Board of Pilotage Commissioners Tug Escort Rulemaking (Chapter 363-116 WAC)
State Environmental Policy Act Draft Environmental Impact Statement

Environmental Health: Releases Discipline Report

Washington State Board of Pilotage Commissioners

Washington State Department of Ecology

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DEPARTMENT OF ECOLOGY
State of Washington

BOARD of PILOTAGE COMMISSIONERS
WASHINGTON STATE

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Acronyms and Abbreviations

AIS	Automatic Identification System
ANT	Advance Notice of Transfer
ASTM	Advancing Standards and Transforming Markets International
ATB	Articulated tug barge
BC	British Columbia
BPC	Washington State Board of Pilotage Commissioners
CANUSPAC	Canada-US Joint Marine Pollution Contingency Plan
CFR	Code of Federal Regulations
COLREGS	International Regulations for Preventing Collisions at Sea (Collision Regulations)
COVID-19	coronavirus disease
CVTS	Cooperative Vessel Traffic Service
DAHP	Washington State Department of Archaeology and Historic Preservation
DNR	Washington State Department of Natural Resources
DWT	deadweight tons
Ecology	Washington State Department of Ecology
ECOPRO	Exceptional Compliance Program
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
ERMA	Environmental Response Management Application
ERTV	emergency response towing vessel
ESA	Endangered Species Act
ESHB	Engrossed Substitute House Bill
ESI	Environmental Sensitivity Index
FORs	functional and operational requirements
GNOME	General NOAA Operational Modeling Environment
HFO	heavy fuel oil
IFO	intermediate fuel oil
IMO	International Maritime Organization
LOP	loss of propulsion
MARPOL	International Convention for the Prevention of Pollution from Ships
MARSIS	Canadian Marine Safety Information System
MISLE	Marine Information for Safety and Law Enforcement
NCP	National Contingency Plan

NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRT	National Response Team
NWAC	Northwest Area Committees
NWACP	Northwest Area Contingency Plan
OPA	Oil Pollution Act of 19990
OSC	On Scene Coordinator
OTSC	Oil Transportation Safety Committee
PAWSA	Ports and Waterways Safety Assessment
PPA	Pacific Pilotage Association
PSHSC	Puget Sound Harbor Safety Committee
QUALSHIP 21	Quality Shipping for the 21st Century
RCW	Revised Code of Washington
RRT	Regional Response Team
SEPA	State Environmental Policy Act
SHPO	State Historic Preservation Officer
SOC	Standard of Care
SRKW	Southern Resident Killer Whale
STCW	International Convention on Standards of Training, Certification, and Watchkeeping for Seafarers
THPO	Tribal Historic Preservation Officer
ULSD	ultra low sulfur diesel
US	United States of America
USCG	United States Coast Guard
VBAP	voluntary best achievable protection
VEAT	Vessel Entries and Transits for Washington Waters
VGO	vacuum gas oil
VTRA	Vessel Traffic Risk Assessment
VTS	Vessel Traffic Service
WAC	Washington Administrative Code
WCD	worst case discharge
WDFW	Washington Department of Fish and Wildlife

Summary

This discipline report is produced by the Washington State Department of Ecology (Ecology) as part of the development of an Environmental Impact Statement (EIS) as required by the State Environmental Policy Act (SEPA).

The Board of Pilotage Commissioners (BPC), in consultation with Ecology, is conducting a rulemaking to amend Chapter 363-116 of the Washington Administrative Code (WAC), Pilotage Rules. The rulemaking will consider 2019 legislative changes made to Chapter 88.16 of the Revised Code of Washington (RCW) (Pilotage Act) through the passage of Engrossed Substitute House Bill 1578 (ESHB 1578). The rules will be designed to achieve best achievable protection, as defined in RCW 88.46.010, and will be informed by other considerations in ESHB 1578. The BPC and Ecology determined that the rulemaking may have significant adverse impacts on the environment and are developing an EIS.

This discipline report describes the existing conditions and potential impacts for oil pollution risk that may result from four rulemaking alternatives: No Action (Alternative A), Addition of Functional and Operational Requirements (FORs) (Alternative B), Expansion of Tug Escort Requirements (Alternative C), and Removal of Tug Escort Requirements (Alternative D). The report study area is the EIS Study Area. It includes the rulemaking alternative boundaries and potential areas for tug escort commute to and from the alternative boundaries.

The following oil pollution-related topics were analyzed:

- Target vessel drift grounding frequency. Escort tugs are best positioned to prevent drift groundings and drift groundings can lead to oil spills.
- Escort tug incident frequency. Escort tugs can be a source of oil spills.
- Distribution of impacts associated with oil spills under the four alternatives.

Significant and unavoidable adverse impacts to environmental health from oil pollution were identified for Alternative D (Removal) due to the increase in target vessel drift grounding risk. Table 1 summarizes the changes in escort tug activity under each alternative, the resulting impacts on water quality, mitigation measures identified, and determinations of significance.

Table 1. Environmental Health: Releases – summary of oil pollution risk and impacts

Change in Activity	Resulting Impact on Oil Pollution Risk	Comparison to Alternative A	Mitigation	Significant and Unavoidable Adverse Impact?
Alternative A: No Action				
Spill risk from target vessels: Continued low (but not zero) risk of target vessel drift groundings and associated oil spills due to existing safety measures and tug escort requirements	Probability of a drift grounding from a target vessel is low: a 186-year event in the EIS Study Area. A spill from a drift grounding is a potentially catastrophic event. This risk level would continue.	N/A	Continued adherence to requirements of existing vessel traffic and oil pollution safety regime.	No
Spill risk from escort tugs: Continued low (but not zero) risk of any incident from an escort tug that could result in a spill	Probability of any incident from an escort tug is low: probability of 0.86/year. Potential impact is likely to be small. This risk level would continue.	N/A	Continued adherence to requirements of existing vessel traffic and oil pollution safety regime.	No
Alternative B: Addition of Functional and Operational Requirements				
Spill risk from target vessels: Continued low (but not zero) risk of target vessel drift groundings and associated oil spills due to existing safety measures and tug escort requirements	Probability of a drift grounding from a target vessel is low: a 186-year event in the EIS Study Area. A spill from a drift grounding is a potentially catastrophic event. This risk level would continue.	Largely the same as No Action. Some minor and unquantified reduction in risk due to standardization of FORs.	Continued adherence to requirements of existing vessel traffic and oil pollution safety regime.	No

Change in Activity	Resulting Impact on Oil Pollution Risk	Comparison to Alternative A	Mitigation	Significant and Unavoidable Adverse Impact?
Spill risk from escort tugs: Continued low (but not zero) risk of any incident from an escort tug that could result in a spill	Probability of any incident from an escort tug is low: probability of 0.86/year. Potential impact is likely to be small.	Same as No Action	Continued adherence to requirements of existing vessel traffic and oil pollution safety regime. FORs provide minor but unquantified benefits to vessel traffic safety	No
Alternative C: Expansion of Tug Escort Requirements				
Spill risk from target vessels: Small decrease in risk of target vessel drift groundings and associated oil spills due expansion of tug escort requirements.	Probability of a drift grounding from a target vessel is a 189-year event in the EIS Study Area. A spill from a drift grounding is a potentially catastrophic event.	1.6% reduction in risk across the EIS Study Area, benefits concentrated in the expansion area.	Continued adherence to requirements of existing vessel traffic and oil pollution safety regime.	No
Spill risk from escort tugs: Tug underway time increases by 2.41%, concentrated in the expansion area. This corresponds to a small increase in risk of any incident from an escort tug that could result in a spill	Probability of any incident from an escort tug increases but remains low: probability of 0.88/year. Potential impact is likely to be small.	2.41% increase in risk of an incident from an escort tug, risks concentrated in the expansion area	Continued adherence to requirements of existing vessel traffic and oil pollution safety regime. FORs provide minor but unquantified benefits to vessel traffic safety	No
Alternative D: Removal of Tug Escort Requirements				
Spill risk from target vessels: Increase in risk of target vessel drift groundings and	Probability of a drift grounding from a target vessel is a 167-year	11.84% increase in risk across the EIS Study Area,	Continued adherence to requirements of existing	Yes

Change in Activity	Resulting Impact on Oil Pollution Risk	Comparison to Alternative A	Mitigation	Significant and Unavoidable Adverse Impact?
associated oil spills due to removal of tug escort requirements	event in the EIS Study Area. A spill from a drift grounding is a potentially catastrophic event.	increases in risk concentrated in the rulemaking area	vessel traffic and oil pollution safety regime.	
Spill risk from escort tugs: Tug underway time associated with the escort of target vessels is eliminated. This also eliminates the risk that a tug engaged in activity required by this rule would experience an incident or associated oil spill.	Risk of any incident from an escort tug associated with this rule is eliminated (0/year)	Risk associated with tugs escorting target vessels is eliminated	N/A	No

1.0 Introduction

1.1 Background

The Board of Pilotage Commissioners (BPC), in consultation with the Washington Department of Ecology (Ecology), is conducting a rulemaking to amend Chapter 363-116 of the Washington Administrative Code (WAC), Pilotage Rules. The rulemaking will consider 2019 legislative changes made to Chapter 88.16 of the Revised Code of Washington (RCW) (Pilotage Act) through the passage of Engrossed Substitute House Bill 1578 (ESHB 1578). The rules will be designed to achieve best achievable protection, as defined in RCW 88.46.010, and will be informed by other considerations in ESHB 1578.

The rulemaking will:

- Describe tug escort requirements for the following vessels (referred to as "target vessels" throughout this report) operating in the waters east of the line extending from Discovery Island light south to New Dungeness light and all points in the Puget Sound area:
  - Oil tankers between 5,000 and 40,000 deadweight tons.
  - ATB and towed waterborne vessels or barges greater than 5,000 deadweight tons (DWT) that are designed to transport oil in bulk internal to the hull.
- Specify operational requirements for tug escorts, where they are required. Specify functionality requirements for tug escorts, where they are required.
- Consider the existing tug escort requirements applicable to Rosario Strait and connected waterways to the east, established in RCW 88.16.190(2)(a)(ii), including adjusting or suspending those requirements, as needed.
- Describe exemptions to tug escort requirements, including whether certain vessel types or geographic zones should be precluded from the escort requirements.
- Make other changes to clarify language and make any corrections needed.

This rulemaking could potentially increase or decrease tug escort activity and the risk of oil spills in the Salish Sea.[1] The BPC and Ecology therefore determined that the rulemaking may have significant adverse impacts on the environment. The BPC and Ecology issued a Determination of Significance on February 22, 2023, which initiated development of an Environmental Impact Statement (EIS) as required under RCW 43.21C.030 (2)(c) pursuant to the State Environmental Policy Act (SEPA). At the same time, Ecology also issued a formal scoping

[1] The term "Salish Sea" is used here to describe the transboundary waters of the Strait of Juan de Fuca, the Puget Sound, and the Georgia Strait. The name for this waterbody was proposed in 1989 by a marine science professor at Western Washington University to emphasize the region as a single ecosystem. It has since been formally adopted by the Washington State Committee on Geographic Names (Chapter 237-990 WAC) and the British Columbia Geographical Names Office (*BC Geographical Names*, n.d.). It was named for the Coast Salish Tribes who live on or near the Salish Sea on both sides of the U.S.-Canadian border. However, the defined geographic boundary of the Salish Sea also extends into the lands and waters of Tribes that are not Coast Salish, including the Makah Tribe (Nuu-Chah-Nulth). We use the term "Salish Sea" in this analysis, but recognize the diversity of native peoples that have lived in and used these waters since time immemorial.

notice as required by the SEPA process. Ecology conducted a scoping meeting on March 21, 2023, to invite comments on the scope of the EIS and a comment period was open from February 22 through April 8, 2023.

The BPC and Ecology have agreed to act as co-lead agencies under SEPA and share lead agency responsibility for the EIS. The elements of the environment to be included in the EIS were preliminarily identified in the scoping notice. This discipline report serves as the detailed analysis of an element identified for inclusion in the EIS and will serve as supporting documentation to the EIS.

The BPC is conducting the rulemaking process concurrently with the EIS development and works closely with Ecology to coordinate the public involvement process. The rulemaking effort includes regular public involvement workshops that are designed to share information with stakeholders, Tribal government representatives, and the public. The BPC also appointed the Oil Transportation Safety Committee (OTSC) as an advisory committee of subject matter experts representing different areas like the regulated industry, Tribal governments, and environmental groups. The OTSC meets regularly to develop recommendations for the BPC, and the BPC makes the final decisions related to this rulemaking.

Note: Unless specified otherwise, the following terminology applies throughout this EIS:

- **"Tug escort"** refers to the act of a tug escorting a target vessel that is specifically affected by this rulemaking.
- **"Escort tug"** refers to the tug that conducts escorts of target vessels. Underway time for an escort tug includes active escort time and time spent commuting to and from an escort job.

1.2 Rulemaking Alternatives

Through the rulemaking public involvement process, the BPC developed rulemaking alternatives for consideration in the EIS. The BPC has proposed four reasonable[2] rulemaking alternatives to be analyzed in the EIS. This discipline report analyzes the impacts associated with the four proposed rulemaking alternatives: No Action (Alternative A), Addition of Functional and Operational Requirements (FORs) (Alternative B), Expansion of Tug Escort Requirements (Alternative C), and Removal of Tug Escort Requirements (Alternative D). The proposed rulemaking alternatives are summarized below and are shown in Figure 1.

Alternative A. No Action. Under Alternative A, the existing tug escort regulations would continue in effect with no changes.

Alternative B. Addition of Functional and Operational Requirements. The existing tug escort regulations would continue with the addition that escort tugs operating under the rule would need to meet the following three functional and operational requirements:

1. Pre-escort conference: Prior to beginning the escort, the escort tug and the target vessel need to coordinate and discuss safety measures and other standard requirements.

[2] As defined in Chapter 197-11-786 WAC.

2. Minimum horsepower: Escort tugs must meet minimum horsepower requirements based on the DWT of the escorted vessel:
    - Escort tugs must have 2,000 hp for vessels greater than 5,000 and less than 18,000 DWT
    - Escort tugs must have 3,000 hp for vessels equal to or greater than 18,000 DWT and less than 40, 000 DWT.
3. Propulsion specifications: To ensure sufficient propulsion, escort tugs must have a minimum of twin-screw propulsion.

Alternative C. Expansion of Tug Escort Requirements. This alternative would maintain the geographic scope of the current tug escort regulations and extend them to the northwest (See Figure 1 below). This alternative would add 28.9 square miles (74.9 square kilometers) to the existing geographic extent where tug escort requirements apply. The expansion area would be located at the northern boundary of the existing tug escort requirement. This alternative would include the above-mentioned three functional and operational requirements set forth under Alternative B.

Alternative D. Removal of Tug Escort Requirements. This alternative would remove the current tug escort requirement for the target vessels within the rulemaking boundaries.

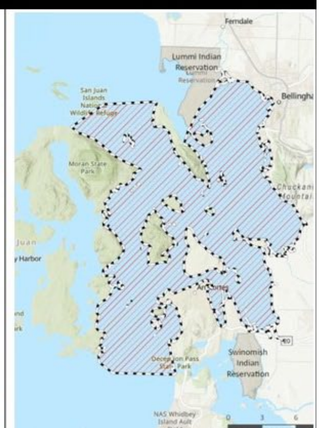
Alternative A (No Action)	Alternative B (Add FORs)	Alternative C (Expansion)	Alternative D (Removal)
 No change to geographic scope of requirements	 No change to geographic scope of requirements	 Expand current requirements north to Patos Island	 Remove requirements within current boundary
No change to existing functional and operational requirements (FORs)	Add pre-escort conference, minimum horsepower, and propulsion requirements	Add pre-escort conference, minimum horsepower, and propulsion requirements	N/A – tug escort requirements for target vessels are removed

Figure 1. Proposed rulemaking alternatives.

Under ESHB 1578, Ecology developed a model to simulate vessel traffic patterns and oil spill risk, including tug escort activity. The model was based on historical automatic identification system (AIS) data from 2015-2019 and was used to inform the 2023 Analysis of Tug Escorts for Tank Vessels. For the current EIS effort, Ecology used the model to 1) simulate the tracks of escort and assist[3] tug traffic, based on 2015-2019 historical AIS data, and 2) simulate the current volumes of escort and assist tug traffic along these tracks while accounting for tug escort requirements that went into effect in 2020.

The model produced 1,000 annual simulations of escort and assist tug traffic. To represent current conditions and Alternative A, Ecology selected the simulation output with the highest amount of escort tug traffic (i.e., the "worst case scenario") to ensure that the EIS does not undercount potential environmental impacts and to account for other potential near-term growth in vessel traffic (e.g., traffic from the Trans Mountain Expansion). For Alternative C, Ecology modified the Alternative A simulated traffic outputs to account for the proposed changes in tug escort requirements under that alternative.

Ecology used 2023 historical AIS data (i.e., not simulated) to represent all vessel categories other than escort and assist tugs, with some adjustments to account for recreational and fishing vessels that are not equipped with AIS. Traffic for these other vessel categories did not require simulation because it would not change based on the rulemaking alternatives.

The simulation outputs are used here to show the differences in underway time for escort tugs[4,5] under Alternative A and Alternative C. Figure 2 and Figure 3 show the results of these simulations, compiled to indicate the total minutes per year (min/yr) of target vessel escort tug underway time within each one-square-kilometer grid cell. Figure 4 depicts the change in escort tug underway time between Alternatives A and C. Escort tug activity under Alternative B would not be expected to be meaningfully different than under Alternative A, while Alternative D would result in zero tug escorts. Refer to the Transportation: Vessel Traffic Discipline Report for details regarding the vessel activity simulation methodology and results.

[3] Escort tugs are often referred to as “escort/assist tugs” in this analysis because the same vessels typically perform both escorting and assisting work. Ecology used the model to simulate traffic for both escorting and assisting work; however, only escorting work would be affected by the rulemaking alternatives.
[4] Escort tug underway time includes time spent traveling to an escort job, time while escorting a target vessel, and time spent traveling from an escort job.
[5] Unless specified otherwise, the terms “escort tug” and “tug escort” refer to the subset of overall tug escort activity or underway time for target vessels that are specifically affected by this rulemaking.

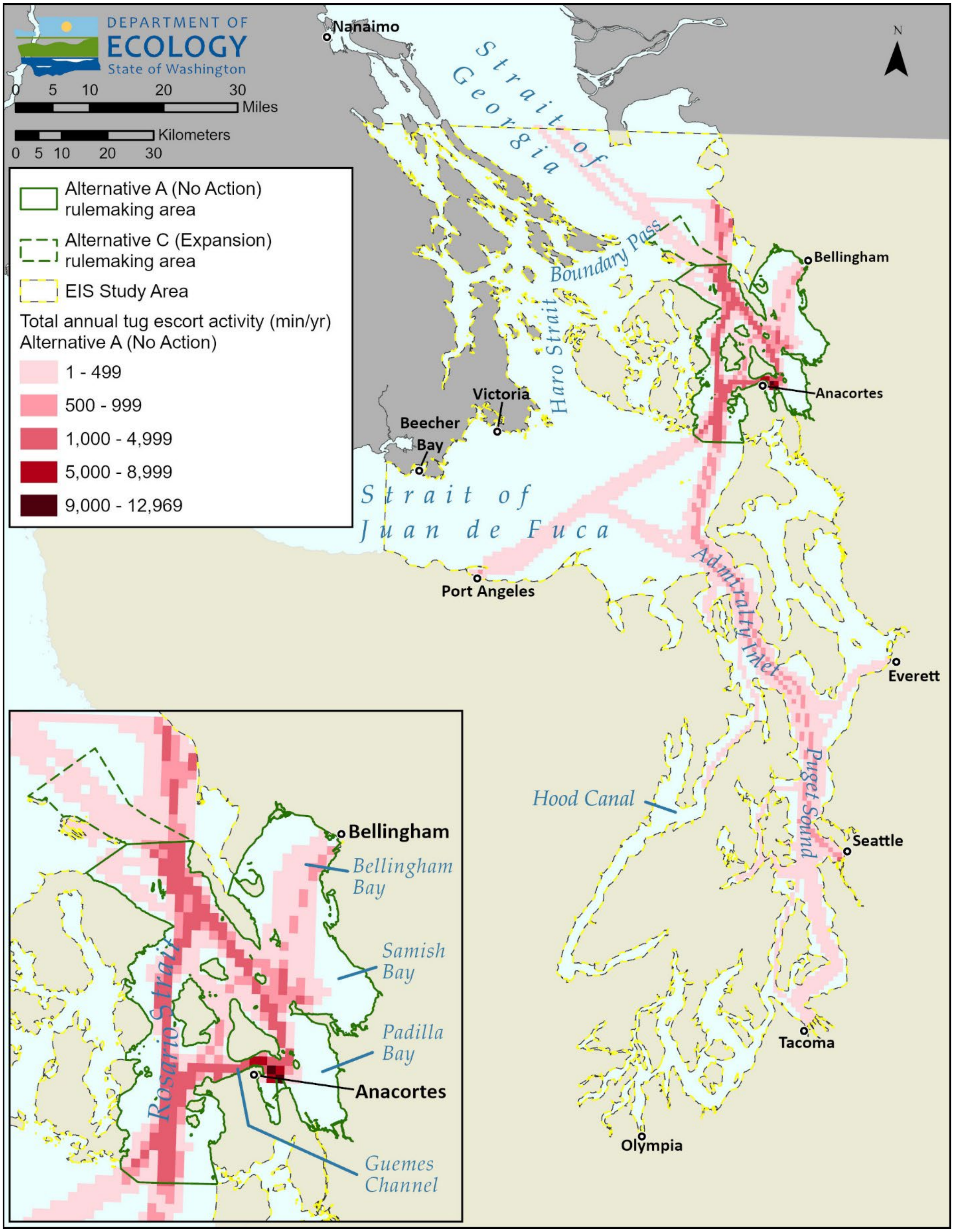


Figure 2. Simulated escort tug underway time under Alternative A and B.

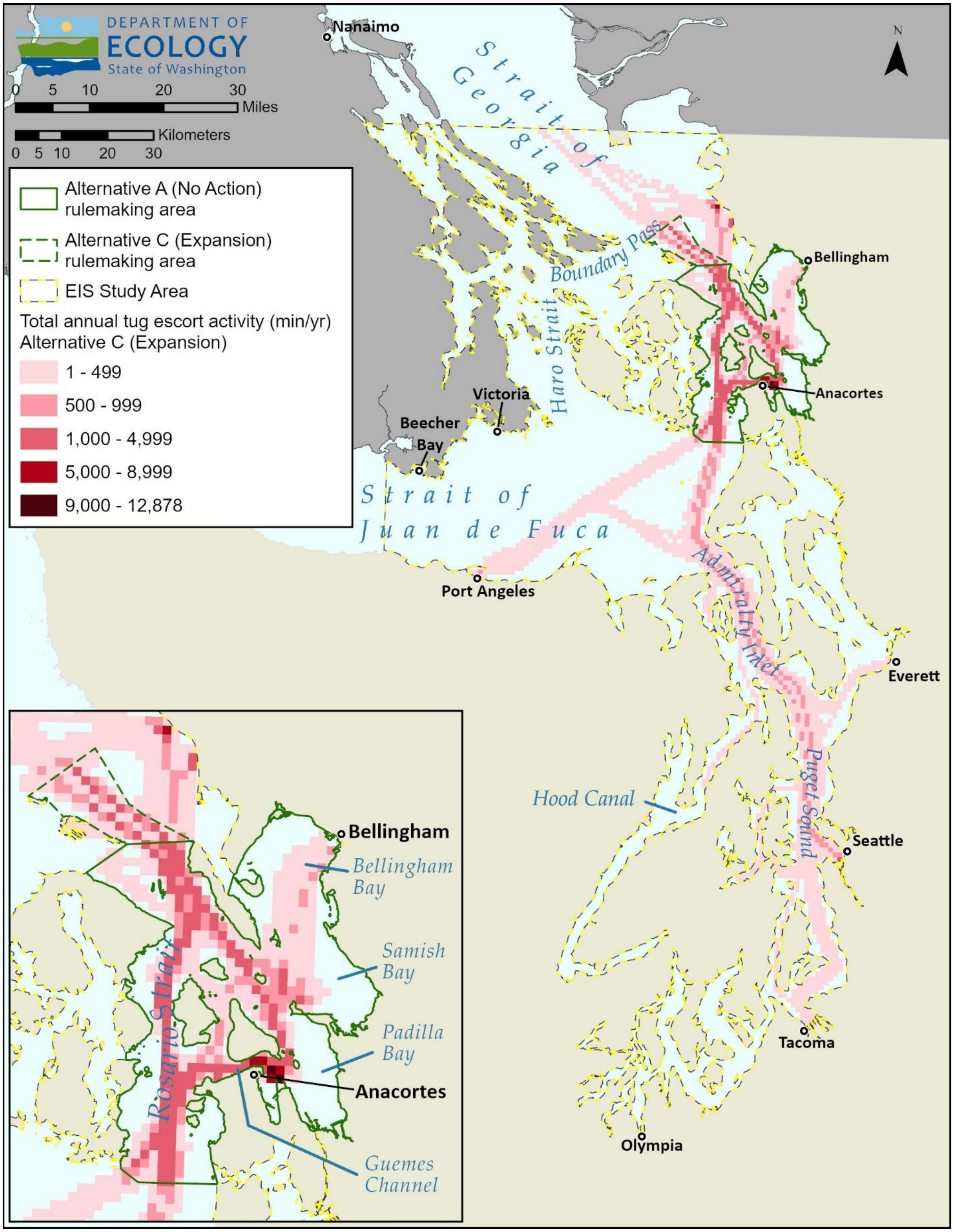


Figure 3. Simulated escort tug underway time under Alternative C.

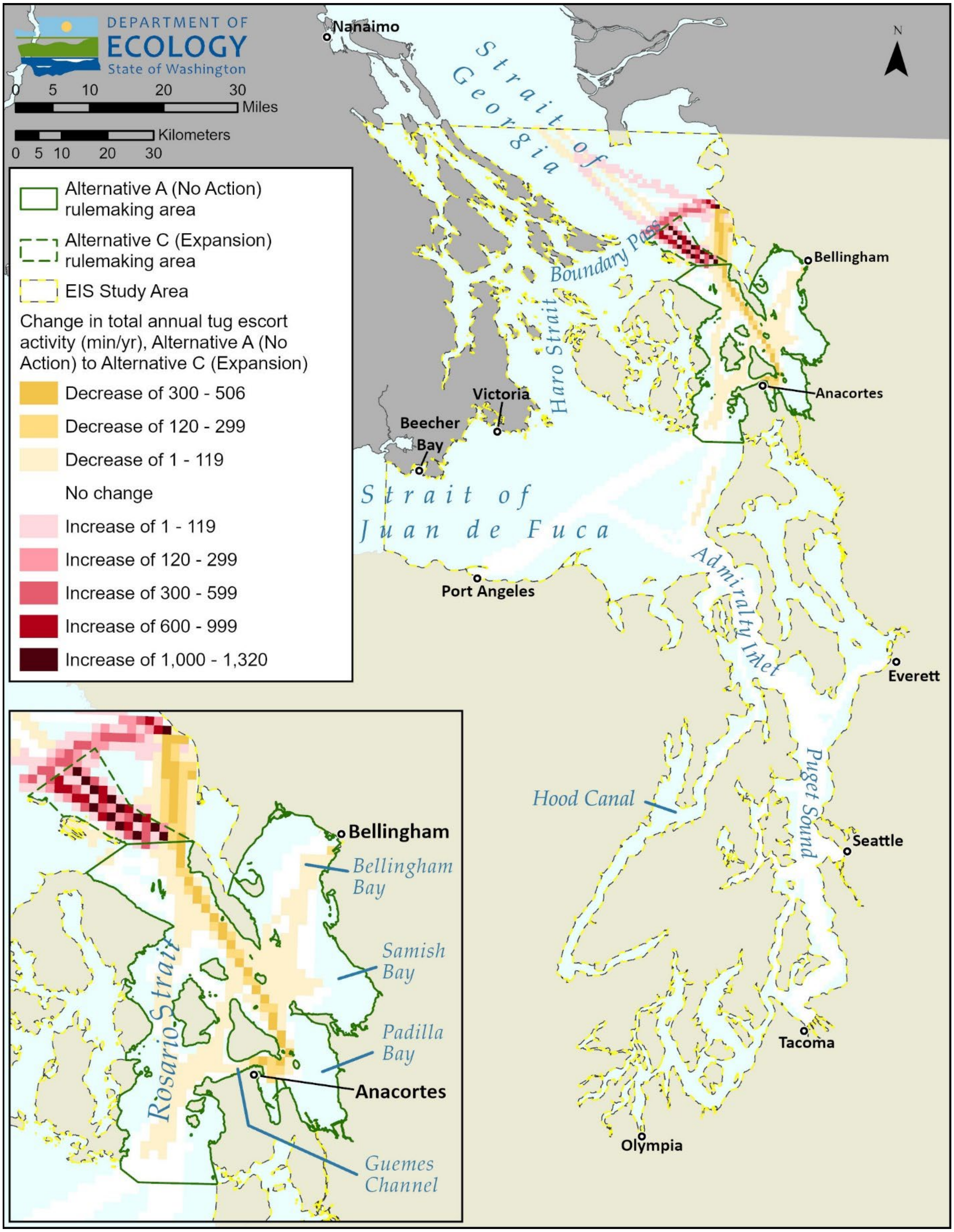


Figure 4. Simulated change in escort tug underway time between Alternative A and Alternative C. An additional accessible version of this map is available in Appendix M.

1.3 Resource Study Area

The EIS Study Area includes the rulemaking alternative boundaries and potential areas for tug escort commutes to and from the alternative boundaries. Specifically, the EIS Study Area for oil pollution includes connected marine waters in the Salish Sea network of coastal waterways (including Puget Sound), bounded to the north by the 49^{th} Parallel and bounded to the west by a line extending across the Strait of Juan de Fuca from Pike Point to Tongue Point (see Figure 5). We also model spill trajectories for this analysis, some of which extend beyond this boundary. Those impacts are also considered.

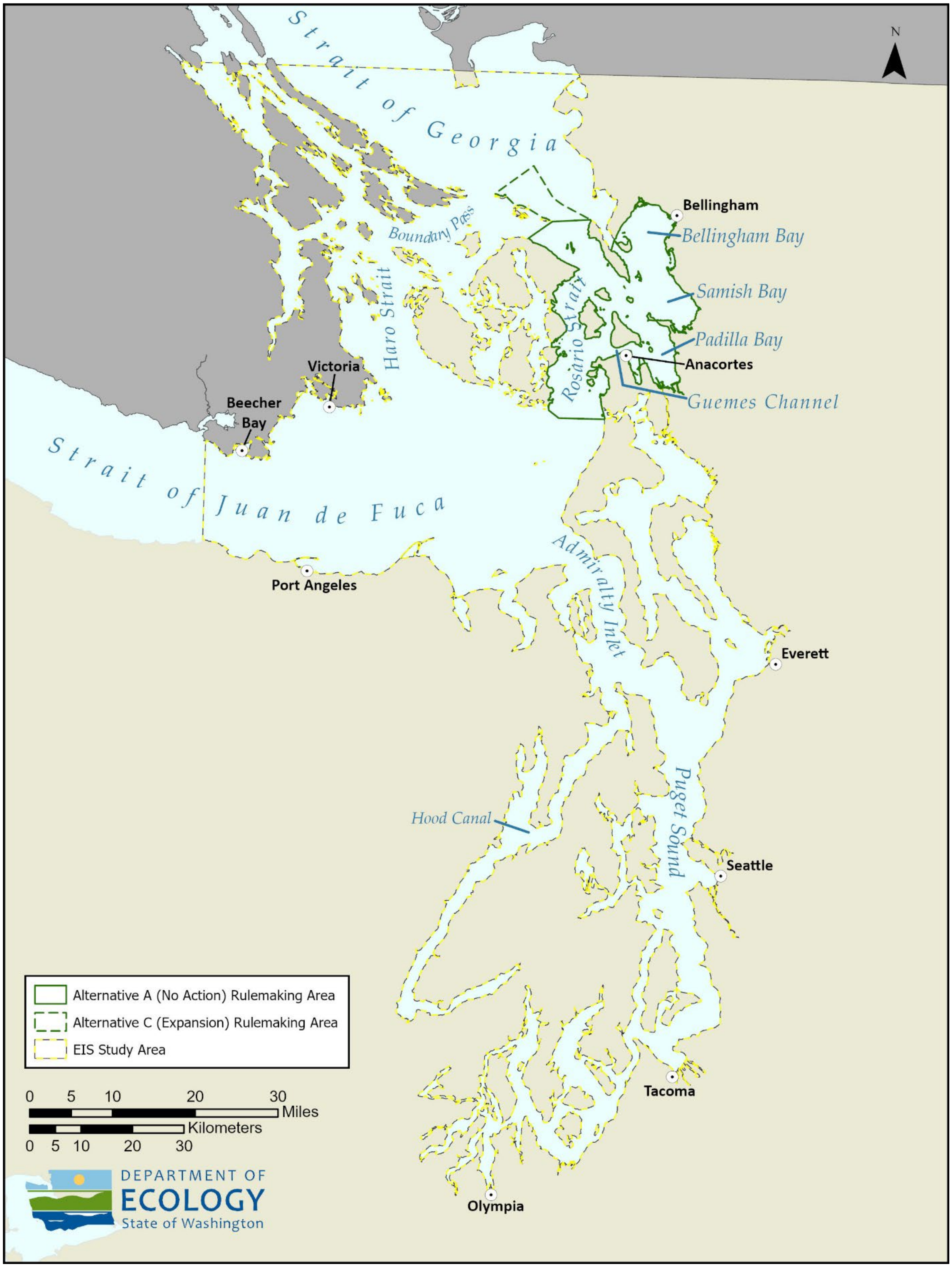


Figure 5. Boundary of the EIS Study Area.

1.4 Resource Description

This report focuses on oil pollution risk within the EIS Study Area. To characterize the affected environment, we describe the volume and type of oil carried by target vessels and escort tugs in the EIS Study Area and the history of oil spill incidents for both target vessels and escort tugs.

There are lots of ways that oil can be spilled. This analysis focuses on the subset of oil pollution incidents that could be affected by tug escort rules or additional tug escorts.

Since tug escorts are best suited to preventing drift grounding events (and associated spills), this report focuses on describing the relative frequency of target vessel drift groundings and. We also describe the incident rate associated with escort tugs. Incident frequencies are described for each of the rulemaking alternatives.

The report also includes worst case discharge incidents for both target vessels and escort tugs at high-risk locations. Each incident is described using trajectory models that show the change in the distribution of potential impacts under each of the rulemaking alternatives. The report focuses on how the risk of drift grounding and escort tug incident rate change under each rulemaking alternative. It does not assess spills from vessels other than target vessels or escort tugs, nor does it cover the economic consequences of an oil spill.

1.5 Regulatory Framework

Several Federal, Tribal, State, and local laws, plans, and policies are related to oil pollution in the EIS Study Area. Discussion of these laws, plans, and policies is intended to provide a framework for the overall regulatory context of the action but is not necessarily intended to imply applicability or compliance requirements for the four rulemaking alternatives evaluated in the EIS. Table 2 summarizes relevant Federal regulations for oil pollution.

Table 2. Primary Federal regulation for oil pollution

Regulatory Program	Lead Agency or Entity	Description
Oil Pollution Act of 1990 (OPA 90)	U.S. Coast Guard (most relevant for this rulemaking) and EPA, WA State Department of Ecology at state level	Codifies aspects of oil pollution prevention, preparedness, response, and liability and compensation.

Table 3 identifies the laws, plans, and policies relevant to the evaluation of environmental health: releases in the study area. Based on scoping for the EIS, this report focuses on oil pollution. Additional incidental releases (e.g. wastewater) are covered in the Water Quality Discipline Report. Additional narrative descriptions for the major regulatory components are included in subsections for each regulatory body, following Table 3.

Table 3. Laws, plans, and policies relevant to the evaluation of environmental health: releases, specifically oil pollution

Statute, Regulation, Policy	Description
International	
International Maritime Organization (IMO) International Convention for the Prevention of Pollution from Ships (MARPOL)	Double hull requirements for tank vessels, limited maximum fuel tank sizes and required fuel tanks to be located away from the hull
Canada - US Joint Marine Pollution Contingency Plan: Pacific Geographical Annex (CANUSPAC)	CANUSPAC documents a coordinated approach for spill response in the transboundary waters of the Salish Sea. It is jointly managed by the U.S. Coast Guard and the Canadian Coast Guard. It is exercised every two years.
Federal	
Oil Pollution Act of 1990 (33 U.S.C. §2701 et seq. (1990))	Codifies aspects of oil pollution prevention, preparedness, response, and liability and compensation. It standardized requirements for vessel construction and crew training including double hulls, required contingency planning, enhanced federal response capabilities and enforcement authorities, increased penalties, potential liabilities, and financial responsibility requirements, and established research and development programs. It also established the Oil Spill Liability Trust Fund, which can be used to cover spill response and cleanup costs. The U.S. Coast Guard and EPA are the lead federal agencies responsible for OPA 90.
National Oil and Hazardous Substances Contingency Plan (NCP)	Created a comprehensive system of pollution reporting, spill containment and cleanup. The NCP was updated in 1994 to reflect OPA 90. The NCP also establishes the roles and responsibilities of the National Response Team (NRT), the Regional Response Teams (RRT, see below), and the On Scene Coordinator (OSC). It establishes required standards for regional, area, and local contingency plans.
Tank Vessel Response Plans (33 CFR Part 155 Subpart D)	Establishes requirements for oil spill response plans for certain vessels, including establishing specific planning criteria.
Clean Water Act of 1972	Establishes legislation for the control of pollution into U.S. waters and water quality standards
State	
Washington State Oil Spill Contingency Plan (Chapter 173-182 WAC)	Establishes covered vessel and facility oil spill contingency plans, drill and equipment verification requirements, standards for response providers of various types, and record-keeping and compliance information. Describes planning standards for contingency plan holders.

Statute, Regulation, Policy	Description
Oil and Hazardous Substance Spill Prevention and Response (Chapter 90.56 RCW)	Establishes a comprehensive prevention and response program to protect Washington's waters and natural resources from oil spills. This includes the development of state agency expertise and regulatory authority to centralize spill prevention and response activities and programs to reduce the risk of spills. The RCW also establishes liability and compensation structures, wildlife rescue planning and implementation, and funding for all of these programs. It also complements OPA 90 with regards to contingency planning and provides for independent review of the adequacy of spill prevention, preparedness, and response activities in Washington state.
Water Pollution Control (Chapter 90.48 RCW)	Establishes the policy of Washington state to maintain the highest possible water quality standards and prevent and control pollution to state waters.
Vessel Oil Spill Prevention and Response (RCW Ch. 88.46)	Establishes vessel oil spill prevention and response programs, including tank vessel inspection programs, prevention planning, vessel screening, and contingency plan requirements, enforcement, and emergency response. Also required the development of the Ecology risk model and associated reports.
Northwest Area Contingency Plan (NWACP) (Region 10 RRT & NWACs, 2024)	The NWACP is a joint plan coordinated by the states of Washington, Oregon, and Idaho along with federal partners led by the U.S. Coast Guard and the EPA. This comprehensive plan contains policies on how oil and hazardous substance responses are conducted in the Pacific Northwest. It includes by reference location-specific geographic response plans (GRPs) developed and maintained by the Department of Ecology.
Tribal	
Lummi Nation Spill Prevention and Response Plan (Lummi Water Resources Division & Lummi Natural Resources Department, 2019)	Lummi Nation has developed and published a spill response plan. The Plan is intended to "guide current and future efforts to effectively reduce the potential for damage from hazardous material spills on the Reservation and, in coordination with other jurisdictions as appropriate, to reduce the potential for damage from spills near the Reservation or that cross the Reservation boundaries."
Makah Tribe Resolution 112-17	Created an Oil Spill Work Group tasked with developing a Tribal spill response plan, among other tasks to protect Makah treaty resources from the risk of oil pollution. The plan is anticipated to be finished in 2025 and incorporated into Pacific Northwest Area Plans. The Makah Tribe joined the Region 10 Regional Response Team (RRT) in 2008 as the first Tribal government to join an RRT in the nation. The Tribe is active in oil spill contingency planning, including through Tribal, area, and regional planning.
Other Tribal Response Plans, Programs, and Capacities.	Other Tribes have their own Tribal response plans, programs, and capacities related to oil spill response. While not all of them include a published Tribal plan, they are important components of coordinated spill response in the EIS Study Area.

Statute, Regulation, Policy	Description
Local	
Whatcom County Comprehensive Emergency Management Plan (Whatcom County Sheriff's Office Division of Emergency Management, 2022)	Establishes an all-hazard emergency response plan for Whatcom County, which includes oil and hazardous materials response.
Skagit County Local Emergency Planning Committee Hazardous Materials Contingency Plan (Skagit County Local Emergency Planning Committee, 2019)	Provides effective, coordinated emergency response to incidents involving the release or potential release of hazardous materials in Skagit County.
San Juan County Oil and Hazardous Materials Response Plan (San Juan County, 2019)	Establishes policies and procedures under which San Juan County will operate in the event of an oil spill or other hazardous materials release.

Many entities, including the IMO, the U.S. Coast Guard, Puget Sound Pilots, Ecology, industry associations, and the PSHSC, contribute to improving maritime safety and reducing the risk of oil spills from vessels. These efforts include both the regulatory efforts of State and Federal agencies, and voluntary measures, which have high rates of compliance in this region. A brief overview of these organizations and associated safety practices is provided below.

1.5.1 International Maritime Organization

The IMO creates a consistent regulatory and standards framework for the international shipping industry. This framework is internationally agreed upon, adopted, and implemented. IMO standards cover all aspects of international shipping—ship design, construction, equipment, crewing, operation, and disposal—to ensure that shipping remains safe, environmentally sound, energy efficient, and secure (IMO, n.d.). Key IMO conventions related to oil spill prevention include:

- International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto and by the Protocol of 1997 (MARPOL).
- International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) as amended, including the 1995 and 2010 Manila Amendments.

1.5.2 U.S. Coast Guard

The mission of the U.S. Coast Guard (USCG) is to ensure the nation's maritime safety, security, and stewardship (U.S. Coast Guard, n.d.). The USCG is the designated lead federal responder for oil spills occurring in navigable waters. The USCG operates through authorities as the Sector Commander; Officer in Charge, Marine Inspection; Captain of the Port; Federal On-Scene

Coordinator; and Federal Maritime Security Coordinator. The USCG is engaged locally with the Puget Sound Harbor Safety Committee. U.S. laws and the Code of Federal Regulations (CFR) have incorporated IMO regulations and standards.

Coast Guard missions related to oil spill prevention include (Note: USCG missions related specifically to vessel traffic safety and safe navigation are covered in the Vessel Traffic chapter):

- Port safety, waterways management, and port and coastal security.
- Vessel inspections.
- Oil spill response planning.
- Marine casualty investigations.

In addition to operating the Puget Sound Vessel Traffic Service (VTS), the Coast Guard participates in the Cooperative Vessel Traffic Service (CVTS) with Canada, described in more detail in the Transportation: Vessel Traffic Discipline Report.

46 CFR Chapter I Subchapter M: Of particular relevance to this analysis is 46 CFR Subchapter M, Towing Vessels. These safety regulations apply to the vessels described as escort tugs in this analysis and are administered by the Coast Guard (46 CFR 136, 2016). Subchapter M describes requirements for obtaining and renewing Certificates of Inspection (COI) for towing vessels. Subchapter M increases the types of towing vessels that require a COI; establishes standards for lifesaving equipment, firefighting, machinery and electrical systems, and watertight integrity; and sets minimum crew qualifications and training requirements. The phase-in of these new requirements has been completed, and all towing vessels that fall under Subchapter M now have valid COIs on board as of July 2022.

Incentive Programs: QUALSHIP 21 and E-Zero: The USCG also administers two incentive programs for non-U.S. flagged vessels to encourage and recognize commitment to strict compliance with national and international standards for safety, security, and the environment: Quality Shipping for the 21st Century (QUALSHIP 21), and E-Zero (U.S. Coast Guard, 2017b). Vessels meeting QUALSHIP 21 standards are posted on a U.S. Coast Guard website and Equasis, a public-facing site promoting maritime safety and quality. The E-Zero designation is an additional, more rigorous designation, which includes several standards related to oil pollution including zero maritime pollution detentions and zero environmental deficiencies in the US over the past three years.

1.5.3 Tug Escorts for Tank Ships

Some tank ships in Washington and British Columbia waters require tug escort. In Washington, tank ships greater than 40,000 dead weight tons loaded with oil as cargo must be escorted (RCW 88.16.190, WAC 363-116-500).

In 2019, the Washington state legislature passed ESHB 1578, which amended Chapter 88.16 RCW, Chapter 88.46 RCW, and Chapter 90.56 RCW. Among other actions, the amendments to Chapter 88.16 RCW require tug escorts for smaller oil tankers between 5,000 and 40,000 deadweight tons (DWT) that are laden (carrying oil as cargo onboard), and for laden Articulated

Tug Barges (ATB) and oil barges greater than 5,000 DWT when operating in Rosario Strait and connected waterways to the east. (RCW 88.16.190).

The PPA established guidance for Canadian waters, requiring tug escort for tank ships greater than 40,000 dead weight tons loaded with liquids in bulk, and more stringent requirements for those carrying crude oil (Pacific Pilotage Authority, 2019). Additional details can be found in Appendix B Transportation: Vessel Traffic Discipline Report.

1.5.4 Emergency Response Towing Vessels

There is an Emergency Response Towing Vessel (ERTV) stationed on the Makah Reservation in Neah Bay, at the mouth of the Strait of Juan de Fuca. It has been deployed numerous times since its stationing in 1999 to assist vessels in distress. The ERTV is intended to prevent oil spills from ship and barge groundings. The establishment and use of the emergency response system ERTV is defined in RCW 88.46.130 and WAC 173-182-242.

The ERTV is available to serve vessels in the Strait of Juan de Fuca and off of Washington's western coast from Cape Flattery light in Clallam County south to Cape Disappointment light in Pacific County (RCW 88.46.130). Since its stationing, the ERTV has been called out to provide emergency assistance to vessels 86 times (Ecology, 2025d). The potential usefulness of ERTVs in other locations has also been assessed (Ecology, 2023a).

The Trans Mountain Expansion Project includes an Oil Spill Response Vessel stationed at Beecher Bay, that can respond to disabled vessels and provide towing assistance (Trans Mountain, 2020).

1.5.5 Washington State Department of Ecology

Ecology's Spill Prevention, Preparedness, and Response Program (Spills Program) focuses on preventing oil spills to Washington's waters and land, and planning for and delivering a rapid, aggressive, and well-coordinated response to oil and hazardous substance spills wherever they occur (Ecology, 2025b). The Spills Program works with communities, industry, State and Federal agencies, Tribes, and other partners to prevent and prepare for oil spills. The Spills Program also responds to spills 24/7 from six offices located throughout the state and works to assess and restore environmental damage resulting from spills. Spills Program activities include:

- Preventing oil spills from vessels and oil handling facilities.
- Preparing for aggressive response to oil and hazardous material spills.
- Rapidly responding to and cleaning up oil and hazardous material incidents.
- Restoring public natural resources damaged by oil spills.

Core services include vessel inspections of commercial cargo and passenger vessels of 300 gross tons or more, facility inspections, oil transfer monitoring, plan review and approvals, contingency plan drills, development of Geographic Response Plans, technical assistance, environmental restoration, and 24/7 response to oil and hazardous materials spills.

1.5.6 Voluntary Best Achievable Protection and Exceptional Compliance Program

Ecology also manages voluntary programs for the safe and pollution-free operation of tank vessels (Ecology, 2025e). The goal of these programs is to recognize tank ship companies that go beyond minimum state, federal, and international safety and environmental requirements. Like the USCG QUALSHIP 21 and E-Zero initiatives, the Voluntary Best Achievable Protection (VBAP) and Exceptional Compliance Program (ECOPRO) programs identify standards that represent many of the best practices found on tank vessels throughout the world.

2.0 Methodology Summary

Ecology identified and reviewed historical and simulated data, previous technical reports, and other available information regarding oil pollution risk in the EIS Study Area. Ecology also reviewed Tribal and stakeholder input received from the scoping and workshop phases. During scoping, comments focused on capturing the potential for risk reduction from tug escort requirements, and the oil pollution risk that the tugs themselves pose. Comments also focused on ensuring that activities of escort tugs that could result in a spill (bunkering, fueling, etc.) were considered in the analysis. Ecology also received comments regarding the impact of an oil spill on cultural and historic resources (summarized in the Tribal Resources Discipline Report). Stakeholders also wanted Ecology to use both simulated and historical incident data. This analysis attempts to address the input we received.

Methodology for establishing baseline conditions: Ecology established baseline conditions in the affected environment by reviewing literature and historical data to provide an overview of current trends in how oil is transported by vessels in the EIS Study Area. This review focused on the types and volumes of oil transferred by target vessels and escort tugs. A summary of current response options and limitations is also provided, as well as a summary of existing safety measures to reduce the risk of a spill.

Methodology for assessing target vessel drift grounding probability: Ecology assessed the target vessel drift grounding probability using the Ecology risk model (Ecology, 2025c) for each rulemaking alternative. This analysis focuses on drift grounding frequency because escort tugs are generally considered best suited to intervene in these events (Allan, 2000; ASTM, 2021). Since the proposed rule is not changing any aspect of the vessel traffic system other than tug escort requirements, we assume that other spill events from target vessels remain unaffected for this analysis.

One of the model outputs is designed to represent the likelihood of drift groundings. It is informed by historical loss of propulsion frequency, ocean bathymetry, currents, distance from navigational hazards, and other factors described in more detail in the model report on the tug escort analysis (Ecology, 2023b).

We modeled estimated probability rates for loss of propulsion incidents, drift grounding incidents, and oil spills from drift groundings for each alternative. They are discussed at the scale of the EIS Study Area and at the individual zone scale.

Ecology also reviewed historical vessel incident data involving target vessels from 2017-2023 as a complement to the simulated data produced by the model. Individual incidents were assessed by Ecology staff for relevance to the rulemaking and whether an escort tug might have reduced the risk associated with the incident. The identified incidents are discussed in the context of each rulemaking alternative.

Methodology for assessing escort tug incident rate: Ecology analyzed the frequency of incidents associated with the escort tugs themselves. We assessed each rulemaking alternative individually. For the escort tug analysis, we used an incident rate per underway minute that was developed to support the Tug Escort Analysis (Ecology, 2023b). Ecology developed these rates based on recorded incidents involving tugs in the U.S. and Canadian waters of the Salish Sea from 2002 to 2019.[6]

Ecology also reviewed historical vessel casualty data involving escort tugs from 2017-2023 as a complement to the simulated data. Ecology staff assessed individual incidents for relevance to the rulemaking. The activity the tug was engaged in when the incident occurred is also noted. We then discuss the identified incidents in the context of each rulemaking alternative.

Other non-oil discharges (gray water, etc.) from escort tugs are covered in the Water Quality Discipline Report.

Table 4. Probability of tug incidents per operating minute and per one million operating minutes. These rates are used in the EIS calculations.

Incident Type	Probability	# of incidents per operating minute	# of incidents per 1,000,000 operating minutes
Allisions/Collisions	2.31×10^{-7}	0.0000002310	0.231
Groundings	7.12×10^{-8}	0.0000000712	0.0712
Sinking/Capsize	1.78×10^{-8}	0.0000000178	0.0178
Other	1.09×10^{-6}	0.0000010900	1.09

Methodology for worst case discharge spill trajectory scenarios: Ecology describes how the rulemaking alternatives affect the distribution of potential spill impacts. Informed by the drift grounding results (target vessels), and vessel traffic density data (escort tugs), Ecology selected eight spill locations as worst case spill scenarios for each alternative. We used these spill locations to evaluate worst case discharge (WCD) trajectories.

Ecology then used the General NOAA Operational Modeling Environment (GNOME) trajectory modeling tool to model spill scenarios at these locations (NOAA Office of Response and

[6] The vessel categories that we used to calculate incidents included tugs that aren't specifically escort tugs. For the USCG MISLE database we included incidents associated with vessels classified as "towing vessels," including "harbor/ship assist (tug)", "pushing ahead (towboat)", "pushing ahead/hauling alongside", "ship/harbor assist", "towing astern," and "towing behind (tug)." For the Canadian MARSIS database, we included incidents associated with vessels with length greater than 50 feet classified as "tug."

Restoration, n.d.). A sample worst case discharge spill volume was developed for each spill location. A worst case discharge is defined as "a spill of the vessel's entire cargo and fuel complicated by adverse weather conditions" (WAC 173-182-030 (73)(c)). The vessel type and cargo and fuel capacity were randomly assigned from among the target vessels and escort tugs identified in the appendices of the Synopsis of Changing Vessel Traffic Trends (BPC & Ecology, 2021). We selected the time of year for each incident based on the presence of migratory marine mammal species and the timing of sensitive life stages (e.g. spawning, fledging) for other fish and bird species listed under the Endangered Species Act (ESA). We randomly assigned one of these sensitive times of year to each spill scenario. The GNOME model simulates a 48-hour spill period. To account for daily and seasonal differences in tides and currents, we ran each spill scenario trajectory 360 times using modeled currents and wind conditions over a two-week period. We then compiled the results into a single map showing the average distribution of oil across all spill trajectories for each spill scenario.

Ecology also provided the spill trajectories to the Department of Archaeology and Historic Preservation (DAHP). The DAHP cross referenced the geographic extent of the trajectory models with their internal database of known archaeological sites for inclusion in the EIS. See Section 3.1.6 for more information on oil spills and archaeological resources, including DAHP data.

Methodology for making significance determinations: Ecology assessed whether the impacts of each of the four rulemaking alternatives would be likely to result in significant adverse environmental impacts, per the significance thresholds outlined below in Table 5. WAC 197-11-794 defines significant as "a reasonable likelihood of more than a moderate adverse impact on environmental quality" and states that it should rely on context (e.g., physical setting) and intensity (e.g., magnitude and duration of impact). Findings of significance are reported for each alternative, where identified.

Table 5. Significance thresholds for oil pollution impacts.

Indicator	Significance Thresholds
Target Vessels: Frequency of Drift Groundings	• Rule change results in a meaningful increase in the relative frequency of drift groundings from target vessels potentially resulting in spills. • This increase results in a reasonable likelihood of an increased frequency, severity, and/or extent of oil spills.
Escort Tugs: Incident Rate	• Rule change results in a meaningful increase in the relative frequency of incidents from tug escorts that could result in spills. • This increase results in a reasonable likelihood of an increased frequency, severity, and/or extent of oil spills.

3.0 Technical Analysis and Results

This section describes the affected environment for environmental health: releases and oil pollution risk within the EIS Study Area. It also describes the anticipated changes to oil pollution risk from the four alternatives:

- Alternative A (No Action)
- Alternative B (Addition of FORs)
- Alternative C (Expansion)
- Alternative D (Removal)

This section also identifies mitigation measures that could avoid, minimize, or reduce the potential impacts and determines if there would be significant and unavoidable adverse environmental impacts.

3.1 Affected Environment

More than 20 billion gallons of oil move through Washington each year by vessel, pipeline, rail, and road, and much of it travels through the Salish Sea to and from Washington petroleum refineries. Between 2012 – 2022, this included an average of over 10 billion gallons of oil carried as cargo in Washington state waters (Ecology, 2024c).[7]

3.1.1 Oil transfers over water: statewide and by region

The intent of this section is to establish the baseline of oil movement by target vessels and escort tugs in the rulemaking area by describing the volumes and types of oil being transferred in that area. This analysis uses the volume of oil transferred rather than the number of transfers as the primary metric. While there is a risk of a spill associated with the act of a transfer, that risk is unaffected by this rulemaking and is therefore not used.

Ecology regulates oil transfers over water.[8] This can provide a general idea of the amount of petroleum products moving throughout the state. Between 2021 and 2023, an average of over 10 billion gallons of oil was transferred over water by vessel in Washington state (Ecology, 2024a). During that time, the vast majority (around 96 percent) of oil transferred in Washington waters by vessel was oil carried as cargo, only 4 percent was oil used for fueling.

For the purposes of discussing the study area, this analysis focuses on transfers occurring in the following 3 counties: San Juan, Whatcom, and Skagit.

- **Whatcom County**: Between 2021 and 2023, an average of 4.4 million gallons/year of oil products was transferred over water in Whatcom County. This is around 43.7 percent of the total average volume of oil transferred over water in the state. By far the most significant transfer location is the BP Cherry Point Refinery with an average of 3.6 million gallons/year (83.2 percent of all oil transferred in Whatcom County, equivalent to 36.4 percent of all oil transferred by vessel in WA). The next most significant transfer locations include the Phillips 66 dock in Ferndale, the anchorage in Bellingham Bay, and the Maxum Petroleum dock in Fairhaven, which make up an additional 16.7 percent of total oil transfers by volume in Whatcom County.

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[7] All oil of any kind including crude oil, petroleum, gasoline, fuel oil, diesel oil, oil sludge, oil refuse, biological oils and blends. Cargo only. Does not include fueling transfers.

[8] A "transfer" is defined as "any movement of oil in bulk to or from a nonrecreational vessel or transmission pipeline" (WAC 173-184-025 // WAC 173-184-100). The Ecology database of transfer includes transfers of over 100 gallons.

- **Skagit County:** Between 2021 and 2023, an average of 3.3 million gallons/year of oil products was transferred over water in Skagit County. This is around 33.4 percent of the total average volume of oil transferred over water in the state. By far, the most significant transfer locations are the Anacortes Marathon Refinery with an average of 1.7 million gallons/year and March Point Holly Frontier dock with an average of 1.7 million 664,792,050 gallons/year. Together these two sites account for 98.8 percent of all oil transferred by volume in Skagit County, or 33 percent of all vessel oil transfers in WA waters during this time period. The next most significant transfer locations include the Anacortes Ferry Terminal, at anchor off Anacortes, at anchor off March Point, and at anchor near Vendovi Island, which collectively represent an additional 1 percent of total oil transferred by volume in Skagit County.
- **San Juan County:** Between 2021 and 2023, an average of just under 100 thousand gallons/year of oil products were transferred over water in San Juan County. This represents less than one tenth of one percent of the total average volume of oil transferred over water in the state. The bulk of this volume is transferred at the Friday Harbor ferry terminal, when tank trucks fuel various State ferries.

Since 2012, an average of 46 percent of the oil moving through the state by vessel, pipeline, and rail has been crude oil (Ecology, 2019). Historically, most of the crude oil bound for refineries was delivered by tank ship from Alaska**.** This number has declined in the last 10 years, while delivery of crude oil by pipeline and rail has increased. From 2021 to 2023, approximately 42 percent of crude oil was transported by vessel (inbound to Washington refineries), with the remainder of crude oil transportation occurring by rail (approximately 22 percent) and pipeline (approximately 36 percent) (Ecology, 2024b).

Between 2021 and 2023, the product with the highest volume transferred over water was crude oil. By volume, ten oil types made up 97.9 percent of all oil transfers over water in Washington state (Ecology, 2024a)(See table 6 below). Crude oil makes up approximately 40 percent of oil transferred over water, followed by gasoline (18 percent) and low sulfur diesel (14 percent). Together, crude oil, gasoline, and low sulfur diesel account for over 70 percent of all oil transferred by vessel in Washington waters.

Transfers over water of other types of oil are relatively stable within this three-year period, with a few exceptions. Biodiesel transfers over water have increased in volume by 85 percent between 2021 and 2023. Transfers of edible/vegetable oil have increased in volume by 215 percent during the same time period. Between 2021 and 2023, the vast majority (95.8 percent) of the volume of all oil transferred by vessels is cargo transfers (over 9.6 billion gallons), with only 3.93 percent of transferred oil is fueling transfers (over 393 million gallons) (Ecology, 2024a).

Table 6. Over water oil transfers by volume and type for 2021-2023

Oil Type	2021	2022	2023	3-Year Average	% of Total
CRUDE OIL	3,826,099,225	4,426,896,306	3,698,469,684	3,983,821,738	39.75%
GASOLINE	1,644,360,254	1,917,493,160	1,980,350,849	1,847,401,421	18.43%
DIESEL LOW SULPHUR (ULSD)	1,401,111,425	1,412,022,520	1,537,729,502	1,450,287,816	14.47%
Bunker Oil/HFO (0.5 - 3.5% Sulfur)	485,837,901	684,534,173	687,533,382	619,301,819	6.18%
JET FUEL/KEROSENE	467,533,358	580,370,700	574,739,210	540,881,089	5.40%
Cat Feed/VGO	348,066,012	459,780,384	490,359,114	432,735,170	4.32%
Bunker Oil/HFO (IMO < 0.5% Sulfur)	446,182,524	265,102,102	245,008,161	318,764,262	3.18%
Diesel/Marine Gas Oil (ECA < 0.1% Sulfur	297,069,570	344,625,538	247,655,818	296,450,309	2.96%
ETHANOL	211,867,594	205,166,248	159,365,384	192,133,075	1.92%
CUTTER STOCK	61,843,240	61,781,060	99,747,900	74,457,400	0.74%
Biodiesel	39,696,735	67,783,088	73,399,920	60,293,248	0.60%

3.1.2 Oil Transfers Over Water by Vessel Type (target vessels, escort tugs)

The same dataset also provides insight into the type of petroleum products that target vessels and tugs may have on board. Below, Ecology ANT data is used to describe the type of products that oil tankers (all sizes), ATBs, towed oil barges, and tugs (all types) most commonly transfer (Ecology, 2024a).

3.1.2.1 Oil Tankers Transfer Data:

While oil tankers were involved in only 11.84 percent of total transfers between 2021 and 2023, 64.1 percent of the volume of oil transferred over water involved a tanker either as the receiver or the deliverer. Of the tanker transfers, 99 percent by volume were cargo transfers and less than 1 percent were for fueling. Crude oil accounted for over 60 percent of all oil transferred by tankers (see Fig. 6), followed by gasoline, diesel, bunker oils, jet fuel/kerosene, and cat feed/VGO, which all together made up over 97 percent of oil transferred by tankers.

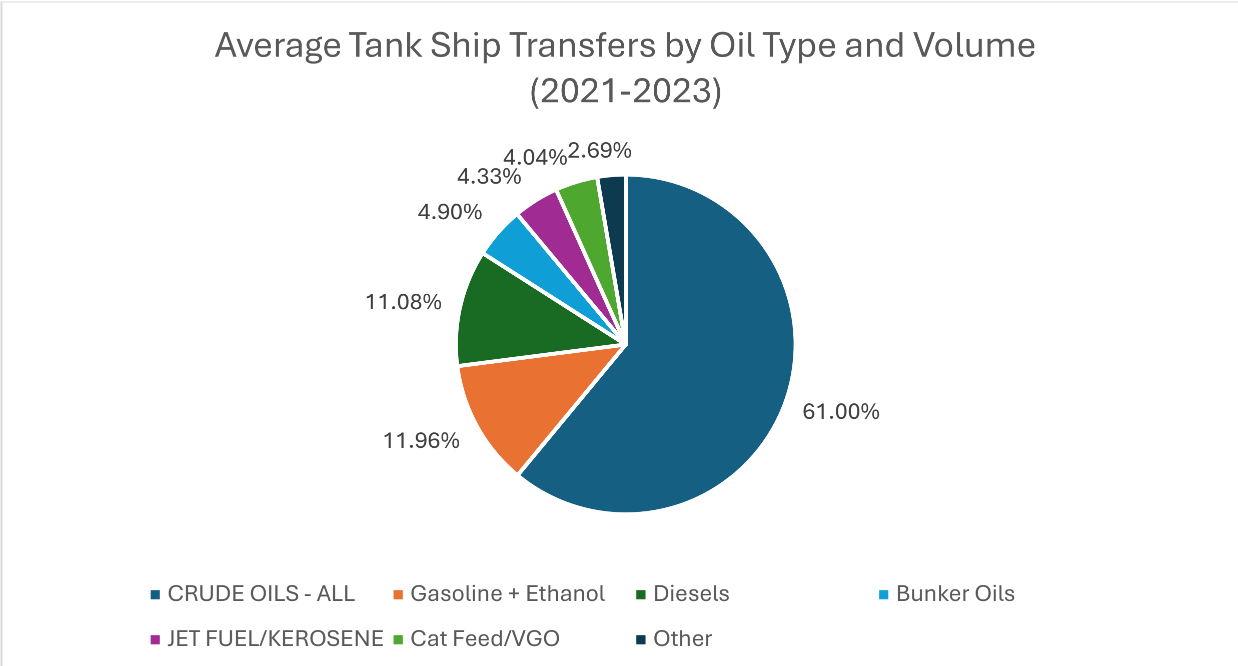

Figure 6. Oil transfers over water involving an oil tanker, by oil type and volume for 2021-2023

3.1.2.2 Tank Barge Transfer Data:

Between 2021 and 2023, transfers involving a tank barge happened more frequently than tank ship transfers, but with smaller total volumes. 30.52 percent of all transfers over water involved a tank barge. Transfers involving a tank barge as the receiver or deliverer only accounted for 18.35 percent of the total volume of oil transferred over water. Of all tank barge transfers by volume, 81.82 percent were cargo transfers and 17.39 percent were fueling transfers. Bunker oils accounted for 31.08 percent of the oil volume of all transfers involving a tank barge (See Fig. 7), followed by diesel products, gasoline and ethanol, jet fuel/kerosene, and cat feed/VGO (94 percent collectively).

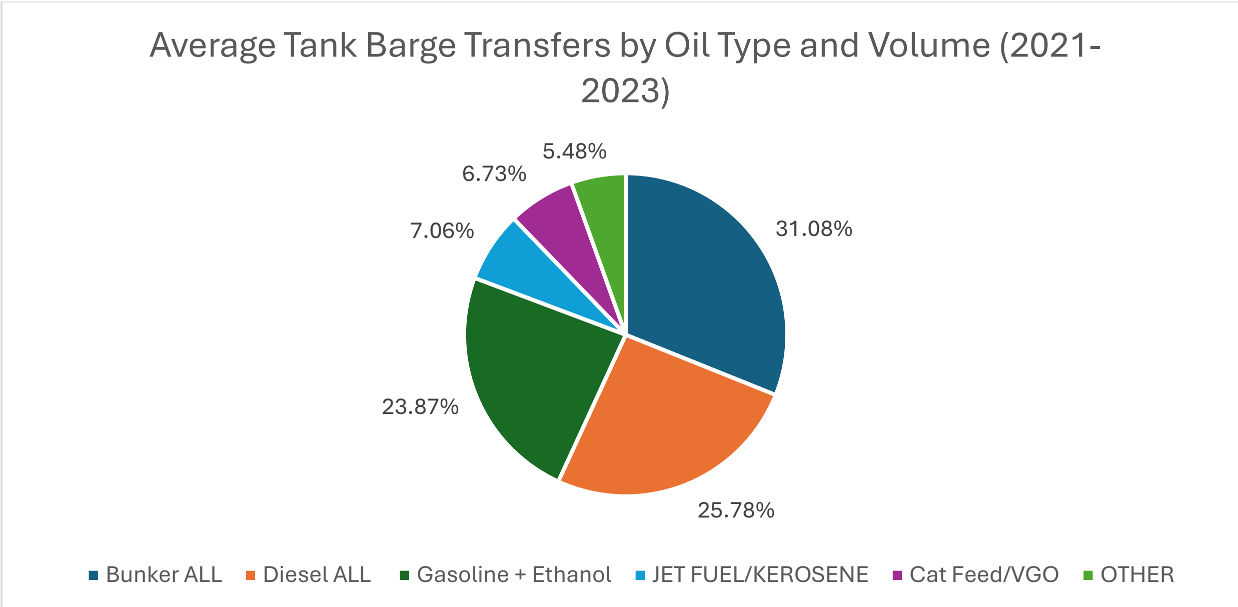

Figure 7. Oil transfers over water involving a tank barge, by oil type and volume for 2021-2023

3.1.2.3 Articulated Tug Barges (ATBs) Transfer Data:

Between 2021 and 2023, 7.82 percent of all transfers over water involved an ATB. Transfers involving an ATB as the receiver or deliverer accounted for 17.56 percent of the total volume of oil transferred over water in Washington state. 98.63 percent of the oil transfers by volume that involved an ATB were for cargo, while less than one percent was for fueling. Gasoline and ethanol accounted for nearly half (46.97 percent) of the oil volume of all transfers involving ATBs (See Fig. 8), followed by diesel products, jet fuel/kerosene, bunker oil, cat feed/VG), and cutter stock (96.25 percent collectively).

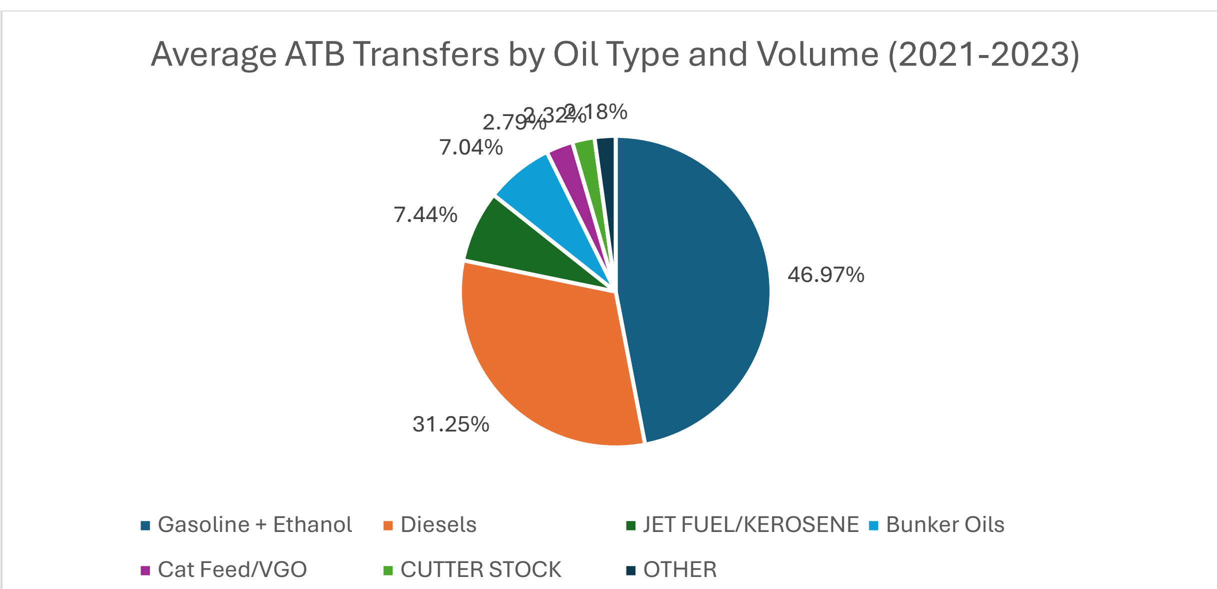

Figure 8. Oil transfers over water involving an ATB, by oil type and volume for 2021-2023

3.1.2.4 Tug Transfer Data:

Between 2021 and2023, tugs were involved in just 3.53 percent of all oil transfers over water in Washington state and just one tenth of one percent of the total oil transferred by volume. 98.95 percent of all transfers involving a tug were for fueling and 99.36 percent of the total oil transferred was diesel products (see Figure 9). The non-diesel transfers were primarily lube oil transfers.

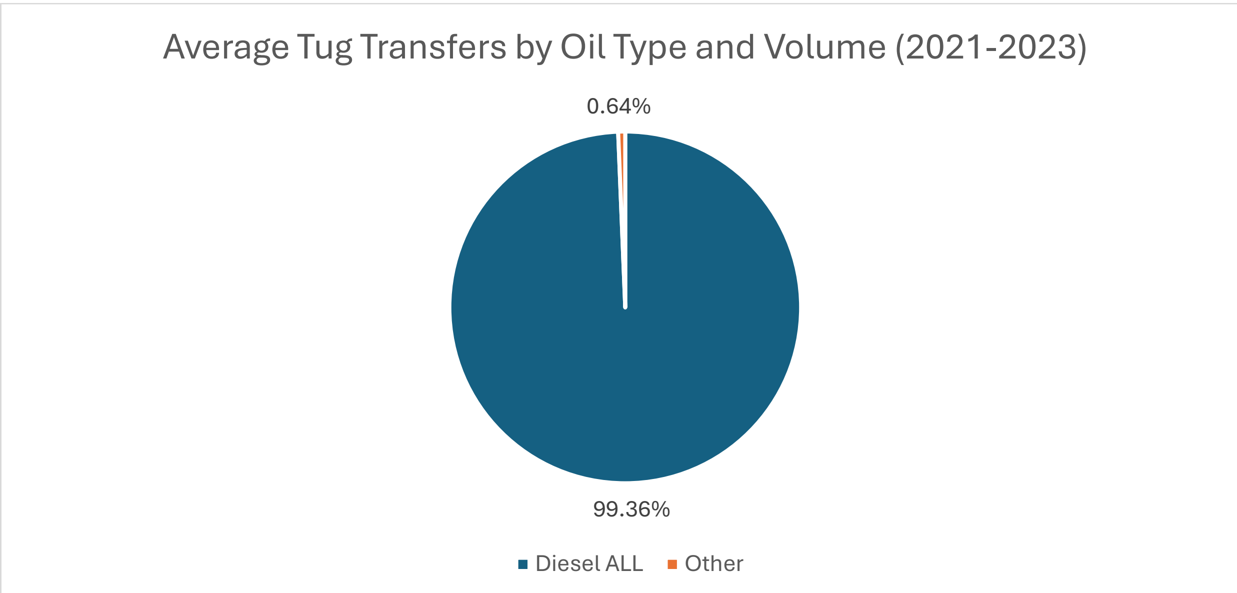

Figure 9. Oil transfers over water involving an escort tug, by oil type and volume for 2021-2023

3.1.3 Establishing baseline conditions using historical incident data

Previous Ecology reports (Ecology, 2019; Pacific States/British Columbia Oil Spill Task Force, 2022) have provided summary information on vessel casualties and oil spills by vessel type. Ecology has also previously looked specifically at drift grounding rates. Based on a review of historical incident data from 2002-2019, Ecology found that there were only two drift groundings in the U.S. and Canadian waters of the Salish Sea,[9] neither of which resulted in a

[9] We identified four records as potential covered vessel drift groundings in the Model Domain. Only two of them actually resulted in a drift grounding:

- (Grounding) February 6, 2004 propulsion failure and grounding of fishing vessel ALASKA MIST (8836259) near Shilshole Bay.
- (Grounding) June 30, 2005 loss of propulsion of car ferry QUEEN OF OAK BAY (7902283). The vessel struck 28 berthed pleasure craft before grounding.
- December 23, 2008 blackout aboard the car ferry QUEEN OF NANAIMO (6404375). The vessel anchored in Long Harbour, B.C. for repairs. The vessel did not ground.

spill (Ecology, 2023b). For this EIS, we conducted a similar analysis of vessel casualty data. Oil pollution and vessel casualty incidents from January 1, 2017 – December 31, 2023, within the EIS Study Area were identified (Ecology, 2024d). The data were then separated into individual target vessel types (ATBs, towed barges, and oil tankers) and escort tugs. Vessels were selected for inclusion in the escort tug category using the list of observed escort and assist tugs in the 2021 Synopsis of Vessel Traffic Trends (BPC & Ecology, 2021).

Data is summarized by vessel type below. Our analysis did not identify any significant change in patterns before and after rule implementation and is not used for decision-making on significance determinations. This analysis is included to complement the modeled incident data.

3.1.3.1 Oil Tanker Incidents:

Between 2017 and 2023, there were 31 vessel casualty and oil pollution incidents involving tankers within the EIS Study Area.

- Twelve of the 31 incidents occurred after the implementation of the 2020 requirements and 19 incidents occurred prior to the 2020 requirements.
- Eighteen events occurred within the Alternative A boundary.
- Seventeen of the 31 incidents involved an oil spill, and eight resulted in a spill to water.
- Twelve of the incidents occurred while the tanker was underway.

Figure 10 below shows the number of incidents by incident type for each year of data. 2019 had the most total incidents, with nine total incidents.

The 17 incidents that involved oil release resulted in a total of 110.44 gallons of oil released, of which 1.41 gallons reached the water (the rest being spilled to an impermeable surface, the deck of the vessel, etc.). Of the 17 incidents, five were spills of hydraulic oils, four were spills of diesel/marine gas, and two were spills of lube oil/motor oil. The remainder included one spill each of aviation gasoline, bunker oil, crude oil, gasoline, and grease. Spills from underway tankers amounted to 0.004 gallons of the oil that reached the water.

Fifteen incidents were identified as a vessel casualty. Of those, seven were loss of propulsion or electrical power events, two were collisions or near collisions, two were allisions or allision/loss of propulsion, and four documented fitness for service issues.

After reviewing the data, Ecology determined that an escort tug might have been helpful during the full or partial loss of propulsion events, which made up four of the 31 incidents. All of those incidents occurred while the vessel was underway, and all four incidents were of oil tankers over 40,000 DWT. Two incidents occurred west of the required escort area for larger tankers. Two of the incidents occurred within the boundary of existing tug escort requirements for larger tankers, so the tankers already had escort tugs. Both of these incidents occurred closer to shore

- March 27, 2018, propulsion failure of the container ship SEAMAX NORWALK (9290464) in Haro Strait. The vessel anchored to avoid grounding.

in narrower waterways, so the existing escort tugs may have helped in ensuring that the loss of propulsion incidents did not become groundings and/or oil spills.

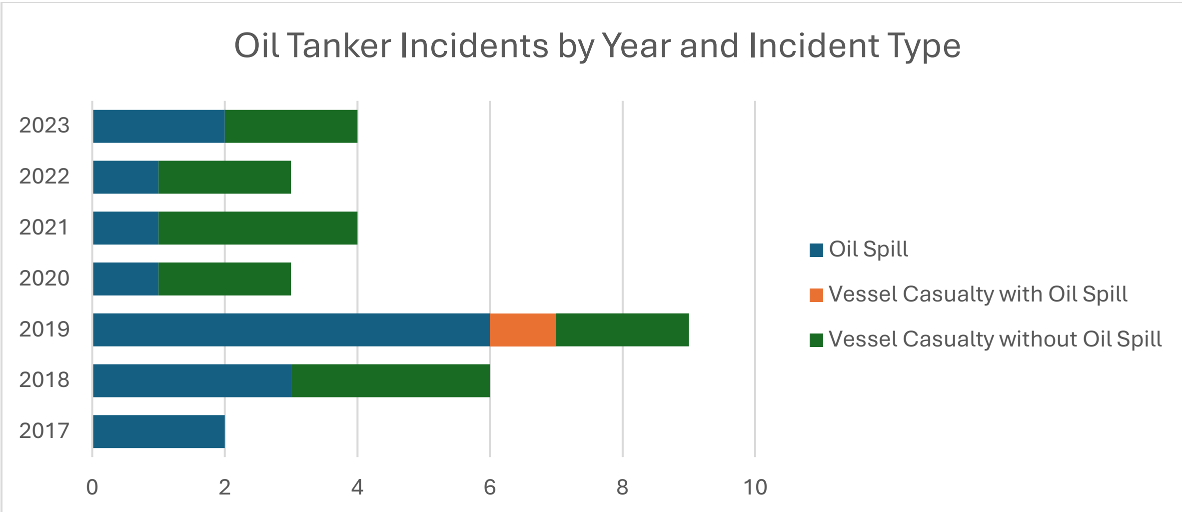

Figure 10. Oil tanker incidents (vessel casualties and oil spills) by year and type for 2017-2023

3.1.3.2 Tank Barge Incidents:

Between 2017 and 2023, there were 16 vessel casualty and oil pollution incidents involving tank barges within the EIS Study Area.

- Ten of the 16 incidents occurred after the implementation of the 2020 requirements and six incidents occurred prior to the 2020 requirements.
- Three events occurred within the Alternative A boundary.
- Fourteen of the 16 events involved an oil spill, with twelve of those incidents resulting in a spill to water.
- Four of the 16 incidents occurred while the barge was underway.

Figure 11 below shows the number of incidents by incident type for each year of data. There were no incidents within the study area in 2020.

The 14 oil spill incidents resulted in 1,085 gallons[10] of oil released, of which 20 gallons reached the water (the rest being spilled to an impermeable surface, the deck of the vessel, etc.). Of the 14 incidents, eight were of diesel/marine gas oil, three were of bunker oil, and the remaining three were hydraulic oil, oily waste, and oily water mixture. One gallon of the oil spilled to water was from barges that were actively underway.

[10] Most of the released oil (976 gallons) comes from two incidents that resulted in oil being spilled primarily to the deck of the vessels in question. One incident occurred while the vessel was fueling and was attributed to faulty welding. The other incident occurred while the vessel was underway and was attributed to procedural error (hatch left open).

Two incidents were identified as a vessel casualty. One was an allision and one was a loss of propulsion event.

After reviewing the data, Ecology determined that an escort tug might have been helpful in four of the incidents, all of which occurred while the barge was underway. For two incidents involving an oil spill, an escort tug might have helped by being able to spot a sheen earlier. One of these incidents occurred outside of the rulemaking area and the other occurred while the tank barge was underway to provide fuel at an anchorage (engaged in bunkering), so an escort tug was not present. An escort tug may also have been able to help in the case of the partial loss of propulsion and the allision. The allision was between a tank barge and a bridge and occurred outside of the proposed alternatives for this EIS. The loss of propulsion incident occurred outside of the rulemaking area, so an escort tug was not present when it occurred.

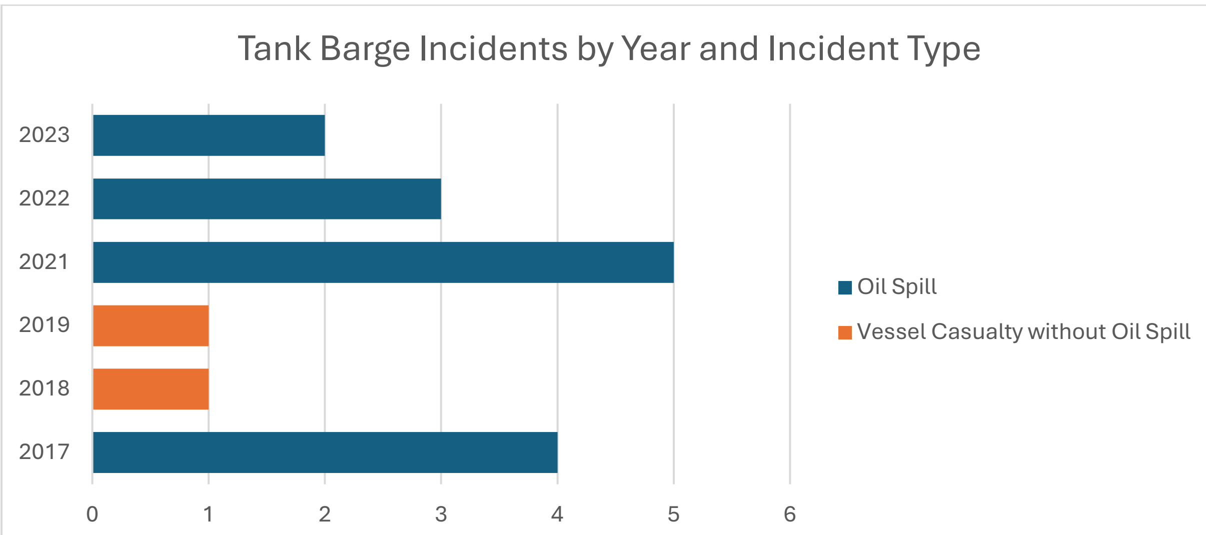

Figure 11. Tank barge incidents by year and type (vessel casualties and oil spills) for 2017-2023

3.1.3.3 ATB Incidents:

Between 2017 and 2023, there were five vessel casualty and oil pollution incidents involving ATBs within the EIS Study Area.

- Four of the five incidents occurred before the implementation of the 2020 requirements and only one occurred after the implementation of the 2020 requirements.
- Three of the incidents occurred within the Alternative A boundary.
- Two of the five events involved an oil spill, both resulting in oil reaching the water.
- One of the five incidents occurred while the ATB was underway.

Figure 12 below shows the number of incidents by incident type for each year of data.

The two incidents that included an oil release resulted in a total of 93 gallons of oil released, with 27 gallons reaching the water (the rest being spilled to an impermeable surface, the deck of the vessel, etc.). One of the incidents spilled approximately two tablespoons of diesel/marine gas oil to the water. The other incident resulted in a spill to water of 27 gallons of crude oil. None of the incidents that resulted in a spill occurred while the ATB was underway.

Three incidents were identified as a vessel casualty. One was a partial loss of propulsion, one was a grounding, and one was a grounding/flooding/safety threat event.

After reviewing the data, Ecology determined that an escort tug might have been helpful in the one loss of propulsion event. The ATB was underway when this incident occurred.

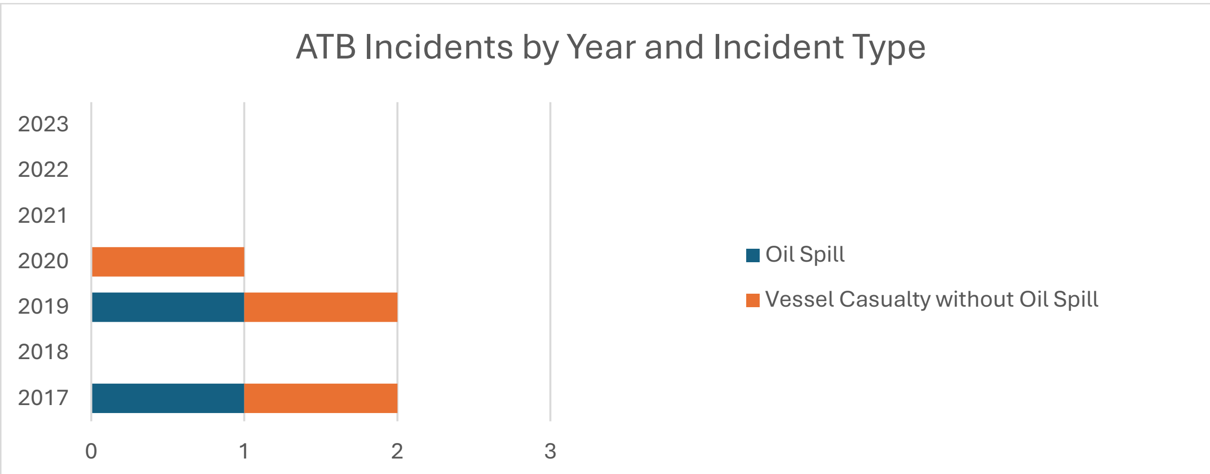

Figure 12. ATB incidents by year and type (vessel casualties and oil spills) for 2017-2023

3.1.3.4 Escort Tug Incidents:

Between 2017 and 2023, there were five incidents involving vessels identified as escort and assist tugs in the 2021 report.

- One incident was an allision and four were oil spills, three of which resulted in oil reaching the water.
- The allision and three of the oil spills occurred after the new 2020 requirements. One of the oil spills occurred prior to the new 2020 requirements.
- Three of the five incidents occurred while the tug was underway.

Given the small amount of data available of spills from escort tugs, there does not appear to be a significant pattern pre and post rule implementation.

The four oil release incidents totaled 65 gallons, five gallons of which reached the water (the other 60 was spilled onto the deck of the vessel). Two of the spills were of lube/motor oil, one of hydraulic oil, and one was identified as a sheen only. Two of the oil spill incidents occurred within the boundaries of Alternative A. Five gallons of the oil that reached the water was spilled from tugs that were actively underway.

The allision incident occurred while a tug was assisting an ATB, and the assisting tug struck the fender system of a bridge. No oil was spilled. The incident occurred outside of the boundaries of any of the alternatives.

3.1.4 Modeled Incident Frequency: Current Conditions (Conditions of Alternative A)

The current tug escort requirements for target vessels have only been in place since September 2020, so in addition to looking at recent incident data, Ecology also calculated drift grounding frequency rates (target vessels) and incident rate (escort tugs) under the conditions in Alternative A. Additional details on how these rates were calculated are provided in Section 2.0 Methodology Summary.

3.1.4.1 Assessing target vessel drift grounding probability:

This analysis focuses on target vessel drift groundings and the spills that could result from them. A drift grounding is one specific type of incident that escort tugs are well-suited to addressing. An important assumption of this analysis is that, while drift groundings are rare events, a target vessel drift grounding can produce a large spill. Target vessels carry significant amounts of oil as cargo and as fuel (see Section 3.1.7 for details on fuel types). As a result, a target vessel drift grounding is always a serious event. Target vessels may also carry a variety of oil types, which vary in their environmental impacts and cleanup challenges. Based on target vessels observed in the 2021 Synopsis of Changing Vessel Traffic Trends, target vessel fuel and cargo capacities can range significantly (BPC & Ecology, 2021). See Table 7 for details.

Table 7. Volume of oil carried as cargo on target vessels. This table includes a low option and a high option.

Target Vessel Type	Small Vessel Cargo Capacity (gallons)	Large Vessel Cargo Capacity (gallons)
Oil Tanker	4,710,930	10,867,248
ATB	1,113,000	8,139,600
Tank Barge	1,339,254	4,350,975

This analysis does not address smaller more common spills from target vessels that can occur while fueling or due to maintenance, as those are unchanged by the rulemaking. Instead, this analysis focuses on changes in drift grounding frequency. Spills from drift groundings are rare, but if one was to occur, there would be major environmental consequences. Our focus on high consequence events like this is consistent the intent of ESHB 1578 to reduce the risk of "catastrophic" spills.

Target vessel drift grounding rates are presented below using a measure of probability called a "recurrence interval." Recurrence intervals are most commonly used to describe flood magnitude and probability. For example, a "100-year flood" means that a flood of that magnitude has a 1 percent chance of occurring in any given year (U.S. Geological Survey, 2018). Recurrence intervals are not predictive of how frequently a specific event will occur or the number of years between such an event. A 100-year event can happen in year one and again in year two, or even twice within a single year. The probability of that occurring is low, but it is still possible. Recurrence intervals are useful for describing low-probability events like oil spills because they put probability into a more easily understandable format than a probability of one ten-thousandth per year.

Table 8 below summarizes the loss of propulsion (LOP), drift grounding, and oil spill from drift grounding probability for target vessels under the conditions of Alternative A, or current tug escort requirement conditions in the Salish Sea. These probability rates are provided for the five zones of the rulemaking area, and for all zones in the EIS Study Area combined. Table 8 demonstrates that under Alternative A, drift groundings in the EIS Study Area are rare, and that drift groundings resulting in a spill are rarer still, both within the rulemaking area and within the EIS Study Area as a whole. For the EIS Study Area, loss of propulsion incidents have a five-year recurrence interval or a 20 percent chance of occurring in any given year. Drift groundings have a 186-year recurrence interval and oil spills resulting from drift groundings have a 25,546-year recurrence interval in the EIS Study Area as a whole. This does not mean that drift groundings occur every 186 years, it just means that they have a one-in-186-chance of occurring in any given year.

All five zones under consideration for the rulemaking area have lower probabilities of drift grounding than in the EIS Study Area as a whole. This may be due partly to the safety measures already in place in the zones under consideration (tug escorts, special operating area designation, etc.), as well as the breadth of the waterways, currents, bathymetry, vessel traffic density, and other factors which are considered in calculating drift grounding frequency. The three zones in the rulemaking area that currently have tug escort requirements (Rosario Strait, Bellingham Channel, and Guemes and Saddlebags Island Zones) have lower probabilities of drift grounding-related incidents occurring than in the EIS Study Area as a whole. Incident probabilities in these three zones are higher than in the Strait of Georgia South Zone. This shows that other factors (vessel traffic density, narrowness of the waterways, presence of navigational hazards, currents, etc.) besides the presence of tug escort requirements also affect drift grounding frequency.

There is some interesting variation in the probability of drift-grounding-related incidents occurring among the three zones that currently require tug escorts for target vessels. Rosario Strait has the highest loss of propulsion probability, but the lowest drift grounding probability of all three zones in the rulemaking area.

Bellingham Channel, Guemes Channel and Saddlebags Zones have higher drift grounding probability compared to Rosario Strait Zone. Loss of propulsion events are approximately 2.57 times more likely to become a drift grounding event in the Bellingham Channel than they are in Rosario Strait. Loss of propulsion events are 4.76 times more likely to become drift grounding events in Guemes Channel and Saddlebags than in Rosario Strait.

Table 8. Recurrence intervals (probability) for loss of propulsion, drift grounding, and oil spill from a drift grounding under Alternative A (current tug escort requirements). Includes relevant zones for the rulemaking alternatives and the EIS Study Area (all zones)

Zone	Number of Years/Loss of Propulsion	Number of Years/Drift Grounding	Number of Years/Oil Spill from Drift Grounding
Bellingham Channel	175	8,470	1,160,289
Guemes Channel and Saddlebags	156	4,046	556,774
Rosario Strait	136	16,931	2,319,352
Strait of Georgia	53	7,180	983,572
Strait of Georgia South	1,554	49,007	6,713,249
All Zones	**5**	**186**	**25,546**

The review of historical data identified two partial or total loss of propulsion incidents in seven years from target vessels in the EIS Study Area. This is an incidence rate of 0.29, which is relatively close to the modeled loss of propulsion rate of 0.20 (5-year recurrence interval). 2017-2023 includes both low-traffic years affected by the COVID-19 pandemic and the higher-traffic year of 2019. There were no drift groundings by target vessels in the EIS Study Area during this time period and no spills resulted from drift groundings. This is consistent with the modeled data reflecting that these are rare event types.

3.1.4.2 Assessing escort tug incident rate:

This analysis is a review of the frequency of incidents encountered by escort tugs. The scope of the escort tug incident analysis is broad – it looks at reportable collisions, groundings, oil spills, equipment malfunctions, fires, and other types of incidents. Many of these incidents are low-consequence and most do not result in an oil spill. This is in contrast to the evaluation of target vessels, which focuses on a single incident type: drift groundings. Because of these differences between the escort tug incident rate metric and the target vessel drift grounding frequency metric, these metrics cannot be directly compared against each other. Escort tugs also carry significantly lower volumes of oil than target vessels, meaning that escort tugs have a lower potential spill magnitude (see Table 9). The risk presented by escort tugs and target vessels is different.

Table 9. Volume of oil carried as fuel by escort tugs. Includes a high and low-end range.

Vessel Type	Small Vessel Fuel Capacity (gallons)	Large Vessel Fuel Capacity (gallons)
Escort Tug	55,000	85,000

Escort tug incident rates are provided in Table 10 below for Alternative A. Because the escort tug incident rate is a combined rate including multiple incident types, as opposed to just one type (drift groundings) for target vessels, the numbers are slightly larger. This makes the probability easier to communicate directly as a probability/year, so recurrence intervals are not used. In order to isolate just the incident rates for just the escort tugs associated with the new 2020 requirements, simulated AIS data is used for this assessment. This analysis uses a rate of tug incidents that could result in a spill per operating minute and applies that rate to the total annual underway time for escort tugs escorting target vessels and commuting to and from escort jobs under Alternative A. For more detailed methods, see the Methods Section.

Table 10. Incident rates for escort tugs under the conditions of Alternative A (current tug escort requirements).

Incident Type	**Probability of Incident/Year**
Allisions/Collisions	0.14
Groundings	0.04
Sinking/Capsize	0.01
Other	0.67
Total Incidents	**0.86**

Overall, incidents from escort tugs engaged in escort jobs associated with the 2020 requirements have a probability of occurring of 0.86/year. Under Alternative A, allisions/collisions are the single incident type with the highest probability (0.14). Groundings are less likely to occur (with sinking/capsize less probable still. The incident type "Other" includes a variety of different incident types including but not limited to hydraulic spills, spills while transferring, abandonment, explosions, loss of stability, damage to cargo, etc.[11] Because this is a combination of several potential incident types, the combined probability of any of these incidents occurring in a single year is relatively high, with a probability of 0.67/year.

The historical data identified five escort tug incidents in the EIS Study Area in seven years. This is an incidence rate of 0.71/year. This is relatively similar to the modeled incident rate, particularly given that 1) the simulated escort tug dataset was deliberately selected to be a high estimate of possible tug traffic (see Section 2.0 of Appendix B Transportation: Vessel Traffic for more details), so the modeled rate of 0.86 is likely high, 2) the fact that historical escort tug traffic increased after the implementation of the 2020 rule and this is an average, and 3) that there is significant inter-annual variation in overall vessel traffic (see Appendix B Transportation: Vessel Traffic for more details) and the years of historical data analyzed

[11] See Table B-24 in the 2023 Summary of Tug Analysis Results for a complete list of incident types included in the "Other" category.

included low outlier years during the COVID-19 pandemic as well as the higher-traffic year of 2019.

3.1.5 Distribution of impact: trajectory models of worst case discharge spill scenarios

The historical incident data, the modeled drift grounding and escort tug incident rates summarized above show that oil spills are relatively infrequent. This is primarily due to the suite of oil spill prevention, preparedness, and response measures summarized in Section 1.5 Regulatory Framework. Although drift groundings are rare and drift groundings resulting in a spill are even more rare,[12] there have been at least two large spills from a vessel drifting aground on Washington's outer coast.[13] Oil spills that result in a large quantity of oil spilled to the water high-consequence events. When large oil spills occur, the impacts to the environment, human health, the economy, nutritional security of coastal communities, treaty rights, and more can be catastrophic. For this reason, Ecology also assessed several Worst Case Discharge (WCD) scenarios that could occur under each alternative for both target vessels and escort tugs. For the purposes of this trajectory modeling, escort tug incidents are also assumed to be worst case discharge spills.

While WCD spills are unlikely, they are the planning standard that the agency uses and appropriately capture the "high consequence" nature of a major oil spill. This is also consistent with the language of RCW 88.16.260, which specifies that the purpose of the rulemaking is to reduce the risk of a catastrophic spill from vessels carrying oil. A Worst Case Discharge incident is defined as "for a vessel, a spill of the vessel's entire cargo and fuel complicated by adverse weather conditions" (WAC 173-182-030 (73)(c)). Ecology used NOAA trajectory modeling tools to assess oil movement and shoreline oiling. See Section 2.0 Methodology Summary for additional information.

Current tug escort requirements (conditions of Alternative A) reduce oil spill risk in some areas for target vessels but maintain or increase the risks in other areas. Under current conditions (conditions of Alternative A) tug escort requirements contribute to:

1. Reduced risk of a WCD from a target vessel drift grounding where tug escorts are currently required.
2. Increased risk of a WCD from escort tugs throughout the EIS Study Area.
3. Risk of a WCD from a target vessel drift grounding in areas where tugs are not required is unaffected, but higher than the risk where tug escorts are required.

Ecology modeled eight locations where a WCD spill could occur within the rulemaking area: five from a target vessel and three from an escort tug. Each spill scenario is described in detail

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[12] See Analysis of Tug Escorts Report (Ecology, 2023b), How Drift Groundings Contribute to a Spill (p.23)

[13] Drift groundings associated with large oil spills include the 1964 drift grounding near Moclips, Washington of a towed oil barge after it broke free from its tug and the 1972 drift grounding of a navy ship just south of Cape Flattery. The navy ship broke free while under tow and drifted ashore. Neither event was the result of loss of propulsion or loss of steering.

below, along with areas of most concentrated oiling. Table 11 summarizes the spill risk by modeled spill scenario.

Table 11. Modeled WCD spill scenarios and how the risk changes for each of the four rulemaking alternatives.

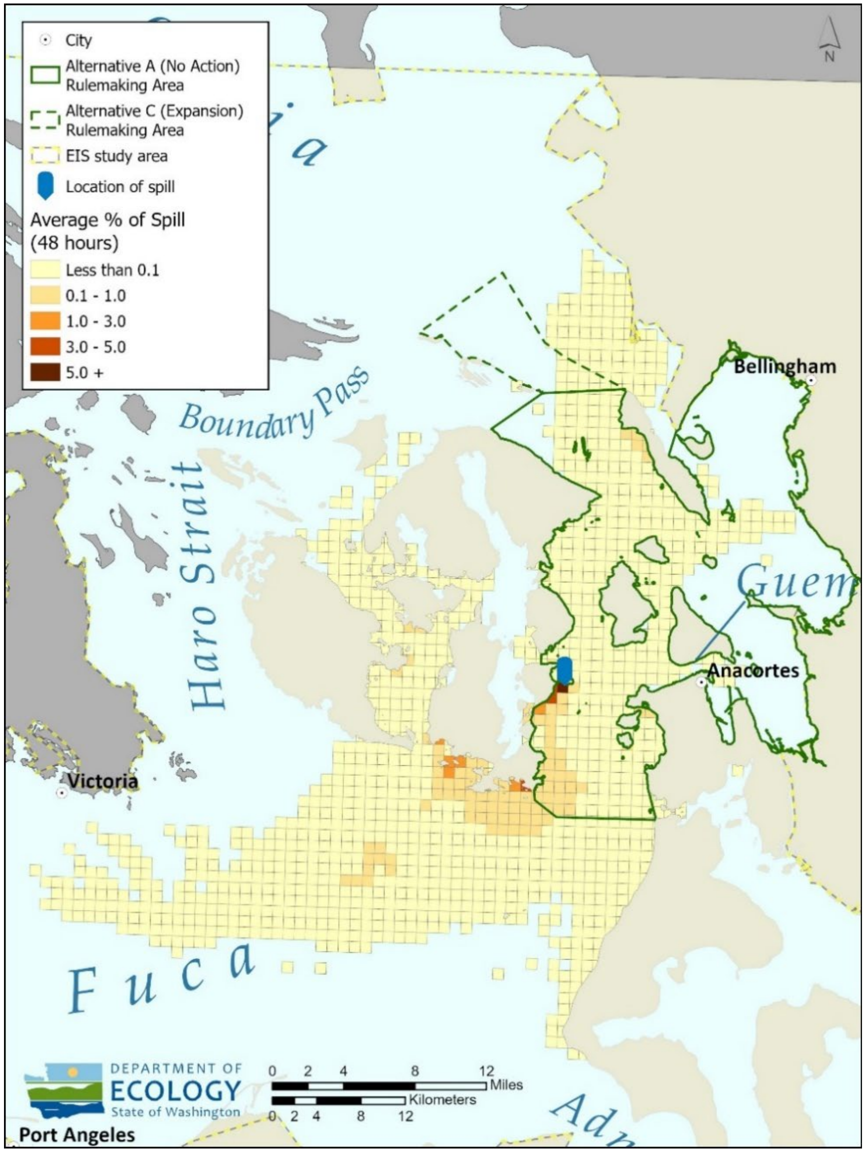
Spill Scenario	Alternative A	Alternative B	Alternative C	Alternative D
James Island (Target Vessel)	Decrease: Target vessels required to have tug escorts at this location. Risk from target vessels reduced.	No Change: No change from Alternative A. Minor but unquantified risk reduction from FORs.	No Change: No change from Alternative A. Minor but unquantified risk reduction from FORs.	Increase: Removal of tug escort requirements increases risk from target vessels.
Hat Island (Target Vessel)	Decrease: Target vessels required to have tug escorts at this location. Risk from target vessels reduced.	No Change: No change from Alternative A. Minor but unquantified risk reduction from FORs.	No Change: No change from Alternative A. Minor but unquantified risk reduction from FORs.	Increase: Removal of tug escort requirements increases risk from target vessels.
North Peapod Island (Target Vessel)	Decrease: Target vessels required to have tug escorts at this location. Risk from target vessels reduced.	No Change: No change from Alternative A. Minor but unquantified risk reduction from FORs.	No Change: No change from Alternative A. Minor but unquantified risk reduction from FORs.	Increase: Removal of tug escort requirements increases risk from target vessels.
Matia Island (Target Vessel)	No Change: Target vessels NOT required to have tug escorts at this location. Risk from target vessels unaffected and remains higher than within Alternative A boundary.	No Change: No change from Alternative A.	Decrease: Target vessels required to have tug escorts at this location. Risk from target vessels reduced from Alternative A. Minor but unquantified risk reduction from FORs.	Increase: Removal of tug escort requirements increases risk from target vessels.
Clark Island (Target Vessel)	No Change: Target vessels NOT required to have tug escorts at this location. Risk from target vessels unaffected and remains higher than within Alternative A boundary.	No Change: No change from Alternative A.	Decrease: Target vessels required to have tug escorts at this location. Risk from target vessels reduced from Alternative A. Minor but unquantified risk reduction from FORs.	Increase: Removal of tug escort requirements increases risk from target vessels.

Spill Scenario	Alternative A	Alternative B	Alternative C	Alternative D
Expansion Corridor (Escort Tug)	**No Change:** Tug escorts are not required in this area. Risk from escort tugs unaffected and lower than within Alternative A boundary.	**No Change:** No change from Alternative A.	**Increase:** Tug escorts are required in this area. Risk of spills higher than outside Alternative C boundary due to increased escort tug underway time.	**Decrease:** Removal of tug escort requirements eliminates risk from escort tugs.
Anacortes (Escort Tug)	**Increase:** Tug escorts are required in this area. Risk of spills higher than outside Alternative A boundary due to increased escort tug underway time.	**No Change:** No change from Alternative A.	**No Change:** No change from Alternative A.	**Decrease:** Removal of tug escort requirements eliminates risk from escort tugs.
Southern Entrance to Rosario Strait (Escort Tug)	**Increase:** Tug escorts are required in this area. Risk of spills higher than outside Alternative A boundary due to increased escort tug underway time.	**No Change:** No change from Alternative A.	**No Change:** No change from Alternative A.	**Decrease:** Removal of tug escort requirements eliminates risk from escort tugs.

3.1.5.1 Spill Scenario: James Island

Table 12. James Island WCD target vessel spill scenario details

Spill Scenario Details	James Island
Vessel Type	Target Vessel (barge)
Amount of Oil	3,623,004 gallons
Oil Type	Bunker fuel
Time of Year	August
Coordinates	48.50640 N, 122.77959 W
Location relative to Alternatives	Within Alternative A boundary



- **Location Selection:** James Island was selected as a spill scenario location because Ecology's modeled drift grounding data identified it as having higher potential for drift groundings than other areas in the vicinity. Additionally, Ecology identified historical incidents of towed barges grounding in this area due to issues with currents, which is why a towed barge was selected as the target vessel type.
- **Description of Trajectory:** Figure 13 shows the trajectory map for a spill of this size occurring at James Island over 48 hours. James Island is a small marine state park located east of Decatur Island in Rosario Strait. An oil spill at this location in August, could result in oil reaching all of Rosario Strait, much of the San Juan Islands, and west toward Vancouver Island. The areas with the highest concentration of oiling are likely to be James Island itself, the southeastern part of Decatur Island, and southern bays of Lopez Island (McArdle Bay, Hughes Bay, Richards Rock/Charles Island, and Davis Bay). Oil would also be concentrated around the southeastern portion of Lopez Island, on the west side of Lummi Island near Legoe Bay, Argyle on San Juan Island (Pear Point and Danger Rock), and Hein Bank south of San Juan Island.

- **Resources at Risk:** During this time of year, SRKW (NMFS, 2021) could be present in the area affected by the spill. Fall-run Chinook and steelhead runs could also be affected (NOAA Fisheries, 2022). August is also a potential spawning time for surf smelt (Essington et al., 2011), one of the three primary forage fish in the Puget Sound. The DAHP data indicates that up to 232 coastal archaeological sites could be affected by this spill trajectory.
- **Likely Impacts of Oil Type:** The product modeled in this trajectory analysis is bunker fuel, which is the most common product transferred to or from towed oil barges by volume. Bunker fuels are a Group 4 Oil. These oils experience very little evaporation or dissolution, and they weather very slowly. Oil spills of heavy fuel oils, like bunker fuel, can spread into thick slicks that may contain large amounts of oil (NOAA, 2019). A spill of Group 4 Oils would likely result in heavy contamination of intertidal areas and long-term contamination of sediments, with shoreline cleanup being limited by weathering. Impacts to furry mammals and birds would also be severe, with smothering and coating of wildlife at the water surface and in the intertidal zone. Direct mortality rates are likely to be high for seabirds, waterfowl, and furry marine mammals especially where populations are concentrated, such as haul outs or migration areas. Long-term sediment contamination is also a concern with these oil types, as is chronic toxicity from residual oil in sediments.
- **Shoreline Types and Response Considerations:** The areas likely to experience the highest concentration of oiling include James Island, the southeastern part of Decatur Island, and the southern bays of Lopez Island. These shorelines are primarily a mix of: Exposed Rocky Shores (1A), Mixed Sand and Gravel Beaches (5), Gravel Beaches (6A), Riprap (6B), Exposed Tidal Flats (7), Sheltered Impermeable Rocky Shores (8A). Sheltered impermeable rocky shorelines and exposed tidal flats are on the higher end of habitat sensitivity for oil cleanup, while exposed rocky shores are on the lower end. Gravel and mixed sand and gravel beaches as well as riprap are in the middle. Across most of these shorelines, for a spill of bunker fuel, NOAA identifies that vegetation cutting/removal, flushing (recommendations for pressure level and water temperature vary by shoreline type), steam cleaning, sandblasting, mechanical recovery, and in situ burning would have significant or worst outcomes for these habitats (NOAA, 2010a). For some shoreline types, shoreline cleaning agents (exposed rocky shores), natural recovery (sand and gravel beaches), flooding (sand and gravel beaches, riprap), sediment reworking/tilling (exposed tidal flats), and manual removal, sorbents and nutrient enrichment (sheltered impermeable rocky shores) can also have significant habitat impacts from oil cleanup.

3.1.5.2 Spill Scenario: Hat Island

Table 13. Hat Island WCD target vessel spill scenario details

Spill Scenario Details	Hat Island
Vessel Type	Target Vessel (oil tanker – small chemical)
Amount of Oil	9,728,396 gallons
Oil Type	Crude oil
Time of Year	May
Coordinates	48.52363 N, 122.55572 W
Location relative to Alternatives	Within Alternative A boundary

- **Location Selection:** Hat Island was selected as a spill scenario location because Ecology's modeled drift grounding data identified it as having higher potential for drift groundings than other areas in the vicinity. Additionally, historical AIS shows that of the three zones in Alternative A, tank ships spend the most time in this zone, many of them moving between the refineries in Anacortes and anchorages to the north, transiting near Hat Island.
- **Description of Trajectory:** Figure 14 shows the trajectory map for a spill of this size occurring at Hat Island over 48 hours. Hat Island is located southeast of Guemes Island in Padilla Bay. An oil spill at this location in May could result in oiling reaching nearly all of Rosario Strait, Guemes Channel, Fidalgo and Padilla Bays, Samish Bay and Bellingham Bays, as well as north to Cherry Point and south to the southern coast of Lopez Island. The areas with the highest concentration of oiling would likely be Hat Island itself and the smaller surrounding islands, the southern facing coast of Samish Island as well as a small portion of the northern facing

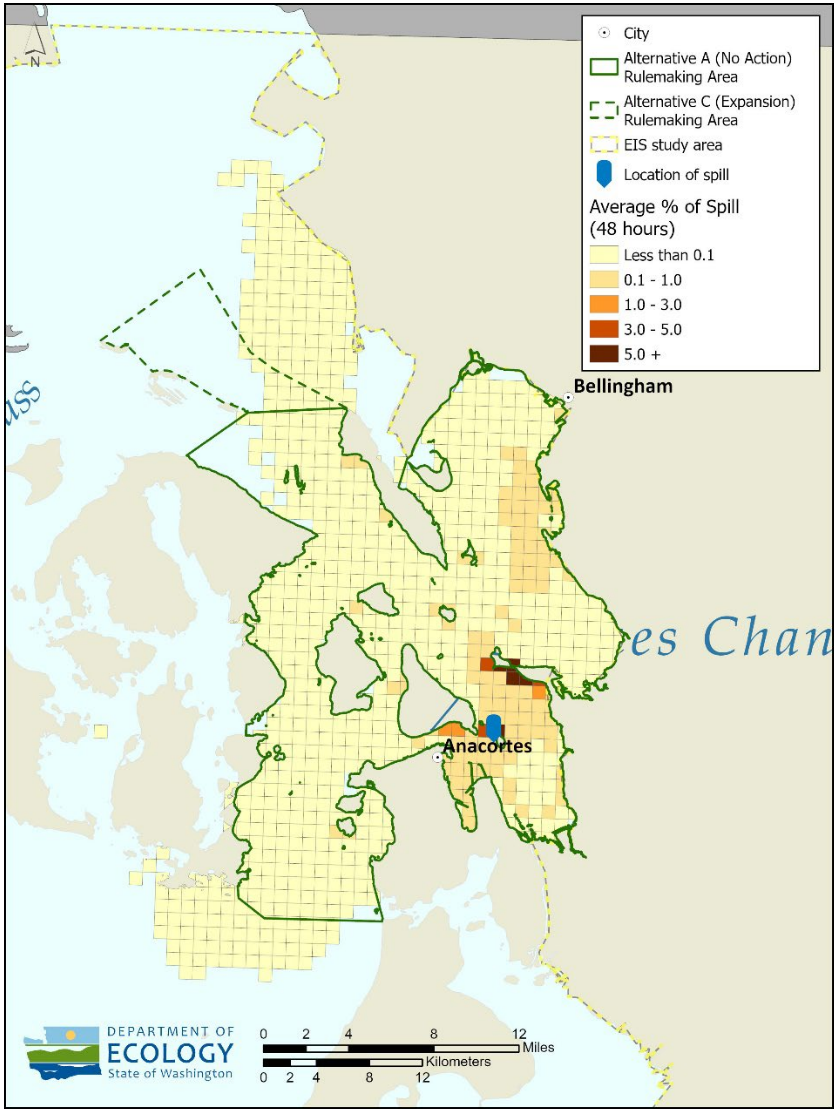


Figure 13 Hat Island WCD target vessel spill scenario compiled trajectory model results

coast, and the Deadman Bay area of Guemes Island. Oil would also be concentrated in Fidalgo Bay and Padilla Bay, Bellingham Bay near Chuckanut Island Preserve, Sinclair Island and Eliza Island-Texwech, parts of Lummi Island, and other parts of Guemes Island.

- **Resources at Risk:** During this time of year, both SRKW (NMFS, 2021) and gray whales (Sato & Wiles, 2021) could be present in the area affected by the spill. Steelhead runs could be affected (NOAA Fisheries, 2022) and both rockfish (NOAA Fisheries, 2017; WDFW, 2025b) and surf smelt spawning (Essington et al., 2011) could also be impacted by the spill. An oil spill during this time could also affect the fledging of ESA-listed Marbled Murrelets (WDFW, 2025a), a particularly vulnerable time for juvenile survival. DAHP data indicates that up to 153 coastal archaeological sites could be affected by this spill trajectory.
- **Likely Impacts of Oil Type:** The product modeled in this trajectory analysis is crude oil, which is the most common product transferred to or from tankers by volume. Crude oils can be Groups II, III, or IV in the categories described by NOAA. Most crudes are Group 3 or medium oils. When spilled, approximately one third of these oils evaporate within 24 hours. Crude oils can cause severe and long-term contamination of intertidal areas and severe impacts to furry marine mammals and birds.
- **Shoreline Types and Response Considerations:** The shorelines that are modeled to experience the highest concentration of oiling are primarily a mix of the following shoreline types: Exposed Rocky Shores (1A), Mixed Sand and Gravel Beaches (5), Gravel Beaches (6A), Exposed Tidal Flats (7), Sheltered Solid Manmade Structures (8B), Sheltered Riprap (8C), Sheltered Tidal Flats (9A). Exposed rocky shorelines are on the lower end of habitat sensitivity to oil cleanup, while sheltered environments and exposed tidal flats are higher-sensitivity shoreline types. Gravel and mixed sand and gravel beaches are in the middle. NOAA indications for cleanup methods that would have significant impacts to coastal habitats are wide-ranging (NOAA, 2010a). Impacts of a crude oil spill and appropriate cleanup methods would vary significantly based on the type of habitat affected.

3.1.5.3 Spill Scenario: North Peapod Island

Table 14. North Peapod Island WCD target vessel spill scenario details

Spill Scenario Details	North Peapod Island
Vessel Type	Target Vessel (ATB)
Amount of Oil	2,976,816 gallons
Oil Type	Gasoline
Target Vessel Type	ATB
Time of Year	March
Coordinates	48.63566 N, 122.752019 W
Location relative to Alternatives	Within Alternative A boundary

- **Location Selection:** North Peapod Island was selected as a spill scenario location because Ecology's modeled drift grounding data identified it as having higher potential for drift groundings than other areas in the vicinity. Additionally, Ecology monitors instances where vessel traffic departs from the traffic lanes while transiting Rosario Strait. While these departures may result from normal operations like avoiding traffic or debris, they can also be indicative of reduced situational awareness or other issues. The Peapod Islands are near one of the areas where ATBs and tank barges have been observed departing from the shipping lane, including while being escorted.
- **Description of Trajectory:** Figure 15shows the trajectory map for a spill of this size occurring at North Peapod Island over 48 hours. North Peapod Island is in Rosario Strait off of Orcas Island between Doe Bay and Sea Acre. An oil spill in this location in March could result in oiling reaching all of Rosario

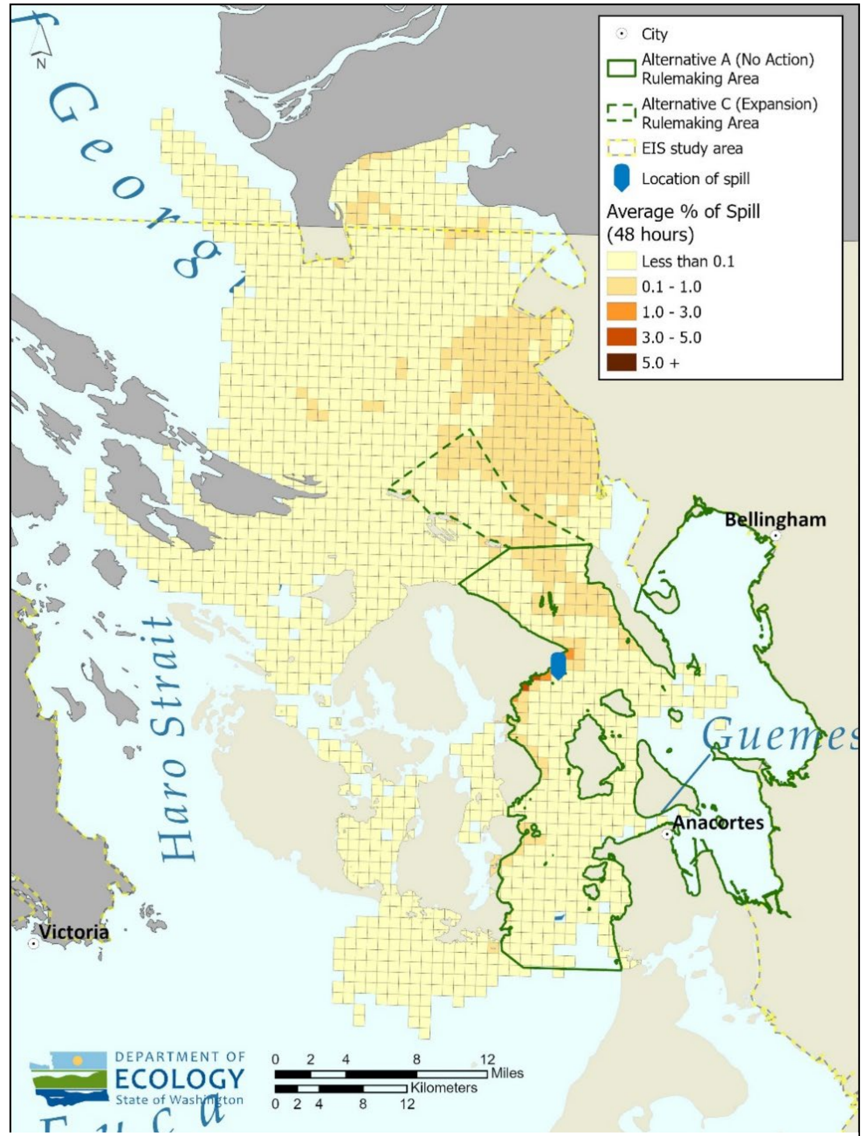


Figure 14. North Peapod Island WCD target vessel spill scenario compiled trajectory model results

Strait and north through Cherry Point, Boundary Bay, and well into the Strait of Georgia, most of the San Juan Islands, and into the Gulf Islands. The area with the highest concentration of oiling would likely be the immediately adjacent southeastern shoreline of Orcas Island that faces Rosario Strait. Other areas of higher concentrations of oil would include the shorelines of Obstruction Island, Blakely Islands, and Decatur Island which faces Rosario Strait, Clark Island, the western coast of Lummi Island, a portion of the shoreline of the Lummi Reservation and north to Birch Point.

- **Resources at Risk:** During this time of year, gray whales (Sato & Wiles, 2021) could be present and affected by a significant spill. Steelhead could also be running (NOAA Fisheries, 2022) and rockfish (NOAA Fisheries, 2017; WDFW, 2025b), herring, and surf smelt could be spawning (Essington et al., 2011) – all of which are life stages that are particularly vulnerable to the impacts of an oil spill. DAHP data indicates that up to 235 coastal archaeological sites in Washington state could be affected by this spill trajectory, with additional sites on the Canadian coastline also affected.
- **Likely Impacts of Oil Type:** The product modeled in this trajectory analysis is gasoline, which is the most common product transferred to or from ATBs by volume. Gasoline is a Group 1 Oil. Group 1 Oils are highly volatile and evaporate quickly without leaving a residue. They have high concentrations of toxic compounds and can cause severe impacts to the water column and to intertidal resources, meaning that impacts to rockfish, forage fish, and salmonids would likely to be particularly significant. These oils are also very flammable and can cause a toxic air hazard that would be harmful to communities that live, work, and/or recreate near areas where the oiling is likely to be concentrated: Orcas Island.
- **Shoreline Types and Response Considerations:** The shoreline of Orcas Island, where oil is modeled to occur in the highest concentration, is primarily a mix of the following shoreline types: Exposed Rocky Shores (1A), Coarse Grained Sand Beaches (4), Mixed Sand and Gravel Beaches (5), Gravel Beaches (6A), Sheltered Impermeable Rocky Shores (8A). Sheltered impermeable rocky shorelines are on the higher end of habitat sensitivity for oil cleanup, while exposed rocky shores are on the lower end. Gravel, mixed sand and gravel, and coarse-grained sand beaches are in the middle. For several of these shorelines, for a spill of gasoline, NOAA identifies that manual removal, mechanical removal, and sediment reworking/tilling can have significant habitat impacts associated with these cleanup methods (NOAA, 2010a). On mixed sand and gravel beaches, barriers and berms can also have significant habitat impacts in a gasoline spill.

3.1.5.4 Spill Scenario: Expansion Corridor

Table 15. Expansion corridor WCD escort tug spill scenario details

Spill Scenario Details	Expansion Corridor
Vessel Type	Escort Tug
Amount of Oil	61,000
Oil Type	Diesel
Time of Year	March
Coordinates	48.80575 N, 122.89161 W
Location relative to Alternatives	Within expansion area (Alternative C boundary)

- **Location Selection:** A spill from a tug in the expansion area was selected for two reasons. First, because under Alternative A there is very little tug traffic in this area, meaning that a WCD spill is unlikely to occur. And second, because under Alternative C, there would be a meaningful increase in tug traffic in this area to meet the new requirement.
- **Description of Trajectory:** Figure 16 shows the trajectory map for a spill of this size occurring in the expansion area over 48 hours. The Expansion Corridor spill scenario is in the shipping lane within the expansion area boundary in the Strait of Georgia South Zone. An escort tug spill in this location, while smaller in oil volume than those of the target vessel spill scenarios, would nonetheless have far reaching impacts. The area with the highest concentration of oiling would likely occur on the southern facing coast of Point Roberts. Other areas of higher concentrations of oil would include the northern facing coasts of Orcas Island, eastern coast of Waldron Island, Patos, Sucia, and Matia Islands, Boundary Bay, and parts of the

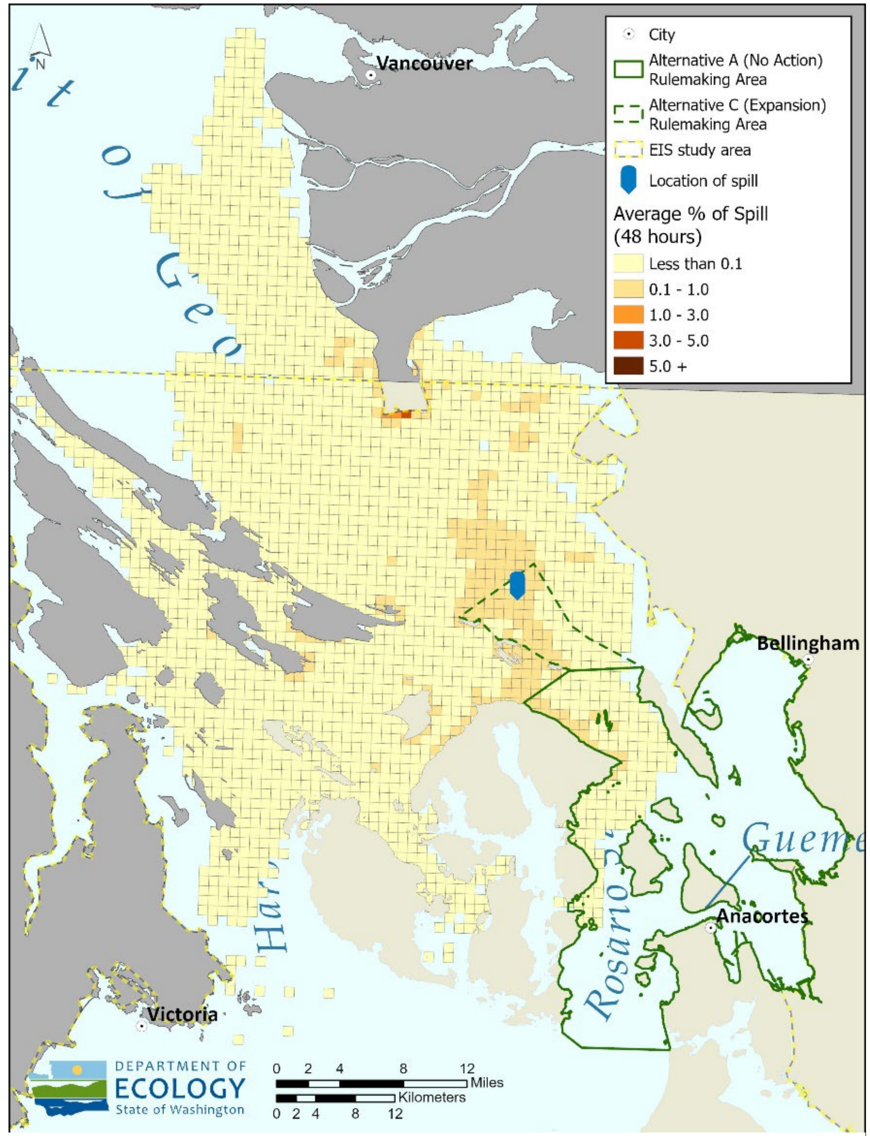


Figure 15Figure 18. Expansion corridor WCD escort tug spill scenario compiled trajectory model results

Southern Gulf Islands. Oiling could reach as far north as Burrard Inlet, as far south as Victoria, and west along the Gulf Islands to Valdes Island.

- **Resources at Risk:** During this time of year, gray whales could be present and affected by a significant spill(Sato & Wiles, 2021). Steelhead could also be running (NOAA Fisheries, 2022), and rockfish (NOAA Fisheries, 2017; WDFW, 2025b), herring, and surf smelt could be spawning (Essington et al., 2011) – all of which are life stages that are particularly vulnerable to the impacts of an oil spill. DAHP data indicate that up to 225 coastal archaeological sites in Washington state could be affected by this spill trajectory with additional sites on the Canadian coastline likely also affected.
- **Likely Impacts of Oil Type:** The product modeled in this trajectory analysis is diesel fuel, which is the most common product transferred to or from escort tugs by volume. Diesel fuel is a Group 2 Oil. These oils are moderately volatile with around one third of the spilled volume evaporating within a few days (NOAA, 2023). Diesel is an acutely toxic oil type, so fish and invertebrates that come into direct contact with it may be killed. Marine birds are primarily affected by direct contact, resulting in mortality from ingestion and hypothermia (oiled feathers). Shellfish contamination from a diesel spill can last up to several weeks after the exposure ends. Both acute and chronic impacts to sensitive nearshore and estuarine habitats (eelgrass, marshes, etc.) and shoreline communities can be significant especially at higher concentrations, causing plant and animal mortality. Diesel spreads quickly due to its low viscosity and is readily dispersed into the water column in higher-energy conditions, which can limit cleanup options. Diesel can persist in higher concentrations in protected areas and on beaches.
- **Shoreline Types and Response Considerations:** Under this trajectory analysis, the area likely to experience the highest concentrations of oiling is Point Roberts. This shoreline includes a mix of: Mixed Gravel and Sand Beaches (5), Gravel Beaches (6A), Riprap (6B), Exposed Tidal Flats (7), Sheltered Riprap (8C). All of these shoreline types are classified as medium to high habitat sensitivity for oil spill response. Across most of these shoreline types for a diesel spill, NOAA resources recommend that manual removal, mechanical removal, and vegetation cutting/removal can have significant to worst impacts to habitat (NOAA, 2010a). For some shoreline types, barriers and berms (mixed gravel and sand beaches), hot water flushing (riprap), and solidifiers and nutrient enrichment (exposed tidal flat) can also have significant negative environmental outcomes if employed as cleanup method.

3.1.5.5 Spill Scenario: Anacortes

Table 16. Anacortes WCD escort tug spill scenario details

Spill Scenario Details	Anacortes
Vessel Type	Escort Tug
Amount of Oil	61,000 gallons
Oil Type	Diesel
Time of Year	August
Coordinates	48.52385 N, 122.57568 W
Location relative to Alternatives	Within Alternative A boundary

- **Location Selection:** A spill scenario near Anacortes was selected because under Alternative A, there is a high concentration of escort tugs associated with target vessels in this area.
- **Description of Trajectory:** Figure 17 below shows the trajectory map for a spill of this size occurring near Anacortes over 48 hours. The Anacortes spill scenario is located just west of the city of Anacortes and just south of Southeast Point on Guemes Island. An escort tug spill in this location, while smaller in oil volume than those of the target vessel spill scenarios, would nonetheless have far reaching impacts. The area with the highest concentration of oiling would likely be on the southern coast of Guemes Island facing Guemes Channel as well as Saddlebag and Hat Islands, around Samish Island, and in Chuckanut Bay. Other areas of higher concentrations of oil would include Fidalgo Bay, Padilla Bay, Burrows Bay and Allan Island, the west coast of Guemes Island, Vendovi Island, Eliza Island-Texwech, and portions of Samish and Bellingham Bays.

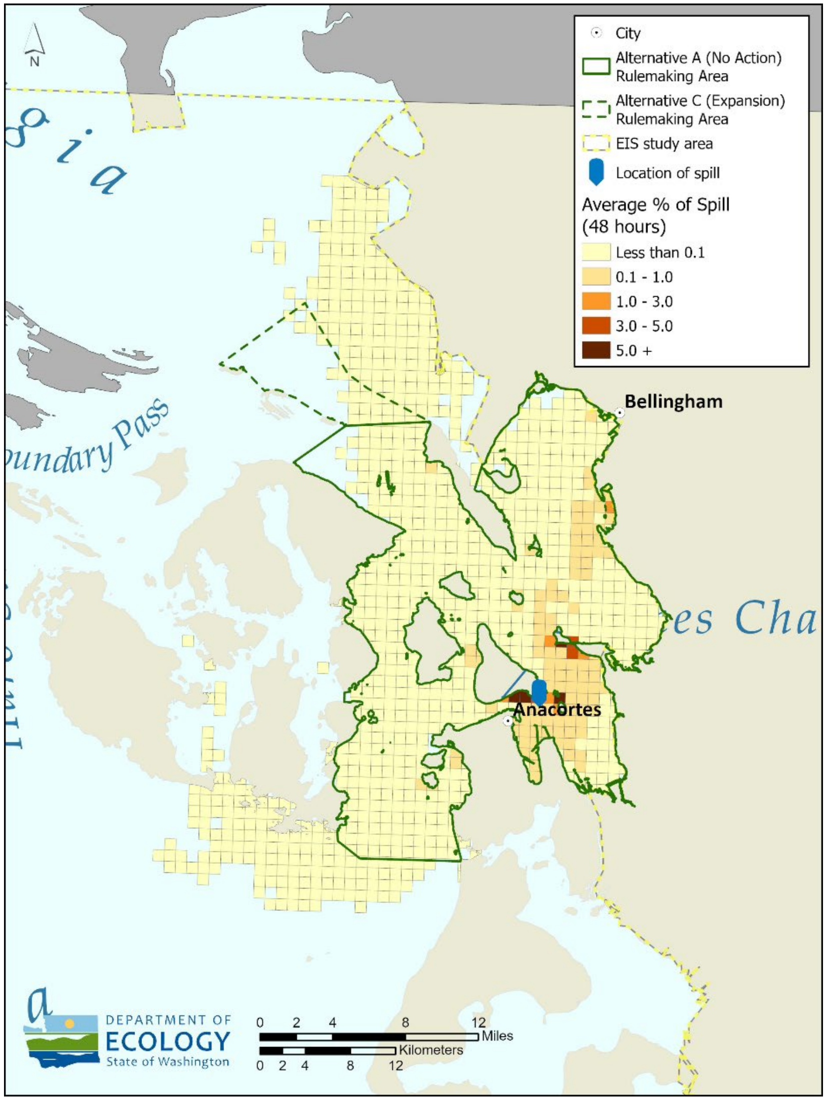


Figure 16. Anacortes WCD escort tug spill scenario compiled trajectory model results

- **Resources at Risk:** During this time of year, SRKW (NMFS, 2021) could be present in the area affected by the spill. Fall-run Chinook and steelhead runs could also be affected (NOAA Fisheries, 2022). August is also a potential spawning time for surf smelt (Essington et al., 2011), one of the three primary forage fish in the Puget Sound. The DAHP data indicate that up to 202 coastal archaeological sites in Washington state could be affected by this spill trajectory.
- **Likely Impacts of Oil Type:** The product modeled in this trajectory analysis is diesel fuel, which is the most common product transferred to or from escort tugs by volume. Diesel fuel is a Group 2 Oil. These oils are moderately volatile with around one third of the spilled volume evaporating within a few days (NOAA, 2023). Diesel is an acutely toxic oil type, so fish and invertebrates that come into direct contact with it may be killed. Marine birds are primarily affected by direct contact, resulting in mortality from ingestion and hypothermia (oiled feathers). Shellfish contamination from a diesel spill can last up to several weeks after the exposure ends. Both acute and chronic impacts to sensitive nearshore and estuarine habitats (eelgrass, marshes, etc.) and shoreline communities can be significant especially at higher concentrations, causing plant and animal mortality. Diesel spreads quickly due to its low viscosity and is readily dispersed into the water column in higher-energy conditions, which can limit cleanup options. Diesel can persist in higher concentrations in protected areas and on beaches.
- **Shoreline Types and Response Considerations:** Under this trajectory analysis, the areas likely to experience the highest concentrations of oiling include the southern coast of Guemes Island, Saddlebag Island, Hat Island, areas around Samish Island, and Chuckanut Bay. These shorelines include a mix of: Mixed Sand and Gravel Beaches (5), Gravel Beaches (6A), Exposed Rocky Shores (1A), Sheltered Impermeable Rocky Shores (8A) and Manmade Structures (8B), Coarse Grained Sand Beaches (4), Exposed Tidal Flats (7). Exposed rocky shorelines and coarse-grained sand beaches are on the lower end of habitat sensitivity, while sheltered impermeable shores and structures and exposed tidal flats are on the higher end of the sensitivity range. Gravel and mixed sand and gravel beaches are medium-sensitivity habitats for shoreline response. Across most of these shoreline types for a diesel spill, NOAA recommends that manual removal, mechanical removal, and vegetation cutting/removal can have significant or the most habitat impacts (NOAA, 2010a). For some shoreline types, nutrient enrichment (exposed tidal flats), barriers/berms (mixed sand and gravel beaches), and solidifiers (sheltered rocky shores) can also have significant habitat impacts.

3.1.5.6 Spill Scenario: Southern Entrance to Rosario Strait

Table 17. Southern entrance to Rosario Strait point WCD escort tug spill scenario details

Spill Scenario Details	Southern Entrance to Rosario Strait
Vessel Type	Escort Tug
Amount of Oil	96,600 gallons
Oil Type	Diesel
Time of Year	May
Coordinates	48.42989 N, 122.74586 W
Location relative to Alternatives	Within Alternative A boundary

- **Location Selection:** A spill scenario near the southern boundary of the rulemaking area was selected because under the conditions of Alternative A, there is a high concentration of escort tugs associated with target vessels in this area. It is also located in an area that the Swinomish Tribe identified as of particular concern for oil pollution (Swinomish Indian Tribal Community representative to H. Kennard, personal communication September 23, 2024). There is also a history of incidents occurring at navigational hazards in this area, for example the 2011 grounding of a non-tank barge at Belle Rocks or the 2013 dragging of a navigational aid at Black Rock. This is also where tugs wait to meet and/or drop their escorted vessel. It is also near the Port Angeles Precautionary Area, which has been identified as high risk for vessel traffic in previous studies (U.S. Coast Guard, 2017a).

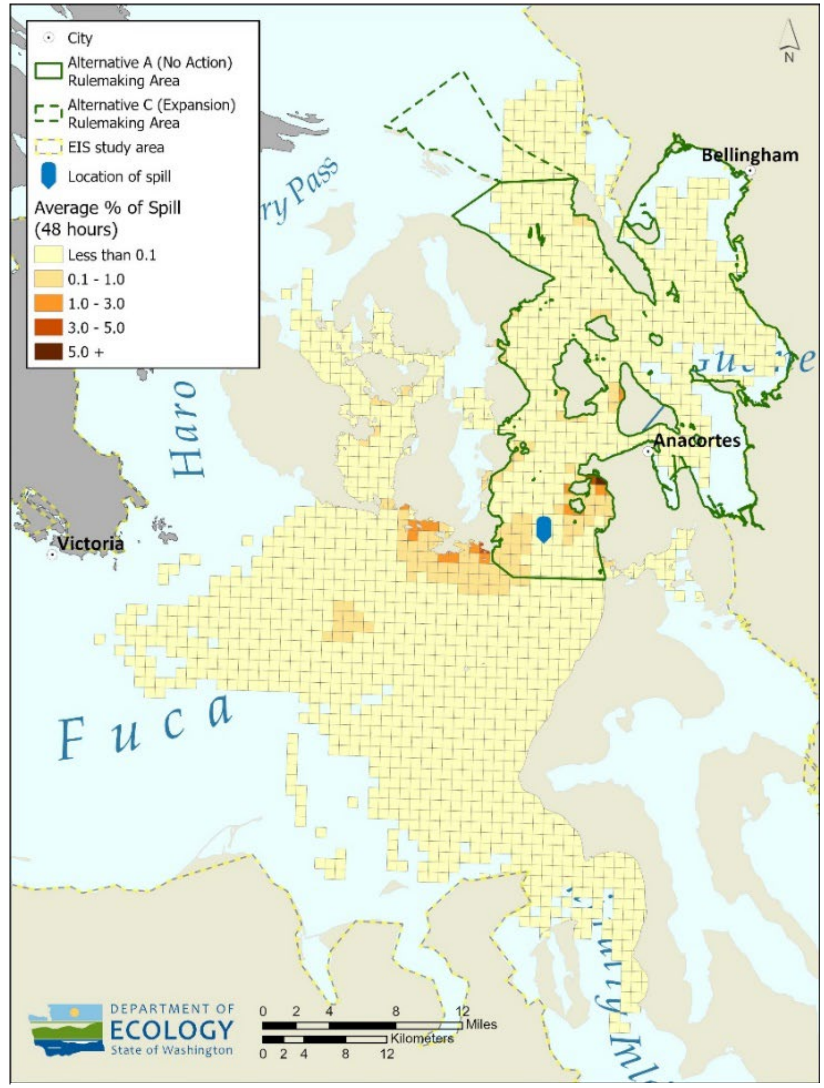


Figure 17. Southern entrance to Rosario Strait point WCD escort tug spill scenario compiled trajectory model results

- **Description of Trajectory:** Figure 18 shows the trajectory map for a spill of this size occurring near the Southern Entrance to Rosario Strait over 48 hours. The Southern Entrance to Rosario Strait spill scenario is in the middle of Rosario Strait, just north of the southern boundary of the rulemaking area. An escort tug spill in this location, while smaller in oil volume than those of the target vessel spill scenarios, would nonetheless have far-reaching impacts. This spill could reach north through Rosario Strait, into much of Bellingham and Samish Bays, through a portion of the San Juan Islands, south to Admiralty Inlet and southwest towards Vancouver Island. The areas with the highest concentration of oiling would likely be in the southern-facing bays of Lopez Island, and Burrows Bay including Burrows and Allan Islands. The areas immediately offshore of these two locations would also experience higher levels of oiling, as would parts of Guemes, Cypress, and Sinclair Islands and Legoe Bay on Lummi Island. Some bays near Argyle on San Juan Island, as well as southern-facing bays on Shaw Island could also experience higher levels of oiling, as would Hein Bank south of San Juan Island.
- **Resources at Risk:** During this time of year, SRKW (NMFS, 2021) and grey whales (Sato & Wiles, 2021) could be present in the area affected by the spill. May is also a time when steelhead could be running (NOAA Fisheries, 2022), as well as spawning season for rockfish (NOAA Fisheries, 2017; WDFW, 2025b) and herring (Essington et al., 2011), making them particularly vulnerable to a spill. Marbled Murrelets could also be fledging (WDFW, 2025a), which is a particularly vulnerable life stage. The DAHP data indicate that up to 295 coastal archaeological sites in Washington state could be affected by this spill trajectory.
- **Likely Impacts of Oil Type:** The product modeled in this trajectory analysis is diesel fuel, which is the most common product transferred to or from escort tugs by volume. Diesel fuel is a Group 2 Oil. These oils are moderately volatile, with around one third of the spilled volume evaporating within a few days (NOAA, 2023). Diesel is an acutely toxic oil type, so fish and invertebrates that come into direct contact with it may be killed. Marine birds are primarily affected by direct contact, resulting in mortality from ingestion and hypothermia (oiled feathers). Shellfish contamination from a diesel spill can last up to several weeks after the exposure ends. Both acute and chronic impacts to sensitive nearshore and estuarine habitats (eelgrass, marshes, etc.) and shoreline communities can be significant, especially at higher concentrations, causing plant and animal mortality. Diesel spreads quickly due to its low viscosity and is readily dispersed into the water column in higher-energy conditions, which can limit cleanup options. Diesel can persist in higher concentrations in protected areas and on beaches.
- **Shoreline Types and Response Considerations:** Under this trajectory analysis, the areas likely to experience the highest concentrations of oiling include portions of Lopez Island and the beaches southwest of Anacortes in Burrows Bay. These shorelines include a mix of: Exposed Rocky Shorelines (1A), Exposed Wave-Cut Platforms (2A), Gravel Beaches (6A), Mixed Sand and Gravel Beaches (5), Sheltered Impermeable Rocky Shores (8A). Exposed rocky shorelines and exposed wave cut platforms are on the lower end of habitat sensitivity, while sheltered impermeable rocky shores are on the higher end of the sensitivity range. Gravel beaches and mixed sand and gravel beaches are medium-sensitivity habitats for shoreline response. Across most

of these shoreline types for a diesel spill, NOAA recommends that manual removal, mechanical removal, and vegetation cutting/removal can have significant or the most habitat impacts (NOAA, 2010a). For some shoreline types, in situ burning (exposed wave cut platforms), hot water flushing (exposed wave cut platforms), barriers/berms (mixed sand and gravel beaches), and solidifiers (sheltered rocky shores) can also have significant habitat impacts.

3.1.5.7 Spill Scenario: Matia Island

Table 18. Matia Island WCD target vessel spill scenario details

Spill Scenario Details	Matia Island
Vessel Type	Towed barge
Amount of Oil	3,519,600 gallons
Oil Type	Bunker fuel
Time of Year	August
Coordinates	48.74918 N, 122.83387 W
Location relative to Alternatives	Within expansion area (Alternative C boundary)

- **Location Selection:** A drift grounding spill scenario at Matia Island was selected because Ecology's model data identified it as having higher potential for drift groundings than other areas in the vicinity. Additionally, there is a history of incidents in this area, most notably the 1994 grounding of a tank barge at Clements Reef (just north of this location) which resulted in a spill of 27,000 gallons. Under Alternative A, target vessels are not required to have an escort tug in this area. Under Alternative C, they would be required to, so this location also provides a good comparison between the alternatives.
- **Description of Trajectory:** Figure 19 below shows the trajectory map for a spill of this size occurring at Matia Island over 48 hours. The Matia Island spill scenario has an origin point on the north side of Matia Island. A spill in this location could affect most of the Southern Gulf Islands, parts of Victoria, the San Juan Islands, Lummi Island, and the coast north of Neptune Beach. The areas with the highest concentration of oiling would likely occur on Matia, Sucia, and Patos Islands, as well as the

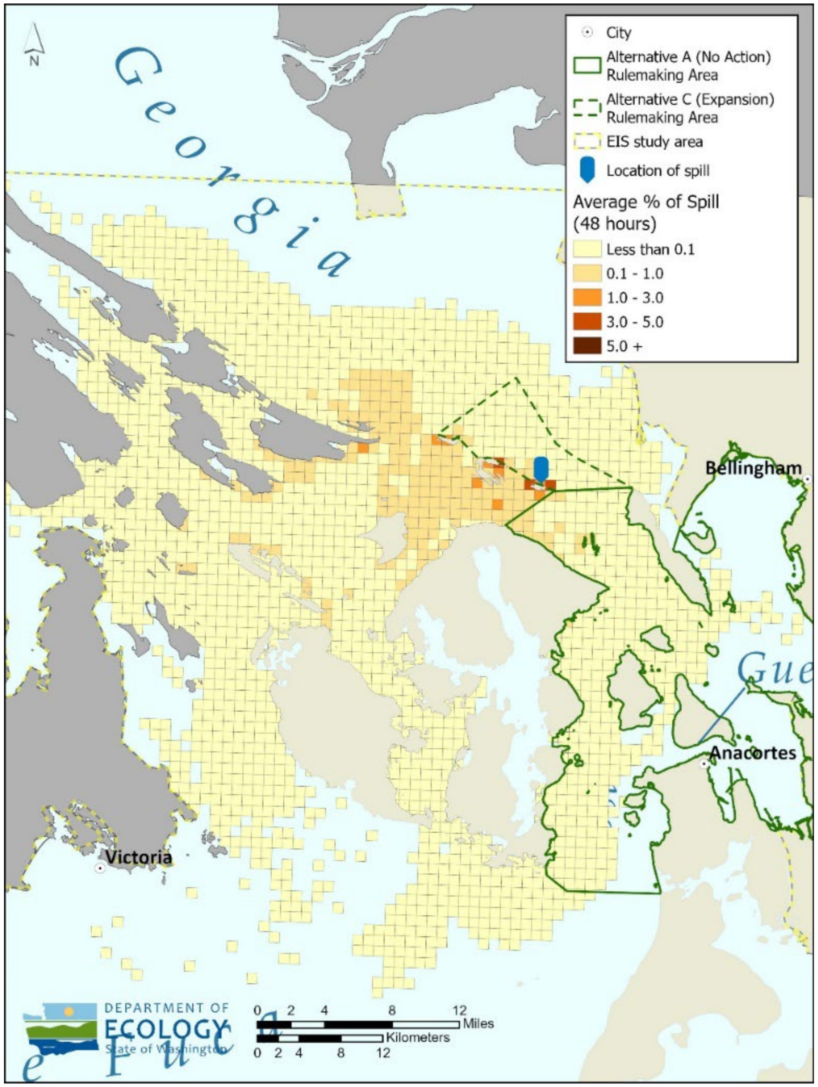


Figure 18. Matia Island WCD target vessel spill scenario compiled trajectory model results

southern-facing coast of Saturna Island near East Point Light. Other areas of higher concentrations of oil would likely include the northern coast of Orcas Island, Waldron Island, Clark Island, south and western-facing shores of Saturna Island, Tumbo Island, areas of North and South Pender Islands, Moresby Island, Gooch Island, Stuart Island, Satellite Island, Johns Island and Speiden Island.

- **Resources at Risk:** During this time of year, SRKW (NMFS, 2021) could be present in the area affected by the spill. Fall-run Chinook and steelhead runs (NOAA Fisheries, 2022) could also be affected. August is also a potential spawning time for surf smelt (Essington et al., 2011), one of three primary forage fish in the Puget Sound. DAHP data indicate that up to 296 coastal archaeological sites in Washington state could be affected by this spill trajectory, with additional sites on the Canadian coastline also affected.
- **Likely Impacts of Oil Type:** The product modeled in this trajectory analysis is bunker fuel, which is the most common product transferred to or from towed oil barges by volume. Bunker fuels are a Group 4 Oil. These oils experience very little evaporation or dissolution, and they weather very slowly. A spill of Group 4 Oils would likely result in heavy contamination of inter-tidal areas and long-term contamination of sediments, with shoreline cleanup being limited under all conditions. Impacts to furry mammals and birds would also be severe.
- **Shoreline Types and Response Considerations:** The areas likely to experience the highest concentration of oiling include Matia, Sucia, and Patos Islands as well as a small portion of Saturna Island. These shorelines are primarily a mix of: Sheltered impermeable rocky shores (8A), Exposed rocky shores (1A), Wave cut platforms (2A), Mixed sand and gravel beaches (5), Coarse grained sand beaches (4). Exposed rocky shores and wave cut platforms are on the lower end of the habitat sensitivity ranking, while mixed sand and gravel beaches and coarse-grained sand beaches fall in the middle. Sheltered impermeable rocky shores are one of the higher-sensitivity shoreline types for response.

3.1.5.8 Spill Scenario: Clark Island

Table 19. Clark Island WCD target vessel spill scenario details

Spill Scenario Details	Clark Island
Vessel Type	ATB
Amount of Oil	8,089,125 gallons
Oil Type	Gasoline
Time of Year	May
Coordinates	48.70305 N, 122.76029 W
Location relative to Alternatives	Within Alternative A boundary

- **Location Selection:** A drift grounding spill scenario at Clark Island was selected because Ecology's model data identified it as having higher potential for drift groundings than other areas in the vicinity. Although it is located within the boundary of current tug escort requirements, due to current patterns, a loss of propulsion occurring in the Expansion Area (no tug escort under Alternative A) could result in a drift grounding at Clark Island. There is also a history of incidents in this area, most notably a near miss grounding of a tank barge at Clark Island.
- **Description of Trajectory:** Figure 20below shows the trajectory map for a spill of this size occurring at Clark Island over 48 hours. The Clark Island spill scenario has an origin point on the western facing shore of Clark Island. A spill in this location could reach all of Rosario Strait, the eastern San Juan Islands, Bellingham and Samish Bays, and waters and shorelines north to around the US-Canadian border. The areas with the highest concentration of oiling would likely occur on the western facing

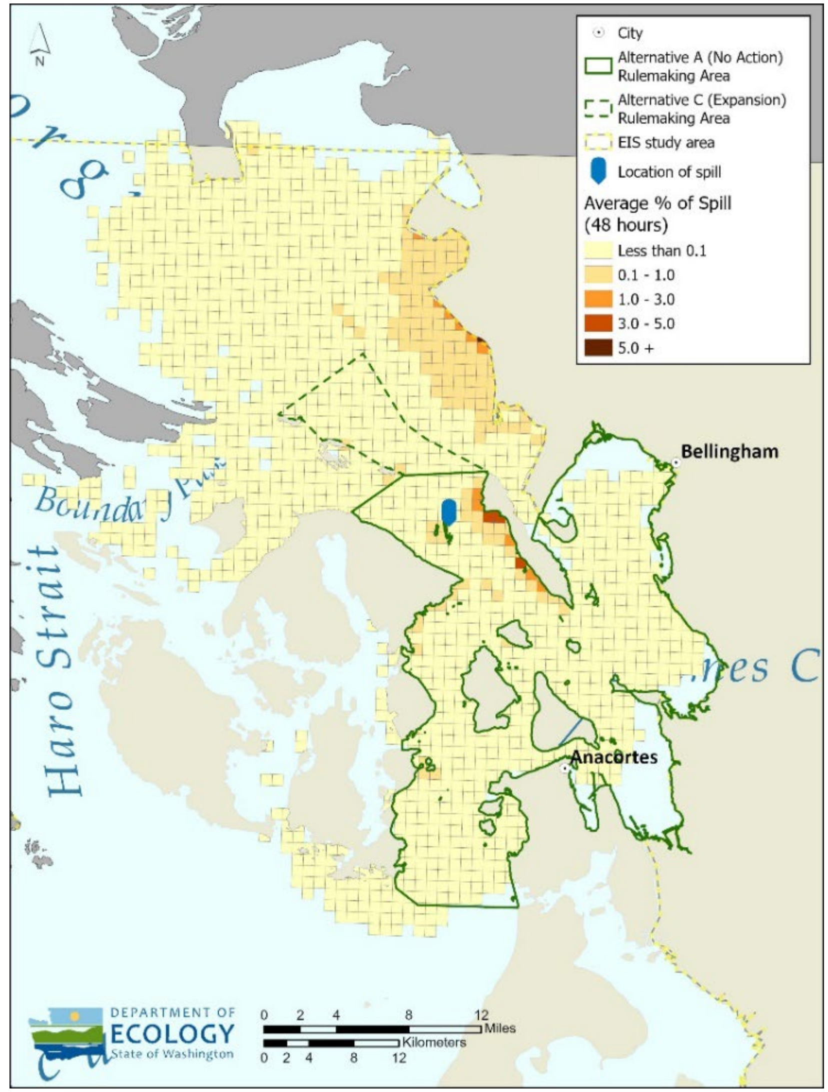


Figure 19. Clark Island WCD target vessel spill scenario compiled trajectory model results

shore of Lummi Island, the coastline near Cherry Point, and Birch Point. Other areas of higher concentrations of oil would likely include Clark Island itself, the coast of Orcas Island facing Rosario Strait, Matia and Sucia Islands, James Island, and the coastline between Lummi Bay and Semiahmoo

- **Resources at Risk:** During this time of year, both SRKW (NMFS, 2021) and gray whales (Sato & Wiles, 2021) could be present in the area affected by the spill. Steelhead runs could be affected (NOAA Fisheries, 2022) and both rockfish (NOAA Fisheries, 2017; WDFW, 2025b) and surf smelt spawning (Essington et al., 2011) could also be impacted by the spill. An oil spill during this time could also affect the fledging of ESA-listed Marbled Murrelets (WDFW, 2025a), a particularly vulnerable time for juvenile survival. The DAHP data indicate that up to 217 coastal archaeological sites in Washington State could be affected by this spill trajectory with additional sites on the Canadian coastline also affected.
- **Likely Impacts of Oil Type:** The product modeled in this trajectory analysis is gasoline, which is the most common product transferred to or from ATBs by volume. Gasoline is a Group 1 Oil. Group 1 Oils are highly volatile and evaporate quickly without leaving a residue. They have high concentrations of toxic compounds and can cause severe impacts to the water column and to intertidal resources, meaning that impacts to rockfish, forage fish, and salmonids would likely to be particularly significant. These oils are also very flammable and can cause a toxic air hazard that would be harmful to communities that live, work, and/or recreate near areas where the oiling is likely to be concentrated: Lummi Island, the coastline near Cherry Point, and Birch Point.
- **Shoreline Types and Response Considerations:** These shorelines are primarily a mix of mixed sand and gravel beaches and exposed tidal flats. Gravel and sand beaches are a medium-sensitive shoreline type for spill response. For cleanup of Group 1 Oils from mixed sand and gravel beaches, NOAA identifies significant adverse habitat impacts occurring from the use of barriers and berms, with the most adverse habitat impact occurring from manual and mechanical removal and sediment reworking or tilling (NOAA, 2010a). For exposed tidal flats, NOAA recommends limiting the use of heavy machinery, performing cleanup at low tide, and using currents and waves for natural removal of oil from the shoreline. None of the recommended cleanup approaches for gasoline would result in a significant or most adverse habitat impact. Because gasoline evaporates so quickly, realistic cleanup options are likely to be limited.

3.1.6 Oil Spills and Archaeological Resources

Tribes have lived on and used the shorelines of present-day Washington state and British Columbia since time immemorial. The border that exists today is a comparatively recent invention. Coast Salish peoples, a cultural group of indigenous peoples who speak or have historically spoken Coast Salish dialects exist on both sides of the modern border as they have for thousands of years (Burke Museum, 2025). There is archaeological evidence of their and other groups' presence dating back many millennia. This region, including the rulemaking area, is rich in cultural resources, and its significance to Indigenous Nations continues today. A major oil spill reaching the shoreline anywhere in this region will likely have archaeological and cultural resource considerations.

Oil can contaminate and damage archaeological and cultural resources and historic properties (Region 10 RRT & NWACs, 2024). The oil type, weathering, spill type, and location all affect impacts to cultural resources. These resources are often made of porous materials (bone, shell, ceramic, glass, wood, etc.) (Striegel, 2010), meaning they are particularly vulnerable to the impact of oil spills (Jariwala, 2024). There is very little research on how to remove crude oil from archaeological materials (Jariwala, 2024).

Oil spills and the cleanup activities that follow them can impact archaeological resources. Specific impacts may include contamination and toxicity affecting storage options, staining, disfiguration, bio-growth, deterioration, and physical damage from cleanup activities (Striegel, 2010). Oil contamination can also prevent carbon dating, complicate or prevent restoration and preservation (Region 10 RRT & NWACs, 2024), and prevent further study of those resources (Striegel, 2010).

Geographic Response Plans (GRPs) are developed preemptively as part of the oil spill planning process. Along with other resources, GRPs identify areas that have archaeological, cultural, and/or historic significance that could be adversely impacted by an oil spill (Region 10 RRT & NWACs, 2024). All of the GRPs for the rulemaking area reference the presence of archaeological, cultural, and/or historic resources at risk in a spill.

To protect archaeological resources in the event of a spill, the NWAC Plan outlines procedures for compliance with the National Historic Preservation Act (NHPA), including notifying the State Historic Preservation Office (SHPO) and relevant Tribal Historic Preservation Offices (THPOs). A Historic Properties Specialist position would be activated to develop measures to protect historic properties and cultural resources. A detailed list of their duties is available in the NWAC Plan. (NWAC Plan Sec. 9403). NWAC Plan adopts *Programmatic Agreement on Protection of Historic Properties During Emergency Response Under the National Oil and Hazardous Substance Pollution Contingency Plan (PA).* The PA is an agreement between federal agencies to ensure that historic properties are accounted for during oil spills nationwide. Specific measures for inadvertent discovery are also included in the NWAC Plan.

3.1.6.1 DAHP Data

For this analysis, Ecology coordinated with the Department of Archaeology and Historic Preservation (DAHP). Ecology provided trajectory models for eight worst-case spill scenarios in the rulemaking area to DAHP. The DAHP cross-referenced the geographic extent of the trajectory models with their internal database of known sites. The DAHP's database only includes data on areas or archaeological sites that have been formally surveyed or identified. Additional sites may exist in uninvestigated areas and would not be included in the database. The DAHP shared information about the number and type of potentially affected archaeological resources with Ecology for this EIS.

The overwhelming conclusion from this analysis is that the rulemaking area contains many archaeological sites that could be at risk during a spill. The spill scenarios affected between 143 and 288 coastal archaeological resources depending on the spill origin location.

The DAHP database covers Washington state only. However, several spill trajectories cross over into Canadian waters and shorelines, affecting the western Gulf Islands and the area around the mouth of the Fraser River near Vancouver. Due to the presence of Coast Salish peoples on both sides the modern U.S.-Canadian border in this area, we assume that a similar distribution of site concentration and type would be present on the Canadian side of the border. The Gulf Island and Fraser River areas that could be affected by a spill are also areas with significant archaeological resources and continued cultural significance.

The DAHP's analysis identified numerous coastal archaeological sites potentially affected by the provided spill scenarios. The majority of the previously identified sites are precontact sites (prior to European arrival), with a few historic sites and a small number of submerged sites. The primary risk from this rulemaking on these sites is the potential for an oil spill and associated cleanup activities. Table 20 below summarizes the DAHP findings by spill scenario. The sites include intersected archaeological sites that are either eligible for listing on a state or federal historic register or where a determination has not been made. Under Washington state law, all pre-contact period sites, and all register eligible historical period sites are protected on both public and private property (Chapter 27.44 RCW and Chapter 27.53 RCW).

Table 20. A summary of archaeological sites potentially affected by each spill scenario.

Spill Trajectory Model	Number of Sites Affected
Southern Rendezvous	295
North Peapod Island	235
Matia Island	296
James Island	232
Hat Island	153
Expansion Corridor	225
Clark Island	217
Anacortes	202

3.1.7 Existing oil spill response options and limitations

When an oil spill happens, the damage it causes to the environment is related to the habitat and shoreline type, the presence of wildlife, plants, and animals, the amount and type of oil spilled, and weather and ocean conditions (NOAA, 2025). Choosing a response method or set of methods is dependent on the specific conditions of the oil spill and always involves tradeoffs (NOAA, 2010b). Spill response and cleanup never remove 100 percent of the spilled oil (NOAA, 2025) and typical recovery rates can be much lower, depending on the specific conditions of the incident.

It is difficult to estimate how much oil can be recovered from any given spill. It depends on what type of oil is spilled (gasoline, diesel, crude, etc.), where it is spilled, how it behaves after being spilled, how quickly it evaporates, and how much time has elapsed since the spill occurred, among other factors. For spills of over 25 gallons to water, Ecology has recovery targets of 15 percent for gasoline, 20 percent for diesel, and 25 percent for other oils. However, our goal is always to recover as much oil as possible.

The individual Discipline Reports discuss the specific impacts of oil pollution on resource types. This section covers response options and their limitations, both physical and regulatory in the EIS Study Area. It also covers specific response considerations by oil type and shoreline type, as well as a summary of the presence of those oil types and shoreline types in the EIS Study Area.

While oil spills can be devastating to the environment, there is a network of measures in place to prevent them. A robust suite of regulatory structures and processes are in place to minimize the risks of oil spills from commercial vessels. Since the early 1990s, significant changes have occurred in maritime safety to improve oil spill prevention, preparedness, and response. The safety of commercial vessels, and oil transportation specifically, has improved as newer vessels enter service that incorporates additional safety and stability requirements, and industry groups have improved how vessels are operated and managed. Existing safety measures are discussed in detail in Section 1.5, Regulatory Context.

3.1.7.1 Common Response Options: Application and Limitations

All spill response options have limitations as well as environmental trade-offs to consider. Responders assess several feasibility considerations, including but not limited to:

- Nature and amount of oil
- Proximity to the shoreline and to natural, cultural, and economic resources, as well as shoreline type
- Timing of the response action
- Environmental conditions that may affect the response (wind, tides, etc.) as well as the presence of vulnerable species and habitats
- Authorization to use the response method

The NOAA Office of Response and Restoration's Characteristics of Response Strategies (NOAA, 2010b) provides additional detail on the considerations for response method decision-making. Geographic Response Plans (Ecology, 2025a; Region 10 RRT & NWACs, 2024) for each region of Washington state shorelines provide a detailed outline of environmental conditions, resources at risk, response contacts, and prioritized spill response details for specific geographic locations. Local GRPs would be the first reference in any response for location-specific information. Site-specific Geographic Response Plans for the entire EIS Study Area exist and are regularly tested by contingency plan holders and response contractors (Ecology, 2025a). This section provides a brief overview of response options, their effectiveness, and whether and where they are authorized for use within the EIS study area.

Mechanical cleanup and recovery of oil is the initial and primary response tool for spill response in the region (see Sec. 4600 of the NWAC Plan) (Region 10 RRT & NWACs, 2024). A primary response option is the use of boom to contain, deflect, divert, and exclude spilled oil to minimize damage and facilitate cleanup. Boom is stationed at 413 locations throughout Washington state (*Worldwide Response Resource List*, 2025). This includes multiple types of boom, and over 60,000 sections of boom of various lengths. Placing and maintaining boom should not cause excessive physical impacts to the environment (NOAA, 2010b), although vehicle and foot traffic could disturb wildlife and/or coastal cultural resources. Cultural resources may also be at risk if new anchor points need to be placed, as this is a ground-disturbing activity. While boom can be used in all water environments, its effectiveness is limited by current speed (0.7 kts), wave height, tides, and weather conditions (International Tanker Owners Pollution Federation, 2014b).

Skimmers and vacuums may also be used to recover floating oil from the surface of the water (skimming) or on the shoreline (vacuums) (NOAA, 2010b). There are 151 pieces of response equipment categorized as skimmer equipment in Washington state and 103 pieces of response equipment listed as vacuums (*Worldwide Response Resource List*, 2025).

Skimming is most effective when enough floating oil is accumulated. Once the oil begins to spread or fragment, the effectiveness of skimming decreases (International Tanker Owners Pollution Federation, 2014c). In general, skimmers operate most effectively in calm waters and recovery rates are also dependent on specific skimmer design (International Tanker Owners Pollution Federation, 2014c).

Recovery rates for vacuums vary based on the type and amount of oil and equipment design, and operations may be limited by access and shoreline type. Damage to shoreline natural resources (wetlands, etc.) and cultural resources from the use of vacuums is possible and should be considered. Section 4410 of the NWAC Plan specifically calls out vacuum trucks as an example of response equipment that could damage cultural resources (Region 10 RRT & NWACs, 2024). Section 4313 states that all spill response activities, including mechanical cleanup or even construction of staging areas, can "physically disturb or destroy artifacts and sites" (Region 10 RRT & NWACs, 2024). The GRPs for the entire EIS study area identify accessible locations for vacuum and other heavy equipment deployment (Ecology, 2025a). The environmental impact of skimming is very low, but the captured oil must be recycled or disposed of. Pump capacity and storage of recovered oil can be a limiting factor (International Tanker Owners Pollution Federation, 2014c).

Oil can also be recovered from shorelines by a variety of other mechanical approaches (International Tanker Owners Pollution Federation, 2014a; NOAA, 2010b). For all mechanical approaches, damage to environmental and cultural resources should be considered thoroughly. Many approaches involve significant ground disturbance, heavy machinery, and/or aggressive cleaning techniques, which can cause acute and long-term damage to sensitive habitats (e.g. marshes) and coastal cultural resources. All approaches require consideration of storage, cleaning, and/or disposal of oiled materials and equipment.

Chemical dispersants can be deployed over some types of oil spills by plane or vessel to disperse or break up oil into the water column where it can be further diluted, biodegraded, or weathered (NOAA, 2010b). As a response option, dispersants are rarely used in the United States – only 27 times in over 40 years (Helton, 2021), and none since 2010 (where they were used extensively during Deepwater Horizon). Chemical dispersants have never been used in the Pacific Northwest.

Where permitted in the EIS Study Area, the use of chemical dispersants is only authorized on a case-by-case basis (Region 10 RRT & NWACs, 2024). Water south of a line between Admiralty Head and Point Wilson Lighthouse that are greater than 60 feet in depth is a No Dispersant Use Zone. The dispersant COREXIT EC9500A is stocked in Everett, Moses Lake, and at Pier 90 in Seattle, WA, with additional spray systems also located in Neah Bay, WA, on the response vessel OSRV Cape Flattery (*Worldwide Response Resource List*, 2025).

Dispersants can be used effectively on light oils and medium to heavy-weight crude oils, if applied quickly (NWAC, 2019), but they decrease in effectiveness as the oil weathers (Committee on the Evaluation of the Use of Chemical Dispersants in Oil Spill Response et al., 2020; Farahani & Zheng, 2022). They can also be used under sea state and weather conditions that would exclude the use of mechanical recovery options. Dispersants can reduce impacts to shorelines and to animals that come to the ocean surface to rest, feed, or breathe. However, they significantly increase the temporary exposure of upper water column concentrations of oil (NWAC, 2019) and increase the aerosolization of oil at the air-sea interface, an increased inhalation exposure risk (Committee on the Evaluation of the Use of Chemical Dispersants in Oil Spill Response et al., 2020; NWAC, 2019).

Surface washing agents are another chemical approach to response. They are applied to substrates and hard surfaces to improve the efficiency of oil removal (NOAA, 2010b). The NWACP definition of surface washing agents explicitly excludes the use of lift and disperse type formulas. The use of surface washing agents in the EIS Study Area requires prior approval from the RRT.

In situ burning is a method of removing oil from the surface of the water by burning it in place. It can only be conducted on oil collected on the surface of the water at a minimum of 1-2mm (NOAA, 2010b). In situ burning is extremely rare in the marine environment and has never been used in Washington state. The Region 10 Regional Response Team in situ burn policy requires

RRT approval for the use of in situ burning as a response method outside of Pre-Authorization zones (Region 10 RRT & NWACs, 2024). In situ burning is pre-authorized in areas that are more than 3 miles from human population (defined as 100 people per square mile), all other areas are on a case-by-case zone and require RRT approval (Region 10 RRT & NWACs, 2024). See Sec. 4617 of the NWAC Plan for more details on the approval process and health and safety requirements, including air monitoring.

Significant operational, environmental, and public health concerns are associated with the use of in situ burning as a response method. All nearby biological resources would be impacted and burn residue has been shown to physically disrupt sensitive habitats. Significant air quality and public health impacts would occur. The burn residue would sink and the toxicological impacts of this to the water column and benthic environment are not well researched (NOAA, 2010b). In situ burning can remove large amounts of oil from the surface of the water, exceeding 90 percent removal rates under prime conditions (NOAA, 2010b). In situ burning can be used on heavy oils, but emulsification makes them less effective once water content reaches 25 percent (NOAA, 2010b). Sea state, weather, and large waves can limit the effectiveness of a burn, including by extinguishing the fire altogether.

3.1.7.2 Response Considerations by Oil Type and Shoreline Type

Response Considerations by Oil Type: 33 CFR 155 categorizes oil into five main groups. NOAA's Office of Response and Restoration, the federal science lead for oil spill response, describes their characteristics as (NOAA, 2024):

- **Group 1: Non-Persistent Light Oils (Gasoline, Condensate):** These oils are highly volatile, evaporate quickly without leaving a residue, and have high concentrations of toxic (soluble compounds). When spilled, they can cause severe impacts to the water column and intertidal resources. Cleanup can be dangerous because these oils are highly flammable and cause a toxic air hazard. Gasoline accounts for nearly 47 percent of all oil transferred by ATBs in Washington state.
- **Group 2: Persistent Light Oils (Diesel, No.2 Fuel Oil, Light Crudes):** These oils are moderately volatile with only about one third of the spill volume evaporating within a few days. They contain moderate concentration of toxic (soluble) compounds and will oil intertidal resources with long-term contamination potential. Cleanup can be very effective. Diesel is the second most common type of oil transferred by tank barges (26 percent by volume) and ATBs (31 percent by volume) in Washington state. It also accounts for over 99 percent of the oil transferred by escort tugs.
- **Group 3: Medium Oils (Most Crudes, IFO 180):** When spilled, approximately one third of these oils will evaporate within 24 hours. Spills of Group 3 oils can cause severe and long-term contamination of inter-tidal areas, as well as severe to furry mammals and birds. Crude oil accounts for over 60 percent of all oil transferred by tankers in Washington state.
- **Group 4: Heavy Oils (Heavy Crude Oils, No.6 Fuel Oil, Bunker C):** These oils experience little to no evaporation or dissolution and weather very slowly. In a spill, they would cause heavy contamination of intertidal areas and possible long-term contamination of

sediments. Impacts to furry mammals and birds from coating and ingestion would be severe. Shoreline cleanup is difficult under all conditions. Crude oil accounts for over 60 percent of all oil transferred by tankers in Washington state. Bunker fuels are the most common type of oil transferred by tank barges by volume (approximately 31 percent).

- **Group 5: Sinking Oils (Slurry Oils, Residual Oils):** These oils will sink in water with no evaporation or dissolution when submerged. This can cause severe impacts to organisms in bottom sediments. On shorelines, they are similar to Group 4 oils. Dredging is an option for removing sinking oils from benthic environments.

Response Considerations by Shoreline Type: The type of shoreline is an important consideration for selecting an appropriate response strategy. It also provides information to responders and decision-makers how the spilled oil is likely to behave once it reaches the shoreline. NOAA's Environmental Sensitivity Ranking gives shoreline classifications based on their sensitivity to damage by oiling, with higher ranked numbers more likely to experience damage (NOAA, 2010a). Table 21 provides a summary of the shoreline types in the study area by their sensitivity ranking. Table 21 also summarizes response considerations and response options with significant adverse and most adverse habitat impacts by response method and oil category, while Figure 21 shows their ranking by total number of shoreline miles in the U.S. side of the Study Area (NOAA, 2022).

Table 21. Environmental sensitivity ranking for shorelines in the EIS Study Area, includes response considerations outlined by NOAA.

ESI Rank	Shoreline Type	Miles in Study Area (U.S. Only)	Regions of the Study Area	Response Considerations (National Oceanic and Atmospheric Administration, 2010b))
1A	Exposed rocky shores	132	Alternatives Boundaries (Primarily) Commute Area	• Cleanup is usually not required as most oil is held offshore by waves reflecting off steep surfaces. • Access can be difficult and dangerous • Significant Adverse Habitat Impacts: vegetation cutting/removal, hot water flushing both low and high pressure, shoreline cleaning agents (Oil Types III, IV, V) • Most Adverse Habitat Impact: steam cleaning (Oil Types III, IV), sand blasting (Oil Types III, IV, V)
1B	Exposed, solid man-made structures	7.48	Alternatives Boundaries (Minimal), Commute Area	• Cleanup usually not required • High pressure water spraying may be conducted to remove risks of contamination or improve aesthetics • Significant Adverse Habitat Impacts: hot water flushing both low and high pressure (Oil Types III, IV, V) • Most Adverse Habitat Impact: steam cleaning, sand blasting (Oil Types III, IV, V)
2A	Exposed wave-cut platforms in bedrock, mud, or clay	63	Alternatives Boundaries (Primarily), Commute Area	• Cleanup usually not required • Where high-tide area is accessible, manually remove heavy oil accumulation and oiled debris • Significant Adverse Habitat Impacts: vegetation cutting/removal, hot water flushing both low and high pressure, shoreline cleaning agents (Oil Types III, IV, V), solidifiers (Oil Types II, III) • Most Adverse Habitat Impact: steam cleaning, sand blasting (Oil Types III, IV, V), hot water flushing both high and low pressure (Oil Type II), In situ burning (Oil Types II, III, IV).
3A	Fine to medium grained sand beaches	0.9	Alternatives Boundaries, Commute Area	Listed in the Manual as "Sandy Beaches" • Among the easiest shoreline types to clean. • Cleanup should concentrate on removing oil and oily debris from upper swash zone. • Manual cleanup is advised to minimize volume of sand removed and requiring disposal.
3B	Scarps and steep slopes in sand	0.56	Alternatives Boundaries (Minimal), Commute Area	

<table>
<tr><th>ESI Rank</th><th>Shoreline Type</th><th>Miles in Study Area (U.S. Only)</th><th>Regions of the Study Area</th><th>Response Considerations (National Oceanic and Atmospheric Administration, 2010b))</th></tr>
<tr><td>4</td><td>Coarse-grained sand beaches</td><td>56</td><td>Alternatives Boundaries, Commute Area</td><td>• Prevent vehicular and foot traffic from mixing oil deeper into the sediments.
• Mechanical reworking of lightly oiled sediments can be effective along exposed beaches.
• Significant Adverse Habitat Impacts: Natural recovery (Oil Types IV and V), Vegetation cutting/removal (Oil Types II, II, IV, V), Flooding, low-pressure ambient water flushing (Oil Type V), Low-pressure hot water flooding, shoreline cleaning agents, in situ burning (Oil Types III, IV, V)
• Most Adverse Habitat Impact: Manual removal, mechanical oil removal, Sediment reworking/tilling (Oil Type I)</td></tr>
<tr><td>5</td><td>Mixed sand and gravel beaches</td><td>721</td><td>Alternatives Boundaries, Commute Area</td><td>• Remove heavy accumulations of pooled oil from upper beach face.
• All oiled debris should be removed, limit sediment removal.
• Low-pressure flushing can be used to float oil away from sediments for recovery. Avoid high-pressure spraying.
• Mechanical reworking of oiled sediments can be effective in areas regularly exposed to wave activity.
• In place tilling may be used to reach deeply buried oil layers in the mid-tide zone.
• Significant Adverse Habitat Impacts: Natural recovery (Oil Types IV, V), barriers/berms (Oil Types I, II, III), manual removal, mechanical oil removal (Oil Type II), Vegetation cutting/removal (oil types II, III, IV, V), flooding (Oil Types IV, V), High-pressure ambient water flushing (Oil Type III), Low-pressure hot water flushing, shoreline cleaning agents, in situ burning (Oil Types III, IV, V)
• Most Adverse Habitat Impact: Manual removal, mechanical removal, sediment reworking/tilling (Oil Type I), High pressure ambient water flushing (oil types IV, V), High pressure hot water flushing, steam cleaning (Oil Types III, IV, V)</td></tr>
<tr><td>6A</td><td>Gravel beaches</td><td>92.35</td><td>Alternatives Boundaries (Primarily), Commute Area</td><td rowspan="2">Gravel Beaches:
• Heavy accumulations of pooled oil should be removed quickly from the upper beach, remove all oiled debris
• Limit sediment removal as much as possible
• Low to high pressure flushing can be effective if all released oil is recovered (skimmers, sorbents)</td></tr>
<tr><td>6B</td><td>Gravel beaches and riprap</td><td>114</td><td>Alternatives Boundaries</td></tr>
</table>

ESI Rank	Shoreline Type	Miles in Study Area (U.S. Only)	Regions of the Study Area	Response Considerations (National Oceanic and Atmospheric Administration, 2010b))
			(Minimal), Commute Area	• Mechanical reworking of oiled sediments can be effective in some areas. • In-place tilling may be used to reach deeply buried oil layers along the mid-tide zone. • Significant Adverse Habitat Impacts: Manual removal (Oil Type II), Mechanical removal, high pressure hot water flushing, in situ burning (Oil Types III, IV, V), Vegetation cutting/removal (Oil Types III, IV), Low pressure hot water flushing (Oil Type III) • Most Adverse Habitat Impact: Manual removal, sediment reworking/tilling (Oil Type I), mechanical oil removal (Oil Types I, II), vegetation cutting/removal (oil type II), Steam cleaning (Oil types III, IV, V) Rip Rap: • High pressure spraying or water flooding may be effective when oil is fresh and liquid and liberated oil is recovered. • Heavy and weathered oils are more difficult to remove (manual scraping, high-pressure hot water flushing) • Removal of oiled debris from deep cervices difficult. • Significant Adverse Habitat Impacts: Mechanical removal (Oil Types III, IV, V), vegetation cutting/removal (Oil Types II, III), flooding, low pressure ambient water flushing (Oil Types IV, V), low pressure and high-pressure hot water flushing (Oil Types II, III, IV, V) • Most Adverse Habitat Impact: steam cleaning, sand blasting (Oil Types III, IV, V), in situ burning (Oil Types III, IV)
7	Exposed tidal flats	374	Alternatives Boundaries, Commute Area	• Currents and waves can be effective in natural removal of the oil • Cleanup can only be done during low tide • Limit use of heavy machinery to prevent oil mixing into sediment • Manual removal methods preferred • Significant Adverse Habitat Impacts: manual removal (Oil Type II), mechanical removal, sediment reworking/tilling (Oil Types III, IV, V), low-pressure ambient water flushing (Oil Types IV, V), solidifiers, nutrient enrichment (Oil Types II, III) • Most Adverse Habitat Impact: mechanical removal (Oil Type II), vegetation cutting/removal (Oil Types II, III, IV, V)

ESI Rank	Shoreline Type	Miles in Study Area (U.S. Only)	Regions of the Study Area	Response Considerations (National Oceanic and Atmospheric Administration, 2010b))
8A	Sheltered scarps in bedrock, mud, or clay	32	Alternatives Boundaries (Primarily), Commute Area	• Low pressure flushing at ambient temperatures is most effective when oil is fresh and liquid • Take extreme care with flushing operations in the upper intertidal zone to prevent oily effluents from impacting lower tidal levels. • D not cut oiled attached algae – use sorbents to recover oil as it is remobilized by tidal action. • Where high=water area is accessible, manually remove heavy accumulations and oiled debris. • Avoid heavy equipment and even foot traffic which could disrupt sediments and mix oil deeper. • Significant Adverse Habitat Impacts: Manual removal (Oil Types II, IV, V) sorbents, nutrient enrichment (Oil Types IV, V), vacuum, flooding, low- and high-pressure ambient water flushing (Oil Type V), solidifiers (Oil Types II, III), in situ burning (Oil Types III, IV, V). • Most Adverse Habitat Impacts: Vegetation cutting/removal, high- and low-pressure hot water flushing, steam cleaning, sand blasting (Oil Types III, IV, V),
8B	Sheltered, solid man-made structures	110	Alternatives Boundaries, Commute Area	• Seawalls cleaned for aesthetic reasons or to prevent leaching of oil. • Low to high pressure spraying at ambient water temperatures is most effective on fresh oil. • Significant Adverse Habitat Impacts: low- and high-pressure ambient water flushing (Oil Types IV, V), low- and high-pressure hot water flushing (Oil Types III, IV, V) • Most Adverse Habitat Impacts: Steam cleaning, sand blasting (Oil Types III, IV, V)
8C	Sheltered riprap	117	Alternatives Boundaries, Commute Area	Not included in Characteristic Coastal Habitats
9A	Sheltered tidal flats	169	Alternatives Boundaries, Commute Area	• High-priority areas for protection as cleanup options are limited • Cleanup of flat surface is very difficult because of soft substrate – many methods restricted • Low-pressure flushing, vacuum, and deployment of sorbents from shallow draft boats may be attempted. • Significant Adverse Habitat Impacts: Barriers/berms (Oil Types II, III, IV, V), manual removal (Oil Types III, IV), vacuum (Oil Type II),

ESI Rank	Shoreline Type	Miles in Study Area (U.S. Only)	Regions of the Study Area	Response Considerations (National Oceanic and Atmospheric Administration, 2010b))
				flooding (Oil Type V), Low pressure ambient water flushing, solidifiers (Oil Types II, III) • Most Adverse Habitat Impacts: Mechanical removal (Oil Type II), vegetation cutting/removal (Oil Types III, IV, V), low pressure ambient water flushing (Oil Types IV, V)
9B	Vegetated low banks	128	Alternatives Boundaries (Minimal), Commute Area	Not included in Characteristic Coastal Habitats
10A	Salt and brackish-water marshes	281	Alternatives Boundaries, Commute Area	• Under light oiling, the best practice is natural recovery, natural removal process and rates should be evaluated before conducting cleanup • Heavily pooled oil can be removed by vacuum, sorbents or low-pressure flushing (take care to prevent transporting oil to other sensitive areas) • Avoid damaging vegetation with cleanup activities • Avoid mixing oil deeper into sediments. Minimize trampling of plants and disturbance of soft sediments. • Aggressive cleanup methods should only be considered when other resources (migratory birds, endangered species) are at greater risk from oiled vegetation left in place. • Significant Adverse Habitat Impacts: Manual removal, vegetation cutting/removal (Oil Types III, IV, V), solidifiers (Oil Types II, III), in situ burning (Oil Type V) • Most Adverse Habitat Impacts: Manual removal, vegetation cutting/removal (Oil Types I, II), mechanical removal, sediment reworking/tilling (All Oil Types)
10C	Swamps	0.15	Commute Area	Not included in Characteristic Coastal Habitats

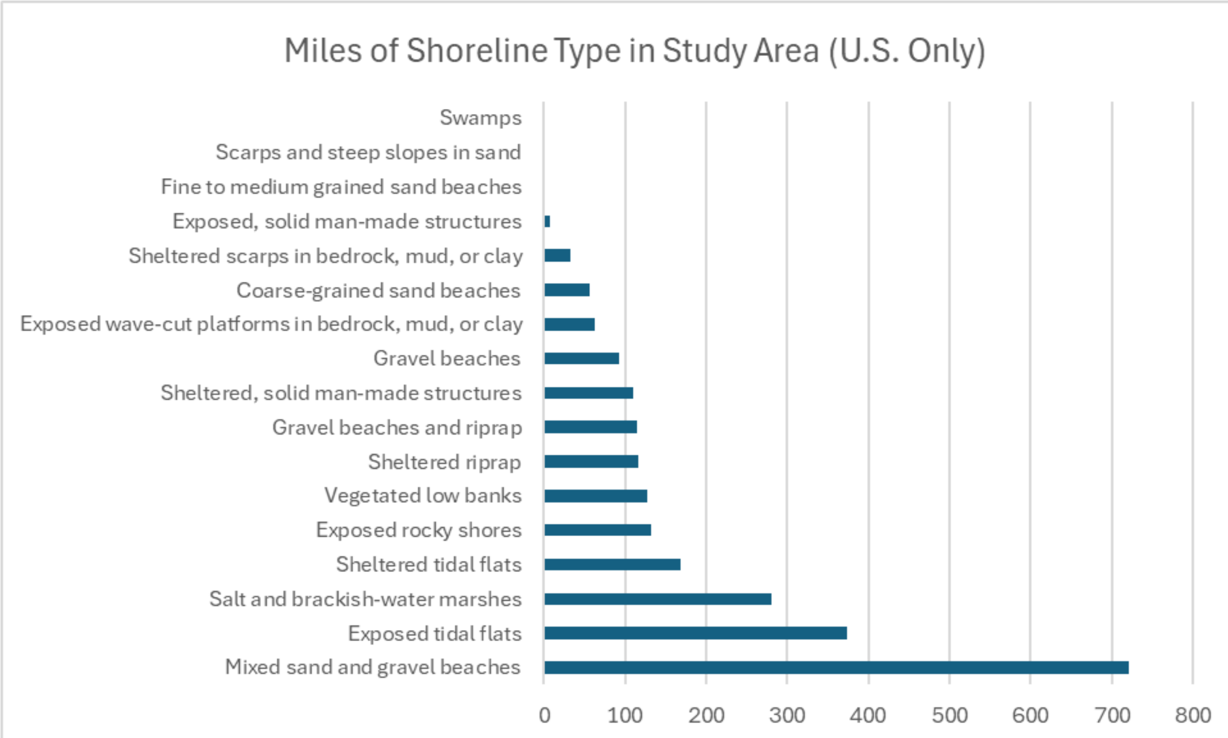


Figure 20. Miles of shoreline types within the EIS Study Area (includes only the U.S. side as NOAA only has shoreline typing data for U.S. shorelines) (NOAA, 2022)

3.2 Alternative A: No Action

3.2.1 Impacts from Implementation

Alternative A represents the most likely future conditions if we make no changes to existing tug escort requirements for target vessels. Tug escort requirements for target vessels would remain in place in the current rulemaking area as established by RCW 88.16.190(2)(a)(ii).

Drift grounding events, the type of incident that escort tugs are best suited to preventing, occur very infrequently in the study area. Drift grounding events resulting in a spill are even more rare. For target vessels, this assessment relies on applying simulated drift grounding rates to target vessel underway time. We use historical AIS underway time from 2023 to estimate target vessel underway time since the conditions of Alternative A were in place in 2023. Alternative A includes tug escort requirements for target vessels in the Bellingham Channel, Guemes Channel and Saddlebags, and Rosario Strait Zones. Alternative C includes the Strait of Georgia South and a corner of the Strait of Georgia Zones, so target vessel incident data is also included for those zones to facilitate comparison.

3.2.1.1 Target Vessels: Probability of Drift Groundings under Alternative A

Modeled Probability of Target Vessel Drift Groundings: Table 22 shows recurrence interval estimates for target vessels for three types of events for Alternative A: loss of propulsion (LOP), drift groundings, and oil spills from drift groundings. Results are presented by zone, as well as for the entire EIS Study Area (all zones). Table 22 also includes a drift grounding rate, which is how frequently loss of propulsion incidents result in a drift grounding. Oil spills from drift groundings are rare in United States and Canadian waters. Because the sample size in that data is relatively small and there are multiple factors unique to each incident that influence whether a vessel spills oil, we focus on the drift grounding rate and drift grounding frequency for the discussion of significant impacts.

Table 22 shows that the probability of loss of propulsion events is low in individual zones, but more common across the EIS Study Area as a whole. Drift groundings are rarer, and drift groundings resulting in a spill are significantly rarer. Under the conditions of Alternative A, our modeling shows that a target vessel loss of propulsion in the EIS Study Area is a 5-year event. This means there is a one-in-five chance that a loss of propulsion occurs in any given year. A target vessel drift grounding is a 186-year event within the EIS Study Area, meaning that there is a one-in-186-chance that a drift grounding occurs in any given year. The modeling found that target vessels in the EIS Study Area have a drift grounding rate of 2.8 percent, which means that approximately 2.8 percent of all losses of propulsion result in a drift grounding.

Of the three zones that make up Alternative A, Rosario Strait has a slightly higher probability of loss of propulsion events (136-year event), followed by Guemes Channel and Saddlebags (a 156-year event), with Bellingham Channel having the lowest rate (a 175-year event). Although Rosario Strait has the highest loss of propulsion frequency, under the conditions of Alternative A, it has the lowest drift grounding probability of all three zones (a 16,931-year event) which is consistent with it having the lowest drift grounding rate (0.80 percent).

Bellingham Channel, Guemes Channel and Saddlebags Zones have slightly higher drift grounding rates than the Rosario Strait Zone. The drift grounding rate for Bellingham Channel Zone is 2.07 percent and the drift grounding rate for Guemes Channel and Saddlebags Zone is 3.83 percent. This means that loss of propulsion events are approximately 2.57 times more likely to become a drift grounding in the Bellingham Channel Zone as they are in the Rosario Strait Zone. Loss of propulsion events are 4.76 times more likely to become a drift grounding in the Guemes Channel and Saddlebags Zone than they are in the Rosario Strait Zone.

Under Alternative A, the Strait of Georgia and Strait of Georgia South Zones do not have tug escort requirements for target vessels. In the Strait of Georgia Zone, loss of propulsion events are 53-year events and drift groundings are 7,180-year events (drift grounding rate of 0.74 percent). In the Strait of Georgia South Zone, loss of propulsion events are 1,554-year events and drift groundings are 49,007-year events (drift grounding rate of 3.17 percent).

Table 22. Probabilities presented as recurrence intervals for target vessel loss of propulsion, drift groundings, and oil spills from drift groundings for Alternative A

Zone	1 LOP per # of Years	1 Drift Grounding per # of Years	1 Oil Spill from Drift Grounding per # of Years	Drift Grounding Rate (estimated drift groundings per LOP)
Bellingham Channel	175 Years	8,470 Years	1,160,289 Years	2.07%
Guemes Channel and Saddlebags	156 Years	4,046 Years	556,774 Years	3.83%
Rosario Strait	136 Years	16,931 Years	2,319,352 Years	0.80%
Strait of Georgia	53 Years	7,180 Years	983,572 Years	0.74%
Strait of Georgia South	1,554 Years	49,007 Years	6,713,249 Years	3.17%
All Zones	5 Years	186 Years	25,546 Years	2.8%

Relevant Historical Incident Data from Target Vessels: We can also look at recent incident data to complement the modeled probability rates. Between 2017-2023, there were two underway loss of propulsion incidents from target vessels in the EIS Study Area. Two loss of propulsion events in seven years is close to but lower than the probability rates described above. Neither of these incidents occurred within the Alternative A boundary, so the vessels were not escorted at the time of the incident.

Target vessels were also responsible for two underway oil spills and one underway allision during this 7-year period. One of the underway spills occurred within the boundary of Alternative A, outside of Anacortes in 2023. This tank barge incident resulted in 0.01 gallons of oil reaching Puget Sound. The vessel was escorted at the time of the spill and the spill was a result of an equipment failure. Nonetheless, it is possible that the existing tug escort requirements contributed to the limited impacts from this incident.

During this timeframe, there was also one partial loss of propulsion incident from an oil tanker over 40,000 DWT (not a target vessel) in the Alternative A boundary. The tanker had a tug escort due to previously existing requirements. It is possible that the escort also helped prevent this loss of propulsion incident from becoming more significant.

3.2.1.2 Escort Tugs: Incident Rate under Alternative A:

Modeled Probability of Incidents from Escort Tugs: In order to isolate the incident rates for the escort tugs associated with the 2020 requirements, simulated vessel traffic data is used for this assessment. This analysis uses a rate of tug incidents (all incident types) that could result in a spill per operating minute and applies that rate to the total annual underway time for escort tugs. Total underway time includes both the active escort of target vessels and commutes to and from escort jobs under Alternative A. Table 23 shows the probability of allisions/collisions, groundings, sinking/capsize, and other incident for tug escorts in Alternative A.[14] This data is presented in probability per year, rather than as a recurrence interval. These probabilities include multiple potential incident types, so the numbers are higher than for the target vessels, which only assess one specific incident type (loss of propulsion and drift grounding). These probabilities are analogous to the drift grounding probability for target vessels in that they are incidents that could result in a spill.

Overall, incidents from escort tugs under Alternative A have a probability of less than one occurrence (0.86) per year. The incident type "Other" includes a variety of different incident types including but not limited to abandonment, explosions, loss of stability, damage to cargo, equipment malfunctions, etc.[15] The "Other" category has the highest probability of occurring because it combines several potential incident types.

Table 23. Incident rates for escort tugs under Alternative A

Hazard Type	Probability of Incidents per Year
Allisions/Collisions	0.14
Groundings	0.04
Sinking/Capsize	0.01
Other	0.67
Total Incidents	**0.86**

Relevant Historical Incident Data from Escort Tugs: We can also look at recent incident data from escort and assist tugs to complement the modeled incident rates. Between 2017 and 2023, Ecology's incident data showed that there were five incidents from escort tugs in the EIS Study Area. This is an incident rate of around 0.71 per year, which is close to, but lower than, the calculated incident rate. This makes sense because escort tug underway time increased after September of 2020 due to the new requirements, so incident rates would be lower between 2017 and August of 2020. Two of these incidents, both oil spills, occurred within the Alternative A boundary after the implementation of the 2020 requirements. Together they resulted in approximately 5 gallons of oil spilled to the Puget Sound.

3.2.1.3 Trajectory Modeling and Distribution of Impacts

Under Alternative A, tug escort requirements within the Alternative A boundary provide an additional protective measure against a major spill from a target vessel drift grounding. Compared to Alternative D, a drift grounding from target vessels is 11.84 percent less likely to occur under the conditions of Alternative A within the EIS Study Area. Just within the

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[14] These categories are based on a review of USCG MISLE and Canadian MARSIS data on incidents developed for Ecology's risk model and associated Report to the Legislature (2023).

[15] See Table B-24 in the 2023 Summary of Tug Analysis Results for a complete list of incident types included in the "Other" category.

boundaries of Alternative A, drift groundings are 90.50 percent more likely to occur without the current tug escort requirements than with them. Because of the escort tug underway time associated with these requirements in Alternative A, there is also a risk of an incident from an escort tug. Under Alternative A, the estimated number of incidents from an escort tug occurring within the EIS Study Area is 0.86 incidents per year. Incident probability rates are highest within the Alternative A boundaries because under these conditions, escort tugs spend the highest amount of underway time in this area. Although the escort tug incident rate includes non-spill incidents (damage to cargo, equipment malfunctions, etc.), for the purposes of this EIS section, escort tug incidents are assumed to be worst case discharge spills.

Alternative A REDUCES the risk of a target vessel spill at the following modeled spill locations:

- James Island
- Hat Island
- North Peapod Island

Reducing the risk of a spill from these locations reduces the likelihood of impacts from an oil spill affecting the shorelines of the Strait of Georgia, west to Victoria, south to Whidbey Island, and most of Rosario Strait, Bellingham, Samish, and Padilla Bays, depending on the specific origin point. Tug escort requirements under Alternative A decrease the likelihood of a WCD spill originating from these locations and the associated impacts to people and the environment. See Section 3.1.6 for a detailed discussion of the individual trajectory models from these spill scenario locations.

Alternative A INCREASES the risk of a spill from an escort tug due to increased underway time at the following modeled spill locations:

- Anacortes
- Southern Entrance to Rosario Strait

These are both areas where there are relatively higher amounts of underway time from escort tugs under the conditions of Alternative A (See Figure 2). While tugs are smaller and carry far less oil than the target vessels, a WCD escort tug spill could nonetheless have far-reaching environmental consequences. A spill at these locations could result in the highest concentrations of oil around the southern-facing bays and islands of Lopez Island, Burrows Bay, including Allen and Burrows Islands, the southern coast of Guemes Island, Saddlebag and Hat Islands, Samish Island and Chuckanut Bay. See Section 3.1.6 for a detailed discussion of the individual trajectory models from these spill scenario locations.

Important plant and animal resources exist within the trajectories of these spill scenarios — including, but not limited to, marine mammal congregation areas, critical habitat, essential fish habitat, habitats of particular concern, national wildlife areas, Aquatic Reserves, and other marine protected area designations. A major oil spill from any of these spill scenario locations would impact marine mammals, finfish, aquatic invertebrates, birds, terrestrial and semi-aquatic animals, intertidal and aquatic plants, and protected ecological areas and special aquatic habitats, including several ESA-listed species.

Any large oil spill in the rulemaking area is also likely to affect archaeological resources (See Sec. 3.1.7 for a description of the impacts of oil on archaeological resources). Alternative A reduces the risk of impacts to archaeological resources from a target vessel spill across the trajectory of the James Island (232 sites identified), North Peapod Island (235 sites identified), and Hat Island (153 sites identified) spill scenarios. Alternative A increases the risk of impacts to archaeological resources from an escort tug oil spill across the trajectory of the Anacortes (202 sites identified) and the Southern Entrance to Rosario Strait (295 sites identified) spill scenarios.

Alternative A reduces the likelihood of these impacts to plant, animal, and archaeological resources occurring from target vessels at the trajectories of the modeled James Island, North Peapod Island, and Hat Island spill scenario locations. Alternative A increases the likelihood of a spill occurring from an escort tug at the trajectories of the modeled Anacortes and Southern Entrance to Rosario Strait spill scenario locations. Target vessels carry significantly more oil and heavier oil products than escort tugs which primarily carry diesel as fuel. Historical data shows that most spills from tugs are small.

3.2.2 Proposed Mitigation Measures

Implementation of the required and/or voluntary mitigation measures described in this subsection would further reduce the potential oil pollution-related impacts from tug escorts described above.

Required Mitigation (Rulemaking or Other Existing Regulations)

Escort tugs mitigate (reduce) the risk of a spill from the target vessels. Escort tug requirements in Alternative A provide an additional layer of risk reduction in what has been identified as a higher-risk area for vessel traffic safety (U.S. Coast Guard, 2017a).

Escort tugs are currently required to comply with all relevant federal and state vessel traffic safety and oil pollution prevention, preparedness, and response measures. Escort tugs are required to comply with the existing vessel traffic safety measures outlined in Appendix B Transportation: Vessel Traffic Discipline Report as well as the requirements outlined under 46 CFR Chapter I Subchapter M (see Sec. 1.5 Regulatory Framework).

Target vessels are required to comply with additional oil pollution prevention, preparedness, and response requirements outlined in Sec. 1.5 Regulatory Context. This includes but is not limited to the existing standards for double hulls and specifications for tank location and vessel construction, crew training requirements, contingency planning, drill and inspection requirements, and vessel traffic safety measures outlined in Appendix B.

Recommended Mitigation Measures

Ecology recommends that escort tugs and target vessels to continue to follow Standards of Care outlined by the Puget Sound Harbor Safety Committee (PSHSC, 2023). These measures help ensure that, while any oil spill can have high consequences, the probability of a spill from target vessels remains low in the EIS Study Area. Ecology also recommends that the Puget Sound

Harbor Safety Committee extend the applicable Standards of Care to the escort of 5,000 to 40,000 DWT target vessels.

3.2.3 Significant and Unavoidable Adverse Impacts

Under the conditions of Alternative A, a target vessel drift grounding in the EIS Study Area has a 186-year recurrence interval. Within the individual zones of Alternative A where tug escorts are currently required for target vessels, the probability of a drift grounding is lower still: ranging from a 4,046-year to a 16,931-year recurrence interval. This low probability is due in part to the existing safety regime and the current escort tug requirements as outlined in the Proposed Mitigation Section above (Sec. 3.2.2). Under Alternative A, target vessel drift grounding frequency is significantly lower than under Alternative D.

Escort tug underway time associated with target vessels under Alternative A can also pose an oil pollution risk. Under Alternative A, there are approximately 610,107 total annual escort tug underway minutes associated with the escort of target vessels. This translates to an incident rate of 0.86 incidents per year from the escort tugs themselves. Recent incident data shows a similar but slightly lower rate: five incidents involving escort tugs in the EIS Study Area in six years. These five incidents resulted in a total of five gallons of oil reaching the water. As described in the Vessels Section, this modeled underway time was deliberately selected to represent the highest-end estimate of escort tug underway time. It likely over-estimates underway time and therefore overestimates the calculation of the incident rate. While the conditions of Alternative A include the potential for spills from the escort tugs themselves, they are not anticipated to have significant or unavoidable adverse environmental impacts on environmental health from oil pollution.

3.3 Alternative B: Addition of Functional and Operational Requirements (FORs)

Alternative B adds functional and operational requirements intended to increase safety and formalize existing best practices. It makes no change to the geographic boundaries described in Alternative A. The added functional and operational requirements (FORs) include 1) minimum either 2,000 or 3,000 horsepower requirements for the escort tugs based on the DWT of the escorted vessel, 2) minimum of twin-screw propulsion, and 3) a pre-escort conference between the tug and the escorted vessel.

Of the 18 tugs identified in the 2021 Vessel Traffic Trend Study (BPC & Ecology, 2021) as performing target vessel escort work, two are between 2,000 and 3,000 horsepower. Ecology reviewed the data used in this report and found that the escort tugs between 2,000 and 3,000 were only escorting target vessels under 18,000 DWT. The horsepower requirement codifies existing industry practices and ensures that tugs have sufficient power to intervene to prevent a drift grounding (and potential subsequent spill). Additionally, all 18 of the identified tugs meet the minimum twin screw propulsion requirement. These two requirements reflect today’s industry practices and are therefore unlikely to result in changes to the distribution of escort tugs and their associated impacts. The FORs are intended to increase safety and formalize existing best practices. Alternative B would not be anticipated to have any impact on the type, quantity or frequency of oil pollution impacts relative to Alternative A.

Under Alternative B, the FORs could result in a minor but unquantified decrease in the risk of oil spills from target vessels due to drift groundings, but would not be expected to change the existing risk of a diesel fuel spill from escort tug incidents.

The Puget Sound Harbor Safety Committee's existing standard of care (SOC) for Tanker Escorts includes a recommendation for pre-escort conferences and they are the industry standard for several individual companies. Some vessels may already complete a pre-escort conference.

3.3.1 Impacts from Implementation

The codification of these FORs is intended to standardize and provide consistency for identified best practices. There is no data regarding the benefits of these specific measures that could be incorporated quantitatively into the modeling of drift grounding or incident rates. Expert opinion from the OTSC suggests that these measures support common sense safety practices and likely result in non-quantifiable safety improvements. Standardized pre-escort communication measures between the escort tug, the escorted vessel, and the pilot (where applicable) support coordination and improve safety outcomes. Because there is no readily available data on these proposed measures and because some of them are already in place on a voluntary basis, we assume no change from the modeled target vessel drift grounding rates and escort tug incident rates from those included for Alternative A. Under Alternative B, the FORs could result in a minor but unquantified decrease in the risk of oil spills from target vessels due to drift groundings but would not be expected to change the existing risk of a diesel fuel spill from escort tug incidents.

Any large oil spill in the rulemaking area is likely to affect both ecological and archaeological resources. Alternative B makes no changes to the risk of an oil spill compared to Alternative A. The FORs may provide an additional but unquantified risk reduction benefit.

3.3.2 Proposed Mitigation Measures

No additional mitigation measures than those included for Alternative A in Sec. 3.2.2 (Proposed Mitigation Measures) have been identified for Alternative B. Escort tugs would be required to continue to adhere to federal vessel traffic regulations. Ecology recommends that escort tugs and target vessels continue to implement PSHSC Standards of Care where safe and prudent to do so. The addition of FORs will help ensure that the escort tug can safely and efficiently conduct escort work. The formalization of the pre-escort conference will support enhanced communication, predictability, and coordination between escort tugs and target vessels.

3.3.3 Significant and Unavoidable Adverse Impacts

The addition of FORs under Alternative B does not meaningfully change incident frequency for target vessels or escort tugs over those described in Alternative A. Alternative B may provide a small and unquantified reduction in risk by standardizing best practices. Alternative B has no significant or adverse unavoidable impacts to environmental health from oil pollution.

3.4 Alternative C: Expansion of Tug Escort Requirements

3.4.1 Impacts from Implementation

Alternative C maintains the tug escort requirements outlined in Alternative A and expands them northwest towards Patos Island. Alternative C would result in a 2.41 percent increase in escort tug underway time. The net increase in escort tug underway time would occur primarily within and near the expansion area (i.e., in the Strait of Georgia and the Strait of Georgia South Zones). Escort tug underway time in the rest of the EIS Study Area would decrease slightly or remain the same (see Figure 4). Alternative C also includes the FORs included in Alternative B.

3.4.1.1 Target Vessels: Probability of Drift Groundings under Alternative C

Modeled Probability of Drift Groundings from Target Vessels: Table 24 shows recurrence interval estimates for target vessels for three types of events for Alternative C: loss of propulsion (LOP), drift groundings, and oil spills from drift groundings. It also includes a drift grounding rate, which is how frequently loss of propulsion incidents actually result in a drift grounding. Alternative C retains the tug escort requirements for the rulemaking area identified under Alternative A (Bellingham Channel, Guemes Channel and Saddlebags, and Rosario Strait Zones) and adds the Strait of Georgia South Zone and a corner of the Strait of Georgia Zone. All five zones relevant to the rulemaking are included in Table 24 along with the combined estimates for all zones/EIS Study Area.

Table 24. Probabilities presented as recurrence intervals for target vessel loss of propulsion, drift groundings, and oil spills from drift groundings for Alternative C

Zone	1 LOP per number of Years	1 Drift Grounding per number of Years	1 Oil Spill from Drift Grounding per number of Years	Drift Grounding Rate (estimated drift groundings per LOP)
Bellingham Channel	175 Years	8,470 Years	1,160,289 Years	2.07%
Guemes Channel and Saddlebags	156 Years	4,046 Years	556,774 Years	3.83%
Rosario Strait	136 Years	16,931 Years	2,319,352 Years	0.80%
Strait of Georgia	53 Years	8,025 Years	1,099,263 Years	0.66%
Strait of Georgia South	1,554 Years	0 Years[16]	0 Years[17]	0.00%
All Zones	5 Years	189 Years	25,830 Years	**2.79%**

[16] The real-life risk of a loss of propulsion event becoming a drift grounding is never zero. A zero risk only exists under modeled conditions.

Alternative C slightly reduces the overall risk of a drift grounding within the EIS Study Area and provides risk reduction benefits to the expansion area. The addition of the expansion area reduces the overall risk of a drift grounding by a target vessel within the EIS Study Area from a recurrence interval of 186 years (Alternative A) to a recurrence interval of 189 years, a decrease of 1.6 percent. The expansion area adds tug escort requirements to the entirety of the Strait of Georgia South Zone and a corner of the Strait of Georgia Zone. Adding tug escorts for target vessels to the Strait of Georgia South Zone reduces the modeled risk of a loss of propulsion event becoming a drift grounding or an oil spill to near zero,[14] although the real-life risk is never truly zero.

Under Alternative A, the Strait of Georgia South Zone had the second highest drift grounding rate in the five zones under consideration (3.17 percent, second to Bellingham Channel at 3.83 percent). Under the Alternative C, this is reduced to just 0.66 percent. By adding tug escorts to the corner of the Strait of Georgia Zone, drift groundings are reduced from a probability of one every 7,180 years (Alternative A) to a probability of one every 8,024 years.

Relevant Historical Incident Data from Target Vessels: Alternative C maintains the requirements that are present in Alternative A, so there is no change to the description provided in Sec. 3.2.1.1 above. There were no additional incidents between 2017-2023 that involved target vessels for this rulemaking in the expansion area.

3.4.1.2 Escort Tugs: Incident Rates Under Alternative C:

Modeled Probability of Drift Groundings from Escort Tugs: In order to isolate just the incident rates for just the escort tugs for target vessels, simulated AIS data is used for this assessment. This analysis uses a rate of tug incidents that could result in a spill per operating minute and applies that rate to the total annual underway time for escort tugs escorting target vessels and commuting to and from escort jobs under Alternative C. Under Alternative C, there are 624,784 underway minutes. Table 25 shows the estimated number of allisions/collisions, groundings, sinking/capsize, and other incidents for tug escorts in Alternative C.[17]

Including the expansion area, incidents from tugs engaged in escorting target vessels still result in less than one (0.88) incident per year. This is an increase in frequency of 2.41 percent from Alternative A, consistent with the increased amount of escort tug underway time necessary to meet the expanded requirements. Rates for each incident type increased incrementally and consistently.

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[17] These categories are based on a review of USCG MISLE and Canadian MARSIS data on incidents developed for the Ecology's risk model and Summary of Tug Escort Analysis Results Report (2023).

Table 25. Escort tug incident rate under Alternative C

Incident Type	Estimated Number of Incidents per Year
Allisions/Collisions	0.14
Groundings	0.04
Sinking/Capsize	0.01
Other	0.68
Total Incidents	0.88

Relevant Historical Incident Data from Escort Tugs: We can also look at recent incident data from escort and assist tugs to complement the modeled incident rates. There were two spills that occurred within the Alternative A boundary as described in Sec. 3.2.1.2 above. There was an additional spill that occurred at Cherry Point, which is in the Strait of Georgia Zone, but outside of the expansion area. Ecology's model suggests a minor northward shift in escort tug traffic as a result of Alternative C with more tugs commuting to and from refineries in this area. This spill was described as a sheen and resulted in an estimated 0.008 gallons of oil spilled to the water.

3.4.1.3 Trajectory Modeling and Distribution of Impacts

Under Alternative C, tug escort requirements are extended to include the expansion area (Strait of Georgia South Zone and a corner of the Strait of Georgia Zone). The expansion of the tug escort requirement to the Strait of Georgia South Zone reduces the modeled risk of drift grounding to near zero. In the Strait of Georgia Zone, the expansion of the requirements reduces the risk of a drift grounding by 10.52 percent compared to Alternative A. The risk reduction benefits within the boundary of Alternative A (including the modeled spill scenarios at James Island, Hat Island, and North Peapod Island) are retained under Alternative C. Because of the escort tug underway time associated with the expansion of these requirements under Alternative C, there is also an increased risk of an incident from an escort tug. Under Alternative C, the escort tug incident rate within the EIS Study Area is 2.41 percent higher than under Alternative A. The increase in risk of an incident from an escort tug within the boundary of Alternative A (including the modeled spill scenarios at Anacortes and Southern Entrance to Rosario Strait) remains the same under Alternative C. Although the escort tug incident rate includes non-spill incidents (damage to cargo, equipment malfunctions, etc.), for the purposes of this EIS section, escort tug incidents are assumed to be worst case discharge spills.

Alternative C REDUCES the risk of a target vessel spill at the following modeled spill locations:

- Matia Island
- Clark Island

Reducing the risk of a spill from these locations reduces the likelihood of impacts from an oil spill reaching most of the Southern Gulf Islands, parts of Victoria, the San Juan Islands, all of Rosario Strait, Bellingham and Samish Bays, Lummi Island, and the coast north of Neptune Beach including waters and shorelines to the U.S.-Canadian border. Tug escort requirements under Alternative C decrease the likelihood of a WCD spill originating from these locations and the associated impacts to people and the environment. See Section 3.1.6 for a detailed discussion of the individual trajectory models from these spill scenario locations.

Alternative C INCREASES the risk of a spill from an escort tug due to increased underway time at the following modeled spill locations:

- Expansion Corridor

This modeled spill is in the shipping lane where escort tug presence increases under Alternative C (See Fig. 3). While tugs are smaller and carry less fuel than target vessels, a WCD escort tug spill could nonetheless have far-reaching environmental consequences. A spill at this location could result in high concentrations of oil around Point Roberts in particular and could extend through the northern part of the San Juan Islands, as far north as Burrard Inlet, as far south as Victoria, and west along the Gulf Islands to Valdes Island. See Section 3.1.6 for a detailed discussion of the modeled trajectory from this spill scenario location.

Important plant and animal resources exist within the trajectories of these spill scenarios — including, but not limited to, marine mammal congregation areas, critical habitat, essential fish habitat, habitats of particular concern, national wildlife areas, Aquatic Reserves, and other marine protected area designations. A major oil spill from any of these spill scenario locations would impact marine mammals, finfish, aquatic invertebrates, birds, terrestrial and semi-aquatic animals, intertidal and aquatic plants, and protected ecological areas and special aquatic habitats, including several ESA-listed species.

Any large oil spill in the rulemaking area is also likely to affect archaeological resources (See Sec. 3.1.7 for a description of the impacts of oil on archaeological resources). Alternative C reduces the risk of impacts to archaeological resources from a target vessel spill across the trajectory of the Matia Island (296 sites identified) and Clark Island (217 sites identified) spill scenarios. Alternative C increases the risk of impacts to archaeological resources from an escort tug oil spill across the trajectory of the Expansion Corridor (225 sites identified) spill scenario.

Alternative C reduces the likelihood of these impacts to plant, animal, and archaeological resources occurring from target vessels at the spill locations in and near the expansion area (Matia Island and Clark Island). The impacts outlined above would be less likely to occur along these trajectories due to the expansion of this protective measure. This is a benefit to the environment. Alternative C also increases the likelihood of a spill occurring from an escort tug in the expansion area (Expansion Corridor) due to increased underway time in the expansion area. The risks described to the spill scenarios under Alterative A remain unchanged. Target vessels carry significantly more oil and heavier oil products than escort tugs which primarily carry diesel as fuel. Historical data shows that most spills from tugs are small.

3.4.2 Proposed Mitigation Measures

No additional mitigation measures other than those included for Alternative A in 3.2.2 (Proposed Mitigation Measures) have been identified for Alternative C. Escort tugs would be required to continue to adhere to federal vessel traffic regulations. Ecology recommends that escort tugs and target vessels continue to implement PSHSC Standards of Care where safe and prudent to do so. The addition of FORs will help ensure that the escort tug can safely and efficiently conduct escort work. The formalization of the pre-escort conference will support enhanced communication, predictability, and coordination between escort tugs and target vessels.

3.4.3 Significant and Unavoidable Adverse Impacts

Under Alternative C, the probability of a drift grounding from the target vessels in the EIS Study Area has a 189-year recurrence interval. This is a decrease in frequency of 1.6 percent. Most of this decrease is in the Strait of Georgia (recurrence interval of 8,025 years) and Strait of Georgia South Zones (escort requirement virtually eliminates drift grounding risk). While the consequences of a spill from a target vessel could be severe, the probability of such an event is low under Alternative C. This low probability is due in part to the existing safety regime and the current escort tug requirements as outlined in the Proposed Mitigation Section above (Sec. 3.4.2). Alternative C reduces the probability of drift groundings from target vessels and extends the risk reduction benefits of escort tugs through the expansion area – further mitigating oil spill risk. The expansion area includes the location of a significant target vessel oil spill: the 1994 grounding and spill from a tank barge at Clements Reef. There is no significant or unavoidable adverse impact from target vessels in Alternative C.

Escort tug underway time associated with target vessels under Alternative C also poses an oil pollution risk. Under Alternative C, there are approximately 624,784 minutes of total annual underway time associated with the escort of target vessels. This is an increase of 2.41 percent in underway time over Alternative A. This underway time translates to an incident rate of 0.88 incidents per year from the escort tugs themselves, a corresponding 2.41 percent increase in incident probability over Alternative A. Recent incident data shows a similar but slightly lower rate: five incidents involving escort tugs in the EIS Study Area in seven years. These five incidents resulted in a total of five gallons of oil reaching the water. As described in Appendix B, this modeled underway time was deliberately selected to represent the highest-end estimate of escort tug underway time. It likely over-estimates underway time and therefore overestimates the calculation of the incident rate.

While the consequences of a spill from an escort tug could be severe, the probability of such an event is quite low under Alternative C. Alternative C is not anticipated to have significant or unavoidable adverse impacts on environmental health from oil pollution.

3.5 Alternative D: Removal of Tug Escort Requirements

3.5.1 Impacts from Implementation

3.5.1.1 Target Vessels: Probability of Drift Groundings under Alternative D

Alternative D removes the existing tug escort requirements for target vessels, eliminating escort tug underway time associated with this proposed rule. Removing escort tugs changes the oil spill risk for target vessels as described below. We can reasonably assume that most or all of the 18 identified escort tugs would remain within the EIS Study Area but shift to other assisting and/or escort work for larger vessels. While the individual tugs would continue to have an oil pollution risk to the environment, they would be unrelated to this rulemaking.

Modeled Probability of Drift Groundings from Target Vessels: Table 26 shows recurrence interval estimates for target vessels for three types of events for Alternative D: loss of propulsion (LOP), drift groundings, and oil spills from drift groundings. It also includes a drift grounding rate, which is how frequently loss of propulsion incidents actually result in a drift grounding. Alternative D eliminates all tug escort requirements for target vessels, specifically the existing requirements for Bellingham Channel, Guemes Channel and Saddlebags, and Rosario Strait Zones. There is no change from Alternative A for the Strait of Georgia South and Strait of Georgia Zones; they are included for consistency only.

Removing existing tug escort requirements for target vessels in the EIS Study Area increases the probability of a drift grounding from a target vessel. Under Alternative D, target vessel drift grounding probability changes from a 186-year event (Alternative A) to a 167-year event, an increase of 11.84 percent across the EIS Study Area. The probability of an oil spill resulting from a drift grounding would also increase (from a 25,546-year event to a 22,841-year event). Because the change in risk is limited to just three zones, the rate of change for each of those zones is much higher when assessed individually. For Guemes Channel and Saddlebags Zone, target vessel drift grounding frequency increases by 52.07 percent over Alternative A with the removal of all target vessel tug escort requirements. In the Bellingham Channel Zone, the modeled increase in target vessel drift grounding frequency is 112.50 percent with the removal of all target vessel tug escort requirements. In the Rosario Strait Zone, target vessel drift grounding frequency increases by 204 percent with the removal of all target vessel tug escort requirements.

Table 26. Probabilities presented as recurrence intervals for target vessel loss of propulsion, drift groundings, and oil spills from drift groundings for Alternative D

Zone	1 LOP per number of Years	1 Drift Grounding per number of Years	1 Oil Spill from Drift Grounding per number of Years	Drift Grounding Rate (estimated drift groundings per LOP)
Bellingham Channel	175 Years	3,986 Years	546,018 Years	4.39%
Guemes Channel and Saddlebags	156 Years	2,662 Years	364,613 Years	5.85%
Rosario Strait	136 Years	5,569 Years	762,932 Years	2.44%
Strait of Georgia	53 Years	7,180 Years	983,572 Years	0.74%
Strait of Georgia South	1,554 Years	49,007 Years	6,713,249 Years	3.17%
All Zones	5 Years	167 Years	22,841 Years	3.16%

Relevant Historical Incident Data from Target Vessels: In Section 3.1.3 above, recent incident data involving escort tugs and target vessels was reviewed and incidents where an escort tug might have helped were identified. In this section, the incidents identified as being potentially helped by an escort tug are reviewed for consistency with the conditions of Alternative D. If removing tug escort requirements under Alternative D might have impacted the outcome of those events, those incidents are identified.

The only identified incident that Alternative D would have potentially affected is the tank barge incident that occurred within the boundary of Alternative D. The incident occurred in 2023, so the barge was escorted under the 2020 requirements. It resulted in 0.01 gallons of oil reaching the Puget Sound and occurred while the vessel was underway. Had the vessel not had a tug escort, it is possible that additional oil could have been spilled before it was spotted, given that the escort tug serves as an additional set of eyes on the water during an escort. Additionally, removing tug escort requirements could lower the concentration of tugs commuting to and from the requirement boundary, meaning fewer tugs of opportunity in this region when incidents occur.

3.5.1.2 Escort Tugs: Incident Rate under Alternative D:

Modeled Probability of Drift Groundings from Escort Tugs: Removing escort requirements for target vessels would also remove all incident risk associated with those specific escort jobs. This removes 100 percent of the incident risk associated with these *specific* escort minutes under Alternative A, which equates to a rate of less than one (0.86) incident per year. The breaks down to:

- Allisions/Collisions: 0.14 fewer incidents per year
- Groundings: 0.04 fewer incidents per year
- Sinking/Capsize: 0.01 fewer incidents per year
- Other: 0.67 fewer incidents per year.

Incidents from escort and assist tugs engaged in escorting oil tankers over 40,000 DWT and from general assist work would remain unchanged at a rate of between 3 and 4 incidents per year (3.73) in the EIS Study Area.

Relevant Historical Incident Data from Escort Tugs: We can also look at recent incident data from escort and assist tugs to complement the modeled incident rates. Between 2017-2023, there were 5 incidents from escort tugs in the EIS Study Area. Two of these incidents, both oil spills, occurred within the Alternative D boundary. Together, they resulted in approximately 5 gallons of oil spilled into Puget Sound. Removing the requirement for tug escorts for target vessels reduces the probability of incidents involving escort tugs because it reduces underway time. While neither of these incidents occurred while the tug was actively escorting, the probability of these two incidents occurring is lower under Alternative D.

3.5.1.3 Trajectory Modeling and Distribution of Impacts

Alternative D would eliminate all tug escort requirements for target vessels, which currently provide a protective measure against a major oil spill from a target vessel drift grounding. Compared to Alternative A, drift groundings are 11.84 percent more likely to occur in the EIS Study Area under Alternative D. Within the Alternative D boundaries, target vessel drift groundings are 90.50 percent more likely to occur than they are under Alternative A. The removal of tug escort requirements also means that escort tug underway time associated with target vessels would be eliminated. The risk of an incident from an escort tug associated with a target vessel would also be zero. While incidents from these tugs could still occur, they would not be associated with tugs engaged in the escort of target vessels as required by this rule.

Alternative D SIGNIFICANTLY INCREASES the risk of a target vessel spill at the following modeled spill locations:

- James Island
- Hat Island
- North Peapod Island

Spill trajectories for these locations could reach north into the Strait of Georgia, west to Victoria, South to Whidbey Island, and cover most of Rosario Strait, Bellingham, Samish, and Padilla Bays, depending on the specific origin point. The removal of tug escort requirements under Alternative D increases the likelihood of a WCD spill originating from these locations and the associated impacts to people and the environment along the modeled trajectory. See Section 3.1.6 for a detailed discussion of the individual trajectory models from these spill scenario locations.

Alternative C REDUCES the risk of a spill from an escort tug due to increased underway time at the following modeled spill locations:

- Anacortes
- Southern Entrance to Rosario Strait

These are both areas where there are relatively higher amounts of underway time from escort tugs under the other alternatives. Under Alternative D, they would see a reduction in underway time and associated risk with the removal of tug escort requirements. Reducing the risk of a spill from these locations reduces the likelihood of impacts from an oil spill around the southern-facing bays and islands of Lopez Island, Burrows Bay, including Allen and Burrows Islands, the southern coast of Guemes Island, Saddlebag and Hat Islands, Samish Island and Chuckanut Bay. See Section 3.1.6 for a detailed discussion of the individual trajectory models from these spill scenario locations.

Important plant and animal resources exist within the trajectories of these spill scenarios — including, but not limited to, marine mammal congregation areas, critical habitat, essential fish habitat, habitats of particular concern, national wildlife areas, DNR aquatic reserves, and other marine protected area designations. A major oil spill from any of these spill scenario locations would impact marine mammals, finfish, aquatic invertebrates, birds, terrestrial and semi-aquatic animals, intertidal and aquatic plants, and protected ecological areas and special aquatic habitats, including several ESA-listed species.

Any large oil spill in the rulemaking area is also likely to affect archaeological resources (See Sec. 3.1.7 for a description of the impacts of oil on archaeological resources). Alternative D significantly increases the risk of impacts to archaeological resources from a target vessel spill across the trajectory of the James Island (232 sites identified), North Peapod Island (235 sites identified), and Hat Island (153 sites identified) spill scenarios. Alternative D reduces the risk of impacts to archaeological resources from an escort tug oil spill across the trajectory of the Anacortes (202 sites identified) and the Southern Entrance to Rosario Strait (295 sites identified) spill scenarios.

Tug escort requirements reduce the risk of a drift grounding and oil spill from target vessels. Alternative D removes tug escort requirements for target vessels, so the likelihood of these impacts to plant, animal, and archaeological resources from target vessel spills increase significantly within the removal boundary. The impacts outlined above would be more likely to occur along these trajectories due to the removal of this protective measure. Alternative D also eliminates the likelihood of a spill occurring from an escort tug associated with the escort of target vessels in the rulemaking area. Target vessels carry significantly more oil and heavier oil products than escort tugs which primarily carry diesel as fuel. Historical data shows that most spills from tugs are small.

3.5.2 Proposed Mitigation Measures

No additional mitigation measures other than those included for Alternative A in 3.2.2 (Proposed Mitigation Measures) have been identified for Alternative D, although the escort tug measures would no longer be relevant. Target vessels would be required to continue to adhere to federal vessel traffic regulations. Ecology recommends that target vessels continue to implement PSHSC Standards of Care where safe and prudent to do so.

Escort tugs mitigate (reduce) the risk of a spill from target vessels. Alternative D removes the tug escort requirements for target vessels. This increases the risk of a target vessel drift grounding in the EIS Study Area and, in particular, in the Alternative A boundary where tug escorts are currently required for target vessels. This area has been identified as a higher-risk area for vessel traffic safety (U.S. Coast Guard, 2017a). The modeling of worst case discharge spills shows that a major spill would have devastating consequences to the environment. Both the recent incident data and the drift grounding modeling show that oil spill incidents from target vessels occur relatively infrequently. Under the current safety regime, a worst case discharge incident is a low-probability but high-consequence event.

3.5.3 Significant and Unavoidable Adverse Impacts

Under Alternative D, the probability of a drift grounding from the target vessels in the EIS Study Area has a 167-year recurrence interval. This is an increase in the probability of 11.84 percent from Alternative A across the EIS Study Area. Within the removal area where tug escorts are currently required for target vessels, Alternative D increases the probability of a target vessel drift grounding by 90.50 percent. Although the absolute numbers remain low, this is a meaningful increase in the relative frequency of spills at the EIS Study Area scale and within the rulemaking boundary.

The existing safety regime and the current escort tug requirements contribute to keeping the probability of a major spill event low. However, the consequences of a spill from a target vessel could be severe. Ecology's trajectory modeling of worst case discharge incidents in the Alternative D boundary shows that the impacts of a spill in this area would have devastating environmental consequences. Therefore, Alternative D does have a significant and unavoidable adverse impact to environmental health from oil pollution, based on the increase in target vessel drift grounding risk and the potential scope of impacts if a spill did occur.

The removal of the tug escort requirements under Alternative D removes underway time for tug escorts and therefore their associated incident risk. While these individual tugs will likely continue to operate in Puget Sound, they will not be escorting target vessels as is currently required. Alternative D eliminates this specific source of oil pollution risk. Therefore, Alternative D does not have a significant and adverse impact to environmental health from oil pollution from escort tugs.

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