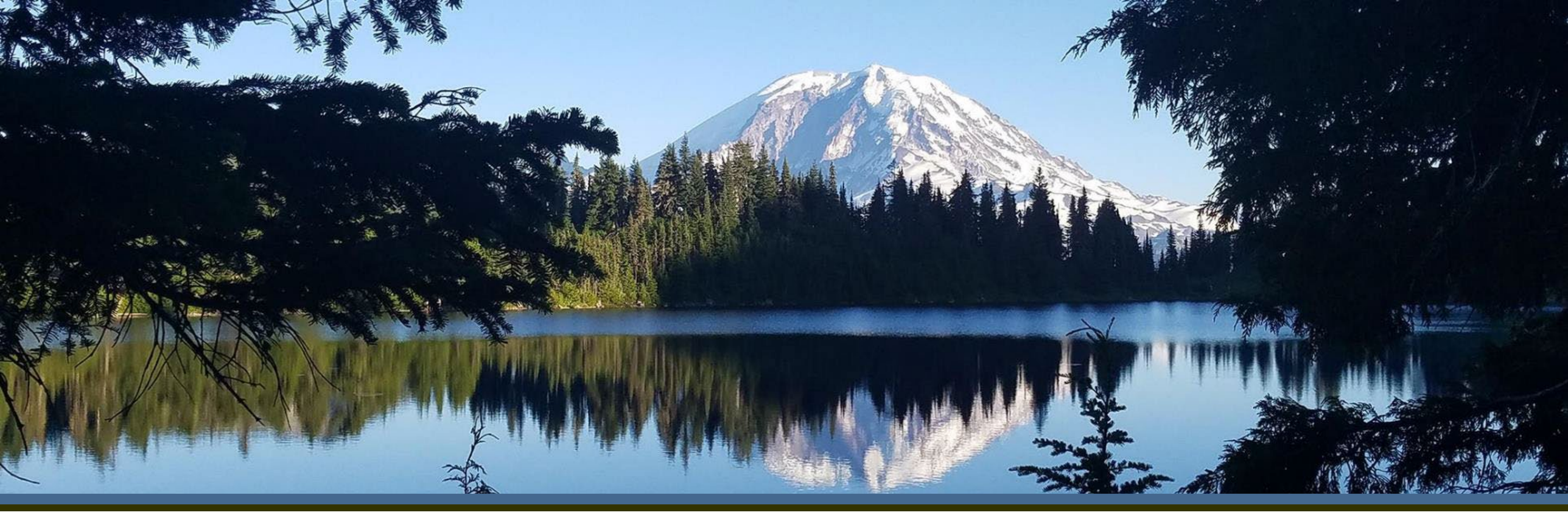


Results of the Tug Escort Analysis

Rulemaking Workshop for Tribes #4

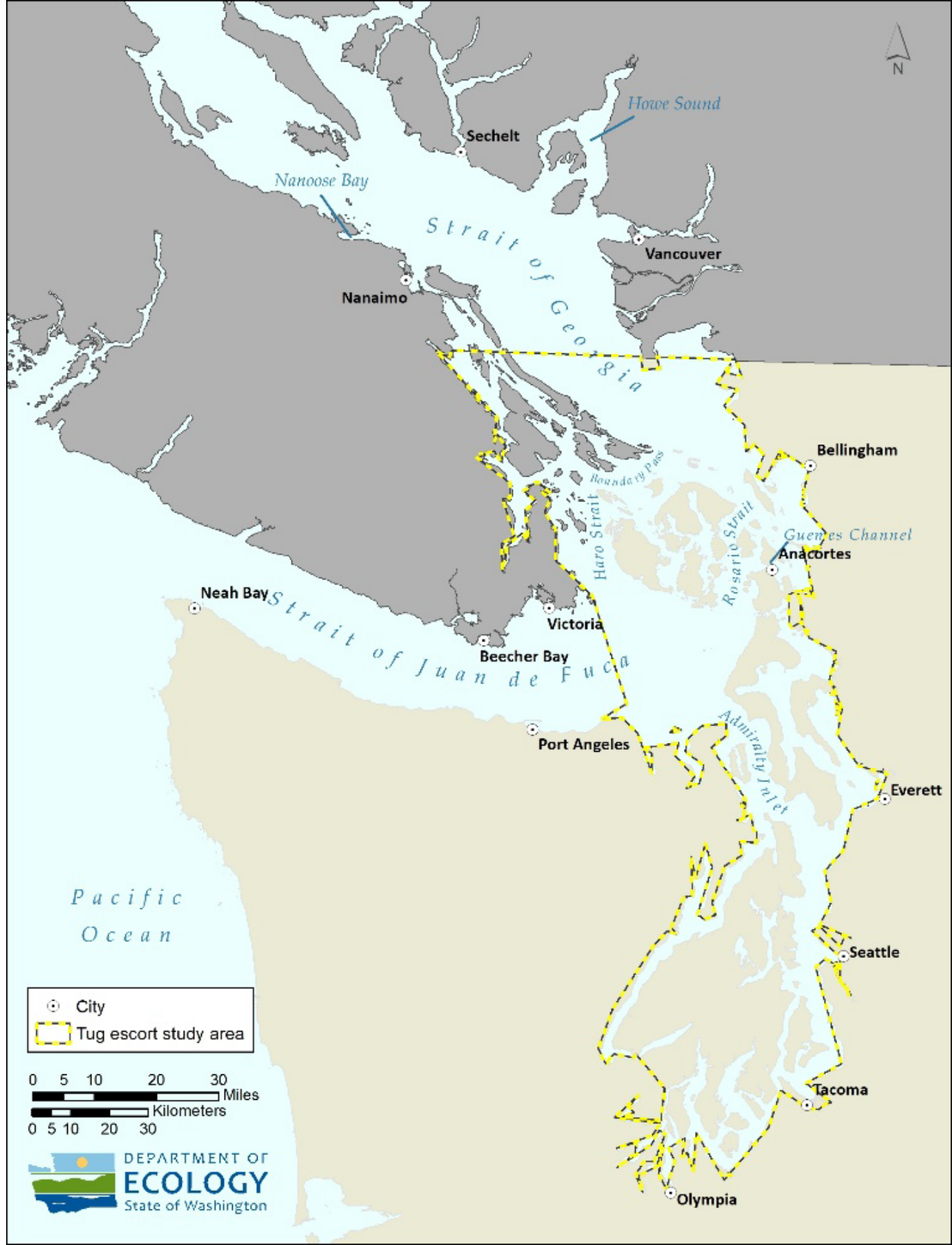
December 7th, 2023

Today's agenda

1. Introduction
2. Scenario 2 Results (analysis of 2020 escorts in Rosario)
3. Scenario 3 Results (analysis of expanding escorts beyond Rosario)
4. Other Analysis Results and Discussion
5. Introduction to filtering of analysis result

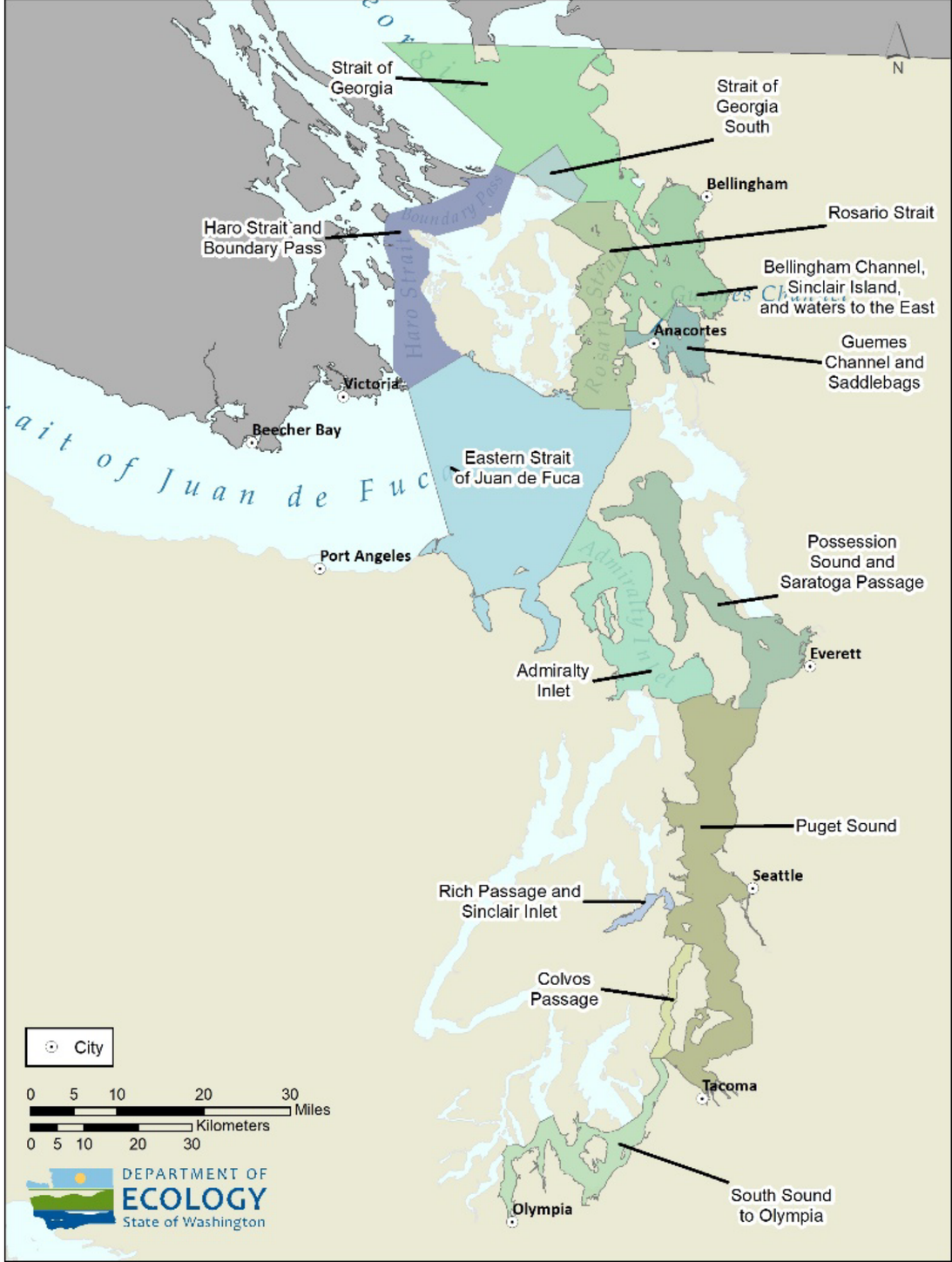
Tug Escort Analysis
Study Area

The study area included all Washington waters of the Salish Sea where the BPC might consider new tug escort rules (outlined in yellow)



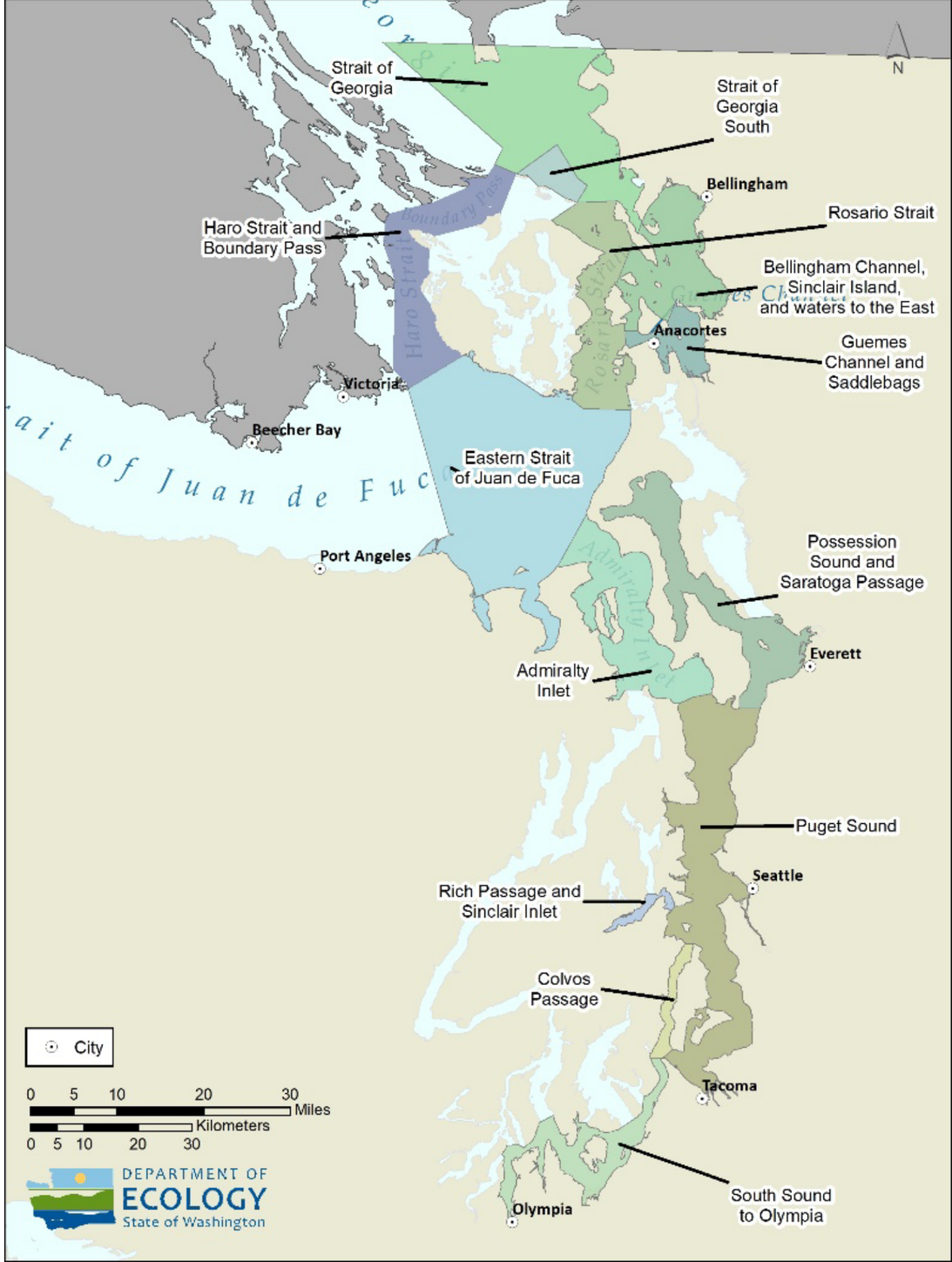
Tug Escort Analysis Geographic Zones

- Strait of Georgia
- Strait of Georgia South
- Haro Strait and Boundary Pass
- Rosario Strait
- Bellingham Channel, Sinclair Island, and waters to the East
- Guemes Channel and Saddlebags
- Eastern Strait of Juan de Fuca
- Admiralty Inlet
- Puget Sound
- Possession Sound and Saratoga Passage
- Rich Passage & Sinclair Inlet
- Colvos Passage
- South Sound to Olympia



Tug Escort Scenarios

	Description	Escorted vessels
Scenario 1	Escort requirements prior to 2020	Laden tank ships over 40,000 DWT
Scenario 2	Escort requirements established in 2020	Laden ATBs, tank barges, and tank ships between 5,000 and 40,000 DWT in Rosario Strait and connected waters east.
Scenario 3	Expansion of escort requirements to the entire study area.	Laden ATBs, tank barges, and tank ships between 5,000 and 40,000 DWT in the rest of the study area.



Reminder for reference, these are the rulemaking escort ideas presented at the last rule workshop

1. Remove Rosario and waters east requirement (Pre – 2020)
2. Maintain Rosario and waters east requirement – no other change
3. Escorts for specific vessels in specific zones
4. Escorts for all vessel types in all zones

Analysis Results & this rulemaking

Analysis Result	**Rulemaking topic it informs**
Changes in oil spill risk from Rosario requirements (Scenario 2 results)	Whether 2020 requirement should be maintained or adjusted **(Rule escort ideas 1 and 2)**
Zones and vessel types that show most benefit from theoretical requirements of Scenario 3	Whether escort requirements should be added to additional zones and vessel types **(Rule escort ideas 3 and 4)**
Risk from additional escort traffic	SEPA
Benefit of tethering	Escort tug operational requirements

Scenario 2:

Changes in oil spill risk from Rosario requirements

(informs rule escort ideas 1 and 2)

The requirement for tug escorts in Scenario 2 resulted in a small overall decrease in risk:

- Drift groundings declined 2.3%
- Oil volume at risk declined 3.1%
- Oil outflow declined 2.6%

In absolute values:

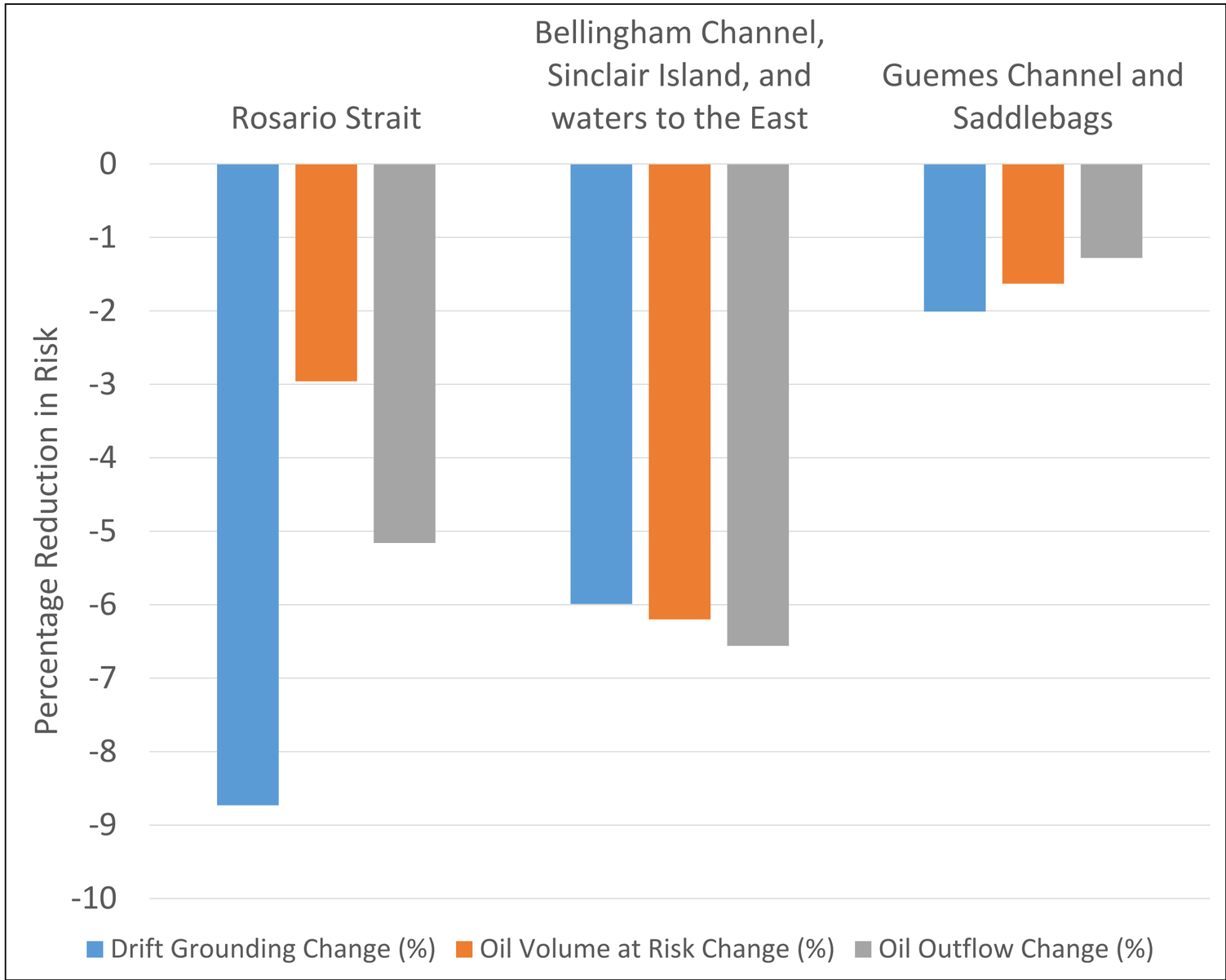
- Drift groundings declined 0.0047 per simulation
- Oil volume at risk declined 22,430.1 gallons per simulation
- Oil outflow declined 1.5 gallons per simulation

Changes in oil spill risk from Rosario requirements, by zone

In Scenario 2, escorts were newly required in three zones, that collectively make up Rosario and waters east. The zones include:

- Bellingham Channel Sinclair Island and Waters East
- Guemes Channel and Saddlebags, and
- Rosario Strait.

Each of these zones saw small percentage reductions in oil spill risk.

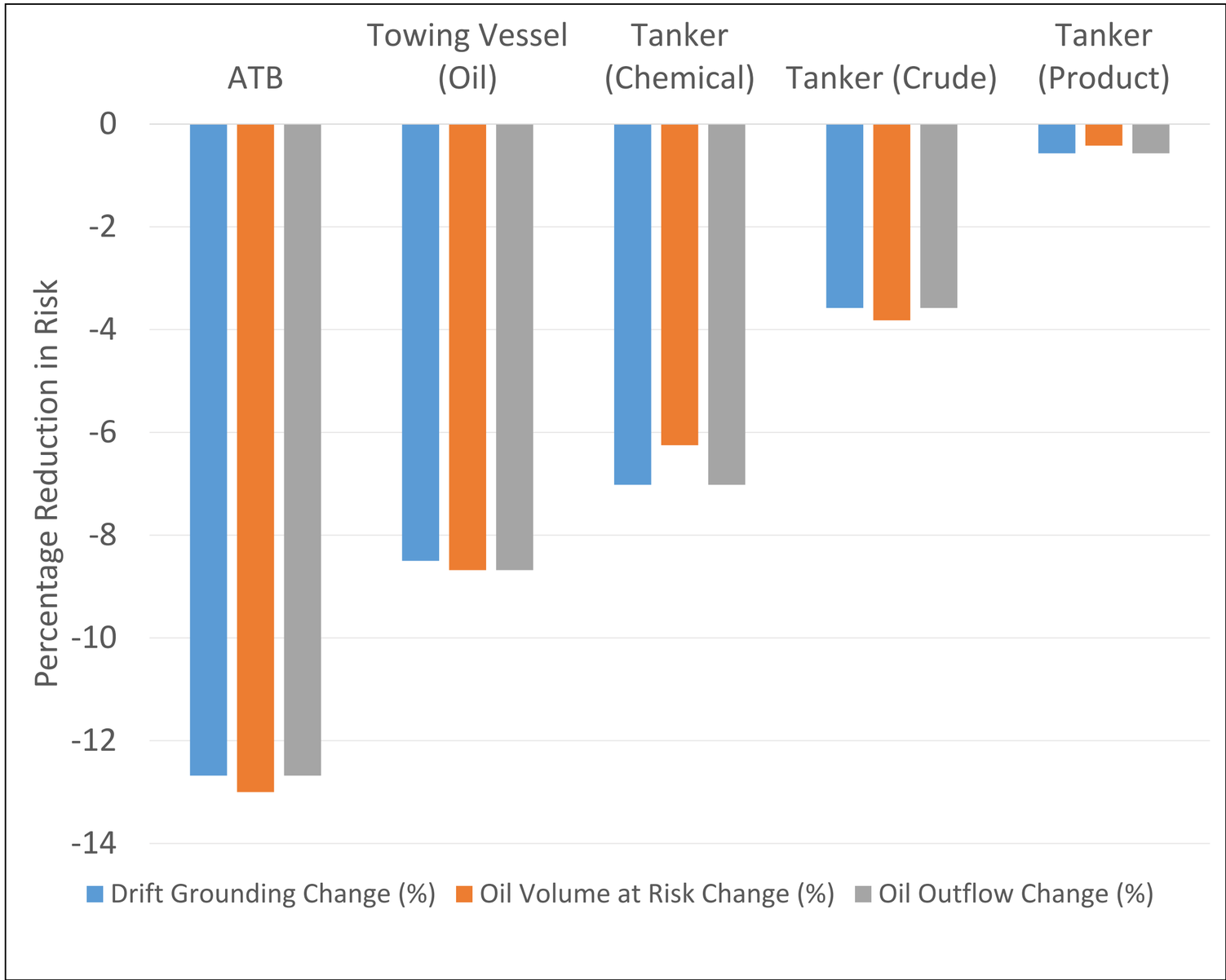


Changes in oil spill risk from Rosario requirements, by vessel type

In Scenario 2, escorts were newly required for five vessel types:

- ATBs
- Towed oil barges
- Chemical tankers
- Crude tankers
- Product tankers

Each of these vessel types saw a reduction in oil spill risk.



Changes from Rosario requirements for ATBs

13% risk reduction for ATBs

1 in 8 drift grounding prevented

A reduction of 0.0001 drift groundings per simulation year

Changes from Rosario requirements for Barges

9% risk reduction for barges

1 in 12 drift grounding prevented

A reduction of 0.0003 drift groundings per simulation year

Changes from Rosario requirements for Chemical Tankers

6-7% risk reduction for chemical tankers

1 in 14 drift grounding prevented

A reduction of 0.0004 drift groundings per simulation year

Scenario 3:

Changes in oil spill risk from expansion of escort requirements beyond Rosario and water east

(informs rule escort ideas 3 and 4)

Modeling the expansion of tug escort rules from Scenario 2 to Scenario 3 resulted in a small overall decrease in risk:

- Drift groundings declined 1.8%
- Oil volume at risk declined 0.1%
- Oil outflow declined 0.8%

In absolute values:

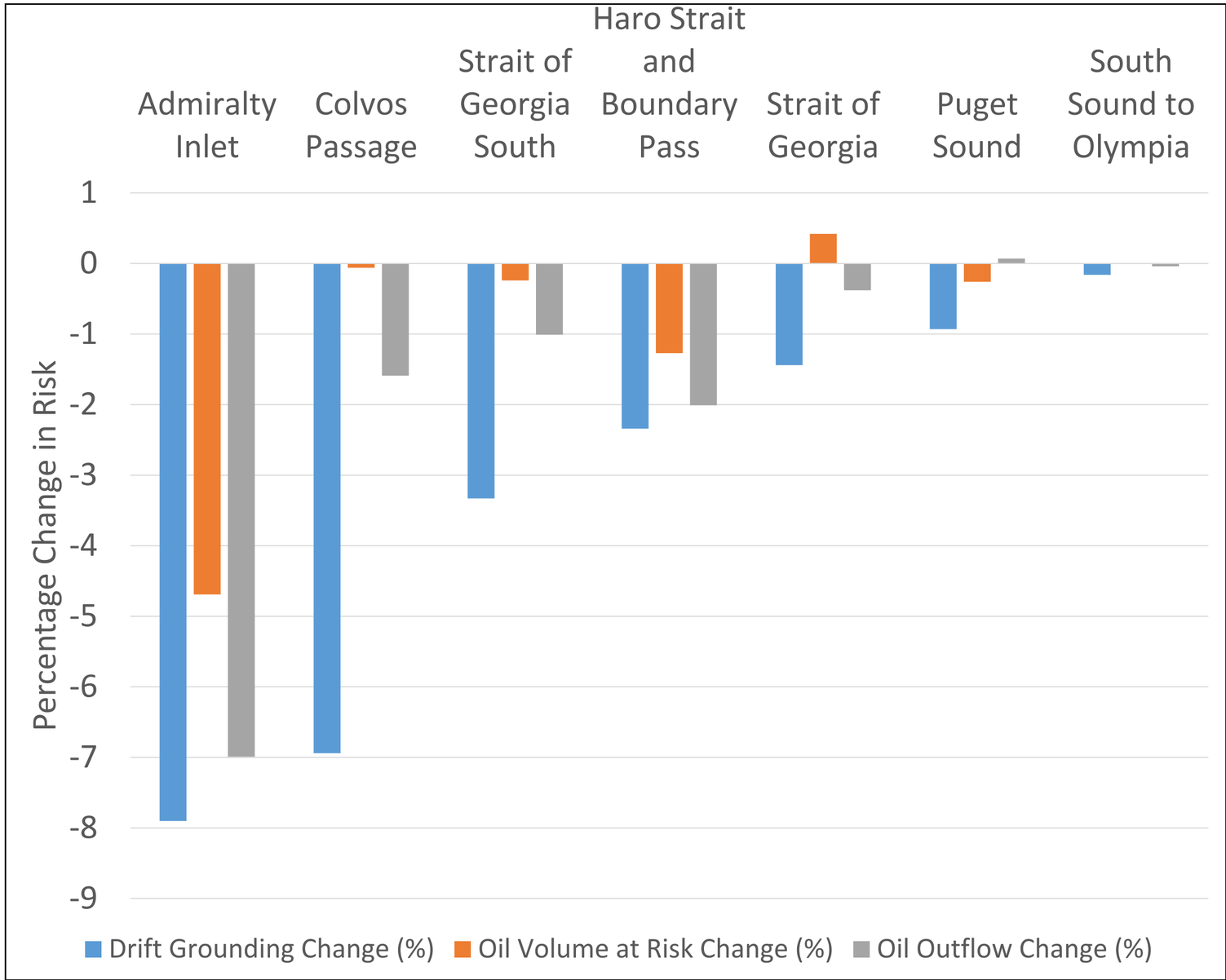
- Drift groundings declined 0.0035 per simulation
- Oil volume at risk declined 103.9 gallons
- Oil outflow declined 0.4 gallons

Changes in oil spill risk for Scenario 3 escort expansion, by zone

In Scenario 3, escorts were newly required throughout the rest of the study area

- In absolute terms, Haro Strait and Boundary Pass saw the biggest reduction in risk across all risk metrics:
  - 0.0015 decrease in drift groundings
  - 1,790.3 decrease in oil volume at risk
  - 0.35 decrease in oil outflow

- Admiralty Inlet was a close second at:
  - 0.0015 decrease in drift groundings
  - 1,736.7 decrease in oil volume at risk
  - 0.29 decrease in oil outflow

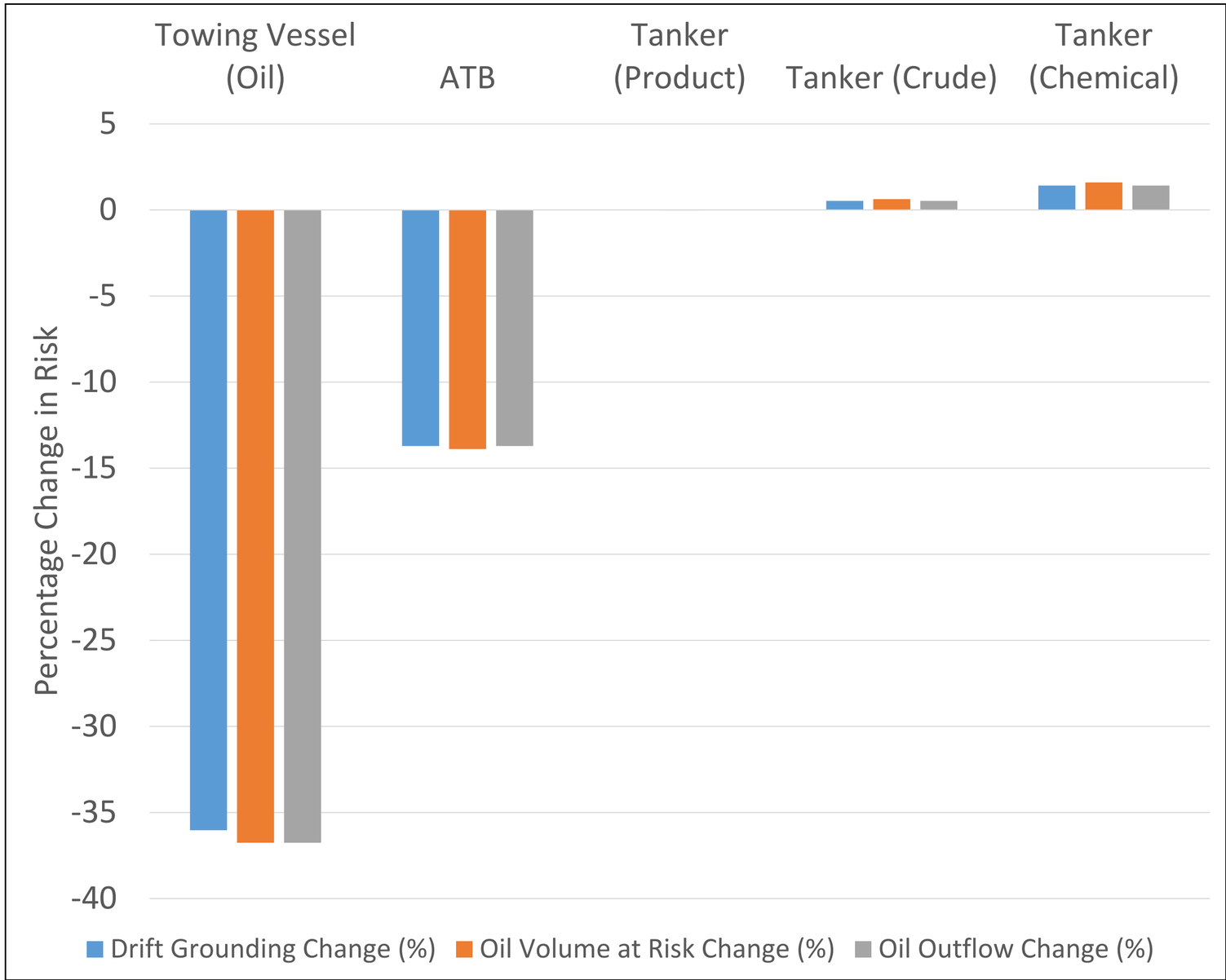


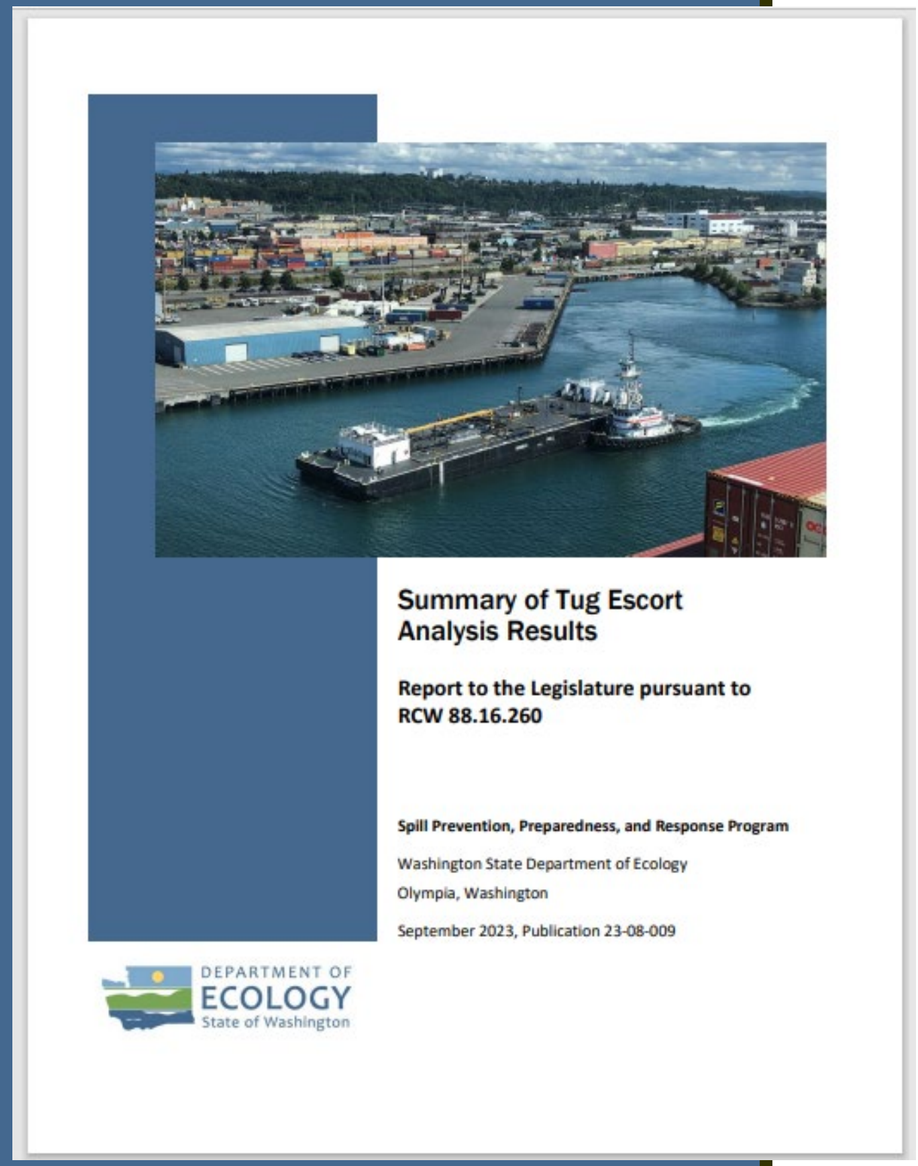
Changes in oil spill risk for Scenario 3 escort expansion, by vessel type

In Scenario 3, escorts were newly required for five vessel types:

- ATBs over 5,000 DWT
- Towed oil barges over 5,000 DWT
- Chemical tankers under 40,000 DWT
- Crude tankers under 40,000 DWT
- Product tankers under 40,000 DWT

Only towed oil barges and ATBs saw an additional reduction in risk, beyond what we saw in Scenario 2.





Other Analysis Results

- **Risk from additional escort traffic**
- **How tethered escorts affect oil spill risk**
- **How escort tugs may support loss of steering events**

Risk from additional escort traffic

Model results provided estimates of how expanding tug escorts requirements increase escort tug movements.

Based on historical incident rates for tugs*, that increase in underway time implies an increase in risk.

- For Scenario 2, we estimated a 134 percent increase in underway escort tug time
- For Scenario 3, we estimated a 263 percent increase in underway escort tug time

Incident Type	Incident Rate per operating minute	Number of additional incidents per year (Scenario 1 to Scenario 2)	Number of additional incidents per year (Scenario 2 to Scenario 3)
Allisions/Collisions	2.31×10^{-7}	0.1063	0.4917
Groundings	7.12×10^{-8}	0.0328	0.1515
Sinking/Capsize	1.78×10^{-8}	0.0082	0.0379
Other	1.09×10^{-6}	0.5016	2.3201

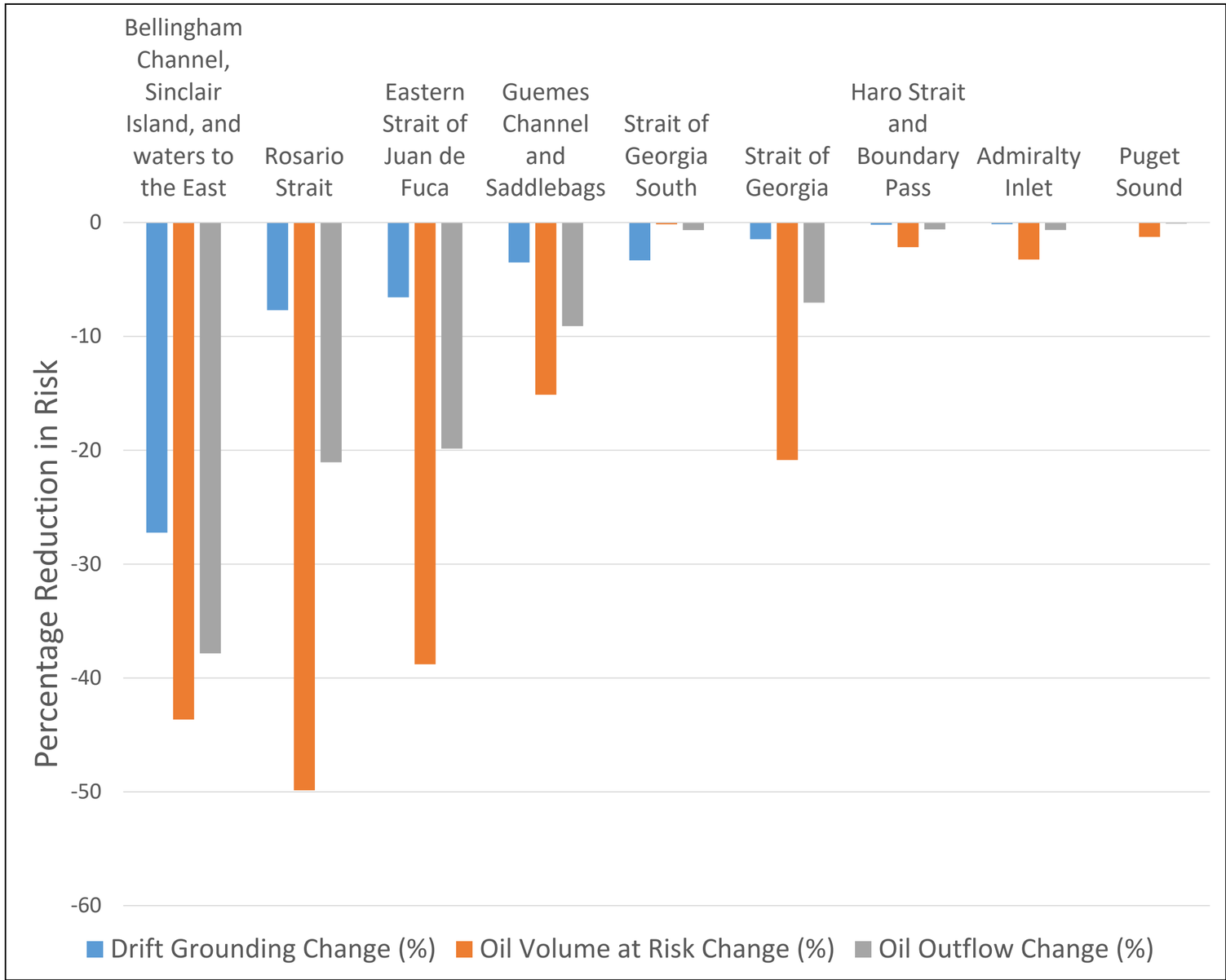
*The vessel categories that we used to calculate hazards included tugs that aren't specifically escort tugs. For the USCG MISLE database we included incidents associated with vessels classified as "towing vessels," including "harbor/ship assist (tug)", "pushing ahead (towboat)", "pushing ahead/hauling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

How tethered escorts affect oil spill risk

When vessels required to be escorted under Scenario 2 are modeled as tethered the model shows an additional reduction in risk in the study area.

In our model, the tethering of escort tugs, reduces the time required for a tug to connect and control a disabled vessel from 30 minutes to 15 minutes.

- Bellingham Channel, Sinclair Island, and waters to the east and Rosario Strait saw the greatest percentage reductions in drift groundings due to tethering.



How escort tugs may support loss of steering events

For loss of steering events, we assessed how frequently laden vessels are escorted when an event occurs.

We also examined how close the nearest tug of opportunity was to the event.

- Percentage of loss of steering events where an escort was present:
  - 38 percent in Scenario 1
  - 62 percent in Scenario 2
  - 99 percent in Scenario 3

- Model results indicated that on average the nearest tug of opportunity is over an hour away when a laden tank vessel loses steering.

Credit: U.S. Navy photo by Mass Communication Specialist 2nd Class Cameron McCulloch/Released Source: https://www.flickr.com/photos/navalsurfaceforces/35401626713

Report findings

- Drift groundings make up a small part of maritime oil spill risk.[1]
- Tank vessels make up a portion of drift grounding oil spill risk (33-43%).[2]
- Tug escorts have a preventative effect on drift groundings of tank vessels.[3]
- The expansion of tug escorts to Rosario and connected waters east reduced oil spill risk by 2-3% over the whole study area – 0.0047 drift groundings per simulation year.[4]
- Haro Strait and Boundary Pass, and Admiralty Inlet had the most meaningful reductions in risk when escorts requirements were expanded there – an additional combined 0.0030 per simulation year.[5]
- Escort tug underway time increased 134% when escort requirements were added to Rosario Strait and connected waters; and 263% when requirements were expanded to the rest of study area waters.[6]

[1]Drift groundings account for 2% of marine accidents, and 2% of drift groundings are linked to spills (pg 23, Tug Escort Report).
[2]See table A-21, Tug Escort Report.
[3]See slides 10 and 16 in this presentation.
[4] See slide 15 in this presentation.
[5] See slide 15 in this presentation.
[6] See page 32, Tug Escort Report.

Results Discussion

Questions?

Introduction to filtering of analysis result

The model structure allows filtering of variables to better analyze the model results. Our final report, and the results presented today represent one way of filtering the results.

Filtering can help us further examine results of interest.

Available variables include:

- Zone
- Vessel type
- Laden status
- Deadweight tonnage (DWT)
- With or without anchoring potential
- With or without tugs of opportunity
- With or without tethering

Use of filters

The purpose of a filter: Deeper evaluation tug escort ideas under consideration.

How will filters be used: The rulemaking team will request them as needed.

An example of a filter

Variable	Filter Selection for Published report	Filter Selection for Rule Analysis
Zone	Include All	Rosario Strait, Guemes Channel and Saddlebags, Bellingham Channel and waters east
Vessel Type	Include All	ATBs, Barges, and Product, Chemical and Crude Tank Ships
Laden status	Include All	Laden only
DWT	Include All	Under 40,000 DWT
Anchoring	Y	Y
Tug of Opportunity	Y	Y
Tethered	N	N

What the filter shows

Oil spill risk changes across the entire study area.

Oil spill risk changes for laden vessels under 40,000 DWT within Rosario and connected waters?

Upcoming Workshops

Dates	Activity
February 2023	CR-101, rule announcement
March 2023	SEPA Scoping meeting
May 2023 – Dec 2024	Workshops with tribes, stakeholders, and interested parties
July 2025	CR-102, propose rule
December 2025	CR-103, adopt rule
January 2026	Rule effective

Dates	Activity
January 10, 2024	OTSC – Workshop #5
January 23, 2024	Tribal Meeting #5
January 25, 2024	Stakeholder Workshop #5
January 31, 2024	OTSC – Workshop #6
February 6, 2024	Stakeholder Workshop #6
February 8, 2024	Tribal Meeting #6

Additional Discussion

Questions?

Oil Spill Risk Metrics

Drift Grounding Metric

- The drift grounding metric is designed to represent the likelihood of drift groundings. It is weighted by incident likelihood and the overall number of drift groundings identified in model outputs.

Oil Volume at Risk Metric

- Oil volume at risk is designed to represent risk of a maximum potential spill. It is based on the fuel and oil cargo capacity of an involved vessel. It is calculated by multiplying the maximum possible volume of oil (in gallons) aboard a simulated vessel, against the incident likelihood.

Oil Outflow Metric

- The oil outflow metric is designed to represent risk of an average potential spill. It doesn't produce specific outflows for individual events. It is based on the historical averages of spill size, and the historical probability of spills per incident, per vessel type. It is calculated by multiplying the average historical spill volume (in gallons) for a vessel type, against the spill probability per incident, against the incident likelihood.