NEAH BAY SECTION 107 NAVIGATION IMPROVEMENT PROJECT NEAH BAY, WASHINGTON

DRAFT INTEGRATED FEASIBILITY REPORT
AND ENVIRONMENTAL ASSESSMENT
July 2020

US Army Corps of Engineers®
Seattle District

Makah Tribe

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*Sections with asterisks are required for compliance with the National Environmental Policy Act

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List of Acronyms and Abbreviations

AAEQ	Average Annual Equivalent	MLW	Mean Low Water
AEP	Annual Exceedance Probability	MLLW	Mean Lower Low Water
APE	Area of Potential Effects	MMPA	Marine Mammal Protection Act
BCR	Benefit Cost Ratio	MSL	Mean Sea Level
BiOp	Biological Opinion	MTL	Mean Tide Level
BMP	Best Management Practice	N_2O	Nitrous Oxide
CAA	Clean Air Act	NAAQS	National Ambient Air Quality Standards
CAR	Coordination Act Report	NED	National Economic Development
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	NEPA	National Environmental Policy Act
		NFS	Non-Federal Sponsor
		NHPA	National Historic Preservation Act
CFR	Code of Federal Regulations	NMFS	National Marine Fisheries Service
CO	carbon Monoxide	NOAA	National Oceanic and Atmospheric Administration
CO_2	Carbon Dioxide		
CY	Cubic Yards	O_3	Ozone
DA	Design Agreement	O&M	Operations and Maintenance
DMMP	Dredged Material Management Program	OMRR&R	Operations, Maintenance, Rehabilitation, Repair, and Replacement
DO	Dissolved Oxygen	OSE	Other Social Effects
DPS	Distinct Population Segment	PAL	Planning Aid Letter
EFH	Essential Fish Habitat	PED	Pre-construction, Engineering And Design
EOP	Environmental Operating Principles	PM	Particulate Matter
EPA	Environmental Protection Agency	PPT	Parts Per Thousand
ER	Engineering Regulation	PPA	Project Partnership Agreement
ESA	Endangered Species Act	RED	Regional Economic Development
FR/EA	Feasibility Report and Environmental Assessment	ROD	Record of Decision
		SHPO	State Historic Preservation Officer
FWCA	Fish and Wildlife Coordination Act	SLC	Sea Level Change
GHG	Greenhouse Gas	SOx	Sulfur Oxides
GNF	General Navigation Features	SORTF	Southern Resident Orca Task Force
GRP	Gross Regional Product	US	United States
HTRW	Hazardous, Toxic, & Radiological Waste	USCG	United States Coast Guard
LERRD	Lands, Easements, Rights-of-Way, Relocations, and Disposal	USFWS	United States Fish and Wildlife Service
		USGS	United States Geological Survey
LOA	Length Overall	WAC	Washington Administrative Code
LSF	Local Service Facility	WDOE	Washington Department of Ecology
MHW	Mean High Water	WDFW	Washington Department of Fish & Wildlife
MHHW	Mean Higher High Water		

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Executive Summary

The U.S. Army Corps of Engineers (USACE), Seattle District prepared this Integrated Feasibility Report and Draft Environmental Assessment (FR/EA) to determine the feasibility and federal interest in navigation channel improvements at Neah Bay, Washington. An evaluation of benefits, costs, and environmental impacts determines the federal interest. This evaluation resulted in the recommendation of a Tentatively Selected Plan (TSP), also referred to as the "Proposed Action" for purposes of the National Environmental Policy Act of 1969 (NEPA). In accordance with regulations implementing NEPA, this FR/EA compares the environmental consequences of the alternatives, including the Proposed Action, and recommends a preferred alternative (the TSP/Proposed Action) for implementation.

This study is authorized by Section 107, River and Harbor Act of 1960 (Public Law 86-645), as amended (33 USC § 577; hereinafter "Section 107"). Section 107 provides authority for USACE to plan and construct small navigation projects that have not already been specifically authorized by Congress. USACE is undertaking this action in partnership with the Makah Indian Tribe, the study's non-federal sponsor

The project is located at the entrance channel to the Port of Neah Bay. Neah Bay is the nearest port for all vessels traveling at the western end of the Strait of Juan de Fuca and the Pacific Ocean along Northern Washington and Southern Canada. Neah Bay is located at the northwest tip of the Olympic Peninsula in Washington State, 170 miles northwest of Seattle, WA (Figure ES-1). It is separated from Vancouver Island, British Columbia by the Strait of Juan de Fuca and within the Makah Indian Tribe Reservation.

The study identifies navigational challenges to the current and future fleet of vessels at Neah Bay over a 50-year period of analysis. The current controlling depth of -19 feet mean lower low water (MLLW) and channel width of 220 feet restricts the safe and efficient transit of vessels at the Port of Neah Bay. Current channel dimensions restricts safe and efficient transit at all tides to vessels with a maximum draft of 15 feet or less. Many commercial and rescue vessels (Emergency Response Tugs, Self-Loading Log Ships and Rock/Gravel Barges for example) have a deeper draft and either cannot enter/exit the bay or must wait for higher tides to safely transit the bay. Specifically for emergency response towing vessels (ERTVs), this results in extra fuel use while idling outside the bay to ensure emergency response readiness during low tides. Navigation challenges include tide restrictions and other operational inefficiencies created by inadequate channel depth and associated costs to the national economy.

The existing entrance channel to Neah Bay is a natural channel which has never been dredged or modified in any way; it is not currently a federally authorized navigation channel. The TSP/Proposed Action would establish a new federal navigation channel with a depth of -21 MLLW, a length of 4,500, a width of 300 feet, and with a 375-foot by 375-foot turning basin.

This report evaluates three (3) alternatives, including a no action alternative, to improve navigation in Neah Bay, Washington based on benefits and costs. The evaluation results in a recommended plan (TSP) for implementation. If implemented, the TSP/Proposed Action would establish a new authorized federal navigation channel (Figure ES-2). Approximately 36,000 cubic yards of material would be dredged from the channel during construction of the federal navigation channel. The dredge material would be placed along the shoreline via hydraulic pipeline dredge. This is considered beneficial placement of dredged material as it would restore a beach starved of sediment due to shoreline armoring and road construction. No maintenance dredging is expected to be necessary to maintain channel depth of -21 feet during the 50-year period of analysis.

Several structural and non-structural measures were evaluated in the process of formulating alternatives. The final array of alternatives includes No Action, and the following two action alternatives that would deepen the entrance channel: -21 feet MLLW and -23 feet MLLW. The recommended plan is Alternative 2, -21 feet MLLW. With respect to lands required for implementation, the federal government's navigation servitude rights would be exercised.

Based on October 2019 price levels, the estimated project first cost is $1,774,000 (with contingency). In accordance with the cost share provisions in Section 103(c) of the Water Resources Development Act (WRDA) of 1986, as amended {33 U.S.C. 2213(c)}, the federal share of the project first cost is estimated to be $1,331,000 and the non-federal share is estimated to be $443,000, which includes a 90% federal and 10% non-federal cost share for general navigation features (GNFs) shallower than -20 feet MLLW, and a 75% federal and 25% non-federal for GNFs deeper than -20 feet MLLW. Costs in excess of the NED plan are 100% non-federal expense. Aids to navigation are a federal expense to the USCG. The value of LERRDs are 100% non-federal and are estimated to be $0. Construction and operations, maintenance, relocations, rehabilitations, and replacement (OMRR&R) costs are estimated at $0.

Figure ES-1. Location of Neah Bay

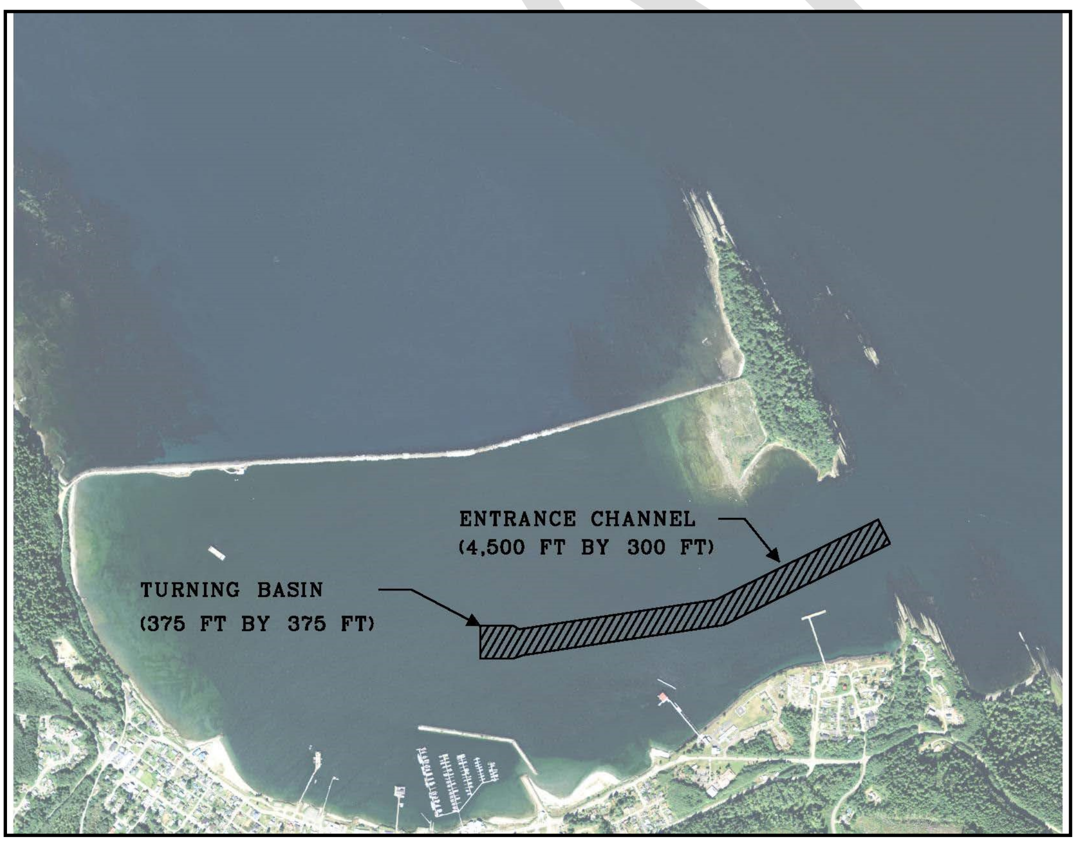

Figure ES-2. Proposed Channel Improvements

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1 Introduction

This Section 107 FR/EA is being undertaken by the U.S. Army Corps of Engineers, Seattle District (USACE) to develop and evaluate alternatives for navigation channel improvements to the entrance channel in Neah Bay, Washington. This report documents the planning process for assessing the federal interest in navigation improvements to demonstrate consistency with USACE planning policy and the National Environmental Policy Act (NEPA). The following sections provide background information regarding the basis for this study. The sections required for NEPA compliance are denoted with an asterisk (*).

1.1 Study Purpose and Scope

The study investigates transportation cost savings opportunities in Neah Bay that could result in National Economic Development (NED) benefits consistent with protecting the natural environment. The current Neah Bay fleet consists of vessels of drafts ranging from shallower draft (8-foot) fishing vessels to deeper draft (17.5 feet) emergency response vessels. Depending on the wave and wind conditions, emergency vessels with drafts greater than 15 feet need to leave Neah Bay to maintain emergency response readiness when tides get below + 0.5-1 feet MLLW, which currently happens approximately 200 days a year (Appendix A, Section 6). Under RCW 88.46.135 the State of Washington requires that an emergency rescue tug be permanently stationed at Neah Bay. The scope of the study is restricted geographically to Neah Bay due to this requirement and its proximity to the entrance of the Strait of Juan de Fuca, which makes it optimal for timely response to distressed vessels and oil spills.

This feasibility study analyzes alternatives for navigation improvements to Neah Bay, including potential waterway deepening and widening. The study identifies and evaluates a full range of reasonable alternatives including the No-Action Alternative.

1.2 Study Authority*

This project is authorized under the Continuing Authorities Program (CAP), section 107 of the River and Harbor Act of 1960; 33 USC 577, as amended, which provides authority for USACE to partner with non-federal sponsors to construct small river and harbor improvement projects: “that will result in substantial benefits to navigation and which can be operated consistently with appropriate and economic use of the waters of the Nation for other purposes, when in the Opinion of the Chief of Engineers such work is advisable, if the benefits are in excess of the cost.“

1.3 Lead Federal Agency and Non-Federal Sponsor*

USACE (lead federal agency) and the Makah Indian Tribe of the Makah Indian Reservation are partnering in conducting this feasibility study. As the non-federal sponsor, the Makah Indian Tribe contributes 50% of the total feasibility study costs in the form of cash or in-kind contributions. A Feasibility Cost Sharing Agreement was executed in October 2015.

1.4 Location and Description of the Study Area*

Neah Bay, part of the Makah Indian Reservation (also known as the Makah Reservation), is located on the northwest tip of the Olympic Peninsula in Clallam County, Washington (Figure 1-1). Neah Bay is a protected, semi-enclosed waterway connected to the Strait of Juan de Fuca. The following four federal projects are present within the study area: (1) an outer breakwater built by USACE in 1944, (2) a revetment running from the USCG station to the Agency Creek Confluence built in the 1960's, (3) an inner breakwater, and (4) an entrance channel to the marina built in 1996. After the construction of the inner breakwater the tribe constructed the marina facility behind the breakwater. The marina is primarily used for commercial and recreational fishing vessels. The study area includes the navigation channel that enters Neah Bay on the eastern edge of the Bay and the dredged material placement area along the southern shoreline between the USCG dock and the "old tribal fish processing" dock (Figure 1-2). The existing channel is a natural channel that has never been dredged or modified in any way. The channel is limited to a 220-foot width at an elevation of -19 feet MLLW, which limits the use of the channel at lower tides.

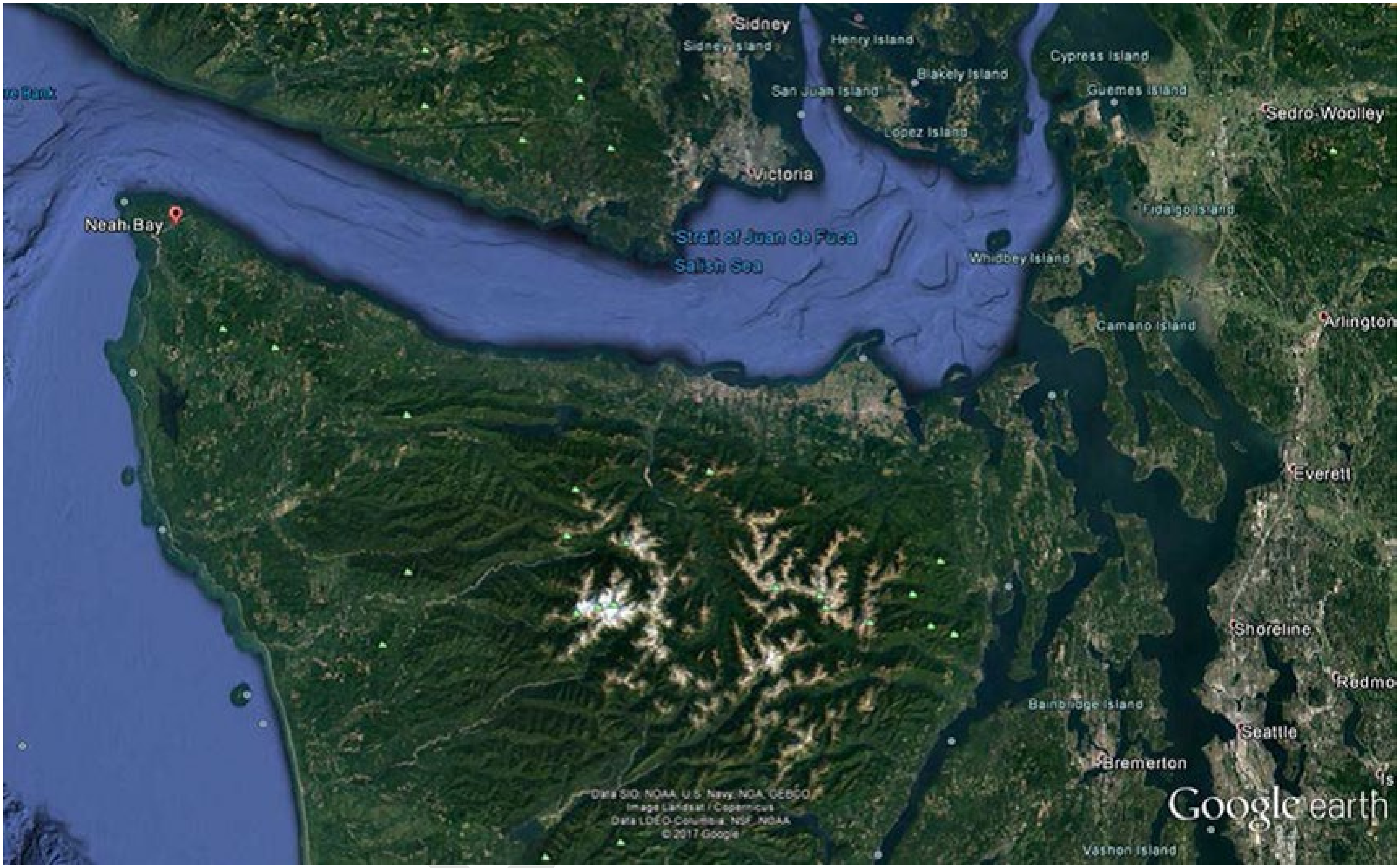

Figure 1-1. Vicinity Map

Figure 1-2. Study area with Navigation Features

1.5 Proposal for Federal Action*

The proposal for navigation improvements to Neah Bay triggered analysis under the National Environmental Protection Act (NEPA). For analysis of potential environmental impacts of the alternatives, USACE is analyzing two action alternatives. The first assumes a maximum length, width, and depth of improvements; the second is an economically optimized plan that would require less total dredging. The proposed action is to deepen the natural channel as needed to a controlling depth of -21 feet MLLW for a length of 4,500 feet, terminating in a 375-foot by 375-foot turning basin. Dredged materials will be placed in a currently subtidal area along the southern shoreline where substantial downgrading has occurred as a result of shoreline armoring and lack of sediment input from tributary streams that have been cut off by roads and a large revetment that cuts off sediment supply (Figure 1-3 and Figure 1-4). Placement is intended to restore Intertidal habitat. While this is the Tentatively Selected Plan (TSP), channel options were assessed in detail during this feasibility study and the final recommendation will be based on that analysis.

Deepening the waterway would require dredging up to a maximum of approximately 36,000 cubic yards (cy) of material from the channel. These quantity estimates assume a proposed depth of -21 feet MLLW, an additional 10% of material to account for potential survey inaccuracies, and 2-foot allowable overdepth to a maximum of -23 feet MLLW. The resulting channel depths would accommodate increased reliability of vessels to access the channel during the 50-year study period. No maintenance dredging is expected to be required as this channel accumulates very little sediment.

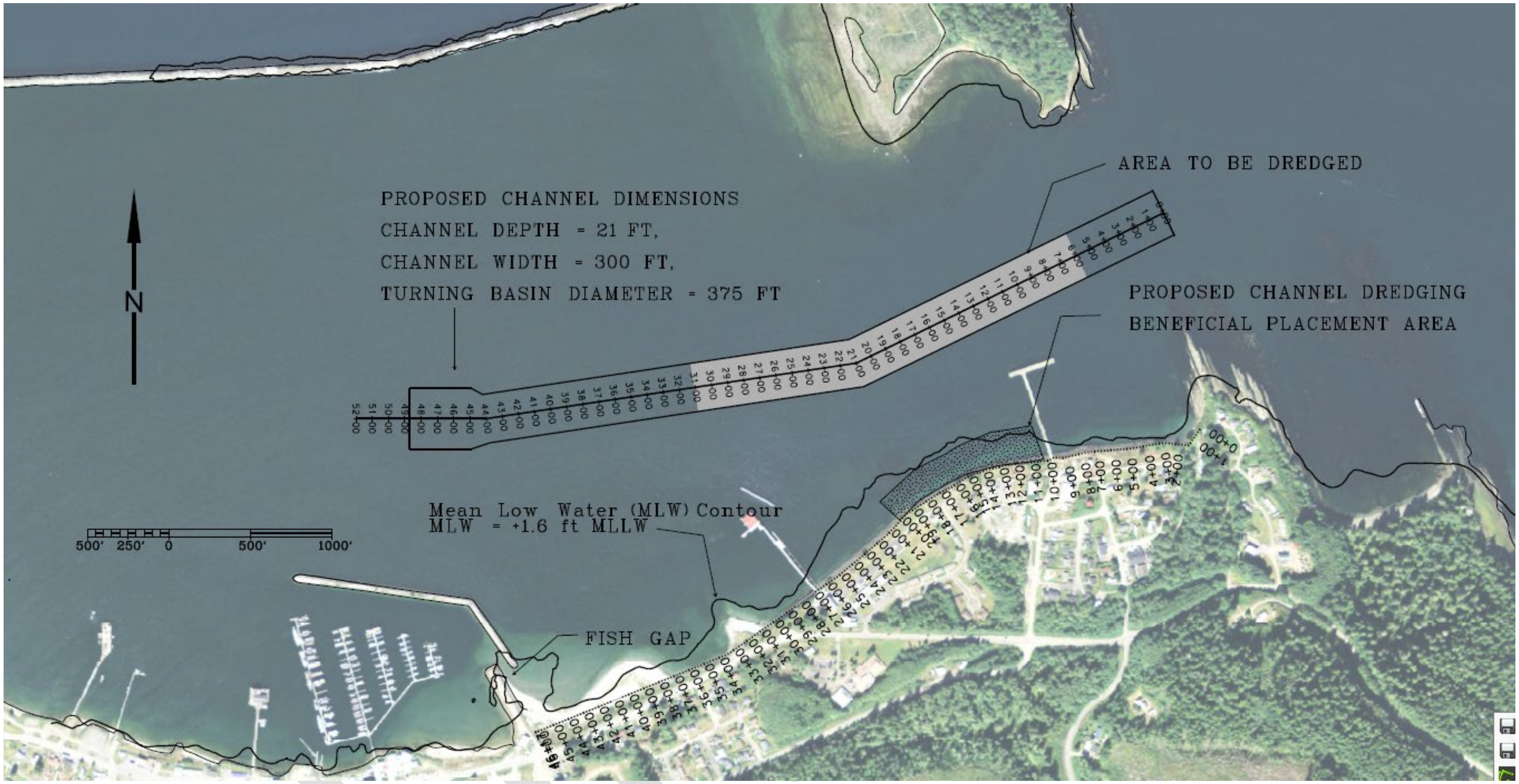

Figure 1-3. Proposed Dredging and Placement Footprint

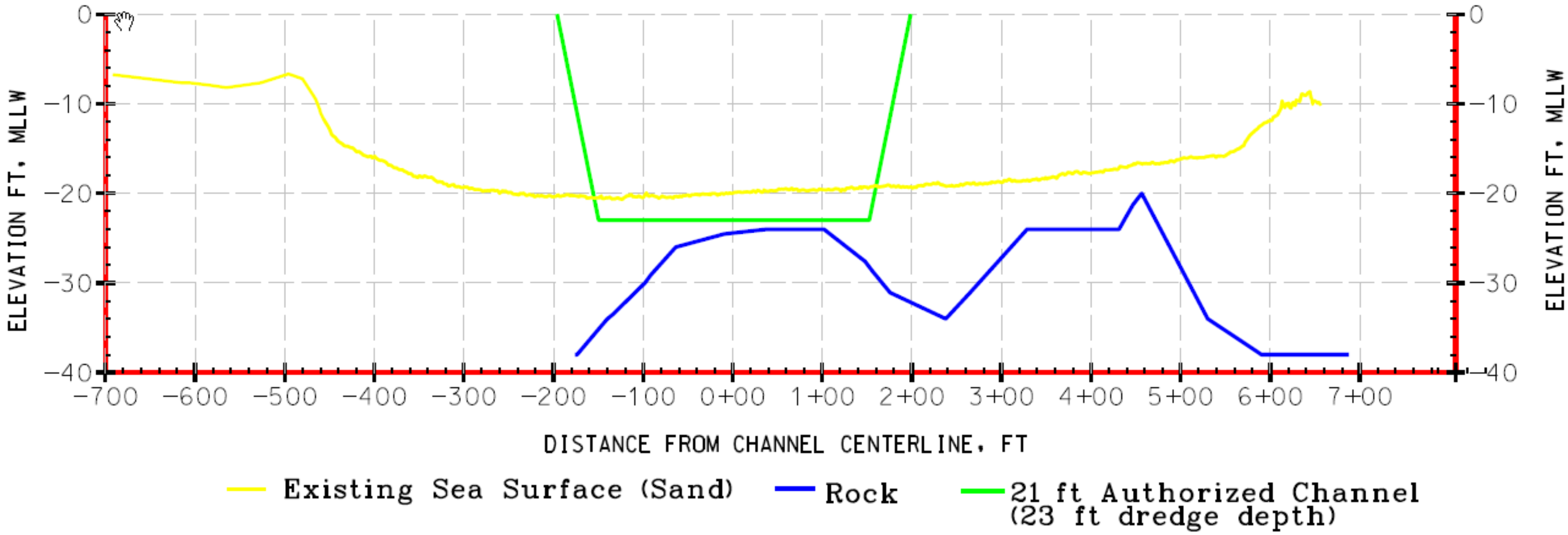

Figure 1-4. Neah Bay Navigational Channel Cross-section

1.6 Overview of Integrated FR/EA

This document is an integrated feasibility report and environmental assessment (FR/EA). The purpose of the feasibility report is to identify the plan that reasonably maximizes the national economic development benefits, is technically feasible, and environmentally acceptable. The purpose of the EA portions of the report is to comply with NEPA requirements to identify and analyze environmental effects of the alternatives, incorporate environmental concerns into the decision-making process, and determine whether any environmental impacts are significant and warrant the preparation of an Environmental Impact Statement. The six steps of the USACE planning process each align with a NEPA requirement. The planning steps are listed below followed by the document chapter and NEPA element to which they relate:

Table 1-1. USACE Six Step Planning Process Alignment with NEPA Requirements

Planning Step	NEPA Element and Document Chapter
Step 1: Problems and Opportunities	Purpose and Need for Action; Chapter 2
Step 2: Inventory and Forecast of Conditions	Affected Environment; Chapter 4
Step 3: Formulate Alternative Plans	Alternatives including Proposed Action; Chapter 3
Step 4: Evaluate Effects of Alternative Plans	Environmental Consequences; Chapters 3 and 4
Step 5: Compare Alternative Plans	Alternatives including Proposed Action; Chapters 3 and 4
Step 6: Select Recommended Plan	Agency Preferred Alternative; Chapter 5

2 Need for and Objectives of Action

This chapter presents results of the first step of the planning process, the specification of water and related land resources problems and opportunities in the study area. The chapter also establishes the planning objectives and planning constraints, which are the basis for formulation of alternative plans.

2.1 Problems and Opportunities

The problem being investigated by the study is the following:

> The existing depth of the naturally-occurring entrance channel to Neah Bay does not fully meet the draft requirements of today's fleet of emergency response vessels (Appendix A, Section 4.1.1), causing lost transportation and cost efficiencies at Neah Bay. The current controlling depth of -19 feet MLLW and 220-foot clear span at the entrance to Neah Bay restricts the size of vessels that can reliably utilize the Port of Neah Bay during low tides. Vessels with drafts greater than 15 feet experience tidal restrictions at low tides that occur approximately 200 times per year (Appendix A, Section 6.1.1.3).

Opportunities for this study include the following:

1. Increase safety while improving the efficiency of vessels transiting Neah Bay.
2. Reduce fuel consumption and reduce air emissions from larger vessels utilizing Neah Bay.
3. Allow for larger vessels (drafts above -15 MLLW) to utilize Neah Bay as a harbor of refuge at a greater range of tidal conditions. This opportunity is enhanced by the proximity of Neah Bay to major traffic lanes using the Strait of Juan de Fuca.

Opportunities associated with improving a subsistence harbor used by the Makah Indian Tribe (also known as the Makah Tribe) include the following:

1. Increased access to natural resources for subsistence purposes
2. Local and regional economic opportunities (e.g. tourism)
3. Welfare of the local populace
4. Social and cultural values of the community

2.2 Purpose and Need for Action*

The purpose of the proposed federal action is to achieve transportation cost savings (increased economic efficiencies) at Neah Bay over a 50-year period of analysis. Tide restrictions, light loading, and/or other operational inefficiencies created by inadequate channel depth result in transportation costs for vessels at Neah Bay. Channel modifications could alleviate these challenges and lead to transportation cost savings for the national economy.

2.3 National Objective

The federal objective of water and related land resources project planning is to contribute to national economic development consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other federal planning requirements.

2.4 Planning Objectives

Planning objectives for the study include the following:

1. Achieve transportation cost savings to and from Neah Bay to the extent economically justifiable over the 50-year period of analysis. This is the primary planning objective for the study and is intended to reflect the crucial needs of the project.
2. Reduce navigation challenges in Neah Bay leading to more efficient operating practices over the 50-year period of analysis.

2.5 Planning Constraints

1. The study area is within the Makah Reservation and is within treaty-reserved usual and accustomed fishing areas for the Makah Indian Tribe. USACE will continue to coordinate with the Makah in order to avoid or minimize impacts to Tribal fishing consistent with treaty obligations.
2. There are threatened and endangered species within the project footprint. Avoidance and minimization of impacts to endangered species will be consistent with the Endangered Species Act.

3 Plan Formulation

The guidance for conducting civil works planning studies, Engineering Regulation (ER) 1105-2-100, Planning Guidance Notebook, requires the systematic formulation of alternative plans that contribute to the federal objective. To ensure sound decisions are made with respect to development of alternatives and ultimately with respect to plan selection, the plan formulation process requires a systematic and repeatable approach. This chapter presents the results of the plan formulation process. Alternatives were developed in consideration of study area problems and opportunities as well as study objectives and constraints with respect to the four evaluation criteria described in the Principles and Guidelines (completeness, effectiveness, efficiency, and acceptability).

A planning charrette was held at the Seattle District during February 2016. A meeting synopsis was developed to capture decisions made and planning procedures conducted. This initial planning process ensured the team and relevant stakeholder's views were acknowledged and understood with respect to the planning problem statement, project constraints, assumptions, risks, decision criteria, measures, and alternatives.

The national importance of maintaining emergency response capacity at Neah Bay was discussed at the charrette. From Port Angeles, the current response time can be up to 10 hours or more for an emergency incident near the entrance of the Strait of Juan de Fuca. The USCG moved the boundary of the Higher Volume Port Area (HVPA), currently a 50-mile arc centered on the entrance to Port Angeles, Washington, westward to Cape Flattery in 2018. This puts Neah Bay at a more central and optimum location for emergency response tugs to quickly address the higher than normal risk of cargo spill in the HVPA. The redefinition of the HPVA does not significantly change ERTV operations; rather, the new boundary emphasizes Neah Bay's geographical importance. (HVPAs are areas where the risk of a cargo spill is considered higher than normal because of a higher volume of shipping activity; to offset the increased risk, these HVPAs require faster response times).

The Makah Tribe has a strong dependence on the sea for its daily subsistence and the ocean is a major part of its cultural beliefs and values. The Makah rely on the sea for their food and for most of their economic development. The Makah Tribe also believes that there are other benefits that include the Olympic Coast National Marine Sanctuary that must be protected. Slower emergency response results in higher risk of negative environmental impacts from an emergency, which results in negative impact for the Makah Tribe.

The charrette also highlighted the high study risk associated with a rock pinnacle located beneath the existing channel. The pinnacle is a very large rock that overlaps the entrance channel to Neah Bay. To move or alter the rock would likely require more funding than Section 107 of the Continuing Authorities Program allows. It would likely trigger an Environmental

Impact Statement and require a permit under the Marine Mammal Protection Act due to the methods of removal.

After discussing the problems and opportunities, the team created a list of constraints to take into consideration in developing the alternatives. During the charrette the team discussed measures to address the navigation issues at Neah Bay. The measures developed were then evaluated and screened based on specific planning criteria to determine which measures were to move forward for future alternative development.

3.1 Management Measures and Screening

The plan formulation process identified several potential structural and non-structural management measures to improve the safety and efficiency of the navigation system. A management measure is a feature or activity that can be implemented at a specific geographic site to address one or more of the planning objectives.

Non-Structural Management Measures

- Alternative Modes and Ports: Use of an alternative port or alternative modes of transportation to avoid channel constraints
- Light-loading: Reducing total vessel cargo and/or bunkering to allow vessels to transit the harbor under existing and future without-project conditions
- Lightering: Transferring cargo between vessels of different sizes to allow vessels to transit the harbor under existing and future without-project conditions
- Tide Timing: Timing transits to leave the channel during low tide events to avoid becoming trapped by the tide

Structural Management Measures

- Anchorage/Mooring Facility: Build a new anchorage/mooring facility to allow vessels to wait outside the harbor to avoid channel constraints
- Channel Deepening: Deepen the channel to allow for passage of deep-draft vessels
- Channel Widening: Widen channel to improve channel navigability
- Removal of rock pinnacle to allow for straight path for channel
- Beneficial use of dredge material
- Open-water disposal of dredge material

Screening of Management Measures

Screening is the ongoing process of eliminating management measures from further consideration, based on planning criteria. Criteria are derived for the specific planning study, based on the planning objectives, constraints, and the opportunities and problems of the study area. Criteria used to screen measures as well as qualitative metrics associated with each criteria included the following:

- Criteria 1: Does the measure meet the primary planning objective? (YES/NO)
  - If YES: carry forward; if NO: screen out.
- Criteria 2: Is the measure already being carried out by a non-federal entity? (YES/NO)
  - If NO: carry forward; if YES: screen out.
- Criteria 3: Does the measure violate planning constraints? (YES/NO)
  - If NO: carry forward; if YES: screen out.
- Criteria 4: Is the measure technically feasible? (YES/NO)
  - If YES: carry forward; if NO: screen out.

Screening results are listed in Table 3-1, below:

Table 3-1. Measures Screened from Further Evaluation

Measure	Screening Criteria			
	Criteria 1	Criteria 2	Criteria 3	Criteria 4
Alternative Modes and Ports	NO	NO	NO	YES
Light-Loading	YES	YES	NO	YES
Lightering	NO	NO	NO	YES
Tide Timing	YES	YES	NO	YES
Anchorage/Mooring Facility	NO	NO	NO	YES
Channel Deepening	YES	NO	NO	YES
Channel Widening	YES	NO	NO	YES
Contract Modification	YES	NO	NO	YES
Removal of Rock Pinnacle	NO	NO	NO	YES
Beneficial Use of Dredge Material	YES	NO	NO	YES
Open-water Disposal of Dredge Material	NO	NO	NO	YES

Based on the screening process summarized above, Lightering, Anchorage/Mooring Facility, Removal of Rock Pinnacle, and Open-water Disposal of Dredge Material were screened out because they do not meet the primary planning objective, which is to achieve transportation cost savings to and from Neah Bay to the extent economically justifiable over the 50-year period of analysis. Lightering would not address the primary objective, as the design vessel is not a freight-moving vessel; the other three items were screened out because costs would be so high as to dramatically reduce cost-effectiveness. By inspection, Anchorage/Mooring Facility, Open Water Disposal, and Removal of Rock Pinnacle would be so costly as to not be economically justifiable. The Anchorage/Mooring Facility costs relate to the wave conditions described in Section 8 of the Engineering Appendix. Additionally, due to winter storm conditions, it is not considered technically feasible to have an Anchorage/Mooring Facility outside the harbor. Removal of the rock pinnacle would require blasting (see Engineering Appendix), which triggers removal, disposal and environmental compliance expenses. The nearest open-water disposal site is far enough away that transportation costs make the Open-water Disposal of Dredge Material measure not economically justifiable.

Alternative Modes and Ports was considered but also removed from screening given that RCW 88.46.130 mandates that the ERTV be located at Neah Bay due to its proximity to the entrance of the Strait. Research confirms the importance of the use of Neah Bay over other ports as the station for an emergency response vessel. In January 2017 a report titled, “A Potential Oil Loss Comparison of Scenario Analysis by Four Spill Size Categories” was prepared for the Washington State Department of Ecology (WSDOE, 2017). This report identified Neah Bay as a critical part of a portfolio of risk management measures recommended to prevent oil spills and significant environmental pollution.

The primary driver of economic benefits is reduction of costs of operating emergency response vessels required to be on call 24 hours a day, seven days a week. Deepening the entrance channel would significantly reduce the amount of time the ERTV on call at Neah Bay exits and idles outside the harbor. Currently the ERTV often exits the harbor at low tides to maintain emergency response readiness. The closest alternative ports are Port Angeles, WA, approximately 50 miles to the east, and La Push, WA approximately 30 miles to the south; nether is optimally located to respond to emergencies related to shipping traffic entering the Strait of Juan de Fuca. Alternative Modes and Ports, Lightering and Light-loading are measures that could contribute to benefits tied to freight transport but not emergency vessel transport.

Modification of the contract required by RCW 88.46.135 for an on-call ERTV involving the use of a shallower-draft vessel could reduce or eliminate the costs of operating the emergency response vessels. Additional analysis is conducted on design vessel specification in the next section (Section 3.2) and Appendix A (Economics).

Light-Loading and Tide Timing (use of favorable tides) were screened out because they are already being carried out by a non-federal entity.

Channel Deepening, Channel Widening, Beneficial Use of Dredge Material, and contract modification are the only measures carried forward for additional analysis given that they satisfy all four screening criteria. These measures meet the primary planning objective of the study, which is to achieve transportation cost savings to and from Neah Bay to the extent economically justifiable over the 50-year period of analysis. They can be designed to avoid or minimize impacts outlined in the planning constraints, they are not being implemented by a non-federal entity, and they are considered technically feasible.

3.2 Formulation of Alternatives

Alternative plans are a set of one or more management measures functioning together to address one or more planning objectives. Through screening out measures as described above, the study team also screened out potential alternative plans comprised of each screened-out measure, alone or in combination with dredging and/or other screened-out measures. An initial array of alternative plans was subsequently formulated that satisfy the screening criteria; they were developed through consideration of the study assumptions listed below.[1]

Design Fleet Assumptions

Identification of a design fleet assists the study team by informing design parameters for alternatives. For deep draft projects, the design fleet is selected based on economic studies of the vessel types and sizes comprising the ship fleet expected to use the proposed channel over the project life. The design fleet includes the maximum or near maximum size ship in the forecasted fleet expected to call on a frequent and continuing basis. The design fleet informs channel depth, width, and length assumptions.

Channel Depth Assumptions

The design fleet for channel depth is based on the ERTV. Over the study period, many vessels will likely serve as the ERTV at Neah Bay. Many of these vessels will have a shallower draft and many may have a deeper sailing draft than the vessel chosen to represent the design fleet. This analysis attempts to select the most likely class of vessels to operate at Neah Bay over the study period. Section 8 of the Appendix A (Economics) addresses the risk and uncertainty around ERTV sailing drafts.

At a minimum, the ERTV at Neah Bay must meet the legal requirements of RCW 88.46.135, which states that an ERTV must be stationed at Neah Bay and that the vessel, in severe weather conditions, must be capable of responding to a disabled vessel of 180,000 metric dead weight tons. The Washington State Office of Marine Safety Emergency Towing System Task Force recommends that a towing vessel would need at least 100 ton bollard pull and up to 150 ton bollard pull to effectively respond to 99 percent of vessels adrift in severe weather conditions. In addition to the minimum requirements of the law, plan formulation took into account the requirements of the ERTV fleet over the entire period of analysis. Vessel sizes transiting the Strait of Juan de Fuca continue to grow and will on average be significantly larger in the future. The authorized Corps plan to deepen Seattle Harbor, the ongoing Corps feasibility study of potential deepening at Tacoma Harbor, and growth in tanker traffic to British Columbia indicate

[1] The “alternatives” presented herein can also be viewed as various scales of a “channel-turning basin dredging & widening alternative”.

a high likelihood of increased volume and size of vessel traffic through the Strait of Juan de Fuca. Growth in vessel sizes and likely increases in traffic volume indicate a need for a design fleet capable of successful emergency response in the future. Consequently, the study assumes that a vessel of at least 100 short ton bollard pull will be the most likely vessel class deployed at Neah Bay.

Analysis of the historical and current fleet at Neah Bay as well as expert solicitation and analysis of vessel order books informed the ERTV design vessel identification. This study selected the class of Emergency Response Towing Vessels (ERTVs) represented by the dimensions of the *Denise Foss* as the design fleet for channel depth. The *Denise Foss* is the current vessel serving as the permanently-stationed ERTV at Neah Bay. Industry consultation confirmed that the Denise Foss will likely continue to serve as the permanently-stationed ERTV at Neah Bay through the end of the current contract (2020) and beyond. This vessel class has a bollard pull of approximately 110 short tons, fully meeting the requirements of RCW 88.46.135. The vessel class' towing capacity accounts for the growing vessel sizes anticipated to call the Pacific Northwest. Additionally, the Denise Foss represents a reasonably available vessel class for the Puget Sound region. There are limited available ERTVs in the current and expected fleet of vessels that could replace the *Denise Foss*, and these vessels' average draft is within half a foot of the *Denise Foss*. Additional design vessel considerations are presented in Appendix A. Table 3-2. summarizes the dimensions of the class of vessels represented by the *Denise Foss*.

Table 3-2. *Denise Foss* Dimensions

Deadweight Tonnage	Length Overall (feet)	Breadth (feet)	Sailing Draft (feet)
655	130	41	17.5

Channel Width Assumptions

While the ERTVs have the greatest draft and control the channel depth, the channel width is controlled by the vessel with the greatest beam (i.e., width at the widest point as measured at the ship's nominal waterline). For this project the vessel with the largest beam projected to use the channel is an Oil Spill Response Barge. Table 3-3, below, summarizes the dimensions of a typical Oil Spill Response Barge.

Table 3-3. Typical Oil Spill Response Dimensions

Deadweight Tonnage	Length Overall (feet)	Breadth (feet)	Sailing Draft (feet)
n/a	250	76	17.0

The current natural channel width is limited to a 220-foot width at low tide. Based on the design criteria, a channel width multiplier of 4 times the beam is used, resulting in a design channel width of 300 feet (see Appendix B). Widening included in alternatives will be dependent on engineering design requirements associated with channel deepening.

Channel Length Assumptions

Proposed channel lengths for each alternative have been determined based on the physical limitations of the channel (see Appendix B). The current natural entrance channel length is approximately 4,500 feet long with a 375-foot long turning basin. There is no proposed lengthening beyond the current channel dimensions because the current channel length is sufficient for the design vessels.

Dredged Material Management Assumptions

Dredged material management measures are evaluated as part of the measures screening process summarized in Section 3.1; assuming suitable dredge material, beneficial use is the measure that resulted from the screening process. Open water placement is likely a higher cost option and, therefore, not recommended. A suitability analysis (USACE 2017) for beneficial use of dredge material to support the extension of a commercial dock in the marina was recently completed. The section tested for the dock was at similar elevations to the proposed entrance channel dredging. Given that these samples were taken at similar depths to the proposed entrance channel, it is reasonable to assume that the sediment composition of the channel will be similar to this representative sample. The majority of the material was deemed suitable for beneficial use, with only a small amount, located directly under the existing dock, being deemed unsuitable. The material in the entrance channel is assumed to be clean and suitable for beneficial use based on its location and the low development in the area. The Dredge Material Management Program (DMMP)[2] recommends that minimal grain size/TOC (total organic carbon) sampling be done to confirm exclusion from more rigorous testing. This will be done during the pre-construction, engineering and design (PED) phase following completion of the Feasibility Study. USACE will follow the DMMP process to see if further testing of the sediment is warranted. If testing indicates it’s not suitable for beneficial use, then other disposal options will need to be evaluated.

Local Service Facility Assumptions

Local service facilities (LSF) at Neah Bay include terminals, docks, and berthing areas. The LSF assumed for this project include the Makah Marina and a new dock extension dredged to -25 feet MLLW that is suitable for commercial fishing vessels, skimmers, ERTVs, and tugs. The

[2] The Dredged Material Management Program (DMMP) is an interagency approach to the management of dredged material in Washington State. Seattle District acts as the lead agency. Cooperating agencies are Region 10 of the U.S. Environmental Protection Agency, the Washington Department of Ecology, and the Washington Department of Natural Resources. Together the DMMP agencies are responsible for evaluating dredged material and for co-management of the DMMP disposal sites.

proposed dock extension is an extension of the existing fishing pier just west of the marina; it will accommodate an emergency response towing vessel and other associated spill response vessels. The pier extension will be about 563 feet in length extending to the northwest of the existing fishing pier. The proposed dock extension and dredging for the ERTV and associated vessels is a non-federal project that compliments the proposed federal project but is not required to realize the assumed benefits. Operation of the ERTV in regards to depth restrictions from tides will not be affected by the presence or absence of the proposed non-federal dock extension project. There is a Coast Guard facility in the project area; however, it is not expected to benefit from channel deepening and, as a federal facility, is not considered an LSF.

Initial Array of Alternative Plans

An initial array of channel deepening alternatives that meet the study objectives was developed. These plans are based on study assumptions as well as input from the non-federal sponsor and the initial charrette. Initial evaluation focused on 2-foot increments. Optimization analysis was completed prior to final plan selection (Appendix A). Table 3-4, below, summarizes all alternatives; each (except the No Action alternative) involves deepening of both the entrance channel and turning basin:

Table 3-4. Alternatives Considered for Deepening the Entrance Channel and Turning Basin*

Alternative	Segment	Station	Length	Width	Limiting Depth	Dredged Material Management
Alternative 1 (No Action)	Entrance Channel	Sta. 0+00 to 45+00	4,500'	220'	-19' MLLW	N/A
	Turning Basin	Sta. 45+00 to 54+00	375'	375'	-19' MLLW	N/A
Alternative 2	Entrance Channel	Sta. 0+00 to 45+00	4,500'	300'	-21’ MLLW	Beneficial Use
	Turning Basin	Sta. 45+00 to 54+00	375'	375'	-21' MLLW	Beneficial Use
Alternative 3	Entrance Channel	Sta. 0+00 to 45+00	4,500'	300'	-23' MLLW	Beneficial Use
	Turning Basin	Sta. 45+00 to 54+00	375'	375'	-23' MLLW	Beneficial Use
Alternative 4	Entrance Channel	Sta. 0+00 to 45+00	4,500'	300'	-25’ MLLW	Beneficial Use
	Turning Basin	Sta. 45+00 to 54+00	375'	375'	-25’ MLLW	Beneficial Use
Alternative 5	Entrance Channel	Sta. 0+00 to 45+00	4,500'	300'	-27’ MLLW	Beneficial Use
	Turning Basin	Sta. 45+00 to 54+00	375'	375'	-27’ MLLW	Beneficial Use
Alternative 6	Entrance Channel	Sta. 0+00 to 45+00	4,500'	300'	-29’ MLLW	Beneficial Use
	Turning Basin	Sta. 45+00 to 54+00	375'	375'	-29’ MLLW	Beneficial Use
Alternative 7	Entrance Channel	Sta. 0+00 to 45+00	4,500'	300'	-31’ MLLW	Beneficial Use
	Turning Basin	Sta. 45+00 to 54+00	375'	375'	-31’ MLLW	Beneficial Use

*During the planning process, as economic optimization was carried out, the proposed channel dimension became progressively smaller. Consequently the dimensions described in early environmental coordination documentation – including the biological assessment, were larger than those reported here.

3.3 Preliminary Screening of Initial Array of Alternative Plans

The initial array of alternative plans underwent qualitative screening based on environmental acceptability, cost and engineering considerations. Engineering analysis showed the presence of rock within the proposed channel footprint at least as shallow as -24 ft MLLW. At a project depth of -22 feet MLLW there is some risk that rock removal would be required, and at project depths greater than -22 feet MLLW there is increased risk that significant rock removal would be required. For feasibility level analysis it is assumed that removing the rock underneath the sand in the channel could be done with a large mechanical excavator (see Appendix B). Rock removed would also require upland offload to stockpiles. Preliminary cost estimates of this rock removal method show a high risk for costs exceeding the CAP per-project limit for Section 107 ($10,000,000), and of annualized costs exceeding annualized benefits, resulting in a benefit cost ratio of less than one. Additionally, if rock removal requires underwater blasting, there is potential to create noise and over-pressure levels that harass, injure, and/or kill fish and marine mammals, including federally threatened and endangered species. Such action would likely require an environmental impact statement and require a permit issued under the Marine Mammal Protection Act, which could add significant time and cost to the study. A summary of this screening step is provided in the table below. This round of screening eliminated all but 3 alternatives, Alternative 1 - No Action (-19' MLLW), Alternative 2 (-21' MLLW) and Alternative 3 (-23' MLLW). Table 3-5, below, summarizes the screening of the initial array of alternatives:

Table 3-5. Summary of Screening of the Initial Array of Alternatives

Alternative Depth	Engineering/Dredging				Environmental Concerns	
	Hydraulic Dredge	Hydraulic Excavator	Upland Offload to Stockpile	Potential for Cost to Exceed CAP limit	Risk of Unacceptable Environmental Impact[3]	EIS Required?
-19' MLLW	NO	NO	NO	NO	NO	NO
-21' MLLW	YES	NO	NO	NO	NO	NO
-23' MLLW	YES	MAYBE	MAYBE	MAYBE	MAYBE	MAYBE
-25' MLLW	YES	YES	YES	YES	YES	YES
-27' MLLW	YES	YES	YES	YES	YES	YES

[3] Channel depths greater than -21 feet MLLW require the removal of rock. The removal method would either be hydraulic excavator or underwater blasting, which has the potential to create noise and over-pressure levels that harass, injure, and/or kill fish and marine mammals, including federally threatened and endangered species.

-29' MLLW	YES	YES	YES	YES	YES	YES
-31' MLLW	YES	YES	YES	YES	YES	YES

3.4 Final Array of Alternatives

A summary of the final array of alternatives is included below:

- Alternative 1: No Action Alternative (-19' MLLW)
- Alternative 2: -21' MLLW
- Alternative 3: -23' MLLW

Both action alternatives entail dredging to create a new channel 4,500 feet long and 300 feet wide. Both include beneficial use of dredged material as a measure, and both would employ a hydraulic pipeline dredge. Alternative 2 would entail dredging 36,000 cy of material; Alternative 3 would entail dredging 75,000 cy of material. For either alternative much of the proposed channel and turning basin area is already sufficiently deep and would require no dredging. No maintenance dredging is anticipated to be required for either action alternative during the 50 year period of analysis. Additional evaluation and comparison of alternatives will guide the study team in identifying the TSP.

3.5 Evaluation and Comparison of the Final Array of Alternatives

The evaluation and comparison process incorporated the four accounts established in the P&G to facilitate evaluation and display of effects of alternative plans. The four accounts are national economic development (NED), environmental quality (EQ), regional economic development (RED), and other social effects (OSE).

3.5.1 National Economic Development

The NED account displays changes in the economic value of the national output of goods and services. The benefit-cost analysis was conducted for each alternative. Benefits of the proposed alternatives are based on transportation cost savings associated with each alternative. The full economic evaluation is summarized in Appendix A.

Consultation with the port did not reveal sufficient industry interest in changes to commercial fishing and logging operations as a result of any project alternative. While fish processing vessels could benefit from increased channel depth and access to the Makah Marina, there is currently no significant evidence that these vessels would change operation and begin use of Neah Bay Harbor. Similarly, logging industry around the study area lacks infrastructure and interest in using Neah Bay to transport logs. For the purposes of this study, the primary beneficiary of channel improvements is the ERTV, which translates into a reduction in overall transportation costs of vessels transiting the Strait of Juan de Fuca.

Table 3-6 estimates total annual movements required by the ERTV to avoid tide constraints by alternative depth. This total was calculated using the average of NOAA's Annual Tide Predictions for 2015 through 2017. The study assumes that the ERTV will need to leave the channel for approximately 4 hours any time usable channel depth falls below 19.5 feet. This depth is equal to ERTV design sailing draft plus 2-foot underkeel clearance. The purpose of Corps of Engineers' underkeel design standards is to provide clearance between a ship's bottom and a channel's bottom, which minimizes the risk of grounding by a design vessel under design conditions in the design channel. From 2015 through 2017, the channel depth fell below 19.5 feet an average of 217 times per year. Pilot consultation and AIS data analysis confirm that the ERTV is likely to need to leave the channel for roughly 4 hours anytime available depth falls below 19.5 feet.

Table 3-6. Estimated Annual Tide-Related Movements*

Year	Channel Depth			
	19'	**21'**	**23'**	**25'**
2015	218	30	0	0
2016	213	29	0	0
2017	220	30	0	0
2015-2017 Average	**217**	**30**	**0**	**0**

*Tide-related movement refers to the instances where the ERTV exits Neah Bay solely to avoid being prevented from exiting by low tides (or grounding while attempting to exit), thereby maintain emergency response readiness.

The study assigned an average cost to each tide-related movement based on the vessels' average fuel consumption during tide-related movements (120 gallons per typical trip) and average fuel costs for the Seattle area (from the beginning of 2013 to the end of 2017) to determine an average annual cost for tide-related movements by channel depth. The design vessel typically refuels at docks in the Seattle area. The average price of marine fuel over the past five years plus use-tax equals $3.18 (Puget Sound Marine Fuel Cost Survey). Marine Fuel is not subject to 9.6 percent local percent fuel tax. Per ER 1110-2-1404, fuel price is not escalated.

Table 3-7 presents the estimated average annual equivalent (AAEQ) transportation cost savings benefits for tide-related movements for each study depth.

Table 3-7. Tide-Related Movements Cost Benefit Analysis Summary

Channel Depth	AAEQ Transportation Costs	AAEQ Transportation Benefits
19'	$83,000	$-
21'	$12,000	$71,000
23'	$-	$83,000

Table 3-8 presents costs of the alternatives. Conceptual cost estimates for the alternatives are provided at the fiscal year 2020 discount rate of 2.75%. Costs are presented as an Average Annual Equivalent (AAEQ) cost at the October 2019 price level. The costs include all economic costs including project first costs (design, construction, construction management, lands, easements, rights-of-way, relocations, and disposal areas), interest during construction (IDC), and operations and maintenance (O&M), which primarily consists of monitoring costs.

Table 3-8. Summary of Costs

Depth (MLLW)	First Costs	IDC	Total Investment	AAEQ Total Investment	AAEQ O&M	Total AAEQ
-19' MLLW	$-	$-	$-	$-	$-	$-
-21' MLLW	1,774,000	$2,000	$1,776,000	$66,000	$-	$66,000
-23' MLLW	$3,718,000	$4,000	$3,722,000	$138,000	$-	$138,000

Table 3-9 summarizes the results of the benefit-cost analysis, including the total net benefits and benefit-cost ratio for each alternative. Net excess benefits are maximized at -21’ MLLW.

Table 3-9. Benefit-Cost Analysis (Oct 2018 price level, 2.75 percent discount rate)

Alternative Depth	AAEQ Costs	AAEQ Benefits	Net Benefits*	Benefit/Cost Ratio*
-19’ MLLW	$-	$-	$-	-
-21’ MLLW	$66,000	$71,000	$6,000	1.09
-23’ MLLW	$138,000	$83,000	$(55,000)	0.60

*Arithmetic discrepancies in net benefits and Benefit/Cost Ratio due to rounding

The study team performed optimization analysis which verified -21’ MLLW as the depth which maximizes NED benefits compared to -20’ MLLW or -22’ MLLW (Section 3.6.1.1). Sensitivity analysis addressed the risks associated with key study assumptions, especially the ERTV design fleet. If the design fleet includes more vessels with sailing drafts greater than 17.5 feet, there is less separation between NED benefits for the -21’ MLLW and -22’ MLLW channel depths (Appendix A, Economics); however, both depths produce similar levels of net benefits. Consequently, the less costly plan is the NED plan (ER 1105-2-100, Exhibit G-1). In addition, the -21’ MLLW plan reduces the risk of required rock removal, which poses significant risk to the overall project cost and increases environmental impacts (Section 3.6.1.2).

3.5.2 Environmental Quality

The environmental quality account considers non-monetary effects on ecological, cultural, and aesthetic resources. Under this account, the preferred plan should avoid or minimize environmental impacts in the study area to the extent practicable considering other criteria and planning objectives. Alternative 2 may have short-term ecological impacts as detailed in chapter 4, but would have no long-term effects to cultural or environmental resources in the area. It has the least impact on ecological resources of the action alternatives considered because it dredges and places the minimum amount of sediment of the alternatives considered while still providing safe navigation for emergency response vessels in and out of Neah Bay. Furthermore, the placement of materials along the shoreline will provide a source of sediment in an area that is largely subtidal due to substantial downgrading caused by shoreline armoring and road construction, resulting in a net improvement in aquatic habitat. The restored intertidal habitat will a provide a migratory pathway for juvenile salmonids to avoid marine predators, opportunity for recruitment of eelgrass meadows that function as three dimensional habitat for a variety of fish and invertebrates, and support shellfish beds that have ecological and Tribal value.

In addition, the Neah Bay ERTV is the only permanently stationed rescue tug in the Puget Sound/Washington. The closest permanently stationed rescue tug along the West Coast occurs in the Columbia River. Ports in Washington and Canada anticipate low to moderate growth in the future, yet these projections could change if expansion projects in Canada are completed, or if new projects in Washington or British Columbia are developed in the future (WDOE 2019). Canada's National Energy Board has approved a tripling of capacity in the Trans Mountain Pipeline so that bitumen processed from interior oil sands can be exported from Vancouver, British Columbia to global markets. This will result in up to a seven-fold increase in tankers in the Strait of Juan de Fuca and Salish Sea. The recommendation is currently under Canadian federal review under the Prime Minister (KNKX 2019). With a greater number and fleet size expected in the Pacific Northwest in the future, the risk of oil spill also increases. The ability of emergency response vessels in Neah Bay to quickly and efficiently respond to distressed vessels in the Strait of Juan de Fuca and along the Washington Coast and prevent oil spills is critical to protect natural resources.

Several federally Endangered Species Act (ESA) listed species use the Strait of Juan de Fuca to forage and as a migration corridor, including Puget Sound Chinook salmon, Puget Sound steelhead, Hood Canal summer chum salmon, and southern resident killer whales (SRKW). SRKWs often transit the Strait of Juan de Fuca as they move between summer/fall forage grounds in the San Juan Islands and Puget Sound to winter forage grounds along the West Coast. In recent years, the SRKW population has dropped to 74 individuals, the lowest number in 30 years, with no calves surviving since 2015. The Southern Resident Orca Recovery Task Force identified oil spills as a persistent, low probability, high-impact risk to SRKWs. With so few reproductive females, the population is particularly vulnerable to the catastrophic effects of oil spills, including both physiological and toxicological exposure and impacts to their preferred prey resources (Chinook and chum salmon) (SROTF 2018). A recent population viability analysis by Lacy et al. suggests a catastrophic oil spill of two to four million gallons could kill between 12.5 and 50 percent of the Southern Resident orca population.

The Olympic Coast National Marine Sanctuary occurs along West Coast of Washington from the west end of Neah Bay in the Strait of Juan de Fuca to just North of Grays Harbor. The sanctuary extends 25 to 50 miles seaward, covering much of the continental shelf and several major submarine canyons. The sanctuary protects a productive upwelling zone - home to marine mammals and seabirds. Along its shores are thriving kelp and intertidal communities, teeming with fishes and other sea life (NOAA 2017). Oils spills could have devastating impacts in this pristine marine sanctuary.

3.5.3 Regional Economic Development (RED)

The RED account measures changes in the distribution of regional economic activity that would result from each alternative plan. Evaluations of regional effects are measured using nationally consistent projections of income, employment, output, and population. Due to the small scale of this project no significant regional economic benefits would be expected to result from any of the alternatives.

3.5.4 Other Social Effects (OSE)

This project is within the Makah Tribe's Usual and Accustomed Treaty Area (U&A). The Makah Tribe actively exercises its fishing rights and has commercial and subsistence fisheries for halibut, groundfish, salmon, and additional species in Neah Bay and the Strait of Juan de Fuca. There are also a number of charter fishing operations run by the Makah Tribe out of Neah Bay. The Lower Elwha, the Jamestown S'Klallam, Port Gamble S'Klallam, and the Suquamish Tribes have U&A in the Strait of Juan de Fuca and the Quinault, Hoh, and Quileute Tribes have U&A along the Northern portion of the Washington Coast. In addition, the Strait of Juan de Fuca is used for various recreational activities including scuba diving, kayaking, and beach combing. Oils spills could have devastating impacts to tribal and recreational fisheries, as well as other recreational activities.

Both Alternative 2 and Alternative 3 would positively impact the OSE account by reducing the severity and number of oils spills that would impact Tribal fisheries, and recreational activities in the Strait of Juan Fuca and Washington Coast.

3.5.5 Completeness, Effectiveness, Efficiency, and Acceptability

Completeness, effectiveness, efficiency, and acceptability are the four evaluation criteria specified in the Council for Environmental Quality Principles and Guidelines (Paragraph 1.6.2(c)) in the evaluation and screening of alternative plans. Alternatives considered in any planning study should meet minimum subjective standards of these criteria to qualify for further consideration and comparison with other plans.

Completeness is the extent to which a given alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects.

Effectiveness is the extent to which an alternative plan alleviates the specified problems and achieves the specified opportunities.

Efficiency is the extent to which an alternative plan is a cost effective means of alleviating the specified problems and realizing the specified opportunities, consistent with protecting the nation's environment.

Acceptability is the workability and viability of an alternative plan with respect to acceptance by State and local entities, tribes, and the public and compatibility with existing laws, regulations, and public policies.

Table 3-10, below, summarizes the evaluation of the final array of alternatives against these criteria. The questions of whether each criteria is met are answered with a "Yes" or a "No", with explanation provided below.

Table 3-10. Alternatives Evaluation - Completeness, Effectiveness, Efficiency, Acceptability

Alternative	Depth	Completeness	Effectiveness	Efficiency	Acceptability
1 (No Action)	-19' MLLW	NO	NO	YES	YES
2	-21' MLLW	YES	YES	YES	YES
3	-23' MLLW	YES	YES	NO	YES

Alternative 1 is not complete, nor effective, as it does not achieve the desired effect of transportation cost savings. It is efficient in that the cost is $0. It is acceptable in so far as it is the status quo.

Alternative 2 is complete because is accounts for all necessary investments or other actions to ensure the realization of the planned effects. It is effective because it alleviates the specified problems and achieves the specified opportunities. It is efficient in that it cost effectively alleviates the specified problems and realizes the specified opportunities, consistent with protecting the nation's environment. And it is acceptable because it is workable and viable with respect to acceptance by State and local entities, tribes, and the public and compatible with existing laws, regulations, and public policies.

Alternative 3 is complete, effective and acceptable for the same reasons as Alternative 2. However it is inefficient because the benefit-to-cost ratio is less than 1.

Based on the above evaluation, Alternative 2 (-21' MLLW) satisfies all screening criteria.

3.6 Selection of the Tentatively Selected Plan (Agency Preferred Alternative)*

The NED Plan is defined as the alternative plan that reasonably maximizes net economic benefits consistent with protecting the Nation's environment. Contributions to NED are increases in the net value of the national output of goods and services, expressed in monetary units. For this study, the contributions to NED are the direct net benefits that accrue in the planning area and the rest of the nation. Alternative 2 compares most favorably in consideration of the four accounts and the four evaluation criteria, and it reasonably maximizes net economic benefits consistent with protecting the Nation's environment. Alternative 2 is the NED plan and the TSP (agency preferred alternative).

3.6.1.1 Optimization Analysis

This section presents the results of optimization of the TSP using net excess benefits of one-foot increments from -20 feet MLLW to -23 feet MLLW. The design vessel experiences nearly 100 percent channel reliability at -23 feet MLLW; therefore, the project cannot realize additional net benefits for depths beyond -23 feet MLLW. The results of the optimization confirm -21 feet MLLW to be the plan that maximizes net excess benefits. Table 3-11 presents the results of the optimization analysis.

Table 3-11: Channel Depth Optimization

Channel Depth	AAEQ Costs	AAEQ Benefits	Net Benefits	BCR
20' MLLW	$54,000	$45,000	$(9,000)	0.83
21' MLLW	**$66,000**	**$71,000**	**$6,000**	**1.09**
22' MLLW	$79,000	$82,000	$3,000	1.03
23' MLLW	$138,000	$83,000	$(55,000)	0.60

3.6.1.2 Additional Depth Selection Considerations

In addition to maximizing net excess benefits, the -21 feet MLLW plan reduces risk that dredging will encounter subsurface rock. The study relies on 20-year-old acoustic surveys of the project location to estimate the depth of rock. There is higher risk that dredging could encounter rock for the -22 feet MLLW alternative. Rock removal at the project location adds both cost and additional environmental impacts, as described in Section 3.3.

4 Affected Environment and Environmental Consequences of the Alternatives*

This chapter provides the existing conditions and regulatory setting for each of the resources that could be affected by implementing the final array of alternatives as identified in Section 3.4. Existing conditions are the physical, chemical, biological, and sociological characteristics of the study area. The assessment of environmental effects is based on a comparison of conditions with and without implementation of the proposed plan and a reasonable range of alternatives; in this case, two of the various scales of an action alternative that were formulated through the screening process are compared to the No-Action Alternative. The spatial scale of analysis focuses on Neah Bay, and surrounding waters of the Strait of Juan de Fuca. The time scale for analysis is a 50-year period beginning in 2021 and extending to 2070.

4.1 Alternatives Analyzed for Environmental Effects

Chapter 3 outlines the formulation and evaluation of alternatives for determining the action that maximizes the national economic development plan. This chapter provides a comparison of potential environmental effects of a full range of all reasonable alternatives. Therefore, the alternatives analyzed in this chapter include the No-Action Alternative, the -21' MLLW Alternative (preferred alternative), and the -23 MLLW Alternative to represent a range of alternatives. An overview of these alternatives follows.

4.1.1 Alt 1: No Action Alternative

The No Action Alternative, or the future without project condition, is analyzed as the baseline condition and serves as a reference condition for comparison of the action alternatives. Taking no action in this case would mean continuing standard operations in Neah Bay with no improvements to the navigation channel. All physical conditions existing at the time of this analysis are assumed to remain, and vessels with greater than a 15-foot draft would continue to be limited by the depths and tidal conditions in Neah Bay.

4.1.2 Alt 2: -21-foot MLLW Channel Depth (Preferred Alternative)

This alternative involves dredging the channel to -21 feet MLLW with an additional 2 feet of allowable overdepth. This will require up to 36,000 cy of material to be dredged from the channel and placed along the shoreline to the south of the channel via hydraulic pipeline dredge. The proposed channel is 4,500 feet long and 300 feet wide with a 375-foot diameter turning basin, although this entire length does not need to be dredged due to naturally occurring deeper waters. USACE does not anticipate maintenance dredging beyond the initial deepening of the channel since Neah Bay is closed system with little to no sediment input. Although sediment does drift along the shoreline, none would drift into the middle of the Bay where the proposed channel will be. See Figure 1-3 for an overview of this alternative and Chapter 5 for a detailed project description.

4.1.3 Alt 3: -23-Foot MLLW Channel Depth

This alternative involves dredging the channel to -23 feet MLLW with an additional 2 feet of allowable overdepth. This would require the removal up to 75,000 cy of material to be dredged from the channel and placed along the shoreline to the south of the channel via hydraulic pipeline dredge, and another 2,000 cy of rock that would likely be removed by blasting methods and would need to be disposed of at upland location.

4.2 Resources Analyzed and Resources Screened from Detailed Analysis

The environmental analysis conducted in the NEPA process should provide the decision maker with relevant and timely information about the environmental effects of his or her decision and reasonable alternatives to mitigate those impacts. Table 4-1 identifies the resources evaluated for detailed analysis with a rationale for inclusion or exclusion. Resources were excluded from detailed analysis if they are not potentially affected by the alternatives or have no material bearing on the decision-making process.

Table 4-1. List of Resources Considered for Detailed Effects Analysis

Resource	Included in Detailed Analysis (Y/N)	Rationale for inclusion or exclusion
Navigation and Economic Conditions	Y	The purpose of the project is to have beneficial effects to national and regional economic conditions.
Hydraulics and Geomorphology	Y	Problems identified center on the relationship between hydraulics and geomorphology. The proposed action requires study of these characteristics.
Groundwater	N	The proposed action is limited to the subtidal environment. No groundwater will be affected.
Water Quality	Y	Analysis is required to determine the intensity of potential changes to turbidity and dissolved oxygen
Air Quality	Y	The air-pollutant concentrations in the study area consistently meet the National Ambient Air Quality Standards; an analysis of pollutants emissions from construction is necessary to disclose to the public.

Resource	Included in Detailed Analysis (Y/N)	Rationale for inclusion or exclusion
Greenhouse Gas Emissions	Y	Emissions that would occur during construction and the potential changes to long-term vessel emissions are analyzed for impacts.
Noise	Y	The action has the potential to impact sensitive noise receptors during construction. Analysis is required to determine the intensity of effects. Noise will be evaluated under the fish and wildlife sections.
Hazardous, Toxic, and Radiological Waste	N	There is currently no evidence or concern for any HTRW presence on the site. See appendix E for an environmental baseline study documenting this conclusion.
Fish	Y	Many fish species may be present. Analysis is required to determine which species would be present, the intensity of effects, and how to avoid or minimize effects.
Wildlife (birds and marine mammals	Y	Species that may occur in the study area include harbor seals, killer whales, sea lions, and a variety of marine birds. Noise and turbidity from construction may be temporarily disruptive. Underwater noise from construction would occur during periods when sensitive receptors may be present. These include marine mammals, fish, and diving birds. Analysis is required to determine the intensity of effects, and how to avoid or minimize impacts.
Benthic Organisms	Y	Benthic macroinvertebrate populations are known to recover quickly from the type of action proposed. Significant effects are not anticipated, but analysis is required to determine intensity of effects.
Vegetation	Y	Marine vegetation exists along the proposed placement area and impacts need to be evaluated to determine the intensity of effects.
Threatened and Endangered Species	Y	The proposed action may affect ESA-listed species in the study area. Analysis is required to determine the intensity of effects.

Resource	Included in Detailed Analysis (Y/N)	Rationale for inclusion or exclusion
Invasive Species	N	The proposed action would benefit egress/ingress of vessels currently moored in Neah Bay. Introduction of invasive species from outside sources in not a concern.
Cultural Resources	Y	Analysis is required to investigate cultural resources and to determine the extent of any potential effects.
Tribal Trust Assets	Y	The study area is within treaty-reserved fishing areas, called Usual & Accustomed areas. No substantial negative effects are anticipated, but analysis is required to avoid and minimize effects.
Environmental Justice Communities	N	The project would occur within the boundaries of the Makah Reservation; the Makah Indian Tribe is the project's local sponsor. The project would not negatively affect their community disproportionately.
Aesthetics	N	The proposed action would have no permanent effect to scenic resources or visual characteristics of the study area.
Recreation Resources	Y	Recreational resources within the study area may be temporarily impacted during construction. Analysis is required to determine the intensity of effects.
Public Services and Utilities	N	The proposed action would have no substantial effect on electricity, water, wastewater and stormwater collection, sewer and solid waste, natural gas, oil/petroleum, or telecommunications services.
Public Health and Safety	N	No HTRW issues have been identified in Neah Bay that would pose a health risk to the public. There would be little to no risk to public safety during construction since the dredge would only occupy one side of the entrance and boats could use the other side to exit and enter the bay. The establishment of a deeper channel could benefit the public by providing a quicker response to oil spills and distressed vessels.
Land-based Transportation and Traffic	N	None of the alternatives would cause changes to local traffic or surface transport of import and export goods and commodities. The same amount of material would move through the area in the future with and without project.

4.3 Context for Cumulative Effects Analysis

Cumulative effects can result from the incremental effects of the proposed action when added to the effects of other past, present, and future actions, regardless of which government agency or private entity undertakes such actions. When effects that are individually minor combine over space or time, the cumulative effects can be significant. NEPA requires analyzing whether the incremental effect of the proposed action will cause a significant impact to the environment when added to past, present, and reasonably foreseeable future actions. This section will summarize actions that have affected the environment, and each resource in sections 4.4 through 4.17 will be analyzed for whether it would accrue a significant cumulative effect.

4.3.1 Historical Conditions

Neah Bay falls entirely within the boundaries of the Makah Tribal reservation. Several logging roads where put in along the shoreline the 1800's that cut off sediment input from tributary creeks into the Bay. The construction of the outer breakwater in 1944 likely had considerable adverse impacts to Neah Bay and the surrounding marine ecosystem. The authorized project was built explicitly to alter the natural processes in the area, specifically to minimize the impacts of tides, currents, large waves, and storms to the community and waters of Neah Bay. The outer breakwater has changed the littoral processes within the Bay and altered the biological structure of the marine and nearshore communities in the area. However, the local environment has, over time, adapted to the existence of the outer breakwater. The outer breakwater is now a component of the Neah Bay marine environment and has allowed the Makah Tribe to develop a marina and an associated fishing industry. A large percentage of the Tribe's income is derived from fishing-related activities. Repairs to this outer breakwater were performed in 1949, 1959, 1980, 1998, 2002, and 2010. There is also a large revetment backing the shoreline to the east of the existing marina that was constructed in 1956 to slow the rate of upland erosion.

In 1995-96 USACE constructed an inner breakwater around the Tribe's existing marina along the south shore of Neah Bay; the Tribe has since replaced the marina. The inner breakwater was built for protection from storms along the north and eastern sides of the marina. The breakwater was built in two sections at the request of both state and federal resource agencies to leave an opening referred to as the "fish gap." The fish gap was to be maintained at an elevation of between 0 feet and –2 feet mean lower low water (MLLW) to allow migrating salmon to pass through the marina and avoid being forced into deep water by the north marina breakwater. In addition, the gap also provided for the flushing of water from behind the breakwater into the Bay thereby improving water quality within the marina. This fish gap is no longer maintained, since it would fill in with sediment soon after being dredged. It currently self-maintains at elevations of +4 to +6 MLLW, which still allows for fish passage much of the time. It was last dredged in 2009.

A USCG Station is located in Neah Bay near Baada Point, to the east of the marina. The original station had been established on Waadah Island in 1908, but only two years later it was moved to the mainland after large waves from the Pacific destroyed its boat rails. The station had to retreat again after the storm of December 2, 1967, which badly damaged one rescue boat and swept away parts of the walkway leading to the moorings. The station was rebuilt 920 feet to the west on less vulnerable land and includes a large dock. The "new" USCG station has been operational since 1972 (USGG 2018).

4.3.2 Current Conditions

The town of Neah Bay is home primarily to members of the Makah Indian Tribe. The small marina still exists and provides moorage for the Makah Tribal fishing fleet and recreational fish charters (many of which are run by the Tribe). All other features described in the previous section are also still in existence. The USCG station is located to the east of the marina. There are currently no active construction projects occurring in the study area.

4.3.3 Future Actions

The only other project that is currently being planned in Neah Bay is a Makah Tribe proposal to provide a permanent mooring location for the emergency response towing vessel and associated emergency and spill response vessels. They are proposing the following: 1) dredge up to 208,000 cubic yards of material in the marina, 2) place 187,000 cubic yards of this material along the shoreline to the west of the proposed placement site for the navigation channel deepening (these placement sites do not overlap), and 3) construct an updated facility in the marina. This project received a Clean Water Act (CWA) section 404 permit from the USACE Regulatory Branch in Seattle in December 2018. This project would not increase the number or size of boats entering the bay, but rather allow better moorage for the existing towing and emergency response vessels that already use Neah Bay. No other new construction actions are known to be proposed or planned at this time. There may be repairs needed to the outer breakwater and the marina breakwater, as well as maintenance and repair of docks within the bay.

4.4 Navigation and Economic Conditions

Safe passage in and out of Neah Bay Harbor is crucial for the economic well-being of the Tribe. Many Tribal members make their living as fishermen; sport fishing charters and tourism involving boats are also large contributors to the Makah Tribe's economy. The remoteness of Neah Bay makes employment challenging and natural resources and tourism are the main economic opportunities outside of working for the tribal government. An economic assessment of the Washington coast found that during 2009-2013, the main industries of employment in Neah Bay were public administration (30.7%); agriculture, forestry, fishing and hunting, and mining (18.6%); and educational services, and health care and social assistance (17.7%). The U.S. Census Bureau estimates that almost 55% of these jobs were government positions, including Tribal employees, and other local, state, and federal employees (Taylor, 2015). Makah fishermen participate in 20 different commercial fisheries including but not limited to Pacific whiting, halibut, black cod/sablefish, and various species of salmon. About 70 commercial fishing vessels, including several charter boats, operate out of Neah Bay and are run by Tribal members. Roughly 515 jobs are associated with those fishing vessels and their operations.

A deeper channel would have multiple navigational and economic benefits for Neah Bay. An ERTV, currently the *Denise Foss*, is stationed in Neah Bay and provides emergency assistance to vessels in distress at the entrance and western extent of the Strait of Juan de Fuca, and along the coast of Washington State. This vessel has an approximate sailing draft of 17.5 feet. Given the current channel depth of 19 feet MLLW, the ERTV must leave Neah Bay when the water depth falls below 19.5 feet MLLW (17.5 feet sailing draft plus 2 feet underkeel clearance) to maintain emergency response capability. A deeper channel would also allow larger vessels in distress to use Neah Bay as a port of refuge. The conditions are frequently rough off the coast of Washington and the western extent of the Strait of Juan de Fuca, and the next closest deep draft harbors are Port Angeles, roughly 70 miles east into the Strait of Juan de Fuca and Grays Harbor, about 165 miles south along the outer coast of Washington.

4.4.1 Alt 1: No-Action Alternative

This alternative will not affect current navigation. However, under this alternative, the current navigational challenges will remain, and the potential economic opportunities related to larger vessels will be lost.

4.4.2 Alt 2: -21 MLLW Channel (Preferred Alternative)

There will be a temporary disruption to navigation while dredging is occurring, which is estimated to take 13 days at ten hours per day. However, under this alternative, a deeper channel (-21ft MLLW) would allow deeper draft vessels to enter Neah Bay providing additional economic opportunities for the Makah Tribe. The Emergency Response Towing Vessel will be able to enter and exit the harbor on most tides, resulting in reduced fuel use and cost savings for the operation of that vessel (see table 7-4 in Appendix A of the EA). This alternative also increases harbor of refuge options for vessels in distress that require depths greater than -19 but less than -21 MLLW. Given that Neah Bay is home to an active marina, no significant adverse impacts to navigation or economic conditions are anticipated.

4.4.3 Alt 3 -23 MLLW Channel

The impacts from this alternative are predicted to be similar to but of a greater intensity and duration of impact than attributable to Alternative 2. This Alternative would involve the removal of a larger volume of dredge material than Alternative 2, as well as the blasting of rock. Actual construction would take longer (estimated 27 days or longer depending on required rock removal methods) than Alternative 2, leading to a longer disruption to navigation of the channel. With a slightly deeper channel, additional ships with a requiring depths between -21 and -23ft MLLW would be able to enter the harbor for refuge or otherwise. The additional depth would not provide any additional benefits for emergency tug operations. As with Alternative 2, no significant adverse impacts to navigation or economic conditions are anticipated.

4.4.4 Cumulative Effects of the Preferred Alternative

The planned moorage improvement for the tow vessel and the deepening of the channel will both have temporary impacts to navigation during construction, but it's unlikely they would occur at the same time. There is typically only one small hydraulic dredge available on the West Coast and the timeline of the USACE regulatory process is likely faster than the USACE civil works process. Both actions, in combination with past installation of navigation features, contribute cumulatively to improvements in navigation and provide economic opportunities for residents in and around Neah Bay.

4.5 Hydraulics and Geomorphology

Neah Bay is located near the northwest point of Washington State in the Water Resource Inventory Area (WRIA) 19 and has a rain dominated precipitation pattern. Neah Bay is on the northeastern side of the most northern point of the Olympic Peninsula and is enclosed on its northern side by a breakwater that extends between Waadah Island and the mainland. The entrance from the Strait of Juan de Fuca is located between the southern side of Waadah Island and the mainland, and the main basin of the bay ranges in depth from 20 to 38 feet. The largest nearby watersheds are the Tsoo-Yess River and Waatch River, both of which empty into the Pacific Ocean. There are several small freshwater creeks that empty into Neah Bay including Agency, Halfway and Village Creek, but the flow of Village and Agency Creeks has been diminished by residential construction and armoring at both their mouths and outflows.

Neah Bay experiences a mixed semidiurnal tidal pattern like the rest of the Pacific coast. Within Neah Bay, the movement of water is influenced by the tides and local bathymetry. Currents in the adjacent Strait of Juan de Fuca can be strong and irregular. Tidal currents entering and leaving Neah Bay can exceed 0.5 knots but currents are minimal near the marina according to 1986 USACE measurements (USACE, 2009). The shorelines within the bay are a mix of natural and riprapped.

Table 4-2, below, lists elevations of tidal datums referred to Mean Lower Low Water (MLLW), in feet as reported by the National Ocean Service:

Table 4-2. Elevations of Tidal Datums Referred to Mean Lower Low Water
(from https://tidesandcurrents.noaa.gov/benchmarks/9443090.html#Datums)

Datum Plane	Elevation Relative to MLLW (feet)
Highest observed water level (11/30/1951)	12.3
Mean higher high water	7.96
Mean high water	7.11
Mean tide level	4.36
Mean sea level	4.32
Mean low water	1.60
North American vertical datum	0.84
Mean lower low water	0.000
Lowest observed water level (11/26/2007)	-3.94

The seafloor in Neah Bay is composed mostly of sand with some gravel, silt, and clay. A suitability analysis for dredging to support the extension of a commercial dock was recently completed (USACE 2017). The section tested for the dock was at similar elevation to the proposed channel and resulted in the following sediment composition: 4% gravel, 72% sand, 16% silt, and 8% clay. There are no sources of sediment input into the bay, so it is reasonable to assume that the sediment in the channel will be a similar composition as this representative sample.

Natural sediment transport in the bay has been altered by creeks becoming disconnected due to the installation of roads, a large revetment along the southern shoreline, and breakwaters affecting sediment drift around the bay. On the south and north sides of the bay the flow of sediment is predominantly from east to west with the focus of sediment transport located at the northwest corner of the bay (Coast and Harbor Engineering 2016).

4.5.1 Alt 1: No-Action Alternative

Hydraulics and geomorphology would not be affected by this alternative.

4.5.2 Alt 2: -21 MLLW Channel (Preferred Alternative)

This alternative would have no effect on the sediment character and grain size distribution of the bay. Since the movement of water within the bay is affected by local bathymetry, water movement could be minimally affected by an increase in channel depth. The beneficial use of the dredged sediment may impact sediment transport in the bay through the increase of available sediment along the shoreline. The sediment placement will restore a previously emergent beach that has lost sediment due to reduced natural beach nourishment that was caused by the installation of roads and a large revetment that backs the shoreline.

Materials placed along the shoreline are expected to drift in a westward direction, forming shallow water habitat along the outside of the marina. See section 5.1.1 for more details on the selection of the placement site and its projected drift along the shoreline. The proposed channel deepening and material placement would not result in detectable changes to tides or currents in Neah Bay. Given the lack of impacts to water movement in the Bay and the improvements resulting from placing sediment along the shoreline, no significant adverse impacts hydraulics and geomorphology are anticipated.

4.5.3 A -23-Foot MLLW Channel

The impacts from this alternative are anticipated to be similar to in nature but much more extensive than Alternative 2. There would be about 2.5 times as much material requiring disposal after by dredging to this depth, resulting in a larger beach and larger volume of sediment that will be available for transport around the bay. All rock that is removed/blasted would be recovered and placed upland.

4.5.4 Cumulative Effects of the Preferred Alternative

Given that previously installed navigation features have substantially altered hydraulic and sediment patterns in Neah Bay, negative cumulative impacts to overall hydrology and geomorphology are not expected from the channel deepening in combination with other current or future actions in the study area. Although previous action have altered hydrology in Neah Bay, the two future actions (including the proposed action) would only move sediment within the bay and would not change tides, currents, or freshwater input. See Figure 4-1 for the footprint of the materials placement from USACE channels deepening and the conceptual footprint of the Makah's marina dredging materials placement:

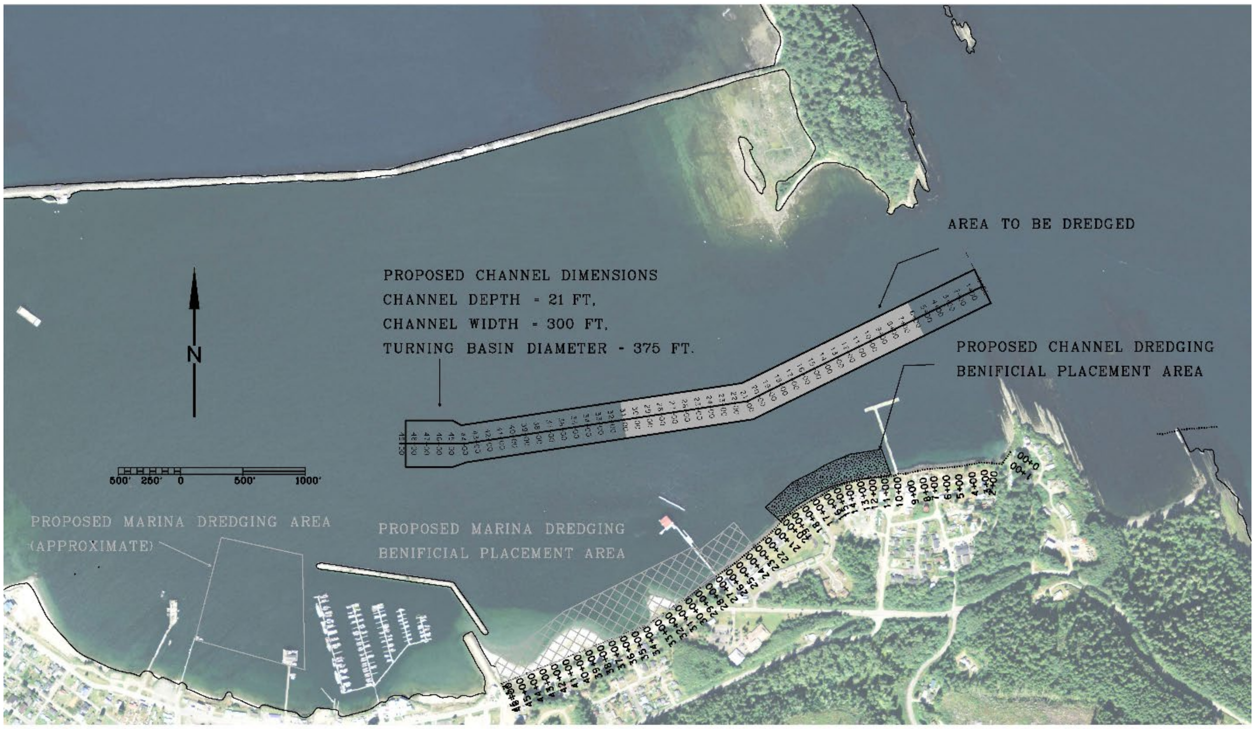

Figure 4-1. Combined Materials Placement Footprint
Note: Black hashing - Placement footprint from USACE channel dredging; Grey hashing - Conceptual placement footprint from Makah marina dredging.

There would be a net benefit in cumulative impacts from the material placement associated with USACE'S channel deepening and the Makah's marina dredging to geomorphology on a local scale. Both actions would provide sediment to an area where input has been cut-off, and will restore beach and intertidal habitat to an area that is currently subtidal due to substantial downgrading caused by shoreline armoring and lack of sediment input from tributary streams.

4.6 Water Quality

The water in Neah Bay is primarily coastal marine water from the Strait of Juan de Fuca, and there are no major sources of pollution within the bay. There is a small amount of freshwater input from the Agency, Halfway and Village Creeks. The Makah Tribe has established its own Tribal Water Quality Standards which were approved by the Environmental Protection Agency (EPA) on December 29, 2006, in accordance with the Clean Water Act, 33 U.S.C. 1377(e). The Tribe monitors for water quality issues in local streams at several beaches. The water quality standards were established to protect public health and water quality necessary for traditional economic and cultural uses. The following are the Marine Water Designated Uses and Criteria:

1. Ceremonial and religious
2. Cultural
3. Aquatic life - salmonid and other fish rearing, migration, and harvesting; clam, oyster, and mussel spawning, rearing, and harvesting; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) spawning, rearing, and harvesting
4. Wildlife habitat
5. Recreation
6. Commerce and navigation (Makah Tribal Council, 2006)

Water quality criteria for marine waters are established for the following parameters: temperature, dissolved oxygen, pH, turbidity, aquatic life bacteria, toxic, radioactive, and deleterious materials, cultural, ceremonial, religious, and aesthetic values, and recreation. Rensel (2002) found that dissolved oxygen (DO) levels in Neah Bay consistently average between 4.5 to 5.5 mg/L. Rensel's work also indicated that Total Suspended Solids (TSS) levels within Neah Bay averaged less than 1g/L. In 2008, Washington Department of Ecology reported one exceedance of State criteria for bacteria out of 6 samples (WDOE). There are no other reports of exceedances on the WDOE online mapping tool (WDOE 2012).

4.6.1 Alt 1: No-Action Alternative

Water quality would not be affected by this alternative.

4.6.2 Alt 2: -21 MLLW Channel (Preferred Alternative)

Temporary reduction in water quality is expected during the dredging process. This would be associated with increased turbidity from the dredging and sediment placing processes. During the dredging process, sediment will be disturbed and released into the water column as the dredging equipment contacts the seafloor and is raised through the water column to place the spoils onto a barge. This will result in increased turbidity near the active dredging, with an associated potential decrease in dissolved oxygen. The increased turbidity will also impact the penetration of sunlight into the water column and affect the ability of phytoplankton to undergo photosynthesis. These impacts would be temporary, limited to the estimated 13 days it would take to complete the work.

This project will comply with water quality requirements set by the Washington Department of Ecology and the Makah Tribe water quality certifications (WQC). Temporary longitudinal dikes will be constructed along the waterline as needed to control turbidity and avoid direct discharge towards the bay by directing sediment discharged by the transport pipeline longitudinally along the beach. Additional best management practices like turbidity curtains and settling basins may also be employed to help control turbidity as needed. The tidal currents and flushing in the bay are strong and are anticipated to dissipate much of the sediments suspended during dredging, and there should be no long-term effects on turbidity within Neah Bay. Given that water quality in Neah Bay is fairly good, water quality impacts would be temporary, and best management practices would minimize temporary impacts, no significant impacts to water quality are anticipated.

4.6.3 Alt -23 MLLW Channel

Similar temporary reduction is water quality would be expected under this alternative as Alternative 2, but of a greater intensity and duration of impact than attributable to Alternative 2. This Alternative would involve the removal of a larger volume of dredge material than Alternative 2, as well as the blasting of rock. As with Alternative 2, no significant impacts to water quality are anticipated.

4.6.4 Cumulative Effects of the Preferred Alternative

Water quality in Neah Bay is fairly good due to low development and tidal flushing. Sources of water quality impacts stem from the marina, which would include leakage and runoff from fuel and other lubricants. There are no other sources of elevated turbidity in Neah Bay, other than the marina dredging and dock placement proposed by the Makah Indian Tribe. As mentioned previously, it is highly unlikely that this action would occur at the same time as the USACE proposed entrance channel deepening. Given the relative good water quality, limited sources of pollutants, and lack of other turbidity generating activities in the Bay, no cumulative impacts to water quality are anticipated.

4.7 Air Quality and Greenhouse Gas Emissions

Air quality in Neah Bay is regulated by the State of Washington using the Washington Air Quality Advisory (WAQA) tool. There is a real-time monitoring station located within Neah Bay and near real time air quality information[4]. A recent WAQA reading (September 28, 2016) was 16 and in the "good" category. This is consistent with the general good air quality of the area, which is remote and is only minimally impacted by automobile and boat emissions.

Greenhouse gases (GHGs) include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N2O), and ozone (O_3). GHGs act as insulating agents by retaining thermal radiation within the Earth's atmosphere, subsequently changing the global climate. GHGs are produced through natural and anthropogenic activities, however, human activities have accelerated the amount of GHGs in the Earth's atmosphere. Since Neah Bay is a small, rural town and located in a remote area of Washington, the local sources of GHGs are primarily cars and boats. This is consistent with the common sources of anthropogenic GHG emissions from Clallam County and Washington State

[4] https://fortress.wa.gov/ecy/enviwa/StationInfo.aspx?ST_ID=127

(Clallam County Climate Action Plan, 2009, Washington State GHG Emissions Inventory 2010-2011).

4.7.1 Alt 1: No-Action Alternative/Future Without-Project Conditions

This alternative would have no effect to air quality or greenhouse gas emissions beyond current conditions.

4.7.2 Alt 2: -21 MLLW Channel (Preferred Alternative)

The dredge and the tugs necessary to move the dredge and barges, and the equipment needed to grade the material at the placement area are diesel powered and thus contribute to air pollution and greenhouse gas emissions; however, the amount generated by the dredge operation would be minimal compared to any one of the large ocean going ships that traverse the area. The increases in air pollutants would be temporary, extending only during the short duration of dredging and placement operations. Dredging and disposal activities are scheduled to be performed between July 16 and February 15 for about 13 days, when winds from the Pacific Ocean would likely disperse air pollutants quickly.

Calculations of common pollutants based on the Sacramento Metropolitan Air Quality Management District (SMAQMD) model for non-road emissions (2008) are presented in Table 4-3. These projections of emissions for the tugs moving the dredge are difficult to calculate due to the sporadic nature of the operation, but a conservative estimate of 12 hours of operation per day was used. Emissions associated with the back hoe and bulldozer are conservative in that 500 HP was used. In reality both have about 100 HP, but the SMAQMD model only calculates for 50, 500, and 1,000 HP. These estimates are not intended as an exact calculation of the emissions associated with this project but rather as a means for comparison among the alternatives.

Table 4-3. Estimated Emissions Associated with Clamshell Dredging 36,000 cy of Material

Equipment	Horsepower	Pieces	Hours/day	Days	Tons CO	Tons ROG	Tons CO_2	Tons NOx	Tons PM	Tons SOx
Bulldozer	50	1	10	2	0.003	0.002	2.555	0.026	0.001	7.04E-08
Back hoe	50	1	10	2	0.003	0.002	2.555	0.026	0.001	7.04E-08
Dredge	500	1	12	11	0.025	0.015	16.866	0.173	0.007	4.6464E-07
Tug	1000	1	12	11	0.211	0.051	43.044	0.565	0.018	4.7916E-07
Total					0.239	0.068	62.466	0.764	0.026	1.014E-06

There will be additional emissions associated with increased vessel use in Neah Bay, but again, these emissions would be small fraction of emissions in the region. In light of the temporary and occasional construction activities and rapid dispersal, these emissions would not permanently or significantly affect regional air quality.

The dredge and other construction equipment would emit carbon dioxide, nitrous oxides, and water vapor (powerful greenhouse gases). If the project need is to be met then there is no practical alternative to hydrocarbon (primarily fossil fuel) powered dredge and tugs. Although GHG emissions associated with this alternative are not expected to significantly increase the rate of climate change and sea level rise, diesel fuel consumption by heavy machinery required for maintenance dredging, material disposal, and gasoline consumption for travel to the site are a part of world-wide cumulative contributions to change in climate by way of increases in greenhouse gas emission. In light of the short duration of the greenhouse gas emissions, and the unavoidability of use of diesel equipment to conduct the dredging, the difference in emissions between Alternative 2 and Alternative 3 is negligible in the context of all anthropogenic sources of greenhouse gas emissions.

4.7.3 Alt 3: -23 MLLW Channel

The same types of equipment will be used as Alternative 2, but for greater amount of time due to more material being removed so air pollutants and greenhouse gas emissions would also be greater. It is unknown if blasting would be needed for rock removal, but for the purposes of air pollutants and greenhouse gases it is assumed the material could be dredged. Table 4-4 lists estimates of air pollutants and greenhouse gases associated with this alternative.

Table 4-4. Estimated Emissions Associated with Clamshell Dredging 77,000 cy of Material

Equipment	Horsepower	Pieces	Hours/day	Days	Tons CO	Tons ROG	Tons CO2	Tons NOx	Tons PM	Tons SOx
Bulldozer	500	1	10	4	0.008	0.005	5.111	0.052	0.002	1.408E-07
Back hoe	500	1	10	4	0.008	0.005	5.111	0.052	0.002	1.408E-07
Dredge	500	1	10	23	0.043	0.026	29.388	0.301	0.011	8.096E-07
Tug	1000	1	10	23	0.368	0.089	75.001	0.984	0.031	8.349E-07
Total					0.418	0.12	109.5	1.338	0.045	1.7853E-06

Alternative 3 also requires upland disposal of 2,000 cubic yards of rock. There will be emissions associated with trucks hauling this material to the disposal site, which has not yet been determined. The following assumptions were made regarding emissions:

1. The nearest site to handle such disposal material is 5 miles away.
2. A 30-cubic-yard dump truck would be used that gets roughly 5 miles per gallon.
3. Every gallon of diesel fuel burned produces 22 pounds of CO_2 and 0.84 pounds of PM_{10}

Based on these assumptions, Table 4-5, below, lists the calculations for emissions from trucks hauling material off-site:

Table 4-5. Estimated Amount of Emissions from Vehicles for Material Haul-off

Equipment	MPG	# of trips	Total miles	Total gas gallons	Pounds CO_2/ gallon	CO_2 pounds	Tons CO_2	Pounds of PM / gallon	Pounds PM	Tons PM
Dump truck (construction)	5	167	1670	334	22	7348	3.67	0.84	281	0.14

The results show that Alternative 3 does generate greater emissions than Alternative 2. As with Alternative 2, these emissions would not permanently or significantly affect regional air quality, and greenhouse gas emissions would be a fraction of global emissions.

4.7.4 Cumulative Effects of the Preferred Alternative

Significant cumulative effects to air quality are unlikely given the low level of emissions associated with the proposed action and the low level of emissions in the area due to low development. GHG emissions are cumulative by nature; however, the emissions associated with the proposed actions are a minor fraction of global emissions and insignificant.

4.8 Noise and Aesthetics

Ambient noise levels in the Neah Bay area are well within the Washington State Legislature Revised Code of Washington (RCW Chapter 70.107) regulated noise levels. Main sources of noise are wind, surf, and boat traffic.

4.8.1 Alt 1: No-Action Alternative

Noise levels and aesthetics will remain in current condition with this alternative.

4.8.2 Alt 2: -21 MLLW Channel (Preferred Alternative)

Under this alternative, there will be additional above and underwater noise from the dredging activity. There will be a temporary increase in ambient noise due to dredging equipment operation. No noise ordinances will be violated by this work. Potentially affected animals will be marine mammals, fish, and diving birds. Dredging and beach nourishment will temporarily negatively affect the aesthetics in the area during construction; but, the beach nourishment should ultimately provide for improved aesthetics and water access. Given the minor and temporary impacts to noise (estimated 13 days of work), impacts are expected to be insignificant.

The primary source of noise in this project will be the dredging process and use of a hydraulic pipeline dredge. Dredging usually produces lower levels of sound but with longer durations than activities like pile driving. A hydraulic pipeline dredge creates underwater noise through several processes including:

1) Dredge material collection sounds originating from the rotating cutterhead in contact with the bed and intake of the sediment-water slurry,

2) Sounds generated by pumps and impellers driving the suction of material through the pipes,

3) Transport sounds involving the movement of sediment through the pipes, and

4) Ship and machinery sounds, including those associated with the lowering and lifting of spuds and moving of anchors by dredge tenders.

One study indicated that pipeline cutterhead dredges have a source level at 1 meter of 172 dB – 185 dB re 1uPa rms, ranging from 100 – 500 Hz (Reine et al., 2012). CEDA (2011). A second study found sounds peaking at 100-110 dB in the frequency range of 700-1000 Hz and they were inaudible roughly 500 meters from the source (Clarke, 2002). Since most of sediment in this case is sand and silt, the noise generated should be on the quieter end of the range. See the fish, marine mammals, and birds sections for more specific information on impacts to organisms related to underwater noise. Impacts from noise will be temporary and minor and are expected to be insignificant.

4.8.3 Alt 3: -23 MLLW Channel

The noise impacts of removing sand and silt under this alternative are anticipated to be similar to those under Alternative 2 in that the sound generated will be the same, while the duration will be longer because of a longer dredging process. The rock removal process would generate higher levels of underwater noise than the removal and sand and silt. Less information is available about noise generated from rock blasting, which may be required for this alternative, compared to dredging sediment. A mechanical backhoe dredge that was engaged in rock fracturing and excavation generated sound levels of (170–175 dB re 1 lPa–1 m rms. Other sources associated with rock excavation had sound levels ranging from 164.2 to 179.4 dB re 1 lPa-1 m rms (Reine and Clarke, 2014). A study on underwater explosions found that in open water, a 20-kg charge has a peak pressure of 259 dB re 1 μPa (Kongsberg, 2015). Open water detonations produce higher amplitude and higher frequency shock waves than those that are contained in rock. This would be similar to the potential effects with this alternative. Hempen et al. (2005) evaluated pressures of open water shots compared to contained shots during a channel deepening and found that the contained shots had the pressure of 19 to 41% of the open-water shots. See species sections for more specific information on impacts to organisms related to underwater noise.

4.8.4 Cumulative Effects of the Preferred Alternative

No other construction activities are likely to occur at the same time as the proposed channel deepening that would impact aesthetics or noise above ambient conditions Neah Bay. Ongoing boat activities affect noise in the bay, but marine life is likely acclimated to such noise. Given the temporary and localized nature of the dredging and placement activities and the lack of other construction actions in Neah Bay, significant cumulative impacts to aesthetics and noise are not anticipated.

4.9 Marine Vegetation

The shoreline of Neah Bay is a mixture of beach and riprap. The area of proposed beneficial use is primarily riprap that is partially inundated at high tide. An early study documented 88 species of macroalgae in the Neah Bay area (Rigg and Miller, 1949). The waters of the bay are home to primary producers like phytoplankton, algae, and vascular plants including bull kelp (*Nereocystis luetkeana*), pickle weed (*Salicornia depressa*), sea lettuce (*Ulva fenestrata*), sugar wrack (*Laminaria saccharina*), Pacific rock weed (*Fucus distichus, F. gardneri*), kelp (*Pterygophora* sp.), green ribbon algae (*Enteromorpha* sp.), brown seaweeds (*Costaria costata, Sargassum muticum, Egregia menziesii*), red alga (*Gracilaria* sp.), and Pacific laver (*Porphyra* sp.) (Simenstad et al. 1988). A 2003 USCG survey around the USCG pier and within the area of proposed beach nourishment for this project found sparse vegetation including red algae like Turkish towel (*Chondracanthus exaspertus*), *Sarcodiotheca gaudichaudii*, red sea fan (*Callophyllis edentate*), California limu (*Gracilaria paficica*), red antlers (*Scinaia confusa*) and other unidentified small red algae. Brown algae included *Desmarestia* sp., sugar kelp (*Laminaria saccharina*), bladder kelp (*Nereosystis leutkeana*), California kelp (*Macrocystis integrifolia*) and *Egregia menziesii*, and green algae included sea staghorn (*Codium fragile*), sea lettuce (*Ulva* sp.) and *Enteromorpha* sp. (USCG, 2003).

The Washington Department of Natural Resources Marine Vegetation Atlas has two polygons that cover the portion of the shoreline where the dredged sediment will be placed; the atlas notes the presence of surfgrass but the absence of *Zostera* species in the section just to the west of Baada Point and notes both groups as absent in the next section to the west (Figure 4-2). The second polygon of interest extends from roughly halfway in between Baada Point to midway through the marina; the eastern portion of that polygon is within the area of proposed beach nourishment. The atlas states that California kelp (*Macrocystis integrifolia*) is present in both sections while bladder kelp (*Nereosystis leutkeana*) is present in the Baada Point area. Other results from the atlas include the presence of red algae and *Ulva* sp. and absence of *Gracilaria sp., Sargassum muticum* in both polygons.

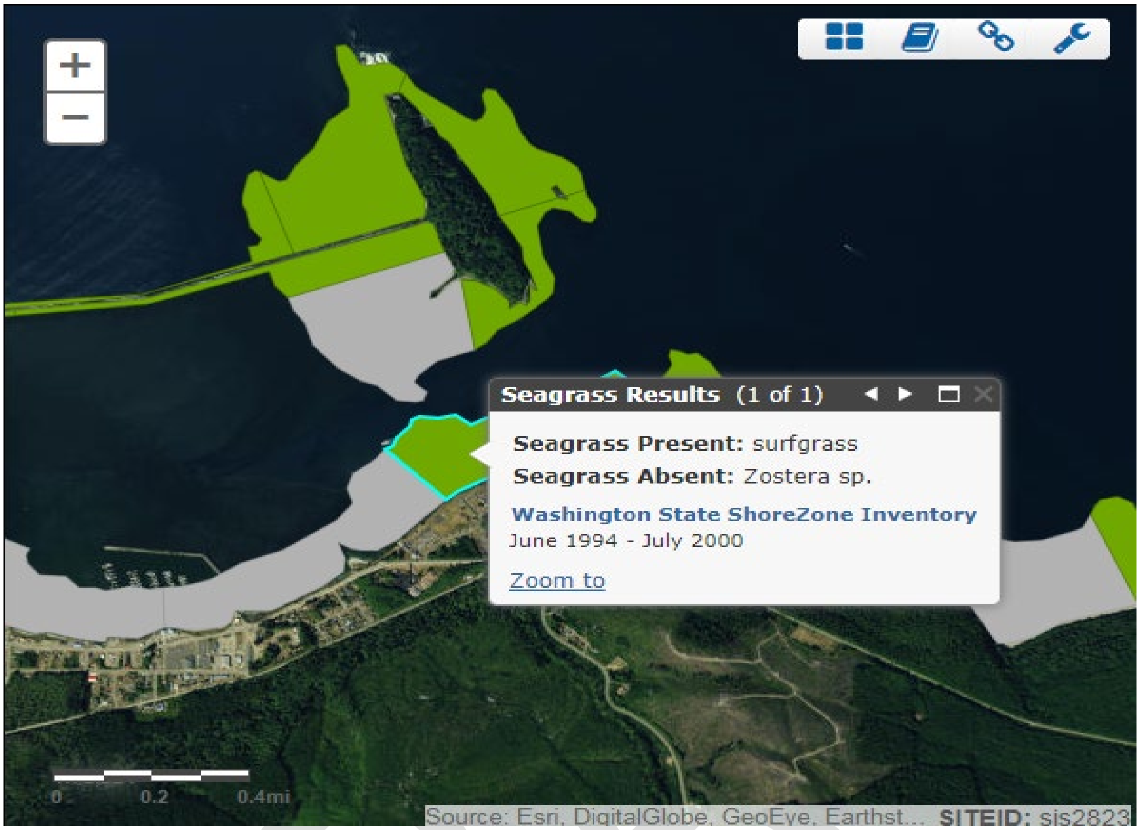

Figure 4-2. Marine Vegetation in Neah Bay

No marine vegetation exists in the navigation channel, as the depth is beyond the photic zone. Several marine vegetation surveys have been completed in the area of proposed beneficial use. A marine vegetation survey along the proposed placement shoreline was completed on the morning of September 27, 2016, starting at first light following a low tide by two Makah contractors. The survey area encompassed the nearshore area between Evans Mole and Baada Point, the proposed area for beach nourishment, and transects were spaced 25-feet apart. The survey was conducted using Tier 1 survey methodology from the USACE protocol outlined in *Components of a Complete Eelgrass Delineation and Characterization Report* (2016) and a complete write-up of the survey can be found in Appendix C. Another survey was done by a USACE biologist in March of 2017 to confirm the location of a bull kelp bed and an eelgrass patch observed during the September site visit. In general, there was sparse marine vegetation in the proposed area for beach nourishment. No eelgrass was observed, but a bull kelp bed occurs just to the west of the proposed placement area on the other side of the old fish processing dock. This kelp patch is up-drift of the proposed placement and therefore would not be affected. The Makah Tribe did a photo survey during a neap tide in May 2016 (see Appendix

C) and confirmed that there was no eelgrass within the proposed placement footprint. Patches of marine vegetation do occur throughout the area that consist of sea lettuce, sugar kelp, and other understory macroalgae. Information from these additional shoreline surveys can also be found in Appendix C.

4.9.1 Alt 1: No-Action Alternative

Existing vegetation will not be affected by this alternative.

4.9.2 Alt 2: -21 MLLW Channel (Preferred Alternative)

There is likely to be little to no impact associated with the dredging of the channel given the depth and little existing vegetation there. Marine vegetation does exist in the area of proposed for beach nourishment, an area that historically was emergent and intertidal beach before construction of shoreline armoring and logging roads (see Figure 5-1 and Figure 5-2 for historic photos). Placement of the dredged material will bury nearshore vegetation like sea lettuce, sugar kelp, and other understory macro-algae; but, would avoid the bull kelp bed just west of the old Makah Tribe fish processing dock. Disruption to marine vegetation will be temporary and recolonization is anticipated to happen quickly from recruitment from other parts of the bay that are undisturbed by sediment placement.

There will likely be small shifts in marine vegetation distribution where beach nourishment occurs as the nearshore habitat will change from mostly subtidal to a mix of subtidal, intertidal, and upland beach. To minimize disturbance to beach and nearshore vegetation, effort will be made to ensure that equipment used to place or spread sediment will access the beach from a single point. Equipment will be staged at an approved upland location. Given the long-term benefit to vegetation communities that would result from placing sediment, which would provide a natural beach profile more similar to the historic condition, no significant negative impacts to marine vegetation are anticipated.

4.9.3 Alt 3: -23 MLLW Channel

The results of this alternative would be similar in quality but greater in magnitude compared to Alternative 2. The disturbance to shoreline vegetation is anticipated to be greater due to the increased volume of dredge spoils used for beach nourishment. All rock that is removed/blasted would be recovered and placed upland. As with Alternative 2, no significant negative impacts to marine vegetation are anticipated.

4.9.4 Cumulative Effects of the Preferred Alternative

Historically, prior to construction of the outer breakwater, marine vegetation in Neah Bay was likely dominated by species that are more tolerant of the currents and wave exposure of the Strait of Juan de Fuca. Although patches of kelp do exists within Neah Bay, the shoreline also has vegetation communities associated with embayments due to the protection provided by the outer breakwater. The only other planned action that would impact marine vegetation in Neah Bay is the Makah Indian Tribe's proposed dredging and disposal of materials associated with the marina. This material will be placed just up drift of the proposed placement area associated with USACE'S dredging of the entrance channel (see Figure 4-1). The placement of materials from the marina will have similar impacts to those described for the USACE action described in the previous sections. These actions would both have temporary impacts to the vegetation by burying existing communities until the areas are recolonized. A net benefit would result from both actions placing sediment along a section of shoreline that has had its sediment input cut off by man-made structures, thereby creating a beach profile that supports marine vegetation that is more similar to historic conditions. No significant negative cumulative impacts to vegetation are anticipated.

4.10 Benthic Invertebrates

The primary benthic organisms in Neah Bay are marine invertebrates. Marine invertebrates have an important role in the coastal ecosystem; they are a relatively low trophic level in the food web and many species are also of commercial and subsistence harvest value to the Makah Indian Tribe. Surveys conducted in 1998 found that 31 species of shellfish and other invertebrates were still used by Makah members for subsistence purposes (Sepez, 2008). Some invertebrates like shellfish, are filter feeders, and their health is strongly influenced by local water quality. The local invertebrate community is healthy and diverse because of good water quality, strong tidal flushing, clean sediments and an abundant food supply.

Invertebrates that have documented in Neah Bay include (Cooney 1971, Jeffrey 1976, Simenstad et al. 1988, Shaw 1994):

- acorn barnacle (*Balanus glandula*)
- buckshot barnacle (*Cthamalus dalli*)
- thatched barnacle (*Semibalanus cariosus*),
- aggregating anemone (*Anthopleura elegantissima*),
- plumose anemone (*Metridium senile*),
- large eelgrass isopod (*Idotea resecata*),
- ochre sea star (*Pisaster ochraceus*), blood star (*Henricia leviuscula*),
- keyhole limpet (*Diodora aspera*),
- Sitka periwinkle (*Littorina sitkana*),
- checkered periwinkle (*L. scutulata*),
- turban snail (*Calliostoma costatum*), turret snail (*Batillaria zonalis*),
- the polychaete (*Capitella capitata*),
- mussels (*Mytilus spp*.), soft-shell clam (*Mya arenaria*),
- bent-nosed clam (*Macoma nasuta*),
- Baltic macoma clam (*Macoma balthica*),

- horse/gaper clams (*Tresus capax*),
- bivalves (*Transennella tantilla*, *Tellina spp*.),
- Pacific littleneck clam (*Protothaca staminea*),
- heart cockle (*Clinocardium nuttalli*),
- Dungeness crab (*Cancer magister*), graceful crab (*C. gracillis*),
- red rock crab (*C. productus*),
- yellow shore crab (*Hemigrapsus oregonensis*),
- purple shore crab (*H. nudus*), helmet crab (*Telmessus cheiragonus*),
- shielded-back kelp crab (*Pugettia producta*),
- porcelain crab (*Petrolisthes eriomerus*),
- coonstripe shrimp (*Pandalus danae*),
- spot prawns (*P. platyceros*), ghost shrimp (*Upogebia pugettensis*),
- skeleton shrimp (*Caprella californica*)

The 2003 USCG Biological Evaluation of the area around the USCG pier found the most significant species in that area were a number of clams including horse clams, littleneck clams, cockles, butter clams, and Sabellid feather duster worms.

4.10.1 Alt 1: No-Action Alternative

The benthic community will not be affected by this alternative.

4.10.2 Alt 2: -21 MLLW Channel (Preferred Alternative)

Invertebrates that are most likely to be impacted are those associated with or that can occupy softer substrate including, but not limited to, clams, cockles, sea stars, various worms species, isopods, anemones, crabs, and shrimp. Rock attaching invertebrates like barnacles, mussels, limpets, periwinkles, and sea urchins would not be affected. Any benthic organisms in the channel will be disturbed by this alternative and are likely to suffer direct mortality from entrainment in the dredge. However, the overall community and ecosystem is healthy in Neah Bay and relatively undisturbed, so it is expected that the population will recolonize and recover quickly. The beach area where sediment is placed will also see direct mortality during the placement operations, mostly of sessile organisms. Mobile organisms like crabs and shrimp have the opportunity to flee the area once they detect disturbance, although many may not escape.

A study conducted in Half Moon Bay in Westport, WA on a beach fill project found that the benthic community was not substantially altered by the beach fill maintenance activity and that they recolonized the disturbed area quickly (SAIC, 2005). It is likely that recruitment will occur from adjacent shorelines areas that will not be disturbed during this process, and benthic organisms will colonize the beach nourishment site once dredging is complete. As the shoreline will change from mostly subtidal to intertidal and emergent beach, an associated shift in community composition is expected that would reflect the change in habitat type. No long-term significant impacts to benthic communities are anticipated.

4.10.3 Alt 3: -23 MLLW Channel

The impacts from this alternative are anticipated to be like those of Alternative 2, but on a greater scale due to the larger footprint of placed sediment. As the dredging process will take longer and include rock blasting, there is also an increased likelihood of mortality in the channel. The rock in the channel that would require removal is under a layer of sand/silt, so communities associated with rocky substrate would not be affected. As with Alternative 2, no long-term significant impacts to benthic communities are anticipated.

4.10.4 Cumulative Effects of the Preferred Alternative

Historically, prior to construction of the outer breakwater, benthic communities in Neah Bay were likely dominated by species that are more tolerant of the currents and wave exposure of the Strait of Juan de Fuca. The only other planned action that would impact benthic invertebrates in Neah Bay is the Makah Indian Tribe's proposed dredging and disposal of materials associated with the marina. Entrainment of benthic invertebrates would result from both the Tribe's dredging of the marina and USACE's dredging of the entrance channel. As discussed previously, the material from the Tribe's dredging will be placed just up drift of the proposed placement area associated with USACE's dredging of the entrance channel. The placement of materials from the marina will have similar impacts to those described for the USACE action described in the previous sections. These actions would both have temporary impacts to the benthic invertebrate communities by burying existing communities until the areas are recolonized. A net benefit would result from both actions placing sediment along a section of shoreline that has had its sediment input cut-off by man-made structures, thus creating a beach profile that supports a benthic invertebrate community that is more similar to historic conditions. The Tribal members have expressed a preference for sediment placement along this section of shoreline to help restore clam beds that have been lost due to the downgrading of the beach (B. Parkin, pers. comm., March 2017). No significant negative cumulative impacts to benthic communities are anticipated.

4.11 Fish

Similar to the benthic community, because of the combination of abundant food resources, multiple habitat types and clean environmental conditions within the Neah Bay region, the local fish community is both healthy and diverse. The following fish species have been documented in the area (Simenstad et al. 1988):

- Pacific herring (*Clupea harengus pallasi*)
- northern anchovy (*Engraulis mordax*)

- surf smelt (*Hypomesus pretiosus*),
- Pacific sand lance (*Ammodytes hexapterus*)
- tube-snout (*Aulorhynchus flavidus*)
- Chinook salmon (*Oncorhynchus tshawytscha*)
- pink salmon (*O. gorbuscha*)
- chum salmon (*O. keta*), coho salmon (*O. kisutch*)
- lingcod (*Ophiodon elongatus*)
- cabezon (*Scorpaenichthys marmoratus*)
- black rockfish (*Sebastes melanops*)
- brown rockfish (*S. auriculatus*), copper rockfish (*S. caurinus*)
- quillback rockfish (*S. maliger*)
- kelp greenling (*Hexagrammos decagrammus*)
- striped sea perch (*Embiotoca lateralis*)
- starry flounder (*Platichthys stellatus*)
- spotted ratfish (*Hydrolagus colliei*)
- sturgeon poacher (*Argonus acipenserinus*)
- Pacific cod (*Gadus macrocephalus*)
- Pacific tomcod (*Microgadus proximus*)
- white sturgeon (*Acipenser transmontanus*)
- big skate (*Raja binoculata*)
- English sole (*Parophrys regulus*)
- Dover sole (*Microstomus pacificus*)
- rock sole (*Lipidoptsetta bilineata*)
- sand sole (*Psettichthys melanostictus*)
- speckled sand dab (*Citharichthys stigmaeus*)
- various species of sculpin (family *Cottidae*)
- stickleback (*Gasterosteus aculeatus*)
- penpoint gunnel (*Apodichthys flavidus*)
- crescent gunnel (*Pholis laeta*)

Two of the creeks that drain into Neah Bay, Village and Agency Creeks, are fish bearing streams. The anadromous populations of those creeks are comprised of coho and steelhead. The smolts out-migrate during spring and early summer while adult fish return to those creeks in fall and winter. It is likely that the smolts reside in Neah Bay for a short period of time before entering the Strait. There is no known forage fish spawning within Neah Bay (Martin, personal communication, 2018). Forage fish documented by Simenstad (1988) as present in the area include American shad, Pacific herring, northern anchovy, surf smelt, whitebait smelt, and Pacific sand lance. Of those, Pacific herring, surf smelt, and Pacific sand lance were the only ones that occurred with sufficient consistency and with significant enough numbers to indicate population structure. Most of the herring and surf smelt caught during sampling were post-larval or juvenile. The closest documented forage fish spawning, as noted in the WDFW forage fish spawning map, is Shipwreck Point, roughly ten miles to the east, a location of smelt spawning.

4.11.1 Alt 1: No Action

The fish community will not be affected by this alternative.

4.11.2 Alt 2: -21 MLLW Channel (Preferred Alternative)

Temporary effects to the fish community are likely during the dredging process (estimated to take 13 days). Those fish associated with rocky substrate like adult and sub-adult rockfish, lingcod, kelp greenling, and sculpin are unlikely to be impacted by the proposed action. Those fish associated with softer substrate, non-floating marine vegetation, and the pelagic zone have the potential to be impacted. These fish include adult and juvenile salmonids, flat fish like sole and flounder, forage fish like smelt, herring, anchovy, and sand lance, juvenile rockfish, ratfish, sea perch, and cod species. Impacts from dredging to these fish include sediment stress and physiological damage related to suspended sediment, release of toxic contaminants (although this is very unlikely at this location), hydraulic entrainment, noise pollution (Wenger et al., 2017), and smothering. The dredge spoils in this project are not anticipated to have any toxic contaminants; the remaining impacts are more likely under this alternative though actual impact will vary by life history and life stage of the fish. Suspended sediments can impair the foraging of visual predators, damage gill tissue and structure, and result in behavioral changes to avoid turbid areas. Entrainment, or the capture of fish in the dredging machinery, is possible and more likely for eggs or larval fish than adults. Evidence of entrainment of mobile adult fish shows low levels of capture; benthic fish or those in high densities are most likely to be caught (Drabble, 2012).

Impacts related to noise are likely to occur but should be temporary, and behavioral changes related to avoiding the noise are the most likely response by fish. High intensity underwater noise can result in temporary threshold shifts (TTS), non-injurious temporary reduction in hearing sensitivity. No permanent hearing loss has been documented in fish (NOAA 2016). Hearing varies depending upon the species of fish, however most react to sounds in the range of 50 Hz to 2 kHz with a minimum threshold around 70 dB (Hastings, 1995). Noise generated by hydraulic dredges are characterized as continuous (or non-pulsed), since the elevated sound pressure occurs over seconds (not milliseconds, as is the case with pulsed noise) (Agness, NMFS, personal comm., July 23, 2013). The following are noise thresholds for various forms of effects on salmonids for both impact and vibratory pile driving (note that vibratory pile driving is also considered continuous):

- 150 dB_{RMS}[5] for harassment for continuous noise for fish of all sizes (Hastings 2002)
- 187 dB cumulative SEL[6] for injury of fish ≥ 2 grams[7] (NMFS et al. 2008)
- 183 dB cumulative SEL for injury of fish < 2 grams (NMFS et al. 2008)
- 206 dB_{peak}[8] for injury of fish of all sizes (NMFS et al. 2008)

A more recent study lists the following continuous noise[2] thresholds based on Popper et al. 2014:

- For fish with swim bladders that are involved in hearing (e.g. herring, sardines, and anchovies)
  - 170 dB_{RMS} for 48 hours for recoverable injury
  - 158 dB_{RMS} for 12 hours for TTS (Temporary Threshold Shift, or complete recovery of hearing loss)
- There is no direct evidence for mortality or potential mortal injury for continuous noise
- There are no continuous noise thresholds set for fish without swim bladders (sculpins) or those with bladders that are not involved in hearing (salmonids)

Data for how continuous sound affects fish is limited and in the technical report of sound exposure guidelines prepared by Popper et al. (2014), they rank the level of risk of injury as high, moderate, or low for most categories of fish instead of presenting number thresholds for harm. As noted above, studies have shown that pipeline cutterhead dredges have a source level at 1 meter of 172 dB – 185 dB re 1uPa rms, ranging from 100 – 500 Hz (CEDA, 2011). A second study found sounds peaking at 100-110 dB in the frequency range of 700-1000 Hz and they were inaudible roughly 500 meters from the source (Clarke, 2002). According to Popper, the risk of mortality for continuous sound such as this is low for all categories of fish at all distances from the sources of sound; the risk of recoverable injury is the same except for fish with a swim bladder used for hearing. Their threshold for recoverable injury, 170 dB rms, is below the range for dredging described by Clarke as is the sound levels of temporary threshold shifts for the same types of fish, 158 dB rms. The risk of temporary threshold shift for the other groups of fish, those without swim bladders and those with swim bladders that do not use them for

[5] Decibels root mean square over a period of time
[6] Decibels sound exposure level over a 24 hour period (cumulative)
[7] Injury thresholds are based on pile driving (pulsed noise)
[8] Peak sounds in decibels

hearing, is moderate near the source of the sound but low for intermediate or far distances. Fish are not expected to linger near the source of the sound. Based on these guidelines, the most likely impacts to fish include behavioral effects like the avoiding preferred sites for feeding or reproduction due to sound, or masking, which is the impairment of hearing by greater than 6 dB in the presence of the anthropogenic sound.

The only fish in the study area that would be vulnerable to the physiological effects of noise generated by hydraulic dredging would be herring, and possibly sardine and anchovy, although the effects would be recoverable since the noise would not exceed the injury thresholds. There is potential for behavioral responses of all fish via harassment since there is potential for the sound levels to exceed the Hastings and NMFS thresholds, but these impacts would be temporary. Furthermore, the impacts of noise on fish would be insignificant since there is a finite community of fish that would be affected within the limited confines of the study area, which already has higher levels of ambient noise from vessel traffic; and the size of this affected sub-population would be minimal compared to communities in the adjacent Pacific Ocean.

The risk of smothering during sediment placement along the shoreline would be low for pelagic species that are mobile, but would be greater for benthic species like flatfish and burrowing sand lance. Berms would be used during construction to isolate the area and minimize in-water impacts to fish. After placement of materials along the shoreline, there would be a temporary loss of marine vegetation and benthic prey items for fish. However, the area is expected to recolonize within a few months and the shallower depth of the shoreline (both immediately on site and in the future in areas down-drift) will be more conducive to juvenile rearing for salmonids and forage fish species. Although no forage fish spawning has been documented with the project footprint, it is possible that it does occur, particularly for herring which are known to spawn on a variety of marine vegetation. Impacts to herring spawning will be avoided by working within the designated fish window.

Given that the impacts would be temporary and fishes' ability to avoid the area, no long-term significant impacts are anticipated.

4.11.3 Alt 3 -23 MLLW Channel

A portion of the impacts of this alternative will be the same as those for Alternative 2. The noise level and potential impacts related to the use of a cutterhead dredge to remove the sand and finer material will be the same as those outlined above with a proportional higher level of impact due to increased exposure time because of the additional time spent dredging. This alternative also includes the removal of rock. It is unknown if the rock can be removed with a dredge or would need to be removed by blasting methods. For the purposes of this analysis, a worst case scenario of blasting will be assumed. Table 4-6 is a summary from Popper et al. (2014) for potential fish mortality and injury associated with underwater explosives.

Table 4-6. Table 7.2 from Popper (2014): Fish and Sea Turtles Injuries Due to Explosions Noise

Table 7.2 Explosions: Guidelines for explosions. Levels other than for eggs and larvae from Hubbs and Rechnitzer (1952); levels for eggs and larvae from Wright and Hopky (1998). Guidelines are not provided for masking since the animals are not exposed to more than a few explosive events, and masking would not last beyond the period of exposure

Type of Animal	Mortality and potential mortal injury	Impairment			Behavior
		Recoverable injury	TTS	Masking	
Fish: no swim bladder (particle motion detection)	229 - 234 dB peak	(N) High (I) Low (F) Low	(N) High (I) Moderate (L) Low	NA	(N) High (I) Moderate (F) Low
Fish where swim bladder is not involved in hearing (particle motion detection)	229 - 234 dB peak	(N) High (I) High (F) Low	(N) High (I) Moderate (F) Low	NA	(N) High (I) High (F) Low
Fish where swim bladder is involved in hearing (primarily pressure detection)	229 - 234 dB peak	(N) High (I) High (F) Low	(N) High (I) High (F) Low	NA	(N) High (I) High (F) Low
Sea turtles	229 - 234 dB peak	(N) High (I) High (F) Low	(N) High (I) High (F) Low	NA	(N) High (I) High (F) Low
Eggs and larvae	>13 mm s^{-1} peak velocity	(N) High (I) Low (F) Low	(N) High (I) Low (F) Low	NA	(N) High (I) Low (F) Low

Notes: peak and rms sound pressure levels dB re 1 μPa; SEL dB re 1 μPa^2-s. All criteria are presented as sound pressure even for fish without swim bladders since no data for particle motion exist. Relative risk (high, moderate, low) is given for animals at three distances from the source defined in relative terms as near (N), intermediate (I), and far (F).

Ketten (1995) found that underwater explosives in the marine environment exceeded the injury threshold up to 1,000 meters from the source and the harassment threshold up to 10,000 meters from the source. However, this study was done in an open water environment and explosives in open water produce a higher frequency and amplitude shock wave than in environments such as enclosed embayment (Hempin et al. 2007). In addition to sound waves, the detonation velocity of the explosives would produce shock waves that result in nearly instantaneous rises in pressure and a rapid fall below ambient conditions that are likely to injure or kill fish within a certain radius around the blast (Hastings 2002 and Alaska Department of Fish and Game (ADFG) 2013a). When explosives are detonated in a confined manner (e.g., in bore holes) the pressure oscillates in a series of positive and negative pressure (ADFG 2013a). Godard et al. (2008) found that juvenile salmonids showed injury at overpressures as low as 10 pounds per square inch (psi). The ADFG (2013b) recommends limiting overpressures to no more than 7.3 psi. Impacts to fish from shock waves from explosives and elevated noise levels from blasting and drilling include mortality from internal organ damage, swim bladder rupture, internal hemorrhaging, embolisms, temporary and permanent hearing loss from middle and inner ear damage, elevated stress levels (as measured by cortisol levels); and behavioral responses like fleeing, changes in feeding patterns, and delayed migration (ADFG 2013a and Hastings and Popper 2005).

As with Alternative 2, all impacts discussed are temporary and, although there would likely be mortality of individuals, no long-term significant impacts to fish population are anticipated.

4.11.4 Cumulative Effects of the Preferred Alternative

Historically, prior to construction of the outer breakwater, fish communities in Neah Bay were likely dominated by species that are more tolerant of the currents and wave exposure of the Strait of Juan de Fuca. The only other planned action that would impact fish in Neah Bay is the Makah Indian Tribe's proposed dredging and disposal of materials associated with the marina. Entrainment of benthic species will result from both the Tribe's dredging of the marina and USACE's dredging of the entrance channel. As discussed previously, the material from the Tribe's dredging will be placed just up drift of the proposed placement area associated with USACE's dredging of the entrance channel. The placement of materials from the marina will have similar impacts to those described for the USACE action described in the previous sections. These actions would both have temporary impacts to the benthic fish communities by burying them. Rapid recolonization is likely from the adjacent area, as Neah Bay has healthy fish communities. A net benefit would result from both actions placing sediment along a section of shoreline that has had its sediment input cut-off by man-made structures, thus creating a beach profile and marine vegetation that is more similar to historic conditions. The shallower depth will provide refuge habitat for juvenile fish. No significant negative cumulative impacts to fish populations are anticipated.

4.12 Marine Mammals

Twenty-one species of marine mammals are known to inhabit the Strait of Juan de Fuca; nine of those species are listed as common. Those common species include the river otter (*Lutra canadensis*), California sea lion (*Zalophus californianus*), Steller sea lion (*Eumetopias jubatus*), harbor seal (*Phoca vitulina*), gray whale (*Eschrichtius robustus*), minke whale (*Balaenoptera autorostrata*), killer whale (*Orcinus orca*), harbor porpoise (*Phocoena phocoena*), and Dall's porpoise (*Phocoenoides dalli*). Marine mammals do not frequently occur within the bay itself other than California sea lions and harbor seals who use Waadah Island, at the eastern end of the breakwater, as a minor haul-out spot (WDFW, 2000). Occasionally, sea otters, Steller sea lions, and gray whales have been seen within Neah Bay (Calambokidis et al. 1987).

4.12.1 Alt 1: No Action

Marine mammals would not be affected by this alternative.

4.12.2 Alt 2: -21 MLLW Channel (Preferred Alternative)

The most likely impact to marine mammals from this alternative is due to the underwater noise generated by the dredging process. The National Marine Fisheries Service (NMFS) has provided technical guidance on the effects of underwater noise on the hearing of marine mammal species. The hearing ranges and acoustic thresholds at which marine mammals are predicted to experience changes in hearing due to non-impulsive anthropogenic underwater noise, such as dredging, are summarized in Table 4-7. There are different thresholds for temporary (TTS) and permenant threshold shifts (PTS) of hearing sensitivity. For non-impulsive sounds the thresholds are presented using the cumulative sound exposure level (SEL_{cum}) (NMFS, 2016).

Table 4-7. Generalized Hearing Ranges, PTS, and TSS Thresholds for Non-impulsive Sounds

Hearing Group	Generalized Hearing Range	PTS Onset Acoustic Thresholds (received level)	Weighted TTS onset acoustic threshold (SEL_{cum})
Low frequency (LF) cetaceans (baleen whales)	7 Hz to 35 kHz	L_E,LF,24h: 199 dB	179 dB
Mid-frequency (MF) cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales)	105 Hz to 160 kHz	L_E,MF,24h: 198 dB	178 dB
High-frequency cetaceans (true porpoises, *Kogia*, river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*)	275 Hz to 160 kHz	L_E,HF,24h: 173 dB	153 dB
Phocid pinnipeds (PW) (underwater) (true seals)	50 Hz to 86 kHz	L_E,PW,24h: 201 dB	181 dB
Otariid pinnipeds (PW) (underwater) (sea lions and fur seals)	60 Hz to 39 kHz	L_E,OW,24h: 219 dB	199 dB

NMFS 2016. In the PTS column, L_E is the cumulative sound exposure level, other abbreviations, like LF, represent the auditory weighting function for that group of marine mammals, and the accumulation period is 24 hours.

The dredging equipment can generate noise at 1 meter of 172 dB – 185 dB rms, ranging from 100 – 500 Hz (CEDA, 2011) and another study showed sounds peaking at 100-110 dB in the frequency range of 70-1000 Hz (Clarke et al. 2002). Note that these noise units are not the same as the thresholds listed a Table 4-7. There is no simple way convert the noise units in the literature to the NMFS threshold units without having the raw data. A 2018 BiOP issued to USACE for eight maintenance dredging projects assumed dB_{RMS} and dB_{SEL} to be equal for continuous noise. The BiOp also noted that noise associated with the hydraulic dredge cutterhead as 150 dB_{SEL} and a hydraulic dredge engine as 165 dB_{SEL}, both of which are below TTS onset threshold and PTS thresholds (NMFS 2018). Behavioral changes from noise avoidance are the most likely impacts to marine mammals. Few marine mammals, other than seals and sea lions, frequent the protected waters within the bay, so the impacts within the bay itself are predicted to be low. The sound exposure level (SEL), the threshold that causes a temporary shift in hearing ability, is 181 dB and 199 dB for seals and sea lions, respectively, which is above the level of noise generate by dredging cited by Clarke. Note that the noise levels in CEDA 2011 are not in the same units as the NMFS thresholds. The sounds from dredging are inaudible roughly 500 meters from the source (Clarke, 2002); since the dredging will take place near the entrance to the bay the noise will project some distance out into the Strait depending on the location of equipment. The PTS thresholds for all groups of marine mammals are unlikely to be exceeded under this alternative.

In addition to underwater noise generated by dredging directly affecting marine mammals, noise may also cause the displacement of food sources, such as fish, that are avoiding the work area. Marine mammals themselves are anticipated to avoid the work area, and any impacts are likely to be temporary with normal behaviors resuming once the project is completed. No long-term significant impacts to marine mammal populations are anticipated.

4.12.3 Alt 3 -23 MLLW

The impacts related to the dredging of sediment under this alternative are the same as those for the preferred alternative, though there will be a longer window of potential disturbance due to the lengthier dredging process. Blasting methods for rock removal is assumed for noise impacts, and will generate louder, more explosive sound compared to the continuous sound of dredging. NMFS has a different set of thresholds for explosive and other impulsive sources, and they are presented in Table 4-8 below using dual metrics of cumulative sound exposure (SEL_{cum}) and peak sound level (PK).

Table 4-8. Marine Mammal TTS and PTS Thresholds for Explosives and Other Sources
(For Different Marine Mammal Hearing Groups - NMFS 2016)

Group	Hearing threshold at f_0	TTS threshold		PTS threshold	
	SPL (dB SPL)	SEL (weighted) (dB SEL)	peak SPL (dB SPL)	SEL (weighted) (dB SEL)	peak SPL (dB SPL)
LF	54	168	213	183	219
MF	54	170	224	185	230
HF	48	140	196	155	202
SI	61	175	220	190	226
OW	67	188	226	203	232
PW	53	170	212	185	218

LF= low frequency cetecean, MF=mid-frequency cetecean, HF= high frequency cetecean, SI= sirenians (manatees), OW= otarids (eared seals, sea lions, sea otters), PW= phocids (true seals)

Given the noise levels associated with blasting regularly exceeds injury thresholds for fish (see section 4.11.3), it is likely that both TTS and PTS thresholds for marine mammals will also be exceeded and there is potential for damage associated with the shock wave caused by underwater explosives. Pinnipeds, seals and sea lions, have the greatest risk of exposure since they are regular inhabitants of Neah Bay. Although there is risk of hearing and tissue damage to individuals, significant impacts to marine mammal populations in Neah Bay are not likely.

4.12.4 Cumulative Effects of the Preferred Alternative

Currently, the most numerous marine mammal species in Neah Bay are harbor seals and California sea lions, which tend to take refuge in calmer waters created by the breakwater and are known to haul out on manmade structures. These species are also more tolerant of human activity. The only other planned action that would impact marine mammals in Neah Bay is the Makah Indian Tribe's proposed dredging and disposal of materials associated with the marina. Noise disturbance will result from both the Tribe's dredging of the marina and USACE's dredging of the entrance channel, but are unlikely to occur at the same time. As discussed previously, the material from the Tribe's dredging will be placed just up drift of the proposed placement area associated with USACE's dredging of the entrance channel. The placement of materials from the marina will have similar impacts to those described for the USACE action in the previous sections. These actions would both have temporary impacts to the benthic fish communities, which are prey items of pinnipeds, by burying them. Rapid recolonization is likely from the adjacent area, as Neah Bay has healthy fish communities. A net benefit would result from both actions placing sediment along a section of shoreline that has had its sediment input cut-off by man-made structures, thus creating a beach profile and marine vegetation that is more similar to historic conditions. The shallower depth will provide refuge habitat for juvenile fish, which will provide a prey base for marine mammals. No significant negative cumulative impacts to marine mammals are anticipated.

4.13 Birds

Washington Department of Fish and Wildlife (WDFW) Marine Bird Density Atlas displays distributions and density indices for marine birds and diving waterfowl species seen by aerial surveys conducted since 1992 by WDFW. Neah Bay and the surrounding area have a high density of marine birds (Figure 4-3). Common birds in Neah Bay include scaups, scoters, buffleheads (*Bucephala albeola*), black turnstones (*Arenaria melanocephala*), and various gull species. Tatoosh Island, Seal and Sail Rocks, located outside of Neah Bay, are roosting sites for nesting pairs of gulls, comorants, tufted puffins (*Fratercula cirrhata*), rhinoceros auklets (*Cerorhinca monocerata*), common murres (*Uria aalge*), and storm petrels (*Oceanodroma* spp.) (Wahl et al., 1981). Other species that have been documented in Neah Bay include double-crested and pelagic coromorants (*Phalacrocorax auritus* and *P. pelagicus*), a number of ducks, pigeon guillemots (*Cepphus columba*) and marbled and ancient murrelets (*Brachyramphus marmoratus* and *Synthliboramphus antiquus*) (EDAW, 2005). Bald eagles (*Haliaeetus leucocephalus)* are known to nest year-round around Neah Bay and are listed among the WDFW Priority Species for Neah Bay.

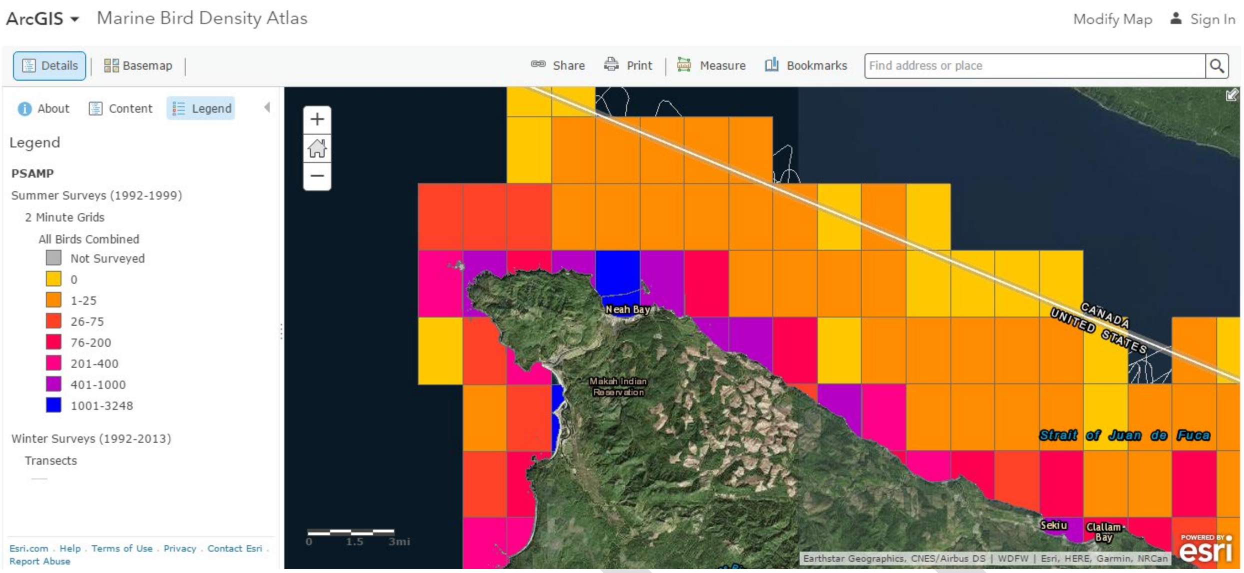

Figure 4-3. WDFW Marine Bird Density Atlas[9]

4.13.1 Alt 1: No-Action Alternative

Birds would not be affected by this alternative.

4.13.2 Alt 2: -21 MLLW Channel (Preferred Alternative)

There will be temporary impacts to bird populations due to elevated turbidity and noise, and potential impacts to their prey base. They are anticipated to avoid the work area and forage in the remainder of the bay or nearby where there is no disturbance. Little is known about how underwater noise effects diving birds. Diving birds near regular sources of noise may be habituated to the sounds; diving birds near the Ballard Locks show no effects or alternations in behavior (University of Maryland 2000). The first measurements of underwater auditory thresholds for diving birds were measured on long-tailed ducks. They responded to high intensity stimuli greater than 117 dB (Therrien 2014). For marbled murrelets the U.S. Fish and Wildlife Service (USFWS) uses 150 dB rms as a "guideline" for where to consider exposure to continuous sounds and the potential behavioral responses that exposure within that area would cause (E. Teachout, USFWS, pers. comm, Dec 27, 2017). Note this is below the noise levels cited in CEDA 2011 for hydraulic dredging. Given the differences in physiology and behavior of diving birds it is hard draw conclusions from the limited data, but it seems that the most likely consequences of the dredging noise will be avoidance of the area initially, with potential return of the birds to regular behavior as they become accustomed to the noise.

[9] http://www.arcgis.com/home/webmap/viewer.html?webmap=2d7eb8143c3c49679dcf8af25ee20b0a&extent=-127.2413,46.3222,-119.1279,49.3197

Forage fish, a prey item of many marine birds, may be affected by the dredging and placement of materials. This is particularly true for sand lance, which burrow in the sediment, but recolonization would occur from nearby populations in Neah Bay. Other species, like herring and anchovy, are pelagic and can avoid the area of disturbance. No long-term significant impacts to bird populations in Neah Bay are anticipated.

4.13.3 Alt 3: -23 MLLW Channel

The impacts related to the dredging of sand portion of this alternative will be similar to those from Alternative 2 with an extended length of disturbance because of the additional time needed to dredge to this depth. The noise from blasting rock will result in a greater response from birds, with potential for hearing and tissue damage to them and their prey items. They will likely disperse farther from the source of noise and take longer to return. The sound will travel farther underwater than dredging alone. As with Alternative 2, no long-term significant impacts to bird populations in Neah Bay are anticipated.

4.13.4 Cumulative Effects of the Preferred Alternative

The outer breakwater has created refuge for birds seeking calmer water that that of the Strait of Juan de Fuca, although they also need to be more tolerant of human activity. The only other planned action that would impact marine birds in Neah Bay is the Makah Indian Tribe's proposed dredging and disposal of materials associated with the marina. Noise disturbance will result from both the Tribe's dredging of the marina and USACE's dredging of the entrance channel, but they are unlikely to occur at the same time. As discussed previously, the material from the Tribe's dredging will be placed just up drift of the proposed placement area associated with USACE's dredging of the entrance channel. The placement of materials from the marina will have similar impacts to those described for the USACE action in the previous sections. These actions would both have temporary impacts to the benthic fish communities, which are prey items of marine birds, by burying them. Rapid recolonization is likely from the adjacent area, as Neah Bay has healthy fish communities. A net benefit would result from both actions placing sediment along a section of shoreline that has had its sediment input cut off by man-made structures, thus creating a beach profile and marine vegetation that is more similar to historic conditions. The shallower depth will provide refuge habitat for juvenile fish, which will provide a prey base for birds. No significant negative cumulative impacts to marine birds are anticipated.

4.14 Threatened and Endangered Species

Table 4-9, below, is a list of ESA listed species and their critical habitat that occur within the action area[10]:

Table 4-9. ESA Listed Species Found within the Vicinity of Neah Bay

Species	Listing	Critical Habitat
Puget Sound Chinook Salmon (*Oncorhynchus tshawytscha)*	Threatened	Designated; none in action area
Hood Canal Summer Chum (*Oncorhynchus keta)*	Threatened	Designated; none in the action area
Puget Sound Steelhead (*Oncorhynchus mykiss)*	Threatened	Designated; none in the action area
Coastal/Puget Sound Bull Trout *(Salvelinus confluentus)*	Threatened	Designated; none occurs at the action area
Marbled Murrelet (*Brachyramphus marmoratus*)	Threatened	Designated; none occurs in the action area
Short-tailed Albatross (*Phoebastria albatrus*)	Endangered	Not designated
Pacific Eulachon (southern DPS) (*Thaleichthys pacificus)*	Threatened	Designated; none in the action area
Green sturgeon (southern DPS) (*Acipenser medirostris)*	Threatened	Designated; occurs in the action area
Southern Resident Killer Whale *(Orcinus orca)*	Endangered	Designated; occurs in the action area
Humpback Whale (*Megaptera novaeangliae*)	Threatened	Not designated

Other ESA listed species potentially found in the general vicinity of the project in the Strait of Juan de Fuca and the Pacific Coast of Washington include blue whale, sperm whale, and green

[10] Per the Federal Endangered Species Act, the action area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action."

and leatherback sea turtles. However, these species are found in deeper, offshore waters, well away from the action area, and some, such as the blue whale, may be very unlikely to be nearby. Thus, "**no effect**" is anticipated for these species or their critical habitat. Puget Sound bocaccio and yellow-eye rockfish, which are ESA listed east of Port Angeles and in all of Puget Sound (NMFS 2010a), are not considered to be in the western Strait of Juan de Fuca because of their non-migratory, close homing behavior. Therefore USACE has not evaluated the effects of this action on these rockfish species.

4.14.1 Alt 1: No-Action Alternative/Future Without-Project Conditions

Threatened and endangered species would not be affected by this alternative.

4.14.2 Alt 2: -21 MLLW Channel (Preferred Alternative)

There are likely to be temporary and localized impacts to threatened and endangered fish, bird, and marine mammal populations from dredging similar to those described in sections 4.11, 4.12, and 4.13, including exposure to elevated turbidity and noise, potential entrainment, and impacts to prey. USACE has prepared a Biological Assessment (BA) and submitted it to the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) to comply with section seven of the Endangered Species Act. The BA evaluated the effects of the proposed action on ESA-listed species and their critical habitat (if present) in the action area. Table 4-10, below, summarizes USACE's determinations:

Table 4-10. USACE Preliminary Effects Determinations for ESA Listed Species

Species	Species	Critical Habitat
Puget Sound Chinook Salmon	NLAA	NE
Hood Canal Summer Chum	NLAA	NE
Puget Sound Steelhead	NE	NE
Coastal/Puget Sound Bull Trout *Salvelinus confluentus*	NLAA	NE
Marbled Murrelet *Brachyramphus marmoratus*	NLAA	NE
Short-tailed Albatross *Phoebastria* (=*Diomedea*) *albatrus*	NE	ND
Pacific eulachon (southern DPS) *Thaleichthys pacificus*	NLAA	NE
Green sturgeon (southern DPS) *Acipenser medirostris*	LAA	LAA

Species	Species	Critical Habitat
Southern Resident Killer Whale *Orcinus orca*	NLAA	NLAA
Humpback Whale	NLAA	ND

NLAA= Not likely to adversely affect, NE= No effect, LAA= Likely to adversely affect, ND= None designated

Rationales for these determination are listed below:

Puget Sound Chinook: Based on the low likelihood of juvenile Puget Sound Chinook to be in Neah Bay during the in-water work window, the ability of adults to avoid the construction activities, the use of BMPs during construction, and the long-term benefit of the placement of material along the shoreline USACE has determined that the proposed action **"may affect, but is not likely to adversely affect"** Puget Sound Chinook salmon. Because designated critical habitat is not in the action area, the work will have "**no effect"** on designated critical habitat for this species.

Hood Canal Summer Chum: Based on the low likelihood of juvenile Hood Canal summer chum being in Neah Bay during the in-water work window, the ability of adults to avoid the construction activities, the use of BMPs during construction, and the long-term benefit of the placement of material along the shoreline USACE has determined that the proposed action **"may affect, but is not likely to adversely affect"** Puget Sound Chinook salmon. Because designated critical habitat is not in the action area, the work will have "**no effect"** on designated critical habitat for this species.

Puget Sound Steelhead: Given the behavior of steelhead to migrate out to deeper water once they enter saltwater, it is highly unlikely that Puget Sound steelhead would be exposed to any of the stressors associated with the dredging and placement of materials in Neah Bay. Based on this low likelihood of occurrence USACE has determined the proposed action will have **"no effect"** on Puget Sound steelhead. Because designated critical habitat is not in the action area, the work will have "**no effect"** on designated critical habitat for this species.

Bull Trout: Based on the low likelihood of bull trout to be in Neah Bay, the ability of adults to avoid the construction activities if they are present, the use of BMPs during construction, and the long-term benefit of the placement of material along the shoreline that would benefit their forage base, USACE has determined that the proposed action **"may affect, but is not likely to adversely affect"** Coastal/Puget Sound bull trout. Because designated critical habitat is not in the action area, the work will have "**no effect"** on designated critical habitat for this species.

Marbled Murrelet: Since construction activities will have no effect on nesting habitat, long-term effects to the murrelet food base are not anticipated, and the effects of any noise disturbance during construction are expected to be minor and short in duration, the proposed project "**may**

affect, but is not likely to adversely affect" marbled murrelet. Because designated critical habitat is not in the action area, the work will have "**no effect"** on designated critical habitat for this species.

Short-tailed Albatross: Given the very low likelihood of occurrence in the study area, USACE has determined the proposed action will have **"no effect"** on short-tailed albatross.

Pacific Eulachon: Based on the low density of eulachon in Neah Bay, their ability to avoid the construction activities if they are present, and the use of BMPs during construction, USACE has determined that the proposed action **"may affect, but is not likely to adversely affect"** Pacific eulachon. Because designated critical habitat is not in the action area, the work will have "**no effect"** on designated critical habitat for this species.

Green Sturgeon Southern Distinct Population Segment (DPS): Although density of southern DPS green sturgeon is likely low in Neah Bay, their benthic-oriented behavior puts them at a greater risk of entrainment than pelagic species of fish. Furthermore, there will be temporary impacts to their forage base, which includes benthic invertebrates like shrimp, crab, worms, amphipods, and isopods (Center for Biological Diversity 2018), in the channel and possibly a permanent impact to their forage base at the placement area. BMPs will minimize impacts to water quality during dredging and placement. Based on the risk of entrainment and impacts to their prey base, USACE has determined that the proposed action **"may affect, is likely to adversely affect"** green sturgeon and their critical habitat.

Southern Resident Killer Whale: Based on the low likelihood of occurrence in Neah Bay, their ability to avoid the elevated noise and degraded water quality, and minimal short-term impacts and long-term benefits to their prey, USACE has determined that the proposed action **"may affect, but is not likely to adversely affect"** southern resident killer whales or their critical habitat.

Humpback Whale: Based on the low likelihood of occurrence in Neah Bay, their ability to avoid the elevated noise and degraded water quality, and minimal short-term impacts to their prey, USACE has determined that the proposed action **"may affect, but is not likely to adversely affect"** humpback whales.

In summary, impacts to ESA listed species would be temporary and no long-term significant impacts would result from the proposed action.

USACE received a letter of concurrence from the USFWS for species under their jurisdiction on June 21, 2018. USACE received a Biological Opinion (BiOp) from NMFS for species under their jurisdiction on March 29, 2019. NMFS did not agree with USACE's determinations for Puget Sound Chinook and steelhead, and Hood Canal summer chum, and they determined the action was "likely to adversely affect" these species. The BiOp issued an incidental take statement, and reasonable and prudent measures with associated terms and conditions to minimize take. USACE will comply with all the terms and conditions.

4.14.3 Alt 3: -23 MLLW Channel

Impacts of this alternative are similar to those described in sections 4.11, 4.12, and 4.13, including exceedances of TTS and PTS thresholds and tissue damage caused by the noise and overpressure associated with blasting. Although there is a potential to harm and harass individuals with this alternative, there would be no long-term significant impacts to populations of ESA listed species in the action area.

4.14.4 Cumulative Effects of the Preferred Alternative

Cumulative effects are similar to those described in sections 4.11, 4.12, and 4.13, including the impacts of the breakwater on Neah Bay and the impacts of the planned Makah Project in the marina, in combination with the impacts of the preferred alternative.

4.15 Cultural Resources

Cultural resources are locations on the physical landscape of past human activity, occupation, or use and typically include archaeological sites such as lithic scatters, villages, procurement areas, resource extraction sites, rock shelters, rock art, shell middens; submerged resource types such as fish traps, weirs, or watercraft; historic era sites such as trash scatters, homesteads, railroads, ranches, logging camps; and any structures or buildings over 50 years old. Cultural resources include traditional cultural properties, which are aspects of the landscape that are a part of traditional lifeways and practices and are considered important to a community. Properties protected under Section 106 of the National Historic Preservation Act (NHPA) are those listed or eligible for listing in the National Register of Historic Places. Eligible properties must generally be at least 50 years old and possess integrity of physical characteristics, meaning it must "possess integrity of location, design, setting, materials, workmanship, feeling and association" (36 CFR 60.4). Finally, an historic property must be significant under one or more of the following criteria.

- Criterion A. Be associated with events that have made a significant contribution to broad patterns of our history.
- Criterion B. Be associated with the lives of persons significant to our history.
- Criterion C. Embody the distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction.

- Criterion D. Have yielded, or may be likely to yield, information important in prehistory or history.

The project lies within the Makah Indian Tribe's ancestral homeland and within the boundaries of its current reservation is located at the Northwest point of the Olympic Peninsula in Washington State. The existence of the Makah Tribe has always been closely tied to their relationship with the ocean. Five permanent villages made up the Makah community: Bahaada, Deah (present day Neah Bay), Waatch, Sooes, and Ozette. The two ethnographically reported villages included Bahaada and Deah Village, which was located at the west end of the Bay adjacent to the present-day town of Neah Bay. Bahaada, the larger of the two villages, was located east of the boat harbor near Baada Point at the mouth of Agency Creek.

For this project, the Port of Neah Bay hired a consultant to conduct an assessment of the archaeological potential for the study area (Wessen 2017). The assessment indicates that the closest archaeological sites to the study area are 45CA211, 45CA512 and 45CA513. Site 45CA513 is located on Waadah Island along the southeastern shoreline and has been identified as cemetery for two individuals associated with the Baada Point Life Saving Station. Site 45CA512 is a cluster of petroglyphs with dates and initials likely carved by Bureau of Indian Affairs employees. The petroglyphs range in date from 1892 to 1954. The third site is 45CA513 and has been identified as a historic dump associated with the Makah Indian Agency School (Wessen 2017). The archaeological assessment of the study area concluded that there is a low probability of finding archaeological sites within the study area. The report notes that the northwestern tip of the Olympic Peninsula has been undergoing uplift for the past millennia and that older Holocene shorelines are now located in the current nearshore forest settings. This means that the current lower intertidal and shallow subtidal zones of today were once located deep below sea level. Therefore, the current intertidal and shallow subtidal zones would not contain intact inundated archaeological deposits.

A review of the Washington Information System for Architectural and Archaeological Records Data (WISAARD) shows the archaeological sites referenced in the Wessen report, three potential shipwrecks within Neah Bay and a previous cultural resource survey that was conducted in 1993 for the then-proposed Neah Bay Navigation Improvement project. A multibeam survey undertaken by the National Oceanic Atmospheric Administration (NOAA) in 2001 encountered two shipwrecks. The first shipwreck is the Songefjord wreck, which sank in 1983. The second wreck was previously charted in a NOAA survey, but the 2001 survey noted that it was 400 meters southwest of its last charted location. This second wreck is unidentified but according to the NOAA data is a 32-foot fishing vessel. The WISAARD database notes a possible third shipwreck identified as the Una. The Una was a Hudson's Bay Company ship which was driven ashore near Cape Flattery in December of 1851 due to bad weather. Accounts indicate that the crew of the Una survived (Douglas to Earl Gray May 18, 1852). The 1993 cultural resources report prepared by USACE archaeologist David Rice was for the marina and breakwater that has since been constructed (Rice 1993). The 2017 Wessen report and the review of the WISAARD database indicate that there are no archaeological sites or shipwrecks located in the study area.

4.15.1 Alt 1: No-Action Alternative

This action will have no effect on any cultural resources.

4.15.2 Alt 2: -21 MLLW Channel (Preferred Alternative)

Since there are no cultural resources located near or in the study area this action will also have no effect on any cultural resources. There is no expectation that any cultural material will be discovered during the project, however, an inadvertent discovery protocol will be put in place.

4.15.3 Alt 3: -23 MLLW Channel

The impacts from this alternative will be similar to those of Alternative 2. Even though the channel will be deeper, there is still no expectation of encountering cultural resources. The same instructions would be given about inadvertent discovery.

4.15.4 Cumulative Effects of the Preferred Alternative

There are no cumulative effects of the preferred alternative to cultural resources. There is no expectation of encountering cultural resources either in the navigation channel or the beach nourishment area.

4.16 Tribal Trust Assets

The Treaty of 1855 was signed on January 31, 1855 between the United States government and the Makah Indian Tribe. In this treaty the Makah ceded some of their territory but maintained the "right of taking fish and of whaling or sealing at usual and accustomed (U&A) ground and stations." These rights have been upheld in court decisions, including the 1974 Boldt decision. The Makah Usual and Accustomed Treaty Area, defined in sub-proceeding under *United States v. Washington* (1985), is located in waters of the United States off the outer coastline north from 48° 02'15" latitude and east of 125° 44'00" longitude and in the western end of the Strait of Juan de Fuca east to 123° 41'56" (Figure 4-4). This project is within the Makah U&A. The Makah actively exercise their fishing rights and have commercial and subsistence fisheries for halibut, groundfish, salmon and additional species.

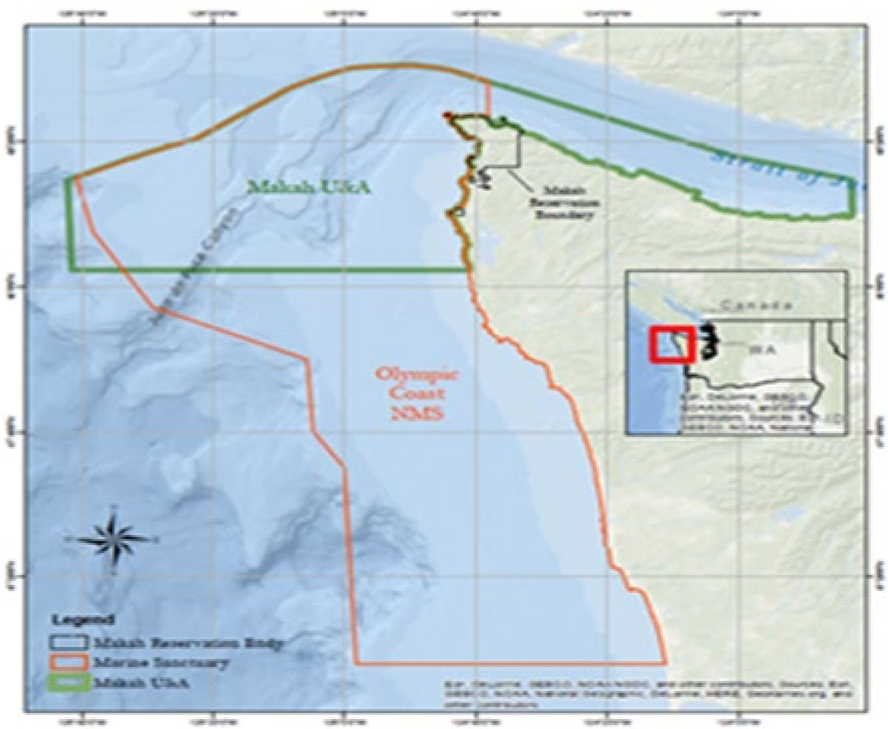

Figure 4-4. Makah Usual and Accustomed Treaty Area

4.16.1 Alt 1: No-Action Alternative

Tribal Trust Assets will not be affected by this alternative.

4.16.2 Alt 2: -21 MLLW Channel (Preferred Alternative)

Tribal Trust Assets would be minimally affected by this alternative. Dredging will be conducted in a manner such that it does not interfere with fishing vessels leaving the harbor. There would be temporary disturbances to their target fishery species, such as salmon, which may affect their catch rate within Neah Bay during dredging and placement. USACE will coordinate with the Makah Tribe to minimize impacts to their Tribal fisheries. A long-term benefit is expected at the placement area since opportunities from shellfish harvest will improve as the area transitions from subtidal to intertidal and upland beach.

4.16.3 A -23 MLLW Channel

The impacts from this alternative would be the same as those of Alternative 2, however since dredging and potential blasting will last longer, there is a greater chance of conflict with fishing vessels. Blasting would have a greater impact on target species.

4.16.4 Cumulative Effects of the Preferred Alternative

The modifications historically made to Neah Bay currently benefit Tribal fishing as moorage is provided for boats and easy access to Makah Tribal U&A fishing. A long-term benefit is expected from the placement of materials along the shoreline from USACE's channel deepening, as well as the Makah's marina dredging; since opportunities for shellfish harvest will improve as the area transitions from subtidal to intertidal and upland beach. No negative cumulative impacts to Tribal Trust Assets are expected.

4.17 Recreational Resources

Many tourists frequent the areas surrounding Neah Bay in pursuit of open space and recreation and use it as an access point for the northern beaches of the Olympic National Park. Recreation activities occurring near the project site include, but are not limited to, hiking, hunting, boating, fishing, crabbing, clam digging, beach combing, bird watching, surfing, snorkeling, diving, and picnicking. These activities occur primarily in the late spring, summer, and early fall when weather is more favorable, however Tribal members and other locals likely use the area for recreation year-round.

4.17.1 Alt 1: No-Action Alternative

Recreational resources will not be affected by this alternative.

4.17.2 Alt 2: -21 MLLW Channel (Preferred Alternative)

There will be a temporary disruption to aquatic recreational activities while the dredging is taking place; any disruption should be minimal and temporary given the proposed dredging is only expected to take 13 days of the in-water work window of July 16 through February 15. Access to and from the marina would occur on the side of the dredge that does not include the pipeline. Many of the recreational activities in the area take place at the beaches on the ocean side of reservation, away from the dredging site. The beach nourishment may lead to an increase of recreational activities such as beach walking and shellfish gathering. Given the minor and temporary impacts to recreation, impacts are expected to be insignificant.

4.17.3 -23 MLLW Channel

The impacts from this Alternative would be the same as Alternative 2, however the disruption to recreational activities will last longer due to increased time needed to complete this alternative. Rock blasting and associated underwater noise may impact fishing in the immediate area as fish will likely avoid the greater channel area during the blasting.

4.17.4 Cumulative Effects of the Preferred Alternative

Cumulative impacts to recreation would derive from past modifications of Neah Bay, combined with current and future actions. The modifications that have been made to Neah Bay are currently a benefit to recreation, as they provide moorage for boats and easy access for recreational fishing in the Strait of Juan de Fuca. The outer jetty can be a popular dive spot. The impacts of the project are unlikely to have cumulative effects on recreation when combined with these past actions and the one planned Makah project near the marina, since past actions have benefited recreation and the one planned, future action is unlikely to occur at the same time. Therefore, no cumulative impacts to recreation are expected.

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5 Tentatively Selected Plan - Agency Preferred Alternative

This chapter discusses the details of the Tentatively Selected Plan (TSP) which includes material quantities and classifications, requirements for operations, maintenance, repair, rehabilitation, and replacement (OMRR&R), dredged material placement, and costs. The navigation improvements respond to local needs and desires as well as the economic and environmental criteria used to screen, evaluate, select, and refine measures and alternatives. If implemented, the TSP would handle the current and forecasted vessel fleets with improved safety, fewer delays, and less congestion and damages than under the No-Action Alternative while avoiding unacceptable adverse environmental impacts.

5.1 Description of the TSP

The TSP is Alternative 2, as identified in section 3.6. Alternative 2 includes a -21 feet MLLW channel, 375-foot diameter turning basin, and beneficial placement of dredge material along the shore in Neah Bay.

5.1.1 Design

Details of the TSP entail deepening the existing navigation channel to -21 feet MLLW (mean lower low water) plus 2 feet allowable overdepth, for a total of -23 feet MLLW. The proposed channel is 4,500 feet long and 300 feet wide with a 375-foot diameter turning basin, although this entire length does not need to be dredged due to naturally-occurring deeper waters. This will require up to 36,000 cubic yards of material to be dredged from the channel and placed along the shoreline to the south of the channel via hydraulic pipeline dredge. See Figure 1-3 for the project footprint and Figure 1-4 for the channel cross-section. Project design details will continue to be developed and refined in the pre-construction, engineering and design (PED) phase.

The proposed dredge material disposal location is the along the southern shoreline of Neah Bay between the USCG dock and the “old tribal fish processing dock” (Figure 1-3). This section of shoreline is currently backed by a large revetment, initially placed to reduce erosion. This armoring, along with the construction of logging haul roads, has cut-off sediment input to this shoreline, which derived from erosion of the shoreline and input from Agency and Halfway Creeks. Historical photos from the late 1800’s from the Makah Museum show a significant upland beach with a steep slope along Baada Point and a flatter, wider beach further into the bay (Figure 5-1 and Figure 5-2). The next data point is a 1932 survey (approximately 10 years after the elimination of sediment supply) which shows severe erosion of the intertidal nearshore and subaerial beach in this area. This trend continues in the next survey, a 1955 preconstruction survey for the revetment that shows a total loss of the subaerial beach and a significant conversion of intertidal to subtidal (Figure 5-3). The revetment, constructed in 1956, slowed the rate of upland erosion. The conversion of the intertidal to subtidal has continued and is evident in a 2017 survey. The proposed placement is an attempt to recreate the beach conditions which existed prior to the construction of the haul roads and revetment, and consequent loss of sediment supply (see orange line on Figure 5-3 and cross section on Figure 5-4).

Figure 5-1. Close-up of Historic Beach along Proposed Placement Area

Figure 5-2. Historic Beach along the Proposed Placement Area

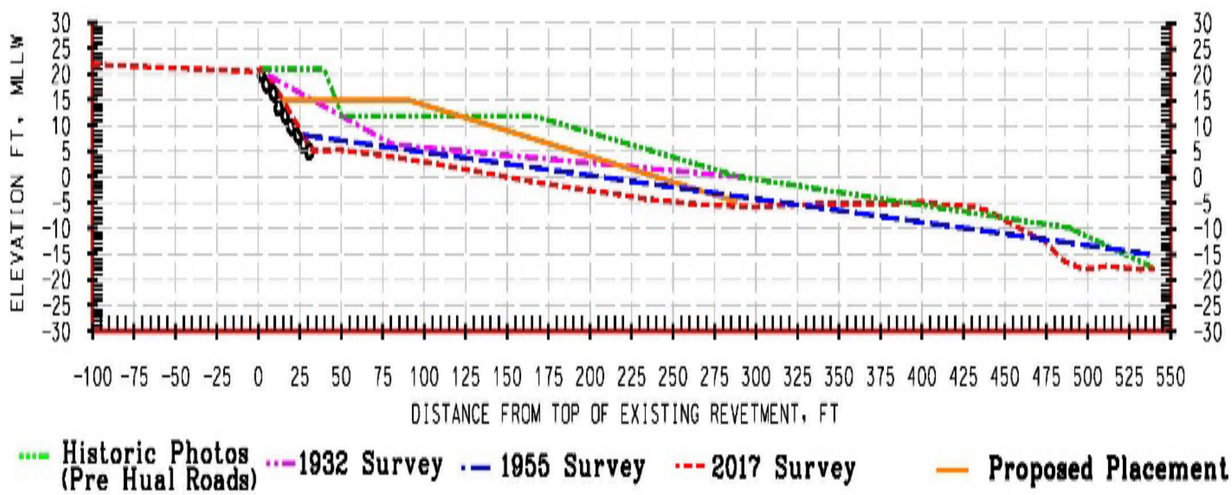

Figure 5-3. Temporal Shoreline Change of Proposed Placement Area

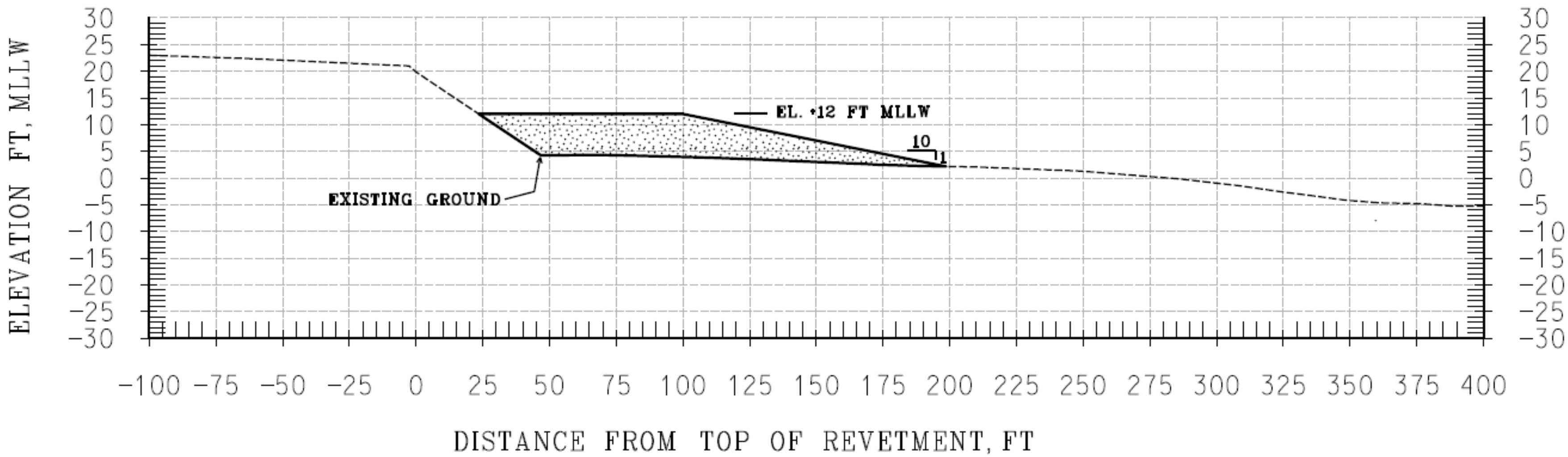

Figure 5-4. Beach Cross-section Post Placement of Materials

The primary mechanism for sediment transport within Neah Bay is from waves entering the bay through the entrance at the eastern end. As a result the net sediment transport direction is east to west along the shoreline. The net annual sediment transport rate due to waves is approximately 4,000 cy/yr. Based on this rate the 36,000 cy of material will take 15-20 years to be transported away from the placement area. The material will be pushed to the west until it encounters the existing marina breakwater which acts as a groin along the shoreline. At this point the material will begin to accumulate and reorient the beach towards the incoming wave direction. Figure 5-5 shows the results of a conceptual shoreline change model. The orange line shows the initial beach placement area and the yellow line shows the predicted shoreline after 15 years. The material will build up along the breakwater, with some material moving through the fish gap and into the marina and some being lost offshore as it reaches the deeper water near the outer edge of the breakwater. This is due to the steep bathymetry and deep water just offshore of the outer edge of breakwater which does not allow for sediment build-up on the outer edge of the breakwater. There is no plan for maintenance of the beach material via backpassing. Based on previous dredge material placements, the fish gap[11] will fill in to no more than +6 feet MLLW but would remain open at tides that are greater. Future maintenance of the marina is not associated with this Section 107 project and is the responsibility of the non-federal sponsor.

[11] The fish gap is a gap in the marina breakwater (Figure 1-2). The fish gap was agreed to be maintained by USACE, the Makah Indian Tribe, and the natural resource agencies when the marina was built in 1996 at an elevation of between 0 and -2 feet MLLW to allow migrating salmon to pass through the marina and avoid being forced into deep water by the north marina breakwater. USACE maintained the fish gap as needed from 1996 to 2009 (2009 being the last episode), but found that it would fill in to +4 to +6 feet MLLW within a month of excavation. The Makah Indian Tribe requested that the fish gap no longer be maintained, and the topic was discussed with the natural resource agencies at USACE's semi-annual dredging meeting in April 2010. Participants agreed that it was not sustainable to maintain the fish gap to 0 to -2 feet, and doing so was not a good use of resources. No dredging has occurred since 2010, and the gap has filled in to the elevations mentioned above.

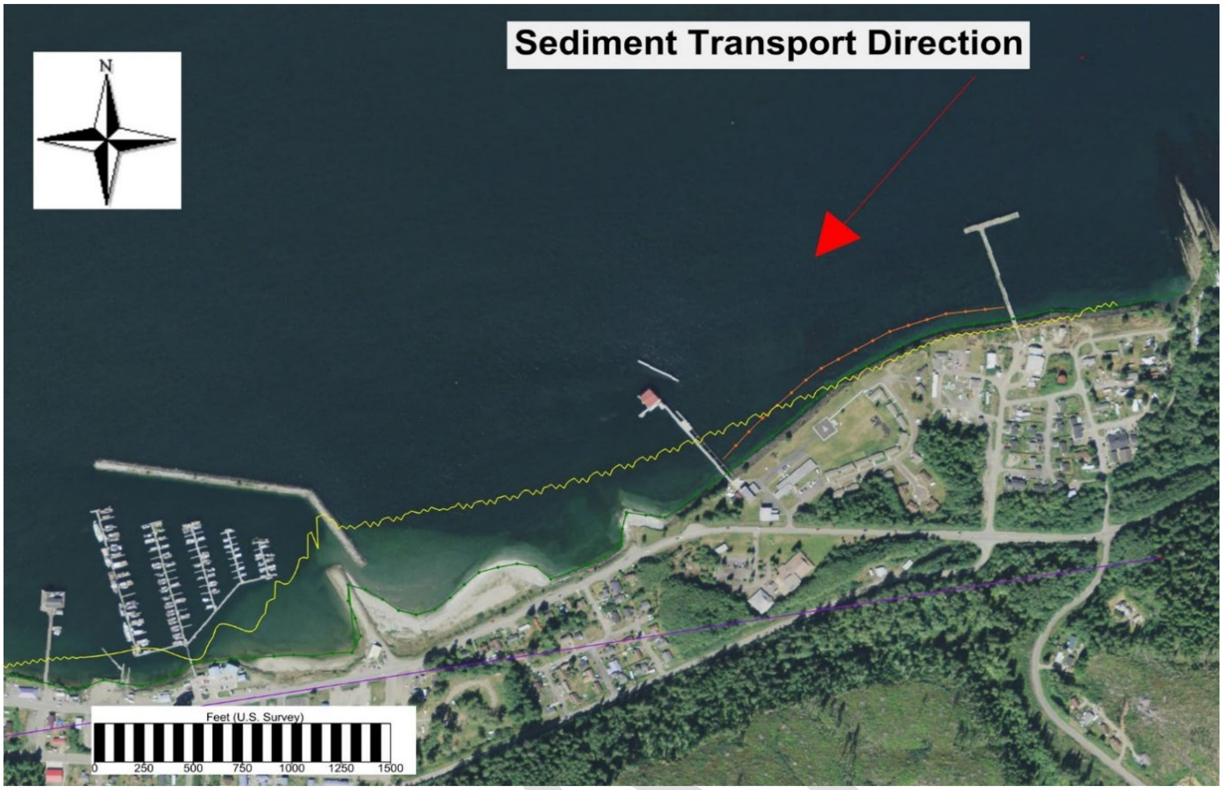

Figure 5-5. Conceptual Sediment Transport of Material Placed Along the Shoreline

5.1.2 Construction

USACE plans to use a hydraulic pipeline dredge to accomplish the proposed action. A hydraulic pipeline dredge employs a barge mounted centrifugal pump, intake pipe outfitted with a cutterhead, and a discharge pipe (Figure 5-6 and Figure 5-7). The intake pipe is made of steel and is attached to the pump via a flexible joint. A rotating cutterhead is attached to the intake end of the pipe and is used to “agitate” sediment into a slurry. The intake pipe is suspended from a structure by an “A” frame, also known as a “ladder,” fixed to the barge. The cutterhead and intake pipe are attached to the narrow end of the ladder and are lowered to, and in some cases, into the substrate. The depth of the cutterhead is controlled by raising and lowering the cutterhead. The depth a hydraulic pipeline dredge can reach is determined by the ladder length and the pumping (lifting) capability. The cutterhead is generally three to four times the diameter of the intake to the pipeline. As the cutterhead rotates and cuts into the substrate, suction created by the pump draws water and sediment into the intake pipe. A 12-inch dredge might have a 36-inch to 48-inch diameter cutterhead. The size of a cutterhead dredge is determined by the diameter of the outlet pipe of the dredge.

The machinery that powers the hydraulic dredge is located in the barge (Figure 5-6). To function properly, the hydraulic pipeline dredge must take in a slurry of water and sediment. The dredge barge is not self-propelled but can be moved short distances using anchors and spuds. A small tender vessel sets the anchors. A spud at the opposite end of the barge from the cutterhead is set and the anchor winches retrieve the anchor lines in such a way that the dredge pivots on the set spud sweeping the cutterhead across the area to be dredged. At the end of the sweep, another spud is set, the first spud is retrieved, and the anchor line process is repeated sweeping the cutterhead across the area to be dredged in the opposite direction. In this fashion, the dredge moves forward. A tender vessel redeploys the anchors as needed, again facilitating forward movement of the support dredge. A variation on this theme is a barge with a "walking" spud. In this case, a spud is located in a slot along the centerline of the barge at the end opposite the cutterhead. To move the barge forward or backward, the spud is used as a stationary point and the barge pushes or pulls against the spud. The anchors and anchor lines are still necessary to pivot the support barge during maintenance dredging.

To summarize, a hydraulic dredge operation includes a support barge with an "A" frame (ladder), and a tender vessel or a tugboat to move the support barge into position.

Figure 5-6. Small Hydraulic Dredge, Barge, and Machinery that Powers the Hydraulic Dredge

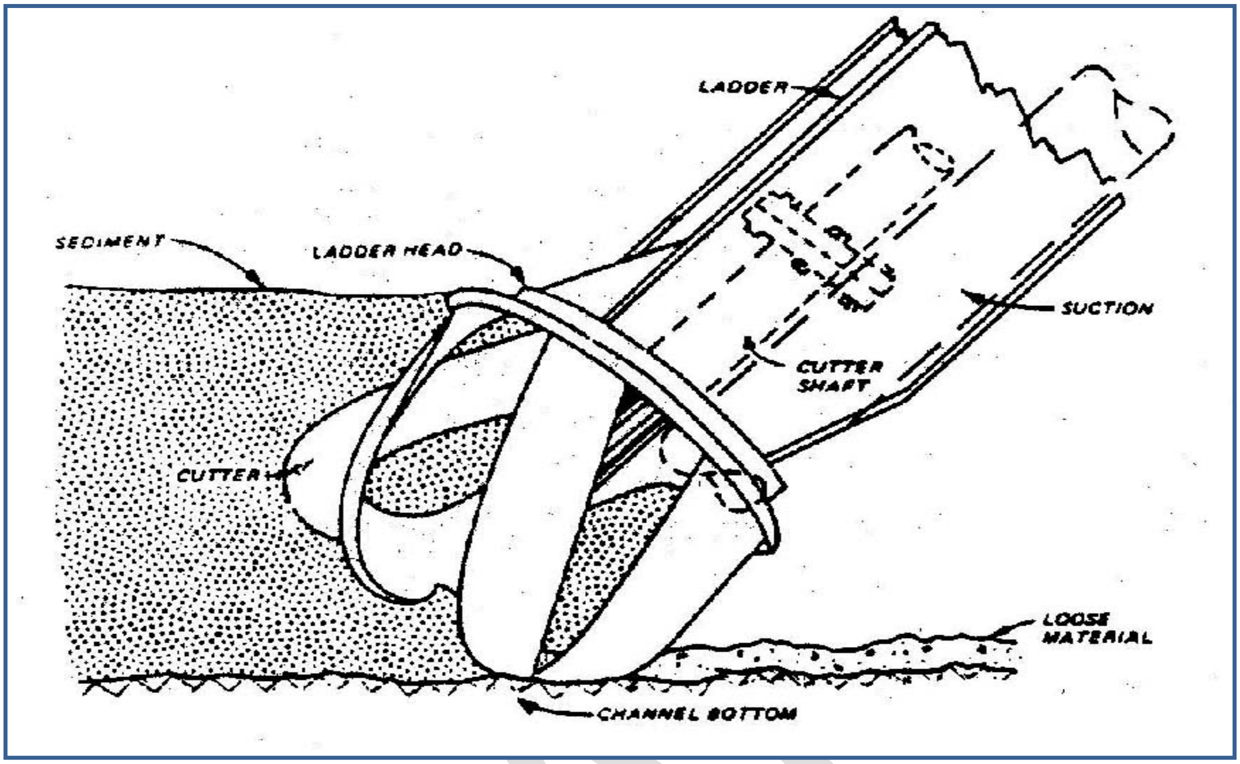

Figure 5-7. Cutterhead in Operation Including the Major Components

5.1.2.1 Dredged Material Management

All material from the dredging area will be hydraulically transported via pipeline and placed on the beach; then if required, it will be mechanically graded within the lines, grades and cross-sections shown on the drawings that will be developed during the PED phase. Any debris larger than 12 inches x 12 inches found within the beach fill limits will be removed and disposed of at an upland location (with the exception of natural woody debris). Temporary longitudinal dikes will be constructed along the waterline as necessary to control turbidity and avoid direct discharge towards the bay by directing the pipeline discharge longitudinally along the beach. Additional best management practices such as turbidity curtains and settling basins will also be used to help control turbidity as necessary. Spreaders or other methods will be used as necessary by the contractor to meet the requirements in the water quality certification (WQC) issued by the Makah Tribe and Washington Department of Ecology (WDOE) to prevent gullying and erosion of the existing beach and fill and to retain the fill on the beach and within the limits of the fill cross-section. Any equipment used to place and spread the material will remain within the aerial footprint of the beach fill outline and will access the area via a single designated access point. All staging of material and equipment will occur upland at an approved location that will be determined by USACE and the Makah Tribe during the pre-construction, engineering and design (PED) phase flowing completion of the feasibility study.

5.1.3 Best Management Practices

USACE has developed a list of standard Best Management Practices (BMPs)[12] to reduce environmental impacts of dredging to ESA listed species. These measures, as well as some specific to Neah Bay, appear below:

1. USACE will conduct dredging operations during the project's prescribed work window which currently is July 16 to February 15, but may change with further coordination with the Tribe and natural resource agencies. If this cannot be done due to extenuating circumstances, then USACE will notify USFWS and NMFS and re-consult if necessary.

2. USACE will coordinate with the Makah Tribe, which has usual and accustomed fishing rights in the study area.

3. If killer or humpback whales approach active moving vessels, tugs or dredges, the tug will continue under power and at a safe speed to maintain safe control of the tug and barge(s). USACE acknowledges the 2011 expansion of the required vessel separation zone around killer whales (76 FR 20870). While Federal Government vessels engaged in the course of official duty are exempt from these regulations, USACE seeks to minimize impacts of its operations while also accomplishing official duties consistent with its authorities, as a tug with tow is generally considered limited in its maneuverability. If a killer or humpback whale approaches within a 200 yard radius of a hydraulic dredge that is not in motion, the dredge will shut down until the whale exits this zone.

4. Once the dredged material has been removed, the material will not be dumped back into the water, except into a disposal or beneficial use site.

5. Longitudinal dikes will be constructed along the waterline to control turbidity. Turbidity curtains and settling basin will also be used, if feasible.

6. All criteria and conditions in the water quality certification from WDOE and the Makah Tribe will be adhered to the extent that they are determined to be feasible and consistent with USACE authorities.

[12] Developed in the BA for USACE's Multi-project Maintenance Dredging program, of which a Biological Opinion was issued from NOAA on 2018.

7. A water quality monitoring plan (WQMP) will be developed that is consistent with the conditions and adheres to applicable criteria issued in the water quality certification from the WDOE associated with the disposal of dredged material into the waters of the U.S. The dredge operator will adhere to the methods and criteria in the WQMP.

8. Dredge operators will use best available technologies to ensure that dredging and/or disposal activities are confined to areas within the current official boundaries of the federal channels and in-water disposal sites.

9. Dredge operators will limit the dredge prism and the volume of removed sediment to the minimum area necessary to achieve project goals.

10. Effort will be made to ensure that equipment used to place or spread sediment will access the beach from a single point.

5.2 Hazardous, Toxic, and Radioactive Waste (HTRW)

A Phase I Environmental Baseline Study (EBS) was conducted in support of this report to determine if there is a potential concern or presence of HTRW on this site. The EBS concluded that there are no records or recognized environmental conditions which indicate a potential or historical release of petroleum products or HTRW on or near the site.

This site was deemed as a "Type 1" as defined by ASTM D-5746-98, in this EBS. A "Type 1" is defined as, *"An area or parcel of real property where no release, or disposal of hazardous substances or petroleum products or their derivatives has occurred including no migration of these substances from adjacent properties."* See Appendix E for the complete Phase I EBS report.

5.2.1 Sediment Composition

The seafloor in Neah Bay is composed mostly of sand with some gravel, silt, and clay. A suitability analysis for dredging to support the extension of a commercial dock in the marina was recently completed (USACE 2017). The section tested for the dock was at similar elevations to the proposed channel and resulted in the following sediment composition:

Table 5-1. Sediment Composition Found in Dock Extension Suitability Analysis

Gravel	4%
Sand	72%
Silt	16%
Clay	8%

The above samples were taken at similar depths to the entrance channel, so it is reasonable to assume that the sediment composition of the channel will be similar to this representative sample. The material is assumed to be clean and suitable for beneficial use based on its location and the low development in the area.

Given the dredge material is expected to be clean, the Dredge Material Management Program (DMMP) recommends that minimal grain size/TOC (total organic carbon) sampling be done to confirm exclusion from more rigorous testing. This will done in the pre-construction, engineering and design (PED) phase. USACE will follow the DMMP process to see if further testing of the sediment is warranted. If testing indicates it's not suitable for beneficial use, then other disposal options will need to be evaluated.

5.3 Real Estate Considerations

Ownership of the lands required for the implementation of this project (dredge footprint and beneficial dredged material placement area) are held in trust by the Bureau of Indian Affairs (BIA) and managed by the Makah Tribe. The Washington Department of Natural Resources (WDNR) also claims ownership of said lands. The Tribe has consented to provide a permit to access the lands for the purpose of constructing the project. The federal government's navigation servitude rights will be exercised with respect to DNR's claim of ownership. Any dredge material that does not meet disposal criteria would be transported to an upland commercial facility for disposal. No maintenance dredging is anticipated because the channels accumulate very little sediment. Please see the Real Estate Plan in Appendix F for more detail.

5.4 Cost Estimate

Class 4 level estimates were developed for each of the alternatives considered in the economic evaluation. Cost estimates for various depths were developed based on technical information provided for each alternative and form assumptions based on historical similar work. This included quantities, type of material, disposal options, dredge plant, etc. A detailed "Basis of Cost Estimate" that outlines cost assumptions was prepared separately. Potential risk events were evaluated and incorporated into a risk model to determine contingency levels.

Based on October 2019 price levels, the estimated project first cost is $1,774,000 (with contingency). In accordance with the cost share provisions in Section 103(c) of the Water Resources Development Act (WRDA) of 1986, as amended {33 U.S.C. 2213(c)}, the federal share of the project first cost is estimated to be $1,331,000 and the non-federal share is estimated to be $443,000, which includes a 90% federal and 10% non-federal cost share for general navigation features (GNFs) shallower than -20 feet MLLW, and a 75% federal and 25% non-federal for GNFs deeper than -20 feet MLLW. Costs in excess of the NED plan are 100% non-federal expense. Aids to navigation are a federal expense to the USCG. The value of LERRDs are 100% non-federal and are estimated to be $0. Construction and operations, maintenance, relocations, rehabilitations, and replacement (OMRR&R) costs are estimated at $0. Cost share percentages are shown in Table 5-2.

Table 5-2. Cost Sharing Allocation for Navigation Construction

Work Breakdown Structure	Federal Cost Share	Non-Federal Cost Share
For Project Depths ≤ -20 MLLW		
General Navigation Features (GNF)	90%	10% + 10% (1)
LERR (2)	0%	100%
Mitigation	90%	10%
Local Service Facilities	0%	100%
OMRR&R of GNF (3)	100%	0%
OMRR&R of LSF (4)	0%	100%
OMRR&R of Aids to Navigation	100%	0%
For Project Depths > -20 feet MLLW and ≤ 45 feet MLLW		
GNF	75%	25% + 10% (1)
LERR (2)	0%	100%
Mitigation	75%	25%
Local Service Facilities	0%	100%
OMRR&R of GNF (3)	75%	25%
OMRR&R of LSF (4)	0%	100%
OMRR&R of Aids to Navigation	100%	0%
(1) - 10% Post-Construction contribution less credit for LERR over 30 years (2) - LERR: Lands easements, rights-of-way, and relocations (3) - OMRR&R: Operations, maintenance, relocations, rehabilitation, and replacements (4) - Cost Share does not depend on project depth		

Table 5-3 outlines the project first costs, associated costs, and cost share of the NED plan. All costs are presented at the October 2019 price level.

Table 5-3. Cost Summary for the NED Plan

Federal/Non-Federal Cost Apportionment - NED Plan			
Cost Item	**Total Cost Allocated**	**Federal**	**Non-Federal**
Cost Sharing for ≤ -20ft MLLW General Navigation Features (GNF) [90% Federal/10% Non-Federal]			
Dredging (1)	$856,000	$771,000	$86,000
Mobilization & Demobilization - 65% dredging cost (2)	$327,000	$295,000	$33,000
Subtotal GNF	**$1,184,000**	**$1,065,000**	**$118,000**
Cost Sharing for > -20ft MLLW and ≤ -45ft MLLW GNF (75% Federal/25% Non-Federal)			
Dredging (1)	$391,000	$331,000	$110,000
Mobilization & Demobilization - 35% dredging cost (2)	$150,000	$112,000	$37,000
Subtotal GNF	**$540,000**	**$443,000**	**$148,000**
Total GNF	**$1,774,000**	**$1,508,000**	**$266,000**
Lands, Easements, Rights-of-Way, and Relocations (LERR) [100% Non-Federal]	$-	$-	$-
Subtotal - Project First Costs	$1,774,000	$1,508,000	$266,000
Additional 10% of GNF Over 30 Years less LERR (100% Non-Federal expense)	$-	$(177,000)	$177,000
Subtotal - Project First Costs with 10% GNF Adjustment over time	**$1,774,000**	**$1,331,000**	**$443,000**
Total Non-Federal Local Service Facilities	$-	$-	$-
USCG Aids to Navigation (100% USCG Federal Cost)	$-	$-	$-
Project Costs - NED Plan	**$1,774,000**	**$1,331,000**	**$443,000**
Cost Share Breakdown		75%	25%
(1) - Including Preconstruction, Engineering & Design, and Construction Management (2) - Proportion based on Percent of Dredging Cost by Depth Zone (PGL No. 62)			

Table 5-4 provides an economic summary of the costs and benefits of the NED plan. Interest during construction was computed using estimated project costs at the October 2019 price level, anticipated construction durations (1 month), and the current Federal discount rate (2.75% for Fiscal Year 2020), bringing total investment costs to $1,776,000. No operations and maintenance dredging expenses are expected over the 50-year study period. Average annual equivalent (AAEQ) costs were developed for the current cost estimate at the October 2019 price level. AAEQ Cost is estimated at $66,000. AAEQ benefits include transportation cost savings of approximately $71,000 resulting in AAEQ net benefits of $6,000 and a 1.09 BCR. First costs for authorization purposes are estimated at $1,774,000 (October 2018 price level) and the fully funded cost estimate to the mid-point of construction is estimated at $1,891,000.

Table 5-4. Cost Benefit Summary for the NED Plan

Cost and Benefit Summary of the NED Plan (October 2018 Price Level)	
Interest Rate (Fiscal Year 2018)	2.75%
Construction Period, Months	1
Period of Analysis, Years	50
Estimated First Costs	$1,774,000
Interest During Construction	$2,000
Total Economic Investment Cost	**$1,776,000**
AAEQ Construction Costs	$66,000
OMRR&R	$-
Total AAEQ Costs	**$66,000**
AAEQ Benefits	**$71,000**
AAEQ Net Benefits	**$6,000**
Benefit-to-Cost Ratio	**1.09**

5.5 Fish and Wildlife Coordination Act Considerations*

USACE coordinated with the USFWS regarding the proposed action. USFWS determined that a planning aid letter/memo is sufficient to meet the requirements of FWCA. USACE received a planning aid letter (PAL) on April 30, 2019. Recommendations in the PAL, and USACE's ability to implement them, are summarized in section 6.6.

5.6 Summary of Environmental Consequences of the TSP (Agency Preferred Alternative)

Effects of an action can be additive, synergistic, or countervailing. After direct and indirect effects were identified, the potential for cumulative impacts on many resources were considered as part of this study. The majority of resources were determined to have little risk of being cumulatively impacted. Direct and indirect effects are summarized in Table 5-5 followed by a discussion of cumulative effects.

Table 5-5. Summary of Environmental Consequences of the TSP (Agency Preferred Alt)

Resource	Short- and Long-term Consequences of the TSP
Navigation and Economic Conditions	There will be a temporary disruption to navigation (estimated at 13 days) while dredging is occurring. Once the channel is complete, deeper draft vessels requiring depths greater than -19ft but less than -21ft MLLW will be able to enter Neah Bay providing additional economic opportunities for the Makah.
Hydraulics and Geomorphology	Short-term: No short-term effects to hydraulics have been identified. Long-term: There would be a long-term beneficial effect to geomorphology along the placement area by restoring the profile to more closely match historic conditions.
Water Quality	Short-term: Brief, minor pulses of turbidity and nearly undetectable decreases in DO may occur during dredging. Long-term: No long-term effects to water quality have been identified.
Air Quality	Short-term: Estimated air-pollutant concentrations from construction will stay below the threshold for NAAQS. Long-term: No long-term effects to air quality have been identified.
Greenhouse Gas Emissions	Short-term: Construction would contribute a tiny fraction of global GHG emissions. Long-term: No long-term changes in GHG emissions are expected.
Underwater Noise	Short-term: Underwater noise from construction would occur when sensitive receptors are present. These include marine mammals, fish, and diving birds. Long-term: No long-term effects of underwater noise have been identified.
Hazardous, Toxic, and Radiological Waste (HTRW)	Short-term: No short-term HTRW effects have been identified. Long-term: No long-term HTRW effects have been identified.
Vegetation	Short-term: There would be no impacts to vegetation from the channel deepening as it occurs at a depth beyond the photic zone. All vegetation within the placement footprint would be buried. Long-term: The vegetation community within and down drift of the placement area will likely transition to a community more typical of intertidal habitats.
Benthic Organisms	Short-term: Dredging and placement of materials along the shoreline would cause mortality within the project footprint. Long-term: Benthic macroinvertebrate populations are known to recover quickly from the type of action proposed, as in up to three years. No long-term change

	to the benthic community is predicted to occur within the channel. Benthic communities within and down drift of the placement site will likely transition to communities more typical of intertidal habitats.
Fish	Short-term: Construction would cause temporary displacement of fish due to elevated turbidity and noise. Pelagic fish are likely to avoid the area. Bottom dwelling fish, particularly those that burrow in the sediment may become entrained by the dredge or smothered during the sediment placement. Long-term: No long-term impacts to fish communities would result from the channel deepening. There would be a benefit to fish communities, particularly juveniles, from the shallow water habitat and possible recruitment of eelgrass beds created by the placement of materials along the shoreline.
Marine Mammals	Short-term: Construction may cause temporary displacement primarily due to elevated noise and a possible reduction in prey resources. Long-term: No long-term effects to marine mammals have been identified.
Birds	Short-term: Construction may cause temporary displacement primarily due to elevated noise and a possible reduction in prey resources. Long-term: No long-term effects to birds have been identified.
Threatened and Endangered Species	Short-term: Dredging and placement of materials would cause noise and minor turbidity disturbance to the ESA-listed species. Adherence to work windows and conservation measures would avoid potential significant impacts to salmonids. Long-term: No long-term impacts to ESA listed species have been identified, other than a beneficial effect to juvenile salmonids resulting from the shallow water habitat created by the placement of materials along the shoreline.
Cultural Resources	Short-term: No historic properties affected. Long-term: No historic properties affected.
Tribal Trust Assets	Short-term: Spatial conflicts between dredging and Tribal fishing would be avoided to the maximum extent practicable by coordinating with the Makah Indian Tribe. Long-term: No long-term effects to Tribal Trust Assets have been identified.
Recreation	Short-term: There may be a temporary disruption of water-related recreational activities during dredging and placement of materials. Long-term: No long-term effects to recreation would result from the channel deepening. There is likely to be an increase in recreational activities at the placement site since the area will transition from subtidal to intertidal and upland beach.

No negative cumulative effects have been identified, only a beneficial cumulative effect of the placement of materials along the shoreline from USACE's proposed channel deepening and the Makah Tribe's proposed marina dredging.

5.7 Mitigation for Adverse Environmental Effects*

No compensatory mitigation is proposed for this action as no loss of wetlands would occur, any adverse effects to ESA-listed species would be temporary, no significant impacts to commercially important species or protected marine mammals are anticipated to occur based on the analyses in this document, and the placement of materials along the shoreline is considered beneficial to aquatic resources in Neah Bay, recreation, and Tribal trust assets. Several avoidance and minimization measures are proposed to ensure that impacts are insignificant; these include the following:

1. Complying with all water quality standards and conditions issued in the water quality certification and adhering to monitoring protocols in the WQMP.
2. Dredging only within the designated work window of July 16 through February 15.
3. Implementing reasonable and prudent measures and associated terms and conditions, issued by NMFS for ESA listed species.
4. A spill kit would be onboard the dredge at all times.
5. Fuel hoses, oil drums, oil or transfer valves and fittings, etc., shall be checked regularly for drips and leaks, and shall be maintained and stored properly to prevent spills into tribal or state waters.
6. Refueling shall be monitored by the contractor for the duration of the construction.
7. Use of berms during placement of materials along the shoreline.
8. Effort will be made to ensure that equipment used to place or spread sediment will access the beach from a single point.

5.8 Operations, Maintenance, Repair, Rehabilitation, and Replacement (OMRR&R)

5.8.1 Dredging O&M Requirements

Historically sediment was supplied to Neah Bay by three creeks (Agency, Halfway and Village Creek). Construction of logging roads in the 1930s effectively cut off the sediment supplied by Agency Creek and Halfway Creek. Since the 1930s the shoreline has been actively eroding. The presence of Baada Point and Waadah Island prevent sediment supplied by longshore-transport from entering the bay. As a result there is no sediment source entering the bay from either longshore transport or creek inputs. Due to the lack of sediment sources the sediment transport within the bay is limited to the rearranging of sediment that was in the system prior to construction of the outer breakwater and revetments. This transport is limited to westerly wave-driven transport along the shoreline. Because there is no sediment source, or mechanism for sediment existing in the system to be transported into the proposed channel it is anticipated that maintenance dredging will not be required.

5.8.2 Sea Level Change

Sea level change was calculated per ER 1100-2-8162 for the low, medium and high USACE scenarios (see Appendix B). One unique feature of Neah Bay is that the vertical land movement is currently outpacing sea level change. As a result under the low sea level change scenario the water level actually lowers approximately 0.27 feet over the 50 year project life. This would results on 0.27 feet less of channel clearance. Under the medium and high seal level change scenarios the water level would increase 0.27 and 1.74 feet respectively adding additional clearance to the channel. Due to the small values of projected sea level change for the low and medium USACE scenarios (+- .27 feet) over the 50 year project life there is not expected to be any impact to the proposed project under these scenarios. A sea level change of 0.27 feet in either direction can easily be accounted for in the dredging tolerances without affecting the channel depth or width. Under the high USACE scenarios the projected rise of 1.74 feet over the 50 year project life would provide additional clearance to vessels transiting the channel further increasing channel availability to nearly 100%.

5.9 Risk and Uncertainty

The study team has used a risk-based strategy in its approach to formulating and evaluating alternatives. Key risks, uncertainties, or assumptions for the study are summarized below.

Table 5-6. Risk and Uncertainty

Measure	Risk or Uncertainty	Steps to Reduce Risk
Rock Layer Beneath Dredge Prism	There is a layer of rock approximately 3 feet beneath the -21 MLLW channel depth for the TSP. If the rock layer is higher in certain areas, dredge costs could increase. Assuming the material is to be dredged, this could lead to more need for dredge repair; more rock would require changing from hydraulic to mechanical (e.g. clamshell) dredge and additional cost and time associated with environmental compliance. There is a **low likelihood** that enough rock would be found at or above -21 feet MLLW to require a change to mechanical dredging and result in reinitiating ESA consultation due to impacts of blasting rock. Such a change would cause a significant cost increase.	Gather more data regarding the actual rock conditions where the channel is proposed during PED phase; adjust dredge path to avoid any high rock.
Hydraulic Dredge Plant Availability	Given remoteness of site, if the closest hydraulic dredge plant is not available, mob/de-mob costs could go up significantly; or switching to clamshell dredging would also increase costs. Costs would also increase if not able to use the proximately located dredge plant. There is a **low likelihood** this will occur.	Advanced market research to identify proximately located hydraulic dredging plants that are capable of conducting the work and using that information to help inform an appropriate Acquisition Strategy.
Sediment Suitability for Beneficial Use	In order to use the dredged material for beach construction (beneficial use), the material must be deemed suitable (i.e. not contaminated, of appropriate particle size, etc.). Given that we have conducted a Phase One Site Assessment and identified no HTRW concerns, and that the DMMP recently completed a suitability analysis on sediment from the same depth at a nearby location (in Neah Bay) and found that material is suitable for beneficial use, there is a **low likelihood** that the material dredged from the proposed channel would not be suitable. If sediment were not suitable for beneficial use, costs would increase significantly.	Complete suitability analysis for the material in the dredge footprint early during the PED phase.

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6 Compliance with Environmental Statutes*

This chapter provides documentation of how the TSP (agency preferred alternative) complies with all applicable federal environmental laws, statutes, and executive orders.

6.1 National Environmental Policy Act

The National Environmental Policy Act (NEPA) (42 U.S.C. §4321 et seq.) commits federal agencies to considering, documenting, and publicly disclosing the environmental effects of their actions. NEPA documents must provide detailed information regarding the proposed action and alternatives, the environmental impacts of the alternatives, appropriate mitigation measures, and any adverse environmental impacts that cannot be avoided if the proposal is implemented. Agencies are required to demonstrate that decision makers have considered these factors prior to undertaking actions. This Draft Feasibility Report/Environmental Assessment is intended to achieve NEPA compliance for the proposed project. USACE has published a Notice of Availability of an EA with an accompanying 30 day public comment period. All comments received will be considered in determining whether it will be in the public interest to proceed with the proposed project. A draft Finding of No Significant Impact/ Statement of Findings (FONSI/SOF) can be found in Appendix D.

6.2 Endangered Species Act of 1973

The Endangered Species Act (ESA) (16 U.S.C. §1531-1544), Section 7(a) requires that federal agencies consult with NMFS and the USFWS, as appropriate, to ensure that proposed actions are not likely to jeopardize the continued existence of endangered or threatened species or to adversely modify or destroy their critical habitats. USACE prepared a Biological Assessment (BA) and submitted it to UWFWS and NMFS on 4 April 2018 to comply with section seven of the Endangered Species Act. The BA evaluates the effects of the proposed action on ESA-listed species and their critical habitat (if present) in the action area. USACE received a letter of concurrence from the USFWS for species under their jurisdiction on June 21, 2018. A Biological Opinion (BiOp) from NMFS for species under their jurisdiction is pending. The BA was submitted prior to the optimization of the TSP and detailed larger channel dimensions (5,200 foot long, 300 foot wide channel, with a 375 ft^2 turning basin) then are presented in this document. Since the footprint consulted on is greater than the TSP, reinitiating ESA consultation is not necessary.

USACE received a letter of concurrence from the USFWS for species under their jurisdiction on June 21, 2018. USACE received a BiOp from NMFS for species under their jurisdiction on March 29, 2019. NMFS did not agree with USACE's determinations for Puget Sound Chinook and steelhead, and Hood Canal summer chum, and they determined the action was “likely to adversely affect” these species. The BiOp issued an incidental take statement, and reasonable and prudent measures with associated terms and conditions to minimize take. USACE will comply with all the terms and conditions.

6.3 Marine Mammal Protection Act

The Marine Mammal Protection Act of 1972, as amended, prohibits the taking of marine mammals by citizens of the United States except under certain conditions (16 U.S.C. 1361). Marine mammals can be found in Neah Bay and the adjacent Pacific Ocean waters. The ones likely to occur within the immediate project vicinity are harbor seals and California sea lions. USACE has determined that the preferred alternative (TSP) would not significantly disturb any marine mammal behavioral patterns (harassment or cause any harm (see section 4.12.2), and thus it is not necessary to pursue an incidental harassment authorization under the MMPA. The rationale for this determination is the following:

1. Marine mammals have the ability to avoid the area while underwater and/or haul out in areas nearby that are not exposed to the elevated underwater noise from dredging.
2. The noise generated by the dredging is not likely to exceed PTS or TTS thresholds for marine mammals and the soft substrate in Neah Bay is expected to better absorb noise than the other hydraulic dredging studies cited in section 4.12.2.
3. Ambient underwater noise levels in the Neah Bay area are already higher than unconfined and undeveloped marine areas due to boat traffic, and marine mammals are likely acclimated to these disturbances.

6.4 Clean Water Act of 1972

The Clean Water Act (33 U.S.C. §1251 et seq.) requires federal agencies to protect waters of the United States. The regulation implementing the Act disallows the placement of dredged or fill material into water unless it can be demonstrated there are no practical alternatives that are less environmentally damaging. The sections of the Clean Water Act (CWA) that apply to the proposal are 401 regarding discharges to waterways and 404 regarding fill material in waters and wetlands. USACE policies related to the CWA disallow the placement of dredged or fill material into waters of the U.S. unless it can be demonstrated disposal occurs in the least costly, environmentally acceptable manner, consistent with engineering requirements established for the project. Based on the analysis identified in this feasibility report, Alternative 2 is expected to be less costly than Alternative 3 and have less of an impact on the environment. The placement of dredged materials along the shoreline is considered a beneficial use a materials based on the analysis presented in 4.5.2. Compliance with each of these sections of the CWA is detailed below:

Section 401

Any project that involves placing dredged or fill material in waters of the United States or wetlands, or mechanized clearing of wetlands requires a water quality certification from the state agency as delegated by the U.S. Environmental Protection Agency (EPA). For Neah Bay, the EPA has determined that the delegated authority is the Makah Tribe for portions of the project that fall above Mean Low Water (MLW) and Washington Department of Ecology (WDOE) for the portions of the project that fall below MLW. USACE has coordinated with both the Makah Tribe and WDOE, and will obtain a water quality certification (WQC) with both entities prior to construction when the project is at a higher level of design (typically 65%).

Section 404

In 1972, Section 404 established a program to regulate the discharge of dredged or fill material into the navigable waters of the United States (U.S.). The fundamental principle of the program is that no discharge of dredged or fill material should be permitted if there is a practicable alternative that would be less damaging to aquatic resources or if significant degradation would occur to the nation's waters. To comply with Section 404, it is necessary to avoid negative effects to wetlands wherever practicable, minimize effects where they are unavoidable, and compensate for effects in some cases.

USACE prepared a 404(b)(1) evaluation to document findings regarding this project pursuant to Section 404 of the CWA, attached in Appendix D. USACE has prepared and distributed a Section 404 public notice for public comment contemporaneous with this Draft EA. No wetlands would be affected by the project.

6.5 Coastal Zone Management Act of 1972

The Coastal Zone Management Act (CZMA) of 1972 as amended (16 U.S.C. §1451-1464) requires federal agencies to conduct activities in a manner that is consistent to the maximum extent practicable with the enforceable policies of the approved State Coastal Zone Management Program. The aim of the act is to "preserve, protect, develop, and where possible, to restore or enhance the resources of the nation's coastal zone." The delegated authority for review of consistency with the Coastal Zone Management Program is WDOE. In compliance with State law, each of the 15 coastal counties in Washington has developed its own Shoreline Master Program in compliance with the State Shoreline Management Act. USACE prepared a consistency determination that has concluded that the TSP/preferred alternative is substantively consistent with the enforceable polices of the Clallam County Shoreline Master

Program (Appendix D). USACE will initiate coordination with the WDOE when we submit our request for a WQC package for their concurrence on our determination.

6.6 Fish and Wildlife Coordination Act of 1934

The Fish and Wildlife Coordination Act (FWCA) of 1934 as amended (16 U.S.C. §661-667e) ensures that fish and wildlife conservation is given equal consideration as is given to other features of water-resource development programs through planning, development, maintenance, and coordination of wildlife conservation and rehabilitation. This law provides that whenever the waters of any stream or other body of water are proposed to be impounded, diverted, deepened or otherwise controlled or modified, USACE shall consult with the USFWS and NMFS as appropriate, and the agency administering the wildlife resources of the state. The consultation shall consider conservation of wildlife resources with the view of preventing loss of and damages to such resources as well as providing for development and improvement in connection with such water resources development. Any reports and recommendations of the wildlife agencies shall be included in authorization documents for construction or modification of projects. USACE shall consider the reports and recommendations of the wildlife agencies and include such justifiable means and measures for wildlife mitigation or enhancement as USACE finds should be adopted to obtain maximum overall project benefits. Recommendations provided by the USFWS in Coordination Act Reports must be specifically addressed in USACE feasibility reports.

USACE has coordinated with the USFWS regarding the proposed action. USFWS determined that a planning aid letter/memo was sufficient to meet the requirements of FWCA. USACE received a draft PAL on April 30, 2019 (Appendix D). The PAL listed nine comments to assist USACE in implementing the proposed action to benefit fish, wildlife, plants, and their habitat. These comments, followed by USACE's responses in italics, are:

- Monitor noise thresholds during dredging activities as to not exceed 150 dBrms

  USACE evaluated the impacts of noise on fish and wildlife in sections 4.11 and 4.12 and determined that noise related impacts would be insignificant. This analysis compared pertinent literature on noise levels generated by hydraulic dredging with established noise thresholds for different hearing groups of fish, marine mammals, and birds. While the USACE can't guarantee that 150 dBrms will not be exceeded during dredging, it is unlikely given the softer substrate and smaller size dredge that will be used. USACE does not believe noise monitoring is necessary.

- Monitor water quality during dredging activities according to the appropriate State of WA and Tribal Agency (e.g., Makah Tribe) water quality certification standards.

  USACE will seek a water quality certification from the WDOE and the Makah Tribe prior to construction, which will likely require water quality monitoring.

- Monitor pollutants in the Action Area before, during, and after the project's prescribed work window to ensure that construction activities are not further impacting water quality

  There is currently no evidence or concern for any hazardous, toxic, or radioactive waste presence on the site. See appendix E for an environmental baseline study documenting this conclusion. USACE will implement best management practices described in section 5.7 to ensure pollutants from equipment do not enter the environment during construction. Monitoring of pollutants before, during, and after is not necessary.

- Limit human activity in and near the Action Area to avoid or minimize additional disturbance(s)

  Humans will be excluded from the Action Area during construction for safety reasons. Placement of material along the shoreline will re-establish a historical beach that was used by members of the Makah Tribe for shell fish harvest. The Makah Tribe has expressed that they hope to resume these harvest activities once native shellfish have been re-established. It is likely that this beach will be used for multiple recreational purposes by the Makah Tribe since it is located within their reservation, and by members of the public.

- In the event that evaluation species appear in the Action Area (bull trout, marbled murrelet, short-tailed albatross, Brandt's cormorant, sea otter, tufted puffin, and pacific herring), cease all construction activities until they leave the Action Area.

If a killer or humpback whale approaches within a 200 yard radius of the hydraulic dredge when it is not in motion, USACE will direct the dredge to shut down until the whale exits this zone. USACE will not cease construction for species other than killer whale or humpback whale, unless they can be reasonably observed and are within the immediate vicinity (100 ft.) of the dredge and placement operations. Most wildlife in the project area, such as marine birds, should be acclimated to the presence of vessel activity in Neah Bay, and/or will avoid the dredge and disposal operations. Sea otter sightings in Neah Bay are rare, and do not occur in the middle of the channel or the area where the material will be placed since they are associated with kelp beds. There is no *feasible way to observe for fish presence in the action area, but working within the in-water work window will avoid times when herring spawn and bull trout are present.*

- Develop a plan to manage vessel traffic in and out of Neah Bay that includes information about type and size of vessel, purpose of travel, and timing of travel, and that addresses potential impacts (e.g., increased likelihood of oil spills) of increased vessel size and increased vessel traffic

  This is outside of the purview of the Neah Bay Navigation Improvement Project and the USACE mission. The primary benefit of the project is to provide transportation cost savings and allow a rescue tug to exit the bay during a variety of tides. The ability of this tug to respond to distressed vessels will decrease the likelihood of oil spills in the surrounding waters of the Strait of Juan de Fuca and the Pacific Coast. USACE has no oversight of the management of vessel traffic in and out of Neah Bay.

- When appropriate, remove and recover derelict fishing gear from shallow and deep waters, respectively, in the Action Area

  This is outside of the purview of the Neah Bay Navigation Improvement Project and the USACE mission. USACE has no oversight in the management of derelict fishing gear.

- Develop or support commercial vessels efforts to monitor, estimate, and reduce bycatch in and around the Action Area

  This is outside of the purview of the Neah Bay Navigation Improvement Project and the USACE mission. USACE has no oversight in the management of commercial fisheries. Currently, the Neah Bay Marina is used for Tribal fisheries boats and recreational charter fishing boats run by the Makah Tribe.

- Develop an educational outreach program and create signage that details the restoration of the historical beach along the south side of the new navigation channel for interested members of the general public

  USACE does not have the authority for educational outreach on the Makah Tribe Reservation. The primary purpose of the project is to provide transportation cost savings in Neah Bay, with an added benefit of restoring a historical beach. However, USACE can discuss with the Makah Tribe if they would like to incorporate beach signage during the project engineering and design (PED) phase.

6.7 Magnuson-Stevens Fishery Conservation and Management Act of 1976

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), (16 U.S.C. §1801 et. seq.) requires federal agencies to consult with NMFS on activities that may adversely affect Essential Fish Habitat (EFH). The objective of an EFH assessment is to determine whether the proposed action(s) "may adversely affect" designated EFH for relevant commercial, federally managed fisheries species within the proposed study area. The assessment also describes conservation measures proposed to avoid, minimize, or otherwise offset potential adverse effects to designated EFH resulting from the proposed action. Adverse effects to EFH may result from actions occurring within outside EFH, and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810).

An EFH determination for the dredging and placement of materials for the Neah Bay channel deepening is included in the Biological Assessment submitted to NMFS. USACE has made a determination that the action *may adversely affect* EFH. USACE received a concurrence with its determination from NMFS on March 29, 2019 which included recommended conservation measures to incorporate into the project design and construction methods to the extent practicable to minimize and/or avoid adverse impacts to EFH . USACE issued a letter to NMFS on 25 April 2019 detailing if/how we will implement the conservation measures (Appendix D).

6.8 National Historic Preservation Act of 1966

The National Historic Preservation Act (NHPA) of 1966 (16 U.S.C. §470), as amended through 1992 (Public Law 102-575), establishes preservation as a national policy and directs the Federal Government to provide leadership in preserving, restoring and maintaining the nation's historic and cultural environment. Section 106 of NHPA requires federal agencies to account for the indirect, direct, and cumulative effects of their undertakings on Historic Properties (i.e., archaeological sites, Traditional Cultural Properties, buildings, structures, objects, districts, and landscapes listed in or eligible for listing in the National Register of Historic Places). Section 106 and its implementing regulations at 36 CFR 800 establish procedures for federal agencies to follow in identifying Historic Properties and assessing and resolving effects of their undertaking on them, in consultation with State Historic Preservation Officers (SHPO), Indian tribes, Native Hawaiians, and the Advisory Council for Historic Preservation (ACHP), as appropriate. Other parties may participate in the Section 106 consultation process, including but not limited to applicants for federal assistance, permit and license applicants, certified local governments, and other groups or individuals with an economic, social, or cultural interest in the project. Maximum public involvement in the process is encouraged. Under the NHPA if a Tribe that has assumed the responsibilities of the SHPO for section 106 on tribal lands the Tribal Historic Preservation Officer (THPO) is the official representative for the purposes of Section 106 800.2.(c)(2)(1)(A).

No cultural resources have been identified within either the navigation channel, turning basin or beach nourishment area.

USACE is consulted with the THPO of the Makah Indian Tribe. The Makah Tribe has assumed the responsibilities of Section 106 on Tribal land. On April 5, 2018 USACE sent a letter to the THPO for the Makah Indian Tribe. The letter described the project and provided USACE's determination of finding of no historic properties affected for the project (Appendix D). Prior to sending the letter a phone conversation occurred with the THPO. The THPO stated that she was aware of the project and that emailing the consultation letter would be preferred. To date no comment has been received from the THPO. Section 106 consultation occurred prior to the optimization of the TSP and detailed larger channel dimensions (5,200 foot long, 400 foot wide channel, with a 600 ft^2 turning basin) then are presented in this document. Since the footprint consulted on is greater than the TSP, reinitiating section 106 consultation is not necessary.

6.9 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (16 U.S.C. § 703-712) as amended protects over 800 bird species and their habitat, and commits that the U.S. will take measures to protect identified ecosystems of special importance to migratory birds against pollution, detrimental alterations, and other environmental degradations. EO 13186 directs federal agencies to evaluate the effects of their actions on migratory birds, with emphasis on species of concern, and inform the USFWS of potential negative effects on migratory birds. Implementation of the preferred alternative would not have any negative effects on migratory bird habitat and would only have minor and temporary effects on a small number of individual birds that may be present in the project area during construction (See Section 4.13.2). These birds are assumed to be habituated to the noise and activity of the marina in Neah Bay.

6.10 Native American Tribal Treaty Rights

The federal trust responsibility to Native American Tribes arises from the treaties signed between the Federal Government and the Tribes. Under Article VI, Clause 2 of the U.S. Constitution, treaties with the Tribes are superior to State laws, and equal to federal laws. In these treaties, the United States made a set of commitments in exchange for tribal lands, including the promise that the United States would protect the tribe's people. The U.S. Supreme Court has held that these commitments create a trust relationship between the United States and each treaty Tribe, and impose upon the Federal Government "moral obligations of the highest responsibility and trust." The scope of the federal trust responsibility is incumbent upon all federal agencies

USACE is closely coordinating with the Makah Indian Tribe, which is the project's local sponsor, and has usual and accustomed fishing grounds in the study area. Prior to construction USACE will coordinate with the Tribe to ensure access to its U&A sites and other Tribal trust assets are not impacted.

6.11 Executive Order 13175 Consultation with Indian Tribal Governments

Executive Order 13175 (November 6, 2000) reaffirmed the Federal Government's commitment to a government-to-government relationship with Indian tribes, and directed federal agencies to establish procedures to consult and collaborate with tribal governments when new agency regulations would have tribal implications. USACE has a government-to-government consultation policy to facilitate the interchange between decision makers to obtain mutually acceptable decisions. In accordance with this Executive Order, USACE has engaged in regular and meaningful consultation and collaboration with the Makah Indian Tribe, who is the project's local sponsor.

6.12 Executive Order 12898 Environmental Justice

Executive Order 12898 directs every federal agency to identify and address disproportionately high and adverse human health or environmental effects of agency programs and activities on minority and low-income populations.

The Makah Tribe constitutes a distinct, separate community of Native Americans who rely on Treaty-reserved fish for subsistence, economic, and spiritual purposes. Dredging in Neah Bay is not expected to result in any disproportionate adverse environmental effects or impacts on the health of tribal members, or other minority/low-income populations. No interference with treaty rights is anticipated.

7 Public Involvement, Review, and Consultation

Public involvement activities and agency coordination are summarized in this chapter.

7.1 Public Involvement Process

USACE will publish a Notice of Availability of this FR/EA with an accompanying 30 day public comment period. The notice, along with a link to the FR/EA, will be sent out as an email and regular mail notification to interested parties in the State of Washington. All comments received will be considered in determining whether it will be in the public interest to proceed with the proposed project.

7.2 Tribal Government Consultation and Coordination Process

Neah Bay is surrounded in its entirety by the Makah Indian Reservation (Makah Reservation), and the Makah Indian Tribe (Makah Tribe) is the project's local sponsor. As such, USACE has coordinated regularly with the Tribe regarding the plan formulation process and environmental impacts. USACE has had several in-person meetings, phone calls, and email exchanges with the Makah Tribe regarding the project. The Makah Tribe has also assisted in writing portions of this FR/EA.

7.3 Agencies and Persons Consulted*

The following list of agencies and individuals were consulted during the plan formulation and environmental compliance of this feasibility study and preparation of the Integrated FR/EA.

- U.S. Environmental Protection Agency
- National Marine Fisheries Service
- U.S. Fish and Wildlife Service
- Washington Department of Fish and Wildlife
- Washington Department of Ecology
- Makah Indian Tribe
- Washington Department of Natural Resources

7.4 Public Interest Evaluation Factors for Maintenance Dredging Activities

An evaluation of the maintenance dredging and disposal activity was conducted in light of the public interest factors prescribed in 33 CFR 336.1(c). The use of the term "maintenance" is meant broadly - and it would include this section 107 CAP project because it is not a federal project specifically authorized by Congress, but rather is reliant upon a standing authority and appropriation source. Public interest factors include: navigation and the federal standard for dredged material disposal; water quality; coastal zone consistency; wetlands; endangered species; historic resources; scenic and recreation values; fish and wildlife; marine sanctuaries; and applicable state/regional/local land use classifications, determinations, and/or policies. Of these, navigation and the federal standard, water quality, coastal zone consistency, wetlands, endangered species, historic resources, scenic values, recreational values, and fish and wildlife have been evaluated in this FR/EA. The factor of marine sanctuaries established under the Ocean Dumping Act is not applicable, as there are no sanctuary effects of dredging or disposal. The factor of application of non-federal land use policies was considered in connection with the coastal zone consistency evaluation and in section 3.10; no additional impacts to state/regional/local land use classifications, determinations, and/or policies are anticipated as the project would maintain a federally authorized boat basin that is already used for vessel moorage.

In accordance with 33 CFR 337.1(a)(14) and 325.3(c)(1), the following additional relevant factors were also considered:

- Conservation: This action would entail dredging, and new channel depths would be constructed. The effects on fish and wildlife, including marine mammals and listed species, have been fully evaluated. Dredged material as a resource would be conserved through placement as a beneficial use to restore intertidal and beach habitat to an area that is currently subtidal due downgrading caused by mad-made structures that cut off sediment input to the shoreline.
- Economics: As reflected in this FR/EA, the rescue operations in Neah Bay relies on the ability to exit and enter the bay, the use of which this action would perpetuate. The preferred alternative is the least costly alternative that would meet the project’s purpose and need. Based on recent pricing of similar dredging projects of small harbors in the Northwest, Alternative 2 is expected to be less costly than Alternative 3. The economic benefits afforded through constructing the channel were determined to outweigh the federal costs of the action.
- Shoreline erosion and accretion: The effects on shoreline erosion and accretion have been addressed in the geomorphology section of this FR/EA.

- Safety: Interests of safety would be served by accomplishing the dredging to the depths under the preferred alternative, and providing a navigable waterway for the safe and efficient transit to vessels.
- Property ownership: Full utilization of the private vessel ownership interests by tenants of and visitors to Neah Bay would be fostered by the dredging.

As provided in 33 CFR sections 335.4, 336.1(c)(1) and 337.6, USACE has fully considered, on an equal basis, all alternatives that are both reasonable and practicable, i.e., available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes. The necessary budget resources, including required items of local responsibility assigned to the Makah Tribe as non-federal sponsor, are available and adequate to fully support the action. The preferred alternative represents the least costly alternative, constituting the discharge of dredged or fill material into waters of the United States in the least costly manner and at the least costly and most practicable location, is consistent with sound engineering practices, and meets the environmental standards established by the Clean Water Act Section 404(b)(1) evaluation process. Execution of the preferred alternative, following consideration of all applicable evaluation factors, would be in the public interest.

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8 Summary of Environmental Impacts

Overall there would be general non-significant effects to the environment of the Neah Bay navigation improvement project and the disposal site because of the timing of the work windows, the use of other best management practices, and the beneficial use of materials. The preferred alternative would not generate significant impacts on the quality of the human environment, and, at this time, the preparation of an Environmental Impact Statement is not warranted. The USACE would conduct sampling and analysis of the sediments to be dredged during the PED phase to assure they are suitable for beneficial use. USACE will follow the DMMP process to see if further testing of the sediment is warranted. If testing indicates it's not suitable for beneficial use, then other disposal options will need to be evaluated. USACE will complete compliance with all environmental laws including ESA, CWA, and CZMA upon finalization of the FR/EA.

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9 Recommendations

The following language outlines USACE's recommendations for project approval and authorization for implementation.

I concur with the findings, conclusions, and recommendations of the reporting officers. Accordingly, I recommend that navigation improvements for Neah Bay be authorized in accordance with the reporting officers' recommended plan. The estimated project first cost of the recommended plan is $1,774,000 (October 2019 price level). The federal portion of the estimated project first cost is $1,331,000. The non-federal sponsors' portion of the required cost share of estimated project first costs is $443,000. My recommendation is subject to cost sharing, financing, and other applicable requirements of federal and state laws and policies, including Section 101 of WRDA 1986, as amended. This recommendation is subject to the non-federal sponsor agreeing to comply with all applicable federal laws and policies including that the non-federal sponsor must agree with the following requirements prior to project implementation:

a. Provide, during the periods of design and construction, funds necessary to make its total contribution for commercial navigation consistent with the amounts estimated in Section 5.4 of this report, subject to adjustments per 33 USC 2310.

b. Provide all lands, easements, rights-of-way, and relocations (LERR), including those necessary for the borrowing of material and placement of dredged or excavated material, and perform or assure performance of all relocations, including utility relocations, all as determined by the government to be necessary for the construction or operation and maintenance of the General Navigation Features (GNFs). Provide and maintain during the authorized life of the project the mitigation lands determined to be required for mitigation for impacts for the project.

c. Pay with interest, over a period not to exceed 30 years following completion of the period of construction of the GNFs, an additional amount equal to 10 percent of the total cost of construction of the NED GNFs less the amount of credit afforded by the government for the value of the LERR and relocations, including utility relocations, provided by the non-federal sponsor for the GNFs, subject to adjustments per 33 USC 2310. If the amount of credit afforded by the government for the value of LERR, and relocations, including utility relocations, provided by the non-federal sponsor equals or exceeds 10 percent of the total cost of construction of the GNFs, the non-federal sponsor shall not be required to make any contribution under this paragraph, nor shall it be entitled to any refund for the value of LERR and relocations, including utility relocations, in excess of 10 percent of the total costs of construction of the GNFs.

d. Provide, operate, and maintain, at no cost to the government, the local service facilities in a manner compatible with the project's authorized purposes and in accordance with applicable federal and state laws and regulations and any specific directions prescribed by the government.

e. Provide 100 percent of the excess cost of operation and maintenance of the project over that cost which the government determines would be incurred for operation and maintenance of a project of the depth described in the NED plan.

f. Accomplish all removals determined necessary by the Federal Government other than those removals specifically assigned to the Federal Government.

g. Give the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon property that the Sponsor owns or controls for access to the project for the purpose of completing, inspecting, operating and maintaining the GNFs.

h. Hold and save the United States free from all damages arising from the construction or operation and maintenance of the project, any betterments, and the local service facilities, except for damages due to the fault or negligence of the United States or its contractors.

i. Perform, or ensure performance of, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC 9601-9675, that may exist in, on, or under LERR that the government determines to be necessary for the construction or operation and maintenance of the GNFs. However, for lands, easements, or rights-of-way that the government determines to be subject to the navigation servitude, only the government shall perform such investigation unless the government provides the non-federal sponsor with prior specific written direction, in which case the non-federal sponsor shall perform such investigations in accordance with such written direction.

j. Assume complete financial responsibility, as between the government and the non-federal sponsor, for all necessary cleanup and response costs of any hazardous substances regulated under CERCLA that are located in, on, or under LERR that the government determines to be necessary for the construction or operation and maintenance of the project.

k. Agree, as between the Federal Government and the non-federal sponsor, that the non-federal sponsor shall be considered the operator of the local service facilities for the purpose of CERCLA liability.

l. To the maximum extent practicable, perform its obligations in a manner that will not cause liability to arise under CERCLA.

m. Provide the non-federal share of that portion of the costs of mitigation and data recovery activities associated with historic preservation, that are in excess of 1 percent of the total amount authorized to be appropriated for the project.

The recommendation contained herein reflects the information available at this time and current departmental policies governing formulation of individual projects. It does not reflect program and budgeting priorities inherent in the formulation of a national civil works construction program or the perspective of higher review levels within the executive branch. Consequently, the recommendation may be modified before it is transmitted to the Northwestern Division as a proposal for approval and implementation funding. However, prior to transmittal to the Northwestern Division, the Makah Indian Tribe (the non-federal sponsor) will be advised of any significant modifications and will be afforded an opportunity to comment further.

Alexander "Xander" L. Bullock
Colonel, Corps of Engineers
District Commander

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