Letter of Transmittal

School of Marine and Environmental Affairs Consultant Team
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National Oceanic and Atmospheric Administration
4570 W Marginal Way SW Seattle, WA 98106

Dear NOAA,
Attached to this letter is the requested policy issue paper investigating alternative policies and solutions surrounding the impact of passenger-only ferries (POFs) on Southern Resident Killer Whales (SRKW) and relevant decision-making. An executive summary appendices containing details about the significance of POFs on SRKW and an analysis of each proposed policy alternative are also included. We look forward to hearing back from you at your earliest convenience; if there are any questions, please do not hesitate to reach out to any one of us, and we would be happy to assist you.

Sincerely,
School of Marine and Environmental Affairs Consultant Team
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Executive Summary

The Puget Sound region faces a pressing challenge: managing the increasing traffic congestion while safeguarding the fragile ecosystem, particularly the endangered SRKW. The analysis delves into the potential risks POFs pose to SRKW, including vessel strikes, noise disturbance, and oil spills. It reviews existing regulations and identifies gaps in POF regulation that must be addressed to mitigate these risks effectively. Through a comprehensive literature review, the paper identifies three alternatives to minimize the impact of POFs on SRKW while still meeting the region's transportation needs.

The alternatives presented in this analysis encompass the establishment of stringent regulations for POFs, integrating measures to diminish noise disturbance and augment vessel monitoring and detection of marine wildlife. The effective implementation of these recommendations necessitates a collaborative effort among federal agencies, local governments, industry stakeholders, and environmental organizations.

In conclusion, this analysis underscores the urgent need for proactive measures to manage the impacts of POFs on SRKW and the marine ecosystem. By adopting a holistic approach that

balances transportation needs with environmental conservation, policymakers can ensure the Puget Sound region's long-term sustainability and its iconic resident killer whales.

Background of the problem

A. Overview Problem Situation

SRKW are a critically endangered species of large cetacean in Puget Sound. These large marine mammals are piscivorous, meaning that they only consume fish in their diet. Unfortunately, due to heightened anthropogenic disturbance within the past 150 years, the SRKW population has experienced a steep decline, with only 74 documented individuals remaining in Puget Sound.

Although Puget Sound has always been utilized for transportation by indigenous communities, the rapid shift to steam-powered passenger ferries in the late 1800s and early 1990s marked the beginning of commercial use of Puget Sound. Throughout the 1900s, the expansion of POFs, or passenger-only ferries, could be seen within the sound, even with the rise of vehicle-delivery ferries experiencing a large increase during the same period. In 2006, Washington state legislature declared POFs an integral part of the transportation infrastructure in the state and diverted further funds to this method of transportation.

Currently, there are four operators of passenger-only ferries exclusively in Washington state: King County Metro, Puget Sound Express, and Kitsap County. Below is a table documenting the schedule of each POFs operator, including the total sailing hours.

Table 1. Current POF Routes and Operators in Puget Sound

Route Name	**Vashon-Seattle (King)**	**W.Seattle - Seattle (King)**	**Bremerton-Seattle (Kitsap)**	**Kingston - Seattle (Kitsap)**	**Southworth-Seattle (Kitsap)**	**Seattle-Victoria (Clipper)**	**Friday Harbor-Port Townsend (Puget Sound Express)**
Schedule	(M-F) 12 trips total per day	(M-F) 34 trips total per day (S&S) 22 trips total	(M-F) 40 trips total per day (Sat) 7 trips total	(M-F) 12 trips total per day	(M-F)16 trips total per day	Varied 1-2x a day; **632 total** sailings	(M-S) 2 trips total per day April 26 – Septembe

		per day	per day			for 2024	r 22 150 days
Min. Per Trip	22 minutes per trip	10-15 minutes per trip	30 minutes per trip	40 minutes per trip	26 minutes per trip	2 hrs 45 min	19 knots; 29 miles= 1.5 hrs
Holidays affecting sailings	12	7	4	4	4		0
Total Hours Per Year	1,095.6 hours per year	2,275.8 hours per year	5,504 hours per year	2,056 hours per year	1,781.9 hours per year	1,738 hours per year	450 hours per year

As shown in the table, POFs are highly utilized as transportation between the mainland and various islands within Puget Sound, and the number of routes has continued to grow. Currently, there are 4 new proposed routes for POFs within Puget Sound, shown in the table below.

Table 2. Potential New POFs Routes in Puget Sound

Potential Route	**Tacoma-Seattle**	**Bellingham-San Juans**	**Everett-Whidbey**	**Des Moines-Southworth (Puget Sound Express)**
Schedule	(M-F) 12 trips total	(M-Sun) 8 trips total Seasonal (6 Months a year)	(M-F) 12 trips total	(W-Sat) 8 trips total
Min. Per	55 minutes	50 minutes	20 minutes	40 minutes

Trip	per trip	per trip	per trip	per trip
Total Hours Per Year	2,871 hours per year	1,216.7 hours per year	1,044 hours per year	1,109.3 hours per year

With the total hours of vessel routes being well over 10,000 hours per calendar year, the need to monitor, regulate, and mitigate the impact of these vessels on the SRKW population has been identified to be critical for the population's survival. Especially with the proposal of new POFs routes and the testing of one of these routes already being conducted (Des Moines), the impact of POFs on SRKW and the concurrent regulation of these impacts must be conducted. Although these are not the only vessels within Puget Sound consistently, there is an apparent lack of solid regulation around POFs and their interaction with SRKW.

B. Problem Sensing

POFs, along with other large commercial vessels, have been attributed to a heightened negative impact on the ecosystem of Puget Sound, specifically SRKW. Negative impacts include chemical pollution, vessel strikes of SRKW, and underwater noise. Underwater noise has been identified as one of the major impacts of the SRKW; heightened amounts of ambient noise have been shown to disrupt the population's communication mechanism, making it confusing and difficult for these mammals to make sense of their environment. SRKW and other killer whales rely heavily on echolocation through clicks, whistles, and calls. This sound transmittal into the environment allows them to send and receive signals about their surrounding environment by forming an image of their surroundings. This image of their surroundings allows SRKW to navigate waters and locate and capture prey. Besides disrupting this vital form of communication and navigation for SRKW, heightened anthropogenic ambient noise has been shown to increase stress levels. This higher baseline of stress within SRKW has been linked to lower fertility rates and pod cohesion.

C. Prior Efforts to Solve Issue

Stopping the decline of SRKW is a multifaceted issue, with the involvement of multiple regulatory bodies and stakeholders needed to save this species from harmful anthropogenic

effects. Past efforts to solve declining SRKW due to increasing vessel noise include voluntary slowdown measures, lateral displacement of vessel routes outside of known SRKW territory, and mandatory 1000m buffer zones around SRKW members. However, these past efforts have focused on general vessel noise, and have not targeted POFs vessel noise or disturbance to SRKW.

Significance of the problem

A. Evaluate past policy performance

Through research, we identified multiple entities wielding regulatory authority in Puget Sound. However, no specific regulatory framework addressing POFs is focused on potential impacts on SRKW. This results in a fragmented regulatory landscape, leaving gaps in the comprehensive mitigation of vessels' risks to SRKW's recovery. Despite the complicated nature of the issue, proactively addressing these gaps can significantly contribute to SRKW conservation efforts. According to William N. Dunn's, *Public Policy Analysis: An Integrated Approach,* POF's and their impact on SRKW would be in between a moderately structured and ill structured problem. This fragmented regulatory approach has many stakeholders, but the policy alternatives are limited all with a high success rate, some with high economic costs.

Presently, diverse policies concerning vessels and SRKW exist. While these policies typically center on distinct facets like vessel safety, vessel operator safety, and SRKW recovery initiatives, what is missing is an integrative approach that directly integrates protection-focused controls on POFs with SRKW.

Vessel policies, such as those outlined in the Navigation and Vessel Inspection Circular (NVIC) by the USCG, primarily aim to bolster the operational safety of vessels. This entails prioritizing the protection of onboard staff and passengers with secondary considerations for preventing or mitigating harm to marine life. NVIC 5-01, revised in 2003, explicitly targets high-speed vessels falling under subchapter categories H, K, and T. Subchapter T vessels are defined as small vessels weighing under 100 tons, which includes most POFs (*46 CFR Chapter I -- Coast Guard, Department of Homeland Security*, n.d.). Subchapter K vessels are categorized as medium vessels, capable of carrying more than 150 passengers or offering overnight accommodations for more than 49 passengers (*46 CFR Chapter I -- Coast Guard, Department of Homeland Security*, n.d.). Subchapter H vessels, the largest category, include those like the WSF (*46 CFR Chapter I -- Coast Guard, Department of Homeland Security*, n.d.). For instance, the Clinton to Everett route is anticipated to utilize a subchapter T vessel. In contrast, the Bellingham to San Juans and Seattle to Tacoma routes are expected to employ subchapter K vessels. The NVIC serves as an interpretation of regulations and isn't mandatory, adhering to its guidelines

would establish a baseline for craft and passenger safety, including the addition of an extra crew member during periods of low visibility or when the risk of interacting with SRKW are heightened. Interestingly, whales are regarded as a navigational hazard within the NVIC, yet there are no specific provisions addressing the safety of cetaceans .

Contrastingly, the Marine Mammal Protection Act (MMPA) of 1972 advocates for an ecosystem-based approach to natural resource management and conservation. This legislation prohibits the take (including hunting, killing, capture, and harassment) of marine mammals. For cetaceans, oversight of the Act primarily rests with NOAA. All killer whale populations are safeguarded by the MMPA, which grants regulatory authority to NOAA. Only two killer whale populations are granted distinct protections under federal law: The Southern Resident population is one of the two and was designated as endangered in 2005 according to the Endangered Species Act and is classified as depleted under the MMPA (*NOAA,* 2024).

In 1994, the MMPA was amended to facilitate an expedited process for citizens and U.S. agencies to seek authorization for incidentally taking small numbers of marine mammals through "harassment," known as Incidental Harassment Authorizations (IHAs). IHAs are now a regulatory mechanism under the MMPA and ESA (*NOAA,* 2024). IHAs are issued by government agencies such as the National Marine Fisheries Service (NMFS) to authorize the incidental, but not intentional, harassment of marine mammals during activities such as seismic surveys, construction projects, or military exercises (*NOAA,* 2024). These authorizations limit the level of harassment allowed and often require measures to minimize impacts on marine mammals (*NOAA,* 2024). IHAs are typically issued for specific periods and locations, and they may include monitoring requirements to ensure compliance with the conditions outlined in the authorization (*NOAA,* 2024). WSF has acquired IHAs for short-term activities that may inadvertently harass marine mammals, with most IHAs involving the incidental harassment of marine mammals by noise (*Chapter 320,* 2016).

Washington State plays a pivotal role by collaborating and providing input to federal agencies, particularly NOAA, which holds jurisdiction over issuing IHAs (*Washington Department of Fish and Wildlife,* 2024). Washington State may contribute valuable data, recommendations, or regulatory guidelines to safeguard marine mammals. Moreover, it collaborates with federal counterparts to ensure adherence to state laws and regulations concerning marine mammal protection (*WDFW,* 2024). On the other hand, NOAA assumes a central role in the IHA process by evaluating and granting authorizations for activities that could cause incidental harassment to marine mammals, such as underwater construction or vessel operations (*NOAA,* 2024). NOAA assesses the potential impacts of these activities on marine mammal populations, issuing IHAs with appropriate mitigation measures to minimize harm (*NOAA,* 2024). Furthermore, NOAA oversees compliance with the terms and conditions of these

authorizations, conducting environmental reviews, consulting stakeholders, and monitoring activity to uphold marine mammal welfare and conservation (*NOAA,* 2024). In the context of proposed new routes for fast ferries within Puget Sound, designated critical habitat under the ESA for the SRKW population, NOAA holds authority to reject IHAs for such routes under the MMPA and the ESA, as a means of safeguarding the SRKW population.

The Cetacean Desk is an experimental program, currently scheduled for 3-4 years, drawing loose inspiration from Canada's Marine Mammal Desk. Its objective is to enhance real-time situational awareness of cetaceans for large commercial vessels. The Cetacean Desk will be housed in VTS Seattle. It's important to clarify that the VTS does not normally engage with recreational vessels; therefore, the Cetacean Desk will not interact with them directly.

Washington Department of Fish and Wildlife (WDFW) oversees the licensing requirements for commercial whale-watching vessels. WDFW aims to minimize the impacts of recreational and commercial whale-watching activities on SRKW (*WDFW,* 2022). WDFW adheres to the regulations outlined in RCW 77.15.740, which currently mandates a 400-yard distance between vessels and SRKW. However, beginning January 1, 2025, this requirement will be expanded to a 1,000-yard distance for recreational boaters, as stipulated by Senate Bill 5371 (*WDFW,* 2024).

The Quiet Sound initiative is a collaborative program between federal, state, tribal, port, maritime industry, scientists, and NGOs aimed at mitigating the impact of large commercial vessels on SRKW through voluntary measures (*Quiet Sound,* 2024). Quiet Sound is an initiative under the nonprofit entity Washington Maritime Blue (*Quiet Sound,*2024). Stemming from Recommendation 22 of the ORCA Task Force, the program draws inspiration from the established ECHO initiative in British Columbia. Following submitting a proposal to the state legislature, funding for Quiet Sound was secured in spring 2021. Administrative support for the newly established Quiet Sound program is provided by the nonprofit organization Washington Maritime Blue (*Quiet Sound,* 2024). Quiet Sound is a voluntary initiative for SRKW in Puget Sound to minimize underwater noise during peak periods. The program conducted a voluntary slowdown trial within the inbound and outbound shipping lanes of Admiralty Inlet and North Puget Sound, requesting that vessels reduce their speed to 11-14 knots, contingent upon their size (*Quiet Sound,* 2024). This foundational trial occurred from October 24, 2022, to January 12, 2023 (*Quiet Sound,* 2024). Results from this trial will be outlined in a later section. Quiet Sound is presently evaluating results of its second slowdown initiative, conducted from October 2023 to January 2024 (*Quiet Sound,* 2024).

B. Assess the scope and severity of problem

In Puget Sound, vessels are abundant, posing significant risks to SRKW and cetaceans in general. Vessel noise is a major threat as it interferes with their communication signals, including clicks, calls, and whistles, which are crucial for foraging and echolocation. This disruption in foraging leads to inadequate nutrition and can have far-reaching consequences on marine animals' immune function, growth, and development.

The presence of vessels has also been observed to diminish whales' foraging activities, resulting in prolonged dive durations and slower ascents, affecting individuals' growth, reproduction, and overall fitness. The consequences extend to reproductive female orcas, primarily affected by interruptions to foraging behaviors, resulting in a shift from diving to traveling, expending more energy. This disruption in successful foraging can lead to reproductive stress. Additionally, female orcas share their prey at the surface, making them vulnerable to disturbances from noise or presence, potentially causing nutritional deficits for pregnant or nursing individuals and further impeding recovery.

Unfortunately, quantifying vessel strikes on cetaceans has proven challenging. The occurrence of vessel strikes can unfold in two scenarios: either as an event witnessed by observers or as an unnoticed incident where harm is inflicted upon a whale and evidence surfaces only upon post-mortem examination. Studies by Laist et al. (2011) and Conn and Silber (2013) indicate a significant reduction in fatal strikes when vessels operate below 10 knots and POFs travel upwards of 35 knots.

Given that POF can travel at speeds exceeding 30 knots per trip, the risk of vessel strikes is heightened for SRKW and slower-moving whales like the humpback, which are also protected under the MMPA.

C. Determine the need for analysis

As you can see, there is a lot of specific regulation context, but none at the intersection of POFs and SRKW. Managing vessel traffic in Puget Sound represents a complex and pressing challenge with significant implications for the conservation and recovery of the SRKW population. While various agencies and organizations play roles in managing vessel traffic, there is a clear need for enhanced coordination, strengthened regulations, and innovative solutions to safeguard SRKW habitat and mitigate the risks posed by vessel traffic. This analysis has revealed the limitations of existing regulatory mechanisms in effectively addressing these challenges. Therefore, further analysis is required to determine feasibility of policy alternatives.

Problem statement

A. Diagnose problem

The problem addressed in this paper is how best to reduce disturbance of the Southern Resident Killer Whales (SRKW) from POF currently operating and scheduled to be operated in Puget Sound.

The Orcas are an "iconic species" in the State of Washington and have cultural value to the Indigenous Tribes. In spite of such significance, the killer whale was designated as an endangered species under the Endangered Species Act in 2005 and the population has declined to the lowest level of 74 since 1984 (NOAA, 2021; Executive Order 18-02, 2018). In addition to the declining population size, the killer whale's behavior and abilities to forage and communicate are known to be affected by vessels and their noise (NOAA, 2021).

In response, there have been many actions taken to address this issue. For example, Governor Jay Inslee launched a Washington State Task Force in 2018 and the Task Force made relevant recommendations, among which 12 were related to the impact of vessel traffic. In particular, recommendation 20 calls for enhancing enforcement and upholding regulations concerning small vessels. Nonetheless, there are still regulatory gaps concerning the interaction between fast ferries and the Southern Resident Killer Whales.

Against this backdrop, the issue addressed in this paper is what would be the best option to reduce vessel noise and disturbance on the Southern Resident Killer Whale. To address this issue, three alternatives will be examined by employing judgemental forecasting methods to determine the level of effectiveness and feasibility of the policy. While there are multiple stakeholders, few primary stakeholders will implement alternatives set forth below.

B. Describe major stakeholders

Stakeholders who significantly affect and are significantly impacted by the prescription and implementation of policy can be categorized as follows:

- Primary stakeholders: operators of fast ferries, NOAA, US Coast Guard, Washington Department of Fish and Wildlife (WDFW), Cetacean Desk, Quiet Sound
- Secondary stakeholders: Pacific Whale Watch Association
- Tertiary stakeholders: advocacy groups and environmental NGOs.

Taking into account the different levels of influence, this paper will focus its analysis on the effectiveness and feasibility of policy from the perspectives of primary stakeholders, and other stakeholders will not be discussed in the analysis.

C. Define goals and objectives

The main goal of this policy is to reduce disturbance of the Southern Resident Killer Whales from vessels operating in the Puget Sound. The objective to meet this goal is i) to improve vessel capacities to detect the presence of the SRKW, and ii) to prevent possible impact of vessels (e.g. noise, strikes) to the whales' behavior and their abilities to forage and communicate. Any efforts to better detect the whales and minimize the impact of vessels to the whales should take into account the effectiveness and feasibility of policy actions and the interest of the stakeholders involved.

Analysis of alternatives

A. Describe alternatives

- Alternative 1 (Alt-1): **Status quo.** POFs would maintain their current operation without implementing any changes to the vessel operators or any further implementation of technology that can track SRKW.
- Alternative 2 (Alt-2): **Technology use.** PFOs implementation of audio-visual devices and thermal cameras to keep the vessel from striking killer whales and avoid collision.
- Alternative 3 (Alt-3): **Voluntary efforts**. Encouraging POFs operators to voluntarily slow down through training and incentives when the navigation vessel is in the proximity of SRKW.

Feasibility Table With Stakeholders

B. Forecast consequences of alternatives

The suggested options outlined above adhere to well-established research principles and predictable behavioral patterns of involved parties. This paper contends that there is a need to advocate for the enhancement and implementation of strategies and technologies that limit the polluting impact of PFOs on SRKW's well-being. Due to this emphasis on values, we employed abductive reasoning through judgemental forecasting as the most suitable method. Judgemental forecasting is based on Expert Judgement, and uses the method of feasibility forecasting in order to assess the practicality and viability of each alternative in meeting the ethical imperative of reducing PFOs noise pollution and traffic, thereby positively impacting the lives of SRKW in the Puget Sound. (Dunn, 2018) Feasibility forecasting tables were utilized to observe if the stakeholders will support or oppose the alternatives and which could be identified as the most feasible to implement.

Appendix

Alternative 1 - Status Quo

`Stakeholder	**Coded Position**	**Probability**	**Resources Available**	**Resources Rank**	**Feasibility Score**
Kitsap Transit	1	0.8	0.5	0.7	0.28
King County Water Taxi	1	0.7	0.6	0.8	0.336
Puget Sound Express	1	0.6	0.4	0.5	0.12
NOAA	-1	0.9	0.8	0.9	-0.648
Cetacean Desk	-1	0.9	0.8	0.9	-0.648
WDFW	-1	0.7	0.6	0.7	-0.294
Quiet Sound	-1	0.8	0.9	0.8	-0.576
USCG	0	0.5	0.5	0.6	0
Total Feasibility					-1.43
Adjusted Feasibility					-0.715

- Alt-1: The Feasibility Table shows that Kitsap Transit, King County Water Taxi, and Puget Sound Express would support Alt-1, these organizations may fear that any drastic changes to boost the orca population may disrupt the balance of the environment, and affect their operation leading to uncertainty and potential losses. Status quo policies may be preferred for the beliefs of slowing down change to think about the issue holistically, rather than a quick fix, also helping in maintaining positive relationships due to a lack of navigating conflict.

Alternative 2 - Technology

`Stakeholder	**Coded Position**	**Probability**	**Resources Available**	**Resources Rank**	**Feasibility Score**
Kitsap Transit	1	0.7	0.6	0.8	0.336
King County Water Taxi	1	0.5	0.5	0.6	0.15

Puget Sound Express	1	0.6	0.4	0.5	0.12
NOAA	1	0.9	0.8	0.9	0.648
Cetacean Desk	1	0.9	0.8	0.9	0.648
WDFW	1	0.8	0.7	0.8	0.448
Quiet Sound	1	0.8	0.9	0.8	0.576
USCG	1	0.7	0.7	0.8	0.392
Total Feasibility					3.318
Adjusted Feasibility					1.659

- Alt-2: The feasibility table shows that Alt-2 would be supported by every stakeholder due to its potential to significantly reduce vessel collisions with killer whales. Kitsap Transit, King County Water Taxi, and Puget sound express are keen on safeguarding marine wildlife while maintaining efficient operations. NOAA, Cetacean Desk, and WDFW emphasize the importance of protecting endangered species and preserving marine ecosystems. QuietSound and the USCG back the alternative for its alignment with environmental conservation efforts and maritime safety regulations.

Alternative 3 - Voluntary Efforts

`Stakeholder	**Coded Position**	**Probability**	**Resources Available**	**Resources Rank**	**Feasibility Score**
Kitsap Transit	1	0.8	0.7	0.7	0.392
King County Water Taxi	1	0.65	0.5	0.6	0.195
Puget Sound Express	1	0.5	0.4	0.5	0.1
NOAA	1	0.9	0.9	0.9	0.729
Cetacean Desk	1	0.9	0.8	0.9	0.648
WDFW	1	0.8	0.7	0.8	0.448
Quiet Sound	1	0.8	0.8	0.8	0.512

USCG	1	0.8	0.7	0.8	0.448
Total Feasibility					3.472
Adjusted Feasibility					1.736

- Alt-3: All stakeholders support Alt-3, which encourages voluntary efforts for POF operators to slow down through training and incentives, due to its cost-effectiveness and immediate implementation potential. Kitsap Transit, King County Water Taxi, and Puget Sound Express favor it for minimizing operational disruption while enhancing whale protection. NOAA, Cetacean Desk, and WDFW appreciate the proactive approach and its positive impact on conservation without requiring regulatory changes. QuietSound and the USCG endorse the alternative for promoting industry cooperation and conservation management.

C. Describe any spillovers and externalities

- **Alt-1:Status Quo**

- **Negative externalities**: Continued risk of vessel collision with SRKW, potentially leading to injuries and fatalities among an already endangered population. While there is already an ongoing environmental degradation and disruption of the marine ecosystem due to chemical pollution and underwater noise. Furthermore, there is a potential long-term economic impact from declining whale populations affecting both ecological balance and tourism, interests of all the stakeholders present within analysis.
- **Positive externalities**: No improvement or positive externalities directly related other than minimal immediate cost or no new investment, and stability or predictability in operational procedure.

- **Alt-2:Technology**

- **Negative externalities**: High initial costs for the equipment development, purchase, installation and maintenance, therefore a possible push back from stakeholders of Alt-2 integration into existing systems.
- **Positive externalities**: A significant reduction in collision with killer whales and therefore enhancing their survival and contributing to the larger marine biodiversity of the Puget Sound. Manufacturing industries which are responsible for on-board camera, audio, visual, would benefit from the application and continue the technology development. By installing these devices, there will also be an improvement in data collection on whale movements which benefit the conservation efforts through research.

Lastly, an increased public awareness and support for marine conservation through visible technological measures.

- **Alt-3:Voluntary Efforts**

- **Negative externalities**: POFs are privately owned entities that would need to adhere to outside of commercial regulations, there could be inconsistent compliance among operators leading to low effectiveness. Because of slowing down the vessel, there could be potential delays that could cause a pushback from the general public. There will be administrative costs associated with the training programs and managing the incentives schemes.
- **Positive externalities**: POFs could increase their accountability and engagement in committing to marine conservation through voluntary measures. There would be flexibility in implementation since it would allow operators to have a different response depending on the circumstances. This would mean to be in control and being in a position of leadership in environmental stewardship. Lastly, there could be progress into the well-being of SRKW that will allow a greater margin of time to further implement any technology and policy change.

D. Assess constraints and political feasibility

The commitment of minimizing harm and enhancing SRKW well-being seems to be a common ground among all the stakeholders; however there are constraints and political feasibility when evaluating the alternatives, based upon cost, acceptance, regulatory implications, and practical implementation challenges. (Dunn, 2018)

- **Alt1 (Adjusted Feasibility: -0.715)** This negative score reflects the inadequacy of the status quo in addressing critical environmental concerns and its potential future regulatory and reputational risk. Alt-1 constraints are failing to address the ongoing threat to killer whales, which would lead to a further pushback and increased pressure from environmental groups and regulatory bodies.
- **Alt2 (Adjusted Feasibility: 1.659)** This positive score reflects the substantial environmental benefits and strong political support, outweighing the financial/technical constraint. Significant investment may be required with available support and maintenance. However, there is a need to get funding from state and federal agencies since POFs contribute to the transportation and are an alternative from cars meeting WA State emissions goals.

  Furthermore, this alternative has substantial backing and support from environmental agencies, NGOs, and the public due its protective commitment.

- **Alt3 (Adjusted Feasibility: 1.736)** The highest score reflects the balance within environmental benefits, stakeholder acceptance, and political feasibility. Making Alt-3 the most practical and widely supported option. This alternative succeeds in lowering cost, but leaving the accountability and efficiency into the operators leadership.

Conclusions and recommendations

A. Selection criteria

Selection criteria for the preferred policy alternative is ranked by four factors: i) positive impact on the SRKW; ii) economic burden on vessel operators; iii) government expenditure (including subsidy for devices; human and monetary resources used for SRKW protection); and iv) political feasibility (whether there is opposition from NGOs; political environment is mature to adopt the policy). In addition, different points are allocated to rankings to make the results comparable: 3 points to the 1st ranking; 2 points to the 2nd ranking; and 1 point to the 3rd ranking. The policy alternatives are ranked as shown in Table 3.

Table 3. Selection Criteria and the Results

Alt. Policy	**Impact on SRKW**	**Economic burden**	**Government expenditure**	**Political feasibility**	**Scoring***
Alt-1. Status Quo	3rd	1st	3rd	3rd	6 points
Alt-2 Technology	1st	3th	2nd	1st	9 points
Alt-3 Voluntary	2nd	2nd	1st	1st	**10 points**

B. Results and Recommendation

First, installing onboard audio and video sensors or thermal cameras (Alt-2) will help keep vessels from striking killer whales by detecting the marine mammals in advance and making the vessels avoid the collision. However, compared to the other two alternatives, it would impose a great economic burden on vessel operators who need to install the devices. In addition, government subsidies might be needed as well for the initial installation of the devices. The Alt-2

appears to be feasible given that support from environmental groups and local residents' concern over the status of the killer whales.

Second, encouraging vessel operators to voluntarily slow down in proximity of SRKW (Alt-3) would have a positive impact on the stock status and appears feasible to implement. Compared to Alt-2, the vessel operators would find the Alt-3 less burdensome economically, but some additional operating costs might be incurred when vessels need to slow down their speed or detour the route to avoid the interactions with the whale.

Third, the status quo (Alt-1) seems to be the most viable option when it comes to economic burden on the vessel operator. However, it would not help address possible impact of vessels to the whales' behavior, thereby providing administrative burdens on the government to put more human and monetary resources to better protect the whales. In addition, oppositions from environmental groups are also expected, making the option relatively less feasible.

As shown in Table 3 above, Alt-3 Voluntary Measures is the preferred alternative policy now that it has the most 1st and 2nd place rankings across the four selection criteria. If the impact on the SRKW is given double weight, Alt-2 and Alt-3 will have the same results (Alt-1: 7 points, *Alt-2: 12 points, Alt-3: 12 points*). If economic burden on vessel operators is given double weight, Alt 3 will still be chosen like the rankings without double weighing (Alt-1: 9 points, Alt-2: 10 points, *Alt-3: 12 points*).

We therefore recommend that the Alt-3 be adopted and implemented, since it is likely to be the most politically feasible and contribute to the achievement of intended goals and objectives with relatively less economic burden on the government under present conditions.

C. Description of preferred alternative

Alternative 3 is encouraging vessel operators to voluntarily slow down when the vessels are in proximity to the SRKW. Alt-3 has the greatest potential to be implemented because it can contribute to the policy goal and objectives and, at the same time, there would be not much additional economic burden both on the operator and government agency.

D. Outline implementation strategy

Alt-3 has the objective of encouraging POF operators to voluntarily slow down through training and incentive when navigating in the proximity of SRKW to reduce risk of collision.

a. Providing incentives to participate in a voluntary measure:
    - Incentive design program offering rewards for compliance.

- Ex: fuel subsidies and priority docking privileges.

b. Reduction in dockage fees for vessels/entities & compliance certifications:
   - Dockage fee reductions with vessels that demonstrate consistent compliance with the voluntary speed reduction measures.
   - Development of a certification program to recognize compliant operators and monitor to ensure adherence.
   - Promote both the dockage fee reduction and certification program to facilitate networking.

c. Referencing Quiet Sound Initiative:
   - Aligning with a voluntary efforts program with QuietSound Initiative leverages already existing frameworks and resources.
   - Use QuietSouns monitoring tools to use information and track compliance.
   - Utilize Quiet Sounds data and research to inform training content and refine compliance criteria.
   - Campaigning awareness, joint events, webinars etc.

E. Summarize plan for monitoring and evaluation

The monitoring and evaluation plan for Alt-3 focuses on ensuring the effectiveness of the voluntary efforts program through comprehensive measures. To monitor compliance, the program can utilize Automatic Identification Systems (AIS) and tracking technologies. Within this process, data collection is a crucial component, with detailed data about speed, compliance, and whale sightings. Then, there will be a need to establish metrics adjusted based on data. The evaluation will measure incidents of collision and participation rates. Lastly, reports can be produced to be shared with stakeholders and the public.

F. List limitations and unanticipated consequences

The implementation of Alt-3 is not without limitations. One of the primary challenges is the reliance on voluntary participation, which may lead to inconsistent compliance across different operators. The fact that compliance isn't required, and the voluntary measures are based on willingness to slow down, could reduce the effectiveness of the program. Ensuring accurate and comprehensive monitoring can become challenging in large marine areas. Therefore, there is a need for adequate funding and resources to maintain training and monitoring efforts. Despite the limitations, there are several positive consequences such as an increased awareness and commitment to marine conservation, SRKW population recovery, and partnerships could be strengthened within all the stakeholders. Overall, Alt-3 presents promising opportunities for conservation, careful consideration and mitigation essential for its success.

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