range. Specific temperatures within this range will depend on bull trout life-history stage and form; geography; elevation; diurnal and seasonal variation; shading, such as that provided by riparian habitat; streamflow; and local groundwater influence.*

The action will have no effect on this PCE.

PCE 6: *In spawning and rearing areas, substrate of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergency, and young-of-the-year and juvenile survival. This includes ensuring there is a minimal amount of fine sediment, generally ranging in size from silt to coarse sand, embedded in larger substrates, which is characteristic of these conditions. The size and amounts of fine sediment suitable to bull trout would likely vary from system to system.*

The action will have no effect on this PCE.

PCE 7: *A natural hydrograph, including peak, high, low, and base flows within historic and seasonal ranges, or, if flows are controlled, minimal flow departure from a natural hydrograph.*

The action will have no effect on this PCE.

PCE 8: *Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.*

The Port facilities are substantially developed and support a variety of commercial and industrial activities. Current baseline conditions are substantially degraded and habitat functions are impaired. Port Angeles Harbor is listed on the State of Washington's 303(d) list of impaired waterbodies and the action area lies within the limits of the Washington State Department of Ecology's Western Port Angeles Harbor Study Area, which is currently undergoing a Remedial Investigation/Feasibility Study to explore cleanup options. The proposed action may temporarily introduce water quality impairments due to elevated turbidity, potential resuspension of contaminants within the water column, and the potential for construction machinery to leak oil or pollutants into the harbor. These effects will be limited in physical extent, limited in duration, and intermittent. The Port and their contractor(s) will utilize in-water containment booms and implement a project-specific Temporary Erosion and Sediment Control Plan and a Stormwater Pollution and Prevention Plan to minimize water quality impacts and discharge of debris into the harbor. With full and successful implementation of the proposed conservation measures, effects to this PCE are considered insignificant and/or discountable. Upon completion of the Project, the function of this PCE will improve due to stormwater treatment upgrades.

PCE 9: *Sufficiently low levels of occurrence of nonnative predatory (e.g., lake trout, walleye, northern pike, smallmouth bass); interbreeding (e.g., brook trout); or competing (e.g., brown trout) species that, if present, are adequately temporally and spatially isolated from bull trout.*

The action will have no effect on this PCE.

CONCLUSION

This concludes consultation pursuant to the regulations implementing the ESA. Our review and concurrence with your effect determination is based on the implementation of the action as described. It is the responsibility of the Federal action agency to ensure that the actions they authorize or carry out are in compliance with the regulatory permit and ESA. If a permittee or the Federal action agency deviates from the measures outlined in a permit or project description, the Federal action agency has an obligation to reinitiate consultation and comply with section 7(d).

This action should be re-analyzed and re-initiation may be necessary if 1) new information reveals effects of the action that may affect listed species or critical habitat in a manner, or to an extent, not considered in this consultation, 2) if the action is subsequently modified in a manner that causes an effect to a listed species or critical habitat that was not considered in this consultation, and/or 3) a new species is listed or critical habitat is designated that may be affected by this action.
This letter constitutes a complete response by the Service to your request for consultation. A complete record of this consultation is on file at the Washington Fish and Wildlife Office, in Lacey, Washington. If you have any questions about this letter or our shared responsibilities under the ESA, please contact the consulting biologist or supervisor identified below.

U.S. Fish and Wildlife Service Consultation Biologist(s):
Sara Tilley (sara_tilley@fws.gov)
Joshua Emery (joshua_emery@fws.gov)

Sincerely,

JOSHUA EMERY
Digitally signed by JOSHUA EMERY
Date: 2024.01.22 08:33:38 -08'00'

For Brad Thompson, State Supervisor
Washington Fish and Wildlife Office

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
1201 NE Lloyd Boulevard, Suite 1100
PORTLAND, OR 97232-1274

Refer to NMFS No:
WCRO-2023-00672

March 20, 2024

Kristine Gilson
United States Maritime Administration (MARAD)
Senior Environmental Specialist
505 S. 336th St.
Federal Way, Washington 98422

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Port of Port Angeles Intermodal Handling and Transfer Facility Improvements Project

Dear Ms. Gilson:

Thank you for your letter of August 11, 2023, requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for the Port of Port Angeles Intermodal Handling and Transfer Facility Improvements project. Thank you, also, for your request for consultation pursuant to the essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson–Stevens Fishery Conservation and Management Act [16 U.S.C. 1855(b)] for this action.

In this opinion, NMFS concludes that the proposed action is not likely to jeopardize the continued existence or result in adverse modification of designated critical habitat for the following species:

- *Oncorhynchus keta*: Hood Canal summer-run (HCSR) chum
- *O. mykiss:* Puget Sound (PS) steelhead
- *O. tshawytscha:* PS Chinook salmon and their critical habitat

We also conclude that the proposed action is not likely to adversely affect the following species and critical habitat:

- *Acipenser mediostris*: Southern distinct population of North American green sturgeon
- *Thaleichthys pacificus*: Southern distinct population of eulachon
- *Megaptera novaeangliae*: Central America distinct population and Mexico distinct population of humpback whale
- *Orcinus orca: Southern Resident Killer Whale (*SRKW) or its designated critical habitat

As required by Section 7 of the Endangered Species Act, the NMFS provided an incidental take statement with the biological opinion. The incidental take statement describes reasonable and prudent measures the NMFS considers necessary or appropriate to minimize incidental take associated with this action. The take statement sets forth nondiscretionary terms and conditions. Incidental take from actions that meet the term and condition will be exempt from the Endangered Species Act take prohibition.

NMFS also reviewed the likely effects of the proposed action on essential fish habitat (EFH), pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1855(b)), and concluded that the action would adversely affect the EFH of Pacific Coast salmon, Pacific Coast groundfish, and coastal pelagic species. Therefore, we have included the results of that review in Section 3 of this document.

Please contact Bonnie Shorin, of the Oregon Washington Coastal Office in Lacey, Washington, at bonnie.shorin@noaa.gov, if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

Kim W. Kratz, Ph.D
Assistant Regional Administrator
Oregon Washington Coastal Office

cc: Jesse Waknitz, Port of Port Angeles

Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion [and Magnuson–Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the

Port of Port Angeles Intermodal Handling and Transfer Facility Improvement Project

NMFS Consultation Number: WCRO-2023-00672

Action Agency: USDOT - MARAD

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely to Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely to Destroy or Adversely Modify Critical Habitat?
North American green sturgeon, southern DPS (*Acipenser mediostris)*	Threatened	No	N/A	No	N/A
Hood Canal summer-run (HCSR) chum (*Oncorhynchus keta*)	Threatened	Yes	No	No	N/A
PS steelhead (*O. mykiss*)	Threatened	Yes	No	No	N/A
PS Chinook salmon (*O. tshawytscha*)	Threatened	Yes	No	Yes	No
Eulachon, Southern DPS *(Thaleichthys pacificus)*	Threatened	No	N/A	No	N/A
Southern Resident Killer Whale (SRKW) (*Orcinus orca*)	Endangered	No	N/A	No	N/A
Humpback Whale (*Megaptera novaeangliae*) (Central America DPS/Mexico DPS)	CAM (Endangered) MEX (Threatened)	No	N/A	No	N/A

Fishery Management Plan That Identifies EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon	Yes	Yes
Pacific Coast Groundfish	Yes	Yes
Coastal Pelagic Species	Yes	Yes

Consultation Conducted By: National Marine Fisheries Service, West Coast Region

Issued By:

Kim W. Kratz, Ph.D
Assistant Regional Administrator
Oregon Washington Coastal Office

Date: March 20, 2024

TABLE OF CONTENTS

1. INTRODUCTION

This Introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3, below.

1.1 Background

The National Marine Fisheries Service (NMFS) prepared the biological opinion (opinion) and incidental take statement (ITS) portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 et seq.), as amended, and implementing regulations at 50 CFR part 402.

We also completed an essential fish habitat (EFH) consultation on the proposed action, in accordance with section 305(b)(2) of the Magnuson–Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 et seq.) and implementing regulations at 50 CFR part 600.

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. A complete record of this consultation is on file at Lacey, Washington.

1.2 Consultation History

On May 27, 2021, the U.S. Army Corps of Engineers (USACE) submitted a request for consultation to NMFS for repair of the Port of Port Angeles Cofferdam Dock Facility. On June 1, 2021, the NMFS responded that the Project was potentially suitable for the Salish Sea Nearshore Programmatic (SSNP).

In December, 2022, the Port of Port Angeles (Port) received grant funding for this Project from the U.S. Department of Transportation (USDOT) Maritime Administration (MARAD). MARAD subsequently became the new lead federal action agency for the Port's Cofferdam Dock Facility Project and the USACE withdrew its request for consultation on December 7, 2022.

On May 15, 2023, MARAD submitted a request for informal consultation to NMFS for the proposed action, which includes the Project activities described in the original consultation request in addition to upland facility improvements.

On August 11, 2023, MARAD revised their consultation request to a request for formal consultation on Puget Sound (PS) Chinook salmon and their designated critical habitat, PS steelhead, HCSR chum, the southern DPS of North American green sturgeon, and the designated critical habitat for Southern Resident Killer Whale (SRKW). On August 14, 2023, NMFS initiated the formal consultation, concurring with the "likely to adversely affect" determinations for all but the North American green sturgeon and SRKW critical habitat. NMFS' analyses are included in Section 2.11 of this document.

On July 5, 2022, the U.S. District Court for the Northern District of California issued an order vacating the 2019 regulations that were revised or added to 50 CFR part 402 in 2019 (“2019 Regulations,” see 84 FR 44976, August 27, 2019) without making a finding on the merits. On September 21, 2022, the U.S. Court of Appeals for the Ninth Circuit granted a temporary stay of the district court’s July 5 order. On November 14, 2022, the Northern District of California issued an order granting the government’s request for voluntary remand without vacating the 2019 regulations. The District Court issued a slightly amended order two days later on November 16, 2022. As a result, the 2019 regulations remain in effect, and we are applying the 2019 regulations here. For purposes of this consultation and in an abundance of caution, we considered whether the substantive analysis and conclusions articulated in the biological opinion and incidental take statement would be any different under the pre-2019 regulations. We have determined that our analysis and conclusions would not be any different.

1.3 Proposed Federal Action

Under the ESA, “action” means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (see 50 CFR 402.02). Under MSA, federal action means any action authorized, funded, or undertaken, or proposed to be authorized, funded or undertaken by a federal agency (50 CFR 600.910).

MARAD has awarded federal funding to the Port of Port Angeles (Port) to perform upgrades to its Cofferdam Dock Facility and install stormwater treatment on the adjacent Intermodal Handling and Transfer Facility (IHTF) located along the Port Angeles Waterfront in Port Angeles, Washington. The Port’s Cofferdam Dock Facility was constructed in 2004 by the Washington State Department of Transportation (WSDOT) to support its Graving Dock Project. The Graving Dock Project was subsequently abandoned and ownership of the IHTF and Cofferdam Dock Facility were transferred to the Port in 2006. This cofferdam dock has since served as a temporary barge moorage for the loading and unloading of timber products. The sheetpile retaining wall along the shoreline margin of the cofferdam is currently corroding due to years of heavy industrial use and saltwater exposure. The Port of Port Angeles Intermodal Handling and Transfer Facility Improvement Project (Project) proposes to conduct maintenance and repair activities to the cofferdam structure, install a three-stage biofiltration facility to treat stormwater from the IHTF structure, and raise the surface elevation and repave 14.4 acres of the IHTF to improve operational efficiency and stormwater conveyance.

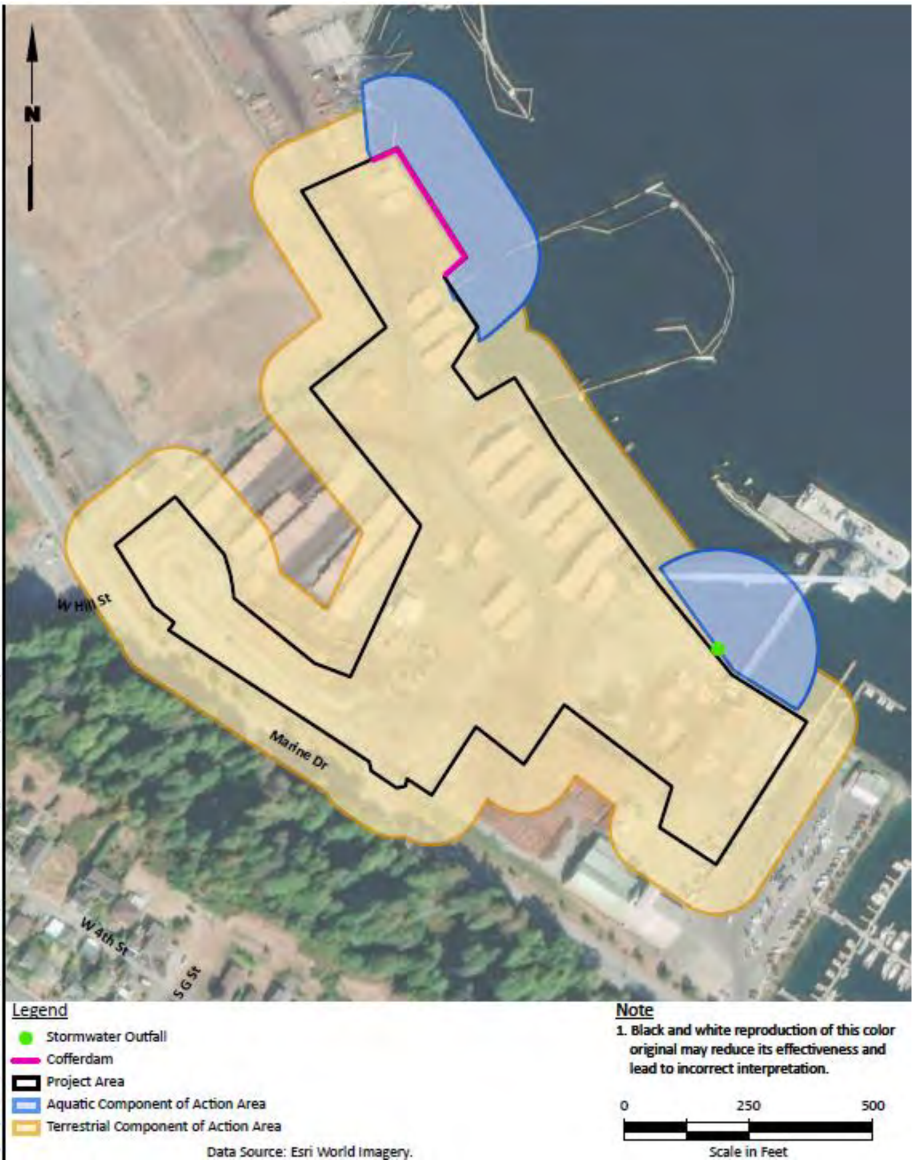

Figure 1. Image of map from BE showing upland and in-water components of Project

The existing Cofferdam Dock Facility is composed of a steel sheetpile wall running approximately 335 linear feet (LF) along the shoreline of Port Angeles Harbor. This sheetpile wall is tied back to a second, parallel sheetpile wall located approximately 30 feet (ft.) landward. These sheetpile walls are connected by tie rods attached to a double channel waler beam above the Highest Astronomical Tide (HAT) and backfill between these walls consists of loose dirt fill and wood debris. Repairs to the Cofferdam Dock Facility will include the following components: constructing a mechanically stabilized earth (MSE) wall and backfilling the area with more structurally sound material, installing a 1.25-inch thick fiberglass encasement against the waterward sheetpile wall to address corrosion, and repairing the waler beams and tie rods connecting these walls to provide structural support.

The existing IHTF site is composed of 30 acres of upland structure used for cargo handling, sorting, and staging. The current surface is a mixture of gravel and deteriorated asphalt and concrete, which has proven insufficient at addressing stormwater management, grounds maintenance, and equipment upkeep. The proposed upland repairs include the regrading and resurfacing of 14.4 acres of the IHTF with high-load capacity asphalt concrete. A three-stage biofiltration stormwater treatment facility will be constructed in this area to bring the Port into compliance with its National Pollutant Discharge Elimination System (NPDES) Industrial Stormwater General Permit. Stage 1 of the treatment facility will consist of a pea gravel filter medium that will be installed in three 18,000-gallon steel tanks. Stage 2 will filter stormwater through a biofiltration soil mix that will be placed in an aboveground, cast-in-place concrete retaining wall structure. Finally, stage 3 will include a polishing medium. Once this system has been installed, surface runoff from the IHTF will drain or sheet-flow into a pump station conveying flows into the biofiltration system and once treated, will discharge into Port Angeles Harbor through an existing outfall pipe.

The current adverse sub-lethal effect threshold in salmonids for dissolved zinc is 5.6 micrograms per liter (µg/L) over background zinc concentrations between 3.0 µg/L and 13 µg/L, and the adverse sub-lethal effect threshold in salmonids for dissolved copper is 2.0 µg/L over background levels of 3.0 µg/L or less. The biofiltration facility is designed to treat total suspended solids, turbidity, zinc, copper, and chemical oxygen demand. Pilot testing of a similar facility at the Port found that a similar three-stage stormwater treatment system provided approximately 90 percent reduction in total copper and zinc concentrations in runoff. These stormwater treatment upgrades will reduce the suspension of sediment and woody debris in runoff and improve the water quality of discharges into Port Angeles Harbor within the Strait of Juan de Fuca.

<u>Construction Methods</u>

Cofferdam Dock Facility upgrades will be performed utilizing excavators, dump trucks, and similar construction equipment. The Port or its contractor will excavate approximately 16,000square feet (SF) of existing backfill material to a depth of 12 ft. below ground surface. The removed material will be stockpiled onsite for future use or transported offsite to an approved upland disposal facility if it is unsuitable for reuse. Once excavation is complete, in-water work will begin by removing the existing waler beam and installing the fiberglass encasement using land-based excavators. Once the encasement has been installed, the gap between the encasement and the existing sheetpile wall will be dewatered and divers will connect the structures using grout. Once the fiberglass encasement has been secured, the replacement waler beams and endcaps will be installed, backfill material will be placed to an elevation of +9 ft. mean lower low water (MLLW), and the MSE wall will be constructed. The MSE wall will be constructed using layers of compacted gravel (WSDOT standard) with sheets of geogrid reinforcement, quarry spalls, crushed surface base coarse rock, ecology blocks, and a 1-foot wide section of free draining rock to allow for stormwater infiltration and drainage.

The upland IHTF work will be performed utilizing excavators, dump trucks, graders, and other construction equipment. 14.4 acres of the Log Yard will be regraded and resurfaced with a high-load capacity asphalt concrete and the construction of the stormwater biofiltration system. Ground disturbance will be minimized by raising the ground elevation with the placement of crushed rock, installation of geogrid reinforcement, and asphalt concrete pavement. The clean fill material and pavement capping will encapsulate existing contaminated soil and groundwater, and mitigate contaminant mobilization risk from runoff. The stormwater biofiltration system will be constructed above grade and any excavations will be limited to maximum depths of 12 inches below ground surface. The existing storage warehouse and electrical building will be demolished and removed.

Project Timing

The applicant estimates that construction will begin in the summer of 2025 pending receipt of all necessary permits. In-water work will be performed consistent with allowable windows established by regulatory agencies to minimize potential disturbance of sensitive fish and wildlife species. Within Port Angeles Harbor, these work windows are expected to occur between July 15 and February 15. Upland improvements to the IHTF are expected to continue after February 15 into the Spring of 2026.

Best Management Practices

Best management practices (BMPs) have been incorporated into the Project design to avoid or minimize environmental effects and the exposure of sensitive species to potential effects from the proposed Project activities. The following BMPs would be implemented to avoid or minimize environmental impacts during the Project:

1. In-water work*:*
    - To minimize the presence of ESA-listed species, all in-water work would be conducted between July 15 and February 15 (when outmigrating juvenile salmonids are less likely to be present).
    - Placement of the fiberglass encasement will be completed during this in-water window. Once the encasement is installed, the small gap between it and the sheetpile wall will be dewatered using a sump pump and transported upland. The water will not be discharged directly back to the harbor, and instead will either be infiltrated on-site, beneficially reused, or hauled off-site, per the decision of the Port and its contractor.
    - Any shifting of riprap necessitated by the installation of the encasement will occur in the dry.

2. Equipment and fueling:
   All equipment will be cleaned and inspected prior to arriving at the Project site to ensure no potentially hazardous materials are introduced, no leaks are present, and the equipment is functioning properly.

3. Debris containment:
   A temporary floating debris boom will be deployed waterward of the loading structure to capture potential debris during Project construction; the debris boom will be anchored to the shore above the HAT.

4. Stockpiling:
   Stockpiles will be mounded in a way to prevent runoff and covered in reinforced plastic sheeting.

5. Erosion Control:
   A Project-specific Temporary Erosion and Sediment Control plan will be developed and implemented. Examples of applicable BMPs include, but are not limited to, the following: maintain the existing plugged catch basin, comply with measures from a Project-specific stormwater pollution prevention plan, and establish a filter fabric construction fence around the site with a 4-inch by 4-inch trench and stabilized construction entrances.

We considered, under the ESA, whether or not the proposed action would cause any other activities and determined that repairs to the Cofferdam Dock Facility would cause the enduring presence of cargo vessel use at this berth that would not occur but for the proposed action.

2. ENDANGERED SPECIES ACT BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by section 7(a)(2) of the ESA, each Federal agency must ensure that its actions are not likely to jeopardize the continued existence of endangered or threatened species or to adversely modify or destroy their designated critical habitat. Per the requirements of the ESA, Federal action agencies consult with NMFS, and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provide an opinion stating how the agency's actions would affect listed species and their critical habitats. If incidental take is reasonably certain to occur, section 7(b)(4) requires NMFS to provide an ITS that specifies the impact of any incidental taking and includes reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

MARAD determined the proposed action is not likely to adversely affect either DPS of humpback whales, SRKW, or the southern DPS of eulachon. Our concurrence, as well as our determinations for North American green sturgeon and the designated critical habitat for SRKW, is documented in the "Not Likely to Adversely Affect" Determinations section (Section 2.11).

2.1 Analytical Approach

This biological opinion includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "jeopardize the continued existence of" a listed species, which is "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

This biological opinion also relies on the regulatory definition of "destruction or adverse modification," which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species" (50 CFR 402.02).

The designation of critical habitat for PS Chinook salmon use the term primary constituent element (PCE) or essential features. The 2016 final rule (81 FR 7414; February 11, 2016) that revised the critical habitat regulations (50 CFR 424.12) replaced this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a "destruction or adverse modification" analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

The ESA Section 7 implementing regulations define effects of the action using the term "consequences" (50 CFR 402.02). As explained in the preamble to the final rule revising the definition and adding this term (84 FR 44976, 44977; August 27, 2019), that revision does not change the scope of our analysis, and in this opinion we use the terms "effects" and "consequences" interchangeably.

We use the following approach to determine whether a proposed action is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Evaluate the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Evaluate the environmental baseline of the species and critical habitat.
- Evaluate the effects of the proposed action on species and their critical habitat using an exposure–response approach.
- Evaluate cumulative effects.
- In the integration and synthesis, add the effects of the action and cumulative effects to the environmental baseline, and, in light of the status of the species and critical habitat, analyze whether the proposed action is likely to: (1) directly or indirectly reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species; or (2) directly or indirectly result in an alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species.
- If necessary, suggest a reasonable and prudent alternative to the proposed action.

As the proposed action is within the Salish Sea, NMFS considered evaluating the Project using a Habitat Equivalency Analysis (HEA)[1] and the Puget Sound Nearshore Habitat Values Model

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[1] A common "habitat currency" to quantify habitat impacts or gains can be calculated using Habitat Equivalency Analysis (HEA) methodology when used with a tool to consistently determine the habitat value of the affected area before and after impact. NMFS selected HEA as a means to identify section 7 project related habitat losses, gains, and quantify appropriate mitigation because of its long use by NOAA in natural resource damage assessment to scale compensatory restoration (Dunford et al. 2004; Thur 2006) and extensive independent literature on the model (Milon and Dodge 2001; Cacela et al. 2005; Strange et al. 2002). In Washington State, NMFS has also expanded the use of HEA to calculate conservation credits available from fish conservation banks (NMFS 2008, NMFS 2015),

(NHVM) adapted from Ehinger et al. 2015. Ecological equivalency that forms the basis of HEA is a concept that uses a common currency to express and assign a value to functional habitat loss and gain. Ecological equivalency is traditionally a service-to-service approach where the ecological functions and services for a species or group of species lost from an impacting activity are fully offset by the services gained from a conservation activity.

When analyzing the Project activities, NMFS determined that the NHVM in its current version was not the best tool to evaluate the site conditions and potential habitat loss associated with the proposed action. This is due to a variety of factors, including the Project setting estuarine system) and the Project elements (stormwater treatment upgrades and the Cofferdam Dock sheetpile encasement) that cannot be easily assessed within the current model. There is no current mechanism to analyze the benefits of stormwater treatment upgrades within the NHVM. Therefore, NMFS evaluated the long-term effects from the Project activities qualitatively in Section 2.5 (Effects of the Action) below. NMFS determined that the functional lift provided by upgraded stormwater treatment to 14.4 acres of the IHTF would sufficiently offset the Project impacts, resulting in no-net-loss of ecological functions.

2.2 Rangewide Status of the Species and Critical Habitat

This opinion examines the status of each species that would be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR 402.02. The opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area, and discusses the current function of the essential PBFs that help to form that conservation value.

One factor affecting the status of ESA-listed species considered in this opinion, and aquatic habitat at large, is climate change. Climate change is likely to play an increasingly important role in determining the abundance and distribution of ESA-listed species, and the conservation value of designated critical habitats, in the Pacific Northwest. These changes will not be spatially homogeneous across the Pacific Northwest. Major ecological realignments are already occurring in response to climate change (IPCC WGII, 2022). Long-term trends in warming have continued at global, national and regional scales. Global surface temperatures in the last decade (2010s) were estimated to be 1.09 °C higher than the 1850-1900 baseline period, with larger increases over land ~1.6 °C compared to oceans ~0.88 (IPCC WGI, 2021). The vast majority of this warming has been attributed to anthropogenic releases of greenhouse gases (IPCC WGI, 2021). Globally, 2014-2018 were the 5 warmest years on record both on land and in the ocean (2018 was the 4th warmest) (NOAA NCEI 2022). Events such as the 2013-2016 marine heatwave (Jacox et al. 2018) have been attributed directly to anthropogenic warming in the annual special issue of Bulletin of the American Meteorological Society on extreme events (Herring et al.

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from which "withdrawals" can be made to address mitigation for adverse impacts to ESA species and their designated CH.

2018). Global warming and anthropogenic loss of biodiversity represent profound threats to ecosystem functionality (IPCC WGII 2022). These two factors are often examined in isolation, but likely have interacting effects on ecosystem function.

Updated projections of climate change are similar to or greater than previous projections (IPCC WGI, 2021). NMFS is increasingly confident in our projections of changes to freshwater and marine systems because every year brings stronger validation of previous predictions in both physical and biological realms. Retaining and restoring habitat complexity, access to climate refuges (both flow and temperature) and improving growth opportunity in both freshwater and marine environments are strongly advocated in the recent literature (Siegel and Crozier 2020).

Climate change is systemic, influencing freshwater, estuarine, and marine conditions. Other systems are also being influenced by changing climatic conditions. Literature reviews on the impacts of climate change on Pacific salmon (Crozier 2015, 2016, 2017, Crozier and Siegel 2018, Siegel and Crozier 2019, 2020) have collected hundreds of papers documenting the major themes relevant for salmon. Here we describe habitat changes relevant to Pacific salmon and steelhead, prior to describing how these changes result in the varied specific mechanisms impacting these species in subsequent sections.

Forests

Climate change will impact forests of the western U.S., which dominate the landscape of many watersheds in the region. Forests are already showing evidence of increased drought severity, forest fire, and insect outbreak (Halofsky et al. 2020). Additionally, climate change will affect tree reproduction, growth, and phenology, which will lead to spatial shifts in vegetation. Halofsky et al. (2018) projected that the largest changes will occur at low- and high-elevation forests, with expansion of low-elevation dry forests and diminishing high-elevation cold forests and subalpine habitats.

Forest fires affect salmon streams by altering sediment load, channel structure, and stream temperature through the removal of canopy. Holden et al. (2018) examined environmental factors contributing to observed increases in the extent of forest fires throughout the western U.S. They found strong correlations between the number of dry-season rainy days and the annual extent of forest fires, as well as a significant decline in the number of dry-season rainy days over the study period (1984-2015). Consequently, predicted decreases in dry-season precipitation, combined with increases in air temperature, will likely contribute to the existing trend toward more extensive and severe forest fires and the continued expansion of fires into higher elevation and wetter forests (Alizedeh 2021).

Agne et al. (2018) reviewed literature on insect outbreaks and other pathogens affecting coastal Douglas-fir forests in the Pacific Northwest and examined how future climate change may influence disturbance ecology. They suggest that Douglas-fir beetle and black stain root disease could become more prevalent with climate change, while other pathogens will be more affected by management practices. Agne et al. (2018) also suggested that due to complex interacting effects of disturbance and disease, climate impacts will differ by region and forest type.

Freshwater Environments

The following is excerpted from Siegel and Crozier (2019), who present a review of recent scientific literature evaluating effects of climate change, describing the projected impacts of climate change on instream flows:

Cooper et al. (2018) examined whether the magnitude of low river flows in the western U.S., which generally occur in September or October, are driven more by summer conditions or the prior winter's precipitation. They found that while low flows were more sensitive to summer evaporative demand than to winter precipitation, interannual variability in winter precipitation was greater. Malek et al. (2018), predicted that summer evapotranspiration is likely to increase in conjunction with declines in snowpack and increased variability in winter precipitation. Their results suggest that low summer flows are likely to become lower, more variable, and less predictable.

The effect of climate change on ground water availability is likely to be uneven. Sridhar et al. (2018) coupled a surface-flow model with a ground-flow model to improve predictions of surface water availability with climate change in the Snake River Basin. Projections using RCP 4.5 and 8.5 emission scenarios suggested an increase in water table heights in downstream areas of the basin and a decrease in upstream areas.

As cited in Siegel and Crozier (2019), Isaak et al. (2018), examined recent trends in stream temperature across the Western U.S. using a large regional dataset. Stream warming trends paralleled changes in air temperature and were pervasive during the low-water warm seasons of 1996-2015 (0.18-0.35°C/decade) and 1976-2015 (0.14-0.27°C/decade). Their results show how continued warming will likely affect the cumulative temperature exposure of migrating sockeye salmon *O. nerka* and the availability of suitable habitat for brown trout *Salmo trutta* and rainbow trout *O. mykiss*. Isaak et al. (2018) concluded that most stream habitats will likely remain suitable for salmonids in the near future, with some becoming too warm. However, in cases where habitat access is currently restricted by dams and other barriers salmon and steelhead will be confined to downstream reaches typically most at risk of rising temperatures unless passage is restored (FitzGerald et al. 2020, Myers et al. 2018).

Streams with intact riparian corridors and that lie in mountainous terrain are likely to be more resilient to changes in air temperature. These areas may provide refuge from climate change for a number of species, including Pacific salmon. Krosby et al. (2018), identified potential stream refugia throughout the Pacific Northwest based on a suite of features thought to reflect the ability of streams to serve as such refuges. Analyzed features include large temperature gradients, high canopy cover, large relative stream width, low exposure to solar radiation, and low levels of human modification. They created an index of refuge potential for all streams in the region, with mountain area streams scoring highest. Flat lowland areas, which commonly contain migration corridors, were generally scored lowest, and thus were prioritized for conservation and restoration. However, forest fires can increase stream temperatures dramatically in short time-spans by removing riparian cover (Koontz et al. 2018), and streams that lose their snowpack with climate change may see the largest increases in stream temperature due to the removal of temperature buffering (Yan et al. 2021). These processes may threaten some habitats that are currently considered refugia.

Marine and Estuarine Environments

Along with warming stream temperatures and concerns about sufficient groundwater to recharge streams, a recent study projects nearly complete loss of existing tidal wetlands along the U.S. West Coast, due to sea level rise (Thorne et al. 2018). California and Oregon showed the greatest threat to tidal wetlands (100%), while 68% of Washington tidal wetlands are expected to be submerged. Coastal development and steep topography prevent horizontal migration of most wetlands, causing the net contraction of this crucial habitat.

Rising ocean temperatures, stratification, ocean acidity, hypoxia, algal toxins, and other oceanographic processes will alter the composition and abundance of a vast array of oceanic species. In particular, there will be dramatic changes in both predators and prey of Pacific salmon, salmon life history traits and relative abundance. Siegel and Crozier (2019) observe that changes in marine temperature are likely to have a number of physiological consequences on fishes themselves. For example, in a study of small planktivorous fish, Gliwicz et al. (2018) found that higher ambient temperatures increased the distance at which fish reacted to prey. Numerous fish species (including many tuna and sharks) demonstrate regional endothermy, which in many cases augments eyesight by warming the retinas. However, Gliwicz et al. (2018) suggest that ambient temperatures can have a similar effect on fish that do not demonstrate this trait. Climate change is likely to reduce the availability of biologically essential omega-3 fatty acids produced by phytoplankton in marine ecosystems. Loss of these lipids may induce cascading trophic effects, with distinct impacts on different species depending on compensatory mechanisms (Gourtay et al. 2018). Reproduction rates of many marine fish species are also likely to be altered with temperature (Veilleux et al. 2018). The ecological consequences of these effects and their interactions add complexity to predictions of climate change impacts in marine ecosystems.

Perhaps the most dramatic change in physical ocean conditions will occur through ocean acidification and deoxygenation. It is unclear how sensitive salmon and steelhead might be to the direct effects of ocean acidification because of their tolerance of a wide pH range in freshwater (although see Ou et al. 2015 and Williams et al. 2019), however, impacts of ocean acidification and hypoxia on sensitive species (e.g., plankton, crabs, rockfish, groundfish) will likely affect salmon indirectly through their interactions as predators and prey. Similarly, increasing frequency and duration of harmful algal blooms may affect salmon directly, depending on the toxin (e.g., saxitoxin vs domoic acid), but will also affect their predators (seabirds and mammals). The full effects of these ecosystem dynamics are not known but will be complex. Within the historical range of climate variability, less suitable conditions for salmonids (e.g., warmer temperatures, lower streamflows) have been associated with detectable declines in many of these listed units, highlighting how sensitive they are to climate drivers (Ford 2022, Lindley et al. 2009, Williams et al. 2016, Ward et al. 2015). In some cases, the combined and potentially additive effects of poorer climate conditions for fish and intense anthropogenic impacts caused the population declines that led to these population groups being listed under the ESA (Crozier et al. 2019).

Climate change effects on salmon and steelhead

In freshwater, year-round increases in stream temperature and changes in flow will affect physiological, behavioral, and demographic processes in salmon, and change the species with which they interact. For example, as stream temperatures increase, many native salmonids face increased competition with more warm-water tolerant invasive species. Changing freshwater temperatures are likely to affect incubation and emergence timing for eggs, and in locations where the greatest warming occurs may affect egg survival, although several factors impact intergravel temperature and oxygen (e.g., groundwater influence) as well as sensitivity of eggs to thermal stress (Crozier et al. 2020). Changes in temperature and flow regimes may alter the amount of habitat and food available for juvenile rearing, and this in turn could lead to a restriction in the distribution of juveniles, further decreasing productivity through density dependence. For migrating adults, predicted changes in freshwater flows and temperatures will likely increase exposure to stressful temperatures for many salmon and steelhead populations, and alter migration travel times and increase thermal stress accumulation for ESUs or DPSs with early-returning (i.e. spring- and summer-run) phenotypes associated with longer freshwater holding times (Crozier et al. 2020, FitzGerald et al. 2020). Rising river temperatures increase the energetic cost of migration and the risk of *en route* or pre-spawning mortality of adults with long freshwater migrations, although populations of some ESA-listed salmon and steelhead may be able to make use of cool-water refuges and run-timing plasticity to reduce thermal exposure (Keefer et al. 2018, Barnett et al. 2020).

Marine survival of salmonids is affected by a complex array of factors including prey abundance, predator interactions, the physical condition of salmon within the marine environment, and carryover effects from the freshwater experience (Holsman et al. 2012, Burke et al. 2013). It is generally accepted that salmon marine survival is size-dependent, and thus larger and faster growing fish are more likely to survive (Gosselin et al. 2021). Furthermore, early arrival timing in the marine environment is generally considered advantageous for populations migrating through the Columbia River. However, the optimal day of arrival varies across years, depending on the seasonal development of productivity in the California Current, which affects prey available to salmon and the risk of predation (Chasco et al. 2021). Siegel and Crozier (2019) point out the concern that for some salmon populations, climate change may drive mismatches between juvenile arrival timing and prey availability in the marine environment. However, phenological diversity can contribute to metapopulation-level resilience by reducing the risk of a complete mismatch. Carr-Harris et al. (2018), explored phenological diversity of marine migration timing in relation to zooplankton prey for sockeye salmon *O. nerka* from the Skeena River of Canada. They found that sockeye migrated over a period of more than 50 days, and populations from higher elevation and further inland streams arrived in the estuary later, with different populations encountering distinct prey fields. Carr-Harris et al. (2018) recommended that managers maintain and augment such life-history diversity.

Synchrony between terrestrial and marine environmental conditions (e.g., coastal upwelling, precipitation and river discharge) has increased in spatial scale causing the highest levels of synchrony in the last 250 years (Black et al. 2018). A more synchronized climate combined with simplified habitats and reduced genetic diversity may be leading to more synchrony in the productivity of populations across the range of salmon (Braun et al. 2016). For example, salmon productivity (recruits/spawner) has also become more synchronized across Chinook populations from Oregon to the Yukon (Dorner et al. 2018, Kilduff et al. 2014). In addition, Chinook salmon have become smaller and younger at maturation across their range (Ohlberger 2018). Other Pacific salmon species (Stachura el al. 2014) and Atlantic salmon (Olmos et al. 2020) also have demonstrated synchrony in productivity across a broad latitudinal range.

At the individual scale, climate impacts on salmon in one life stage generally affect body size or timing in the next life stage and negative impacts can accumulate across multiple life stages (Healey 2011; Wainwright and Weitkamp 2013, Gosselin et al. 2021). Changes in winter precipitation will likely affect incubation and/or rearing stages of most populations. Changes in the intensity of cool season precipitation, snow accumulation, and runoff could influence migration cues for fall, winter and spring adult migrants, such as coho and steelhead. Egg survival rates may suffer from more intense flooding that scours or buries redds. Changes in hydrological regime, such as a shift from mostly snow to more rain, could drive changes in life history, potentially threatening diversity within an ESU (Beechie et al. 2006). Changes in summer temperature and flow will affect both juvenile and adult stages in some populations, especially those with yearling life histories and summer migration patterns (Crozier and Zabel 2006; Crozier et al. 2010, Crozier et al. 2019).

At the population level, the ability of organisms to genetically adapt to climate change depends on how much genetic variation currently exists within salmon populations, as well as how selection on multiple traits interact, and whether those traits are linked genetically. While genetic diversity may help populations respond to climate change, the remaining genetic diversity of many populations is highly reduced compared to historic levels. For example, Johnson et al. (2018), compared genetic variation in Chinook salmon from the Columbia River Basin between contemporary and ancient samples. A total of 84 samples determined to be Chinook salmon were collected from vertebrae found in ancient middens and compared to 379 contemporary samples. Results suggest a decline in genetic diversity, as demonstrated by a loss of mitochondrial haplotypes as well as reductions in haplotype and nucleotide diversity. Genetic losses in this comparison appeared larger for Chinook from the mid-Columbia than those from the Snake River Basin. In addition to other stressors, modified habitats and flow regimes may create unnatural selection pressures that reduce the diversity of functional behaviors (Sturrock et al. 2020). Managing to conserve and augment existing genetic diversity may be increasingly important with more extreme environmental change (Anderson et al. 2015), though the low levels of remaining diversity present challenges to this effort (Freshwater 2019). Salmon historically maintained relatively consistent returns across variation in annual weather through the portfolio effect (Schindler et al. 2015), in which different populations are sensitive to different climate drivers. Applying this concept to climate change, Anderson et al. (2015) emphasized the additional need for populations with different physiological tolerances. Loss of the portfolio increases volatility in fisheries, as well as ecological systems, as demonstrated for Fraser River and Sacramento River stock complexes (Freshwater et al. 2019, Munsch et al. 2022).

2.2.1 Status of the Species

Table 1, below provides a summary of listing and recovery plan information, status summaries and limiting factors for the species addressed in this opinion. More information can be found in recovery plans and status reviews for these species. Acronyms appearing in the table include DPS (Distinct Population Segment), ESU (Evolutionarily Significant Unit), ICTRT (Interior Columbia Technical Recovery Team), MPG (Multiple Population Grouping), NWFSC (Northwest Fisheries Science Center), TRT (Technical Recovery Team), and VSP (Viable Salmonid Population).

Table 1. Listing classification and date, recovery plan reference, most recent status review, status summary, and limiting factors for each species considered in this opinion.

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Puget Sound Chinook salmon	Threatened 6/28/05 (70 FR 37159)	Shared Strategy for Puget Sound 2007 NMFS 2006	NMFS 2016; Ford 2022	This ESU comprises 22 populations distributed over five geographic areas. All Puget Sound Chinook salmon populations continue to remain well below the TRT planning ranges for recovery escapement levels. Most populations also remain consistently below the spawner–recruit levels identified by the TRT as necessary for recovery. Across the ESU, most populations have increased somewhat in abundance since the last status review in 2016, but have small negative trends over the past 15 years. Productivity remains low in most populations. Overall, the Puget Sound Chinook salmon ESU remains at "moderate" risk of extinction.	• Degraded floodplain and in-river channel structure • Degraded estuarine conditions and loss of estuarine habitat • Degraded riparian areas and loss of in-river large woody debris • Excessive fine-grained sediment in spawning gravel • Degraded water quality and temperature • Degraded nearshore conditions • Impaired passage for migrating fish • Severely altered flow regime
Hood Canal summer-run chum	Threatened 6/28/05	Hood Canal Coordinating Council 2005 NMFS 2007	NMFS 2016; Ford 2022	The Puget Sound Technical Recovery Team identified two independent populations for Hood Canal summer chum, one which includes the spawning aggregations from rivers and creeks draining into the Strait of Juan de Fuca, and one which includes spawning aggregations within Hood Canal proper. Natural-origin spawner abundance has increased since ESA listing, and spawning abundance targets in both populations have been met in some years. Productivity had increased at the time of the last review (NWFSC 2015), but has been down for the last three years for the Hood Canal population, and for the last four years for the Strait of Juan de Fuca population. Productivity of individual spawning aggregates shows that only two of eight aggregates have viable performance.	• Reduced floodplain connectivity and function • Poor riparian condition • Loss of channel complexity Sediment accumulation • Altered flows and water quality

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
				Spatial structure and diversity viability parameters, as originally determined by the TRT, have improved, and nearly meet the viability criteria for both populations. Despite substantive gains toward meeting viability criteria in the Strait of Juan de Fuca and Hood Canal summer chum salmon populations, the ESU still does not meet all of the recovery criteria for population viability at this time. Overall, the Hood Canal summer-run chum salmon ESU therefore remains at "moderate" risk of extinction..	
Puget Sound steelhead	Threatened 5/11/07	NMFS 2019	NMFS 2016; Ford 2022	This DPS comprises 32 populations. Viability of has improved somewhat since the PSTRT concluded that the DPS was at very low viability, as were all three of its constituent MPGs, and many of its 32 DIPs (Hard et al. 2015). Increases in spawner abundance were observed in a number of populations over the last five years within the Central & South Puget Sound and the Hood Canal & Strait of Juan de Fuca MPGs, primarily among smaller populations. There were also declines for summer- and winter-run populations in the Snohomish River basin. In fact, all summer-run steelhead populations in the Northern Cascades MPG are likely at a very high demographic risk.	• Continued destruction and modification of habitat • Widespread declines in adult abundance despite significant reductions in harvest • Threats to diversity posed by use of two hatchery steelhead stocks • Declining diversity in the DPS, including the uncertain but weak status of summer-run fish • A reduction in spatial structure • Reduced habitat quality • Urbanization • Dikes, hardening of banks with riprap, and channelization

2.2.2 Status of the Critical Habitat

This section describes the status of designated critical habitat affected by the proposed action by examining the condition and trends of the essential physical and biological features of that habitat throughout the designated areas. These features are essential to the conservation of the ESA-listed species because they support one or more of the species' life stages (e.g., sites with conditions that support spawning, rearing, migration and foraging).

For most salmon and steelhead, NMFS's critical habitat analytical review teams (CHARTs) ranked watersheds within designated critical habitat at the scale of the fifth-field hydrologic unit code (HUC5) in terms of the conservation value they provide to each ESA-listed species that they support (NMFS 2005). The conservation rankings were high, medium, or low. To determine the conservation value of each watershed to species viability, the CHARTs evaluated the quantity and quality of habitat features, the relationship of the area compared to other areas within the species' range, and the significance to the species of the population occupying that area. Even if a location had poor habitat quality, it could be ranked with a high conservation value if it were essential due to factors such as limited availability, a unique contribution of the population it served, or is serving another important role.

A summary of the status of critical habitats, considered in this opinion, is provided in Table 2, below.

Table 2. Critical habitat, designation date, federal register citation, and status summary for critical habitat considered in this opinion

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
Puget Sound Chinook salmon	9/02/05 70 FR 52630	Critical habitat for Puget Sound Chinook salmon includes 1,683 miles of streams, 41 square mile of lakes, and 2,182 miles of nearshore marine habitat in Puget Sounds. The Puget Sound Chinook salmon ESU has 61 freshwater and 19 marine areas within its range. Of the freshwater watersheds, 41 are rated high conservation value, 12 low conservation value, and eight received a medium rating. Of the marine areas, all 19 are ranked with high conservation value.

2.3 Action Area

Under the ESA, "action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). Under the MSA, "Federal action" means any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a Federal agency (see 50 CFR 600.910).

The in-water work necessary for placement of the fiberglass encasement is likely to generate some minor turbidity within Port Angeles Harbor. In Washington, water quality standards (Washington Administrative Code (WAC) 173-201A-210) specify a mixing zone in which visible turbidity must not extend more than 150 ft. from the Cofferdam Dock Facility. Mixing zones will likewise extend 200 ft. from the stormwater outfall per WAC 173-201A-400. However, water quality contaminants in stormwater, even post treatment, are likely to persist without settling out in the manner that suspended sediment does, and for these reasons, we consider the action area to extend well beyond the turbidity mixing zone. Based on water and sediments (Zhang et al. 2016) to be affected by certain likely contaminants (PAHs and 6-PPD-q, for example), we estimate that the action area is 1 kilometer (km) radially from the outfall (Law et al. 1997).

Species present in the action area that are likely to be adversely affected by the proposed action are PS Chinook salmon, PS steelhead, and HCSR chum. Critical habitat for PS Chinook salmon is also present within the action area and likely to be adversely affected by the proposed action.

2.4 Environmental Baseline

The "environmental baseline" refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultations, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR 402.02).

Port Angeles is located on a natural harbor that is protected by the long sand spit of Ediz Hook curing east into the Strait of Juan de Fuca. The Port of Port Angeles owns approximately 35 acres of property in Port Angeles Harbor and manages the property for industrial, commercial, and recreational uses. Historically, the Port terminals, including the IHTF, have primarily operated for log transport from the Olympic Peninsula to Pacific Rim Countries. In recent years, the Port has modernized its facilities and expanded its marine terminal services the accommodate bulk and break-bulk cargoes (Port of Port Angeles 2023).

The Port's Cofferdam Dock Facility was constructed in 2004 by WSDOT in support of the Graving Dock Project, which was abandoned in December 2004 due to the discovery of historically significant archaeological resources and human remains at the site. Ownership of the cofferdam was transferred to the Port in 2006 and it has since become a critical piece of transportation infrastructure to allow for the transportation of logs on and off the North Olympic Peninsula by barge.

As mitigation for the Graving Project, WSDOT and the Port performed several shoreline restoration activities along Ediz Hook, including the removal of creosote piles and derelict concrete rubble, restoration of 1,500 linear feet (LF) of beach surface material, and the placement of large woody debris and planting of native vegetation. Several additional restoration projects have been conducted along Ediz Hook by the Lower Elwha Klallam Tribe, the Salmon Recovery Funding Board, and other governmental and non-profit organizations. As a result of these efforts, Ediz Hook provides functional nearshore habitat including eelgrass beds and forage fish spawning.

Forage fish are an important group of fish in the marine waters of Washington. Forage fish serve as prey for a variety of marine animals, including birds, fish, and marine mammals. Pacific herring (*Clupea pallasii*), surf smelt (*Hypomesus pretiosus*), and Pacific sand lance (*Ammodytes hexapterus*) are the most common forage fish in Puget Sound. All three species are known to occur in Port Angeles Harbor.

Herring typically spawn in northern Puget Sound and the Strait of Juan de Fuca between late January and early April (Bargmann 1998). Herring deposit their transparent eggs on intertidal and shallow subtidal eelgrass and marine algae. Although no herring spawning locations have been documented in the harbor (WDFW 2023), juvenile herring have been caught during seining just off Ediz Hook (Shaffer et al. 2008). No appropriate spawning habitat exists within the action area.

Surf smelt are most abundant in the Port Angeles Harbor in late spring through summer but spawn throughout the year, with the heaviest spawn occurring from mid-October through December. The closest documented surf smelt spawning area is a 1,000 foot long area on the south side of Ediz Hook, at the furthest extent of the action area.

Sand lance spawning typically occurs from early November through mid-February. They deposit eggs on a range of nearshore substrates, from soft, pure, fine sand beaches to beaches armored with gravel (Bargmann 1998). Barmgann (1998) indicates that sand lance comprise 35 percent of all juvenile salmon diets and 60 percent of the juvenile Chinook diet, in particular. The closest documented sand lance spawning area is a 1,000 foot long area on the south side of Ediz Hook, at the furthest extent of the action area. Adult, juvenile, and larval sand lance are expected to be present within Port Angeles Harbor throughout the year.

Port Angeles Harbor is listed on the State of Washington’s 303(d) list of impaired waterbodies for bacteria exceedances. It has also been designated as impaired due to exceedances of several contaminants including mercury, polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs) (Ecology 2023a). The Project action area lies within the limits of the Washington State Department of Ecology’s Western Port Angeles Harbor Study Area, which is currently undergoing a Remedial Investigation/Feasibility Study to explore cleanup options

(Ecology 2023b). The site lacks natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, or side channels.

Water quality in the harbor is strongly tied to water quality in the Strait of Juan de Fuca. A monthly comparison of water quality parameters (temperature, salinity, DO) indicate that conditions in the harbor closely match conditions of the waters of the greater Strait of Juan de Fuca. Temperatures were slightly higher in the harbor in late summer and salinity inside the harbor was higher during the winter but lower during the fall (Ebbesmeyer et al. 1979). Given the proximity to the open ocean and the opportunity for thorough mixing, water quality in the Strait of Juan de Fuca is considered naturally pristine. The difference in temperature between the harbor and the Strait of Juan de Fuca can be attributed to the protection from currents afforded by Ediz Hood, which increases the residence time of water in the harbor. Differences in salinity can be attributed to increased freshwater run-off in the fall due to increased precipitation.

Use of the action area by listed species

PS Chinook salmon:
Chinook salmon presence is documented within Port Angeles Harbor, and juveniles and adults migrate within the action area. None of the freshwater streams within the Port Angeles urban drainages (Ennis Creek, Peabody Creek, Valley Creek, Tumwater Creek, and Dry Creek) currently support or historically supported Chinook salmon spawning and rearing; however, the nearby Dungeness River to the east and Elwha River to the west of the action area support large spawning and rearing populations (Elwha-Dungeness Planning Unit 2005, WDFW 2013). The Elwha estuary has been assessed as one of the highest functioning areas for ESA salmonid use within the central Strait of Juan de Fuca, particularly after the removal of two large dams in the Elwha River between 2011 and 2014. In a 2015 study, Chinook salmon was the dominant species in the Elwha nearshore and annually ranged from 20 to 90 percent of the salmon present, though these results were largely influenced by WDFW Chinook hatchery releases (Shaffer et al. 2008, Shaffer et al. 2017). During nearshore surveys conducted from 2006 through 2014 near the action area, Chinook salmon were recorded from April to September (Fresh 2015), which overlaps with roughly half of the in-water work window. Adult PS Chinook may migrate near the action area between April and October which overlaps with a substantial portion of the work window. Yearling PS Chinook may occur anywhere in the Puget Sound at any time of year, though not in concentrated numbers. Within the Puget Sound and Strait of Juan de Fuca, resident Chinook salmon are found in highest numbers between the months of November through July (Quinn and Losee 2021).

HCSR chum:
The HCSR chum ESU includes all naturally spawned populations of summer-run chum salmon in Hood Canal and its tributaries, as well as populations in Olympic Peninsula rivers between Hood Canal and Dungeness Bay, Washington. Eight artificial propagation programs are also considered to be part of this ESU (NMFS 2005a).

There are two designated independent populations of HCSR chum ESU: one that includes spawning aggregations in Hood Canal and one that includes the spawning aggregations from rivers and creeks draining into the Strait of Juan de Fuca (Ford 2022). The Strait of Juan de Fuca summer chum population is composed of five spawning aggregations (Dungeness River, Jimmycomelately Creek, Salmon Creek, Snow Creek, and Chimacum Creek). Summer chum enter the Dungeness River in late August through late October and spawn in the main channel through September. Eggs incubate in redds for 5 to 6 months and fry emerge between January and May. Typical of chum salmon, fry migrate rapidly downstream and out to the estuary and nearshore areas (NMFS 2005a).

During nearshore surveys conducted from 2006 to 2014, juvenile chum salmon were recorded from April through September, with higher abundances during the spring months (April through June) (Fresh 2015). Nearshore surveys conducted within the Elwha estuary before, during, and after dam removal found that chum size and abundance declined after the removal of the Elwha dams. The study also determined that chum fry abundance was significantly negatively correlated to Chinook salmon catches, indicating that continued hatchery releases of Chinook salmon may be contributing to increased chum predation around the action area (Shaffer et al. 2017). Adult summer-run chum may migrate near the action area between August through October, which occurs fully within the work window.

PS steelhead:
Of the 32 independent populations of the PS steelhead DPS, three may occur in the vicinity of the action area. These include the Dungeness River summer/winter run, Strait of Juan de Fuca Independent Tributaries winter run, and the Elwha River winter run (Myers et al. 2015). The Dungeness River summer/winter-run population spawns in the mainstem of the Dungeness and Grey Wolf Rivers. Within the Dungeness River, spawning typically occurs from mid-March to early June. Genetically, the Dungeness River steelhead most closely cluster with other collections from the Strait of Juan de Fuca and Elwha River populations (Myers et al. 2015).

There are two steelhead natal rivers near the action area, Valley Creek and Tumwater Creek. Valley Creek is known as supporting steelhead but it is not specifically noted in the Salmon and Steelhead Stock Inventory (SASSI) (WDF et al. 1993). Tumwater Creek is known as supporting steelhead but is not specifically noted in SASSI (WDF et al. 1993). Prior to the removal of the Elwha Dams, fewer than 500 wild salmon were utilizing the Elwha River annually. The Washington State Conservation Commission estimated that removal of the dams would result in returns of 10,100 steelhead per year and projected that the river system would recover within 15-18 years (Haring 1999). Surveys within the Elwha River between 2016 and 2021 have shown general increases in steelhead abundance, though in a less consistent trend than Chinook and coho salmon (Munsch et al. 2023).

Adult PS steelhead may migrate near the action area between November and April, which overlaps with a substantial portion of the work window.

2.5 Effects of the Action

Under the ESA, "effects of the action" are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action (see 50 CFR 402.02). A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see 50 CFR 402.17). In our analysis, which describes the effects of the proposed action, we considered the factors set forth in 50 CFR 402.17(a) and (b).

The assessment below considers the intensity of expected effects in terms of the change they would cause on habitat features from their baseline conditions, and the severity of each effect, considered in terms of the time required to recover from the effect. Ephemeral effects are those that are likely to last for hours or days, short-term effects are likely last for weeks, and long-term effects are likely to last for months, years, or decades.

Effects of the proposed action include:

- Water quality diminishment – from suspended sediment associated with construction (temporary) and from discharge of effluent into the Puget Sound (long-term);
- Disturbance of bottom sediments of benthic communities (forage – short-term);
- Loss of nearshore habitat caused by retrofitting the Cofferdam Dock with the fiberglass encasement (long-term);
- Vessel traffic and use of the Cofferdam Dock Facility during construction and post construction (noise, shade, sediment disturbance, and water pollution – long-term);

2.5.1 Effects on Critical Habitat

As mentioned in Section 2.3, designated critical habitat for PS Chinook salmon and SRKW occurs within the action area. There is no designated critical habitat for PS steelhead or HCSR chum within the action area, and effects to SRKW critical habitat are discussed in the "Not Likely to Adversely Affect" Section of this opinion (Section 2.11). Critical habitat includes Physical and Biological Features (PBFs) necessary to support various life stages of salmonid and non-salmonid listed species (i.e. rearing, migration). The NMFS reviews effects on critical habitat affected by a proposed action by examining how the PBFs of critical habitat would be altered, and the duration of such changes.

Three of the six PBFs established for PS Chinook salmon critical habitat are likely to be present in the action area. Those PBFs are:

1. Estuarine areas free of obstruction with water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh-and saltwater; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation,

2. Nearshore marine areas free of obstruction with water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation; and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels, and

3. Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation.

Effects to habitat features include temporary and permanent impacts to water quality, temporary diminishment of forage opportunities, and temporary and permanent impediments to migration. Timing, duration, and intensity of the effects on critical habitat are considered in the analysis, and we also consider them as the pathways of exposure creating effects to the species, as discussed below.

Water Quality –
Water quality is an essential element of the PBFs of PS Chinook salmon critical habitat. The in-water component of the Cofferdam Dock facility improvements would be completed using land-based excavators to remove the existing waler beam and install the fiberglass encasement and divers and a skiff to secure the fiberglass encasement and install the new waler beams and end caps. The fiberglass encasement would be pressed six inches into the mudline, which could affect water quality due to increased turbidity, decreased dissolved oxygen (DO), or resuspended contaminants. Stormwater discharge would also contribute to water quality impairments due to the discharge of effluent from the 14.4 acres of pollution-generating impervious surface (PGIS) at the IHTF.

Turbidity – Temporary and localized increases in turbidity are expected in the immediate vicinity of the fiberglass encasement as it is pressed into the mudline. The contractor would be responsible for ensuring that turbidity does not extend beyond the 150-ft. point of compliance under the Washington State Surface Water Quality Standards (Washington Administrative Code (WAC) 173-201A); however, the turbidity generated from this action is expected to be far more localized due to the method of placement. Turbidity resulting from in-water work would temporarily impact the nearshore water quality PBF for Chinook salmon. For the period of time that placement of the fiberglass encasement occurs, the value of the critical habitat would be diminished such that fish within the immediate vicinity of the Project would be likely to avoid the turbidity plume. The effects of turbidity are significant in proportion to the ratio of the size of the disturbed area to the size of the bottom area and water volume (Morton 1977). Given the relatively small size of the area in which the fiberglass encasement will be placed in relation to the designated Chinook salmon critical habitat within the Strait of Juan de Fuca, it is likely that the turbidity generated from this action would only marginally reduce the value of this habitat for a very limited amount of time. Once in-water work has ceased, the turbidity generated by the fiberglass encasement placement would be expected to disperse within a few tidal cycles (Hitchcock and Bell 2004).

Dissolved Oxygen – Suspension of anoxic sediment compounds during in-water construction activities can result in reduced DO in the water column as the sediments oxidize. Sub-lethal effects of DO levels below saturation can include metabolic, feeding, growth, behavioral, and productivity effects. Behavior responses can include avoidance and migration disruption (NMFS 2005c).

The western portion of Port Angeles Harbor, including the Project area, has historically been classified as a Category 5 impaired water due to low DO levels from legacy wood pulp contamination (Ecology 2023b). Water quality in Port Angeles Harbor is strongly tied to water quality in the Strait of Juan de Fuca. A monthly comparison of water quality parameters performed by Ebbesmeyer et al. (1979) concluded that oxygen concentrations are generally higher inside the harbor during June through September and lower during the rest of the year, meaning that a risk of low dissolved oxygen would overlap with a portion of the in-water work window between July 15 and February 15. A model created by LaSalle (1988) demonstrated that, even in a situation where the upper limit of expected suspended sediment is reached during dredging operations, DO depletion of no more than 0.1 mg/L would occur at depth. As the suspended sediment generated from the proposed in-water construction is likely to be much smaller in quantity and duration than a dredging operation, it is highly unlikely that DO depletion within the Project area would rise to this upper limit. Any reduction in DO beyond background should be limited in extent and temporary in nature. For these reasons, this proposed action is not likely to result in the sub-lethal effects outlined above. Additionally, the short duration of the Project further reduces the potential for effects of low DO due to turbidity and suspended sediment.

Resuspended Contaminants – Several Remedial Investigations and sediment cleanup actions are currently underway within Western Port Angeles Harbor due to exceedances in metals (mercury, cadmium, zinc), dioxins/furans, PCBs, and carcinogenic PAHs (Ecology 2020). In-water construction efforts have the potential to resuspend these contaminants within the water column, impacting the water quality PBFs for PS Chinook salmon. The probability of exposure of individuals to water quality effects is generally low given the highly localized nature of sediment resuspension, the work windows designed to avoid peak presence of juvenile salmonids, and BMPs implemented to minimize sediment mobilization (See Section 1.3). Short-term and intermittent exposure to reduced water quality could result in minor reductions in foraging success, gill damage, and/or sublethal toxicity within the 150 ft. mixing zone surrounding the fiberglass encasement installation. As a result, the designated critical habitat of PS Chinook salmon is expected to be somewhat impaired during in-water construction. In a high energy environment like Port Angeles Harbor, the contaminants are expected to disperse very rapidly once in-water work is complete, at which point the water quality conditions would return to their prior condition.

Discharge of Effluent – The impervious surfaces of the IHTF alter the natural infiltration of vegetation and natural soil and accumulate several pollutants associated with the heavy machinery utilizing the facility. During heavy rainfall, accumulated pollutants are mobilized and transported via runoff and conveyed into adjacent surface waters. The Project proposes to raise the surface elevation and construct high-load capacity asphalt concrete surface covering 14.4 acres of the IHTF in order to construct an upgraded stormwater treatment facility for the area (Landau 2023). The IHTF is currently unpaved and the proposed upgrades are intended to better facilitate the stormwater treatment goals outlined in the Port's NPDES permit by capping and containing existing contaminated soil and groundwater and by treating site runoff that would otherwise discharge directly into the harbor. The proposed biofiltration facility would treat total suspended solids, turbidity, zinc, copper, and chemical oxygen demand in runoff before it discharges into the harbor. The proposed upgrades are intended to lower the level of dissolved zinc and copper in stormwater discharge to below the adverse acute sub-lethal effect threshold in salmonids (5.6 micrograms per liter (µg/L) over background zinc concentrations of between 3.0 µg/L and 13 µg/L, and 2.0 µg/L over background copper levels of 3.0 µg/L or less, respectively) (WSDOT 2022 in Landau 2023). Pilot testing of a similar facility at the Port revealed that a similar three-stage stormwater treatment system reduced total copper and zinc concentrations in runoff by approximately 90 percent (Kennedy/Jenks 2022 in Landau 2023).

Recent research by a NMFS' science team (Northwest Fisheries Science Center, Ecotoxicology and Environmental Chemistry Programs) has shown that untreated stormwater is highly toxic to aquatic species, including Pacific salmon and marine forage fish (French et al. 2022). Conversely, parallel studies have shown that clean water/green infrastructure treatment methods can remove pollutants from stormwater (McIntyre et al. 2015). We expect that despite the improved stormwater treatment provided by the proposed three-stage biofiltration system, effluent would still contain some contaminants, such as PAHs and 6PPD/6PPD-quinone (6-PPD-q) that would adversely affect the physical, biological, and chemical dimensions of habitat quality supporting PS Chinook within the action area. The stormwater treatment upgrades would diminish the quantity and concentration of effluent discharging into Port Angeles Harbor, resulting in a long-term improvement in water quality; however, discharges would still adversely affect water quality due to uncaptured contaminants. Stormwater may also include an array of contaminants depending on the surrounding land use and proximity to industrial facilities (Table 3). At this Project location, the most likely contaminants are microplastics from tires, petroleum products from vehicles and vessels on the dock, metals from the newly paved facilities, and wood debris and dust.

Stormwater can discharge at any time of year; however, first-flush rain events after long dry periods typically occur in September in western Washington. As with stormwater runoff globally, the leading edge of hydrographs (the first flush) in urban watersheds have proportionally higher concentrations of contaminants, including those long known to resource managers (as evidenced by existing aquatic life criteria under the Clean Water Act), as well as many chemicals of emerging concern, so-called because they were largely unknown a decade ago (Maniquiz-Redillas et al. 2022 and Peter et al. 2020). Higher concentrations of pollutants occur less frequently between March and October as longer dry periods exist between storm events. In western Washington, most stormwater discharge occurs between October and March, when the region receives the most rain.

We estimate that the area of effect from stormwater discharge is 1 km radially from the outfall (Law et al. 1997) based on the assumption that water and sediment would be affected by certain likely contaminants, including those listed in Table 3 (Zhang et al. 2016). Stormwater negatively impacts critical habitat of PS Chinook salmon by degrading water quality (water quality is also a feature of EFH, see the analysis in Section 3). Aquatic organisms including ESA-listed fish and marine mammals may take up contaminants from their surrounding environments by direct contact with water and sediments, or via ingestion of contaminated plankton, invertebrates, detritus, or sediment, indicating that prey and substrate are also adversely affected features of critical habitat.

Table 3. Pollutants commonly found in stormwater runoff in Washington State.

Pollutant Class	Examples	Urban Sources
Petroleum hydrocarbons	PAHs (poly aromatic hydrocarbons)	Roads (vehicles, tires), industrial, consumer products
Metals	Mercury, copper, chromium, nickel, titanium, zinc, arsenic, lead	Roads, electronics, pesticides, paint, waste treatment
Microplastics	6PPD/6PPD-q	Vehicle tires
Common use pesticides, surfactants	Herbicides (glyphosate, diquat), insecticides, fungicides, adjuvants, surfactants (detergents, soaps)	Fertilizer, soil erosion
Persistent bio-accumulative toxicants (PBT)	POPs (persistent organic pollutants), PCBs (polychlorinated diphenyl ethers), PFCs (poly- and per-fluorinated compounds), pharmaceuticals (estrogen, antidepressant)	Eroding soils, solids, development, redevelopment, vehicles, emissions, industrial, consumer products
Temperature and dissolved oxygen	Warm water, unvegetated exposed surfaces (soil, water, sediments)	Impervious surfaces, rock, soils (roads, parking lots, railways, roofs)
Bacteria	*Escherichia coli*	Livestock waste, organic solids, pet waste, septic tanks

The water quality impacts from this Project would cause temporary and localized impacts to the PBFs of critical habitat for PS Chinook salmon via placement of the fiberglass encasement, and long-term impacts to these same PBFs via stormwater discharge into Port Angeles Harbor. In-water construction would degrade quality in the harbor up to 150 ft. from placement of the fiberglass encasement (though the area of impact is expected to be much smaller) during the in-water work window. The water quality conditions would return to baseline levels within hours after work ceases. Conditions for juvenile maturation and adult fitness during migration would be disrupted by the water quality degradation, though in a very small area. In-water construction would cause no measurable changes in water temperature and salinity, but mobilized contaminants and suspended sediments in the water column could temporarily impair the value of critical habitat for growth and maturation of juvenile salmon by exposing them to pollutants with both immediate and latent health effects. Increased levels of contaminants could also incrementally impair forage/prey communities that are exposed to the contaminants, delaying the speed that these communities re-establish after being physically disrupted by in-water work.

We anticipate water quality to be degraded by the discharge of stormwater effluent despite the addition of upgraded treatment. The proposed three-stage biofiltration treatment system would provide a significant reduction of pollutants in stormwater effluent, but the discharge itself would still result in some degradation of the water quality PBF of critical habitat for PS Chinook salmon. However, given that discharged effluent from this upgraded stormwater treatment system would contain *less* contaminant than currently occurs with the limited existing treatment on site, we believe that this action would decrease the quantity and concentration of contaminants entering the action area. Therefore, water quality, sediment quality, and prey communities would continue to support the conservation role (e.g., growth, maturation, survival) for PS Chinook salmon.

Disturbed Bottom Sediment and Benthic Communities – The placement of the fiberglass encasement at the Cofferdam Dock is likely to result in sediment disturbance that would temporarily reduce benthic prey. This, in turn, would result in minor, localized impacts to juvenile forage opportunities for the duration of the in-water fiberglass placement. The substrate within the harbor is primarily silty sand and would be expected to disperse very quickly upon completion of in-water work (within a few tide cycles). The speed of recovery by benthic communities is affected by several factors, including the intensity of disturbance, with greater disturbance increasing the time to recovery (Dernie et al. 2003). Given the limited duration of in-water activities, the BMPs measures implemented to reduce turbidity, and the high-energy environment, benthic species would likely recolonize the area very quickly. The fiberglass encasement would also result in a small area of permanent loss to benthic communities where it is placed into the mudline. However, given the width of the encasement being installed (approximately 1.25 inches over a 335 LF area), this permanent disturbance would have a minimal impact on forage opportunities. The temporary and permanent disruptions to this localized area of benthic habitat would not preclude juvenile salmon from foraging along the adjacent Ediz Hook, which provides much higher quality habitat and forage opportunities. Based on these factors, the Project would result in a very small impairment of the forage PBFs for PS Chinook salmon.

Loss of Nearshore Habitat – The proposed action would not alter existing natural cover but would prevent the development of natural cover in the future. As mentioned in Section 2.4, the Cofferdam Dock Facility and surrounding areas have very little shoreline vegetation and contain little to no aquatic vegetation. However, the placement of the fiberglass encasement onto the Cofferdam Dock would extend the duration of the degraded condition of this habitat and prevent the formation of natural cover from undercut banks, side channels, or aquatic vegetation. The use of Port Angeles Harbor for industrial activities for decades has severely degraded the quality of this PBF for PS Chinook salmon. The new area of impact associated with the 1.25-inch fiberglass encasement is extremely small and unlikely to meaningfully further degrade this habitat; however, the proposed action would perpetuate the degraded condition and function of this habitat within the Project footprint.

Vessels – The presence of vessels for construction, or during regular operation of the Cofferdam Dock, produce a variety of habitat effects consistent with those described above: noise, shade, sediment disturbance, and water quality diminishments. Each of these pathways is well described for the short-term use of boats for construction, and we refer to those sections for a more detailed presentation of these effects, to which vessels would contribute. The ongoing use of the Cofferdam Dock by vessels would create temporary but periodic impacts to the water quality, migratory, and forage PBFs for PS Chinook salmon. Studies have shown that boat noise can induce stress responses in a variety of fish (including salmon) that trigger predator avoidance behavior such as schooling (van der Knaap 2022). While this response is beneficial against actual predators, van der Knaap theorized that it has become maladaptive as a response to vessel noise due to the high energy cost required. Shade cast from berthing vessels would also temporarily diminish the PS Chinook migration PBF, as it could result in juvenile salmonids swimming around the structure or risking predation from larger fish utilizing the overwater cover (Nightingale and Simenstad 2001; Shipman et al. 2010; Dethier et al. 2016). Finally, the continued use of the area by cargo vessels increases the chance that pollutants such as PAHs will enter the waterway, diminishing the water quality PBF. We cannot predict the frequency of commercial vessel use, but can conclude that the value of this critical habitat will be slightly diminished for the duration of time that a vessel occupies the area. However, given that the impact is spatially and temporally limited, the proposed action would not preclude the use of this habitat by PS Chinook salmon or meaningfully reduce the value of the habitat.

Project Impact Offsets

As stated above in Section 2.1, NMFS has decided to analyze the positive and detrimental effects of the Project on nearshore habitat qualitatively, as the current version of the nearshore calculator lacks a mechanism for addressing the proposed stormwater treatment upgrades and perpetuation of the Cofferdam Dock within this highly modified estuarine environmental setting. When assessing the adverse effects of the proposed action, they are very limited in size and duration with the most significant diminishment of migration and forage PBFs occurring during construction and returning to existing conditions afterward. Moreover, the functional lift provided by installing stormwater treatment at the highest existing standard on 14.4 acres of the IHTF will reduce impacts water quality and prey resource PBFs for PS Chinook salmon and SRKW.

2.5.2 Effects on Listed Species

Effects of the proposed action on species are based, in part, on habitat effects, as described above. The in-water work window has been designed to minimize exposure of juvenile salmonids to short-term habitat effects, but these effects are still possible. Because habitat conditions are generally poor in the action area, we do not expect significant presence (high numbers) of any of these species during construction. Individuals of these species would be exposed to the habitat effects described above – water quality reductions, reduced prey, disruption of habitat-forming processes within the nearshore environment, noise, shade, and increased predation. However, adult and juvenile responses to these effects are very different. Green sturgeon, eulachon, humpback whale, and SRKW are not likely to be adversely affected and our analyses on these species appears in Section 2.11 of this document.

Water Quality – Exposure to diminished water quality is likely to adversely affect juvenile and adult PS Chinook salmon, HCSR chum, and PS steelhead within the Project vicinity during and after the completion of construction. Water quality would be impaired by suspended sediments and contaminants for a period of up to three months.

Turbidity – Temporary and localized increases in turbidity are likely to occur during the placement of the fiberglass encasement onto the face of the Cofferdam Dock. With the successful implementation of the BMPs listed in Section 1.3, the turbidity generated by this action would not extend beyond 150 feet from the encasement. As a result, any fish within the immediate vicinity of the Cofferdam Dock could experience behavioral or physiological changes as a result of the suspended sediment. The effects of suspended sediments on fish increase in severity with sediment concentration and exposure time, and can progressively include behavioral avoidance and/or disorientation, physiological stress, gill abrasion, and, at extremely high concentrations, death. Physical effects are a function of the exposure duration and concentration of the suspended sediment generating the turbidity (Newcombe and Jensen 1996;

Wilber and Clarke 2001). Studies have also shown that salmonids can detect and distinguish turbidity and other water quality gradients (Quinn 2005; Simenstad 1998), and fish will generally move away from areas within higher concentrations of total suspended solids (Kjelland et al. 2015). As a result, fish are more likely to experience sublethal stress (coughing or gill irritation) and behavioral responses rather than lethal effects. The turbidity generated from this work would likely disperse quickly due to the very limited scope of in-water work and the high-energy environment in which it would take place. These conditions also make behavioral responses far more likely than lasting injury to any fish within the area. The in-water work window has been designed to reduce the presence of juvenile salmonids within the action area to the greatest extent, further reducing juvenile salmonid exposure to suspended sediments. Adult PS Chinook salmon, HCSR chum, and PS steelhead are expected to be migrating through the action area during operations but are not expected to remain long enough to be significantly impacted.

Dissolved Oxygen – Habitat and prey resources may be affected through temporary decreases in DO resulting from increased suspended sediment. Kjelland et al. (2015) noted that suspended sediments resulting from in-water construction activities can reduce light transmission decreasing photosynthesis by aquatic plants and absorb heat energy thereby raising water temperatures, both of which can result in decreased DO levels. A literature review of the effects of DO on salmonids has shown that insufficient DO levels can impact fish at every life stage through altered migration behavior, reduced growth, higher likelihood of predation, and potentially lethal outcomes in extreme conditions (Carter 2005). As discussed in Section 2.5.1, there is a risk of low dissolved oxygen within Port Angeles Harbor during the in-water work window that could be exacerbated by construction activities. However, the extremely limited nature and scope of turbidity generated by in-water activities and the high-energy environment within the harbor would likely limit fluctuations in DO within the Project vicinity, and behavioral response (avoidance) would limit exposure. We therefore consider the potential injury of listed species due to decreased DO extremely unlikely.

Resuspended Contaminants – Due to its legacy of heavy industrial use, Port Angeles Harbor currently has high levels of several hazardous substances, including metals (mercury, cadmium, zinc), dioxins/furans, PCBs, and carcinogenic PAHs, within its sediment (Ecology 2020). Some of the effects of these contaminants to salmonids include:

- Wide-ranging sub-lethal outcomes including impaired growth and reproduction, hormonal alterations, enzyme induction, alterations to behavior patterns, and mutagenicity for juvenile salmon exposed to dioxins (Meador 2002).
- Developmental or reproductive toxicity resulting in decreased food intake, wasting syndrome, and delayed mortality for fish exposed to dioxins/furans (Peterson et al. 1993). Adult fish are less susceptible to dioxin-induced toxicity compared to earlier life stages, requiring considerably higher body burdens to elicit adverse effects (Lanham et al. 2011; Peterson et al. 1993; Walker and Peterson 1992; Walker et al. 1994).
- Lethal and sub-lethal effects of mercury and methylmercury bioaccumulation, including latent effects on the feeding behavior and predator avoidance of hatchlings, necrotic injury, developmental impacts, and additional neurological and behavioral effects (Berntssen et al. 2003;

- Peterson et al. 2007). Predatory fishes such as salmon are particularly susceptible to mercury bioaccumulation.
- Physical or developmental abnormalities, reduced disease resistance, reproductive disfunction, malformations and growth inhibition for salmon exposed to PAHs (Baali and Yahyaoui 2016; Estuary Partnership 2014). Chronic exposure to PAHs such as crude oil during early development in pink salmon has been linked to juvenile mortality and reduced survival outcomes in adulthood (Heintz et al. 2010).

Resuspension of contaminated sediments is proportional to the amount of disturbance and the local levels of contamination. Disturbance of the substrate would increase contaminant concentrations by resuspending particulates, thereby allowing more contaminants to transport into the water column. Contaminant concentration rates would be increased for the duration of the in-water construction (approximately 3 months), with potentially harmful acute increases contained within the 150-foot compliance boundary. Research has established that PAH exposure primarily affects larval and juvenile fish that have not developed the metabolic protections available to older fish with a fully developed hepatic function (Incardona 2017; Incardona and Scholz 2016, 2017, 2018; Incardona et al. 2011). A majority of the juvenile and adult salmonids migrating through the action area are likely to avoid the immediate vicinity of Project activities and will therefore experience very low (though significant) levels of exposure. As a result, we expect that one cohort of each of these age classes of PS Chinook salmon, HCSR chum, and PS steelhead would experience sub-lethal physiological effects leading to reduced fitness and potential mortality.

Discharge of Effluent – The Project would not result in any new pollution generating impervious surface (PGIS), but it would replace approximately half of the existing impervious surface of the IHTF, comprised of a mixture of gravel and deteriorated asphalt, with high-load capacity asphalt-concrete. 14.4 acres of the IHTF would be regraded and repaved to better accommodate the treatment of stormwater conveyed from the facility into the Puget Sound. The IHTF is a working Port berth and is frequently used for the transport of wood fiber (whole logs and wood chips) from Jefferson and Clallam Counties to international ports. As a result, the stormwater runoff from the IHTF is likely to contain several contaminants that have proven damaging to fish, including wood waste leachate, PAHs, and microplastics such as 6PPD-6PPD-q from the vehicles regularly operating on the deck. As these contaminants are of particular concern for salmonids, their effects are discussed in greater detail below.

Wood waste leachate: Wood waste and the material it generates when it degrades can have a profound impact on aquatic ecosystems and organisms. Contaminated stormwater runoff from log yards is of particular concern, as high volumes of organic material in runoff will result in a biological oxygen demand, creating an aerobic zone as it degrades (Hedmark and Scholz 2008). This lack of oxygen can limit the survival of benthic organisms, change the assemblages of benthic communities, and in turn, diminish the prey base and fitness of juvenile salmonids (Kendall and Michelsen 1997). The make-up and concentrations of pollutants from wood waste varies based on the tree species, amount of water it is exposed to, and the receiving waterbody (sulfides tend to form primarily in marine waters). However, the compounds that are generally found in runoff are methylated phenols, benzoic acid and benzyl alcohol, terpenes, and tropolones (Kendall and Michelsen 1997). Exposure to high levels of phenols for even short durations of time can cause hemorrhaging at the base of fins, disruption of blood vessel walls and gill epithelium, edema and blood infiltration in major tissues, and disruptions to feeding and oxygen consumption rates (Buikema et al 1979). The concentrations of these organic materials in stormwater runoff from log yards tends to be quite high, creating a significant risk to the species occupying the receiving waterbody. Treatment approaches involving wetland treatment and bioinfiltration are particularly effective at filtering these organic materials from runoff (Hedmark and Scholz 2008).

PAHs: A large and growing body of environmental monitoring data (analytical chemistry) has established PAHs as a ubiquitous component of stormwater-driven runoff into the Puget Sound. Whether originating from oils spills or stormwater, PAH toxicity to fish can be framed as a bottom-up approach to understanding the impacts of complex mixtures, where one or more PAH compound may share a common mechanism of action, interact with other chemicals in mixtures, and/or interact with non-chemical variables such as the thermal stress anticipated with a changing regional climate. The historical NOAA research on oils spill and urban stormwater are increasingly converging on a risk framework where certain PAHs (Figure 2) cause a well-described syndrome of involving the abnormal development of the heart, eye and jaw structure, and energy reserves of larval fish (Harding et al. 2020). Over the ensuing 30 years, combined research from NOAA’s Alaska Fisheries Science Center (AFSC) and the Northwest Fisheries Science Center (NWFSC) clearly established the developing fish heart as the primary biological target organ for the toxic impacts of water-soluble chemical mixtures derived from petroleum (Incardona 2017; Incardona and Scholz 2016, 2017, 2018; Incardona et al. 2011). At the egg (developing embryo, pre-hatch) and larval stages, organ-specific detoxification pathways (e.g., cytochrome P450 enzymes in the liver) are not yet in place, and therefore do no offer the same intrinsic metabolic protections available to older fish with a fully developed hepatic function. Absent this protective metabolism in larval fish, petroleum-derived hydrophobic compounds such as PAHs bioconcentrate to high tissue levels in fertilized eggs, resulting in more severe corresponding toxicity.

Numerous controlled laboratory exposure-response studies have elucidated a toxicity syndrome with a distinctive and characteristic suite of developmental abnormalities. Severe PAH toxicity is characterized by complete heart failure, with ensuing extra-cardiac defects (secondary to loss of circulation) and mortality at or soon after hatching. More moderate forms of PAH toxicity, such as might be expected for untreated/unfiltered roadway runoff, include acute and latent alterations in subtle aspects of cardiac structure, reduced cardiorespiratory performance and latent mortality in surviving larvae and juveniles. These effects have been studied extensively and characterized in over 20 species of fish at the organismal, tissue and cellular levels (Marty et al., 1997; Carls et al., 1999; Heintz et al., 1999; Hatlen et al., 2010; Hicken et al., 2011; Incardona et al., 2013; Jung et al., 2013; Esbaugh et al., 2016; Morris et al., 2018). Unlike 6PPD-quinone, which varies in hazard across closely related salmonids (e.g., high acute toxicity to coho, low toxicity to chum; McIntyre et al., 2018, 2021), all fish species studied to date are vulnerable to PAH toxicity, with thresholds for severe developmental abnormalities often in the low parts-per-billion (μg/L) range (Figure 2).

Figure 2. Examples of PAH-induced developmental abnormalities in a wide range of fish species (freshwater to marine, tropical to temperate). Our current understanding of PAH toxicity to fish embryos and larvae is drawn from several NOAA-F studies, representing major lessons learned from the Exxon Valdez and Deepwater Horizon disasters, and has been widely confirmed by independent research groups around the world (Scholz and Incardona 2015). The primary form of toxicity is a loss of cardiac function, as exemplified by circulatory failure and accumulation of fluid in the pericardial space around the heart (arrows). The pattern of excess fluid (edema) varies according to the anatomy of each species. Related abnormalities include small eyes, jaw deformities, and a dysregulation of the lipid stores, or yolk, the animal needs to survive to first feeding. This suite of defects, while sublethal, will almost invariably lead to ecological death. Consequently, "delayed-in-time" toxicity is a common risk concern for fish that spawn in PAH-contaminated habitats.

PAH toxicity in fish is often sublethal and delayed in time. The latent impacts of low-level PAH exposures – i.e., representative of the cardiotoxic PAH concentrations and discharge durations comparable with conventional Puget Sound roadway runoff – have been particularly well studied in salmonids (pink salmon, *Oncorhynchus gorbuscha*). Large-scale tagging (mark-and-recapture) studies dating back to Exxon Valdez were among the first to show that embryonic exposure to oil-derived chemical mixtures with total PAH (ΣPAH) levels in the range of 5 -20 µg/L resulted in cohorts of salmon that survived the exposure (and appeared outwardly normal), but nevertheless displayed reduced growth and reduced survival to reproductive maturity in the marine environment. Follow-up studies at NWFSC have linked this poor survival to reduced individual fitness manifested by reduced swimming performance and subtle changes in cardiac structure. In essence, embryonic exposure to petroleum mixtures leads to juvenile fish that show signs of pathological hypertrophy of the heart (Incardona et al., 2015, 2021; Gardner et al., 2019). The latter is well known to be associated with considerable morbidity and mortality across vertebrate species in general, as evidenced by the downstream consequences of congestive heart failure in humans.

To illustrate how PAHs in runoff from the Puget Sound transportation grid align with historical NOAA research on oil spills, stormwater from Longfellow Creek, an urban roadway in West Seattle, shows considerable overlap with the pattern of PAHs derived from a pure oil spill

(Figure 3). Notably, as an added consequence of the engine internal combustion process, the mixture in stormwater is even more complex due to the appearance of larger numbers of 4-ring and ≥ 5-ring compounds. Much of this higher molecular weight PAH mass is associated with the fine particulate matter from vehicle exhaust. The bioavailability of compounds in waters that receive highway runoff is demonstrated by uptake into passive samplers, which have properties very similar to fish eggs. Passive samples vary in design, but generally consist of a housing for a membrane material that passively accumulates lipophilic compounds such as PAHs, which can subsequently be extracted for chemical analyses. They are particularly useful for profiling patterns of bioavailable PAHs in fish spawning habitats.

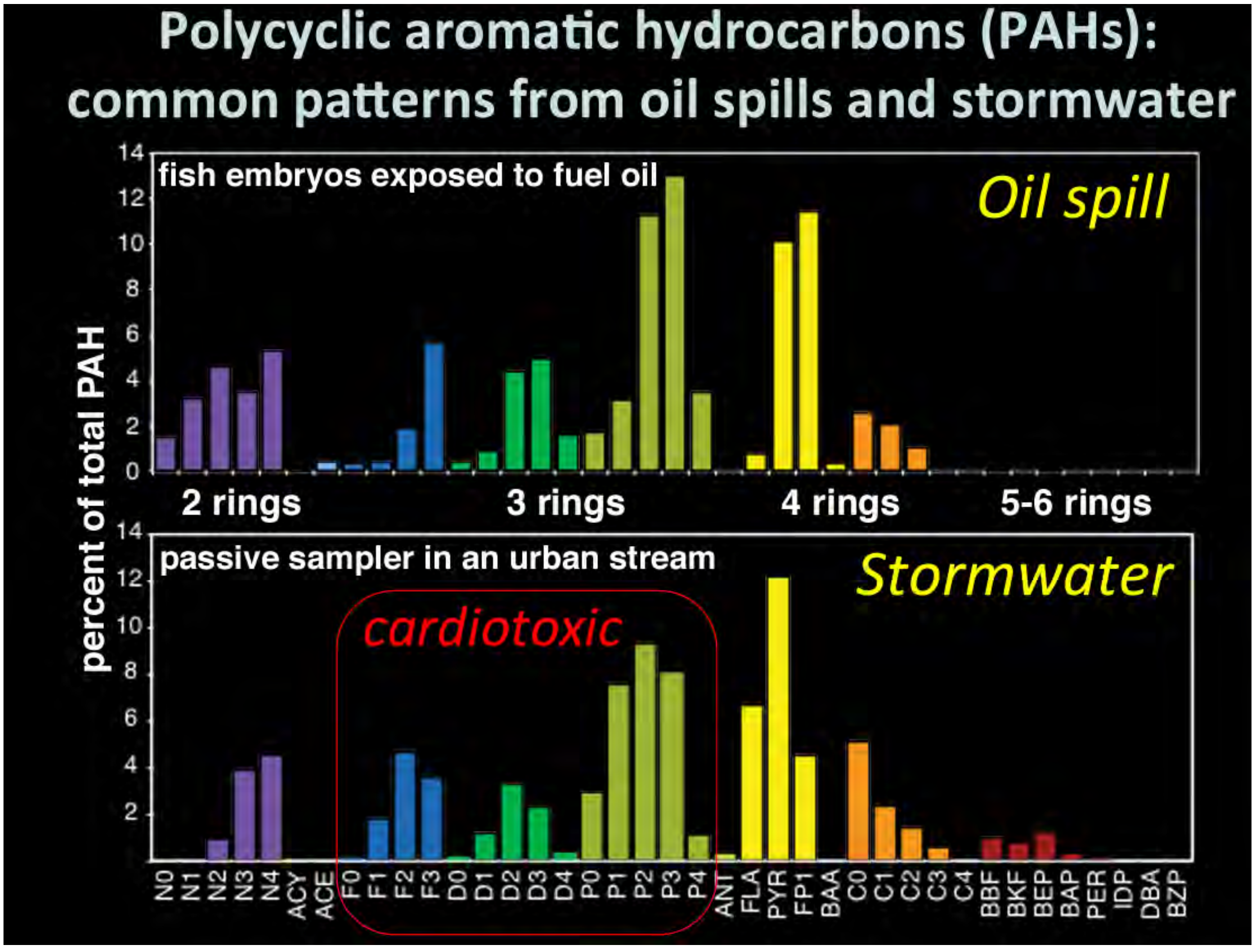


Figure 3. Patterns of PAHs in environmental samples (Scholz 2015). Top, effluent in seawater flowing over gravel coated with Alaskan crude oil (source for Exxon Valdez). Bottom, PAHs extracted from a polyethylene membrane device (PEMD) incubated one week in Longfellow Creek, West Seattle. X-axis shows proportion of total PAH. Abbreviations: N, naphthalenes; BP, biphenyl; AY, acenaphthylene; AE, acenaphthene; F, fluorene; D, dibenzothiophene; P, phenanthrene; ANT, anthracene; FL, fluoranthene; PY, pyrene; FP, fluoranthenes/pyrenes; BAA, benz[a]anthracene; C, chrysene; BBF, benzo[b]fluoranthene; BKF, benzo[j]fluoranthene/ benzo[k]fluoranthene; BEP, benzo[e]pyrene; BAP, benzo[a]pyrene; PER, perylene; IDY, indeno[1,2,3-cd]pyrene; DBA, dibenz[a,h]anthracene/dibenz[a,c]anthracene; BZP, benzo[ghi]perylene. Parent compound is indicated by a 0 (e.g., N0), while numbers of additional carbons (e.g. methyl groups) for alkylated homologs are indicated as N1, N2, etc.

The pattern of bioavailable PAHs in Longfellow Creek depicted above in Figure 3 closely resembles a pure oil spill pattern, with the exception of a larger proportion of combustion-associated 4-ring compounds such as pyrenes and fluoranthenes. Accordingly, urban runoff is a transport pathway for PAHs, and the pattern of bioavailable PAHs closely resembles the relative enrichment of cardiotoxic phenanthrenes. Although more work is needed for Pacific salmonids (e.g., species beyond pink salmon), collected runoff from SR520 containing ΣPAH of 7.5 µg/L produced the stereotypical syndrome of heart failure and associated developmental defects in Pacific herring (Harding et al., 2020). Measured concentrations of PAH runoff from SR520 runoff are often considerably higher than the petroleum toxicity threshold for pink salmon.

6PPD-Quinone: After years of forensic investigation, the urban runoff coho mortality syndrome has now been directly linked to motor vehicle tires, which deposit the compound 6PPD and its abiotic transformation product 6PPD-q onto roads. 6PPD or [(N-(1, 3-dimethylbutyl)-N'-phenyl-p-phenylenediamine] is used to preserve the elasticity of tires. 6PPD can transform in the presence of ozone (O3) to 6PPD-q. 6PPD-q is ubiquitous to roadways (Sutton et al., 2019) and was identified by Tian et al., (2020) as the primary cause of urban runoff coho mortality syndrome described by Scholz et al., (2011). Laboratory studies have demonstrated that juvenile coho salmon (Chow et al., 2019), juvenile steelhead, and juvenile Chinook salmon are also susceptible to varying degrees of mortality when exposed to urban stormwater (French et al., 2022). Fortunately, recent literature has also shown that mortality can be prevented by infiltrating road runoff through soil media containing organic matter, which removes 6PPD-q and other contaminants (Fardel et al., 2020; Spromberg et al., 2016; McIntrye et al., 2015). Research and corresponding adaptive management surrounding 6PPD is rapidly evolving. Nevertheless, key findings to date include:

- 6PPD/6PPD-q has been killing coho in Puget Sound urban streams for decades, dating back to at least the 1980s, likely longer (McCarthy 2008; Scholz 2011)
- Wild coho populations in Puget Sound are at a very high risk of localized extinction, based on field observations of adult spawner mortality in > 50 spawning reach stream segments (Spromberg 2011).
- Source-sink metapopulation dynamics (mediated by straying) are likely to place a significant drag on the future abundances of wild coho salmon in upland forested watersheds (the last best places for coho conservation in Puget Sound). In other words, urban mortality syndrome experienced in one part of the watershed could lead to abundance reductions in other populations because fewer fish are available to stray (Spromberg 2011).
- Coho are extremely sensitive to 6PPD-q, more so than most other known contaminants in stormwater (Scholz 2011; Chow 2019; Tian 2020).
- Coho juveniles appear to be similarly susceptible to the acutely lethal toxicity of 6PPD/6PPD-q (McIntyre 2015; Chow 2021).
- The onset of mortality is very rapid in coho (i.e., within the duration of a typical runoff event) (French et al., 2022).
- Once coho become symptomatic, they do not recover, even when returned to clean water (Chow 2019).

- It does not appear that dilution will be the solution to 6PPD pollution, as diluting Puget Sound roadway runoff in 95% clean water is not sufficient to protect coho from the mortality syndrome (French et al., 2022).
- Preliminary evidence indicates an uneven vulnerability across other species of Puget Sound salmon and steelhead, and a need to further investigate sublethal toxicity to steelhead and Chinook salmon. For example, McIntyre et al., (2018) indicate that chum do not experience the lethal response to stormwater observed in coho salmon.
- Following exposure, the onset of mortality is more delayed in steelhead and Chinook salmon (French et al., 2022).
- The mechanisms underlying mortality in salmonids is under investigation, but are likely to involve cardiorespiratory disruption, consistent with symptomology. Therefore, special consideration should be given to parallel habitat stressors that also affect the salmon gill and heart, and nearly always co-occur with 6PPD such as temperature (as a proxy for climate change impacts at the salmon population-scale) and PAHs.
- Simple and inexpensive green infrastructure mitigation methods are promising in terms of the protections they afford salmon and stream invertebrates, but much more work is needed (McIntyre 2014, 2015, 2016; Spromberg 2016).
- The long-term viability of salmon and other Puget Sound aquatic species is the foremost conservation management concern for NOAA, and thus it will be important to incorporate effectiveness monitoring into future mitigation efforts – i.e., evaluating proposed stormwater treatments not only on chemical loading reductions, but also the environmental health of salmon and other species in receiving waters (Scholz 2011).

The proposed three stage biofiltration system proposed in this Project would not entirely remove the contaminants discussed above from the stormwater discharging from the IHTF into Port Angeles Harbor. However, the proposed action would significantly reduce the risk of delayed mortality in ESA-listed salmonids due to untreated runoff. Furthermore, this enhanced treatment would be particularly beneficial at this location due to the existing Category 5 impairment of the water within Port Angeles Harbor due to low DO levels (Ecology 2023b).

<u>Disturbed Bottom Sediment and Benthic Communities –</u> The Project is expected to result in an extremely localized reduction in benthic prey abundance and diversity within the vicinity of the fiberglass encasement for the duration of in-water construction activities (up to 3 months). The fiberglass encasement will also permanently disrupt approximately 35 square feet of benthic habitat (1.25 inches across 335 LF). Adult PS Chinook salmon, HCSR chum, and PS steelhead migrating through the action area could experience reduced prey availability as a result of Project activities. However, as larger fish they are likely to seek out much larger prey availability than the benthic communities would provide. Therefore, reduced benthic prey availability is unlikely to adversely affect adult salmonids. Likewise, as juvenile PS steelhead are far less nearshore dependent than other salmonids and the proposed action does not preclude the use of much higher quality forage habitat along Ediz Hook, this is not expected to affect PS steelhead in their juvenile life stage.

When juvenile salmonids occupy the nearshore environment, they must have abundant prey to allow for growth, development, maturation, and general fitness. As placement of the fiberglass encasement dislodges bottom sediments, benthic communities are disrupted where the placement occurs and in adjacent areas where sediment falls out of suspension and layers on top of benthic areas. We expect that benthic prey within 150 ft. of the fiberglass encasement would be unavailable to juvenile salmonids for the duration of in-water work (3 months), and the 35 LF of permanent impact would be removed entirely as a prey resource for these species. The speed of recovery by benthic communities is affected by several factors, including the intensity of disturbance, with greater disturbance increasing the time to recovery (Dernie et al. 2003). Given the high energy environment in which the Project is taking place and the limited disturbance of the construction activities, we anticipate a rapid recolonization of the area of temporary impact. The greatest impacts to forage availability will occur during construction activities and will have the greatest impact on juvenile PS Chinook salmon and HCSR chum. Given the much higher quality foraging habitat approximately half a mile east of the Project vicinity, we do not expect that this benthic community disturbance will have a population-level effect on any ESA-listed species.

<u>Natural Cover –</u> The proposed action would have no effect on existing natural cover, as the Cofferdam Dock Facility and surrounding areas have very little shoreline vegetation and contain little to no aquatic vegetation. However, the placement of the fiberglass encasement onto the Cofferdam Dock would extend the duration of the degraded condition of this habitat and prevent the formation of natural cover from undercut banks, side channels, or aquatic vegetation. Armoring of the nearshore can reduce or eliminate shallow water habitats through the disruption of sediment sources and sediment transport, result in a higher rate of beach erosion waterward of the armoring from higher wave energy, and diminish the supply of fine sediment required for forage fish spawning compared to a natural shoreline (Bilkovic and Roggero 2008; Fresh et al. 2011; Morley et al. 2012; Dethier et al. 2016). The effects of the construction and perpetuation of this armoring lead to reductions in primary productivity and invertebrate density within the intertidal and nearshore environment, disrupting prey resources for juvenile salmonids.

When the physical processes are altered, there is also a shift in the biological communities. The number and types of invertebrates, including shellfish, can change; forage fish lose spawning areas; and juvenile salmon and forage fish lose the feeding grounds that they use as they migrate along the shore (Shipman et al. 2010). The enduring loss of nearshore habitat quality within the Project area is expected to contribute to reduced fitness and survival of juvenile PS Chinook salmon, HCSR chum, and, to a lesser degree, PS steelhead. However, the numbers so affected are expected be so low that it will not meaningfully impact any of these listed species on a population level.

<u>Vessels –</u> The presence of vessels for construction, or during regular operation of the Cofferdam Dock, are expected to produce a variety of effects to species, including: water quality reductions, underwater noise, shade, and sediment disturbance from scour. Each are episodic and persistent effects, coextensive with the duration of the Cofferdam Dock once the fiberglass encasement has been installed.

Pollutants: The operation of cargo vessels at the Cofferdam Dock are likely to result in the incidental discharge of small amounts fuels, oils, or lubricants into the Puget Sound. Incidental discharge of PAHs may also result from the exhaust generated by these berthing vessels. Because these materials can disperse quickly, they can become quite widespread at very low concentration. PAHs from the exhaust of these vessels have a similar pattern of dispersal. The environmental fate of each type of PAH depends on its molecular weight. We cannot predict the frequency of such discharges, but can conclude that with each vessel docking, ESA-listed fish within the vicinity have the potential to experience sub-lethal effects.

Noise: Underwater noise associated with vessel traffic along major shipping routes creates a major disruption to species within the aquatic environment. Fish will exhibit a number of behavioral responses to vessel noise, including avoidance of the area (Vabo et al. 2002; Handegard et al. 2003), decreased exploratory activity and reduced home range (Ivanova et al. 2020), increased risk of predation (Simpson et al. 2016), altered migration patterns (van der Knapp 2022), and physiological changes resulting in interrupted courtship (Wysocki et al. 2016). We would expect adult PS Chinook salmon, HCSR chum, and steelhead to remain less affected by predation or altered forage behavior than their juvenile counterparts due to their size and life history at the time of exposure (adults will typically cease prey consumption during upstream migration). Therefore, we expect that underwater noise from vessels is most likely to affect adult salmon and steelhead by altering their migration patterns. We expect that juvenile salmonids would be more vulnerable to the effects of underwater noise due to disrupted forage opportunities, a greater risk of predation, and reduced fitness associated with schooling behavior (van der Knaap 2022). While it is difficult to quantify this effect, it is likely to cause small numbers of persistent juvenile salmonid deaths for the duration of the Cofferdam Dock's operation. We do not expect this small reduction in abundance to be discernible at a population level, and the intermittent nature of vessel traffic will likely not result in a significant reduction in adult salmon or steelhead.

Shade: Berthing vessels have the potential to disrupt the prey base of ESA-listed fish as well as disrupt the migration, and contribute to the predation, of juvenile salmonids. The shade cast from a cargo vessel can inhibit the growth and development of submerged aquatic vegetation (SAV), and lower its overall productivity (Shafer 1999; 2002). As eelgrass is a substrate for herring spawning, this can result in disruptions to the salmon prey base. The shade case from a vessel also has the potential to disrupt the migration of juvenile PS Chinook salmon and HCSR chum, as they are likely to swim around a shaded area rather than pass beneath it (Nightingale and Simenstad 2001; Southard et al. 2006; Celedonia et al. 2008a; Celedonia et al. 2008b; Moore et al. 2013; Munsch et al. 2014). This behavioral modification could cause them to temporarily utilize deeper habitat, thereby exposing them to increased piscivorous predation. This has been shown in the marine environment where juvenile salmonid consumption by piscivorous predators increased fivefold when juvenile pink salmon were forced to leave the shallow nearshore (Willette 2001). We cannot predict with any level of certainty the number of juvenile salmonids that will experience mortality due to the shade cast from berthing vessels. While it is likely that this ongoing occurrence will disrupt the migration and reduce the fitness of a small number of juvenile PS Chinook and HCSR chum, these effects would be mitigated by the very limited amount of time in which vessels typically berth at the dock. As we would not expect this to occur longer than a few days at a time, we do not anticipate that the shade cast from berthing vessels will impact these species on a population level.

Sediment Disturbance: Associated commercial vessel use adversely affects SAV where it is present, and inhibits its recruitment where not present, by frequently churning water and sediment in the shallow water environment. Additionally, the turbidity from boat propeller wash decreases light levels (Eriksson et al. 2004). Shafer (1999; 2002) provides background information on the light requirements of seagrasses and documents the effects of reduced light availability on seagrass biomass and density, growth, and morphology. Decreased ambient light typically results in lower overall productivity, which is ultimately reflected in lower shoot density and biomass (Shafer 1999; 2002). Areas where sediment is routinely disturbed by prop wash will also experience repeated disruption of benthic prey communities, suppressing this forage source. We cannot predict the frequency of such discharges, but can conclude that each vessel docking could hinder habitat-forming processes and reduce forage opportunities for juvenile salmonids.

Summary of Project Effects on Listed Species

Some fish from each of the listed species discussed above are expected to be present during project construction either as juveniles or as adults. Most juvenile salmonids present will be migrating juveniles with limited exposure to the effects of the proposed action, with PS Chinook salmon and HCSR chum likely to have greater exposure than PS steelhead based on their greater degree of nearshore dependence. Adult PS Chinook salmon, HCSR chum, and PS steelhead are all likely to be present for a limited duration during Project activities but are not expected to be as adversely impacted as juveniles within the action area.

Most of the fish present would incur short-term stress or other sublethal responses due to interaction with construction equipment, noise, increased energetic costs, and reduced water quality and foraging ability. This stress and other sublethal responses are likely to reduce long-term fitness for some of these fish. A few other fish may die due to the combination of multiple factors, such as the stresses caused by the proposed action combined with other stressors within the environmental baseline but unrelated to the proposed action (e.g., the significant shoreline armoring, legacy contamination, and vessel use within Port Angeles Harbor). Death and reduced fitness are most likely to cause minimal, reduced abundance in one cohort of PS Chinook salmon, HCSR chum, and PS steelhead and the remaining effects would be indiscernible against other factors affecting abundance. Therefore, effects of Project activities on ESA-listed species are unlikely to result in population-level consequences for exposed populations.

We have analyzed the permanent effects to the aquatic habitat resulting from this project and have determined that the functional lift provided by the implementation of the three stage biofiltration stormwater treatment facility at the IHTF would offset the loss of ecosystem functions due to the modification of habitat. This Project is expected to achieve no-net-loss of habitat function as a result of the proposed activities, which is needed to help ensure that populations of PS Chinook salmon do not drop below the existing 1-2 percent juvenile survival rates (Kilduff et al. 2014; Campbell et al. 2017). PS Chinook salmon juvenile survival is directly linked to the quality and quantity of nearshore habitat. The significant reductions in levels of contaminants in stormwater effluent will vastly increase the water quality within the action area and ensure that long-term impacts to PS Chinook salmon and its critical habitat, HCSR chum, and PS steelhead are completely offset.

2.6 Cumulative Effects

“Cumulative effects” are those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation [50 CFR 402.02 and 402.17(a)]. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Some continuing non-Federal activities are reasonably certain to contribute to climate effects within the action area. However, it is difficult if not impossible to distinguish between the action area’s future environmental conditions caused by global climate change that are properly part of the environmental baseline *vs.* cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described earlier in the discussion of environmental baseline (Section 2.4). Because Port Angeles Harbor and its nearshore environment are expected to remain highly industrialized and utilized for several decades to come, we do expect climate change conditions to become more pronounced over that time period. As a result, we anticipate that these changes may disrupt important habitat features and ecosystem functions that are critical to the survival and recovery of the species discussed in Section 2.5.

Other than commercial and recreational use of the waters, NMFS does not expect any non-Federal activities within the action area, as work within the water would fall under federal authorities such as the Clean Water Act. However, at the watershed scale, future upland development activities lacking a federal nexus would continue and are expected to lead to increased impervious surface, surface runoff, and non-point discharges. NMFS expects that these activities will continue in perpetuity, degrading water quality and exerting a negative influence on ESA-listed species. Any future federal actions would be subject to a Section 7(a)(2) consultation under the ESA.

2.7 Integration and Synthesis

The Integration and Synthesis section is the final step in assessing the risk that the proposed action poses to species and critical habitat. In this section, we add the effects of the action (Section 2.5) to the environmental baseline (Section 2.4) and the cumulative effects (Section 2.6), taking into account the status of the species and critical habitat (Section 2.2), to formulate the agency’s biological opinion as to whether the proposed action is likely to: (1) reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminish the value of designated or proposed critical habitat as a whole for the conservation of the species.

The species considered in this opinion are listed as threatened or endangered with extinction due to declines in abundance, poor productivity, reduced spatial structure, diminished diversity. Factors contributing to this status includes reduced quantity and/or quality of habitat, including reduced prey availability. Systemic anthropogenic detriments in estuarine and marine habitats are impairing populations of PS Chinook salmon, HCSR chum, and PS steelhead within Port Angeles Harbor, and these are often described as limiting factors.

The environmental baseline in the action area is primarily composed of vessel infrastructure as well as commercial development landward of the HAT that degrades nearshore habitat conditions for listed species. Within the action area there are sources of noise and shade (vessels and wharfs), water quality impairments (effluent in stormwater runoff and contaminants within the sediment), and artificial light (marinas, piers, and Coast Guard operations along Ediz Hook).

To this context of species status and baseline conditions, we add the effects of the proposed action, together with cumulative effects (future water quality impairment and stressors associated with climate change), in order to determine the effect of the project on the likelihood of species' survival and recovery. We also evaluate if the project's habitat effects would appreciably diminish the value of designated critical habitat for the conservation of the listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features.

2.7.1 ESA Listed Species

Because the work window is timed to avoid juvenile salmon peak migration, we expect that the number of juvenile PS Chinook salmon, HCSR chum, and PS steelhead exposed to construction effects will be low, and that the responses of the exposed fish will largely be behavioral, with very little reduction in fitness, injury, or mortality. Adult PS Chinook, HCSR chum, and PS steelhead are expected to be present in greater numbers during in-water construction; however, we expect that these species would not experience impacts from these activities to the degree of severity that they would in their juvenile life stage. We likewise anticipate that the responses of the exposed adult fish will largely be behavioral, with very little reduction in fitness, injury, or mortality (though greater numbers of adults would experience these conditions). Ultimately, the limited size and duration of Project activities are unlikely to cause disruptions to these species on a population level.

The most chronic of the temporary effects – reduced benthic prey around the fiberglass encasement for several months to a year – should not affect fitness, growth, or survival of enough fish to discernably reduce abundance of any cohort of any population within this timeframe. As described earlier in this document, long-term habitat effects are expected to be offset and the amount of habitat affected adversely is very small. The reduction in water quality contaminants likely produces exposure at lower concentration to many contaminants and response could include fewer fish with reduced fitness in the successive cohorts. Therefore, we do not expect the habitat loss to have negatively alter the viability parameters of these species.

Accordingly, when NMFS adds the very small reduction in numbers of PS Chinook salmon, HCSR chum, and PS steelhead as a consequence of their exposure to the temporary effects, to the baseline, even when considered with cumulative effects, the reduced abundance is insufficient to alter the productivity, spatial structure, or genetic diversity of any of the species.

2.7.2 Critical Habitat

The temporary effects on features of designated critical habitat for PS Chinook salmon would be water quality, benthic disturbance, natural cover, and noise. We expect diminishment of water quality based on turbidity, resuspension of contaminants, and discharge of effluent. Turbidity and resuspension of contaminants within the water column would diminish water quality for up to 3 months in the work window within 150 ft. of the fiberglass encasement. Because the duration is brief and primarily occurs when juveniles are not relying on the habitat in high numbers for growth or development, the impaired water quality PBF does not diminish conservation values of the action area. Furthermore, the installation of stormwater treatment for 14.4 acres of the IHTF would result in an improvement of the water quality PBF in the long term by significantly reducing the proportion of contaminants being discharged into the Puget Sound. These positive effects would be incremental but permanent within the action area.

The effects on benthic communities is also temporary and highly localized. The area of disruption to benthic communities would take up to a year to fully recover from the sediment falling out of suspension and burying these communities. Despite the duration of this effect, the forage PBF diminishment is not sufficient to reduce conservation values of the action area and the reduced forage base would be most noticeable in the first year.

The installation of the fiberglass encasement on the Cofferdam Dock would perpetuate a long-term effect on features of designated critical habitat for PS Chinook salmon through increased predation and reduction in benthic communities. Likewise, the continued operation of vessels utilizing the Cofferdam Dock would perpetuate an enduring though intermittent effect on features of designated critical habitat for PS Chinook salmon through increased predation and barriers to migration. The significant water quality benefits provided by the three-stage biofiltration stormwater treatment system is reasonably certain to offset the long-term loss of habitat function from the rehabilitation of the Cofferdam Dock. The temporary impacts that disrupt benthic environments would diminish juvenile fish rearing habitats and food sources in the action area; however, when scaled up to the designation scale, the effects are not expected to impact the designated critical habitat.

Accordingly, when NMFS considers the temporary diminishment to the critical habitat of PS Chinook to the baseline, even when considered with cumulative effects, this degradation of essential habitat features is insufficient impact the designated critical habitat. Therefore, the action does not appreciably reduce the value of this habitat or preclude its use by ESA-listed species within the action area.

2.8 Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities caused by the proposed action, and the cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of PS Chinook salmon, HCSR chum, or PS steelhead, and is not likely to destroy or adversely modify the designated critical habitat of PS Chinook salmon.

2.9 Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). "Harass" is further defined by interim guidance as to "create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering." "Incidental take" is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this ITS.

2.9.1 Amount or Extent of Take

Take in the form of harm is often impossible to quantify as a number of individuals, because the presence of the individuals (exposure to the harmful conditions) is highly variable over time, and is influenced by factors that cannot be easily predicted. Additionally, the duration of exposure is highly variable based on species behavior patterns, and the wide variability in numbers exposed and duration of exposure creates a range of responses, many of which cannot be observed without research and rigorous monitoring. In these circumstances, we described an "extent" of take which is a measure of the harming condition spatially, temporally, or both. The extent of take is causally related to the amount of harm that would result, and each extent of take provided below is an observable metric for monitoring, compliance, and re-initiation purposes.

In the biological opinion, NMFS determined that incidental take is reasonably certain to occur as follows:

1. Take in the form of harm to juvenile and adult PS Chinook, HCSR chum, and PS steelhead from turbidity/contaminated sediment, and from reduced prey availability. The extent of take is the area of in-water construction activities plus the 150 ft. turbidity mixing zone from the point of work. This metric is easily observed, and is causally related because generating turbidity in a larger area will increase the amount of suspended sediment and the area of impaired benthic communities.

2. Take in the form of injury or death of juvenile and adult PS Chinook salmon, HCSR chum, and PS steelhead from exposure to toxic chemicals in stormwater effluent discharged from the outfall. The surrogate indicator for the extent of take for discharge of stormwater effluent is the area of PGIS which would be regraded and repaved to accommodate the stormwater treatment upgrades at the IHTF. This area is estimated to be 14.4 acres. This take indicator is causal and proportional to the take identified in this Opinion as it directly affects the amount of stormwater pollution that would be directed to the new treatment. Take would be exceeded if the amount of replaced PGIS is more than 14.4 acres and/or any area that is not currently pollution-generating is converted to PGIS.

3. Take in the form of injury or death of PS Chinook, HCSR chum, and PS steelhead from vessels utilizing the Cofferdam Dock or predacious fish utilizing shade cast from these

berthing vessels. The installation of the fiberglass encasement will extend the life of the Cofferdam Dock, resulting in delayed migration, altered behavior, and increase in risk of predation of juvenile and adult salmonids. The surrogate indicator for the extent of take is the area of the fiberglass encasement (1.25 inches by 335 LF). If the area of the fiberglass encasement is greater than the dimensions analyzed in this Opinion, the take limit is exceeded and consultation must be reinitiated.

2.9.2 Effect of the Take

In the biological opinion, NMFS determined that the amount or extent of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

2.9.3 Reasonable and Prudent Measures

"Reasonable and prudent measures" are measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02).

1. Minimize take associated with turbidity and the resuspension of contaminated sediments.

2. Minimize take associated with stormwater pollution discharging from the site.

3. Ensure the completion of a monitoring and reporting program to confirm the take exemption for the proposed action is not exceeded, and that the terms and conditions in this incidental take statement are met.

2.9.4 Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the Federal action agency must comply (or must ensure that any applicant complies) with the following terms and conditions. The MARAD or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this ITS (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1. The following terms and conditions implement reasonable and prudent measure 1:

    a. The Port or its contractor shall make visual observations for turbid conditions while conducting in-water work activities. If turbidity creates a visible plume extending beyond the 150-ft. point of compliance, the Port or its contractor shall cease work until the plume no longer extends beyond 150 ft. from the area of work. If another exceedance occurs once work has resumed, the Port or its contractor shall modify their operations to ensure that turbidity remains below the established threshold. Examples of such modifications include working more slowly to reduce turbidity, utilizing different machinery for in-water work, or employing a turbidity boom.

2. The following terms and conditions implement reasonable and prudent measure 2:

   a. The Port shall develop a preventative maintenance program that includes sweeping paved areas where loading and unloading occur and that are temporarily covered after removal of the containers, logs, or other material covering the ground to remove loose material that could be washed off by stormwater.

3. The following terms and conditions implement reasonable and prudent measure 3:

   a. The Port shall provide a post-project "as built" report that indicates:
      i. The dimensions of the fiberglass encasement and dates of initiation and completion of the in-water fiberglass placement.
      ii. The total area of replaced PGIS in the upland of the IHTF to accommodate the stormwater treatment upgrades.
      iii. Pictures of the fiberglass encasement and stormwater treatment system once they have been installed.
      iv. Provide a preventative maintenance plan outlining the frequency with which the IHTF will be swept.
   b. Fish Impacts Monitoring. While in-water work occurs, make regular visual survey for distressed, injured, or dead fish. Collect dead specimens and have them identified by species. Include results in the post-project reporting.
   c. The Port of its contractor must submit this as-built report within 60 days of the completion of the Project to:
      projectreports.wcr@noaa.gov
      Reference Project #: WCRO-2023-00672
      CC: sara.m.tilley@noaa.gov

2.10 Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, "conservation recommendations" are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02).

> Continue to support the recovery of ESA-listed species and critical habitat in the Puget Sound through restoration efforts such as removal of derelict overwater structures, replacement of creosote, routine maintenance and cleanup of existing overwater facilities, and applicable upgrades to stormwater facilities with future advances in stormwater science and treatment wherever feasible at the port facilities and adjacent areas in Port Angeles Harbor.

2.11 “Not Likely to Adversely Affect” Determinations

North American green sturgeon:
NMFS has determined that the proposed action may affect, but is not likely to adversely affect the southern distinct population segment (DPS) of North American green sturgeon because species presence within Port Angeles Harbor has never been documented and would be exceedingly rare. Sturgeon have been observed on a southward migration within the Strait of Juan de Fuca waters during summer, however fewer than two dozen observations of this species have been made in the Salish Sea since 1900 (Lindley et al. 2008). There are no records of green sturgeon within Port Angeles Harbor, and the closest observation of green sturgeon to the action area was inside Dungeness Spit (approximately 10 miles west of the action area) in the 1970s (Pietsch and Orr 2015). As a result, we expect exposure of this green sturgeon to be discountable. Critical habitat has not been designated for this species within the action area.

Eulachon:
The Pacific eulachon southern DPS was listed as threatened under the ESA in 2010 (75 FR 13012). This DPS includes all eulachon that range from northern California to southwest and southcentral Alaska and into the southeastern Bering Sea. The Strait of Juan de Fuca lies between two of the larger eulachon spawning rivers (the Columbia and the Fraser rivers). Although Puget Sound and the Strait of Juan de Fuca lack a major eulachon run (Gustafson et al. 2010), there has been a gradual increase in returns to the Elwha River, which likely reflects changes in biological status as well as improved monitoring (Gustafson et al. 2016). Prior to dam removal, eulachon were rare in the Elwha River system (and absent in other Olympic peninsula rivers) and only occasional spawning had been reported from February to May (Gustafson et al. 2010; Shaffer 2009; Shaffer et al. 2009). In January 2015, seining surveys in the lower Elwha River estuary collected hundreds of egg-bearing and spent eulachon, indicating that local spawning was occurring (Coastal Watershed Institute 2015). Larvae and young juveniles become widely distributed in coastal waters once they enter the ocean. Little is known about the present status, timing, and migration routes of eulachon that spawn in the Elwha River and there have been no recent or historical sightings of eulachon within Port Angeles Harbor. We have therefore determined that eulachon exposure to this project’s effects is discountable. Critical habitat has not been designated for this species within the action area.

SRKW:
The Southern Resident killer whale Distinct Population Segment (DPS), composed of J, K, and L pods, was listed as endangered under the ESA on November 18, 2005 (70 FR 69903). SRKW spend considerable time in the Georgia Basin from late spring to early autumn, with concentrated activity in the inland waters of Washington State around the San Juan Islands, and then move south into Puget Sound in early autumn. While these are seasonal patterns, SRKW have the potential to occur throughout their range (from central California north to the Queen Charlotte Islands) at any time during the year. The Whale Museum’s Orca Master Dataset has 23 records of SRKW sightings within or immediately adjacent to Port Angeles Harbor between 1990 and 2018 during the in-water work window (Olson 2019). The Orca Network also has several records of SRKW sightings off of Ediz Hook, the most recent of which occurred in February of 2023 (Orca Network 2023). However, presence of SRKW within Port Angeles Harbor is extremely rare, making exposure to project effects unlikely. If present, SRKW could be briefly exposed to stormwater. Exposure to residual contaminants in the effluent post-treatment is not expected to

occur at an intensity or duration sufficient to cause adverse response in any individual SRKW. Response would be insignificant.

Critical habitat for the SRKW includes approximately 2,560 square miles of Puget Sound, excluding areas with water less than 20 feet deep relative to extreme high water. The three specific areas designated as critical habitat are (1) the Summer Core Area in Haro Strait and waters around the San Juan Islands; (2) Puget Sound; and (3) the Strait of Juan de Fuca. All three of the PBFs established for SRKW (water quality, prey species, and migration) are likely to be present in the action area.

The area surrounding the Cofferdam Dock is too shallow for SRKW; however, SRKW critical habitat does fall within the extent of the action area due to the discharge of stormwater from the outfall. As the project proposes to upgrade the stormwater treatment system at the IHTF, which will meaningfully reduce (though not completely remove) contaminants from the water, we consider exposure, if it does occur, will be at a lower concentration of contaminants than is currently found at the baseline level, reducing, but not fully avoiding water quality contamination. This effect preserves the conservation role of the habitat, should SRKW be present, for survival, growth, and fitness of individuals. And, as stated above in Section 2.5, the effects on PS Chinook, a prey species of SR killer whales, will cause a negligible annual reduction in the population, so that prey quantity as a habitat feature is only insignificantly affected. Finally, the proposed action would not create a barrier to migration.

Based on this analysis, NMFS concludes that the proposed action's effects on SRKW critical habitat are insignificant.

Humpback Whale:
On September 8, 2016, NMFS published a final rule to divide the globally listed endangered humpback whale into 14 DPSs and place four DPSs (Western North Pacific, Arabian Sea, Cape Verde/Northwest Africa, and Central America) as endangered and one (the Mexico DPS) as threatened (81 FR 62259). Only Central America and Mexico DPSs occur within the waters of the Pacific Northwest.

Since 2000, humpback whales have been sighted with increasing frequency in the inside waters of Washington (Falcone et. al. 2005). In 2014 and 2015 sightings sharply increased to around 500 each year. The Orca Network has several records of humpback sightings off of Ediz Hook, the most recent of which occurred in May of 2023 (Orca Network 2023). Humpback whales pass by the outlet of the Port of Port Angeles while transiting the Juan de Fuca; however, humpback presence within the action area is exceedingly rare. As such, Humpback whales are not expected to be near the area during in-water construction, nor are they expected to utilize the action area thereafter. Therefore, because the likelihood of exposure is extremely low, effects on humpback whale are considered discountable. Critical habitat is not designated for these two species within the action area.

2.12 Reinitiation of Consultation

This concludes ESA consultation for the Port of Port Angeles Intermodal Handling and Transfer Facility Improvements Project.

Under 50 CFR 402.16(a): “Reinitiation of consultation is required and shall be requested by the Federal agency or by the Service where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and: (1) If the amount or extent of taking specified in the incidental take statement is exceeded; (2) If new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion or written concurrence; or (4) If a new species is listed or critical habitat designated that may be affected by the identified action.”

3. MAGNUSON–STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT RESPONSE

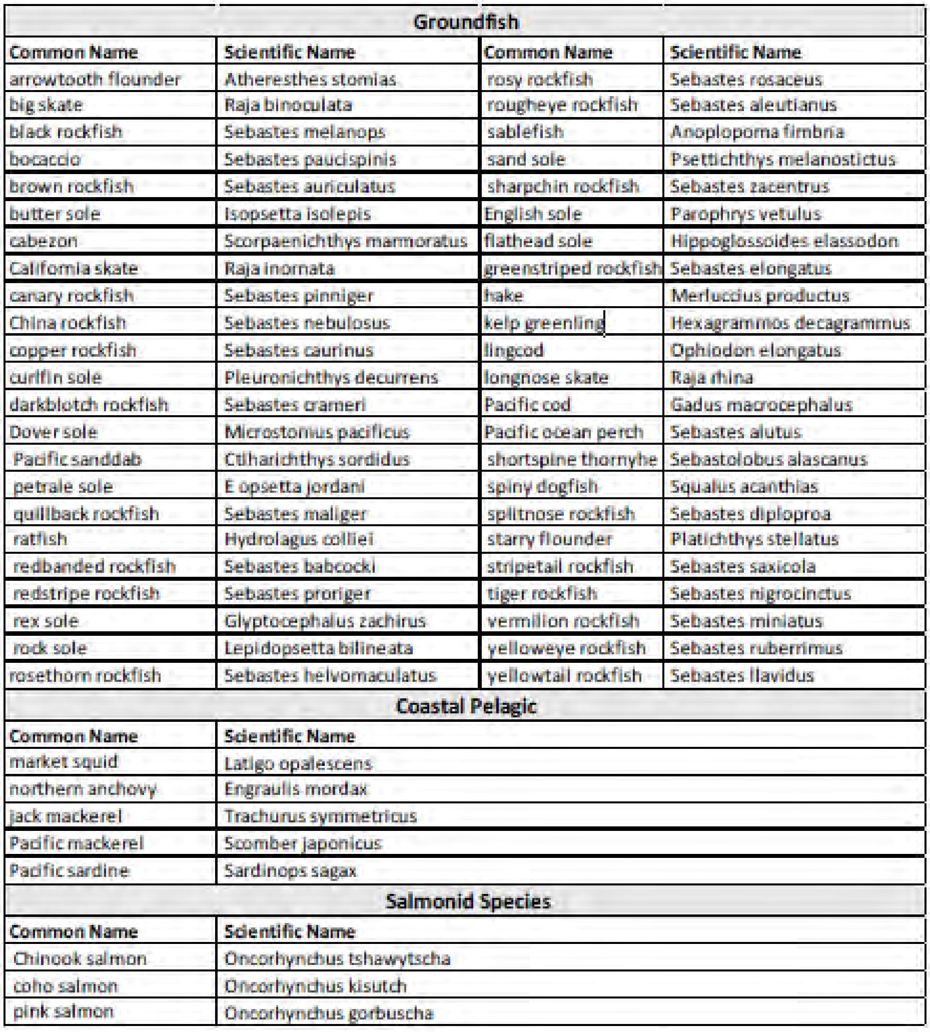
Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. Under the MSA, this consultation is intended to promote the conservation of EFH as necessary to support sustainable fisheries and the managed species’ contribution to a healthy ecosystem. For the purposes of the MSA, EFH means “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity”, and includes the physical, biological, and chemical properties that are used by fish (50 CFR 600.10). Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) of the MSA also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH. Such recommendations may include measures to avoid, minimize, mitigate, or otherwise offset the adverse effects of the action on EFH [CFR 600.905(b)].

This analysis is based, in part, on the EFH assessment provided by the MARAD and descriptions of EFH for Pacific Coast groundfish (Pacific Fishery Management Council (PFMC 2022), coastal pelagic species (CPS) (PFMC 2023), Pacific Coast salmon (PFMC 2022); and highly migratory species (HMS) (PFMC 2023)] contained in the fishery management plans developed by the PFMC and approved by the Secretary of Commerce.

3.1 Essential Fish Habitat Affected by the Project

The entire action area fully overlaps with identified EFH for Pacific Coast salmon, Pacific Coast groundfish, and coastal pelagic species. Designated EFH for groundfish and coastal pelagic species encompasses all waters along the coasts of Washington, Oregon, and California that are seaward from the mean high water line, including the upriver extent of saltwater intrusion in river mouths to the boundary of the U. S. economic zone, approximately 230 miles (370.4 km) offshore (PFMC 1998a,b). Designated EFH for salmonid species within marine water extends from the nearshore and tidal submerged environments within state territorial waters out to the full extent of the exclusive economic zone offshore of Washington, Oregon, and California, north of Point Conception to the Canadian border (PFMC 1999). Groundfish, coastal pelagic, and salmonid fish species that could have designated EFH in the action area are listed in Table 4.

Table 4. EFH species in action area



<table>
<tr><th colspan="4">Groundfish</th></tr>
<tr><th>Common Name</th><th>Scientific Name</th><th>Common Name</th><th>Scientific Name</th></tr>
<tr><td>arrowtooth flounder</td><td>Atheresthes stomias</td><td>rosy rockfish</td><td>Sebastes rosaceus</td></tr>
<tr><td>big skate</td><td>Raja binoculata</td><td>rougheye rockfish</td><td>Sebastes aleutianus</td></tr>
<tr><td>black rockfish</td><td>Sebastes melanops</td><td>sablefish</td><td>Anoplopoma fimbria</td></tr>
<tr><td>bocaccio</td><td>Sebastes paucispinis</td><td>sand sole</td><td>Psettichthys melanostictus</td></tr>
<tr><td>brown rockfish</td><td>Sebastes auriculatus</td><td>sharpchin rockfish</td><td>Sebastes zacentrus</td></tr>
<tr><td>butter sole</td><td>Isopsetta isolepis</td><td>English sole</td><td>Parophrys vetulus</td></tr>
<tr><td>cabezon</td><td>Scorpaenichthys marmoratus</td><td>flathead sole</td><td>Hippoglossoides elassodon</td></tr>
<tr><td>California skate</td><td>Raja inornata</td><td>greenstriped rockfish</td><td>Sebastes elongatus</td></tr>
<tr><td>canary rockfish</td><td>Sebastes pinniger</td><td>hake</td><td>Merluccius productus</td></tr>
<tr><td>China rockfish</td><td>Sebastes nebulosus</td><td>kelp greenling</td><td>Hexagrammos decagrammus</td></tr>
<tr><td>copper rockfish</td><td>Sebastes caurinus</td><td>lingcod</td><td>Ophiodon elongatus</td></tr>
<tr><td>curlfin sole</td><td>Pleuronichthys decurrens</td><td>longnose skate</td><td>Raja rhina</td></tr>
<tr><td>darkblotch rockfish</td><td>Sebastes crameri</td><td>Pacific cod</td><td>Gadus macrocephalus</td></tr>
<tr><td>Dover sole</td><td>Microstomus pacificus</td><td>Pacific ocean perch</td><td>Sebastes alutus</td></tr>
<tr><td>Pacific sanddab</td><td>Citharichthys sordidus</td><td>shortspine thornyhe</td><td>Sebastolobus alascanus</td></tr>
<tr><td>petrale sole</td><td>E opsetta jordani</td><td>spiny dogfish</td><td>Squalus acanthias</td></tr>
<tr><td>quillback rockfish</td><td>Sebastes maliger</td><td>splitnose rockfish</td><td>Sebastes diploproa</td></tr>
<tr><td>ratfish</td><td>Hydrolagus colliei</td><td>starry flounder</td><td>Platichthys stellatus</td></tr>
<tr><td>redbanded rockfish</td><td>Sebastes babcocki</td><td>stripetail rockfish</td><td>Sebastes saxicola</td></tr>
<tr><td>redstripe rockfish</td><td>Sebastes proriger</td><td>tiger rockfish</td><td>Sebastes nigrocinctus</td></tr>
<tr><td>rex sole</td><td>Glyptocephalus zachirus</td><td>vermilion rockfish</td><td>Sebastes miniatus</td></tr>
<tr><td>rock sole</td><td>Lepidopsetta bilineata</td><td>yelloweye rockfish</td><td>Sebastes ruberrimus</td></tr>
<tr><td>rosethorn rockfish</td><td>Sebastes helvomaculatus</td><td>yellowtail rockfish</td><td>Sebastes flavidus</td></tr>
<tr><th colspan="4">Coastal Pelagic</th></tr>
<tr><th>Common Name</th><th colspan="3">Scientific Name</th></tr>
<tr><td>market squid</td><td colspan="3">Latigo opalescens</td></tr>
<tr><td>northern anchovy</td><td colspan="3">Engraulis mordax</td></tr>
<tr><td>jack mackerel</td><td colspan="3">Trachurus symmetricus</td></tr>
<tr><td>Pacific mackerel</td><td colspan="3">Scomber japonicus</td></tr>
<tr><td>Pacific sardine</td><td colspan="3">Sardinops sagax</td></tr>
<tr><th colspan="4">Salmonid Species</th></tr>
<tr><th>Common Name</th><th colspan="3">Scientific Name</th></tr>
<tr><td>Chinook salmon</td><td colspan="3">Oncorhynchus tshawytscha</td></tr>
<tr><td>coho salmon</td><td colspan="3">Oncorhynchus kisutch</td></tr>
<tr><td>pink salmon</td><td colspan="3">Oncorhynchus gorbuscha</td></tr>
</table>

3.2 Adverse Effects on Essential Fish Habitat

The proposed actions would cause negative impacts on the quality of habitat by increasing suspended sediment, disturbing benthic communities, increasing concentrations of waterborne contaminants, altering intertidal habitat function by prolonging the life of an overwater structure, and creating noise and shade impacts through the continued vessel use of the dock. The project's adverse effects are described more fully in Section 2 of this document.

All of the Project activities mentioned above have the potential to adversely affect EFH for Pacific Coast groundfish, Pacific Coast salmon, and coastal pelagic species. However, the effects associated with turbidity, resuspension of contaminants, and disruptions to benthic communities are expected to be temporary in nature and return to baseline conditions upon completion of the project. The enduring effects of the Cofferdam Dock and the installation of a three stage stormwater biofiltration system would have the longest enduring impacts on EFH. The installation of the fiberglass encasement would perpetuate the disruption of intertidal habitat for the life of the structure. The significant reductions of contaminants in stormwater effluent would improve habitat quality and ecological function over the long term.

Offsetting Actions

The proposed project would have temporary and enduring effects on EFH water bottoms and water columns. These effects culminate in short-term (construction-related) and long-term adverse effects on Pacific Coast groundfish, Pacific Coast salmon EFH, and coastal pelagic species. The proposed action incorporates a number of minimization measures to avoid, reduce, and minimize the adverse effects of the action on EFH. Additionally, NMFS has determined that the water quality benefits provided by the stormwater treatment would sufficiently offset the enduring habitat effects caused by the installation of the fiberglass encasement on the Cofferdam Dock.

3.3 Essential Fish Habitat Conservation Recommendations

NMFS determined that the following conservation recommendations are necessary to avoid, minimize, mitigate, or otherwise offset the impact of the proposed action on EFH.

1. Take care when repositioning the riprap at the base of the Cofferdam Dock when installing the fiberglass encasement to minimize bed disturbance and suspended sediments. Perform this activity in the dry, if at all possible.
2. Do not allow work barges or work boats to ground out in the mudline.
3. Monitor turbidity and other water quality parameters to ensure that construction activities are compliant with Washington State Surface Water Quality Standards per WAC 173--201A.
4. Develop a Spill Prevention and Control Countermeasures Plan to address how fuels and hazardous materials onsite shall be stored, used, and cleaned up in the event of a spill.
5. Develop and implement an adaptive management plan for stormwater treatment, which actively pursues and applies upgrades to its treatment methods with future developments in stormwater science and treatment.

Fully implementing these EFH conservation recommendations would protect, by avoiding or minimizing the adverse effects described in section 3.2, above, for Pacific Coast salmon, Pacific Coast groundfish, and coastal pelagic species.

3.5 Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, MARAD must provide a detailed response in writing to NMFS within 30 days after receiving an EFH Conservation Recommendation. Such a response must be provided at least 10 days prior to final approval of the action if the response is inconsistent with any of NMFS' EFH Conservation Recommendations unless NMFS and the Federal agency have agreed to use alternative time frames for the Federal agency response. The response must include a description of the measures proposed by the agency for avoiding, minimizing, mitigating, or otherwise offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the Conservation Recommendations, the Federal agency must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with NMFS over the anticipated effects of the action and the measures needed to avoid, minimize, mitigate, or offset such effects [50 CFR 600.920(k)(1)].

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, we ask that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

3.6 Supplemental Consultation

The MARAD must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH Conservation Recommendations [50 CFR 600.920(l)].

4. DATA QUALITY ACT

The Data Quality Act (DQA) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these DQA components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

4.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this opinion are the MARAD and the Port of Port Angeles. Individual copies of this opinion were provided to the MARAD. The document will be available at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. The format and naming adhere to conventional standards for style.

4.2 Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

4.3 Objectivity

Information Product Category: Natural Resource Plan

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA regulations, 50 CFR 402.01 et seq., and the MSA implementing regulations regarding EFH, 50 CFR part 600.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this opinion *and EFH consultation* contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA *and MSA implementation*, and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

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U.S. Department
of Transportation

**Maritime
Administration**

1200 New Jersey Avenue, SE
Washington, DC 20590

March 22, 2024

VIA ELECTRONIC MAIL

National Marine Fisheries Service
Oregon & Washington Coastal Area Office
Attn: Jennifer McDonald Carlson
Email: jennifer.carlson@noaa.gov
Cc: sara.m.tilley@noaa.gov & consultationupdates.wcr@noaa.gov

RE: Response to Essential Fish Habitat Conservation Recommendations Regarding Port of Port Angeles Intermodal Handling and Transfer Facility Improvements Project (Port Angeles, Washington) - WCRO-2023-00672

Dear Ms. Carlson:

The U.S. Department of Transportation (DOT) Maritime Administration (MARAD) has received your Biological Opinion and Essential Fish Habitat (EFH) Response, dated March 20, 2024, for the Port of Port Angeles (Port) to construct the Intermodal Handling and Transfer Facility Improvements (IHTF), in the City of Port Angeles, WA. MARAD is the lead Federal agency for the EFH consultation for the Port project. This letter is in response to the EFH conservation recommendations provided by NOAA in the above referenced Biological Opinion/EFH Response.

Pursuant to Section 305(b)(4)(B) of the Magnuson-Stevens Fishery Conservation and Management Act, MARAD is required to provide a detailed response to each EFH conservation recommendation within 30 days of receipt. The Port as the project proponent reviewed the conservation recommendations (CRs) and provided the following responses that they support and will implement (responses are italicized):

> **CR #1** – Take care when repositioning the riprap at the base of the Cofferdam Dock when installing the fiberglass encasement to minimize bed disturbance and suspended sediments. Perform this activity in the dry, if at all possible.
>
> ***Response*** – *The Port and their contractor will take care and conduct this activity in the dry, as feasible, when repositioning the riprap at the base of the Cofferdam Dock during the installation of the fiberglass encasement to minimize sediment disturbance. This CR will be included in the contract documents as a permit condition for the contractor to meet when performing this work.*
>
> **CR #2** – Do not allow work barges or work boats to ground out in the mudline.
>
> ***Response*** – *The Port and their contractor will not allow work barges or work boats to ground out in the mudline during the construction of this project. This CR will be included in the contract documents as a permit condition for the contractor to meet when performing this work.*

CR #3 – Monitor turbidity and other water quality parameters to ensure that construction activities are compliant with Washington State Surface Water Quality Standards per WAC 173--201A.

Response *– The Port or their consultant will monitor turbidity and other water quality parameters to ensure that construction activities are compliant with Washington State Surface Water Quality Standards per WAC 173-201A. This monitoring will be conducted per a Water Quality Protection and Monitoring Plan to ensure compliance with Section 401 of the Clean Water Act, for which the Washington State Department of Ecology is the delegated regulatory authority, WA State Water Pollution Control Act (RCW 90.48), and the WA State Surface Water Quality Standards (WAC 173-201A). The proposed monitoring plan will describe water quality protection measures; monitoring parameters, methods, and evaluation criteria; and contingency response and notification procedures in the event a water quality criterion is exceeded during the proposed project. This monitoring plan will be included in the contract documents as a permit condition for the contractor to meet when performing this work.*

CR #4 – Develop a Spill Prevention and Control Countermeasures Plan to address how fuels and hazardous materials onsite shall be stored, used, and cleaned up in the event of a spill.

Response *– The development of a Spill Prevention and Control Countermeasures Plan (SPCC Plan) will be required as a contractor submittal in the contract documents. The SPCC Plan submittal will be approved by the Port Engineer prior to the work being performed and copies will be onsite during the work. The SPCC Plan will detail how fuels and hazardous materials onsite shall be stored, used, and cleaned up in the event of a spill.*

CR #5 – Develop and implement an adaptive management plan for stormwater treatment, which actively pursues and applies upgrades to its treatment methods with future developments in stormwater science and treatment.

Response *– Stormwater treatment and discharge at the project site is and will be regulated under the WA State Department of Ecology Industrial Stormwater General Permit. Adaptive management for stormwater treatment and best management practices (BMPs) governs the Permits multi-tier conditions and requirements to protect water quality. The facility stormwater pollution prevention plan will document and direct adaptive stormwater management for the proposed treatment facility. This will include operation and maintenance, good housekeeping, source control and treatment system adaptation BMPs. The adaptation BMPs could include modified filtration media to remove emerging contaminants or additional plantings in the bioretention treatment cell to improve media/soil structure and expand nutrient and oxygen availability.*

This response letter concludes the MARAD's EFH consultation on this project. If you have any questions please contact Jesse Waknitz, Environmental Manager for the Port at jessew@portofpa.com or (360) 460-1364 (direct).

Sincerely,

Kris Gilson, REM, CHMM
Director- Office of Environmental Compliance
202.366.1939 / kristine.gilson@dot.gov

APPENDIX F

Cultural and Tribal Resources Supporting Documentation

U.S. Department
Of Transportation
Maritime
Administration

1200 New Jersey Avenue, SE
Washington, DC 20590

February 28, 2023

VIA ELECTRONIC MAIL

Allyson Brooks, PhD
State Historic Preservation Officer
Department of Archaeology and Historic Preservation
PO Box 48343
Olympia, WA 98504-8343

Subject: U.S. Department of Transportation Maritime Administration
Section 106 initiation
Port of Port Angeles, Intermodal Handling & Transfer Facility, Port Infrastructure Development Program Grant

Dear Dr. Brooks:

The U.S. Department of Transportation (DOT) Maritime Administration (MARAD) awarded funds to the Port of Port Angeles (Port) under the Port Infrastructure Development Program (PIDP) for improvements to the Port's Intermodal Handling & Transfer Facility. The project is located in Port Angeles, Clallam County, Washington. The project location is entirely within an industrial property owned by the Port along the shoreline of Port Angeles Harbor. The property contains an existing full-service facility for all timber products including cargo loading, storage, roll-out, sorting, and transport.

This action constitutes an undertaking under Section 106 of the National Historic Preservation Act 1966, as amended (54 U.S.C. § 300101 et seq.). Pursuant to Section 106 and its implementing regulations, 36 CFR § 800, MARAD is initiating consultation with your office regarding this project.

Project Description

The total project footprint is 14.4 acres and includes three distinct project elements: regrading and resurfacing, coffer dam facility improvements, and the stormwater treatment facility. Project funding consists of the MARAD PIDP grant and a USACE Water Resources Development Act (WRDA) grant. Figure 1 in Attachment A depicts the project footprint and the locations where the two grants will be used. Photographs of the Port's property are included in Attachment B.

1. *Regrading and Resurfacing*

The project footprint, comprising of 14.4 acres, will be regraded and resurfaced with heavy load capacity asphalt or concrete. Ground disturbance will be minimized through raising the ground elevation with the import of crushed rock, installation of geogrid reinforcement, and placement of asphalt or concrete pavement. Project design ensures that ground disturbances during construction are limited to 12 inches below the existing ground surface.

2. *Cofferdam Dock Facility Improvements*

The Cofferdam Dock Facility Improvement includes the following: a) construction of a mechanically stabilized earth wall; b) installation of fiberglass encasement sheets just waterward of the existing sheet pile bulkhead; and c) replacement of a structural waler beam.

a) The previously installed poor-quality fill soils within the sheet pile encasement will be excavated approximately 8' below the current top of the sheet pile. This will be replaced with granular material which will be installed in layers and compacted to an elevation of 2' below the top of the existing sheet pile. From that point, a Mechanically Stabilized Earth Wall will be built by installing concrete blocks that are 2.5'Wx2.5'Hx5'L just inside the outside sheet pile face. These blocks will be stacked three high with geogrid reinforcement installed between the blocks that extend 7.5' back into the granular fill material.
b) A fiberglass sheet pile having the same profile as the existing sheet piles will be installed 1" waterward of the existing sheets. The void between the existing and the next sheets will be filed with grout. This encasement will prevent further corrosion of the steel with the salt water.
c) There is structural waler beam on the waterward side of the existing sheet pile. Due to this structural member having significant section loss due to corrosion it will be replaced.

3. *Stormwater Treatment Facility*

The stormwater treatment facility will be a 3-stage biofiltration facility. Stage 1 is a pre-filter that will consist of a pea gravel filter media that will be installed in (3) 18,000-gallon steel tanks. Stage 2 will filter stormwater through a biofiltration soil mix that will be placed in an above ground cast-in-place concrete retaining wall structure. Lastly, the stormwater will pass through stage 3 polishing media. That media will similarly be installed in an above ground cast-in-place concrete retaining wall structure. The polishing media will be installed later after sufficient data is collected from water quality monitoring of the inflow and outflow of the stage 2 treatment cell.

Area of Potential Effects

The Port has consulted with the Department of Archaeology and Historic Preservation (DAHP) and Lower Elwha Klallam Tribe since 2017 to refine the project design and footprint. Based on our research of the property, including a review of the DAHP's Washington Information System for Architectural and Archaeological Records Data and two prior surveys undertaken by the Port and their professional archaeological contractor (Colón et al. 2021; Ferris and Scott 2019), we have defined the Area of Potential Effects (APE) as the footprint of the project and buffer around archaeological site 45CA523 (Tse-whit-zen or Čḯxwicən in the Klallam language). The project footprint overlaps four parcels owned by the Port (no. 063000190090, 063000505520, 063099190035, and 063099190025).

Two adjacent parcels under Lower Elwha Klallam Tribe ownership are included in the APE: parcel no. 063099190045 and parcel no. 063099190050. The APE was expanded beyond the project footprint to include these two adjacent parcels due to the presence of archaeological site 45CA523, which lies within them and extends into the project footprint. The APE is inclusive of the anticipated project physical, visual, and acoustic effects on the character or use of historic properties. Figure 2 in Attachment A shows the project APE and Attachment C shows the project APE in relation to site 45CA523.

Identification of Historic Properties

The APE contains a portion of a previously recorded precontact site, 45CA523 (Čḯxwicən) (Colón et al. 2021; Ferris and Scott 2019). Čḯxwicən is a Lower Elwha Klallam ancestral village and burial site that was located along the waterfront at the base of what is known today as Ediz Hook. Čḯxwicən is significant for its long-term occupation (more than 2,000 years) and wide array of cultural practices that occurred at the village, and it holds high cultural and spiritual importance to the Lower Elwha Klallam Tribe (Butler et al. 2019). Site 45CA523 is shown in Attachment C. Attachment C contains a privileged/confidential map depicting the project in relation to the boundary of site 45CA523. This map is considered and treated as confidential in accordance with the Revised Code of Washington (RCW) 42.56.300 and 16 U.S.C. § 470hh(a).

The site was the subject of extensive investigations and documentation associated with the Washington State Department of Transportation's (WSDOT's) Graving Dock Facility for the Hood Canal Bridge Retrofit and Replacement Project, which was formally located on parcels owned by WSDOT. Two of these parcels are now owned by the Lower Elwha Klallam Tribe adjacent to the log yard (parcel no. 063099190045 and no. 063000505520). These investigations are well documented in Gill 2005, Hartmann 2003, Kanipe et al. 2006, Larson 2006, Lewarch et al. 2005, Schumacher 2003, Schumacher and Gill 2005, and White 2009. Site 45CA523 was listed in the National Register of Historic Places (NRHP) at the local level of significance under Criterion D in 2014 (Brooks 2014; White 2013). The period of significance is 300 – 2,700 years before present. The site includes three contributing areas and two noncontributing areas, which correspond with five distinct zones within the site (White 2013). The site boundary at the time of listing was contained entirely within the Lower Elwha Klallam Tribe's parcel (no. 063099190045).

The WSDOT Graving Dock project ended, and the Port acquired its Log Yard property in 2004. A settlement agreement between the State of Washington, Lower Elwha Klallam Tribe, City of Port Angeles, and Port was executed on August 14, 2006 ("Settlement Agreement"). The Settlement Agreement transferred ownership of the land that was the former Graving Dock site from the State to the Lower Elwha Klallam Tribe. The Lower Elwha Klallam Tribe accepted ownership of the land on the condition that it would be used for "cultural and historic preservation uses" and with the acknowledgement that the surrounding property will be used "for heavy industrial and maritime use creating noise, dust, vibration and other similar impacts typical of such uses" (Settlement Agreement Section 5.2).

The Port and its professional archaeological contractor undertook a preliminary archaeological survey in 2017 in advance of an earlier proposed stormwater conveyance project. The project was cancelled shortly after completion of the survey because it was evident the original design had a high probability to negatively impact cultural resources (Ferris and Scott 2019). During this 2017 survey, an extension of site 45CA523 (Čḯxwicən) was identified within two Port parcels east of the original site boundary (parcel no's. 063000190090 and 063000505520). The Port and its archaeological contractor coordinated closely with the Lower Elwha Klallam Tribe to implement the preliminary survey, and the Lower Elwha Klallam Tribe's archaeologist monitored the work.

The Port undertook further survey and site testing in 2020 to refine the project design. This survey and testing work was performed by the Port's archaeological contractor under an Archaeological Site Alteration and Excavation Permit issued by the DAHP and was completed across the entirety of the project footprint (Colón et al. 2021). The Port and its archaeological contractor coordinated closely with the Lower Elwha Klallam Tribe to implement the survey and testing, and the Lower Elwha Klallam Tribe's archaeologist monitored the work. The Port undertook and paid for curating the artifacts and associated documents by contracting with the Burke Museum as the repository until such time the Lower Elwha Klallam Tribe is ready to receive them. The 2020 survey and testing expanded the site boundary further within the Log Yard, which is shown in Attachment C. The survey results were used to further refine the project design to minimize ground disturbance and avoid excavations into the archaeological deposits. No formal determination of eligibility has been made to date for the extension of site 45CA523 within the Log Yard.

The Port has been consulting with the Lower Elwha Klallam Tribe since 2015 for the prior archaeological surveys and to develop the project design. On June 28, 2019, the Lower Elwha Klallam Tribe was notified about the Intermodal Handling & Transfer Facility Project when the Port shared the first conceptual figure of the project. Additionally, as part of the 2020 survey and testing permitting process, the DAHP sent notice and request for comment on the archaeological site alteration and excavation permit application to the Lower Elwha Klallam Tribe, Jamestown S'Kallam Tribe, Port Gamble S'Klallam Tribe, and Suquamish Tribe.

The APE also contains three previously recorded historic archaeological resources including 45CA773 (railroad spur), 45CA796 (railroad spur), and 45CA797 (kiln stack/historic debris scatter), all of which are within the project footprint (Ferris and Scott 2019; Metz 2017a, 2017b, 2017c; Metz and Ferris 2017). All three sites were previously recommended not eligible for listing in the NRHP by the Port's archaeological contractor because they lack integrity and are not significant under any of the NRHP Criteria for Evaluation. The sites do not have any association with significant events or people, nor do they convey distinctive design or construction. Furthermore, the sites were found to lack the potential to yield information important to history by the Port's archaeological contractor. DAHP determined that these three historic archaeological sites did not require further consideration during archaeological testing of the Port's Log Yard in 2020 (Colon et al. 2021).

The Port undertook geotechnical assessment to aid in designing the Cofferdam Facility Improvements in November 2018. The Port communicated the geotechnical excavations and results to the Lower Elwha Klallam Tribe at the time of the assessment. The geotechnical test pits were located north of the site 45CA523, and excavations were monitored by the Port's archaeological contractor. No cultural resources were identified during the monitoring (Ferris 2019).

Assessment of Effects

Based on the findings and information from previous surveys completed by the Port and their archaeological contractor, MARAD has been determined that the portion of 45CA523 within the Port's parcels retains integrity and is eligible for listing in the NRHP under Criterion D. Further, MARAD has also determined that sites 45CA773, 45CA796, and 45CA797 are not eligible for listing in the NRHP and do not qualify as historic properties.

Project design minimizes ground disturbance by paving and limiting excavation to match areas where the new surface transitions to the existing paved stormwater retention area on the east portion of the log yard. Excavation will not exceed a depth of 12 inches. Regrading and resurfacing overlaps with the boundary of the known archaeological site (45CA523); however, as designed, project-related ground disturbance will avoid site 45CA523 by 14 inches, which is below the existing pavement. The Cofferdam Dock Facility Improvements also partially overlap site 45CA523, but will also avoid disturbance to the site. The Stormwater Treatment Facility does not overlap the site and will not cause disturbance to it. Accordingly, project activities would not physically alter the historic property (site 45CA523). However, the project will introduce new visual elements that diminish the overall integrity of setting, feeling, and association for the historic property.

Based on this information, MARAD has determined that the project will have an adverse effect on the NRHP-listed site, 45CA523. Pursuant to 36 CFR 800.4(d)(2), MARAD seeks concurrence by your office with these determinations of eligibility and finding of adverse effect.

MARAD has authorized the Port of Port Angeles's Director of Engineering, Chris Hartman, to consult with your Agency on behalf of MARAD. We therefore request that you provide a copy of your response to them.

I am working remotely and request that all communication be sent electronically. If you have additional questions or comments, please contact me and/or the consultant for the action proponent, Chris Hartman (360-417-3422; chrish@portofpa.com).

Sincerely,

Barbara Voulgaris

Barbara Voulgaris
Federal Preservation Officer
Barbara.Voulgaris@dot.gov
202.366.0866

Encl.

Attachment A: Project Maps
Attachment B: Project Photographs
Attachment C: Project Map with Site Boundary

NOTE: Because of the sensitive nature of locational information related to cultural resources, the map contained in Attachment C is considered privileged and confidential pursuant to RCW 42.56.300 and 16 U.S.C. § 470hh(a). Attachment C has been provided under separate cover.

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Metz, M.

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Schumacher, J.

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White, W.S.

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U.S. Department
Of Transportation
Maritime
Administration

1200 New Jersey Avenue, SE
Washington, DC 20590

February 28, 2023

VIA ELECTRONIC MAIL: bryan.cole@hohtribe-nsn.org

Bryan Cole
Tribal Historic Preservation Officer
Hoh Indian Tribe
PO Box 2196
Forks, WA 98331

Subject: U.S. Department of Transportation Maritime Administration
Section 106 initiation
Port of Port Angeles, Intermodal Handling & Transfer Facility, Port Infrastructure Development Program Grant

Dear Mr. Cole:

The U.S. Department of Transportation (DOT) Maritime Administration (MARAD) awarded funds to the Port of Port Angeles (Port) under the Port Infrastructure Development Program (PIDP) for improvements to the Port's Intermodal Handling & Transfer Facility. The project is located in Port Angeles, Clallam County, Washington. The project location is entirely within an industrial property owned by the Port along the shoreline of Port Angeles Harbor. The property contains an existing full-service facility for all timber products including cargo loading, storage, roll-out, sorting, and transport.

In keeping with a government-to-government relationship, and in compliance with the National Historic Preservation Act of 1966, as amended (54 U.S.C. § 300101 et seq.), and it's implementing regulations, 36 CFR § 800, we invite you to participate in the Section 106 process as a consulting party. As part of the review process, we request information that identifies any resources that may hold traditional religious or cultural significance to the Hoh Indian Tribe that could be affected by the proposed work, and, if applicable, assist in developing alternatives that would avoid, minimize, or mitigate any adverse effects.

Project Description

The total project footprint is 14.4 acres and includes three distinct project elements: regrading and resurfacing, coffer dam facility improvements, and the stormwater treatment facility. Project funding consists of the MARAD PIDP grant and a USACE Water Resources Development Act (WRDA) grant. Figure 1 in Attachment A depicts the project footprint and the locations where the two grants will be used. Photographs of the Port's property are included in Attachment B.

1. *Regrading and Resurfacing*

The project footprint, comprising of 14.4 acres, will be regraded and resurfaced with heavy load capacity asphalt or concrete. Ground disturbance will be minimized through raising the ground elevation with the import of crushed rock, installation of geogrid reinforcement, and placement of

asphalt or concrete pavement. Project design ensures that ground disturbances during construction are limited to 12 inches below the existing ground surface.

2. *Cofferdam Dock Facility Improvements*

The Cofferdam Dock Facility Improvement includes the following: a) construction of a mechanically stabilized earth wall; b) installation of fiberglass encasement sheets just waterward of the existing sheet pile bulkhead; and c) replacement of a structural waler beam.

a) The previously installed poor-quality fill soils within the sheet pile encasement will be excavated approximately 8' below the current top of the sheet pile. This will be replaced with granular material which will be installed in layers and compacted to an elevation of 2' below the top of the existing sheet pile. From that point, a Mechanically Stabilized Earth Wall will be built by installing concrete blocks that are 2.5'Wx2.5'Hx5'L just inside the outside sheet pile face. These blocks will be stacked three high with geogrid reinforcement installed between the blocks that extend 7.5' back into the granular fill material.
b) A fiberglass sheet pile having the same profile as the existing sheet piles will be installed 1" waterward of the existing sheets. The void between the existing and the next sheets will be filed with grout. This encasement will prevent further corrosion of the steel with the salt water.
c) There is structural waler beam on the waterward side of the existing sheet pile. Due to this structural member having significant section loss due to corrosion it will be replaced.

3. *Stormwater Treatment Facility*

The stormwater treatment facility will be a 3-stage biofiltration facility. Stage 1 is a pre-filter that will consist of a pea gravel filter media that will be installed in (3) 18,000-gallon steel tanks. Stage 2 will filter stormwater through a biofiltration soil mix that will be placed in an above ground cast-in-place concrete retaining wall structure. Lastly, the stormwater will pass through stage 3 polishing media. That media will similarly be installed in an above ground cast-in-place concrete retaining wall structure. The polishing media will be installed later after sufficient data is collected from water quality monitoring of the inflow and outflow of the stage 2 treatment cell.

Previous surveys

We have defined the project's Area of Potential Effects (APE) as the footprint of the project and buffer around archaeological site 45CA523 (Tse-whit-zen or Č̓ixwicən in the Klallam language). The project footprint overlaps four parcels owned by the Port (no. 063000190090, 063000505520, 063099190035, and 063099190025). Two adjacent parcels under Lower Elwha Klallam Tribe ownership are included in the APE: parcel no. 063099190045 and parcel no. 063099190050. The APE was expanded beyond the project footprint to include these two adjacent parcels due to the presence of archaeological site 45CA523, which lies within them and extends into the project footprint. The APE is inclusive of the anticipated project physical, visual, and acoustic effects on the character or use of historic properties. Figure 2 in Attachment A shows the project APE and Attachment C shows the project APE in relation to site 45CA523.

Based on our research of the property, including a review of the DAHP's Washington Information System for Architectural and Archaeological Records Data, and information provided by the Port, there have been three prior surveys undertaken by the Port's professional archaeological contractor to refine project design (Colón et al. 2021; Ferris 2019; Ferris and Scott 2019). Additionally, there have been extensive archaeological investigations on property owned by the Lower Elwha Klallam Tribe immediately adjacent to the Port's property.

The Port's property contains a portion of previously recorded precontact site, 45CA523 (Č̓ixwicən) (Colón et al. 2021; Ferris and Scott 2019). Č̓ixwicən, Lower Elwha Klallam Tribe's ancestral village

and burial site, is significant for its long-term occupation (more than 2,000 years) and wide array of cultural practices that occurred at the village, and it holds high cultural and spiritual importance to the Lower Elwha Klallam Tribe (Butler et al. 2019). Site 45CA523 is shown in Attachment C. Attachment C contains a privileged/confidential map depicting the project in relation to the boundary of site 45CA523. This map is considered and treated as confidential in accordance with the Revised Code of Washington (RCW) 42.56.300 and 16 U.S.C. § 470hh(a).

The site was the subject of extensive investigations and documentation associated with the Washington State Department of Transportation's (WSDOT's) Graving Dock Facility for the Hood Canal Bridge Retrofit and Replacement Project, which was formally located on parcels owned by WSDOT. Two of these parcels are now owned by the Lower Elwha Klallam Tribe adjacent to the log yard (parcel no. 063099190045 and no. 063000505520). These investigations are well documented in Gill 2005, Hartmann 2003, Kanipe et al. 2006, Larson 2006, Lewarch et al. 2005, Schumacher 2003, Schumacher and Gill 2005, and White 2009. Site 45CA523 was listed in the National Register of Historic Places (NRHP) at the local level of significance under Criterion D in 2014 (Brooks 2014; White 2013). The period of significance is 300 – 2,700 years before present. The site includes three contributing areas and two noncontributing areas, which correspond with five distinct zones within the site (White 2013). The site boundary at the time of listing was contained entirely within the Lower Elwha Klallam Tribe's parcel (no. 063099190045).

The WSDOT Graving Dock project ended in 2004, the same year that the Port acquired its Log Yard property. A settlement agreement between the State of Washington, Lower Elwha Klallam Tribe, City of Port Angeles, and Port was executed on August 14, 2006 ("Settlement Agreement"). The Settlement Agreement transferred ownership of the land that was the former Graving Dock site from the State to the Lower Elwha Klallam Tribe. The Lower Elwha Klallam Tribe accepted ownership of the land on the condition that it would be used for "cultural and historic preservation uses" and with the acknowledgement that the surrounding property will be used "for heavy industrial and maritime use creating noise, dust, vibration and other similar impacts typical of such uses" (Settlement Agreement Section 5.2).

The Port and its professional archaeological contractor undertook a preliminary archaeological survey in 2017 in advance of an earlier proposed stormwater conveyance project. The project was cancelled shortly after completion of the survey because it was evident the original design had a high probability to negatively impact cultural resources (Ferris and Scott 2019). During this 2017 survey, an extension of site 45CA523 (Čı̓́xwicən) was identified within two Port parcels east of the original site boundary (parcel no's. 063000190090 and 063000505520). The Port and its archaeological contractor coordinated closely with the Lower Elwha Klallam Tribe to implement the preliminary survey, and the Lower Elwha Klallam Tribe's archaeologist monitored the work.

The Port undertook further survey and site testing in 2020 to refine the project design. This survey and testing work was performed by the Port's archaeological contractor under an Archaeological Site Alteration and Excavation Permit issued by the DAHP and was completed across the entirety of the project footprint (Colón et al. 2021). The Port and its archaeological contractor coordinated closely with the Lower Elwha Klallam Tribe to implement the survey and testing, and the Lower Elwha Klallam Tribe's archaeologist monitored the work. The Port undertook and paid for curating the artifacts and associated documents by contracting with the Burke Museum as the repository until such time the Lower Elwha Klallam Tribe is ready to receive them. The 2020 survey and testing expanded the site boundary further within the Log Yard, which is shown in Attachment C. The survey results were used to further refine the project design to minimize ground disturbance and avoid excavations into the archaeological deposits. No formal determination of eligibility has been made to date for the extension of site 45CA523 within the Log Yard.

The Port consulted with the Lower Elwha Klallam Tribe since 2015 for the prior archaeological surveys and to develop the project design. On June 28, 2019, the Lower Elwha Klallam Tribe was

notified about the Intermodal Handling & Transfer Facility Project when the Port shared the first conceptual figure of the project. Additionally, as part of the 2020 survey and testing permitting process, the DAHP sent notice and request for comment on the archaeological site alteration and excavation permit application to the Lower Elwha Klallam Tribe, Jamestown S'Kallam Tribe, Port Gamble S'Klallam Tribe, and Suquamish Tribe.

The APE also contains three previously recorded historic archaeological resources including 45CA773 (railroad spur), 45CA796 (railroad spur), and 45CA797 (kiln stack/historic debris scatter), all of which are within the project footprint (Ferris and Scott 2019; Metz 2017a, 2017b, 2017c; Metz and Ferris 2017). All three sites were previously recommended not eligible for listing in the NRHP by the Port's archaeological contractor because they lack integrity and are not significant under any of the NRHP Criteria for Evaluation. The sites do not have any association with significant events or people, nor do they convey distinctive design or construction. Furthermore, the sites were found to lack the potential to yield information important to history by the Port's archaeological contractor. DAHP determined that these three historic archaeological sites did not require further consideration during archaeological testing of the Port's Log Yard in 2020 (Colon et al. 2021).

The Port undertook geotechnical assessment to aid in designing the Cofferdam Facility Improvements in November 2018. The Port communicated the geotechnical excavations and results to the Lower Elwha Klallam Tribe at the time of the assessment. The geotechnical test pits were located north of the site 45CA523, and excavations were monitored by the Port's archaeological contractor. No cultural resources were identified during the monitoring (Ferris 2019).

Project design minimizes ground disturbance by paving and limiting excavation to match areas where the new surface transitions to the existing paved stormwater retention area on the east portion of the log yard. Excavation will not exceed a depth of 12 inches. Regrading and resurfacing overlaps with the boundary of the known archaeological site (45CA523); however, as designed, project-related ground disturbance will avoid site 45CA523 by 14 inches, which is below the existing pavement. The Cofferdam Dock Facility Improvements also partially overlap site 45CA523, but will also avoid disturbance to the site. The Stormwater Treatment Facility does not overlap the site and will not cause disturbance to it.

Please note that for the purposes of this project, MARAD has authorized the Port's Director of Engineering, Chris Hartman, to consult with your Tribe on behalf of MARAD. We therefore request that you provide a copy of your response to them.

We value your assistance and look forward to consulting further if there are historic properties of religious and/or cultural significance to your Tribe that may be affected by this project. To meet project timeframes, if you would like to participate or provide information regarding this project, MARAD respectfully requests that you notify us within 30 days.

I am working remotely and request that all communication be sent electronically. If you have additional questions or comments, please contact me and/or the consultant for the action proponent, Chris Hartman (360-417-3422; chrish@portofpa.com).

Sincerely,

Barbara Voulgaris

Barbara Voulgaris
Federal Preservation Officer
Barbara.Voulgaris@dot.gov
202.366.0866

Encl.

Attachment A: Project Maps
Attachment B: Project Photographs
Attachment C: Project Map with Site Boundary

NOTE: Because of the sensitive nature of locational information related to cultural resources, the map contained in Attachment C is considered privileged and confidential pursuant to RCW 42.56.300 and 16 U.S.C. § 470hh(a). Attachment C has been provided under separate cover.

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U.S. Department
Of Transportation
**Maritime
Administration**

1200 New Jersey Avenue, SE
Washington, DC 20590

February 28, 2023

VIA ELECTRONIC MAIL: ataylor@jamestowntribe.org

Allie Taylor
Tribal Historic Preservation Officer
Jamestown S'Klallam Tribe
1033 Old Blyn Hwy
Sequim, WA 98382-9342

Subject: U.S. Department of Transportation Maritime Administration
Section 106 initiation
Port of Port Angeles, Intermodal Handling & Transfer Facility, Port Infrastructure Development Program Grant

Dear Ms. Taylor:

The U.S. Department of Transportation (DOT) Maritime Administration (MARAD) awarded funds to the Port of Port Angeles (Port) under the Port Infrastructure Development Program (PIDP) for improvements to the Port's Intermodal Handling & Transfer Facility. The project is located in Port Angeles, Clallam County, Washington. The project location is entirely within an industrial property owned by the Port along the shoreline of Port Angeles Harbor. The property contains an existing full-service facility for all timber products including cargo loading, storage, roll-out, sorting, and transport.

In keeping with a government-to-government relationship, and in compliance with the National Historic Preservation Act of 1966, as amended (54 U.S.C. § 300101 et seq.), and it's implementing regulations, 36 CFR § 800, we invite you to participate in the Section 106 process as a consulting party. As part of the review process, we request information that identifies any resources that may hold traditional religious or cultural significance to the Jamestown S'Klallam Tribe that could be affected by the proposed work, and, if applicable, assist in developing alternatives that would avoid, minimize, or mitigate any adverse effects.

Project Description

The total project footprint is 14.4 acres and includes three distinct project elements: regrading and resurfacing, coffer dam facility improvements, and the stormwater treatment facility. Project funding consists of the MARAD PIDP grant and a USACE Water Resources Development Act (WRDA) grant. Figure 1 in Attachment A depicts the project footprint and the locations where the two grants will be used. Photographs of the Port's property are included in Attachment B.

1. *Regrading and Resurfacing*

The project footprint, comprising of 14.4 acres, will be regraded and resurfaced with heavy load capacity asphalt or concrete. Ground disturbance will be minimized through raising the ground elevation with the import of crushed rock, installation of geogrid reinforcement, and placement of

asphalt or concrete pavement. Project design ensures that ground disturbances during construction are limited to 12 inches below the existing ground surface.

2. *Cofferdam Dock Facility Improvements*

The Cofferdam Dock Facility Improvement includes the following: a) construction of a mechanically stabilized earth wall; b) installation of fiberglass encasement sheets just waterward of the existing sheet pile bulkhead; and c) replacement of a structural waler beam.

a) The previously installed poor-quality fill soils within the sheet pile encasement will be excavated approximately 8’ below the current top of the sheet pile. This will be replaced with granular material which will be installed in layers and compacted to an elevation of 2’ below the top of the existing sheet pile. From that point, a Mechanically Stabilized Earth Wall will be built by installing concrete blocks that are 2.5’Wx2.5’Hx5’L just inside the outside sheet pile face. These blocks will be stacked three high with geogrid reinforcement installed between the blocks that extend 7.5’ back into the granular fill material.
b) A fiberglass sheet pile having the same profile as the existing sheet piles will be installed 1” waterward of the existing sheets. The void between the existing and the next sheets will be filed with grout. This encasement will prevent further corrosion of the steel with the salt water.
c) There is structural waler beam on the waterward side of the existing sheet pile. Due to this structural member having significant section loss due to corrosion it will be replaced.

3. *Stormwater Treatment Facility*

The stormwater treatment facility will be a 3-stage biofiltration facility. Stage 1 is a pre-filter that will consist of a pea gravel filter media that will be installed in (3) 18,000-gallon steel tanks. Stage 2 will filter stormwater through a biofiltration soil mix that will be placed in an above ground cast-in-place concrete retaining wall structure. Lastly, the stormwater will pass through stage 3 polishing media. That media will similarly be installed in an above ground cast-in-place concrete retaining wall structure. The polishing media will be installed later after sufficient data is collected from water quality monitoring of the inflow and outflow of the stage 2 treatment cell.

Previous surveys

We have defined the project’s Area of Potential Effects (APE) as the footprint of the project and buffer around archaeological site 45CA523 (Tse-whit-zen or Č̓íxwicən in the Klallam language). The project footprint overlaps four parcels owned by the Port (no. 063000190090, 063000505520, 063099190035, and 063099190025). Two adjacent parcels under Lower Elwha Klallam Tribe ownership are included in the APE: parcel no. 063099190045 and parcel no. 063099190050. The APE was expanded beyond the project footprint to include these two adjacent parcels due to the presence of archaeological site 45CA523, which lies within them and extends into the project footprint. The APE is inclusive of the anticipated project physical, visual, and acoustic effects on the character or use of historic properties. Figure 2 in Attachment A shows the project APE and Attachment C shows the project APE in relation to site 45CA523.

Based on our research of the property, including a review of the DAHP’s Washington Information System for Architectural and Archaeological Records Data, and information provided by the Port, there have been three prior surveys undertaken by the Port’s professional archaeological contractor to refine project design (Colón et al. 2021; Ferris 2019; Ferris and Scott 2019). Additionally, there have been extensive archaeological investigations on property owned by the Lower Elwha Klallam Tribe immediately adjacent to the Port’s property.

The Port’s property contains a portion of previously recorded precontact site, 45CA523 (Č̓íxwicən) (Colón et al. 2021; Ferris and Scott 2019). Č̓íxwicən, Lower Elwha Klallam Tribe’s ancestral village

and burial site, is significant for its long-term occupation (more than 2,000 years) and wide array of cultural practices that occurred at the village, and it holds high cultural and spiritual importance to the Lower Elwha Klallam Tribe (Butler et al. 2019). Site 45CA523 is shown in Attachment C. Attachment C contains a privileged/confidential map depicting the project in relation to the boundary of site 45CA523. This map is considered and treated as confidential in accordance with the Revised Code of Washington (RCW) 42.56.300 and 16 U.S.C. § 470hh(a).

The site was the subject of extensive investigations and documentation associated with the Washington State Department of Transportation's (WSDOT's) Graving Dock Facility for the Hood Canal Bridge Retrofit and Replacement Project, which was formally located on parcels owned by WSDOT. Two of these parcels are now owned by the Lower Elwha Klallam Tribe adjacent to the log yard (parcel no. 063099190045 and no. 063000505520). These investigations are well documented in Gill 2005, Hartmann 2003, Kanipe et al. 2006, Larson 2006, Lewarch et al. 2005, Schumacher 2003, Schumacher and Gill 2005, and White 2009. Site 45CA523 was listed in the National Register of Historic Places (NRHP) at the local level of significance under Criterion D in 2014 (Brooks 2014; White 2013). The period of significance is 300 – 2,700 years before present. The site includes three contributing areas and two noncontributing areas, which correspond with five distinct zones within the site (White 2013). The site boundary at the time of listing was contained entirely within the Lower Elwha Klallam Tribe's parcel (no. 063099190045).

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Please note that for the purposes of this project, MARAD has authorized the Port's Director of Engineering, Chris Hartman, to consult with your Tribe on behalf of MARAD. We therefore request that you provide a copy of your response to them.

We value your assistance and look forward to consulting further if there are historic properties of religious and/or cultural significance to your Tribe that may be affected by this project. To meet project timeframes, if you would like to participate or provide information regarding this project, MARAD respectfully requests that you notify us within 30 days.

I am working remotely and request that all communication be sent electronically. If you have additional questions or comments, please contact me and/or the consultant for the action proponent, Chris Hartman (360-417-3422; chrish@portofpa.com).

Sincerely,

Barbara Voulgaris

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Encl.

Attachment A: Project Maps
Attachment B: Project Photographs
Attachment C: Project Map with Site Boundary

NOTE: Because of the sensitive nature of locational information related to cultural resources, the map contained in Attachment C is considered privileged and confidential pursuant to RCW 42.56.300 and 16 U.S.C. § 470hh(a). Attachment C has been provided under separate cover.

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U.S. Department
Of Transportation
Maritime
Administration

1200 New Jersey Avenue, SE
Washington, DC 20590

February 28, 2023

VIA ELECTRONIC MAIL: fgcharles@elwha.nsn.us

Chairwoman Frances Charles
Lower Elwha Klallam Tribe
2851 Lower Elwha Road
Port Angeles, WA 98363

Subject: U.S. Department of Transportation Maritime Administration
Section 106 initiation
Port of Port Angeles, Intermodal Handling & Transfer Facility, Port Infrastructure Development Program Grant

Dear Chairwoman Charles:

The U.S. Department of Transportation (DOT) Maritime Administration (MARAD) awarded funds to the Port of Port Angeles (Port) under the Port Infrastructure Development Program (PIDP) for improvements to the Port's Intermodal Handling & Transfer Facility. The project is located in Port Angeles, Clallam County, Washington. The project location is entirely within an industrial property owned by the Port along the shoreline of Port Angeles Harbor. The property contains an existing full-service facility for all timber products including cargo loading, storage, roll-out, sorting, and transport.

In keeping with a government-to-government relationship, and in compliance with the National Historic Preservation Act of 1966, as amended (54 U.S.C. § 300101 et seq.), and it's implementing regulations, 36 CFR § 800, we invite you to participate in the Section 106 process as a consulting party. As part of the review process, we request information that identifies any resources that may hold traditional religious or cultural significance to the Lower Elwha Klallam Tribe that could be affected by the proposed work, and, if applicable, assist in developing alternatives that would avoid, minimize, or mitigate any adverse effects.

Project Description

The total project footprint is 14.4 acres and includes three distinct project elements: regrading and resurfacing, coffer dam facility improvements, and the stormwater treatment facility. Project funding consists of the MARAD PIDP grant and a USACE Water Resources Development Act (WRDA) grant. Figure 1 in Attachment A depicts the project footprint and the locations where the two grants will be used. Photographs of the Port's property are included in Attachment B.

1. *Regrading and Resurfacing*

The project footprint, comprising of 14.4 acres, will be regraded and resurfaced with heavy load capacity asphalt or concrete. Ground disturbance will be minimized through raising the ground elevation with the import of crushed rock, installation of geogrid reinforcement, and placement of asphalt or concrete pavement. Project design ensures that ground disturbances during construction are limited to 12 inches below the existing ground surface.

2. Cofferdam Dock Facility Improvements

The Cofferdam Dock Facility Improvement includes the following: a) construction of a mechanically stabilized earth wall; b) installation of fiberglass encasement sheets just waterward of the existing sheet pile bulkhead; and c) replacement of a structural waler beam.

a) The previously installed poor-quality fill soils within the sheet pile encasement will be excavated approximately 8’ below the current top of the sheet pile. This will be replaced with granular material which will be installed in layers and compacted to an elevation of 2’ below the top of the existing sheet pile. From that point, a Mechanically Stabilized Earth Wall will be built by installing concrete blocks that are 2.5’Wx2.5’Hx5’L just inside the outside sheet pile face. These blocks will be stacked three high with geogrid reinforcement installed between the blocks that extend 7.5’ back into the granular fill material.
b) A fiberglass sheet pile having the same profile as the existing sheet piles will be installed 1” waterward of the existing sheets. The void between the existing and the next sheets will be filed with grout. This encasement will prevent further corrosion of the steel with the salt water.
c) There is structural waler beam on the waterward side of the existing sheet pile. Due to this structural member having significant section loss due to corrosion it will be replaced.

3. Stormwater Treatment Facility

The stormwater treatment facility will be a 3-stage biofiltration facility. Stage 1 is a pre-filter that will consist of a pea gravel filter media that will be installed in (3) 18,000-gallon steel tanks. Stage 2 will filter stormwater through a biofiltration soil mix that will be placed in an above ground cast-in-place concrete retaining wall structure. Lastly, the stormwater will pass through stage 3 polishing media. That media will similarly be installed in an above ground cast-in-place concrete retaining wall structure. The polishing media will be installed later after sufficient data is collected from water quality monitoring of the inflow and outflow of the stage 2 treatment cell.

Previous surveys

We have defined the project’s Area of Potential Effects (APE) as the footprint of the project and buffer around archaeological site 45CA523 (Tse-whit-zen or Čḯxwicən in the Klallam language). The project footprint overlaps four parcels owned by the Port (no. 063000190090, 063000505520, 063099190035, and 063099190025). Two adjacent parcels under your Tribe’s ownership are included in the APE: parcel no. 063099190045 and parcel no. 063099190050. The APE was expanded beyond the project footprint to include these two adjacent parcels due to the presence of archaeological site 45CA523, which lies within them and extends into the project footprint. The APE is inclusive of the anticipated project physical, visual, and acoustic effects on the character or use of historic properties. Figure 2 in Attachment A shows the project APE and Attachment C shows the project APE in relation to site 45CA523.

Based on our research of the property, including a review of the DAHP’s Washington Information System for Architectural and Archaeological Records Data, and information provided by the Port, there have been three prior surveys undertaken by the Port’s professional archaeological contractor to refine project design (Colón et al. 2021; Ferris 2019; Ferris and Scott 2019). Additionally, there have been extensive archaeological investigations on property owned by your Tribe immediately adjacent to the Port’s property.

The Port’s property contains a portion of previously recorded precontact site, 45CA523 (Čḯxwicən) (Colón et al. 2021; Ferris and Scott 2019). Čḯxwicən, your Tribe’s ancestral village and burial site, is significant for its long-term occupation (more than 2,000 years) and wide array of cultural practices that occurred at the village, and it holds high cultural and spiritual importance to the Lower Elwha

Klallam Tribe (Butler et al. 2019). Site 45CA523 is shown in Attachment C. Attachment C contains a privileged/confidential map depicting the project in relation to the boundary of site 45CA523. This map is considered and treated as confidential in accordance with the Revised Code of Washington (RCW) 42.56.300 and 16 U.S.C. § 470hh(a).

The site was the subject of extensive investigations and documentation associated with the Washington State Department of Transportation's (WSDOT's) Graving Dock Facility for the Hood Canal Bridge Retrofit and Replacement Project, which was formally located on parcels owned by WSDOT. Two of these parcels are now owned by your Tribe adjacent to the log yard (parcel no. 063099190045 and no. 063000505520). These investigations are well documented in Gill 2005, Hartmann 2003, Kanipe et al. 2006, Larson 2006, Lewarch et al. 2005, Schumacher 2003, Schumacher and Gill 2005, and White 2009. Site 45CA523 was listed in the National Register of Historic Places (NRHP) at the local level of significance under Criterion D in 2014 (Brooks 2014; White 2013). The period of significance is 300 – 2,700 years before present. The site includes three contributing areas and two noncontributing areas, which correspond with five distinct zones within the site (White 2013). The site boundary at the time of listing was contained entirely within your Tribe's parcel (no. 063099190045).

The WSDOT Graving Dock project ended in 2004, the same year that the Port acquired its Log Yard property. A settlement agreement between the State of Washington, Lower Elwha Klallam Tribe, City of Port Angeles, and Port was executed on August 14, 2006 ("Settlement Agreement"). The Settlement Agreement transferred ownership of the land that was the former Graving Dock site from the State to the Lower Elwha Klallam Tribe. The Lower Elwha Klallam Tribe accepted ownership of the land on the condition that it would be used for "cultural and historic preservation uses" and with the acknowledgement that the surrounding property will be used "for heavy industrial and maritime use creating noise, dust, vibration and other similar impacts typical of such uses" (Settlement Agreement Section 5.2).

The Port and its professional archaeological contractor undertook a preliminary archaeological survey in 2017 in advance of an earlier proposed stormwater conveyance project. The project was cancelled shortly after completion of the survey because it was evident the original design had a high probability to negatively impact cultural resources (Ferris and Scott 2019). During this 2017 survey, an extension of site 45CA523 (Čı̓́xwicən) was identified within two Port parcels east of the original site boundary (parcel no's. 063000190090 and 063000505520). The Port and its archaeological contractor coordinated closely with your Tribe to implement the preliminary survey, and your Tribe's archaeologist monitored the work.

The Port undertook further survey and site testing in 2020 to refine the project design. This survey and testing work was performed by the Port's archaeological contractor under an Archaeological Site Alteration and Excavation Permit issued by the DAHP and was completed across the entirety of the project footprint (Colón et al. 2021). The Port and its archaeological contractor coordinated closely with your Tribe to implement the survey and testing, and your Tribe's archaeologist monitored the work. The Port undertook and paid for curating the artifacts and associated documents by contracting with the Burke Museum as the repository until such time your Tribe is ready to receive them. The 2020 survey and testing expanded the site boundary further within the Log Yard, which is shown in Attachment C. The survey results were used to further refine the project design to minimize ground disturbance and avoid excavations into the archaeological deposits. No formal determination of eligibility has been made to date for the extension of site 45CA523 within the Log Yard.

The Port has consulted with your Tribe since 2015 for the prior archaeological surveys and to develop the project design. On June 28, 2019, the Lower Elwha Klallam Tribe was notified about the Intermodal Handling & Transfer Facility Project when the Port shared the first conceptual figure of the project. Additionally, as part of the 2020 survey and testing permitting process, the DAHP sent notice and request for comment on the archaeological site alteration and excavation permit application to the

Lower Elwha Klallam Tribe, Jamestown S'Kallam Tribe, Port Gamble S'Klallam Tribe, and Suquamish Tribe.

The APE also contains three previously recorded historic archaeological resources including 45CA773 (railroad spur), 45CA796 (railroad spur), and 45CA797 (kiln stack/historic debris scatter), all of which are within the project footprint (Ferris and Scott 2019; Metz 2017a, 2017b, 2017c; Metz and Ferris 2017). All three sites were previously recommended not eligible for listing in the NRHP by the Port's archaeological contractor because they lack integrity and are not significant under any of the NRHP Criteria for Evaluation. The sites do not have any association with significant events or people, nor do they convey distinctive design or construction. Furthermore, the sites were found to lack the potential to yield information important to history by the Port's archaeological contractor. DAHP determined that these three historic archaeological sites did not require further consideration during archaeological testing of the Port's Log Yard in 2020 (Colon et al. 2021).

The Port undertook geotechnical assessment to aid in designing the Cofferdam Facility Improvements in November 2018. The Port communicated the geotechnical excavations and results to your Tribe at the time of the assessment. The geotechnical test pits were located north of the site 45CA523, and excavations were monitored by the Port's archaeological contractor. No cultural resources were identified during the monitoring (Ferris 2019).

Project design minimizes ground disturbance by paving and limiting excavation to match areas where the new surface transitions to the existing paved stormwater retention area on the east portion of the log yard. Excavation will not exceed a depth of 12 inches. Regrading and resurfacing overlaps with the boundary of the known archaeological site (45CA523); however, as designed, project-related ground disturbance will avoid site 45CA523 by 14 inches, which is below the existing pavement. The Cofferdam Dock Facility Improvements also partially overlap site 45CA523, but will also avoid disturbance to the site. The Stormwater Treatment Facility does not overlap the site and will not cause disturbance to it.

Please note that for the purposes of this project, MARAD has authorized the Port's Director of Engineering, Chris Hartman, to consult with your Tribe on behalf of MARAD. We therefore request that you provide a copy of your response to them.

We value your assistance and look forward to consulting further if there are historic properties of religious and/or cultural significance to your Tribe that may be affected by this project. To meet project timeframes, if you would like to participate or provide information regarding this project, MARAD respectfully requests that you notify us within 30 days.

I am working remotely and request that all communication be sent electronically. If you have additional questions or comments, please contact me and/or the consultant for the action proponent, Chris Hartman (360-417-3422; chrish@portofpa.com).

Sincerely,

Barbara Voulgaris

Barbara Voulgaris
Federal Preservation Officer
Barbara.Voulgaris@dot.gov
202.366.0866

Encl.

Attachment A: Project Maps
Attachment B: Project Photographs
Attachment C: Project Map with Site Boundary

NOTE: Because of the sensitive nature of locational information related to cultural resources, the map contained in Attachment C is considered privileged and confidential pursuant to RCW 42.56.300 and 16 U.S.C. § 470hh(a). Attachment C has been provided under separate cover.

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U.S. Department
Of Transportation
Maritime
Administration

1200 New Jersey Avenue, SE
Washington, DC 20590

February 28, 2023

VIA ELECTRONIC MAIL: mcrcjanine@centurytel.net

Janine Ledford
Tribal Historic Preservation Officer
Makah Tribe
PO Box 160
Neah Bay, WA 98357

Subject: U.S. Department of Transportation Maritime Administration
Section 106 initiation
Port of Port Angeles, Intermodal Handling & Transfer Facility, Port Infrastructure Development Program Grant

Dear Ms. Ledford:

The U.S. Department of Transportation (DOT) Maritime Administration (MARAD) awarded funds to the Port of Port Angeles (Port) under the Port Infrastructure Development Program (PIDP) for improvements to the Port's Intermodal Handling & Transfer Facility. The project is located in Port Angeles, Clallam County, Washington. The project location is entirely within an industrial property owned by the Port along the shoreline of Port Angeles Harbor. The property contains an existing full-service facility for all timber products including cargo loading, storage, roll-out, sorting, and transport.

In keeping with a government-to-government relationship, and in compliance with the National Historic Preservation Act of 1966, as amended (54 U.S.C. § 300101 et seq.), and it's implementing regulations, 36 CFR § 800, we invite you to participate in the Section 106 process as a consulting party. As part of the review process, we request information that identifies any resources that may hold traditional religious or cultural significance to the Makah Tribe that could be affected by the proposed work, and, if applicable, assist in developing alternatives that would avoid, minimize, or mitigate any adverse effects.

Project Description

The total project footprint is 14.4 acres and includes three distinct project elements: regrading and resurfacing, coffer dam facility improvements, and the stormwater treatment facility. Project funding consists of the MARAD PIDP grant and a USACE Water Resources Development Act (WRDA) grant. Figure 1 in Attachment A depicts the project footprint and the locations where the two grants will be used. Photographs of the Port's property are included in Attachment B.

1. *Regrading and Resurfacing*

The project footprint, comprising of 14.4 acres, will be regraded and resurfaced with heavy load capacity asphalt or concrete. Ground disturbance will be minimized through raising the ground elevation with the import of crushed rock, installation of geogrid reinforcement, and placement of

asphalt or concrete pavement. Project design ensures that ground disturbances during construction are limited to 12 inches below the existing ground surface.

2. Cofferdam Dock Facility Improvements

The Cofferdam Dock Facility Improvement includes the following: a) construction of a mechanically stabilized earth wall; b) installation of fiberglass encasement sheets just waterward of the existing sheet pile bulkhead; and c) replacement of a structural waler beam.

a) The previously installed poor-quality fill soils within the sheet pile encasement will be excavated approximately 8’ below the current top of the sheet pile. This will be replaced with granular material which will be installed in layers and compacted to an elevation of 2’ below the top of the existing sheet pile. From that point, a Mechanically Stabilized Earth Wall will be built by installing concrete blocks that are 2.5’Wx2.5’Hx5’L just inside the outside sheet pile face. These blocks will be stacked three high with geogrid reinforcement installed between the blocks that extend 7.5’ back into the granular fill material.
b) A fiberglass sheet pile having the same profile as the existing sheet piles will be installed 1” waterward of the existing sheets. The void between the existing and the next sheets will be filed with grout. This encasement will prevent further corrosion of the steel with the salt water.
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The stormwater treatment facility will be a 3-stage biofiltration facility. Stage 1 is a pre-filter that will consist of a pea gravel filter media that will be installed in (3) 18,000-gallon steel tanks. Stage 2 will filter stormwater through a biofiltration soil mix that will be placed in an above ground cast-in-place concrete retaining wall structure. Lastly, the stormwater will pass through stage 3 polishing media. That media will similarly be installed in an above ground cast-in-place concrete retaining wall structure. The polishing media will be installed later after sufficient data is collected from water quality monitoring of the inflow and outflow of the stage 2 treatment cell.

Previous surveys

We have defined the project’s Area of Potential Effects (APE) as the footprint of the project and buffer around archaeological site 45CA523 (Tse-whit-zen or Čí̓xwicən in the Klallam language). The project footprint overlaps four parcels owned by the Port (no. 063000190090, 063000505520, 063099190035, and 063099190025). Two adjacent parcels under Lower Elwha Klallam Tribe ownership are included in the APE: parcel no. 063099190045 and parcel no. 063099190050. The APE was expanded beyond the project footprint to include these two adjacent parcels due to the presence of archaeological site 45CA523, which lies within them and extends into the project footprint. The APE is inclusive of the anticipated project physical, visual, and acoustic effects on the character or use of historic properties. Figure 2 in Attachment A shows the project APE and Attachment C shows the project APE in relation to site 45CA523.

Based on our research of the property, including a review of the DAHP’s Washington Information System for Architectural and Archaeological Records Data, and information provided by the Port, there have been three prior surveys undertaken by the Port’s professional archaeological contractor to refine project design (Colón et al. 2021; Ferris 2019; Ferris and Scott 2019). Additionally, there have been extensive archaeological investigations on property owned by the Lower Elwha Klallam Tribe immediately adjacent to the Port’s property.

The Port’s property contains a portion of previously recorded precontact site, 45CA523 (Čí̓xwicən) (Colón et al. 2021; Ferris and Scott 2019). Čí̓xwicən, Lower Elwha Klallam Tribe’s ancestral village

and burial site, is significant for its long-term occupation (more than 2,000 years) and wide array of cultural practices that occurred at the village, and it holds high cultural and spiritual importance to the Lower Elwha Klallam Tribe (Butler et al. 2019). Site 45CA523 is shown in Attachment C. Attachment C contains a privileged/confidential map depicting the project in relation to the boundary of site 45CA523. This map is considered and treated as confidential in accordance with the Revised Code of Washington (RCW) 42.56.300 and 16 U.S.C. § 470hh(a).

The site was the subject of extensive investigations and documentation associated with the Washington State Department of Transportation's (WSDOT's) Graving Dock Facility for the Hood Canal Bridge Retrofit and Replacement Project, which was formally located on parcels owned by WSDOT. Two of these parcels are now owned by the Lower Elwha Klallam Tribe adjacent to the log yard (parcel no. 063099190045 and no. 063000505520). These investigations are well documented in Gill 2005, Hartmann 2003, Kanipe et al. 2006, Larson 2006, Lewarch et al. 2005, Schumacher 2003, Schumacher and Gill 2005, and White 2009. Site 45CA523 was listed in the National Register of Historic Places (NRHP) at the local level of significance under Criterion D in 2014 (Brooks 2014; White 2013). The period of significance is 300 – 2,700 years before present. The site includes three contributing areas and two noncontributing areas, which correspond with five distinct zones within the site (White 2013). The site boundary at the time of listing was contained entirely within the Lower Elwha Klallam Tribe's parcel (no. 063099190045).

The WSDOT Graving Dock project ended in 2004, the same year that the Port acquired its Log Yard property. A settlement agreement between the State of Washington, Lower Elwha Klallam Tribe, City of Port Angeles, and Port was executed on August 14, 2006 ("Settlement Agreement"). The Settlement Agreement transferred ownership of the land that was the former Graving Dock site from the State to the Lower Elwha Klallam Tribe. The Lower Elwha Klallam Tribe accepted ownership of the land on the condition that it would be used for "cultural and historic preservation uses" and with the acknowledgement that the surrounding property will be used "for heavy industrial and maritime use creating noise, dust, vibration and other similar impacts typical of such uses" (Settlement Agreement Section 5.2).

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Please note that for the purposes of this project, MARAD has authorized the Port's Director of Engineering, Chris Hartman, to consult with your Tribe on behalf of MARAD. We therefore request that you provide a copy of your response to them.

We value your assistance and look forward to consulting further if there are historic properties of religious and/or cultural significance to your Tribe that may be affected by this project. To meet project timeframes, if you would like to participate or provide information regarding this project, MARAD respectfully requests that you notify us within 30 days.

I am working remotely and request that all communication be sent electronically. If you have additional questions or comments, please contact me and/or the consultant for the action proponent, Chris Hartman (360-417-3422; chrish@portofpa.com).

Sincerely,

Barbara Voulgaris

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Encl.

Attachment A: Project Maps
Attachment B: Project Photographs
Attachment C: Project Map with Site Boundary

NOTE: Because of the sensitive nature of locational information related to cultural resources, the map contained in Attachment C is considered privileged and confidential pursuant to RCW 42.56.300 and 16 U.S.C. § 470hh(a). Attachment C has been provided under separate cover.

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U.S. Department
Of Transportation
**Maritime
Administration**

1200 New Jersey Avenue, SE
Washington, DC 20590

February 28, 2023

VIA ELECTRONIC MAIL: pgst-thpo@pgst.nsn.us

Misty Ives
Tribal Historic Preservation Officer
Port Gamble S'Klallam Tribe
31912 Little Boston Road
Kingston, WA 98346

Subject: U.S. Department of Transportation Maritime Administration
Section 106 initiation
Port of Port Angeles, Intermodal Handling & Transfer Facility, Port Infrastructure Development Program Grant

Dear Ms. Ives:

The U.S. Department of Transportation (DOT) Maritime Administration (MARAD) awarded funds to the Port of Port Angeles (Port) under the Port Infrastructure Development Program (PIDP) for improvements to the Port's Intermodal Handling & Transfer Facility. The project is located in Port Angeles, Clallam County, Washington. The project location is entirely within an industrial property owned by the Port along the shoreline of Port Angeles Harbor. The property contains an existing full-service facility for all timber products including cargo loading, storage, roll-out, sorting, and transport.

In keeping with a government-to-government relationship, and in compliance with the National Historic Preservation Act of 1966, as amended (54 U.S.C. § 300101 et seq.), and it's implementing regulations, 36 CFR § 800, we invite you to participate in the Section 106 process as a consulting party. As part of the review process, we request information that identifies any resources that may hold traditional religious or cultural significance to the Port Gamble S'Klallam Tribe that could be affected by the proposed work, and, if applicable, assist in developing alternatives that would avoid, minimize, or mitigate any adverse effects.

Project Description

The total project footprint is 14.4 acres and includes three distinct project elements: regrading and resurfacing, coffer dam facility improvements, and the stormwater treatment facility. Project funding consists of the MARAD PIDP grant and a USACE Water Resources Development Act (WRDA) grant. Figure 1 in Attachment A depicts the project footprint and the locations where the two grants will be used. Photographs of the Port's property are included in Attachment B.

1. *Regrading and Resurfacing*

The project footprint, comprising of 14.4 acres, will be regraded and resurfaced with heavy load capacity asphalt or concrete. Ground disturbance will be minimized through raising the ground elevation with the import of crushed rock, installation of geogrid reinforcement, and placement of

asphalt or concrete pavement. Project design ensures that ground disturbances during construction are limited to 12 inches below the existing ground surface.

2. *Cofferdam Dock Facility Improvements*

The Cofferdam Dock Facility Improvement includes the following: a) construction of a mechanically stabilized earth wall; b) installation of fiberglass encasement sheets just waterward of the existing sheet pile bulkhead; and c) replacement of a structural waler beam.

a) The previously installed poor-quality fill soils within the sheet pile encasement will be excavated approximately 8' below the current top of the sheet pile. This will be replaced with granular material which will be installed in layers and compacted to an elevation of 2' below the top of the existing sheet pile. From that point, a Mechanically Stabilized Earth Wall will be built by installing concrete blocks that are 2.5'Wx2.5'Hx5'L just inside the outside sheet pile face. These blocks will be stacked three high with geogrid reinforcement installed between the blocks that extend 7.5' back into the granular fill material.
b) A fiberglass sheet pile having the same profile as the existing sheet piles will be installed 1" waterward of the existing sheets. The void between the existing and the next sheets will be filed with grout. This encasement will prevent further corrosion of the steel with the salt water.
c) There is structural waler beam on the waterward side of the existing sheet pile. Due to this structural member having significant section loss due to corrosion it will be replaced.

3. *Stormwater Treatment Facility*

The stormwater treatment facility will be a 3-stage biofiltration facility. Stage 1 is a pre-filter that will consist of a pea gravel filter media that will be installed in (3) 18,000-gallon steel tanks. Stage 2 will filter stormwater through a biofiltration soil mix that will be placed in an above ground cast-in-place concrete retaining wall structure. Lastly, the stormwater will pass through stage 3 polishing media. That media will similarly be installed in an above ground cast-in-place concrete retaining wall structure. The polishing media will be installed later after sufficient data is collected from water quality monitoring of the inflow and outflow of the stage 2 treatment cell.

Previous surveys

We have defined the project's Area of Potential Effects (APE) as the footprint of the project and buffer around archaeological site 45CA523 (Tse-whit-zen or Čḯxwicən in the Klallam language). The project footprint overlaps four parcels owned by the Port (no. 063000190090, 063000505520, 063099190035, and 063099190025). Two adjacent parcels under Lower Elwha Klallam Tribe ownership are included in the APE: parcel no. 063099190045 and parcel no. 063099190050. The APE was expanded beyond the project footprint to include these two adjacent parcels due to the presence of archaeological site 45CA523, which lies within them and extends into the project footprint. The APE is inclusive of the anticipated project physical, visual, and acoustic effects on the character or use of historic properties. Figure 2 in Attachment A shows the project APE and Attachment C shows the project APE in relation to site 45CA523.

Based on our research of the property, including a review of the DAHP's Washington Information System for Architectural and Archaeological Records Data, and information provided by the Port, there have been three prior surveys undertaken by the Port's professional archaeological contractor to refine project design (Colón et al. 2021; Ferris 2019; Ferris and Scott 2019). Additionally, there have been extensive archaeological investigations on property owned by the Lower Elwha Klallam Tribe immediately adjacent to the Port's property.

The Port's property contains a portion of previously recorded precontact site, 45CA523 (Čḯxwicən) (Colón et al. 2021; Ferris and Scott 2019). Čḯxwicən, Lower Elwha Klallam Tribe's ancestral village

and burial site, is significant for its long-term occupation (more than 2,000 years) and wide array of cultural practices that occurred at the village, and it holds high cultural and spiritual importance to the Lower Elwha Klallam Tribe (Butler et al. 2019). Site 45CA523 is shown in Attachment C. Attachment C contains a privileged/confidential map depicting the project in relation to the boundary of site 45CA523. This map is considered and treated as confidential in accordance with the Revised Code of Washington (RCW) 42.56.300 and 16 U.S.C. § 470hh(a).

The site was the subject of extensive investigations and documentation associated with the Washington State Department of Transportation's (WSDOT's) Graving Dock Facility for the Hood Canal Bridge Retrofit and Replacement Project, which was formally located on parcels owned by WSDOT. Two of these parcels are now owned by the Lower Elwha Klallam Tribe adjacent to the log yard (parcel no. 063099190045 and no. 063000505520). These investigations are well documented in Gill 2005, Hartmann 2003, Kanipe et al. 2006, Larson 2006, Lewarch et al. 2005, Schumacher 2003, Schumacher and Gill 2005, and White 2009. Site 45CA523 was listed in the National Register of Historic Places (NRHP) at the local level of significance under Criterion D in 2014 (Brooks 2014; White 2013). The period of significance is 300 – 2,700 years before present. The site includes three contributing areas and two noncontributing areas, which correspond with five distinct zones within the site (White 2013). The site boundary at the time of listing was contained entirely within the Lower Elwha Klallam Tribe's parcel (no. 063099190045).

The WSDOT Graving Dock project ended in 2004, the same year that the Port acquired its Log Yard property. A settlement agreement between the State of Washington, Lower Elwha Klallam Tribe, City of Port Angeles, and Port was executed on August 14, 2006 ("Settlement Agreement"). The Settlement Agreement transferred ownership of the land that was the former Graving Dock site from the State to the Lower Elwha Klallam Tribe. The Lower Elwha Klallam Tribe accepted ownership of the land on the condition that it would be used for "cultural and historic preservation uses" and with the acknowledgement that the surrounding property will be used "for heavy industrial and maritime use creating noise, dust, vibration and other similar impacts typical of such uses" (Settlement Agreement Section 5.2).

The Port and its professional archaeological contractor undertook a preliminary archaeological survey in 2017 in advance of an earlier proposed stormwater conveyance project. The project was cancelled shortly after completion of the survey because it was evident the original design had a high probability to negatively impact cultural resources (Ferris and Scott 2019). During this 2017 survey, an extension of site 45CA523 (Čḯxwicən) was identified within two Port parcels east of the original site boundary (parcel no's. 063000190090 and 063000505520). The Port and its archaeological contractor coordinated closely with the Lower Elwha Klallam Tribe to implement the preliminary survey, and the Lower Elwha Klallam Tribe's archaeologist monitored the work.

The Port undertook further survey and site testing in 2020 to refine the project design. This survey and testing work was performed by the Port's archaeological contractor under an Archaeological Site Alteration and Excavation Permit issued by the DAHP and was completed across the entirety of the project footprint (Colón et al. 2021). The Port and its archaeological contractor coordinated closely with the Lower Elwha Klallam Tribe to implement the survey and testing, and the Lower Elwha Klallam Tribe's archaeologist monitored the work. The Port undertook and paid for curating the artifacts and associated documents by contracting with the Burke Museum as the repository until such time the Lower Elwha Klallam Tribe is ready to receive them. The 2020 survey and testing expanded the site boundary further within the Log Yard, which is shown in Attachment C. The survey results were used to further refine the project design to minimize ground disturbance and avoid excavations into the archaeological deposits. No formal determination of eligibility has been made to date for the extension of site 45CA523 within the Log Yard.

The Port consulted with the Lower Elwha Klallam Tribe since 2015 for the prior archaeological surveys and to develop the project design. On June 28, 2019, the Lower Elwha Klallam Tribe was

notified about the Intermodal Handling & Transfer Facility Project when the Port shared the first conceptual figure of the project. Additionally, as part of the 2020 survey and testing permitting process, the DAHP sent notice and request for comment on the archaeological site alteration and excavation permit application to the Lower Elwha Klallam Tribe, Jamestown S'Kallam Tribe, Port Gamble S'Klallam Tribe, and Suquamish Tribe.

The APE also contains three previously recorded historic archaeological resources including 45CA773 (railroad spur), 45CA796 (railroad spur), and 45CA797 (kiln stack/historic debris scatter), all of which are within the project footprint (Ferris and Scott 2019; Metz 2017a, 2017b, 2017c; Metz and Ferris 2017). All three sites were previously recommended not eligible for listing in the NRHP by the Port's archaeological contractor because they lack integrity and are not significant under any of the NRHP Criteria for Evaluation. The sites do not have any association with significant events or people, nor do they convey distinctive design or construction. Furthermore, the sites were found to lack the potential to yield information important to history by the Port's archaeological contractor. DAHP determined that these three historic archaeological sites did not require further consideration during archaeological testing of the Port's Log Yard in 2020 (Colon et al. 2021).

The Port undertook geotechnical assessment to aid in designing the Cofferdam Facility Improvements in November 2018. The Port communicated the geotechnical excavations and results to the Lower Elwha Klallam Tribe at the time of the assessment. The geotechnical test pits were located north of the site 45CA523, and excavations were monitored by the Port's archaeological contractor. No cultural resources were identified during the monitoring (Ferris 2019).

Project design minimizes ground disturbance by paving and limiting excavation to match areas where the new surface transitions to the existing paved stormwater retention area on the east portion of the log yard. Excavation will not exceed a depth of 12 inches. Regrading and resurfacing overlaps with the boundary of the known archaeological site (45CA523); however, as designed, project-related ground disturbance will avoid site 45CA523 by 14 inches, which is below the existing pavement. The Cofferdam Dock Facility Improvements also partially overlap site 45CA523, but will also avoid disturbance to the site. The Stormwater Treatment Facility does not overlap the site and will not cause disturbance to it.

Please note that for the purposes of this project, MARAD has authorized the Port's Director of Engineering, Chris Hartman, to consult with your Tribe on behalf of MARAD. We therefore request that you provide a copy of your response to them.

We value your assistance and look forward to consulting further if there are historic properties of religious and/or cultural significance to your Tribe that may be affected by this project. To meet project timeframes, if you would like to participate or provide information regarding this project, MARAD respectfully requests that you notify us within 30 days.

I am working remotely and request that all communication be sent electronically. If you have additional questions or comments, please contact me and/or the consultant for the action proponent, Chris Hartman (360-417-3422; chrish@portofpa.com).

Sincerely,

Barbara Voulgaris

Barbara Voulgaris
Federal Preservation Officer
Barbara.Voulgaris@dot.gov
202.366.0866

Encl.

Attachment A: Project Maps
Attachment B: Project Photographs
Attachment C: Project Map with Site Boundary

NOTE: Because of the sensitive nature of locational information related to cultural resources, the map contained in Attachment C is considered privileged and confidential pursuant to RCW 42.56.300 and 16 U.S.C. § 470hh(a). Attachment C has been provided under separate cover.

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U.S. Department
Of Transportation
Maritime
Administration

1200 New Jersey Avenue, SE
Washington, DC 20590

February 28, 2023

VIA ELECTRONIC MAIL: doug.woodruff@quileutenation.org

The Honorable Doug Woodruff
Tribal Chair and Historic Preservation Officer
Quileute Nation
PO Box 279
La Push, WA 98350-0279

Subject: U.S. Department of Transportation Maritime Administration
Section 106 initiation
Port of Port Angeles, Intermodal Handling & Transfer Facility, Port Infrastructure Development Program Grant

Dear Chair Woodruff:

The U.S. Department of Transportation (DOT) Maritime Administration (MARAD) awarded funds to the Port of Port Angeles (Port) under the Port Infrastructure Development Program (PIDP) for improvements to the Port's Intermodal Handling & Transfer Facility. The project is located in Port Angeles, Clallam County, Washington. The project location is entirely within an industrial property owned by the Port along the shoreline of Port Angeles Harbor. The property contains an existing full-service facility for all timber products including cargo loading, storage, roll-out, sorting, and transport.

In keeping with a government-to-government relationship, and in compliance with the National Historic Preservation Act of 1966, as amended (54 U.S.C. § 300101 et seq.), and it's implementing regulations, 36 CFR § 800, we invite you to participate in the Section 106 process as a consulting party. As part of the review process, we request information that identifies any resources that may hold traditional religious or cultural significance to the Quileute Nation that could be affected by the proposed work, and, if applicable, assist in developing alternatives that would avoid, minimize, or mitigate any adverse effects.

Project Description

The total project footprint is 14.4 acres and includes three distinct project elements: regrading and resurfacing, coffer dam facility improvements, and the stormwater treatment facility. Project funding consists of the MARAD PIDP grant and a USACE Water Resources Development Act (WRDA) grant. Figure 1 in Attachment A depicts the project footprint and the locations where the two grants will be used. Photographs of the Port's property are included in Attachment B.

1. *Regrading and Resurfacing*

The project footprint, comprising of 14.4 acres, will be regraded and resurfaced with heavy load capacity asphalt or concrete. Ground disturbance will be minimized through raising the ground elevation with the import of crushed rock, installation of geogrid reinforcement, and placement of

asphalt or concrete pavement. Project design ensures that ground disturbances during construction are limited to 12 inches below the existing ground surface.

2. *Cofferdam Dock Facility Improvements*

The Cofferdam Dock Facility Improvement includes the following: a) construction of a mechanically stabilized earth wall; b) installation of fiberglass encasement sheets just waterward of the existing sheet pile bulkhead; and c) replacement of a structural waler beam.

a) The previously installed poor-quality fill soils within the sheet pile encasement will be excavated approximately 8’ below the current top of the sheet pile. This will be replaced with granular material which will be installed in layers and compacted to an elevation of 2’ below the top of the existing sheet pile. From that point, a Mechanically Stabilized Earth Wall will be built by installing concrete blocks that are 2.5’Wx2.5’Hx5’L just inside the outside sheet pile face. These blocks will be stacked three high with geogrid reinforcement installed between the blocks that extend 7.5’ back into the granular fill material.
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c) There is structural waler beam on the waterward side of the existing sheet pile. Due to this structural member having significant section loss due to corrosion it will be replaced.

3. *Stormwater Treatment Facility*

The stormwater treatment facility will be a 3-stage biofiltration facility. Stage 1 is a pre-filter that will consist of a pea gravel filter media that will be installed in (3) 18,000-gallon steel tanks. Stage 2 will filter stormwater through a biofiltration soil mix that will be placed in an above ground cast-in-place concrete retaining wall structure. Lastly, the stormwater will pass through stage 3 polishing media. That media will similarly be installed in an above ground cast-in-place concrete retaining wall structure. The polishing media will be installed later after sufficient data is collected from water quality monitoring of the inflow and outflow of the stage 2 treatment cell.

Previous surveys

We have defined the project’s Area of Potential Effects (APE) as the footprint of the project and buffer around archaeological site 45CA523 (Tse-whit-zen or Čḯxwicən in the Klallam language). The project footprint overlaps four parcels owned by the Port (no. 063000190090, 063000505520, 063099190035, and 063099190025). Two adjacent parcels under Lower Elwha Klallam Tribe ownership are included in the APE: parcel no. 063099190045 and parcel no. 063099190050. The APE was expanded beyond the project footprint to include these two adjacent parcels due to the presence of archaeological site 45CA523, which lies within them and extends into the project footprint. The APE is inclusive of the anticipated project physical, visual, and acoustic effects on the character or use of historic properties. Figure 2 in Attachment A shows the project APE and Attachment C shows the project APE in relation to site 45CA523.

Based on our research of the property, including a review of the DAHP’s Washington Information System for Architectural and Archaeological Records Data, and information provided by the Port, there have been three prior surveys undertaken by the Port’s professional archaeological contractor to refine project design (Colón et al. 2021; Ferris 2019; Ferris and Scott 2019). Additionally, there have been extensive archaeological investigations on property owned by the Lower Elwha Klallam Tribe immediately adjacent to the Port’s property.

The Port’s property contains a portion of previously recorded precontact site, 45CA523 (Čḯxwicən) (Colón et al. 2021; Ferris and Scott 2019). Čḯxwicən, Lower Elwha Klallam Tribe’s ancestral village

and burial site, is significant for its long-term occupation (more than 2,000 years) and wide array of cultural practices that occurred at the village, and it holds high cultural and spiritual importance to the Lower Elwha Klallam Tribe (Butler et al. 2019). Site 45CA523 is shown in Attachment C. Attachment C contains a privileged/confidential map depicting the project in relation to the boundary of site 45CA523. This map is considered and treated as confidential in accordance with the Revised Code of Washington (RCW) 42.56.300 and 16 U.S.C. § 470hh(a).

The site was the subject of extensive investigations and documentation associated with the Washington State Department of Transportation's (WSDOT's) Graving Dock Facility for the Hood Canal Bridge Retrofit and Replacement Project, which was formally located on parcels owned by WSDOT. Two of these parcels are now owned by the Lower Elwha Klallam Tribe adjacent to the log yard (parcel no. 063099190045 and no. 063000505520). These investigations are well documented in Gill 2005, Hartmann 2003, Kanipe et al. 2006, Larson 2006, Lewarch et al. 2005, Schumacher 2003, Schumacher and Gill 2005, and White 2009. Site 45CA523 was listed in the National Register of Historic Places (NRHP) at the local level of significance under Criterion D in 2014 (Brooks 2014; White 2013). The period of significance is 300 – 2,700 years before present. The site includes three contributing areas and two noncontributing areas, which correspond with five distinct zones within the site (White 2013). The site boundary at the time of listing was contained entirely within the Lower Elwha Klallam Tribe's parcel (no. 063099190045).

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Please note that for the purposes of this project, MARAD has authorized the Port's Director of Engineering, Chris Hartman, to consult with your Tribe on behalf of MARAD. We therefore request that you provide a copy of your response to them.

We value your assistance and look forward to consulting further if there are historic properties of religious and/or cultural significance to your Tribe that may be affected by this project. To meet project timeframes, if you would like to participate or provide information regarding this project, MARAD respectfully requests that you notify us within 30 days.

I am working remotely and request that all communication be sent electronically. If you have additional questions or comments, please contact me and/or the consultant for the action proponent, Chris Hartman (360-417-3422; chrish@portofpa.com).

Sincerely,

Barbara Voulgaris

Barbara Voulgaris
Federal Preservation Officer
Barbara.Voulgaris@dot.gov
202.366.0866

Encl.

Attachment A: Project Maps
Attachment B: Project Photographs
Attachment C: Project Map with Site Boundary

NOTE: Because of the sensitive nature of locational information related to cultural resources, the map contained in Attachment C is considered privileged and confidential pursuant to RCW 42.56.300 and 16 U.S.C. § 470hh(a). Attachment C has been provided under separate cover.

References Cited

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U.S. Department
Of Transportation
**Maritime
Administration**

1200 New Jersey Avenue, SE
Washington, DC 20590

February 28, 2023

VIA ELECTRONIC MAIL: dlewarch@Suquamish.nsn.us

Dennis Lewarch
Tribal Historic Preservation Officer
Suquamish Tribe
PO Box 498
Suquamish, WA 98392-0498

Subject: U.S. Department of Transportation Maritime Administration
Section 106 initiation
Port of Port Angeles, Intermodal Handling & Transfer Facility, Port Infrastructure Development Program Grant

Dear Mr. Lewarch:

The U.S. Department of Transportation (DOT) Maritime Administration (MARAD) awarded funds to the Port of Port Angeles (Port) under the Port Infrastructure Development Program (PIDP) for improvements to the Port's Intermodal Handling & Transfer Facility. The project is located in Port Angeles, Clallam County, Washington. The project location is entirely within an industrial property owned by the Port along the shoreline of Port Angeles Harbor. The property contains an existing full-service facility for all timber products including cargo loading, storage, roll-out, sorting, and transport.

In keeping with a government-to-government relationship, and in compliance with the National Historic Preservation Act of 1966, as amended (54 U.S.C. § 300101 et seq.), and it's implementing regulations, 36 CFR § 800, we invite you to participate in the Section 106 process as a consulting party. As part of the review process, we request information that identifies any resources that may hold traditional religious or cultural significance to the Suquamish Tribe that could be affected by the proposed work, and, if applicable, assist in developing alternatives that would avoid, minimize, or mitigate any adverse effects.

Project Description

The total project footprint is 14.4 acres and includes three distinct project elements: regrading and resurfacing, coffer dam facility improvements, and the stormwater treatment facility. Project funding consists of the MARAD PIDP grant and a USACE Water Resources Development Act (WRDA) grant. Figure 1 in Attachment A depicts the project footprint and the locations where the two grants will be used. Photographs of the Port's property are included in Attachment B.

1. Regrading and Resurfacing

The project footprint, comprising of 14.4 acres, will be regraded and resurfaced with heavy load capacity asphalt or concrete. Ground disturbance will be minimized through raising the ground elevation with the import of crushed rock, installation of geogrid reinforcement, and placement of

asphalt or concrete pavement. Project design ensures that ground disturbances during construction are limited to 12 inches below the existing ground surface.

2. *Cofferdam Dock Facility Improvements*

The Cofferdam Dock Facility Improvement includes the following: a) construction of a mechanically stabilized earth wall; b) installation of fiberglass encasement sheets just waterward of the existing sheet pile bulkhead; and c) replacement of a structural waler beam.

a) The previously installed poor-quality fill soils within the sheet pile encasement will be excavated approximately 8' below the current top of the sheet pile. This will be replaced with granular material which will be installed in layers and compacted to an elevation of 2' below the top of the existing sheet pile. From that point, a Mechanically Stabilized Earth Wall will be built by installing concrete blocks that are 2.5'Wx2.5'Hx5'L just inside the outside sheet pile face. These blocks will be stacked three high with geogrid reinforcement installed between the blocks that extend 7.5' back into the granular fill material.
b) A fiberglass sheet pile having the same profile as the existing sheet piles will be installed 1" waterward of the existing sheets. The void between the existing and the next sheets will be filed with grout. This encasement will prevent further corrosion of the steel with the salt water.
c) There is structural waler beam on the waterward side of the existing sheet pile. Due to this structural member having significant section loss due to corrosion it will be replaced.

3. *Stormwater Treatment Facility*

The stormwater treatment facility will be a 3-stage biofiltration facility. Stage 1 is a pre-filter that will consist of a pea gravel filter media that will be installed in (3) 18,000-gallon steel tanks. Stage 2 will filter stormwater through a biofiltration soil mix that will be placed in an above ground cast-in-place concrete retaining wall structure. Lastly, the stormwater will pass through stage 3 polishing media. That media will similarly be installed in an above ground cast-in-place concrete retaining wall structure. The polishing media will be installed later after sufficient data is collected from water quality monitoring of the inflow and outflow of the stage 2 treatment cell.

Previous surveys

We have defined the project's Area of Potential Effects (APE) as the footprint of the project and buffer around archaeological site 45CA523 (Tse-whit-zen or Čí̈xwicən in the Klallam language). The project footprint overlaps four parcels owned by the Port (no. 063000190090, 063000505520, 063099190035, and 063099190025). Two adjacent parcels under Lower Elwha Klallam Tribe ownership are included in the APE: parcel no. 063099190045 and parcel no. 063099190050. The APE was expanded beyond the project footprint to include these two adjacent parcels due to the presence of archaeological site 45CA523, which lies within them and extends into the project footprint. The APE is inclusive of the anticipated project physical, visual, and acoustic effects on the character or use of historic properties. Figure 2 in Attachment A shows the project APE and Attachment C shows the project APE in relation to site 45CA523.

Based on our research of the property, including a review of the DAHP's Washington Information System for Architectural and Archaeological Records Data, and information provided by the Port, there have been three prior surveys undertaken by the Port's professional archaeological contractor to refine project design (Colón et al. 2021; Ferris 2019; Ferris and Scott 2019). Additionally, there have been extensive archaeological investigations on property owned by the Lower Elwha Klallam Tribe immediately adjacent to the Port's property.

The Port's property contains a portion of previously recorded precontact site, 45CA523 (Čí̈xwicən) (Colón et al. 2021; Ferris and Scott 2019). Čí̈xwicən, Lower Elwha Klallam Tribe's ancestral village

and burial site, is significant for its long-term occupation (more than 2,000 years) and wide array of cultural practices that occurred at the village, and it holds high cultural and spiritual importance to the Lower Elwha Klallam Tribe (Butler et al. 2019). Site 45CA523 is shown in Attachment C. Attachment C contains a privileged/confidential map depicting the project in relation to the boundary of site 45CA523. This map is considered and treated as confidential in accordance with the Revised Code of Washington (RCW) 42.56.300 and 16 U.S.C. § 470hh(a).

The site was the subject of extensive investigations and documentation associated with the Washington State Department of Transportation's (WSDOT's) Graving Dock Facility for the Hood Canal Bridge Retrofit and Replacement Project, which was formally located on parcels owned by WSDOT. Two of these parcels are now owned by the Lower Elwha Klallam Tribe adjacent to the log yard (parcel no. 063099190045 and no. 063000505520). These investigations are well documented in Gill 2005, Hartmann 2003, Kanipe et al. 2006, Larson 2006, Lewarch et al. 2005, Schumacher 2003, Schumacher and Gill 2005, and White 2009. Site 45CA523 was listed in the National Register of Historic Places (NRHP) at the local level of significance under Criterion D in 2014 (Brooks 2014; White 2013). The period of significance is 300 – 2,700 years before present. The site includes three contributing areas and two noncontributing areas, which correspond with five distinct zones within the site (White 2013). The site boundary at the time of listing was contained entirely within the Lower Elwha Klallam Tribe's parcel (no. 063099190045).

The WSDOT Graving Dock project ended in 2004, the same year that the Port acquired its Log Yard property. A settlement agreement between the State of Washington, Lower Elwha Klallam Tribe, City of Port Angeles, and Port was executed on August 14, 2006 ("Settlement Agreement"). The Settlement Agreement transferred ownership of the land that was the former Graving Dock site from the State to the Lower Elwha Klallam Tribe. The Lower Elwha Klallam Tribe accepted ownership of the land on the condition that it would be used for "cultural and historic preservation uses" and with the acknowledgement that the surrounding property will be used "for heavy industrial and maritime use creating noise, dust, vibration and other similar impacts typical of such uses" (Settlement Agreement Section 5.2).

The Port and its professional archaeological contractor undertook a preliminary archaeological survey in 2017 in advance of an earlier proposed stormwater conveyance project. The project was cancelled shortly after completion of the survey because it was evident the original design had a high probability to negatively impact cultural resources (Ferris and Scott 2019). During this 2017 survey, an extension of site 45CA523 (Či̋xwicən) was identified within two Port parcels east of the original site boundary (parcel no's. 063000190090 and 063000505520). The Port and its archaeological contractor coordinated closely with the Lower Elwha Klallam Tribe to implement the preliminary survey, and the Lower Elwha Klallam Tribe's archaeologist monitored the work.

The Port undertook further survey and site testing in 2020 to refine the project design. This survey and testing work was performed by the Port's archaeological contractor under an Archaeological Site Alteration and Excavation Permit issued by the DAHP and was completed across the entirety of the project footprint (Colón et al. 2021). The Port and its archaeological contractor coordinated closely with the Lower Elwha Klallam Tribe to implement the survey and testing, and the Lower Elwha Klallam Tribe's archaeologist monitored the work. The Port undertook and paid for curating the artifacts and associated documents by contracting with the Burke Museum as the repository until such time the Lower Elwha Klallam Tribe is ready to receive them. The 2020 survey and testing expanded the site boundary further within the Log Yard, which is shown in Attachment C. The survey results were used to further refine the project design to minimize ground disturbance and avoid excavations into the archaeological deposits. No formal determination of eligibility has been made to date for the extension of site 45CA523 within the Log Yard.

The Port consulted with the Lower Elwha Klallam Tribe since 2015 for the prior archaeological surveys and to develop the project design. On June 28, 2019, the Lower Elwha Klallam Tribe was

notified about the Intermodal Handling & Transfer Facility Project when the Port shared the first conceptual figure of the project. Additionally, as part of the 2020 survey and testing permitting process, the DAHP sent notice and request for comment on the archaeological site alteration and excavation permit application to the Lower Elwha Klallam Tribe, Jamestown S'Kallam Tribe, Port Gamble S'Klallam Tribe, and Suquamish Tribe.

The APE also contains three previously recorded historic archaeological resources including 45CA773 (railroad spur), 45CA796 (railroad spur), and 45CA797 (kiln stack/historic debris scatter), all of which are within the project footprint (Ferris and Scott 2019; Metz 2017a, 2017b, 2017c; Metz and Ferris 2017). All three sites were previously recommended not eligible for listing in the NRHP by the Port's archaeological contractor because they lack integrity and are not significant under any of the NRHP Criteria for Evaluation. The sites do not have any association with significant events or people, nor do they convey distinctive design or construction. Furthermore, the sites were found to lack the potential to yield information important to history by the Port's archaeological contractor. DAHP determined that these three historic archaeological sites did not require further consideration during archaeological testing of the Port's Log Yard in 2020 (Colon et al. 2021).

The Port undertook geotechnical assessment to aid in designing the Cofferdam Facility Improvements in November 2018. The Port communicated the geotechnical excavations and results to the Lower Elwha Klallam Tribe at the time of the assessment. The geotechnical test pits were located north of the site 45CA523, and excavations were monitored by the Port's archaeological contractor. No cultural resources were identified during the monitoring (Ferris 2019).

Project design minimizes ground disturbance by paving and limiting excavation to match areas where the new surface transitions to the existing paved stormwater retention area on the east portion of the log yard. Excavation will not exceed a depth of 12 inches. Regrading and resurfacing overlaps with the boundary of the known archaeological site (45CA523); however, as designed, project-related ground disturbance will avoid site 45CA523 by 14 inches, which is below the existing pavement. The Cofferdam Dock Facility Improvements also partially overlap site 45CA523, but will also avoid disturbance to the site. The Stormwater Treatment Facility does not overlap the site and will not cause disturbance to it.

Please note that for the purposes of this project, MARAD has authorized the Port's Director of Engineering, Chris Hartman, to consult with your Tribe on behalf of MARAD. We therefore request that you provide a copy of your response to them.

We value your assistance and look forward to consulting further if there are historic properties of religious and/or cultural significance to your Tribe that may be affected by this project. To meet project timeframes, if you would like to participate or provide information regarding this project, MARAD respectfully requests that you notify us within 30 days.

I am working remotely and request that all communication be sent electronically. If you have additional questions or comments, please contact me and/or the consultant for the action proponent, Chris Hartman (360-417-3422; chrish@portofpa.com).

Sincerely,

Barbara Voulgaris

Barbara Voulgaris
Federal Preservation Officer
Barbara.Voulgaris@dot.gov
202.366.0866

Encl.

Attachment A: Project Maps
Attachment B: Project Photographs
Attachment C: Project Map with Site Boundary

NOTE: Because of the sensitive nature of locational information related to cultural resources, the map contained in Attachment C is considered privileged and confidential pursuant to RCW 42.56.300 and 16 U.S.C. § 470hh(a). Attachment C has been provided under separate cover.

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U.S. Department
Of Transportation
**Maritime
Administration**

1200 New Jersey Avenue, SE
Washington, DC 20590

February 28, 2023

VIA ELECTRONIC MAIL: robert.brunoe@ctwsbnr.org

Robert Brunoe
Tribal Historic Preservation Officer
Confederated Tribes of Warm Springs
PO Box 460
Warm Springs, OR 97761

Subject: U.S. Department of Transportation Maritime Administration
Section 106 initiation
Port of Port Angeles, Intermodal Handling & Transfer Facility, Port Infrastructure
Development Program Grant

Dear Mr. Brunoe:

The U.S. Department of Transportation (DOT) Maritime Administration (MARAD) awarded funds to the Port of Port Angeles (Port) under the Port Infrastructure Development Program (PIDP) for improvements to the Port's Intermodal Handling & Transfer Facility. The project is located in Port Angeles, Clallam County, Washington. The project location is entirely within an industrial property owned by the Port along the shoreline of Port Angeles Harbor. The property contains an existing full-service facility for all timber products including cargo loading, storage, roll-out, sorting, and transport.

In keeping with a government-to-government relationship, and in compliance with the National Historic Preservation Act of 1966, as amended (54 U.S.C. § 300101 et seq.), and it's implementing regulations, 36 CFR § 800, we invite you to participate in the Section 106 process as a consulting party. As part of the review process, we request information that identifies any resources that may hold traditional religious or cultural significance to the Confederated Tribes of Warm Springs that could be affected by the proposed work, and, if applicable, assist in developing alternatives that would avoid, minimize, or mitigate any adverse effects.

Project Description

The total project footprint is 14.4 acres and includes three distinct project elements: regrading and resurfacing, coffer dam facility improvements, and the stormwater treatment facility. Project funding consists of the MARAD PIDP grant and a USACE Water Resources Development Act (WRDA) grant. Figure 1 in Attachment A depicts the project footprint and the locations where the two grants will be used. Photographs of the Port's property are included in Attachment B.

1. *Regrading and Resurfacing*

The project footprint, comprising of 14.4 acres, will be regraded and resurfaced with heavy load capacity asphalt or concrete. Ground disturbance will be minimized through raising the ground elevation with the import of crushed rock, installation of geogrid reinforcement, and placement of

asphalt or concrete pavement. Project design ensures that ground disturbances during construction are limited to 12 inches below the existing ground surface.

2. *Cofferdam Dock Facility Improvements*

The Cofferdam Dock Facility Improvement includes the following: a) construction of a mechanically stabilized earth wall; b) installation of fiberglass encasement sheets just waterward of the existing sheet pile bulkhead; and c) replacement of a structural waler beam.

a) The previously installed poor-quality fill soils within the sheet pile encasement will be excavated approximately 8’ below the current top of the sheet pile. This will be replaced with granular material which will be installed in layers and compacted to an elevation of 2’ below the top of the existing sheet pile. From that point, a Mechanically Stabilized Earth Wall will be built by installing concrete blocks that are 2.5’Wx2.5’Hx5’L just inside the outside sheet pile face. These blocks will be stacked three high with geogrid reinforcement installed between the blocks that extend 7.5’ back into the granular fill material.
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c) There is structural waler beam on the waterward side of the existing sheet pile. Due to this structural member having significant section loss due to corrosion it will be replaced.

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The stormwater treatment facility will be a 3-stage biofiltration facility. Stage 1 is a pre-filter that will consist of a pea gravel filter media that will be installed in (3) 18,000-gallon steel tanks. Stage 2 will filter stormwater through a biofiltration soil mix that will be placed in an above ground cast-in-place concrete retaining wall structure. Lastly, the stormwater will pass through stage 3 polishing media. That media will similarly be installed in an above ground cast-in-place concrete retaining wall structure. The polishing media will be installed later after sufficient data is collected from water quality monitoring of the inflow and outflow of the stage 2 treatment cell.

Previous surveys

We have defined the project’s Area of Potential Effects (APE) as the footprint of the project and buffer around archaeological site 45CA523 (Tse-whit-zen or Čḯxwicən in the Klallam language). The project footprint overlaps four parcels owned by the Port (no. 063000190090, 063000505520, 063099190035, and 063099190025). Two adjacent parcels under Lower Elwha Klallam Tribe ownership are included in the APE: parcel no. 063099190045 and parcel no. 063099190050. The APE was expanded beyond the project footprint to include these two adjacent parcels due to the presence of archaeological site 45CA523, which lies within them and extends into the project footprint. The APE is inclusive of the anticipated project physical, visual, and acoustic effects on the character or use of historic properties. Figure 2 in Attachment A shows the project APE and Attachment C shows the project APE in relation to site 45CA523.

Based on our research of the property, including a review of the DAHP’s Washington Information System for Architectural and Archaeological Records Data, and information provided by the Port, there have been three prior surveys undertaken by the Port’s professional archaeological contractor to refine project design (Colón et al. 2021; Ferris 2019; Ferris and Scott 2019). Additionally, there have been extensive archaeological investigations on property owned by the Lower Elwha Klallam Tribe immediately adjacent to the Port’s property.

The Port’s property contains a portion of previously recorded precontact site, 45CA523 (Čḯxwicən) (Colón et al. 2021; Ferris and Scott 2019). Čḯxwicən, Lower Elwha Klallam Tribe’s ancestral village

and burial site, is significant for its long-term occupation (more than 2,000 years) and wide array of cultural practices that occurred at the village, and it holds high cultural and spiritual importance to the Lower Elwha Klallam Tribe (Butler et al. 2019). Site 45CA523 is shown in Attachment C. Attachment C contains a privileged/confidential map depicting the project in relation to the boundary of site 45CA523. This map is considered and treated as confidential in accordance with the Revised Code of Washington (RCW) 42.56.300 and 16 U.S.C. § 470hh(a).

The site was the subject of extensive investigations and documentation associated with the Washington State Department of Transportation's (WSDOT's) Graving Dock Facility for the Hood Canal Bridge Retrofit and Replacement Project, which was formally located on parcels owned by WSDOT. Two of these parcels are now owned by the Lower Elwha Klallam Tribe adjacent to the log yard (parcel no. 063099190045 and no. 063000505520). These investigations are well documented in Gill 2005, Hartmann 2003, Kanipe et al. 2006, Larson 2006, Lewarch et al. 2005, Schumacher 2003, Schumacher and Gill 2005, and White 2009. Site 45CA523 was listed in the National Register of Historic Places (NRHP) at the local level of significance under Criterion D in 2014 (Brooks 2014; White 2013). The period of significance is 300 – 2,700 years before present. The site includes three contributing areas and two noncontributing areas, which correspond with five distinct zones within the site (White 2013). The site boundary at the time of listing was contained entirely within the Lower Elwha Klallam Tribe's parcel (no. 063099190045).

The WSDOT Graving Dock project ended in 2004, the same year that the Port acquired its Log Yard property. A settlement agreement between the State of Washington, Lower Elwha Klallam Tribe, City of Port Angeles, and Port was executed on August 14, 2006 ("Settlement Agreement"). The Settlement Agreement transferred ownership of the land that was the former Graving Dock site from the State to the Lower Elwha Klallam Tribe. The Lower Elwha Klallam Tribe accepted ownership of the land on the condition that it would be used for "cultural and historic preservation uses" and with the acknowledgement that the surrounding property will be used "for heavy industrial and maritime use creating noise, dust, vibration and other similar impacts typical of such uses" (Settlement Agreement Section 5.2).

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The Port consulted with the Lower Elwha Klallam Tribe since 2015 for the prior archaeological surveys and to develop the project design. On June 28, 2019, the Lower Elwha Klallam Tribe was

notified about the Intermodal Handling & Transfer Facility Project when the Port shared the first conceptual figure of the project. Additionally, as part of the 2020 survey and testing permitting process, the DAHP sent notice and request for comment on the archaeological site alteration and excavation permit application to the Lower Elwha Klallam Tribe, Jamestown S'Kallam Tribe, Port Gamble S'Klallam Tribe, and Suquamish Tribe.

The APE also contains three previously recorded historic archaeological resources including 45CA773 (railroad spur), 45CA796 (railroad spur), and 45CA797 (kiln stack/historic debris scatter), all of which are within the project footprint (Ferris and Scott 2019; Metz 2017a, 2017b, 2017c; Metz and Ferris 2017). All three sites were previously recommended not eligible for listing in the NRHP by the Port's archaeological contractor because they lack integrity and are not significant under any of the NRHP Criteria for Evaluation. The sites do not have any association with significant events or people, nor do they convey distinctive design or construction. Furthermore, the sites were found to lack the potential to yield information important to history by the Port's archaeological contractor. DAHP determined that these three historic archaeological sites did not require further consideration during archaeological testing of the Port's Log Yard in 2020 (Colon et al. 2021).

The Port undertook geotechnical assessment to aid in designing the Cofferdam Facility Improvements in November 2018. The Port communicated the geotechnical excavations and results to the Lower Elwha Klallam Tribe at the time of the assessment. The geotechnical test pits were located north of the site 45CA523, and excavations were monitored by the Port's archaeological contractor. No cultural resources were identified during the monitoring (Ferris 2019).

Project design minimizes ground disturbance by paving and limiting excavation to match areas where the new surface transitions to the existing paved stormwater retention area on the east portion of the log yard. Excavation will not exceed a depth of 12 inches. Regrading and resurfacing overlaps with the boundary of the known archaeological site (45CA523); however, as designed, project-related ground disturbance will avoid site 45CA523 by 14 inches, which is below the existing pavement. The Cofferdam Dock Facility Improvements also partially overlap site 45CA523, but will also avoid disturbance to the site. The Stormwater Treatment Facility does not overlap the site and will not cause disturbance to it.

Please note that for the purposes of this project, MARAD has authorized the Port's Director of Engineering, Chris Hartman, to consult with your Tribe on behalf of MARAD. We therefore request that you provide a copy of your response to them.

We value your assistance and look forward to consulting further if there are historic properties of religious and/or cultural significance to your Tribe that may be affected by this project. To meet project timeframes, if you would like to participate or provide information regarding this project, MARAD respectfully requests that you notify us within 30 days.

I am working remotely and request that all communication be sent electronically. If you have additional questions or comments, please contact me and/or the consultant for the action proponent, Chris Hartman (360-417-3422; chrish@portofpa.com).

Sincerely,

Barbara Voulgaris

Barbara Voulgaris
Federal Preservation Officer
Barbara.Voulgaris@dot.gov
202.366.0866

Encl.

Attachment A: Project Maps
Attachment B: Project Photographs
Attachment C: Project Map with Site Boundary

NOTE: Because of the sensitive nature of locational information related to cultural resources, the map contained in Attachment C is considered privileged and confidential pursuant to RCW 42.56.300 and 16 U.S.C. § 470hh(a). Attachment C has been provided under separate cover.

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ATTACHMENT A – PROJECT MAPS

LEGEND

▨	MARAD FUNDING LIMITS (~10.1 AC)
▨	USACE FUNDING LIMITS (~4.3 AC)
▨	LEKT OWNED PARCELS (~18.7 AC)
— · — · —	PARCEL BOUNDARY LINES
– – – –	PROPOSED AREA OF POTENTIAL EFFECTS (~41.4 AC)
— — —	PROJECT LIMITS (~14.4 AC)

Scale: 1" = 200'

0 200' 400' 600'

SHEET TITLE
INTERMODAL HANDLING &
TRANSFER FACILITY

PROJECT TITLE AND ADDRESS
PROJECT BOUNDARIES
1301 MARINE DRIVE
PORT ANGELES, WA 98363

NO.	REVISION / ISSUE	DATE

PORT
OF PORT ANGELES
338 WEST FIRST STREET
P.O. BOX 1350
PORT ANGELES, WA 98362

PROJECT # 21-0-00-C6
DATE 2/15/2023
SCALE (FS) 1" = 200'
SHEET C1.1

Figure 1. Map of project and associated funding.

PATH: G:\TEMP\SMM\POPA_LOGYARDSW_CR_10336553_PRO\POPA_LOGYARDSW_CR_10336553_PRO\7.2_WIP\MAP_DOCS\POPA_CR_10336553.APRX - USER: ZSILBERMAN - DATE: 2/10/2023

PORT OF PORT ANGELES LOG YARD. LAST UPDATED ON *THURSDAY, JANUARY 26, 2023* BY *ZSILBERMAN*.

Figure 2. Project design on aerial orthography.

ATTACHMENT B – PROJECT PHOTOGRAPHS

Figure 1. Overview of western portion of Log Yard looking southeast.

Figure 2. Overview of central portion of Log Yard looking south.

Figure 3. Overview of western portion of Log Yard looking southwest. Lower Elwha Klallam Tribe parcels are on the far side of the fence.

Figure 4. Overview of western edge of Log Yard looking south.

Figure 5. Overview of central portion of Log Yard looking southeast.

Figure 6. Overview of northern edge of Log Yard from coffer dam looking southeast. Note Terminal 7 in the background.

Figure 7. North edge of coffer dam overlooking Port Angeles Harbor, looking northeast.

Figure 8. 2022 aerial orthography of the Port of Port Angeles owned parcels.

Steve Quarterman

From: Dennis Lewarch <dlewarch@Suquamish.nsn.us>
Sent: Tuesday, March 7, 2023 11:48 AM
To: Chris Hartman
Cc: Sutherland, Adam CTR (MARAD); Geoff James; Jennifer.Ferris@hdrinc.com
Subject: RE: Port of Port Angeles Intermodal Handling & Transfer Facility - Section 106 Consultation

haʔł sləx̌il (good day)

Hello Chris,

Thank you for consulting the Suquamish Tribe regarding proposed improvements to the Port of Port angeles Intermodal Handling and Transfer Facility. The Tribe will defer to the Lower Elwha Klallam Tribe for cultural resource issues.

Best,

Dennis

tix̌ix̌dubut čəxʷ (take care of yourself)
Every time you use Lushootseed you are breathing life into it.

Dennis E. Lewarch
Tribal Historic Preservation Officer
Archaeology and Historic Preservation Department
Suquamish Tribe

I am working remotely. Please call my cell number 360-509-1321 if you need to speak with me.

THE SUQUAMISH TRIBE
*Office Telephone:*360-394-8529 *Cell:*360-509-1321 *FAX:*360-598-4666

Mailing Address:
P.O. Box 498
Suquamish, WA 98392

Suquamish Tribe Administration Building Street Address:
18490 Suquamish Way
Suquamish, WA 98392

From: Chris Hartman <chrish@portofpa.com>
Sent: Tuesday, March 7, 2023 11:37 AM
To: Dennis Lewarch <dlewarch@Suquamish.nsn.us>
Cc: Sutherland, Adam CTR (MARAD) <adam.sutherland.ctr@dot.gov>; Geoff James <geoffj@portofpa.com>; Jennifer.Ferris@hdrinc.com
Subject: Port of Port Angeles Intermodal Handling & Transfer Facility - Section 106 Consultation

Mr. Lewarch,

The U.S. Department of Transportation (DOT) Maritime Administration (MARAD) awarded funds to the Port of Port Angeles (Port) under the Port Infrastructure Development Program Grant (PIDP) for improvements to the Port's Intermodal Handling & Transfer Facility. In keeping with a government-to-government relationship, and in compliance with the National Historic Preservation Act of 1966, as amended (54 U.S.C. § 300101 et seq.), and it's implementing regulations, 36 CFR § 800, we invite you to participate in the Section 106 process as a consulting party.

Please see attached letter and attachments.

Chris Hartman, P.E.
Director of Engineering
Port of Port Angeles
www.portofpa.com
Office Direct: (360) 417-3422
Mobile: (360) 460-3586
Fax: (360) 452-3959

dahp
protect the past, shape the future

Allyson Brooks Ph.D., Director
State Historic Preservation Officer

March 17, 2023

Ms. Barbara Voulgaris
Federal Preservation Officer
US Dept. of Transportation

In future correspondence please refer to:
Project Tracking Code: 2023-03-01721
Property: Port of Port Angeles_ Intermodal Handling & Transfer Facility, Port Infrastructure Development Program Grant
Re: ADVERSE Effect

Dear Ms. Voulgaris:

Thank you for contacting the State Historic Preservation Officer (SHPO) and Department of Archaeology and Historic Preservation (DAHP) regarding the above referenced proposal. We have reviewed the materials you provided for this project. First, we concur the Area of Potential Effect, as defined in your documentation. We also concur with your determination that the project as proposed will have an Adverse Effect on the property known as 45CA523, which is listed on the National Register of Historic Places.

After the Port of Port Angeles and the US Department of Transportation- Maritime Administration have completed Tribal consultation for the project, we look forward to further consultation and the development of a Memorandum of Agreement (MOA). The MOA shall identify specific measures that when implemented will serve to mitigate the adverse effect on the property.

Also, we appreciate receiving any correspondence or comments from concerned tribes or other parties that you receive as you consult under the requirements of 36 CFR 800.4(a)(4). These comments are based on the information available at the time of this review and on behalf of the State Historic Preservation Officer pursuant to Section 106 of the National Historic Preservation Act and its implementing regulations 36 CFR 800.

Thank you for the opportunity to review and comment. Should you have any questions, please feel free to contact me.

Sincerely,

Dennis Wardlaw
Transportation Archaeologist
(360) 485-5014
dennis.wardlaw@dahp.wa.gov

JAMESTOWN S'KLALLAM TRIBE

1033 Old Blyn Highway, Sequim, WA 98382 360/683-1109 FAX 360/681-4643

ATTN: Barbara Voulgaris
Federal Preservation Officer
U.S. Department of Transportation Maritime Administration
1200 New Jersey Avenue, SE
Washington, DC 20590

March 17, 2023

RE: U.S. Department of Transportation Maritime Administration Port of Port Angeles, Intermodal Handling & Transfer Facility, Port Infrastructure Development Program Grant

Dear Barbara Voulgaris,

The Jamestown S'Klallam Tribal Historic Preservation Office has received a consultation request for the Port of Port Angeles, Intermodal Handling & Transfer Facility, Port Infrastructure Development Program Grant Project, Port Angeles, Clallam County, Washington. With respect to cultural resources, the Jamestown S'Klallam Tribe will defer to the Lower Elwha Klallam Tribe. However, should the scope change or if new data is revealed, please let us know.

Thank you for the opportunity to comment on this project. If you need any additional information, please contact me at (360) 681-4638 or ataylor@jamestowntribe.org

Sincerely,

Allie Rae Taylor

Allie Rae Taylor

Tribal Historic Preservation Officer
Jamestown S'Klallam Tribe

MEMORANDUM OF AGREEMENT
AMONG
THE U.S. DEPARTMENT OF TRANSPORTATION MARITIME ADMINISTRATION, THE WASHINGTON STATE HISTORIC PRESERVATION OFFICER, LOWER ELWHA KLALLAM TRIBE, AND THE PORT OF PORT ANGELES,
REGARDING
THE INTERMODAL HANDLING & TRANSFER FACILITY PROJECT, CLALLAM COUNTY, WASHINGTON
PROJECT TRACKING CODE 2023-03-01721

WHEREAS, the U.S. Department of Transportation (**DOT**) Maritime Administration (**MARAD**) plans to provide funding through a MARAD FY 2022 Port Infrastructure Development Program (**PIDP**) grant to the Port of Port Angeles (**Port**) for the Intermodal Handling & Transfer Facility Project (**Undertaking** or **Project**); and

WHEREAS, MARAD is responsible for complying with Section 106 of the National Historic Preservation Act (54 U.S.C. § 300101), (**NHPA**) with respect to this undertaking and consulted with the Washington State Historic Preservation Officer (**SHPO** or **DAHP**[1]**,** as defined herein below) pursuant to 36 C.F.R Part 800; and

WHEREAS, the Undertaking will be located in the city of Port Angeles, Clallam County, Washington; and

WHEREAS, the Undertaking will consist of the following Project components: site grading and resurfacing approximately 10 acres with asphalt pavement; installing aboveground biofiltration treatment system with pretreatment tanks, biofiltration cell, polishing cell, and associated aboveground piping and appurtenances; and

WHEREAS, MARAD, in consultation with the SHPO, has defined the Undertaking's area of potential effects (**APE**) as the footprint of the Project with a buffer around the adjacent archaeological site 45CA523 (**Čḯxwicən**), inclusive of the potential physical, visual, and acoustic effects as shown in **Attachment A**; and

WHEREAS, the APE overlaps four parcels of land owned by the Port (no. 063000190090, 063000505520, 063099190035, and 063099190025) and two adjacent parcels of land owned by the Lower Elwha Klallam Tribe (**LEKT**) (no. 063099190045 and 063099190050); and

WHEREAS, pursuant to Section 106 of the NHPA and its implementing regulations, 36 C.F.R Part 800, MARAD is required to consider the effects of the Undertaking on properties included in or eligible for inclusion in the National Register of Historic Places (**NRHP**), and to consult with the SHPO; and

WHEREAS, MARAD is the Lead Federal Agency for the purposes of complying with Section

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[1] The SHPO is the director of the Department of Archaeology and Historic Preservation, or DAHP, Washington State’s primary agency with knowledge and expertise in historic preservation.

106 of the NHPA and this Memorandum of Agreement (**MOA** or **Agreement**) memorializes that Section 106 of the NHPA compliance; and

WHEREAS, MARAD, in consultation with the SHPO, LEKT, and the Port, has determined that the Undertaking will have an adverse effect on the NRHP-listed archaeological site 45CA523 **(Čḯxwicən)** pursuant to 36 C.F.R. Part 800, of the regulations implementing Section 106 of the NHPA; and

WHEREAS, the State, Port, and LEKT are parties to the *Settlement Agreement among the State of Washington, Lower Elwha Klallam Tribe, City of Port Angeles, and Port of Port Angeles*, dated August 14, 2006 (the "4 Party Agreement") concerning the preservation and protection of the NRHP-listed archaeological site 45CA523 **(Čḯxwicən)**; and

WHEREAS, in Section 2 of the 4 Party Agreement, the State, Port and Tribe agreed to cooperate with regard to the preservation and use of the stormwater treatment ponds along the west boundary of the property transferred to the Tribe in Section 3 of the 4 Party Agreement (consisting of a portion of the NRHP-listed archaeological site 45CA523 **(Čḯxwicən)**); and

WHEREAS, in Sections 8, 9 and 10 of the 4 Party Agreement, the State, Port and LEKT agreed on protocols for the identification of archeological resources, project permitting, mitigation and disposition of artifacts and human remains located within the geographic scope of the 4 Party Agreement; and

WHEREAS, MARAD notified the Makah Tribe, Hoh Indian Tribe, Jamestown S'Klallam Tribe, the LEKT, Port Gamble S'Klallam Tribe, Quileute Nation, Suquamish Tribe, and the Confederated Tribes of Warm Springs about this Project and invited to consult in the development of this agreement; and

WHEREAS, LEKT agreed to be a signatory to the agreement, the Jamestown S'Klallam Tribe and Suquamish Tribe responded, both deferring to LEKT, and all other tribes did not respond; and

WHEREAS, in accordance with 36 C.F.R. § 800.6(a)(1), MARAD has notified the Advisory Council on Historic Preservation (**ACHP**) of its adverse effect determination with specified documentation, and the ACHP has chosen not to participate in the consultation pursuant to 36 C.F.R § 800.6(a)(1)(iii); and

WHEREAS, MARAD, the Port, LEKT, and SHPO (herein after referred to together as **Consulting Parties**) all agreed to be signatories to this agreement; and

WHEREAS, Signatories and Concurring Parties are defined according to the Advisory Council on Historic Preservation's (ACHP) "Guidance on Agreement Documents: Executing Agreement Documents"; and

WHEREAS, other signatories and concurring parties, in addition to those listed above, may be identified in the future and added to the agreement as necessary; and

WHEREAS, MARAD, pursuant to 36 CFR § 800.6(a)(4), has provided the public an opportunity to comment on this MOA and has considered the recommendations of the public and reviewing agencies in the preparation of this Agreement; and

WHEREAS, the Signatories, which is defined in this Agreement to include both signatories and invited signatories, agree to execute this MOA in counterparts with a separate signature page for each Signatory. The exchange of copies of this MOA and of signature pages by facsimile or by electronic transmission shall constitute effective delivery of this MOA to the parties. Signatures of the parties transmitted by facsimile or electronic transmission shall be effective for executing and signing this MOA;

WHEREAS, MARAD has consulted with the Consulting Parties in accordance with Section 106 of the NHPA to resolve the adverse effects of the undertaking on historic properties;

NOW, THEREFORE, MARAD, the Port, LEKT, and SHPO agree that the Undertaking shall be implemented in accordance with the following stipulations in order to take into account the effect of the Undertaking on historic properties.

STIPULATIONS

MARAD shall ensure that Stipulations I-XIV will be incorporated as Special Grant Terms to the MARAD PIDP Grant approval, and that the Port has and will carry out the following measures as and where described below:

I. LEKT AREA OF INTEREST

A. Consulting Parties acknowledge that Čḯxwicən is a village of continuous uninterrupted use by the LEKT extending back for more than 2,700 years. The village was used extensively as a year-round place of habitation, as well as for traditional practices of sea mammal hunting, shellfish harvesting, and open marine water fishing. A large cemetery and numerous burials are associated with the village and the LEKT continues to maintain a cemetery at the site.

B. In coordination with the LEKT, the Port undertook two archaeological investigations to identify the presence and extent of Čḯxwicən within the Port's Log Yard and to inform early project design. The first investigation consisted of a pedestrian and subsurface survey performed in 2017 (Ferris and Scott 2019). The second investigation was completed in 2020 under a State of Washington Archaeological Site Alteration and Excavation Permit issued by the DAHP and consisted of additional survey and subsurface testing (Colón et al. 2021). The archaeological materials collected during the 2020 investigation are currently held in trust for the LEKT at the Burke Museum in Seattle, Washington. As a result of these investigations, the boundary of Čḯxwicən was expanded into a portion of the Log Yard, which is the LEKT Area of Interest (**Attachment B**).

II. MITIGATION MEASURES

A. The Port will transfer to the LEKT the "Protection Area" property depicted in Attachment B, which is approximately 6.13 acres. The Port will take all necessary steps to create a parcel with boundaries as depicted in Attachment B, preparation of deed, and transfer title from the Port to the LEKT. Prior to transfer, the Port will remove from the Protection Area the existing storage warehouse building, office Conex, travel trailer, truck weigh scale, existing paving, quarry spalls, and bark and woody debris.

B. Ground disturbing activities associated with this undertaking will be monitored by a professional archaeologist in accordance with the Project-specific Monitoring and Inadvertent Discovery Plan (MIDP). The MIDP (Attachment C) details the monitoring and discovery protocols. The MIDP will incorporate the disposition provisions in Section 10 of the 4 Party Agreement. All monitoring activities will be supervised by the Project Senior Archaeologist, who will meet the Secretary of the Interior's (SOI) Professional Qualifications Standards for Archeology (36 CFR Part 61, 48 Federal Register 44738). Additionally, the Port will retain the services of a Tribal Cultural Resources Monitor from the LEKT, who will observe the monitoring activities.

   a. The Port, in consultation with LEKT, will obtain a State of Washington Archaeological Site Alteration and Excavation Permit from the DAHP to carry out the Undertaking, as determined necessary by DAHP.

   b. The Port will retain the services of a professional archaeologist who meets the Secretary of the Interior's Professional Qualifications Standards for archaeology (36 CFR Part 61), to monitor all Project-related ground disturbing activities.

   c. The Port will compensate LEKT Cultural Resource Monitors to observe all Undertaking ground disturbing activities as invoiced by LEKT.

C. The LEKT will transfer to the Port the three stormwater ponds that were constructed during the WSDOT Graving Dock project (2003 – 2004). These ponds are located adjacent to the Northwest property line of the LEKT's property. The footprint area of the three ponds is approximately 0.80 acres and is depicted in Attachment D. The Port will take all necessary steps to create a parcel with boundaries as depicted in Attachment D, preparation of deed, and LEKT agrees to transfer title from LEKT to the Port.

The Port's use of the Ponds will be limited to stormwater treatment and associated operation, maintenance and repair. The Port's ownership and use of the Ponds will satisfy the requirement that the LEKT create a buffer from uses on adjoining property. Any alteration, at any time in the future, of the Ponds will require written approval by the LEKT. Ground disturbing work within the bottom footprint of the Ponds will be subject to the requirements enumerated in Section II.B., above. The Port will be able to perform vegetation maintenance without notification.

The Port will work cooperatively with the LEKT so that the runoff from within LEKT's property can utilize the Ponds and discharge to the harbor through the existing piping system. The Port will ensure that its use of the Ponds will not interfere with or cause damage to the burials located adjacent to the Ponds.

III. PROTECTION OF CONFIDENTIAL INFORMATION

A. To the extent consistent with NHPA Section 304 (Title 54 of the United States Code, Section 300310), the Archaeological Resources Protection Act (ARPA) Section 9(a), and other applicable federal and state laws, cultural resource data from this Undertaking will be treated as confidential by all Signatories and is not to be released to any person, organization or agency not a party to this MOA. Confidentiality concerns for properties that may have traditional religious and cultural significance to the Indian tribes will be respected and will remain confidential to the fullest extent permitted by law.

B. The Port will restrict the possession, knowledge and use of confidential cultural resource data to its employees and any consultants, contractors and subcontractors ("**Port Agents"**) who have a need to know of the confidential cultural resource data. The Port shall include a non-disclosure requirement in any contract with Port Agents involved in the Undertaking which shall legally obligate the Port Agents to protect the confidential cultural resource data to the same or greater degree as required under this MOA. The Port will ensure that its employees, and Port Agent comply with this MOA.

IV. INADVERTENT DISCOVERIES

A. If potential archaeological artifacts or human skeletal remains are discovered during Project-related ground disturbing activities, the Port will provide notice to MARAD, DAHP, and LEKT. All parties will treat all burial sites, human remains, and funerary objects with dignity and respect.

B. The Port will implement the Inadvertent Discovery Plan included in **Attachment C** in accordance with applicable federal and state laws (36 C.F.R. Section 800.13, RCW 68.50.645, RCW 68.60.055, RCW 27.44, RCW 27.53, and WAC 25-48-060), in addition to the 2006 Settlement Agreement between the State of Washington, LEKT, City of Port Angeles, and Port, to which the Port and LEKT are signatories (**4-Party Agreement**), and the 2023 ACHP "Policy Statement on Burial Sites, Human Remains, and Funerary Objects."

C. If archaeological artifacts, human skeletal remains, funerary objects, or objects of cultural patrimony are found during Undertaking activities, construction activities within 100 feet (30.79 meters) of the discovery shall be halted and the Port will contact LEKT, MARAD, and the County Coroner and local law enforcement in the most expeditious manner possible.

D. The area of the find will be secured and protected from further disturbance until MARAD and DAHP provide notice to proceed. Any exposed human skeletal remains shall be protected in situ from any potential disturbance (including vandalism or theft). The remains shall be covered with canvas and not exposed to public view.

E. If the coroner determines the remains are non-forensic, then they will report that finding to MARAD and DAHP. DAHP will then take jurisdiction over the remains. The DAHP will notify any appropriate cemeteries and all affected tribes of the find. The State Physical Anthropologist will make a determination of whether the remains are Indian or Non-Indian and report that finding to any appropriate cemeteries and the affected tribes. The DAHP will then handle all consultation with the affected parties as to the future preservation, excavation, and disposition of the remains.

F. MARAD shall consult with the Consulting Parties to discuss avoidance, minimization of disturbance, or protocols for disinterment.

G. Undertaking activities shall not resume without written authorization from MARAD and DAHP in consultation with the Consulting Parties.

H. No Port staff nor any of its contracted employees will conduct excavation, handling, or removal of any human remains without a State of Washington Archaeological Site Alteration and Excavation Permit from DAHP and concurrence of LEKT.

V. ARTIFACTS AND CURATION

A. The Port will comply with the curation requirement of 36 C.F.R. Part 79 if archaeological artifacts are discovered during Project-related ground disturbing activities.

B. If any artifacts are discovered during Project-related ground disturbing activities, all artifacts and associated documents will be curated and held in trust, for the LEKT, at the Burke Museum of Natural History and Culture, University of Washington in Seattle. The collection will be prepared pursuant to the Burke Museum curation guidelines, which were created following applicable federal standards as presented in 36 CFR Part 79, Curation of Federally Owned and Administered Archaeological Collections. The intent is to transfer the collection to the LEKT repository once the repository is completed.

VI. DURATION

This MOA will expire if its terms are not carried out within five (5) years from the date of its execution. Prior to such time, MARAD may consult with the other signatories to reconsider the terms of the MOA and amend it in accordance with Stipulation X below.

VII. MONITORING AND REPORTING

Annually, following the execution of this MOA until it expires or is terminated, Port shall provide all parties to this MOA a summary report detailing work undertaken pursuant to its terms. Such report shall include any scheduling changes proposed, any problems encountered, and any disputes and objections received in the Port's efforts to carry out the terms of this MOA.

VIII. DISPUTE RESOLUTION

A. Should any signatory or concurring party to this MOA object at any time to any actions proposed or the manner in which the terms of this MOA are implemented, MARAD shall consult with such party to resolve the objection. If MARAD determines that such objection cannot be resolved, MARAD will forward all documentation relevant to the dispute, including MARAD's proposed resolution, to the ACHP. The ACHP shall provide MARAD with its advice on the resolution of the objection within thirty (30) days of receiving adequate documentation. Prior to reaching a final decision on the dispute, MARAD shall prepare a written response that considers any timely advice or comments regarding the dispute from the ACHP, signatories and concurring parties, and provide them with a copy of this written response. MARAD will then proceed according to its final decision.

B. If the ACHP does not provide its advice regarding the dispute within the thirty-day (30) time period, MARAD may make a final decision on the dispute and proceed accordingly. Prior to reaching such a final decision, MARAD shall prepare a written response that considers any timely comments regarding the dispute from the signatories and concurring parties to the MOA and provide them and the ACHP with a copy of such written response.

C. MARAD's responsibility to carry out all other actions subject to the terms of this MOA that are not the subject of the dispute remain unchanged.

IX. AMENDMENTS

This MOA may be amended when such an amendment is agreed to in writing by all signatories. The amendment will be effective on the date a copy signed by all signatories is filed with the ACHP.

X. TERMINATION

A. If any signatory to this MOA determines that its terms will not or cannot be carried out, that party shall immediately consult with the other parties to attempt to develop an amendment per Stipulation IX, above. If within thirty (30) days (or another time period agreed to by all signatories) an amendment cannot be reached, any signatory may terminate the MOA upon written notification to the other signatories.

B. Once the MOA is terminated, and prior to work continuing on the Undertaking, MARAD must either (a) execute an MOA pursuant to 36 C.F.R § 800.6 or (b) request, take into account, and respond to the comments of the ACHP under 36 C.F.R § 800.7. MARAD shall notify the signatories as to the course of action it will pursue.

XI. NO OBLIGATION OF MARAD FUNDS OR VIOLATIONS OF THE ANTI-DEFICIENCY ACT

A. Nothing contained herein shall constitute an obligation or an undertaking to obligate funds appropriated to MARAD.

B. MARAD's future efforts to execute requirements arising from the stipulations of this MOA are subject to the provisions of the Anti-Deficiency Act. If compliance with the Anti-Deficiency Act alters or impairs MARAD's ability to implement the stipulations of this MOA, MARAD shall consult in accordance with the Amendments and Termination procedures found at Stipulations X and XI of this MOA. No provision of this MOA shall be interpreted to require obligation or payment of funds in violation of the Anti-Deficiency Act, Title 31 U.S.C. § 1341.

XII. EFFICIENT COMMUNICATIONS

In accordance with Executive Order 13563 "Improving Regulation and Regulatory Review," and Executive Order 13589 "Promoting Efficient Spending," communications between signatories to this MOA and Consulting Parties discussed herein shall be in electronic form whenever practicable, permitted by law, and consistent with applicable records retention requirements. Unless a Signatory or Consulting Party specifically requests communication in another form (i.e., mail/hard copy) communication pertaining to this MOA shall be by electronic means. MARAD is responsible for maintaining an up-to-date list of email addresses of the signatories and Consulting Parties that have not chosen communications other than electronic communications.

XIII. EXECUTION

The signatories and all parties named herein have agreed to execute this MOA using handwritten signatures or by electronic signatures. Additionally, the signatories and all parties named herein have agreed that the execution of this MOA using legally binding counterparts is and shall be considered effective legal execution of same.

Execution of this MOA by MARAD, SHPO, the Port, and LEKT, and implementation of its terms, are evidence that MARAD has considered the effects of the Undertaking on historic properties, afforded the ACHP and all concerned parties an opportunity to comment, and satisfied the requirements of Section 106 of the NHPA (54 U.S.C. § 306108) and its implementing regulations.

[SIGNATURES APPEAR ON NEXT PAGE]

SIGNATORIES:

US Department of Transportation, Maritime Administration

William Paape Date January 13, 2025
William K. Paape, Associate Administrator for Ports & Waterways

Washington Department of Archaeology and Historic Preservation

Date Jan 10, 2025
Allyson Brooks, Ph.D., State Historic Preservation Officer

Port of Port Angeles

Connie Beauvais Date 1/9/2025
Connie Beauvais, Commission President

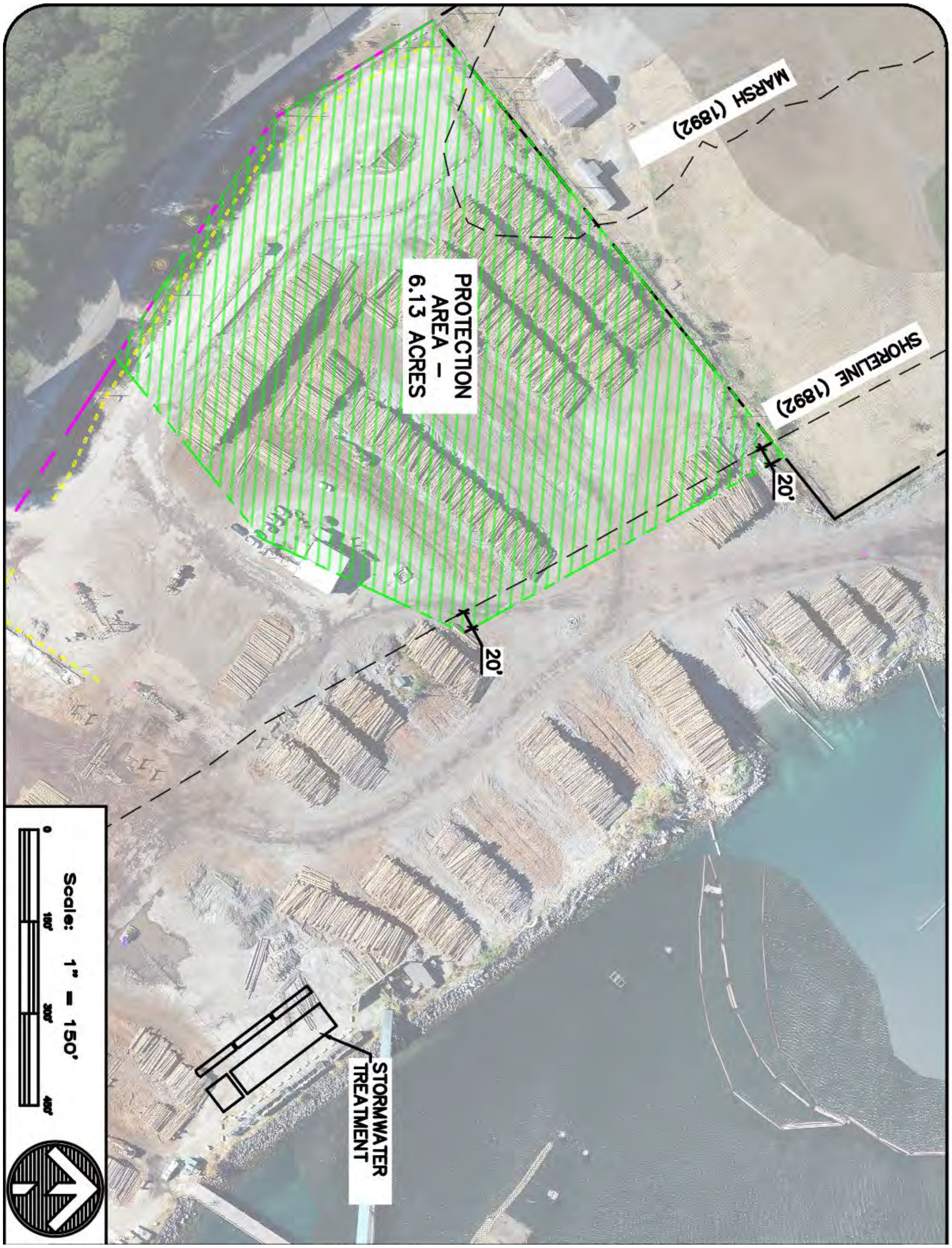
INVITED SIGNATORIES:

Lower Elwha Klallam Tribe

Frances G Charles Date 1/9/2025
Frances Charles, Chairwoman

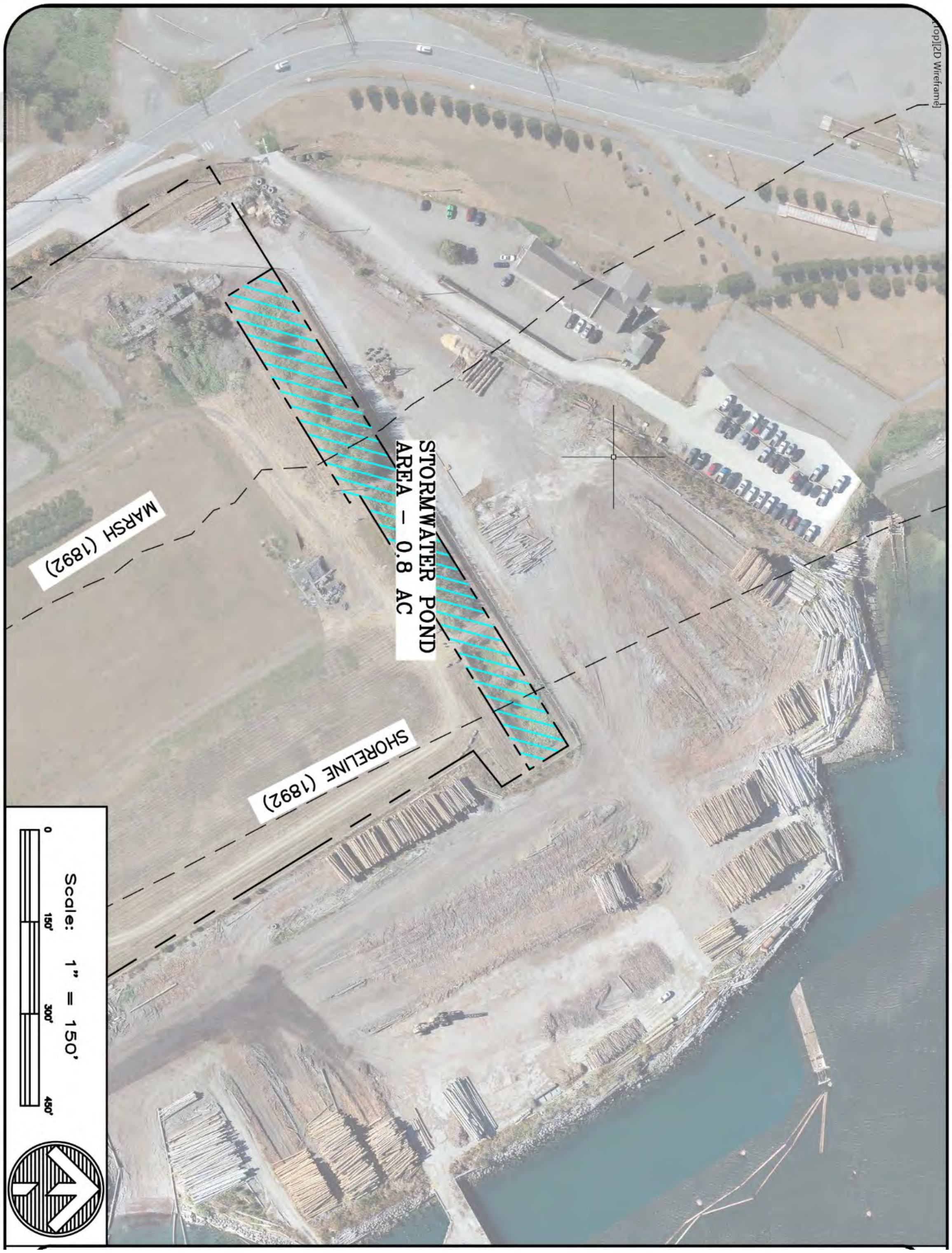
Attachment A: APE Map

Attachment B: Graphic Depiction of LEKT Area Of Interest



Attachment C: Monitoring and Inadvertent Discovery Plan

Attachment D: Graphic Depiction of Stormwater Pond Area



APPENDIX G

Section 4(f) Supporting Documentation

U.S. Department
of Transportation

**Maritime
Administration**

1200 New Jersey Avenue, SE
Washington, DC 20590

September 9, 2024

VIA ELECTRONIC MAIL

City of Port Angeles – Parks and Recreation Department
Attn: Corey Delikat, Park & Recreation Director
Email: cdelikat@cityofpa.us

RE: U.S. Department Transportation Maritime Administration
Port of Port Angeles, Intermodal Handling & Transfer Facility, Port Infrastructure Development
Program Grant No. 693JF72344020
Section 4(f) Temporary Occupancy of the Olympic Discovery Trail

Dear Mr. Delikat:

The U.S. Department of Transportation (DOT) Maritime Administration (MARAD) awarded funds to the Port of Port Angeles (Port) under the Port Infrastructure Development Program (PIDP) for improvements to the Port's Intermodal Handling & Transfer Facility (IHTF), also known as the Port Log Yard. The project is located at 1301 Marine Drive, Port Angeles, Washington. The project location is entirely within an industrial property owned by the Port along the shoreline of Port Angeles Harbor. The property contains an existing full-service facility for all timber products including cargo loading, storage, roll-out, sorting, and transport.

The improvements to the IHTF include:

1) Cofferdam Dock Facility Improvements
    a. Remove and replace existing retaining wall with mechanically stabilized earth wall
    b. Install fiberglass sheet pile encasement
    c. Replace structural steel waler beam
2) IHTF Upland Site Improvements
    a. Raise existing surface elevation and construct high-load capacity asphalt concrete surface covering 10 acres for operational efficiency and stormwater conveyance.
    b. Construct a 3-stage biofiltration facility to treat stormwater from resurfaced IHTF prior to discharge to Port Angeles Harbor.

The Port and MARD are currently conducting environmental review for this project that includes a Section 4(f) consideration of publicly owned parks and recreation areas near or at the project site. The proposed project will result in temporary occupancy of the Olympic Discovery Trail (ODT), a Section 4(f) resource.

In order for the the construction of the proposed project, trucks and equipment will need to cross the ODT to enter and exit the work site from Marine Drive. As per the Federal Register Rules and Regulations 23 CFR 774.13(d), construction access and crossing of a trail may be considered a temporary occupancy of Section 4(f) lands. A temporary occupancy may not constitute a Section 4(f) use when all of the conditions listed below are satisfied (Project specific responses highlighted in blue):

1. The duration of the occupancy will be temporary in nature (i.e., less than the time needed for the construction of the project): During the IHTF construction the duration of increased construction truck and equipment traffic will be temporary and will be ceased months before final project completion.

- There will be no change in ownership of the land: There will be no change in the ownership of the trail during the IHTF project construction.
- The scope of work to be performed will be minor (i.e., both the nature and magnitude of the changes to the Section 4(f) property are minimal). The scope of the impact is minor and is limited to a temporary increase in truck and vehicle traffic entering the Project site across the trail and there will be no changes to the trail.
- There are no anticipated permanent adverse physical impacts nor there any interference with the activities or purposes of the property, on either a permanent or temporary basis: The construction traffic would not result in any permanent adverse physical impacts to the ODT and would not interfere with the protected activities, features, or attributes of the ODT on either a temporary or permanent basis.
- The land being used will be fully restored to a condition that is at least as good as the condition that existed prior to the project: The section of the ODT at the entrance to the Project Site will be fully restored if damaged by construction traffic.
- There must be document agreement of the official(s) with jurisdiction over the Section 4(f) resource regarding the above conditions: Your signature on this document concurring as outlined above constitute your concurrence with the assessment of impacts to the Olympic Discovery Trail in your role as an official with jurisdiction over this resource.

Please review the attached Draft Section 4(f) Applicability/Exceptions Documentation and indicated your concurrence with the work proposed and that the above conditions are met by signing below. Please forward the signed original back to the Port of Port Angeles at jessew@portofpa.com for their and our records. If you have any questions regarding this matter, please contact Jesse Waknitz with the Port of Port Angeles at jessew@portofpa.com at your earliest convenience at If you do not concur with our assessment of impacts to Olympic Discovery Trail, please respond in via email with a reference to this letter.

Sincerely,

Erin Kendle

For:

Kris Gilson, REM, CHMM
Director
Office of Environmental Compliance
202.366.1939
kristine.gilson@dot.gov

I concur with the assessment of proposed impacts to Olympic Discovery Trail property as described above.

Corey D

Corey Delikat, Park & Recreation Director

9.14.2024

Date

Attachments: Draft Section 4(f) Applicability/Exceptions Documentation
CC: Jesse Waknitz, Environmental Manager, Port of PA at jessew@portofpa.com

U.S. Department
of Transportation

**Maritime
Administration**

1200 New Jersey Avenue, SE
Washington, DC 20590

September 9, 2024

VIA ELECTRONIC MAIL

Port of Port Angeles
Attn: Marty Marchant, Marine Trades Manager
Email: martinm@portofpa.com

RE: U.S. Department Transportation Maritime Administration
Port of Port Angeles, Intermodal Handling & Transfer Facility, Port Infrastructure Development Program Grant No. 693JF72344020
Section 4(f) Significance and No Use of the Port Angeles Boat Haven

Dear Mr. Marchant:

The U.S. Department of Transportation (DOT) Maritime Administration (MARAD) awarded funds to the Port of Port Angeles (Port) under the Port Infrastructure Development Program (PIDP) for improvements to the Port's Intermodal Handling & Transfer Facility (IHTF), also known as the Port Log Yard. The project is located at 1301 Marine Drive, Port Angeles, Washington. The project location is entirely within an industrial property owned by the Port along the shoreline of Port Angeles Harbor. The property contains an existing full-service facility for all timber products including cargo loading, storage, roll-out, sorting, and transport.

The improvements to the IHTF include:

1) Cofferdam Dock Facility Improvements
    a. Remove and replace existing retaining wall with mechanically stabilized earth wall
    b. Install fiberglass sheet pile encasement
    c. Replace structural steel waler beam
2) IHTF Upland Site Improvements
    a. Raise existing surface elevation and construct high-load capacity asphalt concrete surface covering 10 acres for operational efficiency and stormwater conveyance.
    b. Construct a 3-stage biofiltration facility to treat stormwater from resurfaced IHTF prior to discharge to Port Angeles Harbor.

The Port and MARD are currently conducting environmental review for this project that includes a Section 4(f) consideration of publicly owned parks and recreation areas near or at the project site. The proposed project would occur adjacent to the Port Angeles Boat Haven and MARAD has made the initial documentation that this project would not impact or use this significant Section 4(f) resource.

Please review the attached Draft Section 4(f) Applicability/Exceptions Documentation and provide your comments or coordination to the Port of Port Angeles at jessew@portofpa.com for their and our records. If you have any questions regarding this matter, please contact Jesse Waknitz with the Port of Port Angeles at jessew@portofpa.com at your earliest convenience.

Sincerely,

Erin Kendle

For:

Kris Gilson, REM, CHMM
Director
Office of Environmental Compliance
202.366.1939
kristine.gilson@dot.gov

Attachments: Draft Section 4(f) Applicability/Exceptions Documentation
CC: Jesse Waknitz, Environmental Manager, Port of PA at jessew@portofpa.com

Jesse Waknitz

From:	Martin Marchant
Sent:	Thursday, September 12, 2024 2:03 PM
To:	Jesse Waknitz
Subject:	RE: Port of Port Angeles IHTF Project - Section 4(f) Review

Jesse,
In reviewing, I don't see any red flags you've done a great job in coving everything from what I have read through.

Cheers,

Marty Marchant
Marine Trades Manager
338 West First Street #301
Port Angeles, WA 98362
360.417.3436 direct
360.808.7571 cell
mmarchant@portofpa.com
www.portofpa.com

PORT
of Port Angeles
Serving Clallam County Since 1923

Communications with the Port may be subject to public disclosure (see WA Public Records Act, Ch. 42.56 RCW)

From: Jesse Waknitz <jessew@portofpa.com>
Sent: Wednesday, September 11, 2024 11:26 AM
To: Martin Marchant <martinm@portofpa.com>
Cc: Sutherland, Adam CTR (MARAD) <adam.sutherland.ctr@dot.gov>; Kendle, Erin (MARAD) <erin.kendle@dot.gov>
Subject: Port of Port Angeles IHTF Project - Section 4(f) Review

Hi Marty,

Hope this email finds you well.

Just wanted to give you a heads-up about the Section 4(f) review for the Port of Port Angeles Intermodal Handling & Transfer Facility (IHTF) project at the Port Log Yard. Section 4(f) is part of the permitting process and evaluates the project's potential impacts on recreational facilities like our Boat Haven and Boat Launch.

I've attached a letter from the U.S. Department of Transportation Maritime Administration (MARAD) that determines the project won't impact the PA Boat Haven.

Please review the letter. If you have any questions or concerns about the Section 4(f) review or the project itself, feel free to reach out. If everything looks good on your end, no further action is needed.

Thanks,

Jesse Waknitz

U.S. Department
of Transportation

**Maritime
Administration**

1200 New Jersey Avenue, SE
Washington, DC 20590

September 9, 2024

VIA ELECTRONIC MAIL

Allyson Brooks, PhD
State Historic Preservation Officer
Department of Archaeology and Historic Preservation
PO Box 48343
Olympia, WA 98504-8343
Email: Allyson.Brooks@dahp.wa.gov

RE: U.S. Department Transportation Maritime Administration
Port of Port Angeles, Intermodal Handling & Transfer Facility, Port Infrastructure Development Program Grant No. 693JF72344020
Section 4(f) Coordination

Dear Dr. Brooks:

The U.S. Department of Transportation (DOT) Maritime Administration (MARAD) awarded funds to the Port of Port Angeles (Port) under the Port Infrastructure Development Program (PIDP) for improvements to the Port's Intermodal Handling & Transfer Facility (IHTF), also known as the Port Log Yard. The project is located at 1301 Marine Drive, Port Angeles, Washington.

Over the last year the Port, MARAD and the Lower Elwha Klallam Tribe have participated in consultation through Section 106 of the National Historic Preservation Act (NHPA) for the IHTF project. The Ports and MARAD's primary goal for this consultation process is to protect in-place Č́ïxwicən (site 45CA523) a Lower Elwha Klallam Tribe's ancestral village and burial site while implementing the Port's IHTF improvements.

In addition to the Section 106 Consultation, the Port and MARAD are currently conducting environmental review for this project that includes a Section 4(f) consideration of publicly owned parks, recreation areas, wildlife refuges and historic sites near or at the project site. Section 4(f) evaluation assesses the potential impact to these resources and then ensures that these resources are protected.

The Č́ïxwicən is a significant Section 4(f) historic resource. MARAD has determined that site 45CA523 meets regulatory criteria excepting it from Section 4(f) approval per 23 CFR 774.13(b).

23 CFR 774.13 Exceptions

> *The Administration has identified various exceptions to the requirement for Section 4(f) approval. These exceptions include, but are not limited to:*
>
> *(b)Archeological sites that are on or eligible for the National Register when:*
>
> *(1) The Administration concludes that the archeological resource is important chiefly because of what can be learned by the data recovery and has minimal value for preservation in place. This exception applies both to situations where data recovery is undertaken and where the Administration decides, with agreement of the official(s) with jurisdiction, not to recover the resource; and*

> *2)The official(s) with jurisdiction over the Section 4(f) resource, have been consulted and have not objected to the Administration finding in paragraph (b)(1) of this section.*

The exception allows the project to proceed without data recovery by recognizing that the archaeological site's importance under Section 4(f) is informational. As you are aware, extensive surveys and salvage excavations have taken place at site 45CA23, which yielded large amounts of information about past use and habitation at the site. Additionally, it has been determined through consultation with the Lower Elwha Klallam Tribe (LEKT) that they wish for no further disturbance of the site due to its cultural importance among tribal members. Because of this, MARAD finds that it is best to not recover any further data from the site and to proceed with the Build Alternative to protect the site from further destruction.

In contrast to Section 4(f), the NHPA Section 106 process focuses on mitigating adverse effects on the site, leading to the decision to preserve it in situ to maintain its cultural and historical integrity. This Section 4(f) finding does not subsume MARAD's legal requirement or responsibility to comply with Section 106 of the National Historic Preservation Act or the implementing regulations at 36 CFR 800. All commitments and mitigation identified in the draft Section 106 Memorandum of Agreement (MOA) will be in-place to protect the site.

Please review the attached Draft Section 4(f) Applicability/Exceptions Documentation. Unless DAHP objects to this exemption finding, this will conclude the Section 4(f) review for this project.

MARAD has authorized the Port of Port Angeles's Director of Engineering, Chris Hartman, to coordinate this Section 4(f) review with your Agency on behalf of MARAD. We therefore request that you provide a copy of your comments or questions to the Port at (360-417-3422; chrish@portofpa.com).

Sincerely,

Erin Kendle

For:

Kris Gilson, REM, CHMM
Director
Office of Environmental Compliance
202.366.1939
kristine.gilson@dot.gov

Attachments: Draft Section 4(f) Applicability/Exceptions Documentation (Privileged and Confidential)

NOTE: Because of the sensitive nature of locational information related to cultural resources, the map contained in the attachment is considered privileged and confidential pursuant to RCW 42.56.300 and 16 U.S.C. § 470hh(a). The attachment, Draft Section 4(f) Applicability/Exceptions Documentation, has been provided under separate email.

Allyson Brooks Ph.D., Director
State Historic Preservation Officer

November 4, 2024

Kris Gibson
Director
Office of Environmental Compliance
US Dept. of Transportation

In future correspondence please refer to:
Project Tracking Code: 2023-03-01721
Property: Port of Port Angeles_ Intermodal Handling & Transfer Facility, Port Infrastructure Development Program Grant
Re: Section 4(f) Determination Review Comments

Dear Kris Gibson:

Thank you for contacting the Department of Archaeology and Historic Preservation (DAHP) and providing a copy of the Section 4(f) analysist for the above referenced project. As a result of our review, we agree with the results of the Section 4(f) analysis conducted by MARAD. At this time we have no additional comments. However, if information becomes available and/or the scope of work changes, please resume consultation with DAHP and all consulting parties.

We appreciate receiving any correspondence or comments from concerned tribes or other parties that you receive as you consult for this project. These comments are based on the information available at the time of this review and on behalf of the State Historic Preservation Officer.

Thank you for the opportunity to review and comment. If you have any questions, please feel free to contact me.

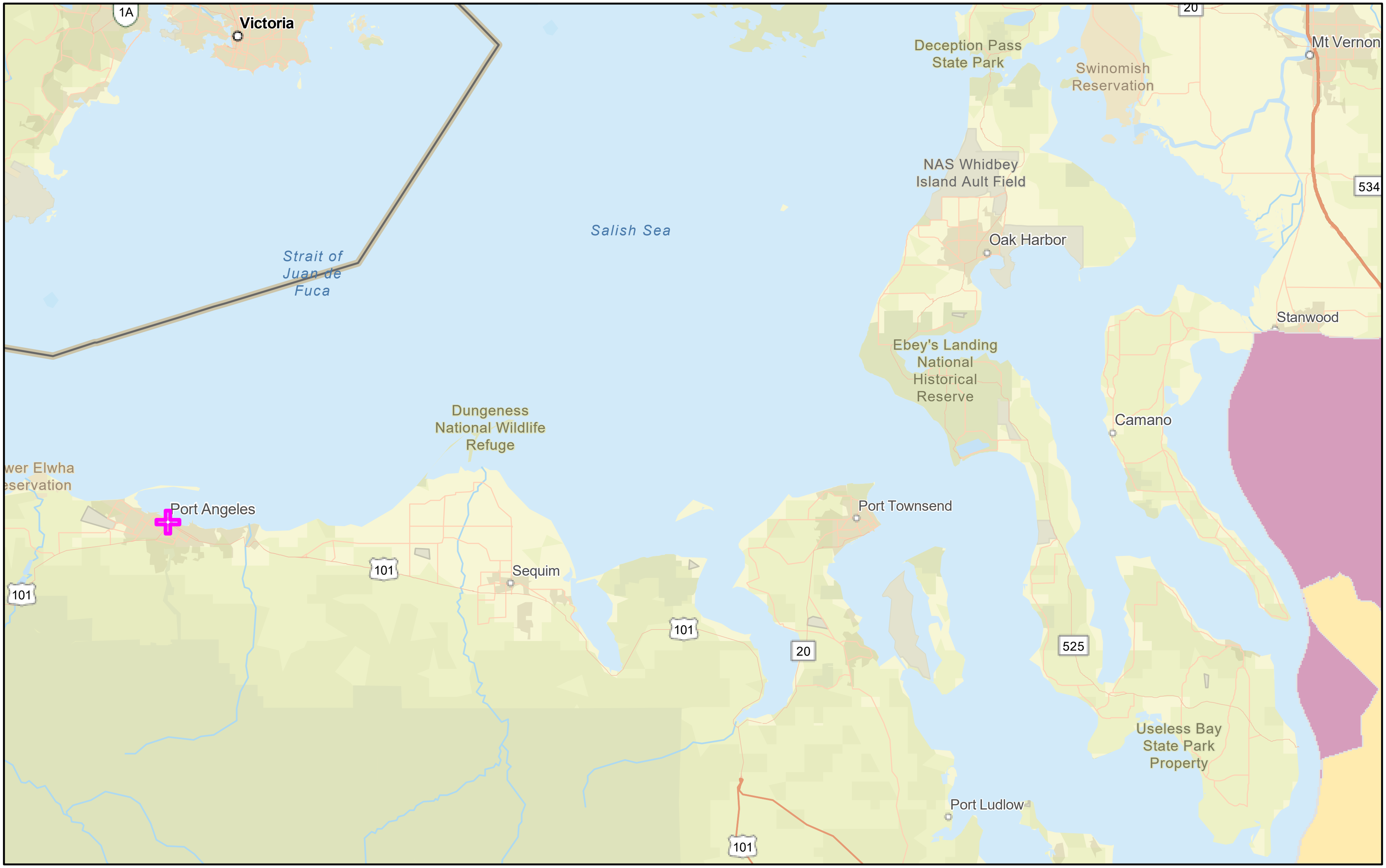
Sincerely,

Dennis Wardlaw
Transportation Archaeologist
(360) 485-5014
dennis.wardlaw@dahp.wa.gov

APPENDIX H

Air Quality Supporting Documentation

Air Quality Attainment Areas



July 26, 2023

✚ Search Result (point)

CO (1971 Standard)

🟨 Maintenance

Ozone 1-hr (1979 standard-revoked)

🟪 Maintenance (NAAQS revoked)

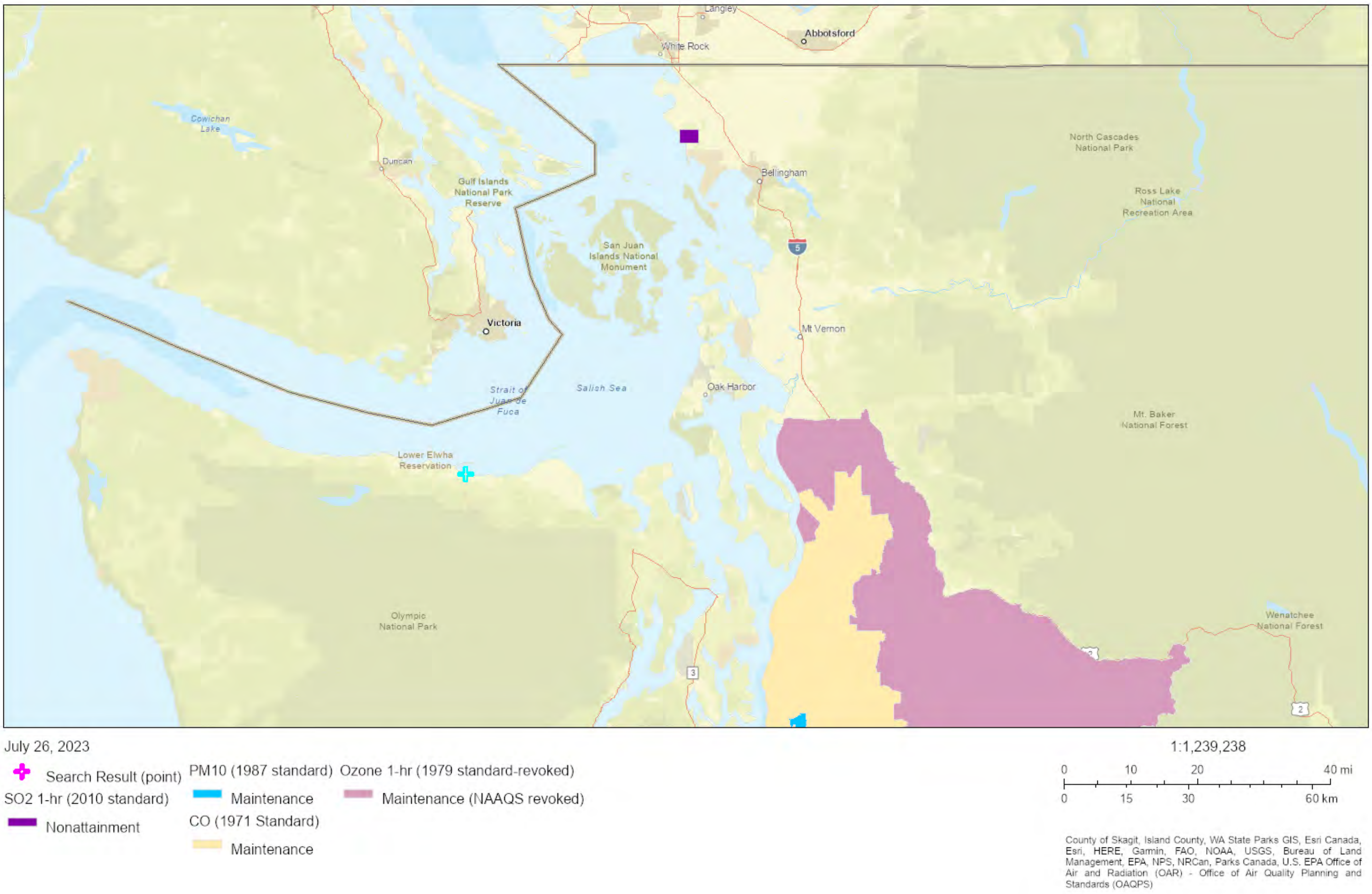
1:577,791

0 3.25 6.5 13 mi

0 5 10 20 km

WA State Parks GIS, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, U.S. EPA Office of Air and

NEPAssist Report



Project Location	48.11872,-123.4313
Within 0.5 miles of an Ozone 8-hr (1997 standard) Non-Attainment/Maintenance Area?	no
Within 0.5 miles of an Ozone 8-hr (2008 standard) Non-Attainment/Maintenance Area?	no
Within 0.5 miles of a Lead (2008 standard) Non-Attainment/Maintenance Area?	no
Within 0.5 miles of a SO2 1-hr (2010 standard) Non-Attainment/Maintenance Area?	no
Within 0.5 miles of a PM2.5 24hr (2006 standard) Non-Attainment/Maintenance Area?	no
Within 0.5 miles of a PM2.5 Annual (1997 standard) Non-Attainment/Maintenance Area?	no
Within 0.5 miles of a PM2.5 Annual (2012 standard) Non-Attainment/Maintenance Area?	no
Within 0.5 miles of a PM10 (1987 standard) Non-Attainment/Maintenance Area?	no
Within 0.5 miles of a Federal Land?	no
Within 0.5 miles of an impaired stream?	yes
Within 0.5 miles of an impaired waterbody?	yes
Within 0.5 miles of a waterbody?	yes
Within 0.5 miles of a stream?	yes
Within 0.5 miles of an NWI wetland?	Available Online
Within 0.5 miles of a Brownfields site?	yes
Within 0.5 miles of a Superfund site?	no
Within 0.5 miles of a Toxic Release Inventory (TRI) site?	no
Within 0.5 miles of a water discharger (NPDES)?	yes
Within 0.5 miles of a hazardous waste (RCRA) facility?	yes
Within 0.5 miles of an air emission facility?	no
Within 0.5 miles of a school?	yes
Within 0.5 miles of an airport?	no

Within 0.5 miles of a hospital?	no
Within 0.5 miles of a designated sole source aquifer?	no
Within 0.5 miles of a historic property on the National Register of Historic Places?	yes
Within 0.5 miles of a Toxic Substances Control Act (TSCA) site?	no
Within 0.5 miles of a Land Cession Boundary?	yes
Within 0.5 miles of a tribal area (lower 48 states)?	no
Within 0.5 miles of the service area of a mitigation or conservation bank?	no
Within 0.5 miles of the service area of an In-Lieu-Fee Program?	no
Within 0.5 miles of a Public Property Boundary of the Formerly Used Defense Sites?	no
Within 0.5 miles of a Munitions Response Site?	no
Within 0.5 miles of an Essential Fish Habitat (EFH)?	no
Within 0.5 miles of a Habitat Area of Particular Concern (HAPC)?	yes
Within 0.5 miles of an EFH Area Protected from Fishing (EFHA)?	yes
Within 0.5 miles of a Bureau of Land Management Area of Critical Environmental Concern?	no
Within 0.5 miles of an ESA-designated Critical Habitat Area per U.S. Fish & Wildlife Service?	no
Within 0.5 miles of an ESA-designated Critical Habitat river, stream or water feature per U.S. Fish & Wildlife Service?	yes

Created on: 7/26/2023 4:50:05 PM

Attachment. Air Quality and Emissions Estimate, Worst-case Scenario
Modified By Landau using M&N EF Calculations for Port of Bellingham (M&N April 11, 2023)

IHTF Marine Infrastructure and Repaving					MOVES CO code = 2			MOVES NOx code = 3			MOVES VOC code = 87			MOVES SO2 code = 31			MOVES CO2 code = 90		
Port of Port Angeles Equipment	***M&N Emission Factor Equivalent Used (Worst-Case)****	**# of equip-ment [1]**	**Hrs/ Day [2]**	**# of Days [3]**	**CO (g/ hr) [4]**	**CO (lbs/ day)**	**CO Total (tons)**	**NOx (g/ hr) [4]**	**NOx (lbs/ day)**	**NOx Total (tons)**	**VOC (g/hr) [4]**	**VOC (lbs/ day)**	**VOC Total (tons)**	**SO2 (g/ hr) [4]**	**SO2 (lbs/ day)**	**SO2 Total (tons)**	**CO2 (g/ hr) [4]**	**CO2 (lbs/ day)**	**CO2 Total (metric tons)**
Excavator	*Excavator*	1	10	25	15.88	0.35	0.00	58.07	1.28	0.02	2.77	0.06	0.00	0.15	0.00	4.09E-05	54734	1207	14
Dump Truck (cyclical; passby)	*Dump Truck (off-road)*	1	10	45	72.71	1.60	0.04	704.86	15.54	0.35	17.95	0.40	0.01	0.67	0.01	3.33E-04	248064	5469	112
Concrete Pump Truck	*Concrete Truck (off-road)*	1	10	15	72.71	1.60	0.01	704.86	15.54	0.12	17.95	0.40	0.00	0.67	0.01	1.11E-04	248064	5469	37
Asphalt Paver	*Asphalt Paving Equipment*	1	10	24	20.19	0.45	0.01	57.81	1.27	0.02	4.23	0.09	0.00	0.07	0.00	1.73E-05	22845	504	5
Double Drum Roller	*Roller*	1	10	24	21.85	0.48	0.01	69.59	1.53	0.02	3.49	0.08	0.00	0.09	0.00	2.25E-05	30456	671	7
Compactor (ground)	*Excavator*	1	10	24	15.88	0.35	0.00	58.07	1.28	0.02	2.77	0.06	0.00	0.15	0.00	3.92E-05	54734	1207	13
Dozer	*Excavator*	1	10	20	15.88	0.35	0.00	58.07	1.28	0.01	2.77	0.06	0.00	0.15	0.00	3.27E-05	54734	1207	11
Front End Loader (Cyclical)	*Dump Truck (off-road)*	1	10	30	72.71	1.60	0.02	704.86	15.54	0.23	17.95	0.40	0.01	0.67	0.01	2.22E-04	248064	5469	74
Grader (passby)	*Dump Truck (off-road)*	1	10	20	72.71	1.60	0.02	704.86	15.54	0.16	17.95	0.40	0.00	0.67	0.01	1.48E-04	248064	5469	50
Pickup Truck	*Excavator*	1	10	150	15.88	0.35	0.03	58.07	1.28	0.10	2.77	0.06	0.00	0.15	0.00	2.45E-04	54734	1207	82
Street Sweeper	*Dump Truck (off-road)*	1	10	150	72.71	1.60	0.12	704.86	15.54	1.17	17.95	0.40	0.03	0.67	0.01	1.11E-03	248064	5469	372
Street Sweeper (Vacuum)	*Dump Truck (off-road)*	1	10	24	72.71	1.60	0.02	704.86	15.54	0.19	17.95	0.40	0.00	0.67	0.01	1.78E-04	248064	5469	60
Asphalt Distributor Truck (Asphalt Sprayer)	*Dump Truck (off-road)*	1	10	24	72.71	1.60	0.02	704.86	15.54	0.19	17.95	0.40	0.00	0.67	0.01	1.78E-04	248064	5469	60
Asphalt Grinder	*Dump Truck (off-road)*	1	10	12	72.71	1.60	0.01	704.86	15.54	0.09	17.95	0.40	0.00	0.67	0.01	8.88E-05	248064	5469	30
Project Total Equipment Emissions **						**15.15**	**0.31**		**132.24**	**2.66**		**3.58**	**0.07**		**0.13**	**0.0028**		**49753**	**926**
Project Total Hauling and Commuter Emissions (pulled from other sheet)						N/A	**2.34**		N/A	**0.11**		N/A	-		N/A	-		N/A	**224**
Project Total Emissions						N/A	**2.65**		N/A	**2.77**		N/A	**0.07**		N/A	**0.0028**		N/A	**1151**
Project Estimated Annual Emissions (tons/year)						N/A	**2.65**		N/A	**2.77**		N/A	**0.07**		N/A	**0.0028**		N/A	**1151**
EPA De Minimis Thresholds (tons/year)						N/A	**100**		N/A	**100**		N/A	**50**		N/A	**100**		N/A	N/A
Significant?						N/A	**No**		N/A	**No**		N/A	**No**		N/A	**No**		N/A	N/A

Notes:

*** Emission Factors (EFs) used are based on an analysis completed for the Port of Bellingham BST EA by Moffat Nichol in 2021. When emission factors were not available matching equipment used in the IHTF project, the EFs for worst-case similar equipment were used.**

**** Project components have overlapping construction schedules. The total emissions in lbs/day assumes all equipment running at the same time, regardless of schedule, resulting in conservative maximum daily emission estimates.**

**** Project total emissions shown in Tons is for the complete project, which occurs over more than one year, resulting in conservative emission estimates. EPA De Minimis Thresholds are based on Tons/Year.**

Source Data:

[1] Equipment assumptions provided by Port of Port Angeles ~~Moffatt & Nichol Engineering~~ staff based on similar past construction projects.

[2] Assumes equipment is running at 8 hours per day for conservative emission estimates. Actual running times will fluctuate throughout the day based on need.

[3] Number of working days based on schedule with active equipment use. Does not include mobilization and demobilization periods.

[4] Motor Vehicle Emission Simulator Version 3.0 (MOVES) Emission Factors in g/operating hour listed by SCC Generated on 08/09/2021. Equipment is assumed to be diesel for conservative emission estimates.

Attachment I.

Table 1a. Air Quality and Emissions Estimate, Worst-case Scenario

Modified By Landau using M&N EF Calculations for Port of Bellingham (M&N April 11, 2023)

IHTF Marine Infrastructure and Repaving					MOVES CO code = 2			MOVES NOx code = 3			MOVES VOC code = 87			MOVES SO2 code = 31			MOVES CO2 code = 90		
Port of Port Angeles Equipment	***M&N Emission Factor Equivalent Used (Worst-Case)****	**# of equip-ment [1]**	**Hrs/ Day [2]**	**# of Days [3]**	**CO (g/ hr) [4]**	**CO (lbs/ day)**	**CO Total (tons)**	**NOx (g/ hr) [4]**	**NOx (lbs/ day)**	**NOx Total (tons)**	**VOC (g/hr) [4]**	**VOC (lbs/ day)**	**VOC Total (tons)**	**SO2 (g/ hr) [4]**	**SO2 (lbs/ day)**	**SO2 Total (tons)**	**CO2 (g/ hr) [4]**	**CO2 (lbs/ day)**	**CO2 Total (metric tons)**
Excavator	*Excavator*	1	10	25	15.88	0.35	0.00	58.07	1.28	0.02	2.77	0.06	0.00	0.15	0.00	4.09E-05	54734	1207	14
Dump Truck (cyclical; passby)	*Dump Truck (off-road)*	1	10	45	72.71	1.60	0.04	704.86	15.54	0.35	17.95	0.40	0.01	0.67	0.01	3.33E-04	248064	5469	112
Concrete Pump Truck	*Concrete Truck (off-road)*	1	10	15	72.71	1.60	0.01	704.86	15.54	0.12	17.95	0.40	0.00	0.67	0.01	1.11E-04	248064	5469	37
Asphalt Paver	*Asphalt Paving Equipment*	1	10	24	20.19	0.45	0.01	57.81	1.27	0.02	4.23	0.09	0.00	0.07	0.00	1.73E-05	22845	504	5
Double Drum Roller	*Roller*	1	10	24	21.85	0.48	0.01	69.59	1.53	0.02	3.49	0.08	0.00	0.09	0.00	2.25E-05	30456	671	7
Compactor (ground)	*Excavator*	1	10	24	15.88	0.35	0.00	58.07	1.28	0.02	2.77	0.06	0.00	0.15	0.00	3.92E-05	54734	1207	13
Dozer	*Excavator*	1	10	20	15.88	0.35	0.00	58.07	1.28	0.01	2.77	0.06	0.00	0.15	0.00	3.27E-05	54734	1207	11
Front End Loader (Cyclical)	*Dump Truck (off-road)*	1	10	30	72.71	1.60	0.02	704.86	15.54	0.23	17.95	0.40	0.01	0.67	0.01	2.22E-04	248064	5469	74
Grader (passby)	*Dump Truck (off-road)*	1	10	20	72.71	1.60	0.02	704.86	15.54	0.16	17.95	0.40	0.00	0.67	0.01	1.48E-04	248064	5469	50
Pickup Truck	*Excavator*	1	10	150	15.88	0.35	0.03	58.07	1.28	0.10	2.77	0.06	0.00	0.15	0.00	2.45E-04	54734	1207	82
Street Sweeper	*Dump Truck (off-road)*	1	10	150	72.71	1.60	0.12	704.86	15.54	1.17	17.95	0.40	0.03	0.67	0.01	1.11E-03	248064	5469	372
Street Sweeper (Vacuum)	*Dump Truck (off-road)*	1	10	24	72.71	1.60	0.02	704.86	15.54	0.19	17.95	0.40	0.00	0.67	0.01	1.78E-04	248064	5469	60
Asphalt Distributor Truck (Asphalt Sprayer)	*Dump Truck (off-road)*	1	10	24	72.71	1.60	0.02	704.86	15.54	0.19	17.95	0.40	0.00	0.67	0.01	1.78E-04	248064	5469	60
Asphalt Grinder	*Dump Truck (off-road)*	1	10	12	72.71	1.60	0.01	704.86	15.54	0.09	17.95	0.40	0.00	0.67	0.01	8.88E-05	248064	5469	30
**Project Total Equipment Emissions ** **						**15.15**	**0.31**		**132.24**	**2.66**		**3.58**	**0.07**		**0.13**	**0.0028**		**49753**	**926**
Project Total Hauling and Commuter Emissions						N/A	**2.34**		N/A	**0.11**		N/A	**-**		N/A	**-**		N/A	**224**
Project Total Emissions						N/A	**2.65**		N/A	**2.77**		N/A	**0.07**		N/A	**0.0028**		N/A	**1151**
Project Estimated Annual Emissions (tons/year)[5]						N/A	**2.65**		N/A	**2.77**		N/A	**0.07**		N/A	**0.0028**		N/A	**1151**
EPA De Minimis Thresholds (tons/year)						N/A	**100**		N/A	**100**		N/A	**50**		N/A	**100**		N/A	N/A
Significant?						N/A	**No**		N/A	**No**		N/A	**No**		N/A	**No**		N/A	N/A

Notes:

*** Emission Factors (EFs) used are based on an analysis completed for the Port of Bellingham BST EA by Moffat Nichol in 2021. When emission factors were not available matching equipment used in the IHTF project, the EFs for worst-case similar equipment were used.**

**** Project components have overlapping construction schedules. The total emissions in lbs/day assumes all equipment running at the same time, regardless of schedule, resulting in conservative maximum daily emission estimates.**

**** Project total emissions shown in Tons is for the complete project, which occurs over more than one year, resulting in conservative emission estimates. EPA De Minimis Thresholds are based on Tons/Year.**

Source Data:

[1] Equipment assumptions provided by Port of Port Angeles, and compared to estimates of similar equipment by Moffatt & Nichol Engineering staff (based on similar past construction projects).

[2] Assumes equipment is running at 8 hours per day for conservative emission estimates. Actual running times will fluctuate throughout the day based on need.

[3] Number of working days based on schedule with active equipment use. Does not include mobilization and demobilization periods.

[4] Motor Vehicle Emission Simulator Version 3.0 (MOVES) Emission Factors in g/operating hour listed by SCC Generated on 08/09/2021. Equipment is assumed to be diesel for conservative emission estimates.

[5] Based on a total of one year for construction.

Table 1b. Hauling and Commuter Calculations

source: Moffat Nichol Air Quality Calculations for Port of Bellingham BST EA; updated with Round trip/Mileage from Port of Port Angeles Staff.

Commuter Component	**Offsite Vehicle**	**Round Trip Mileage/ Day**	**Number of Working days**	**Number of Commuter Vehicles**	**Total VMT**	**CO (g/m) [1]**	**CO Total (g)**	**CO Total (lbs)**	**CO Total (tons)**	**NOx (g/m) [1]**	**NOx Total (g)**	**NOx Total (lbs)**	**NOx Total (tons)**	**CO2 (g/m)**	**CO2 Total (g)**	**CO2 Total (lbs)**	**CO2 Total (metric tons)**
Personal Vehicle	Cars	50	30	370	555,000	3.81	2,115,660	4664	2.33	0.157	87135	192	0.10	404	224220000	494320	224
Commuter Totals					555,000				2.33				0.10				224

Hauling Component		**Offsite Vehicle**	**Round Trip Mileage/ Day**	**Number of Hauling Trips**	**Total VMT**	**CO (g/m) [1]**	**CO Total (g)**	**CO Total (lbs)**	**CO Total (tons)**	**NOx (g/m) [1]**	**NOx Total (g)**	**NOx Total (lbs)**	**NOx Total (tons)**	**CO2 (g/m) [2]**	**CO2 Total (g)**	**CO2 Total (lbs)**	**CO2 Total (metric tons)**
Hauling (off-road)		HD Trucks	30	130	3,900	1.846	7199	16	0.01	3.52	13720	30	0.02	2.97	11592	26	0.01
Hauling Totals					3,900				0.01				0.02				0.01

Hauling and Commuter Totals									**CO Total (tons)**				**NOx Total (tons)**				**CO2 Total (metric tons)**
Total									2.34				0.11				224

Source Data:

[1] USDOT Table 4-43: Estimated National Average Vehicle Emissions Rates per Vehicle, by Vehicle Type using Gasoline and Diesel (2022, Grams per mile) accessed January 2023 at https://www.bts.gov/content/estimated-national-average-vehicle-emissions-rates-vehicle-vehicle-type-using-gasoline-and

[2] Rates from MOVES 3.0 pulled from Baltimore-Washington, DC Superconducting Maglev Project accessed January 2023 at https://bwmaglev.info/index.php/component/jdownloads/?task=download.send&id=51&catid=4&m=0&Itemid=101

APPENDIX I

Noise and Vibration Supporting Documentation

CHARACTERISTICS OF SOUND AND NOISE

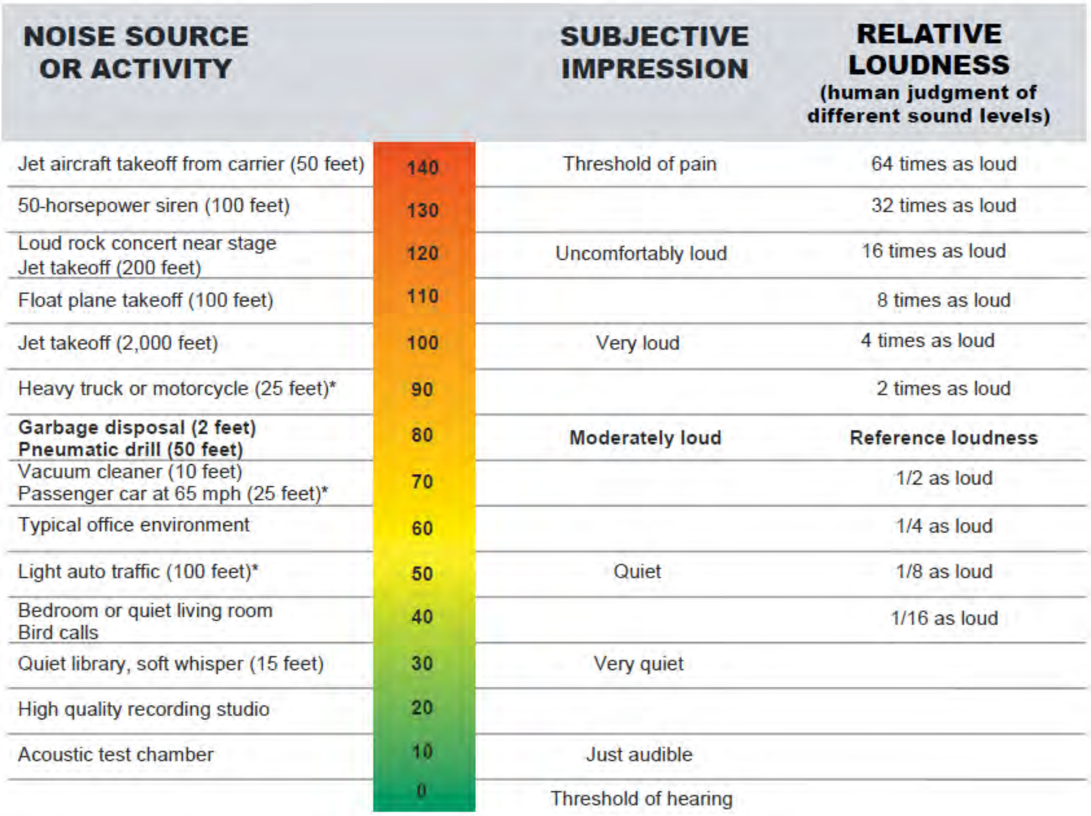
Sound is created when objects vibrate, resulting in a minute variation in surrounding atmospheric pressure, called sound pressure. The human response to sound depends on the magnitude of a sound as a function of its frequency and time pattern (EPA 1974). Magnitude is a measure of the physical sound energy in the air. The range of magnitude the ear can hear, from the faintest to the loudest sound, is so large that sound pressure is expressed on a logarithmic scale in units called decibels (dB). Loudness refers to how people subjectively judge a sound and varies between people.

Sound is measured using the logarithmic decibel scale, so doubling the number of noise sources, such as the number of cars on a roadway, increases noise levels by 3 dBA. A-weighted decibels are noise level measurements that account for relative loudness perceived by human hearing because humans are less sensitive to very low-pitch or high-pitch noises. Therefore, when you combine two noise sources emitting 60 dBA, the combined noise level is 63 dBA, not 120 dBA. The human ear can barely perceive a 3 dBA increase, while a 5 dBA increase is about one and one-half times as loud. A 10 dBA increase appears to be a doubling in noise level to most listeners. A tenfold increase in the number of noise sources will add 10 dBA.

In addition to magnitude, humans also respond to a sound's frequency or pitch. The human ear is very effective at perceiving frequencies between 1,000 and 5,000 hertz (Hz), with less efficiency outside this range. Environmental noise is composed of many frequencies. A-weighting (i.e., dBA) of sound levels is applied electronically by a sound level meter and combines the many frequencies into one sound level that simulates how an average person hears sounds of low to moderate magnitude.

Noise is unwanted or unpleasant sound. Noise is a subjective term because, as described above, sound levels are perceived differently by different people. Magnitudes of typical noise levels are shown in Table 1.

Table 1: Typical Noise Levels



NOISE SOURCE OR ACTIVITY		SUBJECTIVE IMPRESSION	RELATIVE LOUDNESS (human judgment of different sound levels)
Jet aircraft takeoff from carrier (50 feet)	140	Threshold of pain	64 times as loud
50-horsepower siren (100 feet)	130		32 times as loud
Loud rock concert near stage Jet takeoff (200 feet)	120	Uncomfortably loud	16 times as loud
Float plane takeoff (100 feet)	110		8 times as loud
Jet takeoff (2,000 feet)	100	Very loud	4 times as loud
Heavy truck or motorcycle (25 feet)*	90		2 times as loud
Garbage disposal (2 feet) **Pneumatic drill (50 feet)**	80	**Moderately loud**	**Reference loudness**
Vacuum cleaner (10 feet) Passenger car at 65 mph (25 feet)*	70		1/2 as loud
Typical office environment	60		1/4 as loud
Light auto traffic (100 feet)*	50	Quiet	1/8 as loud
Bedroom or quiet living room Bird calls	40		1/16 as loud
Quiet library, soft whisper (15 feet)	30	Very quiet	
High quality recording studio	20		
Acoustic test chamber	10	Just audible	
	0	Threshold of hearing	

Sources: Beranek (1988) and EPA (1974).

The root mean square (RMS or dB_{RMS}) is used in biological noise evaluations and is directly related to the energy carried by a sound wave, not adjusted to human response. RMS can be used to calculate the distance noise is transmitted through air or water before attenuating to background noise levels.

Traffic Noise Sources

An increase in traffic volumes, vehicle speeds, or the number of heavy trucks will increase traffic noise levels. Traffic noise is a combination of noises from the engine, exhaust, and tires. Defective mufflers, truck compression braking, steep grades, the terrain and vegetation near the roadway, shielding by barriers and buildings, and the distance of the receiver from the road can also contribute to the traffic noise heard at the roadside.

Construction Noise

The Federal Highway Administration Construction Noise Handbook provides noise levels and ranges associated with a range of typical stationary and mobile construction equipment (FHWA 2006). Table 2 summarizes the L_{max} (the maximum sound level measured during a single noise event) of a variety of construction equipment used during roadway construction projects. This list is intended to provide representative examples, not to be a comprehensive summary specific to the current proposed project. Project-specific equipment is addressed in the section titled "Proposed Action."

Table 2: Noise Levels of Common Construction Equipment

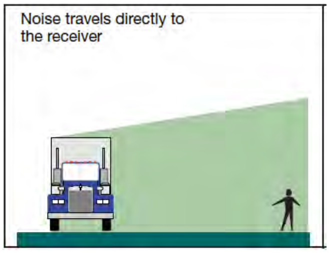
Equipment Description	Impact Device?	Measured L_{max} at 50 feet (dBA)
Auger Drill Rig	No	84
Backhoe	No	78
Chain Saw	No	84
Compressor (air)	No	78
Concrete Mixer Truck	No	79
Concrete Saw	No	90
Crane	No	81
Dozer	No	82
Drum Mixer	No	80
Dump Truck	No	76
Excavator	No	81
Flat Bed Truck	No	74
Front End Loader	No	79
Generator	No	81
Impact Pile Driver	Yes	101
Jackhammer	Yes	89
Mounted Impact Hammer (hoe ram)	Yes	90
Paver	No	77
Pickup Truck	No	75
Pneumatic Tools	No	85
Pumps	No	81
Rock Drill	No	81
Roller	No	80
Scraper	No	84
Vacuum Street Sweeper	No	82
Vibratory Pile Driver	No	101
Warning Horn	No	83
Welder/Torch	No	74

(Source: FHWA 2006; accessed October 20, 2020)

Sound Propagation

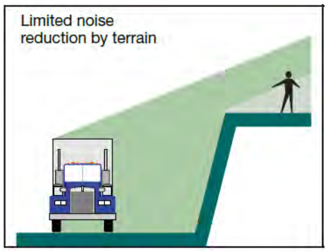
Sound propagation, or how far the sound travels, is affected by the terrain and the elevation of the receiver relative to the noise source. Noise levels can be reduced by breaking the line of sight between the receiver and the noise source.

Level ground: noise travels in a straight path between the source and receiver.



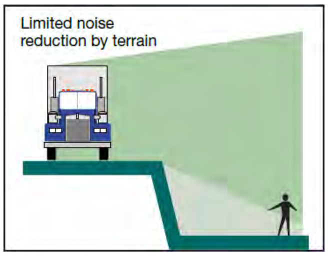
Level Ground

Depressed source/elevated receiver: terrain may act like a partial noise barrier and reduce noise levels if it crests between the source and receiver.



Depressed source/elevated receiver

Elevated source/depressed receiver: the edge of the roadway acts as a partial noise barrier. Even a short barrier, like a concrete safety barrier, can reduce noise levels at the subgrade receiver.



Elevated source/depressed receiver

Line and Point Sources

Noise levels decrease with distance from the noise source. For a line source, like a highway, noise levels decrease 3 dBA for every doubling of distance (e.g., from 50 feet to 100 feet) between the source and the receiver over hard ground (concrete, pavement) or 4.5 dBA over soft ground (grass). For point source, like most construction noise, the levels decrease between 6 and 7.5 dBA for every doubling of distance.

Noise Level Descriptors

The equivalent sound level (L_{eq}) is a measure of the average noise level during a specified period of time. A 1-hour period, or hourly L_{eq} (L_{eq}[h]), is used to measure highway noise. L_{eq} is a measure of total noise during a time period that places more emphasis on occasional high noise levels that accompany general background noise levels. For example, if you have two different sounds, and one contains twice as much energy, but lasts only half as long as the other, the two would have the same L_{eq} noise levels.

Either the total noise energy or the highest instantaneous noise level can describe short-term noise levels, such as those from a single truck passing by. The sound exposure level is a measure of total sound energy from an event and is useful in determining what the L_{eq} would be over a period when several noise events occur. L_{max} is the maximum sound level that occurs during a single event and is related to impacts on speech interference and sleep disruption. L_{min} is the minimum sound level during a period of time.

With L_n, “n” is the percentage of time that a sound level is exceeded and is used to describe the range of sound levels recorded during the measurement period. For example, the L_{10} level is the noise level that is exceeded 10 percent of the time. Sound varies in the environment and people will generally find a higher, but constant, sound level more tolerable than a quiet background level interrupted by higher sound level events. For example, steady traffic noise from a highway is normally less bothersome than occasional aircraft flyovers in an otherwise quiet area.

Noise Calculation Method

The following equation for the inverse square law for sound attenuation between two point-sources was used to estimate sound levels of each Project activity, as well as total (i.e., cumulative) sound levels, as received at each receptor location.

$$Lp(R2) = Lp(R1) - 20 \times Log10(R2/R1)$$

Where:
Lp(R1) = Known sound pressure level at the first location
Lp(R2) = Unknown sound pressure level at the second location
R1 = Distance from the noise source to the location of known sound pressure level
R2 = Distance from the noise source to the second location.

The above equation results in a 6-dBA reduction in sound levels per doubling of distance from the noise source. The application of this equation assumes a direct line-of-sight between the source and receiver, a reasonable assumption given that receivers are located at a higher elevation, and therefore likely to be in direct line-of-sight to construction activities.

VIBRATION TERMINOLOGY

Equipment that creates blows or impacts on the ground surface produces vibrational waves, called groundborne vibration, that radiate along the surface of the earth and downward into the earth, potentially resulting in effects that range from annoyance to structural damage. As vibrations travel outward from the source, they excite the particles of rock and soil through which they pass and cause them to oscillate by a few ten-thousandths to a few thousandths of an inch. The rate of oscillation of particles, or the vibrational frequency, is commonly measured in cycles per second, or Hertz.

Differences in subsurface geologic conditions and the relative distance from the source of vibration will result in different vibration levels that are characterized by different frequencies and intensities. The maximum velocity of particle movement is the commonly accepted descriptor of the vibration "strength." This is referred to as the peak particle velocity (PPV) and is typically measured in inches per second (in/s).

As vibration energy travels through the ground it spreads out, causing the vibration levels to diminish with distance from the source. High-frequency vibrations reduce much more rapidly than low frequencies, so that low frequencies tend to dominate the spectrum as distance from the source increases. Discontinuities in the soil strata can also cause diffractions or channeling effects that affect the propagation of vibration over long distances.

When vibration encounters a building, the transfer of vibration from ground to the building foundation (referred to as "ground-to-foundation coupling") will usually reduce the overall vibration level; however, under certain circumstances, the ground-to-foundation coupling may also amplify the vibration level due to structural resonances of the floors and walls. High levels of vibration can damage fragile buildings or interfere with the operation of sensitive equipment. Depending on the age of the structure and type of vibration (transient, continuous, or frequent intermittent sources), vibration levels as low as 0.5 in/s PPV can damage a structure.

Vibration Calculation Method

The following equation is for the propagation adjustment to the source reference level to account for the distance from the equipment.

$$PPV_{equip} = PPV_{ref} \times (25/D)^{1.5}$$

Where:
PPV_{equip} = The peak particle velocity of the equipment adjusted for distance, in/sec
PPV_{ref} = the source reference vibration level at 25 ft, in/sec
D = Distance from the equipment to the receiver, ft

Vibration Damage Criteria

Federal Transit Administration Construction Vibration Damage Criteria (2018)

Building Category	PPV (in/s)
Reinforced-concrete, steel, or timber (no plaster)	0.5
Engineered concrete and masonry (no plaster)	0.3
Non-engineered timber and masonry buildings	0.2
Buildings extremely susceptible to vibration damage	0.12

Figure I.1: Assumed Construction and Receiver Locations

APPENDIX J

Traffic and Safety Supporting Documentation

Where Green Meets Blue – The Port of Port Angeles' Intermodal Handling & Transfer Facility

A Preliminary Investigation

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9/29/2022

Abstract

This preliminary investigation estimates the economic, social and environmental benefits derived from the Port of Port Angeles Intermodal Handling & Transfer Facility (IHTF). Economic benefits in the form of employment and wage impacts from IHTF operations, mills and trucking in Clallam and Jefferson Counties, and along the Northwest Coast, are estimated to be 2,485 jobs at an annual average wage of $80,496. Those operations support an additional 3,307 jobs at an average annual wage of $44,295. Social benefits are derived from reduced highway congestion (Truck Miles) and Truck Accidents. Barge substitution for long-haul trucking eliminates an estimated 750,000 Truck Miles resulting in 3 less Truck Accidents. Environmental benefits are estimated in terms of reduced greenhouse gas emissions, which are 612 tons of CO2 annually.

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EXECUTIVE SUMMARY

The Intermodal Handling & Transfer Facility (IHTF) operated by the Port of Port Angeles in Clallam County, Washington, plays a pivotal role in the movement of wood fiber (primarily logs at this time) to and from the North Olympic Peninsula (NOP). The IHTF exports logs to regional mills and imports logs to NOP mills using barges. Those log flows help support the financial viability of mills on the NOP and those jobs and wages that improve economic well-being in an economically distressed region where the annual median private sector wage is $36,747 in 2021. In addition, those log flows help support operations at numerous mills along the northwest coast and the jobs and wages working people depend on. Those economic impacts derived from the IHTF and associated NOP Mills, and Regional Mills are summarized in Table ES1. IHTF Direct Impacts, consisting of IHTF Staff and Commercial Logging, support 76 Jobs at an annual average Wage of $72,051, $35,304 more than the median private sector wage. Those operations support an additional 25 Jobs in the supply chain (Indirect Effect) at an annual average Wage of $36,339, and 28 Jobs in the general economy (Induced Effects) at an annual average Wage of $30,820. The operations of NOP Mills are also supported by those log flows, and provide 878 Direct Jobs at an annual average Wage of $84,331, $47,584 more than the median private sector wage; Indirect Jobs of 659 at an annual average Wage of $44,827, and 367 Induced Jobs at an annual average Wage of $27,481. Regional Mills that make use of logs exported through the IHTF support 1,531 Direct Jobs at an annual Wage of $78,718; Indirect Jobs of 1,545 at an annual average Wage of $52,261; and 683 Induced Jobs at an annual average Wage of $35,647.

	Direct Effect		**Indirect Effect**		**Induced Effect**		**Industry Totals**	
Industry Totals	**Jobs**	**Wage**	**Jobs**	**Wage**	**Jobs**	**Wage**	**Jobs**	**Wage**
IHT Operations	76	$72,051	25	$36,339	28	$30,820	129	$56,227
NOP Mills	878	$84,331	659	$44,827	367	$27,481	1,904	$59,700
Regional Mills	1,531	$78,718	1,545	$52,261	683	$35,647	3,759	$59,892
Grand Totals	**2,485**	**$80,496**	**2,229**	**$49,882**	**1,078**	**$32,742**	**5,792**	**$59,747**

Table ES1: Economic impacts associated with the Intermodal Handling & Transfer Facility, 2021.

The substitution of barging for long-haul trucking not only reduce shipping costs, but create social and environmental benefits. Social benefits are a reduction in Truck Miles (miles trucks travel on roads and highways) and associated Truck Accidents. In Table ES2 those social benefits are a reduction of approximately 750,00 Truck Miles and 3 Truck Accidents annually. Fewer Truck Miles reduces diesel fuel combustion, the outcome being a reduction in CO2 emissions, totaling over 600 tons in 2021.

	Long-Haul Trucking			**Barging**			**Net Benefits**		
	Total	**Truck**	**CO2**	**Barge**	**Truck**	**CO2**	**Truck**	**CO2**	**Truck**
Destintation	**Loads**	**Miles**	**(tons)**	**Loads**	**Miles**	**(tons)**	**Miles**	**(tons)**	**Accidents**
Regional Mills	2,246	600,522	1,124	45	51,021	715	-549,500	-409	-2
Local Mills	1,521	207,180	388	30	9,619	184	-197,561	-204	-1
Grand Totals	**3,768**	**807,702**	**1,512**	**75**	**60,640**	**899**	**-747,061**	**-612**	**-3**

Table ES2: Social and environmental net benefits of the Intermodal Handling & Transfer Facility, 2021.

SECTION 1: OVERVIEW AND BACKGROUND

The Port of Port Angeles (Port) is in the process of seeking funding for investments to improve and expand operations at its Intermodal Handling & Transfer (IHTF). The area covers about 30 acres. An overhead view is presented in Figure 1. The IHTF makes possible transfer of materials from the shore to the water without use of large-scale docking and lifting equipment. The absence of those large-scale capital structures makes possible rapid adaptation to evolving needs of customers by utilizing flexible smaller scale capital equipment. In addition, the IHTF docking site, combined with expansive upland staging areas with capital infrastructure for preparation of materials, has lower operating costs compared to large-scale facilities. Road corridors from near-by private staging areas allow private sector businesses to readily utilize the facilities. This advantage helps Clallam County businesses remain financially viable by offsetting other costs associated with the remote geographic location. The result is that the IHTF and local businesses are competitive with markets in the distant urban-waterfront zones, and can support higher wage employment in an economically distressed region.

Figure 1: Satellite image of Port of Port Angeles Intermodal Handling & Transfer Facility[1]

At present, the IHTF is primarily used to barge logs as exports and imports. Export operations begin with sustainably harvested wood from Clallam and Jefferson Counties on the North Olympic Peninsula of Washington State. It is barged to wood product manufactures located along the Northwest coast. Import operations proceed in the same fashion, with the difference that logs are used by local sawmills in Clallam and Jefferson Counties. Each stage of these operations, from tree planting, to commercial harvesting, to short-haul trucking, log handling, shore to barge transfer, barging, barge to

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[1] Image provided by the Director of Engineering, Port of Port Angeles.

shore transfer, short-haul trucking, and wood sent to and used by manufacturers, plays an important role in supporting economic benefits in the form of jobs and wages in Clallam County. In addition, the IHTF creates social benefits in the form of reduced Truck Miles and Truck Accidents, and environmental benefits in the form of reduced greenhouse gas (GHG) emissions. The Port commissioned Olympus Consulting (Olympus) to analyze these impacts.

The Port's facilities play a pivotal role providing the land and facilities that support employment at good wages for the residents of Clallam County.[2] For instance, a study conducted by Olympus on behalf of the Port in 2018 which included log operations and barging (now referred to as IHTF) and the Port's cargo terminal, indicated that international marine exports in 2016 supported 81 Direct jobs in the forest products industry and in shipside operations; an additional 19 jobs were supported in the supply chain and 80 jobs in the general economy. Diversions of some of the logs and other wood fiber to local sawmills helped support 256 jobs in wood product manufacturing, 186 jobs in the supply chain, and 154 jobs in the general economy.[3]

This Preliminary Investigation builds upon some initial data from the 2018 study, refines the economic modeling and adds environmental and social benefits. The report proceeds as follows.

- Section 1 provides an overview and background.
- Section 2 explores the declining level of economic welfare in Clallam County relative to the overall state.
- Section 3 presents the research question to be answered (i.e., the premise of this study). It then develops a conceptual visualization of wood fiber flows to and from the IHTF that provides the foundation for subsequent quantitative analysis.
- Section 4 traces the flow of logs to wood product manufacturers located on the North Olympic Peninsula of Washington State, identifying businesses whose operations are supported by those activities.
- Section 5 estimates the economic benefits from forests on the peninsula to final destinations by way of the IHTF. It also estimates economic benefits at mills receiving exported logs. Lastly, economic benefits are estimated for mills on the North Olympic Peninsula who receive, directly or indirectly, flows of wood fiber that support their operations.
- Section 6 estimates social and environmental benefits.
- Section 7 summarizes conclusions from this Preliminary Investigation.

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[2] The concept of a "good wage" is complex. The MIT Living Wage Calculator establishes a subsistence wage, one that provides for minimum living standards without public assistance, based on household composition. For 2022, with 2 adults, both working, and 1 child, the before tax wage is $70,474. The Clallam Economic Development Council has defined a prosperity wage, one that allow homeownership and retirement savings. With one adult earning the mean wage of approximately $48,000, the other would need to earn around $65,000 to achieve a prosperity threshold of approximately $110,000. That wage would allow purchase of an entry level home at 85 percent of the current (Q1, 2022) median priced home of $430,400 in Clallam County.

[3] Daniel A. Underwood, *The Port of Port Angeles Log Yard: A Nexus in the Forest Products Industry*, 2018. Project was funded by the Port of Port Angeles. The Port of Port Angeles Log Yard: A Nexus in the Forest Products Industry (portofpa.com)

SECTION 2: THE NEED FOR GOOD JOBS WITH GOOD WAGES IN CLALLAM COUNTY

The economic well-being in Clallam County is significantly less than state-wide, and has fallen further behind with time. This increasing disparity is illustrated in Table 1 and Figure 2. In 1990, the average annual nominal mean wage in Clallam County was $18,456; in Washington State it was $22,6768. Thus, those employed in Clallam County earned 81 percent of what those employed in Washington State as a whole earned. In 2021, the average annual nominal wage in Clallam County was $47,836; in Washington State it was $82,478. Thus, by 2021, the relative annual mean wage was 58 percent of the statewide average. This decline is explained by a decline in the average hourly wage.[4]

		Jobs	Total Annual Wages	Mean Annual Wage	Proportion
1990	**Clallam County**	17,788	$328,293,884	$18,456	81%
1990	**Washington State**	2,132,868	$48,369,146,583	$22,678	123%
2021	**Clallam County**	23,148	$1,107,318,794	$47,836	58%
2021	**Washington State**	3,352,607	$276,514,659,439	$82,478	172%

Table 1: Relative nominal wages between Clallam County and Washington State, 1990 and 2021.[5]

A second measure of economic disparity is found in unemployment rates. The Employment Security Department of Washington State (ESD) defines a county as distressed if its unemployment rate exceeds the state-wide average by 20 percent. For January 2022, the state-wide unemployment rate was 4.4 percent. In Clallam County it was 6.7 percent, 60 percent greater than the state-wide average.[6] Clallam County as an economically distressed county is not a recent phenomenon, revealed in Figure 2.

The potential for economic development that brings good paying jobs to residents is partly hampered by educational disparities. Levels of educational attainment in Clallam County are below state-wide averages for college degrees, Bachelors and greater. This is partly seen in Table 2 where 16.1 percent of those 25 and older have a Bachelor's degree compared to 22.4 percent statewide. For graduate degrees, respective values are 11.3 and 13.6 percent. These values, however, overstate the proportion of the working age population with Bachelor's degrees and greater in Clallam County, as the County median age is 50.8, compared to 37.7 state-wide.[7] Clallam has a higher proportion of retired persons who are 47 percent more likely to have a Bachelor's or graduate degree. This data appears in Table 3. Thus, adjusting, for the working age population of 25 to 64, the percent with a Bachelor's or graduate degree is 14.5 percent compared to 36 percent state-wide, or 60 percent less. Bringing jobs at good wages to residents will likely require development of industries that can provide on the job training, or make use of locally provided professional technical education, instead of relying on the possession of advanced credentials in higher education. Jobs requiring advanced education will likely recruit workers and thus not improve the economic well-being of working residents.

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[4] The 1990 mean hourly wage in Clallam County was $12.11 and $13.82 statewide, or 88 percent of the statewide average. In 2020 those values were $28.23 and $44.59, or 63 percent. *ESD, Average hourly wage, 1990 thru 2020.*

[5] Bureau of Labor Statistics, QCEW historical data, https://www.bls.gov/cew/downloadable-data-files.htm

[6] ESDWAGOV - Monthly employment report

[7] Census - Table Results

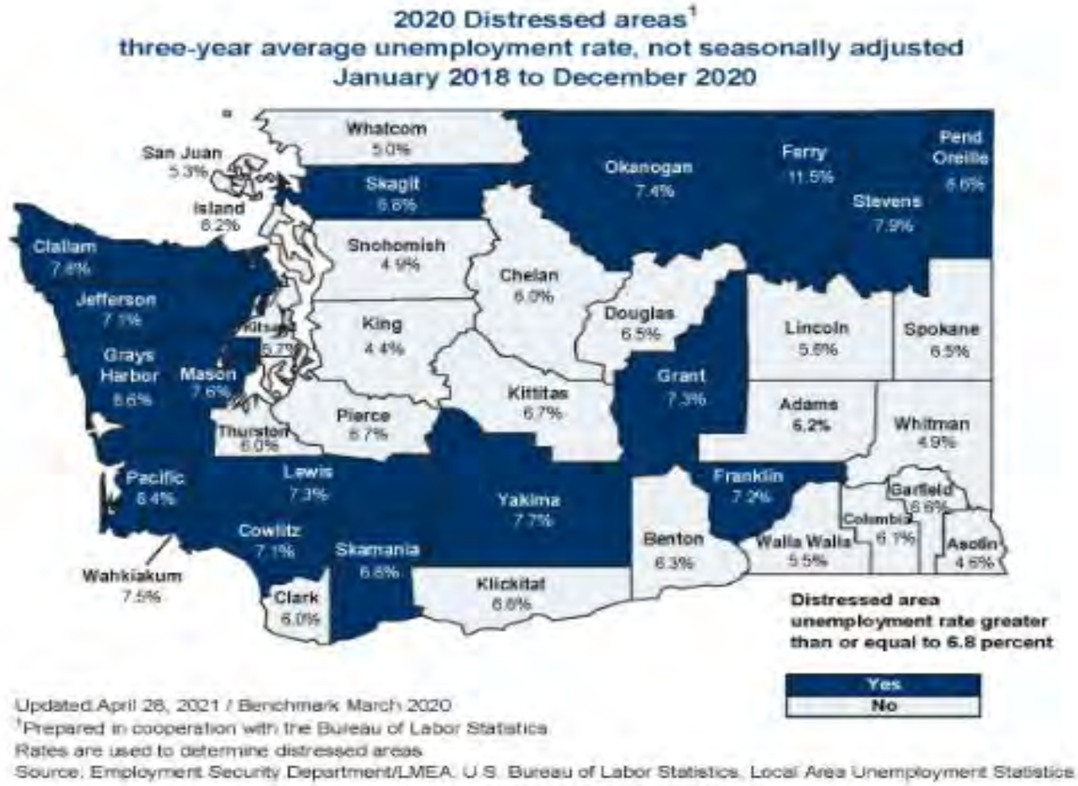

Figure 2: Economically distressed counties in Washington State, 2018 – 2020.[8]

EDUCATIONAL ATTAINMENT	Washington		Clallam County	
Population 25 years and over	5,101,624	5,101,624	57,648	57,648
Less than 9th grade	186,275	3.7%	933	1.6%
9th to 12th grade, no diploma	256,174	5.0%	3,399	5.9%
High school graduate (includes equivalency)	1,122,330	22.0%	15,145	26.3%
Some college, no degree	1,189,880	23.3%	16,483	28.6%
Associate's degree	509,353	10.0%	5,878	10.2%
Bachelor's degree	1,144,545	22.4%	9,281	16.1%
Graduate or professional degree	693,067	13.6%	6,529	11.3%

Table 2: Educational attainment Washington State and Clallam County for populations 25 years and over.[9]

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[8] Employment Security Department of Washington State, March 12, 2022: ESDWAGOV - Distressed areas list

[9] Census - Table Results , 2019.

Educational Attainment by Age Group: CENSUS ACS 2010									
	Demographic -- Age Group								
	25-34		**35-44**		**45-64**		**65 plus**		**Totals**
Degree	Total	Percent	Total	Percent	Total	Percent	Total	Percent	All Ages
Bachelor	729	16%	946	21%	1,220	27%	1,667	37%	4,562
Graduate	231	6%	270	7%	1,229	30%	2,356	58%	4,086
Totals	**960**	**11%**	**1,216**	**14%**	**2,449**	**28%**	**4,023**	**47%**	**8,648**

Table 3: Educational attainment in Clallam County by age groupings.[10]

Annual household income in Clallam County is below state-wide values, which is summarized in Table 4. For median annual household income, we see $52,192 ($56,623 in 2021$) in Clallam County compared to $73,775 ($80,038 in 2021$) state-wide, or 29 percent less. For annual mean household income, those respective values are $67,839 ($73,599 in 2021$) and $98,983 ($107,387 in 2021$), or 31 percent less.

While these income distribution values indicate that economic welfare is less in Clallam County than state-wide, the standard of living for people who work for a living is below these median and mean annual values for household income. In Table 5, for all covered employment in Clallam County in 2021, the annual mean wage for those employed was $47,836, or $34,677 less than the state wide annual mean wage of $82,513. For government employees, those in Clallam County earn an annual mean wage of $61,732, or $13,035 less than the state wide annual average for government employees of $74,767. For private sector employees, those working in Clallam County earned an annual mean wage of $40,430, or $43,596 less than the state wide annual mean private sector wage of $84,026. Thus, in the private sector, Clallam County workers earn less than one-half of private sector workers in Washington State.

Median annual wages tell us more about disparities in income. In Clallam County, half of the labor force earns less than $50,390. Contrasted with Washington State, we see half of the labor force earns more than $71,707, or $21,317 more than in Clallam County. For private sector employees, the disparity is larger. In Clallam County, the median annual private sector wage is $36,747. In Washington State the median annual private sector wage is $69,626. Thus, for private sector employees, the disparity in the median annual wage is $32,879.

In Clallam County, 9.2 percent of all households were living at or below the poverty level in 2019. For Washington State, that value is 6.9 percent. Thus, the poverty rate in Clallam County is 33 percent greater than the state-wide average. For households with children, the poverty rate in Clallam County is 19.6 percent whereas it’s 11 percent state-wide; the poverty rate for households with children is 78 percent greater in Clallam County. As a result, the household rate for cash public assistance is 5.3

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[10] Census - Table Results, 2010.

percent in Clallam County and 3.0 percent state-wide, or 77 percent greater in Clallam County.[11] Differentials in educational attainment may partly explain the income disparities explored above. A second explanation is a dearth of employment opportunities in industries where the necessary knowledge-skill set can be acquired locally and put to use by employers paying higher wages. In the analysis that follows, the economic sectors identified for investment and expansion pay wages above the County mean and median, and provide employment for existing residents.

INCOME AND BENEFITS (2019 DOLLARS)	**Washington**		**Clallam County**	
	Number	Percent	Number	Percent
Total households	2,848,396	2,848,396	32,958	32,958
Less than $10,000	136,214	4.8%	1,948	5.9%
$10,000 to $14,999	91,269	3.2%	1,901	5.8%
$15,000 to $24,999	196,496	6.9%	3,613	11.0%
$25,000 to $34,999	208,347	7.3%	3,591	10.9%
$35,000 to $49,999	322,372	11.3%	4,701	14.3%
$50,000 to $74,999	490,349	17.2%	5,843	17.7%
$75,000 to $99,999	390,278	13.7%	4,845	14.7%
$100,000 to $149,999	503,497	17.7%	4,012	12.2%
$150,000 to $199,999	238,716	8.4%	1,539	4.7%
$200,000 or more	270,858	9.5%	965	2.9%
Median household income	$73,775	(X)	$52,192	(X)
Mean household income	$98,983	(X)	$67,839	(X)

Table 4: Income distribution by earnings groupings in Washington State and Clallam County.[12]

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[11] Census - Table Results, 2019.

[12] Census - Table Results, 2019.

	Annual Mean Wages in 2021			
	Clallam County		**Washington**	
Economic Sector	**Mean**	**Median**	**Mean**	**Median**
QCEW Private	$40,430	$36,747	$84,026	$69,626
QCEW GOV	$61,732	$59,928	$74,767	$71,707
QCEW NCE	$75,908	$75,908	N/A	N/A
QCEW Total	**$47,836**	**$50,390**	**$82,513**	**$71,707**

Table 5: Mean and median wages in Clallam County and Washington State, 2021.[13]

In short, every new job directly associated with the IHTF is likely to reduce the economic disparities analyzed in this section.[14] Thus, maintaining and increasing the jobs analyzed in this Preliminary Investigation are critical to improving the standard of living of working people.

SECTION 3: CONCEPTUALIZING AND MODELING THE INTERMODAL HANDLING & TRANSFER FACILITY

The research question

The research question addressed in this Preliminary Investigation is "*What is the value of the Port of Port Angeles Intermodal Handling & Transfer Facility?*" This question is answered using four levels of analysis.

- First, under its current configuration, the transport of logs is traced from source to final destination. As the IHTF plays a central role in this movement, economic impacts as dependent upon those volumes are estimated, beginning with activities in the forest and continuing to log exports.
- Second, the economic impacts associated with the process of transforming those exported logs into finished products are estimated.
- Third, the economic impacts of log imports and horizontal residual flows of wood chips and hog fuel are estimated.
- Fourth, the social and environmental impacts in terms of Truck Miles, associated Truck Accidents, and reductions in GHG emissions are estimated.

There are additional values attributable to the IHTF not explored in this Preliminary Investigation. First, there could be further investments to modify the transport capabilities of the existing cofferdam dock, which will have economic impacts during the investment period.[15] The resulting changes in infrastructure may expand transport capabilities, allowing not only barging, but also roll on roll off barging (RO-RO barging), another source of economic impacts.[16] RO-RO barging

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[13] qcew-annual-averages-2021-preliminary2.xlsx (live.com) NEC is not classified elsewhere.

[14] The opposite is also true: every job directly associated with the IHTF lost is likely to increase economic disparity.

[15] There are also plans to invest and expand import and export capabilities at the adjacent Terminal 5 and 7 in a future phase. The expected outcomes of those investments may be explored in a separate report.

[16] The Port BST Associates to evaluate the feasibility of barging. See *Barge Feasibility Update*, February 2000; *Port of Port Angeles Review of Barge Studies*, March 21, 2017.

accommodates fully loaded trucks that roll on, move by water to their final destination, and then roll off moving freight to the final user. This process reduces the number of trucks using highways and travel miles. Lastly, the IHTF will make possible additional transport possibilities for markets not yet well developed.

Olympus utilized the expertise of the Port's Operations Director to trace the movement of materials at the Port's existing facility and to envision investments that would expand its capabilities and allow adaptation to future needs and opportunities. The goal was to develop a quantitative model of material flows, transport processes, and end uses. The analytical focal point is the IHTF located on the waterfront of the Port. The physical infrastructure consists of the loading and material handling facilities, the cofferdam dock, and Terminal 7. Anticipated investments will import fill and install new asphalt pavement surface which will increase the facilities' efficiency and throughput capacity while improving water quality of the stormwater runoff. In addition, the cofferdam dock will receive needed structural repairs and surface improvements. These investments on the cofferdam dock could be leveraged to provide the infrastructure to accommodate other barging opportunities, including access for the export of bio-energy.

Figure 3 is an illustrative model that identifies key flows of materials that will provide the analytical context for the subsequent estimation of economic, social and environmental benefits. The outflow of wood fiber (primarily logs at this time) is derived from sustainably managed private and public forest lands in Clallam and Jefferson Counties. Logs moving to the IHTF are illustrated using solid green arrows. Jobs and wages commensurate with those activities are supported in the forests, on the highways via surface transport, at the log scales, in log preparation, and handling and loading. Some of those logs are sold to local sawmills (Evergreen Fibre, Interfor and Port Angeles Hardwoods) where they are manufactured into final products. On-site operations are conducted by Port IHTF union staff who work collaboratively with truck drivers and barge crews. Logs are off-loaded from trucks, sorted, stacked in decks, inventoried, and ultimately loaded on barges for export. Exports, denoted by solid blue arrows, currently move to destinations in Skagit and Snohomish counties in Washington, and Coos County Oregon, are denoted by black line arrows. From there, logs are off-loaded and short hauled to BUSE Timber and Canyon Lumber (Snohomish), Sierra Pacific Industries – Burlington (Skagit), and Roseburg Lumber and Southport Forest Products (Coos). The IHTF also receives barged logs from locations in Canada and Washington, which are off-loaded and short hauled to Port Angeles Hardwoods. Imports too are denoted by a solid blue arrow and import sources by black line arrows. Evergreen Fibre will soon import logs by barge to support its operations. Logs moving through the IHTF to local mills are denoted by a solid green arrow.

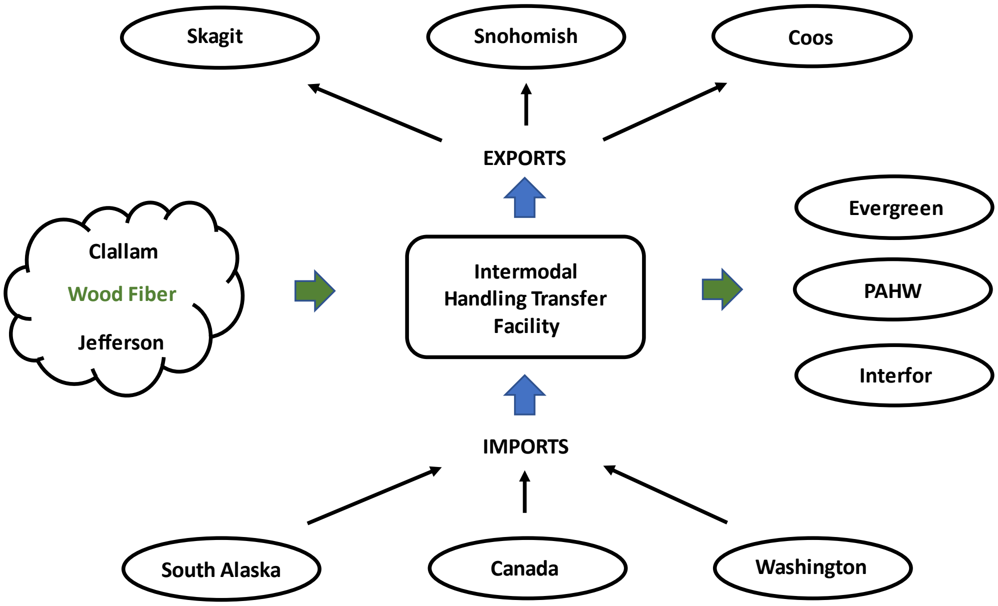

Figure 3: Current material flows through the Intermodal Handling & Transfer Facility.

The next step was to model log flows so that expected benefits can be quantified. The benefits analyzed in this Preliminary Investigation are, in general, three-fold.

- The first are economic benefits measured in terms of jobs and wages. Call these $ECON_j$, where j is an activity associated with IHTF operations and whose economic impact is supported by the flow (export and import) of materials.[17]
- The second are social benefits, $SOC_{j.}$, where j is an outcome derived from barge substitution for long-haul trucks. The social benefits are measured in terms of Truck Miles (a proxy for road congestion) and associated Truck Accidents.
- The third are environmental benefits, ENV_j. They will be measured as reductions in greenhouse gas emissions (GHG) resulting from decreased use of diesel fuel.[18]

These benefits will be used to answer the research question *"What is the value of the Intermodal Handling & Transfer Facility?"*

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[17] In Figure 4, these elements will consist of log exports, log imports, and the economic activities associated with commercial logging. Their economic impacts estimated.

[18] There are additional economic, social and environmental benefits that remain to be analyzed. Those economic benefits include proprietor employment and income, and local, state and federal tax revenues. Social benefits would include reduced travel time resulting from fewer Truck Miles and reduced road maintenance costs. There are also additional environmental benefits, including reductions in surface and air pollutants. Tied into these are the environmental benefits associated with the forest products industry. They include carbon sequestration derived from use of renewable wood products and reduced carbon dioxide resulting from the substitution of wood for concrete and steel in construction. Those topics are beyond the scope of this Preliminary Investigation.

SECTION 4: SOURCING WOOD FIBER AND WOOD PRODUCT MANUFACTURING

The Forest Products Industry is highly integrated, vertically from the forest to retail outlets for finished products, and horizontally with wood fiber flows between manufacturers.[19] All components of harvested trees are economically utilized. Buyers compete over a wide geographic area to secure supplies to keep their mills operating. The primary components of wood fiber important to this Preliminary Investigation are saw logs, chip and saw logs, and hog fuel (mixture of limbs, bark, and clean wood waste that is used for bio-energy production). Saw logs are not "equal." They vary by species and diameter. Wood product manufacturers have specific species and dimensional needs based upon their milling equipment and final markets. Figure 4 illustrates the movement of wood fiber (again, primarily logs), beginning with the forests of Clallam and Jefferson Counties, to final destinations. As explained in previous sections, many of those logs are exported by barge. Additional logs are imported by barge and distributed through the IHTF. The three primary mills that directly acquire logs through the IHTF are Evergreen Fibre (Evergreen), Interfor, and Port Angeles Hardwoods (PAHW).[20] ,[21] Thus, not all of the wood sorted and stacked in decks at the IHTF, nor the Port's upland facilities, is exported. Some is diverted to local mills, and this additional supply is critical to support their overall operations. This complex integration extends another step in the economy of the North Olympic Peninsula. Evergreen, which manufacturers wood chips, is the primary supplier for the Port Townsend Paper Corporation in Jefferson County.[22] Port Townsend Paper Company is the largest private sector employer in Jefferson County and pays the highest wages.[23] McKinley Paper, located in Clallam County, began operations in 2020.[24] It produces cardboard from recycled materials. Its capital infrastructure includes a bio-energy electric power plant which can use steam generated by hog fuel to power production processes. It is capable of producing upwards of 8 megawatts of baseload renewable power. The plant also uses steam generated by hog fuel to power production processes. Evergreen Fibre is the source of that hog fuel, a bio-energy material by-product of log processing operations for exports, both domestic and international. Thus, operations at McKinley are supported by activities revolving around the IHTF.[25]

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[19] For more detailed discussion and analysis, see Daniel A. Underwood, The Port of Port Angeles Log Yard: A Nexus in the Forest Products Industry. Published by the Port of Port Angeles, 2018. [The Port of Port Angeles Log Yard: A Nexus in the Forest Products Industry (portofpa.com)]

[20] At present, two new mills are preparing for operations on the North Olympic Peninsula. The Sustainable Green Team will operate in West Clallam County and expects to employ 95 people. Spencer Forest will operate in West Jefferson County and expects to begin with 45 employees, increasing to 100. Executive Director Clallam EDC.

[21] As discussed above, Evergreen Fibre plans to import wood fiber by barge beginning in 2023, if not sooner. It is to be emphasized the financial viability of mills is determined at "the margin," by the last incremental additions to the wood fiber it purchases. Daniel A. Underwood, Dan Friesner and Jason Cross, Toward an Institutional Legitimation of Sustainability, *Journal of Economic Issues* (September 2014): pages 877-878.

[22] Evergreen Fibre is a subsidiary of Hermann Brothers Logging and Construction, the largest truck transport company on the North Olympic Peninsula. Hermann Brothers plays a pivotal role in providing efficient trucking that supports local wood product manufactures, a point rejoined below.

[23] [Port Townsend Paper Corporation » EDUCATION (ptpc.com)]

[24] McKinley employs approximately 200 people. Correspondence, McKinley Paper.

[25] Investment and expansion plans at the IHTF might accommodate the import of recycled cardboard, the input McKinley uses to produce cardboard. Similarly, finished products might be moved to other ports by barge and then short-haul trucked for all local mills.

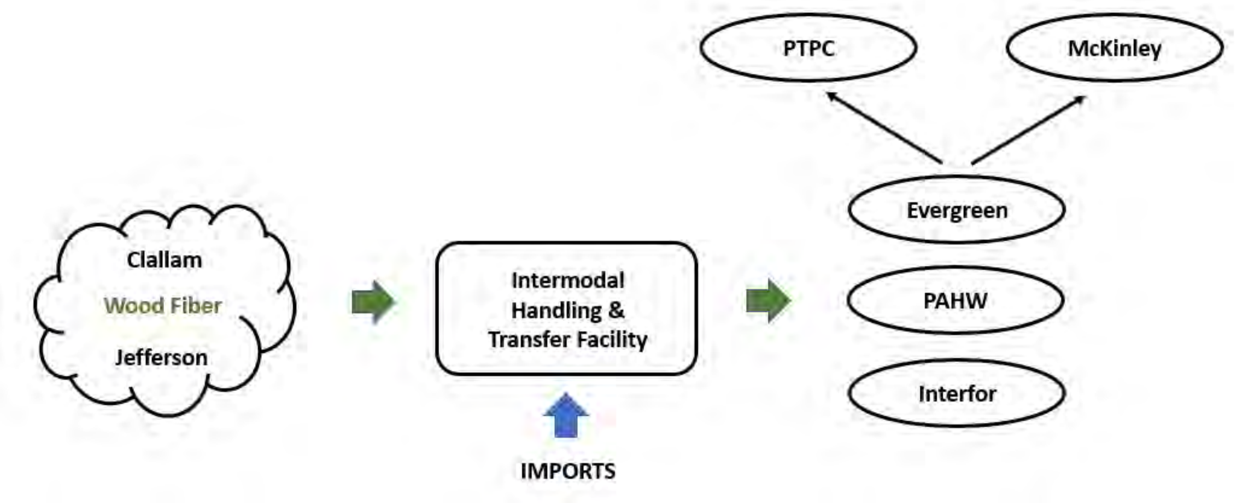

Figure 4: Visualizing the flow of wood fiber and the economic impacts of local mills.

SECTION 5: THE ECONOMIC BENEFITS OF THE INTERMODAL HANDLING & TRANSFER FACILITY

Data and methodology

Economic impacts were estimated using IMPLAN 6.5 (industry standard software). For sawmills and paper mills, data was acquired for total employment using a variety of sources. These included human resource departments, company owners, general managers, other correspondence and the internet. The Port provided employment and wage data which was used to estimate IHTF economic impacts. To estimate the economic impacts in commercial forestry, the value of exported logs was used. Export volumes were provided by log buyers.[26] Prices of $750 per MBF for PSME and $600 per MBF were used for TSHE and true firs.[27] [28] [29] The total export volume of 9,435 MMBF had a value of $7,048,128. The economic impacts for Clallam and Jefferson Counties – the North Olympic Peninsula – were estimated using a multi-regional input-output model. Economic impacts from sawmills in Snohomish, Skagit and Coos Counties were modeled at the county level. The 2019 IMPLAN data set was used to estimate economic impacts.[30] The model was run for 2019 (no use of deflators) and current year (2019) used as end point for the analysis. Estimated IMPLAN wages were then adjusted to 2021

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[26] Green Crow; Northwest Logistics, Port Angeles Hardwoods; BUSE Timber; and Sierra Pacific Industries.

[27] Provided by Interfor's log buyer.

[28] MBF is thousands of board feet; MMBF is millions of board feet. A board foot is 12 inches by 12 inches by 1 inch.

[29] PSME is *Pseudotsuga menziesii* (Douglas-fir), and TSHE is *Tsuga heterophylla* (Western hemlock).

[30] 2019 was the last "pre-pandemic" data year. Government imposed lock downs and significant changes in peoples shopping behavior altered expenditure relationships throughout the economy. Thus, it is professional practice to use 2019 to model a stable economy.

dollars (2021$).[31] ,[32] Employment, as explained above, was used to estimate annual wages based upon industry averages when actual payroll data was not available. IMPLAN wage estimates include benefits and are greater than wages reported in Bureau of Labor Statistic Quarterly Census of Employment and Wages (QCEW) data. Jobs are total employment (wage and salary jobs) for firms in each analyzed industry.[33] While these are not full-time equivalents, employment at mills is generally full-time. Wages are presented as annual averages (mean) expressed as 2021$. Economic impacts are presented as direct, indirect and induced effects:

- Direct effects are those from the specified operations;
- Indirect effects capture the jobs and wages resulting from expenditures by operations in the supply chain. Firms in the supply chain likewise make expenditures which further amplify the indirect effects;[34]
- Induced effects occur when those directly and indirectly employed make expenditures in the economies of Clallam and Jefferson Counties, which support jobs and wages throughout the economy.

The economic benefits associated with the IHTF are estimated using four economic impacts, $ECON_j$, illustrated and analyzed in Section 5. These elements are

$ECON_1$ = economic impacts associated with commercial logging and movement of wood fiber through the IHTF;

$ECON_2$ = economic impacts associated with the use of exported logs to sawmills in Snohomish, Skagit and Coos Counties;

$ECON_3$ = economic impacts from mills in Clallam and Jefferson Counties associated with the import and export of logs through the IHTF;

$ECON_4$ = economic impacts derived from trucking of materials to and from mills in Clallam and Jefferson Counties.

The economic impacts are estimated for a single year. Thus, future benefits are not included in the Preliminary Investigation.

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[31] Inflation has increased significantly since 2019. Olympus tested IMPLAN estimates using the model's dollar year (inflation adjustment) function for 2021, and found that IMPLAN significantly under estimates inflation.

[32] The Bureau of Labor Statistics (BLS) Inflation Calculator was used to convert 2019$ into 2012$, December to December, at a rate of 1.0849. CPI Inflation Calculator (bls.gov)

[33] Job values are rounded, though corresponding annual mean wages used decimal estimates.

[34] Use of a multi-regional model captured jobs supported by expenditures across county lines, expenditures which otherwise would be leakages. The result was an increase in Indirect and Induced employment of about 2 percent.

Economic impacts from the forest to the sea by way of the Intermodal Handling & Transfer Facility

To estimate the economic benefits of *ECON₁* IHTF operations at the cofferdam dock, IMPLAN Industry Code 420, Scenic and Sightseeing Transportation and Support Activities for Transportation to capture IHTF operations,[35] and Code 16 Commercial Logging to capture operations from the forest. Code 19, Support Activities, and Code 15, Forestry and Timber Tract Preparation, supply chain industries, are presented individually to help the reader better understand the nature, organizational structure and the distribution of economic impacts in this industry. All other industries impacted are presented as Other for indirect and induced effects. The results appear in Table 6.[36]

Economic Impacts of IHTF From the Forest to the Sea								
	Direct Effect		Indirect Effect		Induced Effect		Total Effects	
Sector	**Jobs**	**Wage**	**Jobs**	**Wage**	**Jobs**	**Wage**	**Jobs**	**Wage**
IHTF Operations	7	$70,000	5	$34,417	6	$30,692	18	$46,753
Commercial Logging	69	$72,258					69	$72,258
Support Activities			13	$30,909			13	$30,909
Forestry, Tract Prep			3	$83,990			3	$83,990
Other			5	$23,018	21	$30,859	26	$29,418
Grand Totals	**76**	**$72,051**	**25**	**$36,339**	**28**	**$30,820**	**129**	**$56,227**

Table 6: Intermodal Handling & Transfer Facility economic impacts from the forest to the sea, 2021.

The seven people working at the IHTF earn an average annual wage of $70,000.[37] Those operations support an additional 5 Indirect jobs in the supply chain at an average annual wage of $34,417, and 6 Induced jobs in the general economy at an average annual wage of $30,692. [38] Commercial Logging employed 69 people to support $7,048,128 worth of annual production at an average annual wage of $72,258 to harvest and transport those logs to the IHTF.[39] Support Activities provided 13 Indirect jobs in the supply chain at an average annual wage of $30,909; Forestry and Timber Tract Production provided an additional 3 Indirect jobs at an average annual wage of $83,990. Elsewhere in the supply chain an additional 4.8 Indirect jobs were supported at an average annual wage of $23,018. Those directly employed in commercial logging and those employed in the supply chain made expenditures in the local economy that supported an additional 21 Induced jobs at an average annual wage of $30,859.

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[35] Code 420 is the appropriate industry for this activity. Correspondence IMPLAN.

[36] Number may not sum because of rounding.

[37] Director of Finance, Port of Port Angeles.

[38] IMPLAN does not provide a direct Industry Code match for the North American Industrial Classification System (NAICS) 488320, Marine Cargo Handling. Olympus explored the industry structure IMPLAN recommends and found that it underestimates wage averages in this highly unionized sector for marine exports. Thus, the induced impacts are biased downward.

[39] The reader is reminded that this inflation adjusted wage was estimated by IMPLAN and includes estimated benefits. Thus, it is larger than the 2019 QCEW wage of $56,060 ($61,380 2021$), which implies estimated benefits are about 18% of the annual wage.

The economic impacts from exported logs to regional sawmills

The analysis used to estimate the impacts in $ECON_2$ follows the methodology explained above. IMPLAN Industry Code 132 Sawmills was used for impact analysis. Mills purchasing logs that were exported using the IHTF are BUSE Timber and Canyon Lumber in Snohomish County, Sierra Pacific Industries (SPI) – Burlington in Skagit County, and Roseburg Forest Products and Southport Lumber in Coos County, Oregon. While the wood fiber imported from Clallam and Jefferson Counties using the IHTF are a fraction of the total volume processed by those mills, that fraction is critical to maintain financial viability.[40] Hence, as those mills are partly dependent on exported logs through the IHTF, their economic impacts are estimated and presented in Table 7.

Economic Impacts of Saw Mills Receiving IHTF Exports

	Direct Impacts		Indirect Impacts		Induced Impacts		Total Impacts	
Company	**Jobs**	**Wage**	**Jobs**	**Wage**	**Jobs**	**Wage**	**Jobs**	**Wage**
BUSE	68	$74,806	14	$56,733	15	$43,570	97	$67,367
Canyon	65	$74,806	13	$56,566	14	$43,613	92	$67,482
SPI Burlington	200	$79,778	38	$58,590	43	$39,557	281	$70,758
Roseburg	1,000	$78,554	1,235	$52,035	510	$34,996	2,745	$58,530
Southport	198	$78,718	245	$51,935	101	$34,989	544	$58,537
Grand Totals	**1,531**	**$78,410**	**1,545**	**$52,261**	**683**	**$35,647**	**3,759**	**$59,892**

Table 7: The direct, indirect and induced impacts of mills purchasing IHTF log exports, 2021.

BUSE and Canyon Sawmills in Snohomish County provide 133 Direct jobs at an annual average wage of $74,806.[41] Those Sawmill expenditures and Direct employment support an additional 27 Indirect jobs in the supply chain at an average annual wage of $56,653. SPI – Burlington in Skagit County provides 200 Direct jobs at an annual average wage of $79,778.[42] Those Sawmill expenditures and Direct employment support an additional 38 Indirect jobs in the supply chain at an average annual wage of about $58,590. The relatively small number of supply chain jobs in Snohomish and Skagit Counties are attributable to the existence of few jobs in Commercial Logging given the limited acreage and yields in commercial forests.[43] Thus, those three mills are dependent upon logs purchased from outside counties to maintain their financial viability. Direct and Indirect employment and wages in Snohomish Sawmills support an additional 29 Induced jobs at an average annual wage of approximately $43,591. The Skagit sawmill supports 43 Induced jobs at an average annual wage of $39,557.

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[40] Underwood, et.al., Ibid.

[41] Buse Timber & Sales, Inc. Company Profile | Everett, WA | Competitors, Financials & Contacts - Dun & Bradstreet (dnb.com); Canyon Lumber - Overview, News & Competitors | ZoomInfo.com

[42] Correspondence, Sierra Pacific Industries.

[43] In Skagit County, Forestry and Logging provided 91 jobs at an annual average wage of $13,212 in 2019 ($14,334 2021$). In Snohomish County, it was 106 jobs at an annual average wage of $45,046 in 2019 ($49,316). In Clallam County there were 381 jobs at an annual average wage of $56,060 in 2019 ($60,820 2021$). QCEW 2019. Conversely, Clallam and Jefferson have well-developed commercial logging industries that provide high wage employment.

In Coos County, Roseburg and Southport provide over 1,000 and 198 Direct jobs, respectively, at annual average wages of $78,544 and $78,718.[44] Those Sawmill expenditures and Direct employment support an additional 1,480 Indirect jobs in the supply chain at an average annual wage of $52,019. Direct and Indirect employment and wages from Coos County sawmills support an additional 611 Induced jobs at an average annual wage of approximately $34,965.

In total, Sawmills purchasing logs exported through the IHTF provide 1,531 Direct jobs at an average annual wage of $78,410. Those operations support an additional 1,545 Indirect jobs at an average annual wage of $52,261 in the supply chain. The expenditures of those Directly and Indirectly employed in the economies of Snohomish, Skagit and Coos support an additional 683 Induced jobs at an annual average wage of $35,647. Overall, the grand total for all Sawmills, Direct, Indirect and Induced, is 3,759 jobs at an annual average wage of $59,892.

The economic impacts from mills in Clallam and Jefferson Counties supported by operations at the Intermodal Handling & Transfer Facility

To estimate $ECON_3$ and $ECON_4$, Olympus contacted each of the mills analyzed in this section to obtain information on total employment and payroll for 2021. Olympus also utilized additional sources of data such as QCEW, Payroll Protection Plan payroll data, and wage estimates from IMPLAN. A multi-regional model consisting of Clallam and Jefferson Counties was constructed using IMPLAN 6.5 using the 2019 data set.[45] Interfor and Port Angeles Hardwoods were analyzed using Code 132; Code 145 was used for McKinley Paper and Port Townsend Paper. The model was also run for 2019 (no use of deflators) and current (2019) used as end point for the analysis. The dollar year 2019 was used for analysis, though the inputted values were in 2021 dollars (2021$).[46] IMPLAN indirect employment impact estimates by industry were tested against known industry values to assess accuracy. Estimates for trucking employment impacts within the sawmill and paper mill sectors were deficient by a factor of approximately 3. This estimation deficiency warranted further investigation.

Hermann Brothers is the primary supplier of trucking services for Interfor, McKinley Paper, and Port Townsend Paper. In addition, Evergreen Fibre, a subsidiary of Hermann Brothers, is the primary source of wood chips for Port Townsend Paper. Hermann Brothers' trucks haul recycled cardboard to McKinley for processing and their finished products to Tacoma.[47] There are three critical points to be

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[44] Correspondence, Northwest Logistics; Southport Forest Products - Overview, News & Competitors | ZoomInfo.com

[45] 2019 was the last "pre-pandemic" data year. Government imposed lock downs and significant changes in peoples shopping behavior altered expenditure relationships throughout the economy. Thus, it is professional practice to use 2019 to model a stable economy.

[46] Olympus tested IMPLAN's estimate against base years. Use of 2021$ and the base year 2021 over-estimated actual values. Hence, the base year 2019 was used. The implicit assumption is that IMPLAN is estimating 2021$ values under this approach.

[47] Recent correspondence reveals the logistical complexity of Hermann Brothers' operations. "We have (164) employees involved with the transportation activity. 3 dispatchers, 4 office support, 1 safety manager, 3 officers of the company, 12 mechanics, 4 truck wash crew, 3 utility crew (clean up and yard maintenance and dust control) and 137 truck drivers. The drivers are very hard to pin down to the customers as to keep them all efficient they are NOT assigned to any one customer. A driver may take his first load to Tacoma loaded with lumber-drop his

emphasized here. First, the trucking jobs supported by these operations are not captured in IMPLAN estimates. Second, Hermann Brothers utilizes a complex logistical model to ensure its trucks carry loads (back haul) from one destination to another. Thus, when they move rolls of McKinley paper to Tacoma, that truck may carry an additional load to another destination near Tacoma before picking up a load of recycled cardboard to be delivered to McKinley Paper. These efficiencies reduce transport costs for local mills relative to their competitors, compensating for their seemingly remote geographic location. Third, Hermann Brothers, by way of Evergreen Fibre and its log export operations, is also directly a component of mill production on the North Olympic Peninsula. Accordingly, Hermann Brothers is included in the multiregional model as a trucking transport company (Code 417).

Table 8 presents the estimated economic impacts. Jobs are total employment (wages and salary) at each mill. While these are not FTEs, employment at mills is generally full-time. Wages are presented as annual averages, including benefits. To protect the proprietary nature of payroll data provided by companies, the grand mean is used for the average annual wage of all companies. Hence, the uniformity of wage values. Wage values are presented in 2021$. Economic impacts are presented as direct, indirect and induced effects. The direct effects are those from the specified company. Indirect effects capture the jobs and wages resulting from expenditures by the company in the supply chain. The primary indirect industry is commercial logging, which pays on average $72,258.[48] Firms in the supply chain likewise make expenditures which further amplify the indirect effects across the two counties.[49] Those directly and indirectly employed make expenditures in Clallam and Jefferson Counties, which support jobs and wages throughout the economy. These are induced effects.

Economic Impacts of Local Mills Utilizing IHTF Log Flows, 2021								
	Direct Impacts		**Indirect Impacts**		**Induced Impacts**		**Total Impacts**	
Company	**Jobs**	**Wage**	**Jobs**	**Wage**	**Jobs**	**Wage**	**Jobs**	**Wage**
Interfor	131	$84,331	149	$56,984	68	$30,903	348	$62,182
Port Angeles Hardwoods	96	$84,331	110	$56,565	51	$30,814	257	$61,827
McKInley Paper	200	$84,331	160	$49,407	84	$30,869	444	$61,632
Port Townsend Paper	278	$84,331	186	$38,419	110	$26,974	574	$58,462
Hermann Brothers	173	$84,331	54	$42,314	54	$31,641	281	$66,131
Grand Totals	**878**	**$84,331**	**659**	**$48,633**	**367**	**$29,814**	**1904**	**$61,467**

Table 8: The direct, indirect and induced impacts of select mills in Clallam and Jefferson Counties, 2021.

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trailer and get another then go haul Pepsi cola Products for a load then go to Costco warehouse to get a load of OCC (old corrugated cardboard) and bring that load to McKinley. Another may take a load of chips to Wanna OR then get a load of fuel wood (hogged fuel) and bring it back to PTPC then stop at a forest slash harvesting site to bring to McKinley. Another will take a load of sawdust from Interfor to a blue berry farm in the Skagit Valley then go haul recycled car parts to a company making insulation then bring a load of fuel wood back to McKinley. Another may take a load of finished paper rolls to Tacoma and bring a load of OCC back. There is nothing consistent about the work that we do---we provide a lot of efficient transportation." Bill Hermann, Hermann Brothers.

[48] BLS, QCEW, Clallam County, 2021 indicates the average annual wage to be $63,954 without benefits.

[49] More detailed analysis of the intersectoral indirect effects is possible, and may be included in a subsequent final report.

Direct employment at the sawmills Interfor and Port Angeles Hardwoods ranges were 131 and 96 in 2021 respectively. Employment at McKinley Paper and Port Townsend Paper was 200 and 278 respectively. Employment at Hermann Brothers was 173. Total direct employment is estimated to be 878 jobs. The annual average wage rate ranged from a high of $91,727 to a low of $67,156. Only the grand mean of $84,331 is presented for average annual wages under Direct impacts to protect the proprietary nature of disclosed payrolls.

The Indirect job impacts in the supply chain range from a high of 186 from Port Townsend Paper to a low of 54 at Hermann Brothers. The total number of Indirect jobs is 659. The average annual wage for those indirect jobs' ranges from a high of $56,984 from Interfor to a low of $38,419 at Port Townsend Paper. Those Indirect jobs are supported in a wide range of industries. The largest employment impact is in commercial logging, with 174 jobs paying an estimated average annual wage of $72,258. The average annual Indirect wage is estimated at $48,633 for all companies analyzed.[50]

The Induced job impacts in the overall economy range from a high of 110 from Port Townsend Paper to a low of 51 from Port Angeles Hardwoods. Average annual wages range from a high of $31,641 from Hermann Brothers to a low of $26,974 from Port Townsend Paper. The average annual Induced wage is estimated at $29,814 for all companies analyzed. In general, Induced impacts are shaped by the total number of Direct and Indirect jobs and their corresponding wages. The higher the product of direct and indirect jobs and wages, the greater the induced impacts.

In summary, total Direct employment was estimated at 878 jobs at an annual average wage of $84,331. Total Indirect employment was estimated at 659 jobs at an annual wage of $48,633. Total Induced employment was estimated at 367 jobs at an annual wage of $29,814. The Total impact – sum of Direct, Indirect and Induced – was estimated at 1,904 jobs paying an annual average wage of $61,467.

SECTION 6: ESTIMATING NET BENEFITS FROM SUBSTITUTION OF BARGES FOR LONG-HAUL TRUCKING

The estimation of travel costs for long-haul trucking and barge transport

Substitution of barging for long-haul trucking can reduce transport costs. The substitution of barging for long-haul trucking requires additional stages of on-loading materials to the barge. There will also be the cost of barging, off-loading, and use of short-haul trucks to move logs from the port of destination to the final purchaser. As off-loading by the purchaser – in this analysis, wood product manufacturers – would be necessary independent of transport method, there will be no additional off-loading costs at that point. Barging will reduce the total Truck Miles on highways, a reduction which will decrease highway congestion and improve public safety, depreciation of roadways, and diminish travel pollutants caused by trucking. The analysis in this section quantifies reductions in Truck Miles and Diesel fuel consumption, and GHG emissions. In the next section, the analysis is extended to capture changes

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[50] Hermann Brothers was modeled using truck transport (Code 417), its single largest activity. However, Hermann Brother also contains 2 forest product companies – Evergreen and log export operations. Log export operations support approximately 5 estimated jobs. The range of indirect jobs from log export depends on export volumes. Thus, the estimated indirect employment for Hermann Brothers does not capture these high paying jobs.

in road Accidents. Essential to this process will be identification of the parameters needed to construct conversion coefficients. The coefficients for analysis are

(1) Long-haul trucking (distance/MPG): MPG is miles per gallon;
(2) Barging (distance x time/distance x gph);
(3) Onload and offload activities (loads x hours/load x gph);
(4) Short-haul trucking (distance/MPG);
(5) Road Accidents (accidents/distance);
(6) CO_2 emissions (total gallons Diesel fuel x CO_2/gallon).

Calculating diesel fuel consumption by transport component

The assumptions, data and methodology used to estimate SOC_1, SOC_2 and ENV_1 are as follows. First, to determine long-haul distances, Google Maps™ was used to find travel distance from the Port to purchasing wood product manufactures. Likewise, long-haul truck distances for imports to Port Angeles Hardwoods were found. Second, and similarly, short-haul distances from the port of destination to the wood product purchaser (manufacturer) were found. Third, distances between the Port of Port Angeles and the Port of Everett were provided by the barge operator along with their diesel fuel consumption rate of 4.17 gallons per nautical mile.[51] As diesel fuel consumption for large scale ocean barging was not available, values for inside passage barging were used for all barging transport routes.[52] Distance to the Port of Coos and Port Mellon were found using Ports.com.[53] Published studies were consulted for log truck fuel consumption, and a value of 6 MPG used.[54] Diesel fuel consumption for Onload/Offload was estimated using average operations at the Port.[55] It is assumed that these costs are approximately the same at all ports. The Energy Information Administration was used to find GHG emissions, measured in terms of CO_2, emitted from combustion of diesel fuel: 22.46 pounds (lbs.) per gallon of diesel fuel.[56] Lastly, logs move from the forest to scales, and then to a yard where it is off-loaded, sorted and stacked. Those operations are independent of final destination and transport mode. Accordingly, they are not analyzed.[57]

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[51] General Manager and Operator of Star Marine provided diesel fuel consumption for these trips.

[52] It is unknow at this time the direction of bias resulting from this assumption. However, as in general fuel efficiency for volume/weight hauled increases with barge size, the likely direction of bias is upward.

[53] Sea route & distance - ports.com

[54] A wide range of studies have been completed that estimate diesel fuel consumption for hauling by log trucks, on gravel and paved roads. *The Washington Log Trucking Industry: Costs and Safety Analysis*, Rural Technology Initiative, estimates 5.1 MPG on roads with 17 percent gravel and 83 percent paved. Brandon Schoettle, Michael Sivak and Michael Tunnel, *A Survey of Fuel Economy and Fuel Usage by Heavy-Duty Truck Fleets*, University of Michigan, October 2016. A value of 6 MPG was used in this study.

[55] Provided by the Port's Operations Director.

[56] Energy Information Administration.

[57] This assumption likely causes a downward bias in the estimates of net benefits. The reason is that the costs of on-loading long-haul trucks is not addressed, whereas picking up logs for movement to barges is. Technically, there should be a deduction in time and effort to pick up Loads using the equipment in the IHTF.

Estimating diesel fuel consumption, Truck Miles, Truck Accidents and GHG (CO_2) by transport option

Table 9 presents the total Diesel fuel consumption, Truck Miles, Truck Accidents and corresponding GHG (CO_2) emissions that would result if export log from the Port to final destinations at BUSE Timber, Canyon Lumber, Sierra Pacific Industries, Roseburg Lumber Company and Southport Forest Products used long-haul trucking. Similar results are presented for imports from Washington and Canada using distances from the Port of Everett and Port Mellon to Port Angeles Hardwoods (PAHW).[58] The table begins with the total export volume, in thousands of board feet (MBF), to each site.[59] The same was done for imports. Volumes were converted to Loads (truck loads) using the conversion factor of 4,200 board feet (BF). Distances in miles were estimated using Google Maps. A fuel efficiency factor of 6 MPG was used for trucking to calculate total diesel fuel consumption. Truck Miles are the product of loads and distance. Lastly, diesel fuel consumption was converted into tons of CO_2.

Efficiency Gains from Substitution of Barging for Long-Haul Trucking

	Long Haul Trucking			Barging			Net Benefits		
Destintation	**Total Loads**	**Truck Miles**	**CO2 (tons)**	**Barge Loads**	**Truck Miles**	**CO2 (tons)**	**Truck Miles**	**CO2 (tons)**	**Truck Accidents**
BUSE Timber	213	19,627	37	4.3	1,493	26.3	-18,134	-10.5	-0.07
Canyon Lumber	37	3,343	6	0.7	130	4.3	-3,213	-1.9	-0.01
Sierra Pacific Industries	946	123,005	230	18.9	39,740	178.6	-83,265	-51.7	-0.33
Roseburg & Southport	1,050	454,547	851	21.0	9,658	506.3	-444,889	-344.5	-1.78
PAHW (WA)	960	89,280	167	19.2	2,880	111.1	-86,400	-56.0	-0.35
PAHW (CA)	561	117,900	221	11.2	1,684	72.9	-116,216	-147.8	-0.46
Totals	**3,768**	**807,702**	**1,512**	**75**	**55,585**	**899**	**-752,116**	**-612**	**-3.01**

Table 9: Fuel consumption and CO_2 emissions from long-haul trucking by volume and destination, 2021.[60]

The estimated values presented in Table 10 indicate that for 2021 it would have taken 3,768 trucks traveling 807,702 Truck Miles to export and import 15,825 MBF of logs, or 3,768 loads. Those trucks would have traveled on surface streets and highways.[61] That transport would have required 134,617 gallons of diesel fuel. Combustion of that diesel fuel would result in 1,512 tons of CO_2 emissions. These estimated values represent the cost of using long-haul trucking to support the export and import of logs from the North Olympic Peninsula. When barging is substituted for long-haul trucking, those costs are reduced, the difference representing a net benefit to society.

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[58] Import data provided by Port Angeles Hardwoods aggregates all Canadian imports from Vancouver Island and the Sunshine Coast of British Columbia.

[59] These manufacturers are located in Snohomish, Snohomish, Skagit and Coos Counties, respectively. While exports to Sierra Pacific Industries were sent to both the Burlington and Shelton plants, only the former was analyzed in this study. It was assumed all export were sent to that destination.

[60] As the volume exported to Roseburg and Southport were aggregated, the travel distance to sites was averaged.

[61] The trucks traveling to BUSE and Canyon had the option of using a ferry crossing. It was assumed that travel option was used which reduced total travel mileage to 92 and 90 miles respectively.

Onload or Offload Operations: Diesel Fuel and CO2 per 50 Load Barge						
Equipment	**Gallons Hour**	**Total Hours**	**Total Loads**	**Hours Load**	**Gallons Diesel**	**CO2 Tons**
Wagner L80	18	3	50	0.06	54	0.6
Doosan 300LL	12	2	20	0.10	24	0.3
Doosan 380LL	14	3	30	0.10	42	0.5
Totals	**44**	**8**	**50**	**0.26**	**120**	**1.3**

Table 10: Fuel consumption for onload or offload operations per 50 load-barge, 2021.

To capture potential efficiency gains and the corresponding net benefits resulting from the substitution of barge shipping for long-haul trucking, a travel model was developed that consisting of the following components:

(1) Onloading and offloading at ports;
(2) Barging between ports;
(3) Short-haul trucking to the final purchaser.

These components are the only additional sources of wood handling and transport between forest operations and arrival at the purchasing wood product manufacturer.[62] Thus, Diesel fuel used with corresponding CO_2 emissions, and short-haul Truck Miles were analyzed and estimated.

Logs that have been scaled, sorted and stacked by final purchaser, are moved by Wagner L80's to the Cofferdam.[63] A Wagner L80 consumes 18 gallons of diesel fuel per hour (G/HR). It takes a Wagner L80 3 hours to move 50 loads, the capacity of a small barge. In the process, it consumes a total of 54 gallons of diesel fuel, releasing 0.6 tons of CO_2. Logs are then loaded onto the barge using a Doosan 300LL and a Doosan 380LL. They consume 12 and 14 G/HR respectively to complete barge loading. Working in tandem, it takes 2 and 3 hours to complete barge loading, consuming an additional 66 gallons of diesel fuel, which releases 0.8 tons of CO_2. Thus, on-loading uses a total of 120 gallons of diesel fuel with 1.3 tons of CO_2 emissions. The same process is reversed at the port of destination. These estimated one-way values are presented in Table 11.

Estimation of net social and environmental benefits derived from barge substitution

Table 11 integrates the analysis in Table 9 and Table 10 to estimate the total consumption of Diesel fuel, Truck Miles and CO_2 emissions from using barges rather than long-haul trucking. The total Loads in Table 8 are converted to Barge Loads, at 50 Loads per barge. Total Diesel fuel consumption is then estimated using 120 gallons of Diesel fuel per barge, doubled for offloading, and the total number of barges. The impacts of short-haul trucking as Truck Miles are the product of loads and travel distance between the port and final purchaser. CO_2 is estimated using the coefficient described above. The 64.1

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[62] Wood moves from the forest to the Port for scaling, sorting and stacking. Not all of that wood is exported. Some is purchased and used at local mills, an additional source that makes operations profitable.

[63] Operations Director, Port of Port Angeles.

Barge Loads exported and imported consumed 15,391 gallons of Diesel for on and off-loading, 49,226 gallons for barge transport, and 9,264 gallons for short-haul trucking, for a total of 80,088 gallons of Diesel fuel. The sum total of this Diesel fuel combustion resulted in 899.4 tons of CO_2 emissions.

Barging: Diesel Fuel, Truck Miles, and CO2												
	Onload + Offload			Barge Transport			Short Haul Trucking			Totals		
	Barge	Diesel	CO2	Dist	Diesel	CO2	Dist	Diesel	CO2	Diesel	Truck	CO2
Desintation	Loads	(gal)	(tons)	(NM)	(gal)	(tons)	(MI)	(gal)	(tons)	(gal)	Miles	(tons)
BUSE Timber	4.3	1,024	11.5	60	1,068	12.0	7	249	2.8	2,340	1,493	**26.3**
Canyon Lumber	0.7	178	2.0	60	186	2.1	4	22	0.2	386	130	**4.3**
Sierra Pacific Industries	18.9	4,542	51.0	60	4,735	53.2	42	6,623	74.4	15,900	39,740	**178.6**
Roseburg & Southport	21.0	5,039	56.6	439	38,435	431.6	9	1,610	18.1	45,083	9,658	**506.3**
PAHW (WA)	19.2	4,608	51.7	60	4,804	53.9	3	480	5.4	9,892	2,880	**111.1**
PAHW (CA)	11.2	2,695	30.3	75	3,512	39.4	3	281	3.2	6,487	1,684	**72.9**
Totals	**75.4**	**18,086**	**203.1**		**49,226**	**552.8**		**9,264**	**104**	**80,088**	**55,585**	**899.4**

Table 11: Diesel fuel consumption and CO_2 emissions from barging by loads and destination, 2021.

The Net Benefits (NB) to society from the substitution of barging for long-haul trucking can now be estimated as the difference between transport costs, or

NB = cost of barge transport – cost of long-haul trucking;

= [(cost on/off-loading) + (cost barging) + (cost short-haul trucking)] – cost long-haul trucking,

where cost is measured in terms of Truck Miles, CO_2 emissions, and truck Accidents. Truck Accidents are added to the NB equation in the next section.

Discussion of results

The preceding analysis was used to compile the summary results contained in Table 12. The first section presents the total Truck Miles needed to deliver total Loads to the final purchaser with corresponding CO_2 emissions. The 3,768 Loads exported and imported in 2021 would have required 807,702 Truck Miles for delivery, resulting in a total of 1,512 tons of CO_2 emissions. In actuality, 75 barges were used to deliver those Loads, rather than long-haul trucking, creating a Net Benefit. Onloading and offloading operations, barge transport, and short-haul trucking used 60,640 Truck Miles (less than one-tenth) with 899 tons of CO_2 emissions. The difference between the cost of long-haul trucking in terms of Truck Miles and CO_2, and the cost of barge transport represent social and environmental Net Benefits. Thus, current operations at the IHTF reduce total highway traffic by 747,061 Truck Miles and CO_2 emissions by 612 tons. Truck Miles also affect traffic safety. The column Truck Accidents in Net Benefits was constructed using the data from the Federal Highway Administration and the National Highway Safety Administration. In 2019, a total of 124,746,000,000 Truck Miles occurred on rural and urban roads.[64] In the same year there were “an estimated 538,000

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[64] Miles traveled in 2019.pdf

large truck police-reported traffic crashes" injuring 159,000 people, 5,005 fatally.[65] This translated into an accident rate of 0.000,004 accidents per 1,000 Truck Miles. The coefficient was used to estimate a total change in Truck Accidents of - 2.99 associated with reductions in Truck Miles by substitution of barging for long-haul trucking. This is a second social benefit derived from the substitution of barging for long-haul trucking made possible by the IHTF. A third set of social benefits not analyzed in this Preliminary Investigation pertain to reductions in road and highway depreciation and other surface and air pollutants emitted from long-haul trucking.

Efficiency Gains from Substitution of Barging for Long-Haul Trucking									
	Long Haul Trucking			**Barging**			**Net Benefits**		
	Total	**Truck**	**CO2**	**Barge**	**Truck**	**CO2**	**Truck**	**CO2**	**Truck**
Destintation	**Loads**	**Miles**	**(tons)**	**Loads**	**Miles**	**(tons)**	**Miles**	**(tons)**	**Accidents**
BUSE Timber	213	19,627	37	4.3	1,493	26.3	-18,134	-10.5	-0.07
Canyon Lumber	37	3,343	6	0.7	130	4.3	-3,213	-1.9	-0.01
Sierra Pacific Industries	946	123,005	230	18.9	39,740	178.6	-83,265	-51.7	-0.33
Roseburg & Southport	1,050	454,547	851	21.0	9,658	506.3	-444,889	-344.5	-1.78
PAHW (WA)	960	89,280	167	19.2	6,739	111.1	-82,541	-56.0	-0.33
PAHW (CA)	561	117,900	221	11.2	2,880	72.9	-115,020	-147.8	-0.46
Totals	**3,768**	**807,702**	**1,512**	**75**	**60,640**	**899**	**-747,061**	**-612**	**-2.99**

Table 12: The net benefits from barge substitution for long-haul trucking, 2021.

SECTION 7: SUMMARY AND CONCLUSIONS

The Port is concerned about the historical decline in economic prosperity in Clallam County relative to Washington State. Between 1990 and 2021, the average annual nominal mean wage in Clallam County fell from 81 percent to 58 percent of the statewide average.[66] This trend is explained by a transition to a higher proportion of jobs with lower hourly wages and fewer hours worked over 30 years. The decline in earned income has caused higher rates of poverty for adults, households with children, and an increase in the relative demand for cash public assistance.

"The Port of Port Angeles has at its core the mission of bringing prosperity to the communities of the north Olympic Peninsula."[67] To do this, the Port must make strategic investments that attract and retain businesses that produce good wage jobs and offer full-time work. This Preliminary Investigation was conducted to help the Port understand the economic, social and environmental value of its IHTF. This type of investigation allows the Port to evaluate the potential impacts to our community from maintaining, reducing or expanding its IHTF operations. The impacts from IHTF are distinct and separate from the Port's marine terminal wood fiber export operations.

The Port's waterfront properties and infrastructure along with upland areas play a critical role in supporting and expanding economic enterprises that pay some of the highest wages in Clallam County.

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[65] National Highway Traffic Safety Administration, *Traffic Safety Facts* 2019 Data.

[66] Table 1, page 6.

[67] mission statement port of port angeles - Google Search

This Preliminary Investigation highlighted the significant role the IHTF plays in supporting, directing and managing the flow of wood fiber to and from the north Olympic Peninsula and its significant economic benefits. In the process, 954 jobs are directly supported in waterfront activities, ground transport and in sawmill and paper mill operations in Clallam and Jefferson Counties at an average annual wage of \$83,353.[68] Often, it is the last batch of logs processed that make the difference between a mill operating at a profit or loss.

The direct employment supports an additional 684 indirect jobs in the supply chain at an average annual wage of \$48,184.[69] These jobs are in truck transport, commercial logging, wholesale, forestry preparation activities, real estate, package delivery, local government electric utilities, auto repair, services to buildings, management of companies, accounting services, and more. The employment and wage benefits of the IHTF operations do not end here. Those directly and indirectly employed spend income in the local economy, supporting an additional 395 jobs at an annual average wage of \$29,885.[70] The businesses supported include local government, restaurants, retail establishments, nursing and community care facilities, and individual and family services.[71]

The benefits in the form of jobs and wages are not limited to Clallam and Jefferson Counties. Logs exported to mills in Skagit, Snohomish and Coos Counties provide logs to support milling operations. Those regional mills provide 1,531 direct jobs paying an average annual wage of \$78,410. Supply chain operations provide an additional 1,545 indirect jobs at \$52,261, and 683 induced jobs at \$35,647.

Thus, were one to observe the onloading and offloading of barges at the Port's waterfront, they might, having read this Preliminary Investigation, know that over 2,000 jobs are supported in Clallam and Jefferson Counties, and an additional 3,759 jobs along the northwest coast of Washington and Oregon. The 954 direct jobs in Clallam and Jefferson Counties – forestry and logging, waterfront operations, paper mills and sawmills are in the top ten highest paid sectors in the counties.[72] While these benefits are substantial, there are more. There are also social benefits analyzed as, but not limited to, the reduction of 750,000 truck miles on highways resulting with at least 3 fewer truck related accidents. The substitution of barging for trucking goes further. The efficiency gains in terms of larger volumes transported per unit of diesel fuel reduced annual CO2 emissions by 612 tons annually. These

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[68] Table 6, page 16; Table 8, page 19. 954 jobs is the sum of 76 direct jobs in table 6, page 16, and 878 direct jobs in table 8, page 19. \$83,353 is the grand mean for total direct jobs.

[69] Ibid.

[70] Ibid.

[71] The reader may ask "What is the expenditure relationship that links IHTF operations and nursing and community care facilities?" The answer is that the people employed and analyzed in this study – direct and indirect – buy services throughout the economy of Clallam County, and these include expenditures to support loved ones who require special assistance. Thus, both export and import barge also make possible support of people who require special care.

[72] Wood product manufacturing is number three, behind electronic markets and agents, and securities, commodity contracts and investments. QCEW 2021, qcew-annual-averages-2021-preliminary2.xlsx (live.com)

are some of the benefits derived where green meets blue at the Port of Port Angeles Intermodal Handling & Transfer Facility.

While these are the benefits supported today, there is the promise of more tomorrow. With investments, from dredging to accommodate barges throughout the tidal cycle, to capital investments at the cofferdam and log yard, the substitution of barging for long haul trucking can be increased. There are other forms of freight, both for material imports to support local businesses and the export of finished products, that can benefit from these investments. Those benefits will not only include fewer truck miles and reduced CO2 emissions, but lower transport costs. Transport efficiency gains are critical to helping local businesses maintain cost competitiveness given the distance to final markets. Those efficiency gains will help them increase operations and jobs at high wages. This Preliminary Investigation has not only quantified the current role of the IHTF is supporting economic prosperity, but illustrates there can be a vibrant future here for our children.

APPENDIX K

Public Involvement Documentation

Looking Forward: Future Vision for the Next 100 Years

PROJECT #1

A Foreign Trade Z
(FTZ) increases im
and exports and m
us more competi
globally

IHTF project overview given to:

November 9, 2023 - Rotary Club of Sequim Sunrise
January 15, 2024 - Port Angeles Business Association
February 15, 2024 - Kiwanis Club Port Angeles
January 23, 2025 - North Olympic Development Council

PROJECT #2

Port Angeles Boat Haven waterfront improvements adding public space and amenities

PROJECT #3

New warehouses and shovel ready parcels at North Airport Industrial Park

PROJECT #4

New General Aviation Hangars and enhancements for Fairchild International Airport

PROJECT #5

Intermodal Handling and Transfer Facility and Portable-Port Project.

SPECIAL JOINT PORT COMMISSION WORK SESSION WITH CLALLAM COUNTY BOARD OF COMMISSIONERS

Monday, April 25, 2022 at 11:00 AM

338 West 1st Street

Via Zoom and In-Person

The Regular Commission Meeting will be available to the public in person and remotely. For instructions on how to connect to the meeting remotely please visit www.portofpa.com/agendacenter

I. CALL TO ORDER/PLEDGE OF ALLEGIANCE

II. EARLY PUBLIC COMMENT SESSION (total session up to 10 minutes)

III. WORK SESSION TOPICS

A. Clallam County EDC Update..1-16

B. SBDC Update

C. NODC Update...17-29

D. CIE Update...30-36

E. Progress Report on EDC County Wide 5 Year Economic Plan.......................37-58

F. Socioeconomic & Environmental Benefits of the Port's Intermodal Handling & Transfer Facility - Preliminary Brief...59-71

IV. PUBLIC COMMENT SESSION (total session up to 20 minutes)

V. ADJOURN

SOCIOECONOMIC & ENVIRONMENTAL BENEFITS FROM THE PORT'S INTERMODAL HANDLING & TRANSFER FACILITY

A Progress Report

OLYMPUS
CONSULTING

Daniel Underwood, Ph.D.

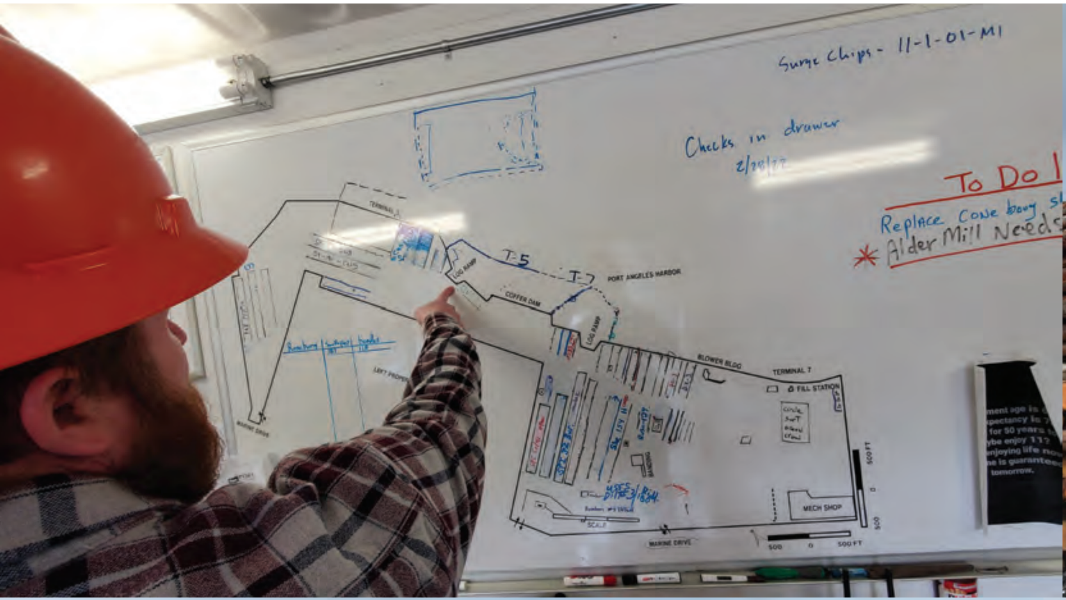
April 25, 2022

Presentation to a Joint Commissioners' Meeting

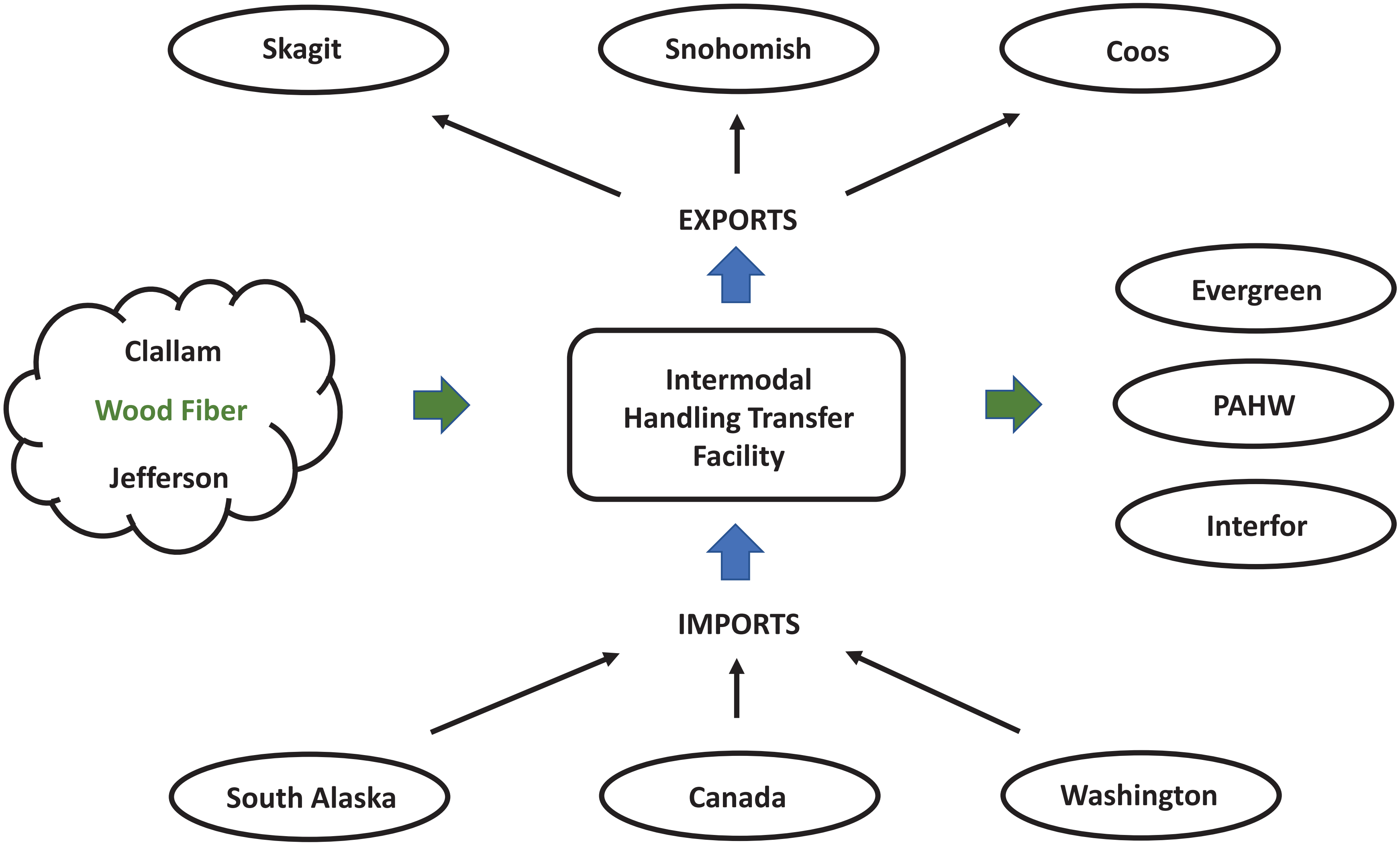
At Olympus, our first task is to help a client express their information needs in the form of a scientific question.

"What is the value of the Port of Port Angeles Intermodal Handling & Transfer Facility?"

Our second task is to understand the actual operation.


Surge Chips - 11-1-01-M1
Checks in drawer
To Do
Replace Cone bearing
Alder Mill Needs
T-5
T-7
PORT ANGELES HARBOR
TERMINAL 7
BLOWER BLDG
COFFER DAM
LOG RAMP
FILL STATION
MECH SHOP
SCALE
MARINE DRIVE


KASHEGA
SEATTLE, WA



Skagit

Snohomish

Coos

EXPORTS

Clallam

Wood Fiber

Jefferson

Intermodal Handling Transfer Facility

Evergreen

PAHW

Interfor

IMPORTS

South Alaska

Canada

Washington

The value of the Intermodal Handling & Transfer Facility has three components:

$$\mathrm{PV(IHTF)} = \sum_{t=1}^{t=50}\left(\sum_{1}^{j} \boldsymbol{ECONj} + \boldsymbol{SOCj} + \boldsymbol{ENVj}\right)/(1 + \mathrm{i})^{\mathrm{t}}$$

For this project, there is a near term, intermediate term and long term vision for the Intermodal Handling & Transfer Facility.

FOR THIS MORNING…

We're going to look at how to estimate some current net benefits of the Intermodal Handling & Transfer Facility.

(1) Write out an equation that can provide an answer;

(2) Specify the units of measurement;

(3) Find the data, run some estimates, look for errors;

(4) Take a look at some preliminary results.

SEEKING CONVERSION FACTORS…

"Common denominators" – How can I link all of these transport components together?

"Loads & Distance & Fuel"

Load = 4200 Board Feet = One Truck

NB(CO2) = {[Onload/Offload: (loads x hours/load x gph)

+ Barging: (distance x time/distance x gph)

+ Short-haul trucking: (distance/mpg)]}

- [Long-haul trucking: distance/mpg)]

WHAT IF THERE WAS NO INTERMODAL HANDLING TRANSFER FACILITY?

	Long Haul Trucking: Diesel Fuel, Truck Miles, and CO2					
	Wood Fiber		Long Haul Trucking			
Destintation	**Vol (MBF)**	**Loads**	**Dist (MI)**	**Diesel (gal)**	**Truck Miles**	**CO2 (tons)**
BUSE Timber	896	213	92	3,271	19,627	37
Canyon Lumber	156	37	90	557	3,343	6
Sierra Pacific Industries	3,974	946	130	20,501	123,005	230
Roseburg & Southport	4,409	1,050	433	75,758	454,547	851
Totals	**9,435**	**2,246**		**100,087**	**600,522**	**1,124**

Truck Miles = Loads x Distance

Diesel Fuel = Distance/MPG

WHAT IS THE NET BENEFIT OF SUBSTITUTING BARGING FOR LONG-HAUL TRUCKING?

WHAT ARE THE TRANSPORT COSTS OF BARGING?

Onload or Offload Operations: Diesel Fuel and CO2 per 50 Load Barge						
Equipment	**Gallons Hour**	**Total Hours**	**Total Loads**	**Hours Load**	**Gallons Diesel**	**CO2 Tons**
Wagner L80	18	3	50	0.06	54	0.6
Doosan 300LL	12	2	20	0.10	24	0.3
Doosan 380LL	14	3	30	0.10	42	0.5
Totals	**44**	**8**	**50**	**0.26**	**120**	**1.3**

	Barging: Diesel Fuel, Truck Miles, and CO2											
	Onload + Offload			**Barge Transport**			**Short Haul Trucking**			**Totals**		
Desintation	**Barge Loads**	**Diesel (gal)**	**CO2 (tons)**	**Dist (NM)**	**Diesel (gal)**	**CO2 (tons)**	**Dist (MI)**	**Diesel (gal)**	**CO2 (tons)**	**Diesel (gal)**	**Truck Miles**	**CO2 (tons)**
BUSE Timber	4.3	1,024	11.5	60	1,186	13.3	7	42	0.5	2,252	1,493	**25.3**
Canyon Lumber	0.7	178	2.0	60	207	2.3	4	21	0.2	406	130	**4.6**
Sierra Pacific Industries	18.9	4,542	51.0	60	5,261	59.1	42	252	2.8	10,055	39,740	**112.9**
Roseburg & Southport	21.0	5,039	56.6	439	5,837	65.5	9	55	0.6	10,931	9,658	**122.8**
Totals	**44.9**	**10,783**	**121.1**		**12,490**	**140.3**		**370**	**4.2**	**23,643**	**51,021**	**265.5**

“What is the value of the Port of Port Angeles Intermodal Handling & Transfer Facility?”

	Efficiency Gains from Substitution of Barging for Long-Haul Trucking							
	Long Haul Trucking			Barging			Net Benefits	
	Total	Truck	CO2	Barge	Truck	CO2	Truck	CO2
Destintation	Loads	Miles	(tons)	Loads	Miles	(tons)	Miles	(tons)
BUSE Timber	213	19,627	37	4.3	1,493	25.3	-18,134	-11.4
Canyon Lumber	37	3,343	6	0.7	130	4.6	-3,213	-1.7
Sierra Pacific Industries	946	123,005	230	18.9	39,740	112.9	-83,265	-117.3
Roseburg & Southport	1,050	454,547	851	21.0	9,658	122.8	-444,889	-728.0
Totals	**2,246**	**600,522**	**1,124**	**45**	**51,021**	**265.5**	**-549,500**	**-858**

WHERE GREEN MEETS BLUE – THE PORT OF PORT ANGELES INTERMODAL HANDLING & TRANSFER FACILITY

A Preliminary Investigation

OLYMPUS
CONSULTING

> "I have only lived here a year. I haven't seen much prosperity as far as jobs for our upcoming generations. Covid has been rough. It's my hope that the county can use what was learned as a resource to create a stable economy for the people of the county and make it an attractive place, not only to build retirement homes, but to house and create a life for our young generation."
>
> EDC Community Survey, Fall 2021

Questions?