NEAH BAY SECTION 107
NAVIGATION IMPROVEMENT PROJECT
NEAH BAY, WASHINGTON

APPENDIX A

ECONOMICS

US Army Corps of Engineers
Seattle District

Makah Tribe

NEAH BAY SECTION 107 NAVIGATION IMPROVEMENT PROJECT, WASHINGTON

ECONOMIC APPENDIX A

June 2020

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1 INTRODUCTION

"The role of the U. S. Army Corps of Engineers with respect to navigation is to provide safe, reliable, and efficient waterborne transportation systems (channels, harbors, and waterways) for movement of commerce, national security needs, and recreation. The Corps accomplishes this mission through a combination of capital improvements and the operation and maintenance of existing projects." (U.S. Army Corps of Engineers, 2000)

1.1 Federal Study Authority

Section 107 of the River and Harbor Act of 1960, as amended, provides authority for the Corps of Engineers to plan and construct small navigation projects that have not already been specifically authorized by Congress. A project is accepted for construction only after detailed investigation shows its engineering feasibility, environmental acceptability, and economic justification. Each project must be complete within itself, not part of a larger project. The maximum federal expenditure per project is $10 million, which includes both planning and construction costs. Any additional costs must be paid by the non-federal sponsor. Costs of lands, easements, and operation and maintenance of the project (other than certain maintenance dredging) must be non-federal.

1.2 Purpose and Scope of Study

The purpose of the proposed Federal action is to achieve transportation cost savings resulting in National Economic Development (NED) benefits. Channel depth and width constraints can lead to tide delays, light loading, or other operational inefficiencies resulting in economic inefficiencies and additional costs to the national economy.

The purpose of this Economic Appendix is to help identify, describe, and compare the list of alternatives with respect to benefits and costs. This analysis allows for a risk-informed selection of a recommended plan. The economic analysis is prepared in a level of detail commensurate with the complexity of the project. The analysis is not intended to be exhaustive, but to provide sufficient data to document the steps used in formulating and identifying the recommended plan.

1.3 Location and Description

The project is located at the entrance channel to the Port of Neah Bay. Neah Bay is an isolated community at the northwest tip of the Olympic Peninsula in Washington State, 170 miles northwest of Seattle, Washington (**Figure 1-1**). Neah Bay is located at the entrance of the Strait of Jaun de Fuca, which connects the Pacific Ocean to the internal waters of Puget Sound and British Columbia (the Salish Sea).

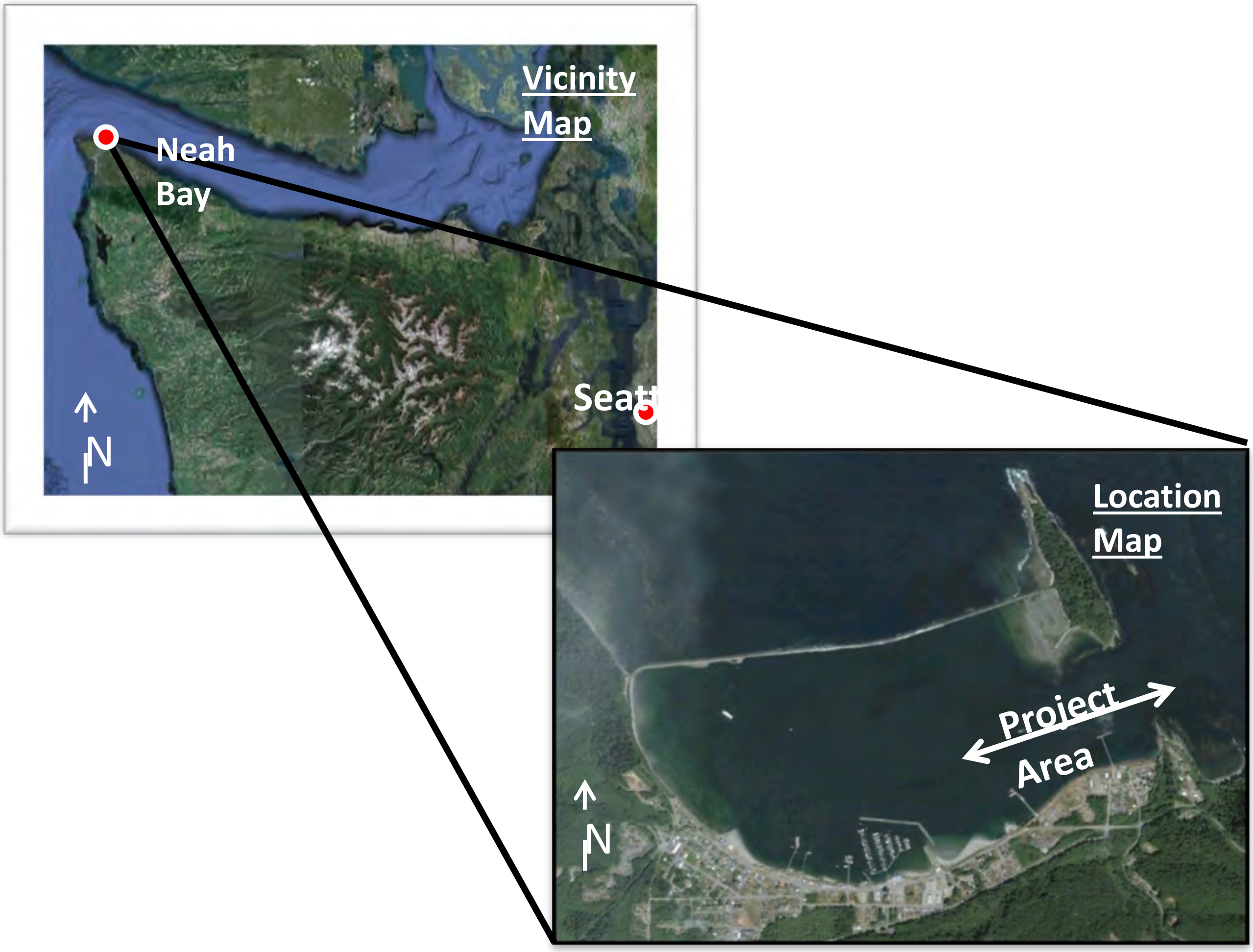

Figure 1-1: Neah Bay Project Location

1.4 Problem Statement

The current controlling depth of -19ft MLLW and entrance channel width of 200ft, along with navigation challenges such as weather, wave action, turbulent seas, and rock obstacles, restrict the size of vessels that can safely and efficiently transit the channel at Neah Bay. Current conditions allow vessels with a maximum draft of 15 feet or less to safely enter the bay with no tide restrictions. Commercial and rescue vessels tend to draft greater than 15 feet, causing face significant operating challenges and costs related to the current channel depth at Neah Bay.

2 SOCIO-ECONOMIC ENVIRONMENT & DEMOGRAPHIC PROFILE OF STUDY AREA

2.1 Demographics

Neah Bay is in Clallam County, Washington (ZIP 98357) inside of the Makah Reservation lands. The Makah Reservation[1] is relatively isolated from other communities within Clallam County, the Olympic Peninsula and Washington State. Clallam County's major commercial center and county seat, Port Angeles, is 75 miles from Neah Bay. Seattle is 150 miles away, and Forks, the closest town, is 60 miles away. A map of Neah Bay is provided by **Figure 2-1**.

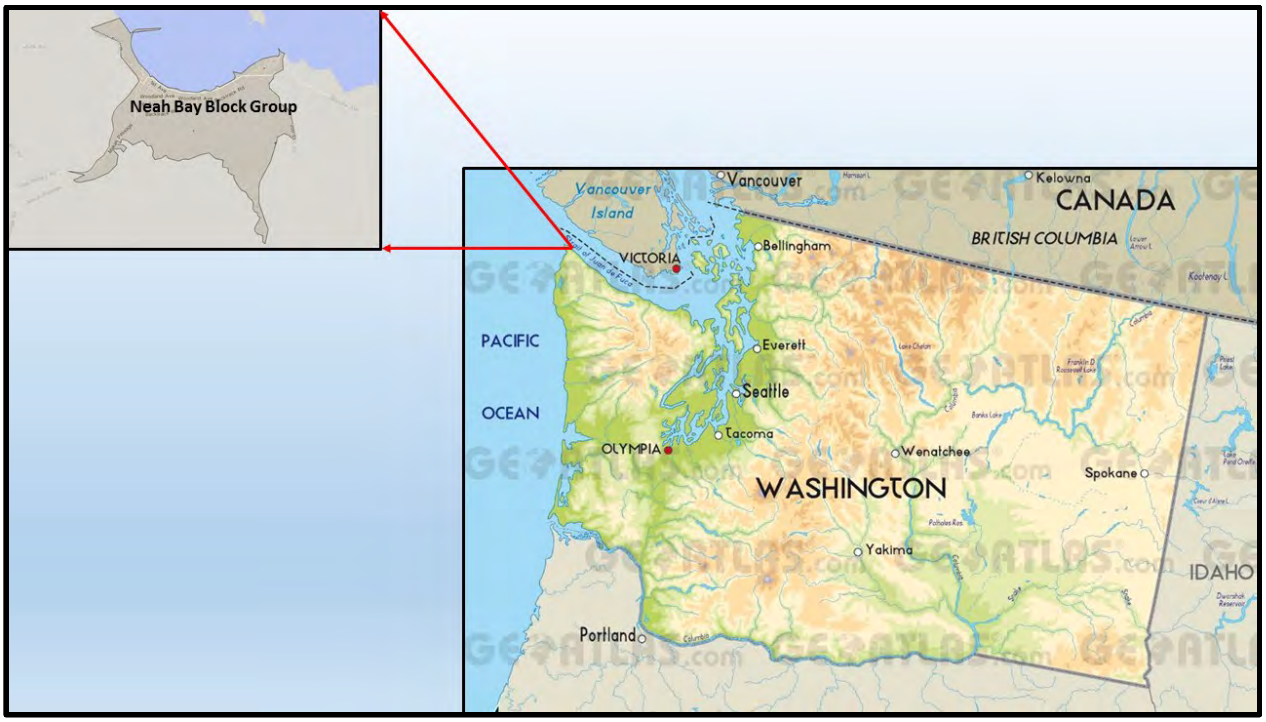

Figure 2-1: Map of Neah Bay Study Area

2.1.1 Age Distribution and Population

Neah Bay is a small rural town within the Makah Indian Reservation with a population less than one thousand. The 2010 census marked the population at 865 with 9% population growth from the previous census in 2000. The median age in Neah Bay is approximately 36.7 years old with 55% of the population male to 45% female.

2.1.2 Race and Ethnicity

Neah Bay is located within the Makah Reservation. Approximately 70 percent of the population identifies as Native American (Races in Neah Bay, 2016). **Figure 2-2** summarizes race and ethnicity statistics for Neah Bay.

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[1] Neah Bay and the Makah Reservation, for the purpose of this document, are synonymous and may be used interchangeably throughout this document.

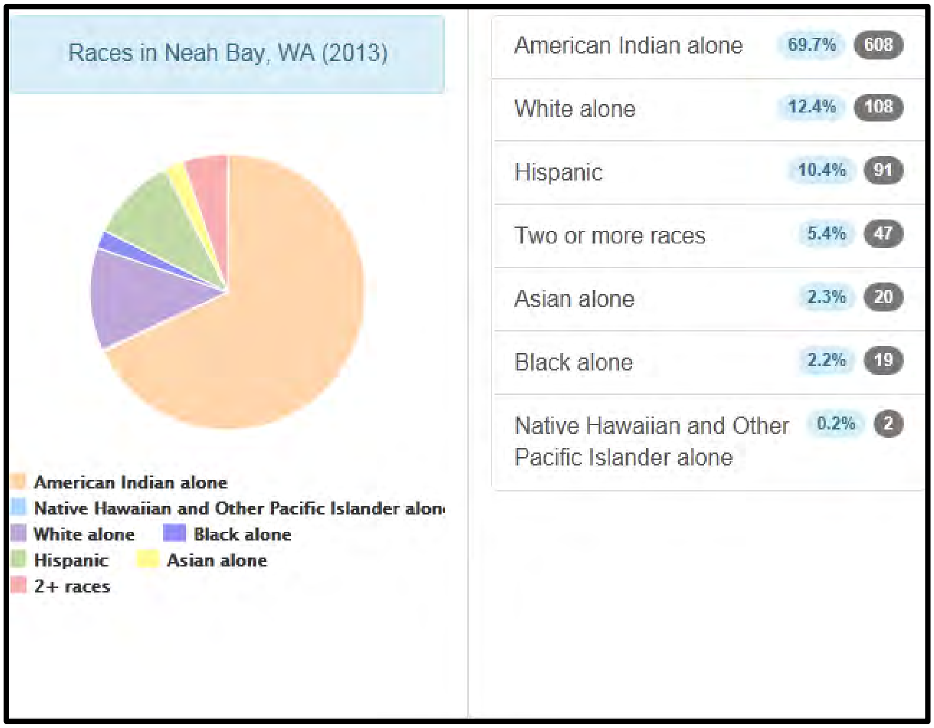


Figure 2-2: Race and Ethnicity

2.2 Economic Activities

2.2.1 Income and Employment

The median annual household income of Neah Bay is approximately $32k—roughly half of the median household income for the State of Washington (**Figure 2-3**). According to City-Data.com, the 2017 unemployment rate for Neah Bay is 7 percent, nearly 2.2 percent higher than Washington State[2].

[2] http://www.city-data.com/city/Neah-Bay-Washington.html

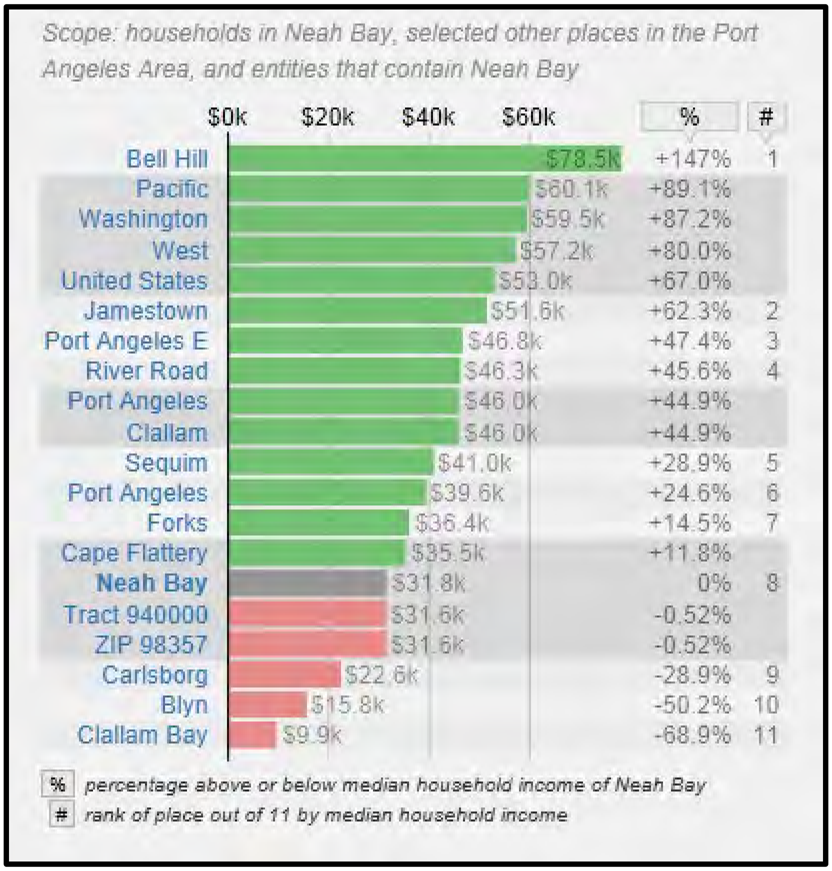


Figure 2-3: Median Household Income

Agriculture (general farming, forestry, fishing, and hunting) and Public Administration account for 18% and 15% of employment at Neah Bay, respectively (Population of Neah Bay, Washington, 2016). **Figure 2-4** summarizes estimated occupation statistics for Neah Bay.

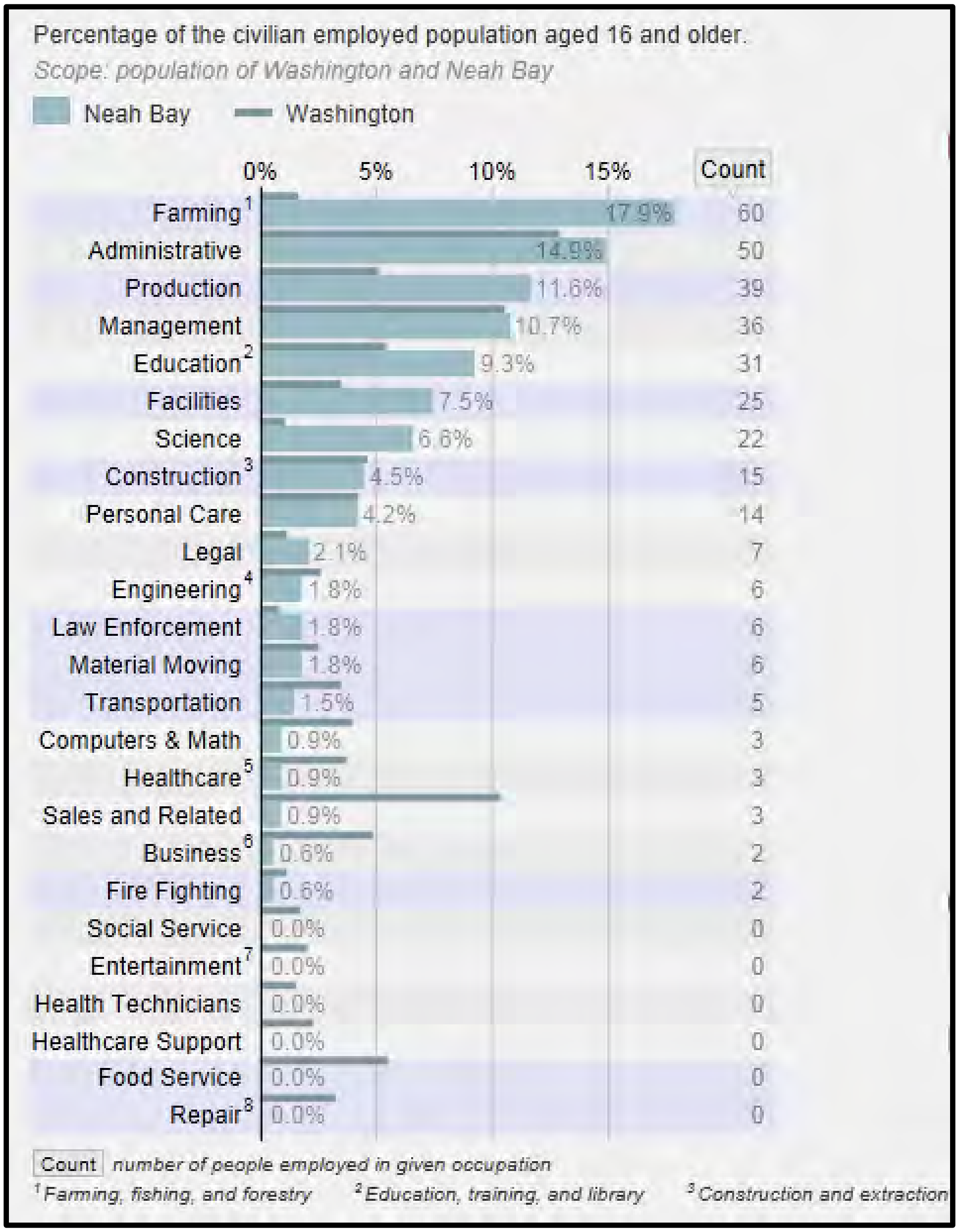


Figure 2-4: Occupation as Percentage Civilian Population 16 and Older

3 EXISTING AND HISTORICAL CONDITIONS

The existing conditions are defined as the project conditions that exist as of 2019. Currently, the Neah Bay Harbor entrance channel is -19ft MLLW. A 1,450ft rubble mound and 350ft grounded bridge pontoon combine to form a Federal breakwater at the north end of the harbor to provide wave protection. Neah Bay includes the Makah Marina, which consists of over 200 slips for vessels from 30 to 70 feet as well as some accommodations for vessels over 100 feet. Makah Marina has depths up to -26 feet MLLW. There is also a US Coast Guard station and dock located to the east of Makah Marina.

3.1 Vessel Operations

Vessels frequently calling Neah Bay include permanently-stationed Emergency Response Towing Vessels (ERTVs), Emergency Oil Response Tugs, fishing vessels, and pleasure crafts. Makah Marina is 1.2 nautical miles from the channel entrance between Waadah Island to the north and Baada Point to the South. Transit to the Strait of Juan de Fuca takes approximately 15 minutes with a main channel speed between 5 and 9 knots. Given the average size of vessels at Neah Bay, the channel is predominantly two-way.

3.1.1 Underkeel Clearance

The measure of underkeel clearance (UKC) for economic studies is applied according to planning guidance. According to this guidance, UKC is evaluated based on actual vessel operator and pilot practice within a harbor and subject to present conditions, with adjustment as appropriate for with-project conditions. Generally, practices for UKC are determined through review of written pilotage rules and guidelines, interviews with pilots and vessel operators, and analysis of actual past and present practices based on relevant data for vessel movements.

Discussion with the Port of Neah Bay and Foss Maritime indicates a standard UKC of approximately 2 feet in the channel. This estimate is based on historical channel use as well as expectations of future channel use and is consistent with engineering safety recommendations in EM 1110-2-1613.

3.1.2 Tidal Range

Neah Bay experiences a 13-foot tidal range. With 19 feet of channel depth and two feet of UKC, current channel depth allows 100 percent access for vessels drafting 15 feet and less. As larger vessels with deeper sailing drafts call at Neah Bay, channel depth availability will continue to be a constraint on vessel operations. **Figure 3-1** presents annual channel reliability. The existing, 19-foot depth is available 89 percent of the year, or approximately 21 of every 24 hours in an aggregate tidal cycle.

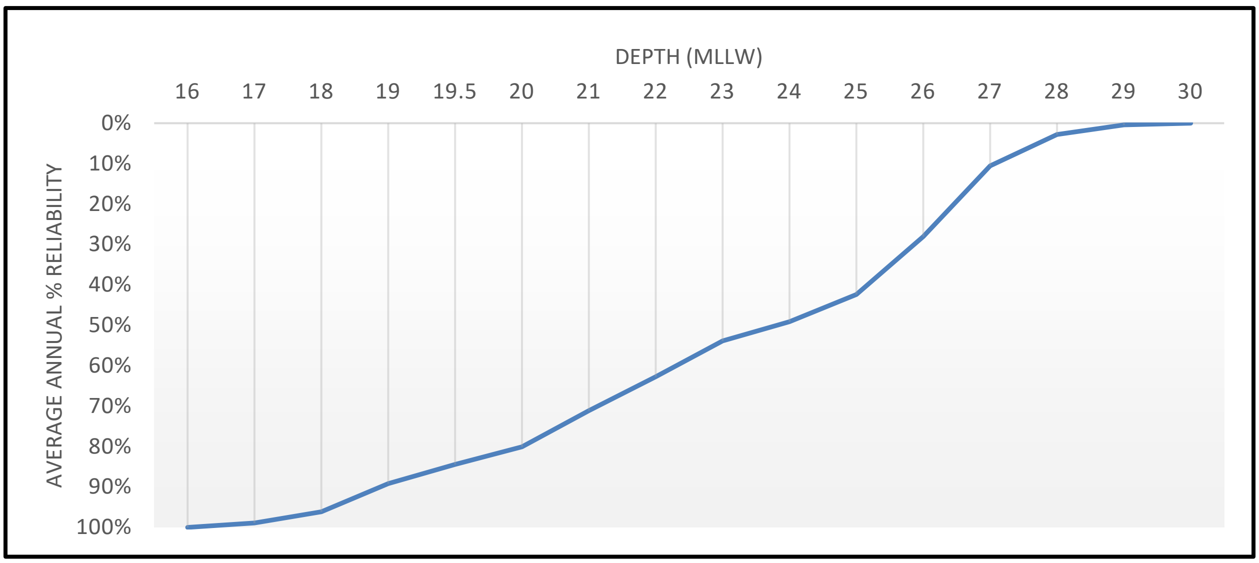


Figure 3-1: Channel Reliability

3.2 Vessel Fleet

This section discusses four vessel types which use the harbor and could be impacted by channel improvements: emergency response towing vessels (ERTVs), oil spill response vessels, fishing vessels, and harbor of refuge vessels currently operating at Neah Bay.

3.2.1 Emergency Response Towing Vessel (ERTV)

The National Oil and Hazardous Substances Pollution Contingency Plan, more commonly called the National Contingency Plan (NCP), is the federal government's blueprint for responding to both oil spills and hazardous substance releases. The National Contingency Plan is the result of the country's efforts to develop a national response capability and promote overall coordination among the hierarchy of responders and contingency plans. Several of the worst oil spills in the State of Washington waters have occurred at the entrance of the Straits of Juan de Fuca. The marine waters and coast contain natural resources that are critical to the Makah Tribe. There is also 2,408 square miles of protected habitat on the west coast of the Olympic Peninsula which is part of NOAA's Olympic Coast National Marine Sanctuary. The region contains numerous protected or listed species and their critical habitat, including orca, salmon, rockfish, migrating birds, and seals.

The mission of the Northwest Area Committee is to ensure efficient and coordinated support of federal, state, tribal and local responses to oil spills as mandated by the National Contingency Plan. As part of this, the state of Washington requires a permanently-station ocean going rescue tug at Neah Bay in addition to oil spill response vessels and equipment at Neah Bay. The State of Washington's Department of Ecology funded an ERTV at Neah Bay from 1999 to 2010. As of July 1, 2010 and per RCW 88.46.130, "the owner or operator of a covered vessel transiting to or from a Washington port through the Strait of Juan de Fuca, except for transits extending no further west than Race Rocks light, shall establish and fund an emergency response system that provides for an emergency response towing vessel to be stationed at Neah Bay" (Legislature, RCW 88.46.130, 2009). As a result, the Marine Exchange of Puget Sound created the Emergency Response Towing Vessel Compliance group to fund and manage the permanently-stationed ERTV at Neah Bay. The following are the legal requirements established by RCW 88.46.135 (Legislature, RCW 88.46.135, 2009):

(1) Covered vessels that are subject to requirements specified in RCW 88.46.130 must provide at least one emergency response towing vessel that must be:
    a. Stationed at Neah Bay; and
    b. Continuously available and capable of responding to any vessel emergency, including but not limited to:
        i. Loss or serious degradation of propulsion, steering, means of navigation, primary electrical generating capability, or sea keeping capability;
        ii. Uncontrolled fire;
        iii. Hull breach; or
        iv. Oil spill

(2) An emergency response towing vessel must be capable of:
    a. Deploying at any hour of any day to provide emergency assistance;

b. Being underway within twenty minutes of a decision to deploy, with adequate crew to safely remain underway for at least forty-eight hours;
c. Effectively employing a ship anchor chain recovery hook and line throwing gun;
d. A bollard pull of at least seventy short tons; and
e. Effectively operating in severe weather conditions with sustained winds measured at forty knots and wave heights of twelve to eighteen feet, including:
    i. Holding position within one hundred feet of another vessel; and
    ii. Making up to, stopping, holding, and towing a drifting or disabled vessel of one hundred eighty thousand metric dead weight tons

(3) An emergency response towing vessel must be equipped with:
a. A ship anchor chain recovery hook
b. A line throwing gun; and
c. Appropriate equipment for:
    i. Damage control patching;
    ii. Vessel dewatering;
    iii. Air safety monitoring; and
    iv. Digital photography

(4) The requirements of this section may be fulfilled by a private organization or nonprofit cooperative providing umbrella coverage under contract to a single or multiple covered vessels. If a nonprofit cooperative is formed or used to meet the requirements of this section, it shall equitably apportion costs to each participating covered vessel based on risk associated with particular classes of covered vessels, navigational and structural characteristics of covered vessels, and the number of covered vessel transits in state waters in the Strait of Juan de Fuca, as defined in RCW 88.46.130(6).

(5) The department is authorized to contract with an emergency response towing vessel provided under this section. Any use by the department must be paid by the department.

(6) Covered vessels that are required to provide an emergency response towing vessel may not restrict the emergency response towing vessel from responding to noncovered vessels in distress.

(7) Nothing in this section prohibits a covered vessel, private organization, or nonprofit cooperative from contracting with an emergency response towing vessel with capabilities exceeding requirements specified in this section.

From 1999 to 2016, the dedicated rescue tug at Neah Bay has deployed to stand by or directly assist 57 vessels that were disabled or had reduced maneuvering ability. The Department of Ecology of the State of Washington estimates that this prevented as much as 18.7 million gallons of spilled fuel. **Figure 3-2** provides a map of all ERTV deployments from 1999 to 2016 (Ecology, 2016).

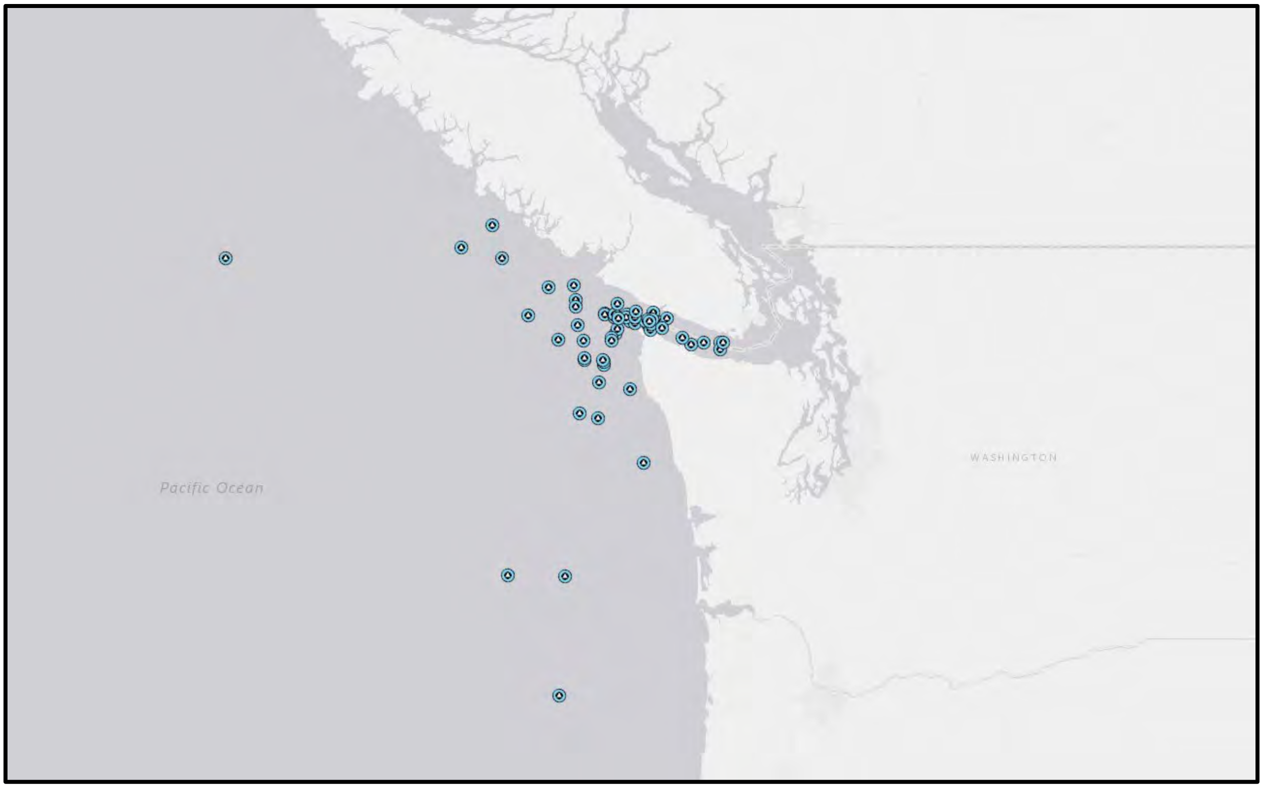


Figure 3-2: ERTV Deployments (1999-2016)

Table 3-1 provides vessel specifications for all vessels used as the permanently-station ERTV at Neah Bay including service start and end dates.

Table 3-1: Emergency Response Towing Vessel Dimensions

Vessel Name	Sailing Draft*	Bollard Pull (short tons)	Service Start	Service End
SEA VALIANT	13.1	88	1999	1999
BARBARA FOSS	16.4	71	2000	2004
GLADIATOR	17.1	75	2006	2008
HUNTER	16.0	75	2008	2010
TAKU WIND	15.1	71	2009	2016
MICHELE FOSS	18.0	109	2016	2016
Nicole Foss	17.0	110	2017	2017
LAUREN FOSS	19.5	108	2004	2017
MARSHALL FOSS	17.7	86	2016	2017
DELTA LINDSEY	19.0	93	2012	2017
MONTANA	18.0	80	2017	2017
DENISE FOSS	**17.5**	**108**	**2017**	**current**

*Based on AIS data

The Denise Foss currently acts as the designated response vessel at Neah Bay Harbor. The Denise Foss currently serves as the designated ERTV. Foss Maritime and the Marine Exchange of Puget Sound anticipate that the Denise Foss will continue to serve as the designated ERTV into 2020.The Denise Foss meets or exceeds all requirements of RCW 88.46.135 and is expected to remain at Neah Bay as the permanently stationed ERTV at least through 2020. **Figure 3-3** provides a picture of the Denise Foss.

Figure 3-3: Denise Foss

Per RCW 88.46.130, the ERTV must be able to immediately respond to an emergency. Currently, the entrance channel depth prevents 24-hour accessibility for the design ERTV. In order for the emergency tugs to maintain their response capability, they must leave Neah Bay Harbor for deeper water during low tide events. Depending on the draft of the emergency response vessel, these tide-induced transits can take place as often as once per day. From the time the vessel leaves berth to the time it returns to dock, these transits last an average of 4 hours (**Attachment 2**). The sensitivity analysis (**Section 1**) tests the impact of these assumptions.

3.2.2 Oil Spill Response Vessel

The entrance of the Strait of Juan de Fuca frequently experience severe coastal weather conditions. Combined with high volumes of traffic in the area, there is a high risk of vessel accidents. Neah Bay is the primary location for ocean going emergency tugs that rescue/aid vessels along this route. Both the for-profit National Response Corporation (NRC) and the not-for-profit Marine Spill Response Corporation (MSRC) maintain vessels (NRC Cape Flattery and the Arctic Tern, respectively) at or near Neah Bay to respond to oil spills. **Table 3-2** provides deadweight tonnage (DWT) and dimensions for vessels currently operated out of Neah Bay by NRC and MSRC. The barge Kenny can be integrated with a tow to respond to an oil spill.

Table 3-2: Emergency Response Vessel Dimensions

Name	DWT	LOA (ft)	Beam (ft)	Operating Draft (ft)	UKC (ft)	Horsepower
NRC Cape Flattery	170	110	26	9.8	2	1,132
Kenny	4,500	248	56	17.5*	2	0
Arctic Tern	N/A	N/A	N/A	9.5	2	N/A

*fully loaded draft

3.2.3 Fishing Vessels

It is estimated that the fishing industry in Neah Bay alone is comprised of 90 small business enterprises representing more than 400 jobs (Council, 2015). The Makah Marina handles roughly 9 million pounds of fish and shellfish annual valued at over $6.5 million (Council, 2015). There are five large commercial fishing vessels owned by Tribal members. These boats fish out of Neah Bay during the Whiting fishery and fish a portion of the year in the Gulf of Alaska. The approximate dimensions of the largest of these vessels is listed in **Table 3-3**.

Table 3-3: Fishing Vessel Dimensions

LOA	Beam	Draft
59	20	8

3.3 Harbor of Refuge

Neah Bay is the nearest Harbor of Refuge to a large part of the Pacific Ocean. Port Angeles (approximately 10 hours away by sea) is the next closest Harbor of Refuge for many vessels. Neah Bay is also used by small vessels as a Harbor of Refuge in dangerous weather conditions. Its proximity to the Straits of Juan de Fuca makes the anchorage essential to small vessels. Fishing vessels operate out of Neah Bay. These vessels fish during the fall when the weather can be especially dangerous. The combination of rough seas and heavily loaded vessels can create delays and safety hazards.

There is no data available on the number of vessels that use Neah Bay as a Harbor of Refuge under their own power; however, the Washington State Department of Ecology maintains records on vessels requiring emergency tug assistance from the emergency tugs kept at Neah Bay. While not an exhaustive list, **Table 3-4** provides insight into the size and quantity of vessels that potentially benefit from the use of Neah Bay under emergency conditions. Of the 57 vessels listed, 26 were taken to Port Angeles, 5 were taken to Neah Bay, and 26 either did not require a Harbor of Refuge or were taken to another location.

Table 3-4: Harbor of Refuge Vessel Specifications

Vessel Type	Vessel Count	Avg. DWT	Avg LOA (ft)	Avg. Breadth (ft)	Avg. Draft (ft)
ATB/Tug/Tow/Barge	11	526	124	38	17
Bulk Carrier	11	57,376	618	94	35
Chemical Tanker	1	33,000	599	97	33
Containership	17	35,226	728	97	37
Fish Processing Vessel	1	1,719	295	44	19
Fishing Vessel	6	692	145	31	14

Vessel Type	Vessel Count	Avg. DWT	Avg LOA (ft)	Avg. Breadth (ft)	Avg. Draft (ft)
General Cargo	4	79,297	710	106	41
Grain Ship	1	28,646	564	89	31
Reefer	2	8,106	437	65	27
Tanker	3	136,841	865	154	52

Additionally, the US Coast Guard operates a station under District 13 at Neah Bay. This station primarily conducts emergency response, environmental protection, and maritime law enforcement operations.

4 WITHOUT-PROJECT CONDITIONS AND FLEET PROJECTION

The Without-Project Condition refers to the prevailing conditions over the study period in the absence of a federal project. At Neah Bay the channel configuration will continue to have an effective limiting depth of -19 feet MLLW based on the low shoaling rate.

4.1 Design Fleet

EM 1110-2-1613 states "…the design ship or ships are selected on the basis of economic studies of the types and sizes of the ship fleet expected to use the proposed navigation channel over the project life…" The design ship is defined in EM 1110-2-1613 as "…the largest ship of the major commodity movers expected to use the project improvements on a frequent and continuing basis…" The study uses expert elicitation from the Port of Neah Bay and industry in addition to analysis of world fleet and order book data to determine what vessels will most likely use the channel over the project life.

4.1.1 Emergency Response Towing Vessel (ERTV)

The analysis determined the ERTV design class dimensions using (1) past vessel deployment, (2) analysis of the world fleet of towing vessels able to meet the legal requirements of RCW 88.46.135, and (3) vessel availability at Neah Bay's remote location.

Consultation with industry and the port revealed that the current vessel will remain as the primary ERTV stationed at Neah Bay through the end of the current contract in 2020. While the vessel could change once the contract ends, it is likely that a vessel similar to the current vessel will be deployed.

Average DWT of vessels calling the Puget Sound region increased from 48,000 DWTs to 60,000 DWTs from 2004 to 2016, and the region has continued to receive 180,000 DWT vessel calls and larger since 2004 (**Table 4-1**). New-build tanker and containership sizes continue to increase, putting additional pressure on the ERTV's emergency response capability, especially given the extreme weather conditions near the Strait of Juan de Fuca. In addition, the pending approval of the Canadian Trans Mountain Expansion Project will likely add to total tanker traffic through the Strait of Juan de Fuca (Trans Mountain Expansion Project Reconsideration Report). While the ERTV Assessment does not apply to vessels calling only on Canadian ports, the ERTV at Neah Bay would be the closest responder to any incident at the mouth of the Strait of Juan de Fuca for U.S. and Canadian traffic and could be hired in an emergency.

RCW 88.46.135 requires the ERTV to "in severe weather conditions, be capable of making up to, stopping, holding, and towing a drifting or disabled vessel of 180,000 metric deadweight tons" (**Section 3.2.1**). The Washington State Office of Marine Safety Emergency Towing System Task Force recommended that a towing vessel would need at least 100 ton bollard pull and up to 150 bollard pull to effectively respond to

99 percent of vessels adrift in severe weather conditions[3]. To meet the legal requirements of RCW 88.46.135, it is most likely that a vessel of at least 100 bollard pull will be necessary.

Table 4-1: Vessel DWT Transiting the Strait of Juan de Fuca, 2004-2016

Year	Average DWT	Max DWT
2004	48,000	165,000
2005	51,000	193,000
2006	54,000	166,000
2007	54,000	215,000
2008	53,000	167,000
2009	55,000	193,000
2010	57,000	193,000
2011	57,000	193,000
2012	57,000	162,000
2013	56,000	165,000
2014	58,000	193,000
2015	59,000	193,000
2016	60,000	185,000

Source: NNOMPEAS

IHS Sea-web vessel data reveals 1,317 U.S.-flagged, ocean towing vessels that could be used as ERTVs. Of these vessels, 151 met the minimum 70 short ton bollard pull requirement for use at Neah Bay. The average sailing draft of all vessels with at least 70 bollard pull was 17.8 feet. The average of vessels with at least 100 ton bollard pull was 20.3 feet, but roughly 20 percent of these vessels have a sailing draft between 16.5 feet and 18.5 feet. Of all legally acceptable vessels, 17 have operated near the study area (Puget Sound or Strait of Juan de Fuca). These 17 vessels have an average sailing draft of 18 feet, and 30 percent (5 vessels) have a sailing draft between 16.5 feet and 18.5 feet (**Table 4-2**).

Table 4-2: Vessels with Operations in the Puget Sound Region

Vessel Name	Constructed	Bollard Pull (Short Tons)	Draft (ft)
MARS	1970	88	14.7
TAKU WIND	1970	71	15.09
HUNTER	1977	76	16.4
BARBARA FOSS	1976	71	16.5
GUARDSMAN	1976	86	17
DENISE FOSS	**2016**	**108**	**17.5**
MARSHALL FOSS	2001	86	17.7
MONTANA	2014	80	17.9
GUARDIAN	1970	88	19
CORBIN FOSS	2003	106	19.5
LAUREN FOSS	2003	108	19.5
SEA VICTORY	1974	120	19.7

[3] https://web.wpi.edu/Pubs/E-project/Available/E-project-011012-222729/unrestricted/Final_Report.pdf

Vessel Name	Constructed	Bollard Pull (Short Tons)	Draft (ft)
ALASKA TITAN	2008	80	20
GULF TITAN	2001	71	20
LINDSEY FOSS	1993	87	20
OCEAN TITAN	2004	80	20
GARTH FOSS	1994	87	20.5

Table 4-3 provides a summary of vessels operated by Foss Maritime, which currently operates the ERTV, and Crowley Maritime Corporation, which operates harbor assist and tanker escort vessels in the Puget Sound region. These firms represent a likely sample of potential contractors in the region capable of fulfilling the requirements of the ERTV. The table includes each vessels' bollard pull rating, draft, and whether or not they meet the legal requirements to serve as the permanently-stationed ERTV at Neah Bay (Bollard Pull Compliant). From this analysis, there are five vessels within the 16.5-foot to 18.5-foot draft range, the most common draft range.

Table 4-3: Foss and Crowley Vessel Specifications

Owner	Vessel Name	Age	Bollard Pull (short tons)	Draft (ft)	Bollard Pull Compliant
Foss	Emmett Foss	2013	13	5	No
Foss	Iver Foss	1977	33	11.5	No
Foss	Sandra Foss	1976	46	11.6	No
Foss	Stacey Foss	1976	46	11.6	No
Foss	Drew Foss	1977	32	14.6	No
Foss	Sidney Foss	1976	33	14.6	No
Foss	Justine Foss	1976	54	14.6	No
Crowley	Guide	1998	56	17	No
Crowley	Chief	1999	56	17	No
Crowley	Protector	1996	60	18	No
Crowley	Guard	1997	60	18	No
Foss	Taku Wind	1970	71	12.7	Yes
Foss	Barbara Foss	1976	71	14.6	Yes
Crowley	Guardsman	1967	86	17	Yes
Foss	**Denise Foss***	**2016**	**108**	**17.5**	**Yes**
Foss	Montana*	2014	80	18	Yes
Foss	Michele Foss	2015	111	18	Yes
Foss	Lindsey Foss	1993	87	18.5	Yes
Crowley	Vigilant*	2008	91	18.7	Yes
Foss	Corbin Foss	2003	106	19.5	Yes
Foss	Lauren Foss	2003	108	19.5	Yes
Crowley	Response	2002	77	20	Yes
Foss	Nicole Foss	2017	108	20	Yes
Crowley	Tan'erliq	1999	110	23	Yes
Crowley	Nanuq	1999	110	24	Yes

*Draft based on AIS data

The analysis considers the class of vessels with a 16.5-foot to 18.5-foot draft range as the design class and bases the transportation cost savings on a 17.5-foot average draft given that (1) the Denise Foss currently serves as the permanently-stationed ERTV and will continue to serve into 2020, (2) the class of vessels with similar sailing draft as the Denise Foss typically meet both the 70 bollard pull legal requirement and the recommended 100 bollard pull, and (3) the Denise Foss or a vessel of similar dimensions in the Pacific Northwest is reasonably available to serve as the ERTV at Neah Bay.

Over the study period, many vessels will likely serve as the designated ERTV. Many of these vessels may have a shallower draft and many may have a deeper sailing draft than the chosen design fleet. This analysis attempts to select the most likely class of vessels to operate at Neah Bay over the study period. Section 8 addresses the risk and uncertainty around ERTV sailing drafts.

4.1.2 Oil Spill Response Vessels

Future Oil Spill Response Vessels will likely remain similar in size to the existing fleet (**Table 4-4**). Channel width is based on the integrated oil response vessel and barge. While the maximum draft for the oil spill response barge is 17.5 feet, it is typically not loaded deep enough to be constrained by current channel depths. Deeper loading of the oil spill response barge could be an important consideration in the event of an oil spill. A fully loaded barge could be required to transit to Port Angeles or Seattle. The width of the barge is used to determine the design width of the channel.

Table 4-4: Future Oil Spill Response Vessel Dimensions

Vessel	DWT	LOA (ft)	Beam (ft)	Draft (ft)	UKC (ft)
Oil Spill Response Vessel (Large)	N/A	210	44	14	2
Oil Spill Response Vessel (Small)	N/A	72	30	9.5	2
Oil Spill Response Barge	N/A	250	76	17	2

4.1.3 Fishing Vessels

Fishing practices at Neah Bay are not expected to change significantly over the study period; consequently, no changes are made to the existing fishing vessel fleet (**Table 4-6**).

Table 4-5: Fishing Vessel Dimensions

LOA (ft)	Beam (ft)	Draft (ft)
59	20	8

4.2 Other Considerations

4.2.1 Fish Processing Vessels

A substantial whiting fishery exists just off the coast from the Makah Reservation. The Makah Tribe has a quota in this fishery that is caught by Tribal members. Current entrance channel dimensions prevent the transit of most fish processing ships requiring the tribe to contract with Seattle processors, which significantly increases the processing costs through increased transportation costs. Processing companies have expressed a desire to bring processing vessels to Neah Bay instead of remaining at sea to service fishing fleets during the fishing season. This could significantly reduce transportation costs as fish processing vessels could use dock power instead of burning fuel at-sea. **Table 4-6** provides vessel specifications for potentially benefitting fish processing vessels.

Table 4-6: Fish Processing Vessel Dimensions

Vessel Type	Vessel Name	Length (ft)	Breadth (ft)	Draft (ft)
Trawler	Island Enterprise	304	46	23
Trawler	Kodiak Enterprise	277	83	16
Trawler	Seattle Enterprise	294	46	18

4.2.2 Self-Loading Log Vessels

The timber industry is a significant employer and significant economic contributor to Neah Bay. Channel modification has the potential to benefit self-loading log vessels. These vessels could be used to transit lumber to destinations such as Seattle, Vancouver, and Tacoma. The timber industry at Neah Bay began in the 1920s (Collins, 1996). Typically, logs were bundled, and formed into rafts drawing up to 20 feet of water and towed to Port Angeles (Thomas, 1949). Today, logs are hauled overland by truck.

4.2.3 Harbor of Refuge Vessels

Neah Bay will continue to be used as an important Harbor of Refuge due to its strategic location at the mouth of the Strait of Juan de Fuca. Channel modification could potentially allow large, deeper drafting vessels to enter Neah Bay in emergency situations.

5 ALTERNATIVES FOR EVALUATION

Proposed project measures potentially benefit up to six vessel types (Emergency Response Towing Vessels, Oil Spill Response Vessels, fishing vessels, fish processing vessels, logging vessels, and Harbor of Refuge Vessels). While all vessel types could benefit from channel improvements, delay cost reductions for Emergency Response Towing Vessels are currently the only benefits that can be quantified in sufficient detail to count toward NED benefits.

5.1 Non-structural Measures

No non-structural measures met the planning objectives of this study. Tide timing is already occurring at Neah Bay; light-loading and lightering do not meet the study objectives. Use of alternative mode and ports was considered but also removed from screening given that RCW 88.46.130 requires the Emergency Response Towing Vessel be located at Neah Bay given its proximity to the entrance of the Strait of Juan de Fuca. Additionally, research confirms the importance of the use of Neah Bay over other ports as the station for an emergency response vessel. “A potential Oil Loss Comparison of Scenario Analysis by four Spill Size Categories” (January 2017) prepared for the Washington State Department of Ecology identified Neah Bay as a critical part of a portfolio of risk management measures recommended to prevent oil spills and significant environmental pollution. **Figure 5-1**, taken from the report, provides a graphic overview of the risk reduction benefit calculated as part of a larger traffic flow model. Green data points on the map represent vessels’ risk reduction benefit from the Neah Bay “escort” tug (Van Dorp & Merrick, 2017).

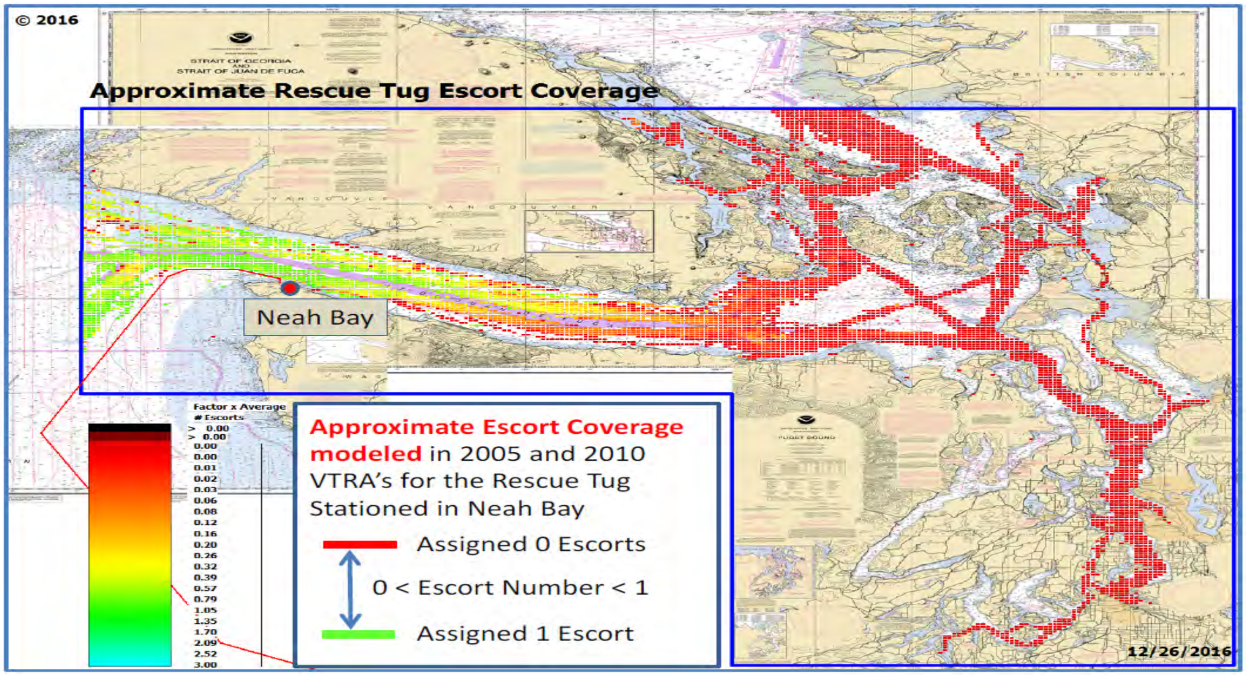


Figure 5-1: Graphical representation of ERTV Emergency Coverage in the VTRA Model

The analysis also considered dedicated use of a shallower drafting ERTV as a non-structural measure. As discussed in **Section 4.1.1,** this recommendation does not fully consider the requirements of future traffic at the Strait of Juan de Fuca, which will include more transits of large tankers. Additionally, imposing restrictions on The Marine Exchange of Puget Sound's contract for the ERTV is not operationally practical and limits their ability to meet the ERTV's legal requirements.

5.2 Structural Measures

Channel deepening best addresses the problems and opportunities at Neah Bay Harbor. The following alternatives were developed to address the problems and opportunities persisting in the future without-project condition. **Table 5-1** summarizes the proposed channel modifications by alternative. The study evaluates deepening in two-foot increments beyond the existing 19-foot channel depth.

Table 5-1: Channel Modifications by Alternative

Alternative	Segment	Station	Length	Width	Limiting Depth
Alternative 1 (No Action)	Entrance Channel	Sta. 0+00 to 45+00	4,500'	300'	-19' MLLW
	Turning Basin	Sta. 45+00 to 54+00	600'	600'	-19' MLLW
Alternative 2	Entrance Channel	Sta. 0+00 to 45+00	4,500'	300'	-21' MLLW
	Turning Basin	Sta. 45+00 to 54+00	600'	600'	-21' MLLW
Alternative 3	Entrance Channel	Sta. 0+00 to 45+00	4,500'	300'	-23' MLLW
	Turning Basin	Sta. 45+00 to 54+00	600'	600'	-23' MLLW
Alternative 4	Entrance Channel	Sta. 0+00 to 45+00	4,500'	300'	-25' MLLW
	Turning Basin	Sta. 45+00 to 54+00	600'	600'	-25' MLLW

6 ALTERNATIVES EVALUATION

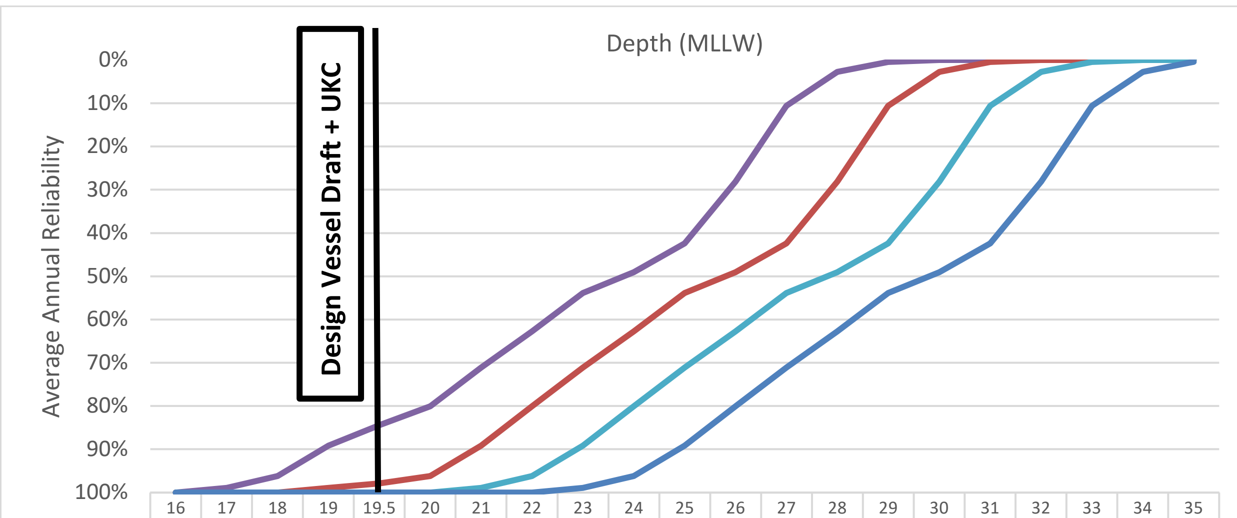
6.1 Methodology and Selection Criteria

NED deep-draft navigation benefits as defined in USACE navigation studies per ER 1105-2-100 and 91-R-13, generally fall into 3 major groups: 1) Reduced cost of transportation 2) Shift in origin or destination and 3) Increased net return to producers from access to new sources of lower cost materials, or access to new and more profitable markets. Reductions in transportation costs are the most significant source of benefits to channel modification at Neah Bay. Transportation cost reduction benefits include the elimination or reduction in transit times, use of larger more efficient vessel loadings, and/or use of alternative mode (e.g. shipping versus truck or rail).

Transportation cost reduction benefits at Neah Bay are evaluated in detail for ERTVs. These vessels accrue the most significant benefits of channel deepening. The results of this analysis are presented in **Section 6.1.1**.

6.1.1 Tide restrictions

The most significant cost savings benefits of project implementation is related to the reduction in costs associated with ERTV tide constraints at Neah Bay. **Figure 6-1** depicts channel reliability by proposed project depth with a black line representing required water depth (MLLW) for design vessel transit (including UKC).



	16	17	18	19	19.5	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
19	100%	99%	96%	89%	84%	80%	71%	63%	54%	49%	42%	28%	11%	3%	0%	0%	0%	0%	0%	0%	0%
21	100%	100%	100%	99%	98%	96%	89%	80%	71%	63%	54%	49%	42%	28%	11%	3%	0%	0%	0%	0%	0%
23	100%	100%	100%	100%	100%	100%	99%	96%	89%	80%	71%	63%	54%	49%	42%	28%	11%	3%	0%	0%	0%
25	100%	100%	100%	100%	100%	100%	100%	100%	99%	96%	89%	80%	71%	63%	54%	49%	42%	28%	11%	3%	0%

Figure 6-1: Channel Reliability by Project Depth

6.1.1.1 Methodology

To estimate the total cost savings benefits of the reduction in tide constraints, the total annual cost of tide constraints was estimated for the future without-project condition. The future without-project cost is equal to the annual fuel cost of all tide-related movements. Benefits are defined as the average annual fuel cost reduction resulting from fewer overall tide-induced movements. Other vessel operating costs, such as crew, maintenance, and store costs are not impacted by any alternative because the crew and vessel must be maintained whether at-dock or at-sea given the requirements of RCW 88.46.130.

Estimates of annual tide-induced movements are supported by evidence of historical movements of the ERTV vessels provided by Foss Maritime in **Attachment 2**. The Maritime Exchange of Puget Sound, who contracts Foss Maritime and pays for ERTV expenses, provided an average annual fuel cost per month for tide-related movements, supporting the results of this analysis (see **Attachment 1**).

6.1.1.2 National Economic Development (NED) Benefit Determination

The project considers cost savings for ERTV vessels as NED benefits given the resulting fee reduction for commercial vessels associated with a reduction in ERTV costs. The attached letter from Marine Exchange of Puget Sound explains that ERTV fees charged to "covered" vessels (mainly tankers) as required by RCW 88.46.130 in protecting natural resources of the Washington Coast including Olympic Coast National Marine Sanctuary, US Fish and Wildlife Service Refuges at Flattery Rocks, Dungeness, and San Juan Islands, and state Marine Protected Areas in the Puget Sound would drop given cost savings at Neah Bay (**Attachment 1**).

6.1.1.3 Transportation Cost Savings Benefit Analysis

Table 6-1 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 (ERTV design draft plus 2-foot UKC). From 2015 through 2017, the channel depth fell below 19.5 feet an average of 217 times per year[4]. 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. Recognizing that over the 50-year study period, different weather conditions, pilots, and vessels will lead to variation around this controlling depth, 19.5 feet is meant to be an estimate of the average depth for which the ERTV will leave port.

Table 6-1: 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**

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

[4] Note: the vessel must leave channel each time the channel depth is below the required sailing draft plus underkeel clearance. An 89 percent channel reliability (Section 3.1.2) corresponds to roughly 217 required vessel movements.

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 6-2** provides the annual cost of tide-related movements by channel depth at the current price level.

Table 6-2: Tide-Related Transportation Cost by Channel Depth (FY2020 price level)

Year	Transportation Cost by Channel Depth			
	19’	21’	23’	25’
2018	$153,00	$70,000	$-	$-

Table 6-3 presents the estimated average annual equivalent (AAEQ) transportation cost savings benefits for tide-related movements for each study depth discounted at the Fiscal Year 2020 Federal Discount Rate. Analysis shows that net average annual economic benefits are maximized at a project depth of -21 feet MLLW.

Table 6-3: Tide-Related Movements Benefit Summary, 2.75% discount rate

Channel Depth	AAEQ Benefits
19'	$-
21'	$45,000
23’	$71,000
25’	$83,000

6.1.2 Other Benefits

At this time, there is insufficient evidence to quantify benefits related to fishing vessels, fish processing vessels, logging vessels, and Harbor of Refuge vessels. As such, these benefits are not included in the project benefit cost analysis. Benefits presented in **Table 6-3** are the only NED benefits used in project justification. Future analysis may be aided with additional data for other vessel classes.

6.2 Benefit Cost Analysis

Total project costs include all project first costs (dredging, construction management, preconstruction engineering and design, and contingency) for each alternative were developed and annualized to compare against the transportation cost savings presented in **Table 6-3**. The study assumes no operations and maintenance costs. **Table 6-4** presents the costs for each alternative.

Table 6-4: Cost Summary (October 2019 Price Level, FY20 2.75 Percent Discount Rate)

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

The final benefit cost analysis is presented in **Table 6-5**. The plan that maximizes net benefits is Alternative 2, -21 feet MLLW. The plan is economically justified with a BCR of 1.09.

Table 6-5: Benefit Cost Analysis (FY20 discount rate, Oct 2019 Price Level)

Channel Depth	AAEQ Cost	AAEQ Benefits	AAEQ Net Benefits	BCR
19'	$-	$-	$-	-
21'	**$66,000**	**$71,000**	**$6,000**	**1.09**
23’	$138,000	$83,000	$(55,000)	0.60

6.3 Depth Optimization

The previous analysis evaluated channel depths in 2-foot increments. This section presents results of channel depth optimization considering net excess benefits for every possible channel depth. The results of the optimization confirm -21 feet MLLW to be the plan that maximizes net excess benefits. **Table 6-6** presents the results of the optimization analysis.

Table 6-6: Channel Depth Optimization (FY20 discount rate, Oct 2019 Price Level)

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
24' MLLW	$167,700	$83,000	$(84,700)	0.49

7 Sensitivity Analysis

The Principle & Guidelines and subsequent ER1105-2-100 recognize the inherent variability to water resources planning. Navigation projects in particular involve uncertainty about future conditions. This sensitivity analysis adjusts the most consequential assumptions pertaining to economic benefits to test the robustness of the final benefit evaluation. Fuel cost and design vessel draft.

7.1 Fuel and Draft Sensitivity

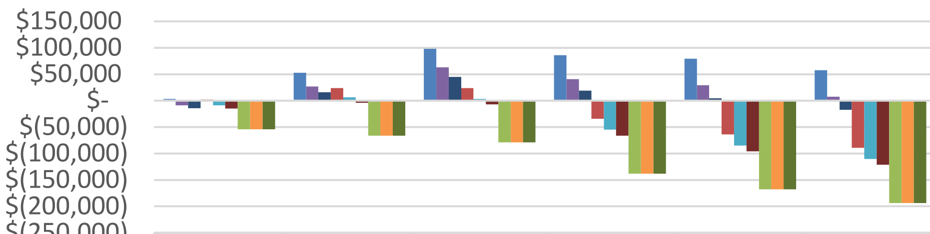
A simple linear regression between the Annual WTI Spot Price and the marine fuel price for Seattle-area docks from 1986 through 2016 confirms a strong, positive relationship between changes in the WTI price and changes in the Seattle-area marine fuel price with a correlation coefficient of .98. The summary of regression statistics for this analysis are presented in **Table 8-1**. The U.S. Department of Energy forecasts an average annual growth rate of the West Texas Intermediate (WTI) spot price of 2.8 percent through 2050 (Administration).

Table 8-1: Fuel Price Regression Statistics

Regression Statistics	
Multiple R	0.98
R Square	0.96
Adjusted R Square	0.95
Standard Error	0.23
Observations	18.00

The analysis uses 12.5 feet as the minimum possible draft of any vessel that still meets the 70 bollard pull requirement. This provides a “low draft” scenario for the sensitivity analysis. Given the growing size of the world tanker fleet and vessels available in the Pacific Northwest (e.g. the Garth Foss and Lindsey Foss), the maximum possible design draft for an ERTV at Neah Bay is likely 20 feet. The study uses this as the “high draft” scenario for the sensitivity analysis.

Figure 8-1 summarizes the cost benefit analysis completed for nine sensitivities. The maximum possible benefits are represented by the “High Draft – High Fuel” scenario. This scenario uses the highest fuel price at Seattle docks over the past 5 years and the highest likely sailing draft of all ERTVs capable of operating at Neah Bay (20 feet). The minimum possible benefits are represented by the “Low Draft – Low Fuel” scenario. This scenario uses the lowest fuel prices at Seattle docks over the past 5 years and the lowest likely sailing draft of all ERTVs capable of operating at Neah Bay (12.5). The reference case presents the results of the assumptions made in the main analysis.



	-20 FT MLLW	-21 FT MLLW	-22 FT MLLW	-23 FT MLLW	-24 FT MLLW	-25 FT MLLW
High Fuel - High Draft	$3,000	$53,000	$98,000	$86,000	$79,300	$57,600
Reference Fuel - High Draft	$(9,000)	$27,000	$63,000	$41,000	$29,300	$7,600
Low Fuel - High Draft	$(14,000)	$16,000	$45,000	$19,000	$4,300	$(17,400)
High Fuel - Reference Draft	$2,000	$24,000	$24,000	$(34,000)	$(63,700)	$(89,400)
Reference Fuel - Reference Draft	$(9,000)	$6,000	$3,000	$(55,000)	$(84,700)	$(110,400)
Low Fuel - Reference Draft	$(15,000)	$(4,000)	$(7,000)	$(66,000)	$(95,700)	$(121,400)
High Fuel - Low Draft	$(54,000)	$(66,000)	$(79,000)	$(138,000)	$(167,700)	$(193,400)
Reference Fuel - Low Draft	$(54,000)	$(66,000)	$(79,000)	$(138,000)	$(167,700)	$(193,400)
Low Fuel - Low Draft	$(54,000)	$(66,000)	$(79,000)	$(138,000)	$(167,700)	$(193,400)

Figure 8-1: Net Excess Benefits by Scenario (FY20 discount rate, Oct 2019 Price Level)

7.2 Vessel Draft Sensitivity

The sensitivity analysis shows the impact of each assumption. Lower design vessel drafts and low fuel costs have a strong, negative impact on net excess benefits leading to an unjustified project in most "low-draft", "low-fuel" scenarios. Design vessel draft is positively related to net excess benefits. To estimate the impact of the vessel draft, **Table 8-2** provides AAEQ net benefits by vessel draft. The chosen design vessel draft (17.5 feet) is the lowest draft where project benefits exceed costs. Net benefits increase as design drafts increase. The cells displaying maximum net excess benefits for each vessel draft is bold.

Table 8-2: Net Excess Benefits by Vessel Draft

Vessel Draft (ft)	Channel Depth (ft MLLW)					
	20' MLLW	21' MLLW	22' MLLW	23' MLLW	24' MLLW	25' MLLW
15'	**$ (50,000)**	$ (62,000)	$ (76,000)	$ (134,000)	$ (164,000)	$ (190,000)
16'	**$ (36,000)**	$ (44,000)	$ (57,000)	$ (116,000)	$ (146,000)	$ (171,000)
17'	$ (17,000)	**$ (10,000)**	$ (20,000)	$ (79,000)	$ (109,000)	$ (134,000)
17.5'	$ (9,000)	**$ 6,000**	$ 2,000	$ (55,000)	$ (85,000)	$ (111,000)
18'	$ (6,000)	$ 20,000	**$ 24,000**	$ (30,000)	$ (60,000)	$ (86,000)
19'	$ (6,000)	$ 31,000	**$ 54,000**	$ 14,000	$ (12,000)	$ (38,000)
20'	$ (9,000)	$ 28,000	**$ 62,000**	$ 41,000	$ 29,000	$ 7,000
21'	$ (3,000)	$ 30,000	**$ 65,000**	$ 55,000	$ 62,000	$ 54,000
22'	$ (31,000)	$ 8,000	$ 40,000	$ 30,000	$ 48,000	**$ 60,000**
23'	$ (20,000)	$ (8,000)	$ 29,000	$ 16,000	$ 34,000	**$ 57,000**

This analysis provides confidence that project benefits will exceed costs. Over the study period vessels of higher and lower draft may be used, but the most likely vessel is the 17.5 foot draft class. If the sailing draft assumption changes and a larger draft vessels is deployed to Neah Bay, -22 feet MLLW would be the NED plan. Where -21 feet is not the NED plan, environmental considerations might still limit the selected plan to -21 feet.

7.3 Vessel Fleet Sensitivity

To evaluate the impact of changes in the vessel fleet through the study period the following analysis uses a fleet distribution based on the world fleet of vessels. Evidence from 2017 vessel deployment shows that an alternate vessel, which in the past has typically been smaller, replaces the assigned vessel at Neah Bay for as much as three months per year. This takes place as the permanent vessel travels to Seattle for repairs, fuel, or other reasons. The following analysis incorporates this practice into the sensitivity analysis and using the world fleet of vessels with bollard pull above 100 short tons. **Table 8-3** presents all ocean-going vessels in the available database which meet the 100 bollard pull short ton capability pulled from IHS Sea-Web. This is likely not the full list, but it is the most complete list of vessels available.

Table 8-3: World ERTV Fleet with 100+ Short Tons Bollard Pull

IMO Number	Ship Name	Operator	Bollard Pull (Short Tons)	Sailing Draft
9097604	TIGER 7	N/A	110	11.8
9253569	SIGNET INTRUDER	Signet	132	16.4
9253571	SIGNET THUNDER	Signet	132	16.4
9748588	NICOLE FOSS	Foss	110	17.0
9748576	DENISE FOSS	Foss	116	17.5
7397660	EXPLORER	Crowley	110	17.7
7726536	ENSIGN	Crowley	110	17.7
9748564	MICHELE FOSS	Foss	109	18.0
7420467	DELTA POWER	BayDelta	105	18.0
9562207	DELTA BILLIE	BayDelta	104	18.0
9409924	VALOR	Crowley	101	18.0
9139830	GUARD	Crowley	109	18.7
9409948	VIGILANT	BayDelta	101	18.7
7501118	CROSBY ENDEAVOR	Crosby	106	18.7
8218938	LAUREN FOSS	Foss	108	19.5
8218926	CORBIN FOSS	Foss	106	19.7
7420455	NATOMA	Sause Bros	105	19.7
7626267	CROSBY COURAGE	Crosby	108	19.7
9562219	DELTA CATHRYN	BayDelta	104	19.7
7390765	FINN FALGOUT	Crowley	120	19.7
9833979	CADEN FOSS	Foss	101	20.0
9097563	ASD NEIL ABERCROMBIE	BAE	110	21.0

IMO Number	Ship Name	Operator	Bollard Pull (Short Tons)	Sailing Draft
9554016	OCEAN WIND	Crowley	165	21.0
9597862	OCEAN SUN	Crowley	160	22.0
9597850	OCEAN SKY	Crowley	165	22.0
9214393	ATTENTIVE	Crowley	121	22.3
9554004	OCEAN WAVE	Crowley	162	22.3
9178379	NANUQ	Crowley	106	22.6
9178381	TAN'ERLIQ	Crowley	106	22.6
7417317	SEA VOYAGER	Crowley	120	23.0
9214381	ALERT	VMS	121	23.0
9214408	AWARE	VMS	121	23.0
9529982	FORTE	NS, LLC	103	23.3

Analysis showed a low probability for vessels with sailing drafts above 20 feet to be used at Neah Bay given that qualified vessels in this category are either owned by one firm (Crowley) which operates vessels with shallower drafts and equivalent pull capacity or are operated by firms that do not have operations in the Pacific Northwest.

Table 8-4 provide the assumed fleet distribution using the world fleet distribution as a proxy for utilization probability.

Table 8-4: Fleet Distribution

Draft Class	Annual Utilization
<17ft	35.7%
17ft-18ft	28.6%
18ft-19ft	10.7%
19ft-20ft	25.0%

Incorporating the fleet distribution from **Table 8-4** into the cost savings analysis yields the following benefit cost summary table. In this case, 22 feet is the NED plan; however, -21 feet MLLW remains justified with net benefits of $13,000.

Table 8-5: Sensitivity Fleet Distribution Benefit Cost Summary

Channel Depth	AAEQ Costs	AAEQ Benefits	Net Benefits	BCR
20' MLLW	$54,000	$43,000	$(11,000)	0.79
21' MLLW	$66,000	$79,000	$13,000	1.20
22' MLLW	$79,000	$104,000	$24,000	1.30
23' MLLW	$138,000	$116,000	$(22,000)	0.84
24' MLLW	$168,000	$120,000	$(47,000)	0.72
25' MLLW	$193,000	$121,000	$(73,000)	0.62

8 Multiport Analysis

Given that the ERTV is required to be permanently stationed at Neah Bay and no significant commodity movements exist for Neah Bay, the deepening project will not impact any ongoing or future operations at other ports in the region. No traffic diversion is expected to take place.

9 NED Employment Benefits

Per ER 1105-2-100, NED unemployment benefits are to be incorporated following project alternative formulation and NED plan determination, and cannot be used to justify a project where the Benefit-to-Cost Ration (BCR) is less than unity.

Clallam County and Neah Bay meet the requisite unemployment thresholds for inclusion of labor resource benefits; however, analysis of labor requirements for similar studies in the area shows limited opportunity for employment benefits. The estimated construction timeframe is less than three months and work will likely be completed by relatively few, non-local workers. Given the limited opportunity for benefits and negligible impact to the overall net benefit calculation, labor resource benefits are not included in the final benefit-cost ratio.

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Attachment 1

MARINE EXCHANGE OF PUGET SOUND
100 West Harrison • Suite S560 • Seattle, WA 98119-4135
Phone: (206) 443-3830 • Fax: (206) 443-3839
Email: info@marexps.com
INFORMATION IS EVERYTHING

October 18, 2017

Walker Messer
US Army Corps of Engineers, Seattle District

Re: OPERATIONS OF THE EMERGENCY RESPONSE TOWING VESSEL FROM NEAH BAY

Dear Mr. Messer:

This letter is written to address potential benefits of deepening Neah Bay such that the Emergency Response Towing Vessel stationed there would not have to get underway and leave the Bay during low tides.

Background

In order to legally enter Washington State waters, certain cargo, passenger, commercial fishing industry and other commercial vessels of 300 or more gross tons and all tank vessels and tank barges are required to file and maintain with the Washington State Department of Ecology an approved oil spill contingency plan for the containment and cleanup of oil spills. In 2009, the Washington State legislature passed a separate law (effective July 1, 2010) requiring all covered vessels to also provide an emergency response towing vessel (ERTV) stationed at Neah Bay, Washington, if those covered vessels transit the ERTV Transit Area (essentially through the Strait of Juan de Fuca) to a Washington port.

In accordance with this state mandate, a maritime industry stakeholders group (ERTV Compliance Group) placed a towing vessel in Neah Bay and vessels to which this requirement applies must enroll in this coverage and pay a fee on each arrival, which is determined by vessel type and size, to cover the cost of this towing vessel.

<u>Potential cost reduction if Neah Bay is deepened</u>

When the ERTV gets underway to provide assistance, it does so off contract to the ERTV CG and under contract to a third party. Otherwise any fuel burned under contract to the ERTV CG is a cost passed along to all covered vessels and is a factor in determining the fee that they pay. At the pier in Neah Bay, the ERTV is on shore power and normally does not burn any fuel, however, the ERTV must get underway during certain low tide conditions and leave Neah Bay. The average cost of fuel charged to the ERTV Compliance Group is $3,700/month YTD for CY 2017, totally about $44,400/year. Also included in that cost of fuel are the periodic underway times necessary for drills and exercises.

The fuel cost associated with low tides is likely about 90% of the annual fuel cost or $39,960. Thus, the average cost per each covered vessel arrival is about $20. If the ERTV did not need to get underway for low tides, then the fees to the covered vessels arriving to U.S. ports via the Strait of Juan de Fuca could be reduced by about $20.

Regards,

J. E. Veentjer
Executive Director
Marine Exchange of Puget Sound
Secretary/Treasurer ERTV CG

Attachment 2

ALWAYS SAFE. ALWAYS READY.

FOSS

September 1st, 2016

Mr. Chad Bowechop
Makah Tribal Council
PO Box 115
Neah Bay, WA 98357

Mr. Bill Parkin
Port Director Port of Neah Bay
PO Box 137,
Neah Bay, WA 98357

Dear Sirs:

This letter is written in response to your request for information concerning the current cost of the tidal restrictions within the entrance to Neah Bay with respect to the Emergency Response Towing Vessels stationed there. I am enclosing our analysis. If you have any questions or concerns, please do not hesitate to contact me.

Sincerely,

Captain Joe LeCato
PNW Port Captain
660 West Ewing St.
Seattle, WA 98119
W: 206-270-4814, C: 206-890-2685
jlecato@foss.com

Analysis of Effect of Tidal Restrictions Related to ERTV Operations in Neah Bay, WA

Assumptions:

- Operating Draft for an Enhanced Tractor Tug (ETT) LINDSEY/GARTH Class = 23'
- Operating Draft for an ASD Tug (ASD) MARSHALL/LYNN MARIE Class = 19'
- Required Depth Beneath Keel = 2'
- Average Hours Vessels Tide Locked/Underway Due to Tidal Restriction = 4 Hrs
- ERTV Required Bollard Pull 70 Tons , Only 3 Towing Vessels in Current PNW Fleet Capable GARTH, LINDSEY & MARSHALL

January 2016 ETT 57 x 4 hrs = 228 hrs ASD 15 x 4 hrs = 60 hrs	July 2016 ETT 64 x 4 hrs = 256 hrs ASD 21 x 4 hrs = 84 hrs
February 2016 ETT 50 x 4 hrs = 200 hrs ASD 10 x 4 hrs = 40 hrs	August 2016 ETT 60 x 4 hrs = 240 hrs ASD 18 x 4 hrs = 72 hrs
March 2016 ETT 53 x 4 hrs = 212 hrs ASD 4 x 4 hrs = 16 hrs	September 2016 ETT 58 x 4 hrs = 232 hrs ASD 10 x 4 hrs = 40 hrs
April 2016 ETT 53 x 4 hrs = 212 hrs ASD 10 x 4 hrs = 40 hrs	October 2016 ETT 56 x 4 hrs = 224 ASD 8 x 4 hrs = 32 hrs
May 2016 ETT 60 x 4 hrs = 240 hrs ASD 17 x 4 hrs = 68 hrs	November 2016 ETT 52 x 4 hrs = 208 hrs ASD 13 x 4 hrs = 52 hrs
June 2016 ETT 58 x 4 hrs = 232 hrs ASD 19 x 4 hrs = 78 hrs	December 2016 ETT 48 x 4 hrs = 192 hrs ASD 16 x 4 hrs = 64 hrs

Totals:
ETTs GARTH FOSS/ LINDSEY FOSS = 2,676 hours Tidal Restricted or Underway as a Result
ASD MARSHALL FOSS/ LYNN MARIE = 646 hours Tidal Restricted or Underway as a Result

Notes:
Information was compiled using NOAA Tide Predictions Station ID: 9443090
No variables such as barometric pressure, weather or sea conditions were taken into account.

Foss Maritime Company www.foss.com