# Report on impacts to marine species at risk from Trans Mountain pipeline expansion project

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## Introduction and Summary

The Wilderness Committee was given $25,000 to conduct scientific research regarding marine species at risk impacts from the Trans Mountain Pipeline Expansion (TMX). This research grant had an attached deadline of a little over a month. Wilderness Committee reached out to experts to conduct the research, all of whom concluded that the allotted amount of time to complete the research on impacts to marine species at risk was drastically not enough. They concluded they would not be able to complete the necessary research given the extremely short deadline.

The Wilderness Committee declined the money and instead are filling this report on the environmental impacts to six federally listed species at risk along the tanker route. There are at least fourteen other marine species at risk that may experience significant adverse harm from the TMX and associate marine traffic. Yet, not enough time has been allotted to do the necessary evaluations for those species.

Therefore, more environmental assessments must be completed for the remaining species at risk along the route. Environmental assessments must determine if significant adverse effects from the project are likely for the leatherback sea turtle, basking shark, bluntnose sixgill, green sturgeon, grey whale, harbour porpoise, long-billed curlew, longspine thornyhead, marbled murrelet, north pacific right whale, northern abalone, rougheye rockfish type I & type II, sea otter, steller sea lion, tope, and yelloweye rockfish.

Wilderness Committee's position is that the TMX project will likely cause significant adverse harm to humpback whales, blue whales, fin whales, short-tailed albatross and pink-footed shearwater. Further, this project will negatively impact the ability to meet recovery objectives laid out in the recovery strategy for the sei whale. This project and its associated risks threatens the survival and/or recovery of these six federally listed marine species at risk. The Wilderness Committee submits that the board should recommend against the approval of the TMX project.

## Trans Mountain pipeline expansion project must review impacts of marine shipping to species at risk

a) Trans mountain ULC ("Trans Mountain") has not provided a complete environmental assessment. Trans mountain's environmental assessment does not adequately identify the Project's environmental effects, the significance of its effects, and mitigation measures. As a result, the Board cannot complete its environmental assessment as required by s. 19(1)(a), (b) and (d) of the Canadian Environmental Assessment Act, 2012 ("CEAA 2012")1 and s. 52(3) of the National Energy Board Act ("NEB Act")2.

b) There are 40 at risk species as listed by COSEWIC and 30 federally listed species at risk designated under the Species At Risk Act along the pipeline route.

Federal prohibitions exist against any activity that would kill, harm, harass, capture or take an individual of a species listed under SARA.

## Trans Mountain pipeline expansion project failed the environmental assessment

*Unless otherwise stated, the following information is taken from the 2018 letter to the Roberts Bank Terminal two panel regarding the terms of reference and scope of environmental assessment for the project, submitted by Ecojustice.*[1]

The TMX includes a pipeline, marine terminal, and marine shipping. The pipeline was the physical activity that triggered the environmental assessment pursuant to the Regulations Designating Physical Activities under CEAA 2012. In its environmental assessment, the Board included only the pipeline and marine shipping and excluded project-related marine shipping from its definition of the "designated project" to be assessed under CEAA 2012. The "designated project", as defined in s. 2 of CEAA 2012, includes physical activities "incidental" to the component of the project that triggers an environmental assessment. The Board considered marine shipping as a part of its review under the National Energy Board Act instead. This approach made a practical difference. The Court noted that "the definition of the designated project truly frames the scope of the Board's analysis", because activities that are part of the designated project are assessed under CEAA 2012, and trigger additional obligations under s. 79(2) of the Species at Risk Act ("SARA").

The Court noted that the exclusion of marine shipping from the designated Project "permitted the Board to conclude that section 79 of the Species at Risk Act did not apply to its consideration of the effects of Project-related marine shipping" and "permitted the Board to conclude that, notwithstanding its conclusion that the operation of Project-related marine vessels is likely to result in significant adverse effects to the Southern resident killer whale, the Project (as defined by the Board) was not likely to cause significant adverse environmental effects."

The Court held that "the Board erred by unjustifiably excluding Project-related marine shipping from the Project's definition", because marine shipping was part of the designated project.

The Court noted on the facts of that case that the primary purpose of the project was to provide additional marine transportation capacity for crude oil to Pacific Rim markets and rejected "the Board's view that it was required to have regulatory authority over shipping in order to include shipping as part of the Project".

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[1] "Re: Terms of Reference and Scope of Environmental Assessment for Roberts Bank Terminal 2 Project." Dyna Tuytel and Margot Venton to The Panel. October 5, 2018. Ecojustice, 2018. 1-5. 2018.

The Court found that the Board "unjustifiably defined the scope of the Project under review not to include Project-related tanker traffic", which "led to successive, unacceptable deficiencies in the Board's report and recommendations."

Specifically, the Board concluded that the project would have significant adverse effects on Southern resident killer whales (the "Southern residents"), but found that the designated project would have no significant adverse environmental effects for the purposes of CEAA 2012 due to the Board's restrictive interpretation of the designated project.

The Board also unjustifiably failed to apply s. 79 of SARA to its consideration of the effects of marine shipping on the Southern residents.

The Court held that the exclusion of marine shipping was a "critical error" which meant that "the Governor in Council could not rely on the Board's report and recommendations when assessing the Project's environmental effects and the overall public interest."

The Board's report was "so deficient that it could not qualify as a 'report' within the meaning of the legislation was it was unreasonable for the Governor in Council to rely upon it."

As such, the Order in Council approving the project was quashed.

## Summary of court case and how it applies to marine species at risk

The Federal Court of Appeal issued its judgment on August 30, 2018 that the scope of the review "unjustifiably" did not include project-related tanker traffic, even though the National Energy Board was "legally obligated" to consider environmental effects. Southern resident killer whales are one of the federally listed species at risk that have the potential to be impacted from the project. However, there are 31 other federally listed species at risk along the marine traffic route that are likely to be impacted from the project. In order to fulfill commitments under section 79 of the SARA and to effectively assess all project-related marine shipping impacts, all species at risk along the TMX marine shipping route must be included in the environmental assessment and risks to those species must be included in the Board's recommendation decision of the project.

The board must consider the following when making a recommendation to the board:[2]

- Section 29(1)(a) of CEAA 2012 requires the Board to include in its report to the Governor in Council a recommendation about whether the project, taking into account mitigation measures, is likely to cause significant adverse environmental effects and if so whether those effects are justified in the circumstances.

[2] Dyna Tuytel, Karen Campbell, and Margot Venton. "FINAL ARGUMENT OF LIVING OCEANS SOCIETY AND RAINCOAST CONSERVATION FOUNDATION." Living Oceans Society and Raincoast Conservation Foundation, 2016.

- Because the Project will affect SARA-listed wildlife species, including the Southern Residents, section 79(2) of SARA imports additional requirements into the environmental assessment and imposes additional, heightened legal obligations on the Board. The Board must meet these obligations to lawfully complete the environmental assessment.
- Section 79(2) of SARA applies when a project is likely to affect a listed species or its critical habitat.12 Section 79(2):
    - a) Establishes a requirement for the Board to ensure that the environmental assessment identifies all adverse effects of the Project on a listed wildlife species and its critical habitat, and, if the Project is carried out, to ensure that those effects are mitigated and monitored;
    - b) Establishes a requirement for the Board to ensure that measures are taken to avoid or lessen all adverse effects of the Project on listed wildlife species and critical habitat, regardless of the significance of those effects; and
    - c) Establishes a requirement that, if a recovery strategy or action plan exists for the species, the measures must be taken in a way that is consistent with that recovery strategy or action plan.
- The Board's Filing Manual reflects these additional SARA-specific requirements, stating that SARA listed species, "are at risk in large part as a result of past cumulative effects on their habitat" and have "crossed a threshold requiring special actions for their protection and recovery", such that "any additional residual effects have the potential to further contribute to this existing situation", and "[c]onsequently, proposed projects must preferably avoid, or fully mitigate or compensate for any residual project contribution to cumulative effects" (emphasis added).

## Marine species at risk to be considered to fulfill requirements under Section 79 (2) SARA

A total of thirty-two species along the tanker route are federally listed as at risk under schedule 1 of the Species at Risk Act.[3] Five federally listed species at risk have critical habitat mapped in the area of the proposed tanker route - southern resident killer whales, northern resident killer whales, marbled murrelet, northern abalone, and humpback whales. Twenty-seven other federally listed species at risk are found within the proposed tanker route but critical habitat has not been mapped for these species. Twelve COSEWIC listed species at risk are found throughout the area of the proposed tanker route.

a) Critical habitat for marine species and protection of habitat

SARA recognizes the importance of habitat for species at risk. For aquatic species, habitat is defined in section 2(1) of the Act as "… spawning grounds and nursery, rearing, food supply,

[3] "Aquatic Species at Risk Map." Map. Fisheries and Oceans Canada. September 26, 2018. http://www.dfo-mpo.gc.ca/species-especes/sara-lep/map-carte/index-eng.html.

migration and any other areas on which aquatic species depend directly or indirectly in order to carry out their life processes, or areas where aquatic species formerly occurred and have the potential to be reintroduced." Critical habitat is made up of "habitat". "Critical habitat" is defined by SARA as "… the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species." Thus, an area that meets the definition of "habitat" for a listed wildlife species with respect to a life process will be necessary for the survival or recovery of that species where there is a lack of such habitat for the species.[4]

For federally listed species at risk with mapped critical habitat, it is required that the minister legally protect this habitat. The Trans Mountain tanker route cuts through the critical habitat of humpback whales and southern resident killer whales.

b) Habitat protection for species at risk without mapped critical habitat

Critical habitat is identified using the best information available. If the information available is insufficient to fully identify critical habitat, the Act requires that the recovery strategy include a schedule of studies.[5] Precautionary approach must be applied when there is a lack of scientific certainty:

For twenty-seven federally listed at risk species along the marine shipping route mapping and identification of critical habitat has not been completed. In these cases, SARA requires that critical habitat be identified to the extent possible using the best available information. In addition, s. 38 of SARA reflects the precautionary approach in the preparation of planning and recovery documents: "In preparing a recovery strategy, action plan or management plan, the competent minister must consider the commitment of the Government of Canada to conserving biological diversity and to the principle that, <u>if there are threats of serious or irreversible damage to the listed wildlife species, cost-effective measures to prevent the reduction or loss of the species should not be postponed for a lack of full scientific certainty."[6]</u>

This means that for the twenty-seven species along the route without mapped critical habitat, the precautionary approach must be applied. Although the critical habitat hasn't been mapped, these species at risk occur and use habitat along the TMX. The precautionary approach requires that measures and action be taken to address and prevent threats and damage to species at risk. The TMX is a serious threat that may cause irreversible damage to the species at risk along the route. The lack of scientific certainty of critical habitat cannot be used as an excuse to avoid addressing threats that twenty-seven federally listed species at risk will face from the TMX project.

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[4] Directive on the Identification of Critical Habitat for Aquatic Species at Risk, 2(1) (2015). Fisheries and Oceans Canada Species at Risk Act

[5] Directive on the Identification of Critical Habitat for Aquatic Species at Risk, 2(1) (2015)

[6] Directive on the Identification of Critical Habitat for Aquatic Species at Risk, 38 (2015)

The DFO has failed to produce critical habitat maps for twenty-seven of the thirty-two federally listed species at risk along the tanker route. This failure to complete critical habitat maps has resulted in weak habitat protections and serious habitat threats being overlooked. Under SARA when a species at risk does not have critical habitat mapped a schedule of studies must be made to fully identify critical habitat. Yet, twenty-seven species at risk within the area of the proposed tanker route do not have critical habitat mapped even though some species legally listing dates back to 2002, sixteen years ago, such as the blue whale. Therefore, DFO's extremely slow timeline for producing critical habitat maps must not be used as an excuse to avoid addressing the threats that theTMX faces to these federally listed at risk species.

## Species at risk impacts from the Trans Mountain expansion project – Humpback whale

### a) Ecology, biology and distribution

*Unless otherwise stated, the information below is gathered from the 2013 Recovery Strategy for the north pacific humpback whale (Megaptera novaeangliae) in Canada.*[7]

Northern humpback whales were designated as threatened in 1989, the status was re-examined and confirmed in 2003 and then downlisted to special concern in 2011. The range of the Northern humpback whale population runs from the west coast of B.C and washington up to Alaska. The recovery strategy states that habitat use in B.C is primarily for foraging and migration. Summer feeding in B.C's productive waters is a critical time because they must build up their fat reserves to sustain them through the winter. Photo identification data from 1992-2006 suggests that the population is utilizing B.C waters, either as a migration corridor or for feeding. High whale densities occur along the east coast of Moresby Island and areas off the north and south west coasts of Vancouver Island. Figure 1 below identifies the locations of the 6401 humpback whales. Notably a high concentration of the locations occurs at the mouth of the juan de fuca strait.

[7] "Humpback Whale (North Pacific Population)." Fisheries and Oceans Canada, 2017.

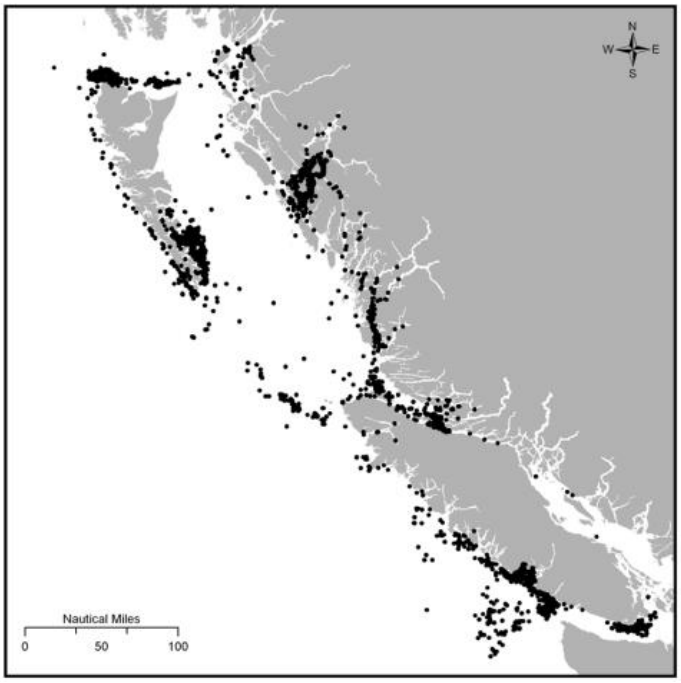


**Figure 1**. Locations of 6401 Humpback Whale photo-identifications in B.C. collected during 1984-2007 (Ford et al. 2009).

Humpback whales feed on a diverse diet of krill and a variety of small schooling fishes[8] (herring and sardine).[9] Humpback whales have no teeth and instead consume their prey using baleen plates which hang from the side of their upper jaws. The baleen plates act as filters and whales will gulp large amounts of water which gets filtered out and the remaining prey is swallowed.[10]

## b) Critical habitat

*Unless otherwise stated, the information below is gathered from the 2013 Recovery Strategy for the north pacific humpback whale (Megaptera novaeangliae) in Canada.*[11]

There have been four distinguishable areas that have been identified as critical habitat and are predictable, persistent hotspots for the humpback whales (Figure 2 and Figure 3). In areas adjacent to the shore, critical habitat boundaries extend to the low tide mark. It is likely that each area supports different parts of the population due to the high degree of site fidelity to feeding

[8] "Humpback Whale (North Pacific Population)." Fisheries and Oceans Canada, 2017.

[9] Andrea Rambeau, John Calambokidis, and 2009-10 DFO Humpback Whale Technical Team. Recovery Strategy for the North Pacific Humpback Whale (Megaptera Novaeangliae) in Canada. Fisheries and Oceans Canada, 2013.

[10] "Humpback Whale (North Pacific Population). Fisheries and Oceans Canada, 2017

[11] "Humpback Whale (North Pacific Population)." Fisheries and Oceans Canada, 2017.

grounds. This means that factors which influence each specific critical habitat area would affect different parts of the population.

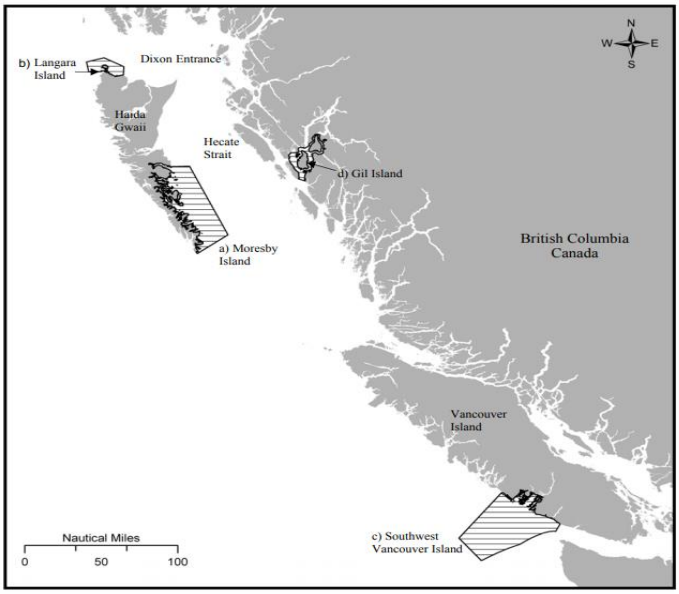


**Figure 2**. Locations of the four critical habitat areas a. Southeast Moresby Island, b. Langara Island, c. Southwest Vancouver Island, d. Gil Island (DFO 2009). The existence of other areas of critical habitat for Humpback Whales in B.C. is likely.

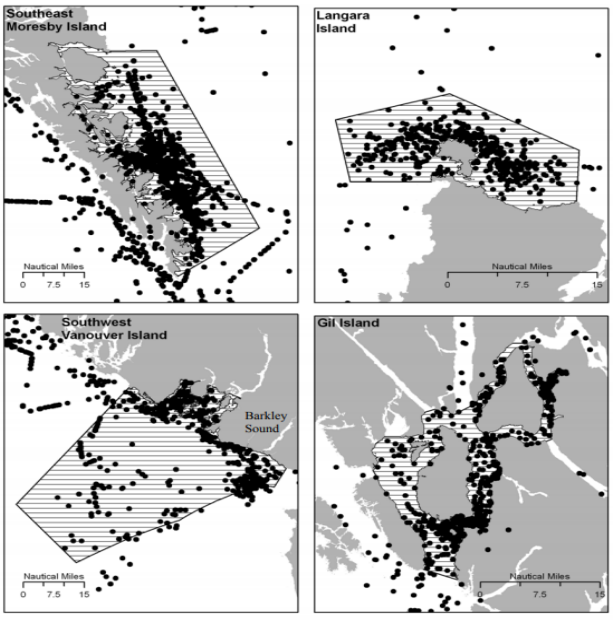


**Figure 3.** Each of the four critical habitat areas showing distribution of sighting from line transect surveys and photo-identification in relation to area boundaries (DFO 2009).

The Minister of Fisheries and Oceans has concluded that these are the areas (figure 4) considered necessary for the species' survival and recovery. The recovery strategy states that

the identified areas of critical habitat are important for feeding and foraging behaviour and resting and socializing.

Feeding and foraging behavior are supported by the following features:

1. Prey - There must be a sufficient quantity of suitable prey species.
2. Acoustic Environment - The acoustics of the environment must be conducive to the successful detection and capture of prey species. Humpbacks use bubble net feeding, which is a cooperative behavior that required vocal communication between whales.
3. Physical Space - An unimpeded physical space is considered to be a vital feature of critical habitat. Humpback whales require a minimum of 100m of unimpeded space around them to undertake actions related in support of life processes. In order to provide an unimpeded path for movement, this limit is extended to 400m along the direct path of travel (both the leading and trailing edge)."
4. Water and Air - Significant proportions of the population utilizes the designated areas of critical habitat and therefore degradation of the quality of water and/or air in critical habitat has the potential to cause population-level effects.

.Resting and socializing behaviour is supported by the following features:

1. Physical space - An environment that is free from disturbance is required in order to rest, socialize and conserve energy for metabolically costly processes
2. Water and Air - Water and air quality of a sufficient level so as not to cause adverse health effects (SoS).
3. Acoustic environment. As social interactions between humpback whales involve a significant amount of vocalization, acoustic disturbance may lead to masking of these signals, interfere with predator detection and avoidance, and disrupt important social behaviours.

A critical habitat map was produced by the Wilderness Committee which showing that the TMX tanker route intersects with the southwest Vancouver island critical habitat (figure 4).

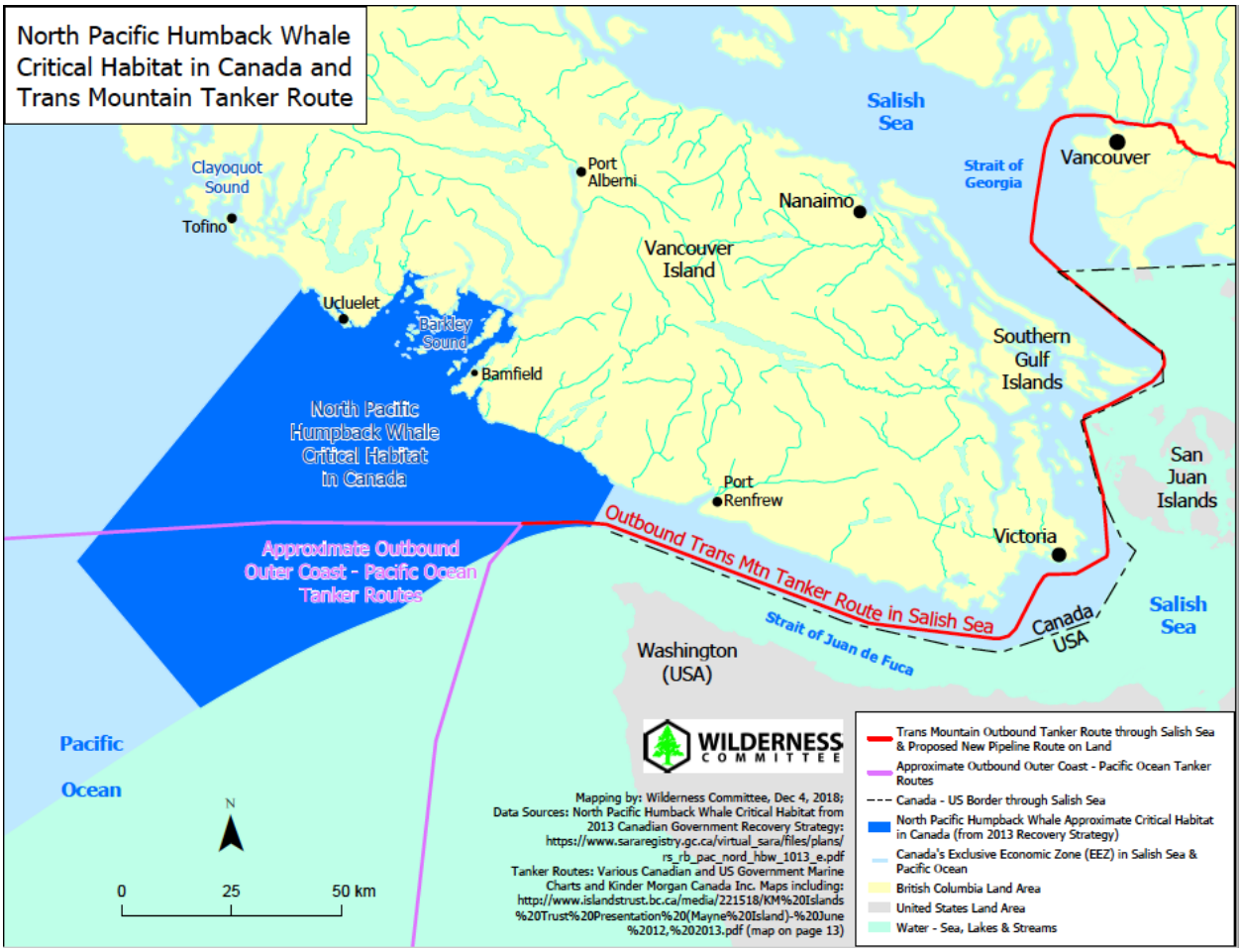


**Figure 4.** The Trans Mountain expansion project marine tanker route intersects with Southwest Vancouver Island critical habitat for humpback whales.

## c) Threats

*Unless otherwise stated, the information below is gathered from the 2013 Recovery Strategy for the north pacific humpback whale (Megaptera novaeangliae) in Canada.*[12]

The threats to the recovery of humpback whales in B.C in the recovery strategy are identified as any activity which "negatively affects the survival or reproduction of an individual, and may include disturbances that impact an animal's ability to conduct its normal life processes." The risks of threats can be applied to the individual whales, the population and the habitat. For the purpose of this report, only the threats that relate to the TMX project will be identified.

[12] "Humpback Whale (North Pacific Population)." Fisheries and Oceans Canada, 2017.

## 1. Vessel strikes

The recovery strategy states that humpback whales have a tendency to occupy shelf-break and coastal locations. This means their use of habitat may frequently coincide with large and small vessel traffic. Data collect on mortality rates of 11 large whales (humpbacks included) found that of 292 ship collisions with whales, 68% of the strikes are fatal and and 16.4% of the strike result in injuries for the whales. Therefore, ship strikes either kill or injure the whales 84.3% of the time (source).[13] The recovery strategy states that between 2001 and 2008, there were 21 reports of vessel strikes involving humpback whales. According to Williams "it is possible that 10-20 humpback whales could be killed each year by ships in BC and this level of mortality could go unnoticed or unreported…"[14]

Shipping lanes are areas where humpbacks are more likely to be hit. Areas with high occurrences of humpback whales especially during summer months, accompanied by intense vessel traffic, may be of particular concern. In B.C., areas of high probability of humpback vessel interaction include Johnstone Strait off northeast Vancouver Island, Juan de Fuca Strait off southwest Vancouver Island, Dixon Entrance and the "Inside Passage" off the northern B.C. mainland which include portions of two of the identified critical habitat areas. As the numbers of vessels and whales increase, and as boats get faster and larger, the frequency of collision events is likely to increase.

## 2. Toxic Spills

Impacts to the individual and population:

The recovery strategy states the importance of taking "proactive measures to reduce likelihood of spills in key feeding areas, and development of spill response measures (specific for cetaceans) should be considered. As well it is suggested that "proposed pipeline projects, associated tanker traffic, and possible offshore oil and gas exploration and development in coastal British Columbia all increase the likelihood of toxic spills in humpback whale habitat in the future, and underscore the importance of protecting critical habitat and supporting mitigation measures and plan."

There is not sufficient data from past oil spill events to conclude how humpback whales specifically are impacted by these spills. However, research after the exxon valdez oil spill showed that it accelerated the killer whale population trajectory towards extinction. Two groups of killer whales were severely impacted by the spill and suffered the losses of 33 and 41% in the year following the spill. Both groups have not recovered to pre-spill numbers even after 16 years post spill and one of the groups is listed as deplete under the marine mammal protection act.[15]

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[13] Aleria S. Jensen, and Gregory K, Silber. "Large Whale Ship Strike Database." NOAA Technical Memorandum NMFS-OPR, 2004.

[14] Rob Williams, and Patrick O'Hara. "Modelling Ship Strike Risk to Fin, Humpback and Killer Whales in British Columbia, Canada." J. Cetacean Res. Manage., 2009.

[15] Matkin, Co, El Saulitis, Gm Ellis, P. Olesiuk, and Sd Rice. "Ongoing Population-level Impacts on Killer Whales Orcinus Orca following the Exxon Valdez Oil Spill in Prince William Sound, Alaska." (2008).

Impacts to critical habitat:

Increased vessel traffic, increased development of ports and pipelines, as well as spills that occur in humpback whale habitat all increase the risk of prey contamination and degradation of the resource. Effects on prey species, either through direct contact with a toxic spill within the habitat, or reduction in overall prey population within the feeding grounds would decrease prey availability.

Critical habitat relates to the functional capacity of certain features in the habitat to support the successful performance of life-cycle processes necessary to achieve the population and distribution objectives for a species at risk.[16] Increased vessel traffic and spills that occur in humpback whale habitat both increase the risk of prey contamination and degradation of the food resource. All animals consume food in the environment which give them the energy that is required for basic functioning, including daily activities and reproduction. The reproductive success and survival of a population ultimately required sufficient food resources which allows sufficient energy intake and energy use.[17] Therefore, successful feeding is an important component of the humpback whale life-cycle and a threat to the food source for humpback whales has the potential disrupt the recovery and survival of the population.

Impacts to food source:

Herring is an important prey species for humpback whales in BC. The exxon valdez

Oil spill heavily impacted herring. Effects on the species included morphological deformities, reduced survival in newly-hatched embryos, failure of the 1989 year class, and a long-term failure of the Prince William Sound population to recover. Krill is also an important food source for humpback whales. In 1989 an oil spill occurred near the Antarctic Peninsula. Biologists reported widespread dying of krill after the accident.[18] There is sufficient evidence to conclude that both herring and krill are impacted by oil spills with the potential for population-level harm. If this happened in BC, both herring and krill populations could be severely impacted resulting in a significant reduction in humpback whale food sources.

## 3. Acoustic disturbance

The primary sensory system used by cetaceans to communicate, navigate, locate prey, detect and avoid predators is hearing. Evidence of disturbance and displacement due to underwater noise has been observed in several baleen whale species including humpback whales at received sound pressure levels of 160 to 170 dB re 1 µPa and lower. The broadband source

[16] Directive on the Identification of Critical Habitat for Aquatic Species at Risk, (2015)

[17] Braithwaite, Janelle E., Jessica J. Meeuwig, and Matthew R. Hipsey. "Optimal Migration Energetics of Humpback Whales and the Implications of Disturbance." (2015).

[18] John Noble Wilford. "Scientist Says Antarctic Oil Spill Does Significant Harm to Wildlife." The New York Times, 1989.

level emitted by drude oil tankers has been observed to be 180.5 dB re 1 µPa, which is extremely close to the sound pressure level that Humpback whales can observe.[19] Observed reactions include avoidance of the noise area, interrupting of feeding and moving away from the sound source, rapid swimming away from source, and changes in respiration and dive patterns.

The consequences of noise exposure may include masking of communication signals for breeding or socializing and interference with prey detection or predator avoidance. There is a significant knowledge gap in determining how humpback whales change their short term behavior (avoidance, moving away, changes in resprotation) and how this results in larger consequences and population impacts. Without this knowledge gap addressed, it is reasonable to assume, based on evidence of avoidance and interrupting during important feeding times, that acoustic disturbance results in impacts to humpback whales.

## d) Trans Mountain expansion project threats to humpback whales

*Unless otherwise stated, the information below is gathered from the 2013 Recovery Strategy for the north pacific humpback whale (Megaptera novaeangliae) in Canada.[20]*

### 1. Vessel strikes

**Magnitude**

The TMX will increase the number of tankers in the salish sea from 120 to 816 of tankers annually.[21] Nichol et al, identifies areas of high risk of collision with humpback whales (figure 5). Three of the high risk area coincides with the proposed tanker route. This means that even without the extra 696 annual TMX tankers, these habitat areas already have the highest probability of a whale collision. The Juan de Fuca Strait and the region due west of its entrance will have a significant increase in tanker traffic if the TMX project is completed. Nichol et al, states that with current levels of vessel traffic, both of these habitat areas have high humpback whale densities and high-intensity marine traffic, concluding there is a elevated risk of lethal ship strikes in this area. Furthermore, “Ship speeds throughout the offshore area of the west coast of

[19] Zizheng Li, & Alexander MacGillivray (2014). Supplemental Underwater Noise Modelling for Trans Mountain Expansion Project. Jasco Applied Sciences.

[20] "Recovery Strategy for the North Pacific Humpback Whale (Megaptera novaeangliae) in Canada." Fisheries and Oceans Canada, 2018.

[21] Dyna Tuytel"FINAL ARGUMENT OF LIVING OCEANS SOCIETY AND RAINCOAST CONSERVATION FOUNDATION." Living Oceans Society and Raincoast Conservation Foundation, 2016.

Vancouver Island were sufficiently high (>12 knots) that collisions with whales are more likely than not (>50%) to result in lethal injuries.[22]

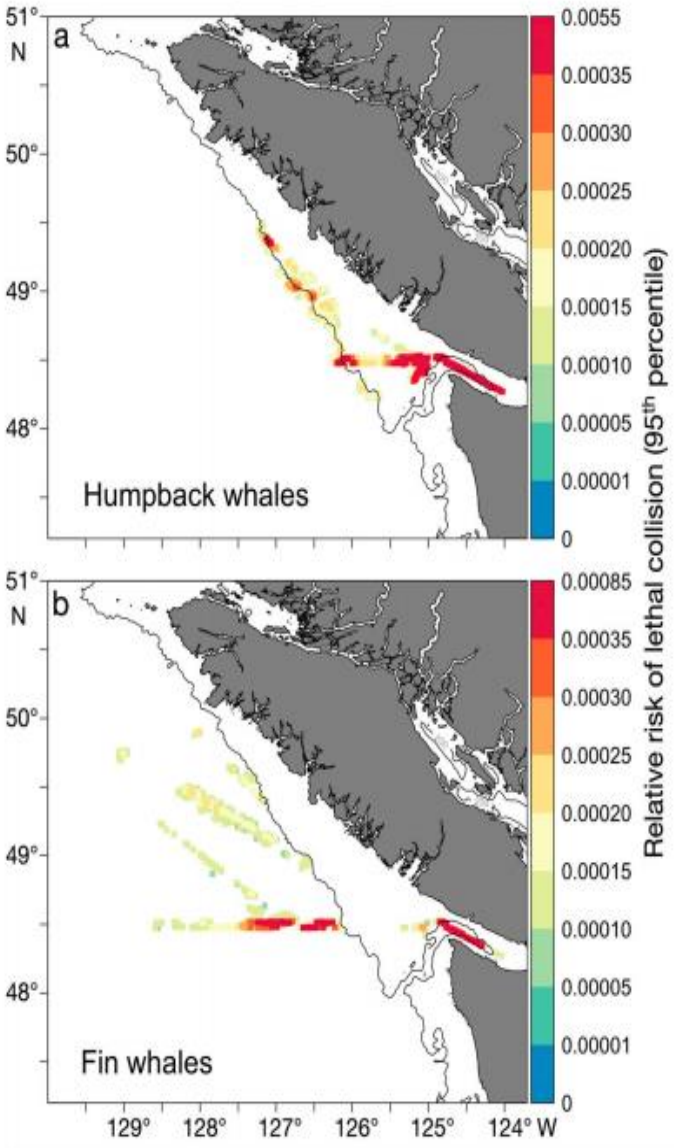


**Figure 5**. Filled cells (n= 1200) indicate areas of highest relative risk (95th percentile) of lethal collisions (per 1 km2) be-tween ships and (a) humpback Megaptera novaeangliae and (b) fin whales Balaenoptera physalus; 2013 Automatic Identification System (AIS) ship traffic dataset. Mean relative risk of a lethal collision is 35.2-fold higher for humpbacks and 8.1-fold higher for fin whales in the illustrated areas than in the remainder of the surveyed study area.Continental shelf break is indicated by the 200 m bathy -metric contour (black line). Colour bars are scaled similarly to one another, and to Fig. 5e,f to facilitate comparisons. Note that colour bar increments for the lowest and/or highest categories are not

[22] Nichol, Lm, Bm Wright, P. O'Hara, and Jkb Ford. "Risk of Lethal Vessel Strikes to Humpback and Fin Whales off the West Coast of Vancouver Island, Canada." Endangered Species Research 32 (2017).

necessarily placed at equivalent intervals, to allow for improved visualization of the majority of the data range. [23]

The Juan De Fuca Strait has been identified as an area with a high probability of humpback vessel interaction with humpback whales (figure 5). The addition of 696 vessels entering the strait annually and an increased number vessels headed to Asian markets through the critical habitat dramatically increases the threat of vessel strikes to the humpback whales. A increase in tanker traffic of this magnitude through the critical habitat will drastically increase the probability of collision.

Between 2001 and 2008, there were 21 reports of vessel strikes involving Humpback Whales in B.C waters in just 7 years. The TMX tanker route will directly intersect with the some of the most concentrated areas of humpback whales (figure 1). The south west vancouver island critical habitat area will have a significant increase in tankers on route to asian markets. As well as tankers are known to bottleneck at the mouth of the Juan de Fuca, which is also part of critical habitat. Bottlenecks are known to be areas of high risk of collision between whales and vessels. Other important habitat areas is in the Juan de fuca strait around the water near Victoria. This area of high humpback whale sighting also directly intersects with the pipeline tanker route (figure 4). At current levels of vessel traffic, we lose up to 3 whales per year in BC waters. With a tanker increase of 696 vessels per year throughout the strait which is frequented by a high concentration of humpback whales, increases the risk of vessel collision to significant. Since 84% of collisions are known to cause mortality or injury it can be concluded that this project has a high probability of increasing the number of whales killed or injured by vessel strikes.

**Geographic Extent**

The entire south West Vancouver Island critical habitat area as well as habitat throughout the Juan de Fuca strait has the potential to impact humpback whales. The recovery strategy states that each critical habitat area supports different parts of the population due to the high degree of site fidelity to feeding grounds. This means that factors which influence each specific critical habitat area would affect different parts of the population. The TMX tanker route would drastically increase the threat of vessel strikes in one of the four critical habitat areas, resulting in the potential for population level impacts to humpback whales.

**Frequency and Duration**

The TMX project will increase tankers through the Salish Sea from five to approximately 34 tankers per month resulting in a 700% increase.[24] This equals an extra 696 tankers annually in and out of the critical habitat and the Juan de Fuca strait. Therefore, whenever humpback

[23] Nichol, Lm. "Risk of Lethal Vessel Strikes to Humpback and Fin Whales off the West Coast of Vancouver Island, Canada." Endangered Species Research 32 (2017).

[24] Dyna Tuytel. "FINAL ARGUMENT OF LIVING OCEANS SOCIETY AND RAINCOAST CONSERVATION FOUNDATION." Living Oceans Society and Raincoast Conservation Foundation, 2016.

whales are present along the tanker route (which is often), the frequency of the threat will be daily for as long as the pipeline is delivering oil to the vessels. The project has an estimated duration (lifespan) of at least fifty years.[25] Therefore, the threat of a 700% increase in tankers along the route will persist daily and until the project is shutdown or after its 50 year lifespan in complete.

**Reversibility**

Since the threat of increased vessel strike is daily and permanent there is no way to reverse the threat over time, as it will persist into the future. Furthermore, large whale mortality rate when colliding with vessels has been known to be as high as 68%.[26] The reversibility of damage that a vessel strike poses is irreversible because the individual whale will most likely die from the injury.

***Conclusion***

The TMX project and its associated vessel strike threat pose a risk to individual humpback whales, the population and their critical habitat. SARA prohibits the killing, harming or harassing or a species at risk and the TMX tankers poses a high risk of harming and killing these federally listed humpback whales. At current levels of vessel traffic, we lose up to 3 whales per year in BC waters. A tanker increase 700% of vessels per month through critical habitat and the Juan de Fuca strait (which has a high probability of vessel-whale collision) causes this threat to be likely. Since 84% of collisions are known to cause mortality or injury it can be concluded that the threat of vessel strikes from the project will likely cause a significant adverse risk to the recovery and survival of humpback whale populations.

## 2. Toxic Spills

The recovery strategy states that “proposed pipeline projects, associated tanker traffic, and possible offshore oil and gas exploration and development in coastal British Columbia all increase the likelihood of toxic spills in Humpback Whale habitat in the future, and underscore the importance of protecting critical habitat and supporting mitigation measures and plan.”

**Magnitude**

<u>Impacts to individuals:</u>

A TMX tanker vessel carrying 750,000 barrels has the potential to spill almost three times as much oil as the exxon valdez (which spilled 257,000 barrels). Impacts to humpback whales of an oil spill of this size is unknown, but impacts to killer whales of an oil spill is known and this is

[25] Kent Spencer. "Can Bridges Withstand a Tanker Collision." Vancouver Sun, January 9, 2017.

[26] Aleria S. Jensen, and Gregory K, Silber. "Large Whale Ship Strike Database." NOAA Technical Memorandum NMFS-OPR, 2004.

the best available knowledge. Evidence gathered from the oil spill showed that a mortality rate of up to 41% occurred within a year of the spill.[27] This mortality rate impacted the survival and recovery of both groups of killer whales impacted. Killer whales and humpback whale are part of the cetacean family. Using the best available knowledge, it can be concluded that if a spill were to happen it would have the potential to impact individual humpback whale survival.

Impacts to critical habitat:

The TMX project would have the potential to spill as much as 750,000 barrels of diluted bitumen into the marine environment. The Tsleil-Waututh Nation, did an extensive assessment of the proposal and found a 79 to 87 % likelihood of a spill in their waters over the span of fifty years if the pipeline went ahead.[28] The Kalamazoo river spill on June 2010 spilled 257,000 barrels of crude oil into the river. Research was done to measure the lasting environmental impacts which found that “after nearly 4 years of continuous remediation, measurable concentrations of PAHs (Polycyclic Aromatic Hydrocarbons) remain in Kalamazoo River sediments within the spill area.” The PAHs were the ones consistent with hydrocarbons found in diluted bitumen.[29] Further research regarding diluted bitumen spills has proven “spills of diluted bitumen pose particular challenges when they reach water bodies. In some cases, the residues can submerge or sink to the bottom of the water body.” It was also concluded that spill response approaches are based on past experiences which involve crude oil. Specifically given the difference regarding how the diluted bitumen performs when spilled, “spills of diluted bitumen should entail special immediate actions in response, for example, that the properties of diluted bitumen and weathered bitumen put such spills in a class by themselves.”[30] When applied to a marine ecosystem spill “If the bitumen sinks in addition to intertidal and shallow subtidal systems, subtidal ecosystems and pelagic fish will also be at risk of oil exposure.”[31] We currently do not have the experience and technology available to deal with a diluted bitumen spill that sinks. Until we have such a protocol that has been proven to be effective in cleaning up dil bit, the TMX poses an unacceptable risk to the critical habitat of the humpback whales.

Impacts to food source:

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[27] Matkin, Co. "Ongoing Population-level Impacts on Killer Whales Orcinus Orca following the Exxon Valdez Oil Spill in Prince William Sound, Alaska." (2008).

[28] Assessment of the Trans Mountain Pipeline and Tanker Expansion Proposal. Report. Treaty, Lands & Resources Department, Tsleil-Waututh Nation.

[29] Tara A Kneeshaw, and Kayla A Lockmiller. "Persistence of Polycyclic Aromatic Hydrocarbons (PAHs) in Sediments Following a Tar Sands Oil Spill." SciFed Journal of Petroleum, July 2, 2018.

[30] Spills of Diluted Bitumen from Pipelines: A Comparative Study of Environmental Fate, Effects, and Response. National Academies Press, 2016.

[31] Chang, Stephanie E., Jeremy Stone, Kyle Demes, and Marina Piscitelli. "Consequences of Oil Spills: A Review and Framework for Informing Planning." Ecology and Society, (2014).

The impacts of a diluted bitumen spill to herring and krill is unknown, but since bitumen is a type of crude oil, evidence from past crude oil spills can be used to determine how a diluted bitumen spill may impact species. The recovery strategy states that herring populations failed to recover following the exxon valdez oil spill. Herring is an important food source for humpback whales and if the herring population in the critical habitat area was wiped out, this would have the potential to significantly decrease the food available for humpback whales. Krill is also an important food source for humpback whales. In 1989 a oil spill occurred near the Antarctic Peninsula, reports from biologists stated the widespread dying of krill after the accident.[32] If a diluted bitumen spill happened along the tanker route there is a extremely high change it would impact the food resources for the humpback whales, specifically herring and krill. The recovery and survival of humpback whales is therefore threatened by the TMX project and significant impacts it would have to valuable prey populations.

**Frequency and Duration**

The frequency of the risk of an oil spill could be sporadic and/or continuous. There could be random leaks, continual contamination from residue of diluted bitumen getting into the water, or a single large event in the case that a tanker carrying diluted bitumen capsizes. Unless the project is shut down once a spill or contamination has been observed, the risk of an diluted bitumen spill will persist. The risk of a diluted bitumen spill will continue throughout the entire lifespan of the project (50 years) or until the project is terminated. If a spill occurs, the effects will last into the foreseeable future. There is potential for the spill impacts to persist for years and years after the spill with lasting impacts on the marine environment and marine life permanently and into the future.

**Reversibility**

As described above we do not know how to clean up diluted bitumen. Therefore, this threat is not reversible. Unless the project is shutdown before a spill occurs, there is no way to reverse the impacts of a diluted bitumen spill.

***Conclusion***

Under SARA this project poses a risk to the individual humpback whale, the population and the critical habitat. SARA prohibits the killing, harming or harassing or a species at risk. The threat of a diluted bitumen spill from a TMX tanker poses a high risk that humpback whale could be killed or harmed. The magnitude of harm that would come from a diluted bitumen spill is significant because impacts range from direct lethal impacts to individual whales, to the depletion of critical habitat, to the collapse of important food resources (krill and herring). Currently, there is a lack of expertise and effectiveness on cleaning up diluted bitumen spills which means impacts can last for a unknown amount of time. The risk of a toxic spill is 79-87%

[32] John Noble Wilford. "Scientist Says Antarctic Oil Spill Does Significant Harm to Wildlife." The New York Times, 1989.

throughout a 50 year life span.[33] Due to the extremely high magnitude of harm that would come from a TMX tanker spill and considering that the likeliness of a spill is 79-87%, it can be concluded that the threat of a diluted bitumen spill from the project will likely cause significant adverse effects to humpback whales, their population and their critical habitat

## 3. Acoustic disturbance

**Magnitude**

Impacts to critical habitat:

As noted in the Raincoast final arguments “Trans Mountain’s evidence shows that the Project’s contribution to underwater noise will exceed standards established by the US National Oceanic and Atmospheric Agency (NOAA) for sensory disturbance in cetaceans, and that whales within 4-7 km of the shipping lanes are expected to experience noise capable of “causing sensory disturbance from Project-related vessels” – noises that may result in behaviour modification.[34] Figure 1 shows that the tanker route intersects the critical habitat of the humpback whales. Therefore, there is potential for the vessels to travel within 4-7 km’s of the shipping lane. The magnitude of noise coming from the tankers will have the potential to degrade the quality of critical habitat.

Impacts to Individual whale:

Observed reactions include avoidance of the noise area, interrupting of feeding and moving away from the sound source, rapid swimming away from source, and changes in respiration and dive patterns. Two locations have a high potential for the vessels to travel within 4-7 km’s of humpback whales. The first is within critical habitat and where tankers bottleneck at the entrance to the Juan de Fuca strait and the second area is inside the Juan De Fuca strait near Victoria (humpback whales have been observed in high numbers (figure 1)).

The recovery strategy states that evidence of disturbance and displacement due to underwater noise has been observed in several baleen whale species including Humpback Whales at received sound pressure levels of 160 to 170 dB re 1 µPa and lower. The broadband source level emitted by crude oil tankers has been observed to be 180.5 dB re 1 µPa, which is

[33] Assessment of the Trans Mountain Pipeline and Tanker Expansion Proposal. Report. Treaty, Lands & Resources Department, Tsleil-Waututh Nation.

[34] Dyna Tuytel. "FINAL ARGUMENT OF LIVING OCEANS SOCIETY AND RAINCOAST CONSERVATION FOUNDATION." Living Oceans Society and Raincoast Conservation Foundation, 2016.

extremely close to the sound pressure level that Humpback whales can observe.[35] Therefore, tankers emit sound pressure levels that may be observed by humpback whales. Observed reactions include avoidance of the noise area, interrupting of feeding and moving away from the sound source, rapid swimming away from source, and changes in respiration and dive patterns. Therefore, as acoustic disturbance increases, it increases the risk of impairing successful breeding, socializing, prey detection and predator avoidance. All of which are crucial to the survival and recovery of the humpback whale.

**Frequency and Duration**

A 700% monthly increase in tankers will move in and out of the critical habitat and the Juan de Fuca strait if the TMX is completed. Therefore, whenever humpback whales are present along the tanker route, the frequency of the acoustic disturbance threat will be daily for as long as the pipeline is delivering oil to the vessels. The project has an estimated duration (lifespan) of roughly 50 years. Therefore, the persistent and frequent threat that the acoustic disturbance from 700% increase in tanker traffic along the route has the potential to cause significant adverse effects to the humpback whale population.

**Reversibility**

The effects of acoustic disturbance would be stopped when the project is cancelled or once the project has completed its 50 year life cycle and is no longer in operation. However, the effects that the acoustic disturbance has already had on humpback whale individuals and the population cannot be reversed.

<u>Impacts to critical habitat:</u>

The acoustic environment in an important biological attribute of critical habitat. As confirmed by the Federal Court, Southern Resident critical habitat includes the biological attributes that make it useful for killer whales, such as its acoustic and environmental quality and the availability of Chinook salmon prey.[36] Therefore, disturbing the acoustic environment in the critical habitat will result in the degradation of critical habitat.

***Conclusion***

The TMX project has the potential to increase chronic noise within the observable range of humpback whales. As acoustic disturbance increases, it increases the risk of impairing successful breeding, socializing, prey detection and predator avoidance. All of which are crucial to the survival and recovery of the humpback whale. There is a high potential that individual

[35] Zizheng Li (2014). Supplemental Underwater Noise Modelling for Trans Mountain Expansion Project. Jasco Applied Sciences.

[36] Dyna Tuytel. "FINAL ARGUMENT OF LIVING OCEANS SOCIETY AND RAINCOAST CONSERVATION FOUNDATION." Living Oceans Society and Raincoast Conservation Foundation, 2016.

humpback whales will be within 4-7 km's of the vessels, where important life strategies will be disturbed, such as feeding and breeding. Impacting the success of these important life components will cause significant adverse effects to the humpback whale population. An important attribute of critical habitat is having a healthy acoustic and environmental quality. This project cuts directly through critical habitat and will likely cause significant adverse harm to the acoustic environment through the south west Vancouver island critical habitat.

## e) Conclusion of impacts from Trans Mountain expansion project to humpback whale and recommendations

The TMX project and its associated threats from a vessel strike, toxic spill, and acoustic disturbance are likely to cause significant adverse harm to individual humpback whales, their population and their critical habitat. Trans Mountain has not offered mitigations from these threats to the whales. This project threatens the survival and recovery of the humpback whales in BC. The Wilderness Committee submits that the Board should recommend against the approval of the Trans Mountain pipeline expansion project.

# Species at risk impacts from the Trans Mountain expansion project – Blue, fin and sei whale

## a) Ecology, biology and distribution

*All information presented in this section is based on the federal recovery strategy for the blue, fin and sei whale unless otherwise stated.*[37]

**Blue whale**

The blue whale's entire Canadian range was designated as Special Concern in April 1983. In 2002 the the population was split into two and the Pacific population was up-listed to Endangered. In 2005, the Pacific population was legally protected and listed as endangered under the federal SARA. Blue whales in BC are likely part of a population based in Northeastern Pacific.

The North Pacific population is reliably estimated at 2000 animals. Nevertheless, given available population estimates, the eastern North Pacific population represents a large proportion of the known blue whales in the world.  Research has found a significant, almost constant intensity of

[37] E.J. Gregr, J. Calambokidis, L. Convey, J.K.B Ford, R.I. Perry, L. Spaven, and M. Zacharias. "Recovery Strategy for Blue, Fin, and Sei Whales (Balaenoptera Musculus, B. Physalus, and B. Borealis) in Pacific Canadian Waters." Species at Risk Act Recovery Strategy Series, 2006.

blue whale calls off British Columbia from October to February. Thus, Pacific Canadian waters appear to represent an important feeding ground for a large portion of the world's blue whales.

Blue whales are low trophic level foragers requiring several tonnes of prey per day per individual. Thus, the viability and recovery of the blue whale population could be constrained by factors that limit availability of food. Given the large quantities of zooplankton required to maintain a blue whale population, their presence in, or absence from, an ecosystem is likely significant. The Pacific population of blue whales remains mostly offshore in the open ocean. Feeding aggregations are often found at the continental shelf edge where upwelling produces concentrations of krill (small shrimp-like crustaceans), the whales' main food.[38] Changes in ocean climate could affect both the total available prey for, and the foraging effectiveness of, blue whales. Such lower trophic foraging specialists may be more immediately affected by large-scale oceanographic shifts than other species with more diverse diets.

Higher-latitude habitat is likely best defined by its suitability as a foraging ground. Blue whales feed along productive shelf-break upwellings in temperate to polar waters from spring to early winter. They feed primarily on euphausiids (Euphausia pacifica, Thysanoessa spinifera, T. inermis, T. longpipes, T. raschii, and Nematoscelis megalops), though calanoid copepods (Calanus spp.) and pelagic red crab (Pleuroncodes planipes) also occur in the diet.

However, the lack of contemporary sei and blue whale sightings in Pacific Canadian waters makes critical habitat designation difficult at this stage of the recovery planning process. No current abundance estimates or population trends exist for eastern North Pacific blue, fin, or sei whales in Canadian waters. There is an urgent need for information on their abundance and distribution, their habitat, and the threats they face.

**Fin whale**

The fin whale was first listed as Special Concern in 1987. In 2005 the population was split into two (Atlantic and Pacific) and the Pacific population was federally listed and designated as threatened.

In 1969 fin whales were regarded as the most abundant baleen whale in Pacific Canadian waters, and it was thought the waters off Vancouver Island contained a summer feeding aggregation. Historically, fin whales were frequently observed in exposed coastal seas (Hecate Strait and Queen Charlotte Sound) and occasionally in the more protected waters of Queen Charlotte Strait and the Strait of Georgia. Contemporary sightings of fin whales in Pacific Canadian waters are predominantly from the west coast of Vancouver Island, Hecate Strait and Queen Charlotte Sound, and occur in summer and winter. Recent summer sightings have also been made off southern Vancouver Island. An opportunistic winter cruise in February 2004 resulted in sightings off the north end of Vancouver Island and in Hecate Strait. The BCCSN database contains 48 high confidence fin whale sightings. Figure 6 predicts the habitat of fin whales.

[38] "Blue Whale Pacific Population." Species at Risk Public Registry, 2018.

Fin whales forage on a variety of species. Generally in the northern hemisphere they eat small invertebrates, schooling fishes and squids. Consequently, it has been suggested that fin whale diet is as much a function of availability as preference. In the North Pacific, the diet is dominated by euphausiids (70%) followed by copepods (25%) with some fish and squid.

No current abundance estimates or population trends exist for eastern North Pacific blue, fin, or sei whales in Canadian waters. There is an urgent need for information on their abundance and distribution, their habitat, and the threats they face.

**Sei whale**

The sei whale was designated as endangered in 2003. Historically the most abundant of the baleen whales, sei whales are now considered rare in U.S. and Pacific Canadian waters. Individuals off the coast of British Columbia are likely part of a northeastern Pacific population that was depleted by whaling.[39] They were once described as abundant off the west coast of Vancouver Island, British Columbia, in June through August. Historic records clearly demonstrate that Pacific Canadian waters were once extensively used by sei whales (Figure 6), with a sharp peak in seasonal abundance during July. When the recovery strategy was produced in 2006, cetacean surveys off the British Columbia coast and shelf-break region did not result in a single confirmed sei whale sighting (CRPDFO, unpublished data). The infrequency of observations (visual and acoustic) suggests that numbers in Canada are currently very low (well below 250 mature individuals).[40] In September 2018 five sei Whales were sighted off the coast off of British Columbia's coast, providing evidence that sei Whales are still using or have returned back to use Canadian waters. The recovery strategy set a timeline to confirm the presence of sei whales by 2011. The recent sighting confirmed their presence and as laid out in the recovery strategy the next step is to maintain or increase the relative proportion of sei whales that occur in the Pacific Canadian waters.[41]

Sei whales are low trophic level foragers that feed primarily on calanoid copepods. However, their diet also contains euphausiids, amphipods, and schooling fish and squid, particularly in the North Pacific. In the North Pacific calanoid copepods represent 83% of the diet.

No current abundance estimates or population trends exist for eastern North Pacific blue, fin, or sei whales in Canadian waters. There is an urgent need for information on their abundance and distribution, their habitat, and the threats they face.

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[39] John K.B. Ford. "COSEWIC Status Appraisal Summary on the Sei Whale Balaenoptera Borealis Pacific Population in Canada." COSEWIC Committee on the Status of Endangered Wildlife in Canada, 2013.

[40] John K.B. Ford. "COSEWIC Status Appraisal Summary on the Sei Whale Balaenoptera Borealis Pacific Population in Canada." COSEWIC Committee on the Status of Endangered Wildlife in Canada, 2013.

[41] Canadian Press. "Endangered Sei Whales Spotted in Canadian Waters for First Time since 1960s." Global News. 2018.

## b) Critical habitat - Blue, fin and sei whale

*All information presented in this section is based on the federal recovery strategy for the blue, fin and sei whale unless otherwise stated.*

The federal recovery strategy states that critical habitat for balaenopterid whales is likely to include spaces important for feeding, socializing, migration, and possibly other activities. The habitat in temperate waters for baleen whales is most likely foraging habitat.

Neither the blue whale, fin whale nor sei whale has known critical habitat. The recovery strategy does not designate critical habitat in Pacific Canadian waters for balaenopterid whales due to the need for further research before critical habitat can be identified. A schedule of studies was developed in the recovery plan in order to identify critical habitat. Critical habitat for the blue, sei and fin whales was to be defined by 2011 based on the amount of potential habitat for survival and recovery.

The department of Fisheries and Oceans Canada has failed to identify critical habitat despite it being seven years after the 2011 deadline in the recovery strategy. The precautionary principle must apply in this scenario. The recovery strategy shows two maps which predict habitat for the blue whale based historic kills. Both these maps identify the southern side of Vancouver island as areas with a high probability of habitat (figure 6 and figure 7). The habitats outlined in both maps must be considered important habitat. The predicted habitat map (figure 6) for the fin whale shows similar results - south coast of Vancouver island has a high probability of being habitat. The sei whale map (figure 6) shows that there is a high probability that the south coast of Vancouver island is important habitat. Although the sei and fin whale have had few sightings off the south Coast of Vancouver island in recent years, the goal of the recovery strategy is to attain long term viable populations of the blue, fin and sei whales in Pacific Canadian waters. In order to ensure progress is being made to reach this goal the recovery strategy states that threats do not significantly reduce potential habitat or the species distribution.

These predicted habitat maps must be used to assess the risks to the blue, fin and sei whales from the TMX expansion. The TMX tanker route would pass through the predicted habitat areas. This project is a threat and has the potential to cause irreversible damage to the predicted habitat of the blue, fin, and sei whale. The directive on identifying for identifying critical habitat for aquatic species at risk states that “if there are threats of serious or irreversible damage to the listed wildlife species, cost-effective measures to prevent the reduction or loss of the species should not be postponed for a lack of full scientific certainty.” Therefore, the threats that the TMX project pose to the predicted habitat of the blue whale, fine whale, and sei whale must be considered.

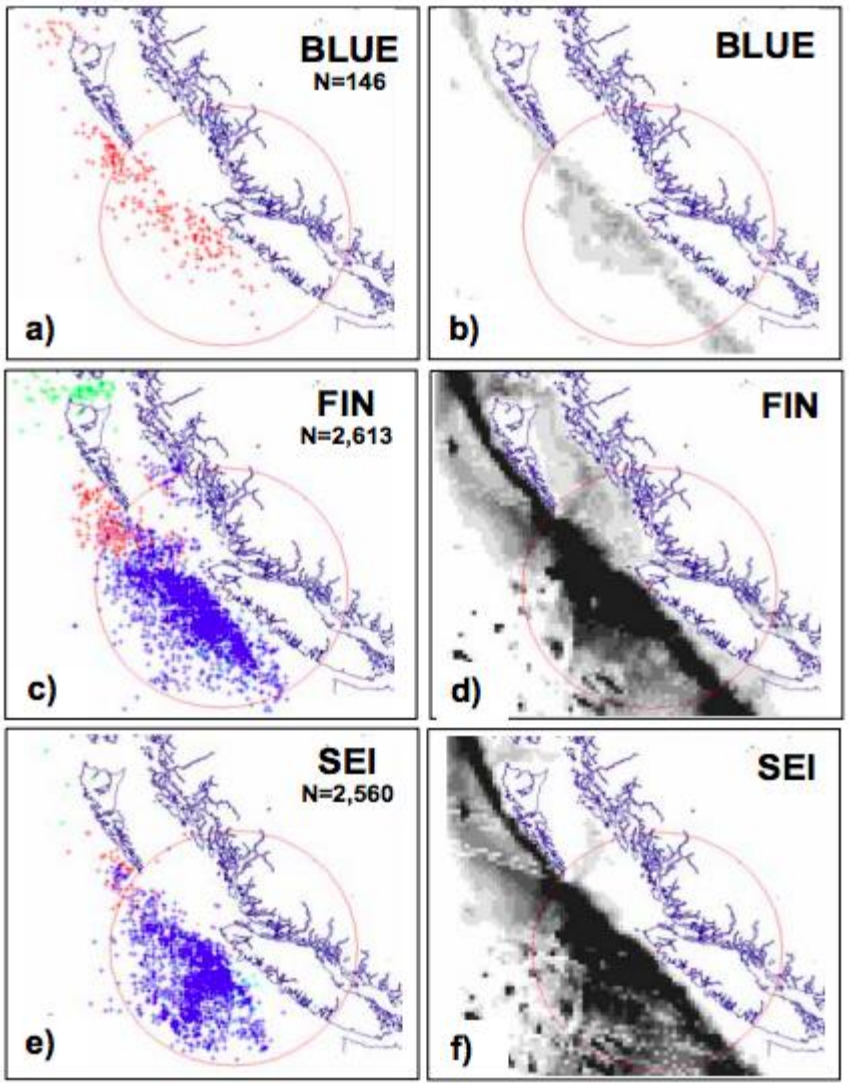


**Figure 6**. Distribution of historic kills (left) and habitat model predictions (right) for blue, fin, and sei whales. Circle shows 150 nm from Coal Harbour, the only operating whaling station during the period when the majority of kill locations were recorded. Predictions are shaded from high to low probability (dark to light) (from Gregr and Trites 2001).

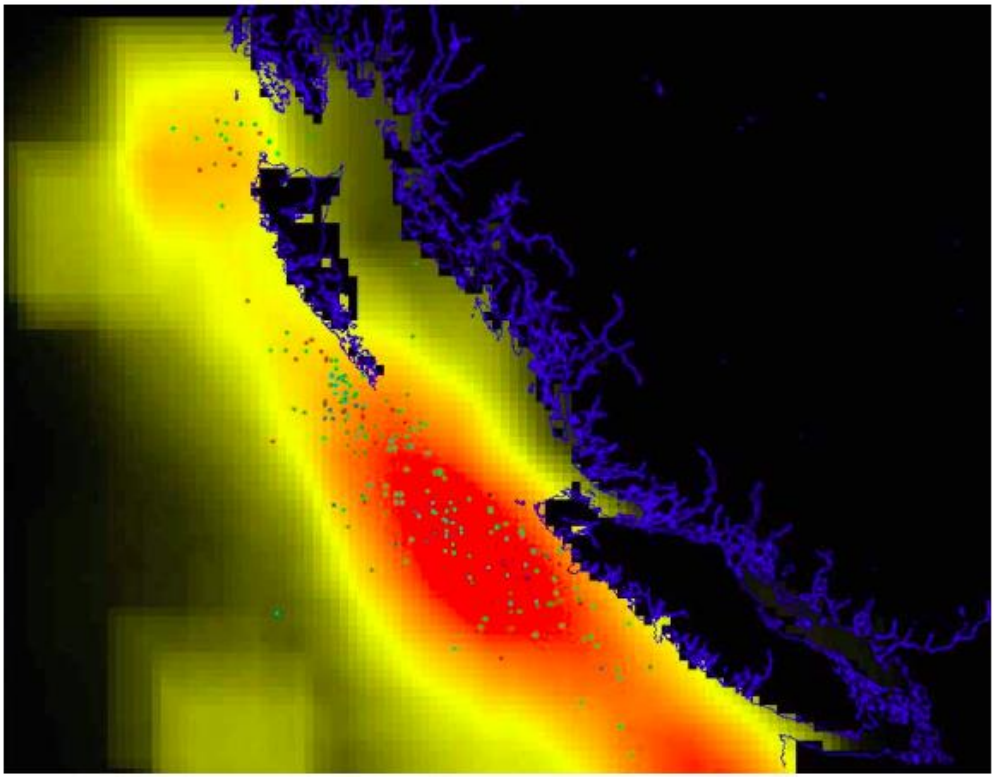

**Figure 7.** Generalized prediction of blue whale habitat showing all recorded kills (coloured data) by British Columbia whaling stations. Predictions are shaded from high (red) through yellow to low (black) (DOF0CRP, unpubl. data).

## c) Trans Mountain expansion project threats to blue, fin and sei whale

*Unless otherwise stated, all information presented in this section is based on the federal recovery strategy for the blue, fin and sei whale.*

The blue, fin and sei whale are threatened by anthropogenic sources, including ship strikes, acute and chronic noise and possible pollution. These threats may result in reduced use of available habitat and/or reduced reproduction.

### 1. Ship Strikes

**Magnitude**

Blue and fin whales occupy shelf break locations, as seen in figure 7. The TMX tankers that are headed to Asian markets go along the shelf break on the southwest coast of Vancouver island (map of tanker route, see figure 4). Therefore, the tanker route is likely to intersect with occupied habitat of the blue and fin whales. Increasing the risk of tanker and whale collison can have lethal impacts. The mortality rate associated with ship strikes is 70-80%. In the St. Lawrence, 16% of observed blue whales have marks associated with large propellers or hulls. Fin whales have also been known to be impacted by ship strikes. At least six fin whales were

reported struck and killed in or near Pacific Canadian waters between 1999 and 2004, and a single dead sei whale came into the Strait of Juan de Fuca on the bow of a ship in 2003.

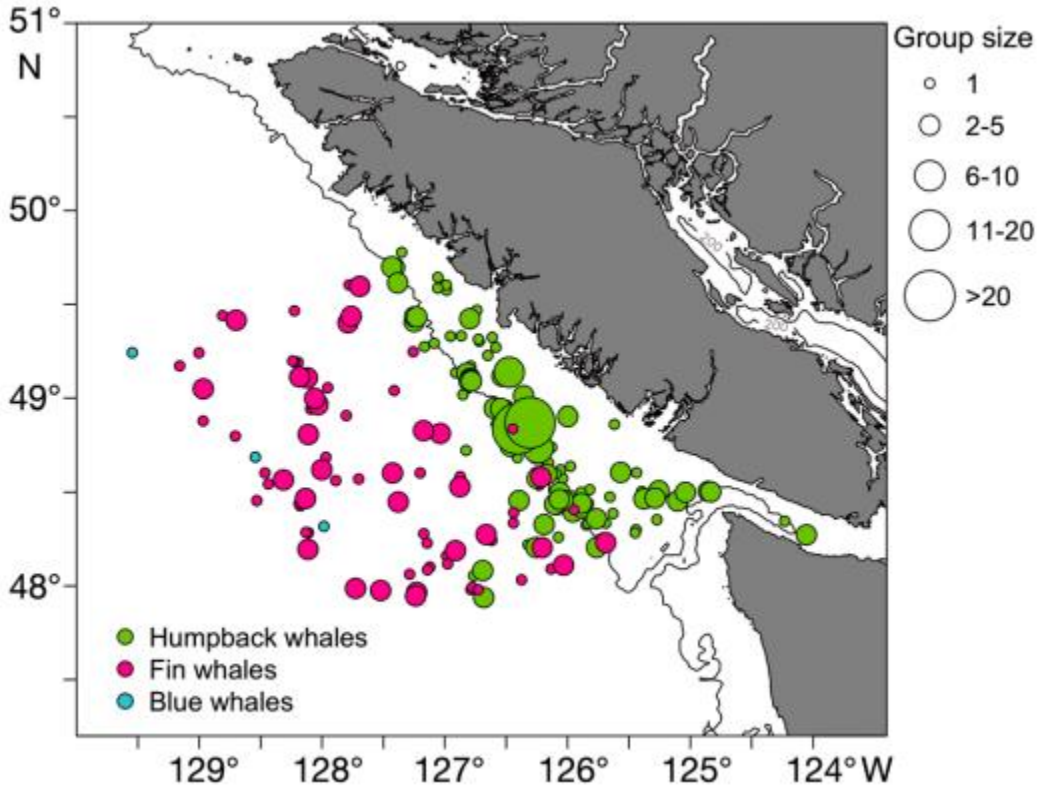


**Figure 8**. Locations of baleen whale sightings (n = 237) by species and group size (range = 1-33 ind.), observed during aerial surveys off the west coast Vancouver Island (2012 - 2015). Continental shelf break indicated by the 200 m bathymetric contour (black line)

Nichol et al, identified the areas of high risk of collision with fin whales (figure 5). The mouth of the Juan De Fuca Strait has the highest probability of collision with a fin whale and this area overlaps with the proposed tanker route.[42] This means that even without the 700% increase in tanker traffic, this area already has the highest probability of a whale collision. The Juan de Fuca Strait and the region due west of its entrance will also have a significant increase in tanker traffic if the TMX project is completed. Both these habitat areas have high humpback whale densities (figure 5) and is along the proposed tanker route (figure 4 and figure 9), concluding there is an elevated risk of lethal ship strikes in this area. Furthermore, “Ship speeds throughout the offshore area of the west coast of Vancouver Island were sufficiently high (>12 knots) that collisions with whales are more likely than not (>50%) to result in lethal injuries.

[42] Nichol, Lm. "Risk of Lethal Vessel Strikes to Humpback and Fin Whales off the West Coast of Vancouver Island, Canada." Endangered Species Research 32 (2017).

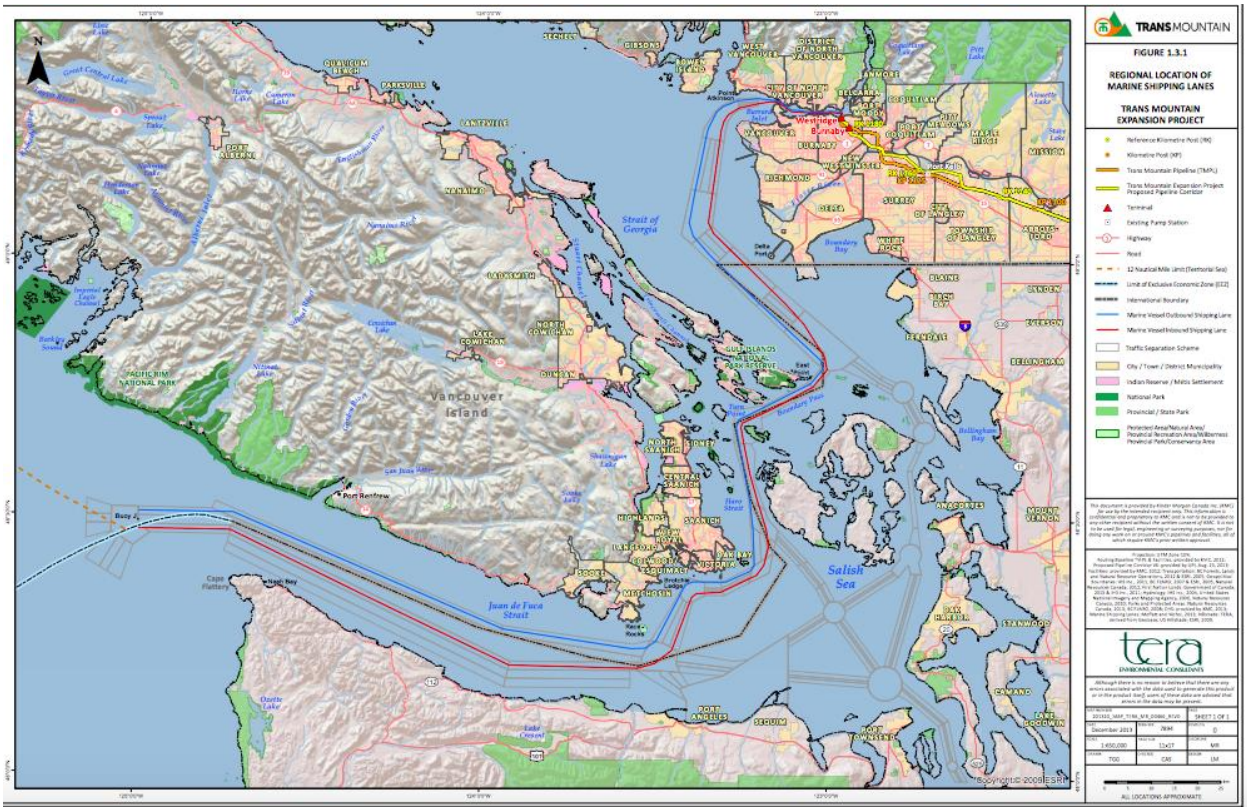


**Figure 9.** Regional location of marine shipping lanes for the Trans Mountain Expansion Project. [43]

### Frequency and Duration

There will be a 700% increase in tankers moving in and out of the mouth of the Juan de Fuca strait monthly. As well, tankers moving to Asian markets will be coming and going constantly. Therefore, whenever fin and blue whales are present along the tanker route, the frequency of the threat will be daily for as long as the pipeline is delivering oil to the vessels. The project has an estimated duration (lifespan) of roughly 50 years. Therefore, the persistent, long (up to 20 years) and frequent threat of a 700% monthly increase in tankers along the route has the potential to cause significant harm to both individual blue and fin whales and their populations.

### Reversibility

Since the threat of increased vessel strike is daily and permanent there is no way to reverse the threat over time, as it will persist into the future. As mentioned in the recovery strategy, 70-80%

[43] Trans Mountain Expansion Project An Application Pursuant to Section 52 of the National Energy Board Act. Report no. Marine Transportation. Kinder Morgan. (2013).

of ship strikes result in mortality. Therefore, the damage that a vessel strike poses is irreversible because the individual whale will most likely die from the injury. The populations will also suffer if blue and fin whale mortality increases as a result of the increase in tankers along route.

***Conclusion***

An increase in tankers of 700% throughout habitat areas which already have the highest probability of blue and fin whale ship strike will drastically increase the risks to the species. Since 70-80% of ship strikes result in mortality, this project has the potential to harm individuals of the blue and fin whale. The threat cannot be reversed unless the tankers completely change route away from areas with a high probability of collision. Unless the tankers are re-routed, the risk will be irreversible and persist daily until the project lifespan is completed (50 years). The threat will persist daily for up to 50 years and it is possible overtime the TMX will also impact the populations of the blue and fin whale. For these reasons it can be concluded that the threat of a vessel strike from the project will likely cause significant adverse effects to blue and fine whale individuals and overtime, to the population.

## 2. Noise

Baleen whales rely on sound primarily for social communication but can also use sound for predator detection, orientation, navigation, and possibly prey detection. Changes to the underwater acoustic environment have the potential to disrupt these behaviours. Tyack (2008) found that “human sources of sound in the ocean can disturb marine mammals, evoking behavioral responses that can productively be viewed as similar to predation risk, and they can trigger allostatic physiological responses to adapt to the stressor.”[44]

**Magnitude**

As noted in the Raincoast final arguments “Trans Mountain’s evidence shows that the Project’s contribution to underwater noise will exceed standards established by the US National Oceanic and Atmospheric Agency (NOAA) for sensory disturbance in cetaceans, and that whales within 4-7 km of the shipping lanes are expected to experience noise capable of “causing sensory disturbance from Project-related vessels” – noises that may result in behaviour modification.” Research has shown the implications that come from disturbed acoustic environments and in Northern Hemisphere oceans, the area over which a fin whale can hear a conspecific has decreased by four orders of magnitude. This can reduce mating ability. Research conducted on gray whales indicated that they had a high probability of being influenced by noise from large oil and gas tankers, airgun arrays and dredges.[45]

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[44] Tyack, Peter L. "Implications for Marine Mammals of Large-scale Changes in the Marine Acoustic Environment." Journal of Mammalogy 89, no. 3 ( 2008).

[45] Sue E. Moore, and Janet T. Clarke. "Potential Impact of Offshore Human Activities on Gray Whales (Eschrichtius Robustus)." J. CETACEAN RES. MANAGE, 19-25, 4, no. 1 (2002).

Evidence of disturbance and displacement due to underwater noise has been observed in several baleen whale species at received sound pressure levels of 160 to 170 dB re 1 µPa and lower. The broadband source level emitted by crude oil tankers has been observed to be 180.5 dB re 1 µPa, which is extremely close to the sound pressure level that baleen whales can observe. Therefore, tankers emit sound pressure levels that may be observed by humpback whales. Observed reactions include avoidance of the noise area, interrupting of feeding and moving away from the sound source, rapid swimming away from source, and changes in respiration and dive patterns. Therefore, as acoustic disturbance increases, it increases the risk of impairing successful breeding, socializing, prey detection and predator avoidance. All of which are crucial to the survival and recovery of sei, blue, and fin whales

The level of noise disturbance from the TMX tankers (around 180.5 dB re 1 µPa) is extremely close to the sound pressure levels observed by the fin, sei and blue whales (170 dB re 1 µPa). Trans mountain tankers have the potential to disturb the acoustic environment at a level observable by the sei, blue, and fin whales, which can adversely impact the ability for the whales to carry out important life strategies (mating, socializing, feeding and predator avoidance).

**Frequency and Duration**

The vessels will come and go daily through the mouth of the Juan De Fuca strait and will increase by 700% monthly. This area has the highest probability of encountering fin whales (figure 5). Since this area is a bottleneck, it is likely that they fin whales frequenting the area will be within 4-7km of the vessels. When this happens, they will be exposed to noise that is capable of causing sensory disturbance. The threat of ongoing vessels is persistent (daily) and up to the project lifespan (50 years). This level of noise added to an already disturbed marine environment presents a high risk. For fin whales that frequent the entrance to the Juan de Fuca strait, there will be a high level of noise disturbance associated with the TMX tankers. Blue whales that occupy the shelf break along the southwest Vancouver island will be exposed to sound disturbance from the increase number of vessels headed to Asian markets. The recovery strategy states that chronic noise may result in population level changes in both short and long-term behaviour, while acute sounds may result in hearing damage leading to drastically reduced fitness or death. Noise is therefore a potential threat to individuals, the population, and the habitat of these species.

The daily increase in tanker traffic would become a chronic noise in along the tanker route. Chronic noise is a serious threat. Tyack (2008) suggests that “although acute responses to intense sounds have generated considerable interest, the more significant risk to populations of marine mammals is likely to stem from less visible effects of chronic exposure.”

**Reversibility**

The effects of acoustic disturbance would be stopped when the project is cancelled or once the project has completed its 50 year life cycle and is no longer in operation. However, the effects

that the acoustic disturbance has already had on fin and blue whale individuals and the population cannot be reversed.

***Conclusion***

The threat of increased acoustic disturbance has the potential to cause significant harm to blue and fin whale individuals and the population. There a few areas along the tanker route where blue and fin whale are likely to be encountered. One location is the mouth of the Juan de Fuca strait and the second is along the shelfbreak of southwest Vancouver island. The TMX project will drastically increase the number of tankers operating at a frequency within the observable range of baleen species. Therefore, the constant daily vessel traffic will produce, or contribute to, chronic acoustic disturbance of the marine environment. The chronic noise that will be emitted by the tankers can have population level impacts due to short term and long term behavioral changes of the whales in response to the disturbance. Therefore, this project and its associated acoustic disturbance will likely cause significant adverse effects to blue and fin whales.

Sei whales have returned to B.C waters. The recovery plans objective is to maintain or increase the relative proportion of sei whales that occur in Pacific Canadian waters. If tanker traffic increases by 700% monthly throughout habitat that was once occupied by sei whales, the chance of them returning to use this habitat is low. Sei whales would likely avoid returning to the habitat with chronic noise levels associated with the TMX tankers. In order to ensure objectives laid out in the recovery strategy are being met, the previously occupied habitat off the south coast of Vancouver island should have an acoustic environment that can support sei whales. This is not achievable if the TMX project goes ahead as the 700% monthly increase in tanker traffic will disturb the acoustic environment of the sei whale.

## 3. Pollution

Blue, sei and fin whales feed at low trophic level therefore chemical bioaccumulation through low exposure to pollution is low.

**Magnitude**

The magnitude of diluted bitumen pollution in the marine environment could be anywhere from trace amounts of residue entering the water consistently to the spilling of an entire tanker carrying 750,000 barrels of diluted bitumen. If a tanker spills diluted bitumen in the presence of the sei, blue, or fin whales the impacts are unknown but could potentially be devastating. The probability of a spill occurring in the project lifespan 79-87%. Research after the exxon valdez oil spill showed that it accelerated the killer whale population trajectory towards extinction. Two groups of killer whales were severely impacted by the spill and suffered the losses of 33 and 41% in the year following the spill. Both groups have not recovered to pre-spill numbers even after 16 years post spill and one of the groups is listed as deplete under the marine mammal protection act.[46] There is no data confirming the impacts to sei, blue and fin whales from a

[46] Matkin, Co. "Ongoing Population-level Impacts on Killer Whales Orcinus Orca following the Exxon Valdez Oil Spill in Prince William Sound, Alaska." (2008).

diluted bitumen spill. Using the best available information from the impact of an oil spill on killer whales, it can be concluded that a spill would likely adversely impact sei, blue and fin whales.

The TMX project would have the potential to spill as much as 750,000 barrels of diluted bitumen into the marine environment. The Kalamazoo river spill on June 2010 spilled 257,000 barrels of crude oil into the river. Research was done to measure the lasting environmental impacts which found that "after nearly 4 years of continuous remediation, measurable concentrations of PAHs (Polycyclic Aromatic Hydrocarbons) remain in Kalamazoo River sediments within the spill area." The PAHs were the ones consistent with hydrocarbons found in diluted bitumen.[47] Further research regarding diluted bitumen spills has proven "spills of diluted bitumen pose particular challenges when they reach water bodies. In some cases, the residues can submerge or sink to the bottom of the water body." It was also concluded that spill response approaches are based on past experiences which involve crude oil. Specifically given the difference regarding how the diluted bitumen performs when spilled, "spills of diluted bitumen should entail special immediate actions in response, for example, that the properties of diluted bitumen and weathered bitumen put such spills in a class by themselves."[48] When applied to a marine ecosystem spill "If the bitumen sinks in addition to intertidal and shallow subtidal systems, subtidal ecosystems and pelagic fish will also be at risk of oil exposure."[49] We currently do not have the experience and technology available to deal with a diluted bitumen spill that sinks. Until we have such a protocol that has been proven to be effective in cleaning up diluted bitumen, the TMX poses an unacceptable risk to the sei, blue and fin whale and their habitat.

**Frequency and Duration**

The frequency of the risk of a oil spill could be sporadic and/or continuous. There could be random leaks, continual contamination from residue of diluted bitumen getting into the water, or a single large event in the case that a tanker carrying diluted bitumen spills. Unless the project is shut down once a spill or contamination has been observed, the risk of an diluted bitumen spill will persist. The risk of a diluted bitumen spill will continue throughout the entire lifespan of the project (50 years) or until the project is terminated.

**Reversibility**

If a spill occurs, the effects will likely last long into the future because there is no certainty that diluted bitumen spills can be cleaned up. The threat of a diluted bitumen spill has the potential

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[47] Tara A Kneeshaw, and Kayla A Lockmiller. "Persistence of Polycyclic Aromatic Hydrocarbons (PAHs) in Sediments Following a Tar Sands Oil Spill." SciFed Journal of Petroleum, July 2, 2018.

[48] Spills of Diluted Bitumen from Pipelines: A Comparative Study of Environmental Fate, Effects, and Response. National Academies Press, 2016.

[49] Chang, Stephanie E., Jeremy Stone, Kyle Demes, and Marina Piscitelli. "Consequences of Oil Spills: A Review and Framework for Informing Planning." Ecology and Society, (2014).

to persist for years and years after the spill with lasting impacts on the marine environment and marine life permanently and into the future.

***Conclusion***

There is a high probability that a diluted bitumen spill will happen (79-87%) throughout the projects lifespan and no effective clean up strategy exists today. Oil spills have been proven to have lethal impacts on individual killer whales which have resulted in the depletion of an entire population. This potential magnitude of harm to killer whales can be used as a guideline to how sei, blue and fin whales will be impacted from a spill. The magnitude of harm to the habitat if a tanker spilled is significant. The TMX could spill 750,000 barrels of diluted bitumen into the habitat (or potential habitat) of the blue, fin and sei whale, which is three times the size of the exxon valdez spill. The duration of the spill could have lasting impacts on the marine environment because there is a lack of effective clean up measures. The risk of an diluted bitumen spill throughout the projects lifespan is likely and would have significant adverse effects on the marine environment that the blue, fine and sei whales occupy in British Columbia and as well significant adverse effects on the blue and fin whale population.

## d) Conclusion of impacts from Trans Mountain expansion project to blue, fin and sei whale and recommendations

**Blue whales**

The TMX project and its associated threats from a vessel strike, toxic spill, and acoustic disturbance are likely to cause significant adverse harm to blue whales, their population and their critical habitat. Trans Mountain has not offered mitigations from these threats for blue whales. The Wilderness Committee submits that the Board should recommend against the approval of the Trans Mountain pipeline expansion project due to impacts to blue whales

**Fin whales**

The TMX project and its associated threats from a vessel strike, toxic spill, and acoustic disturbance are likely to cause significant adverse harm to fin whales, their population and their critical habitat. Trans Mountain has not offered mitigations from these threats for fin whales. The Wilderness Committee submits that the Board should recommend against the approval of the TMX project due to impacts to fin whales.

**Sei whales**

The TMX project and its associated risk of a significant diluted bitumen spill threatens the ability to reach objectives laid out in the recovery strategy. The recovery strategy states that the goals of recovery are to see the relative proportion of sei whales using these waters is maintained or increased; and to see that threats do not significantly reduce potential habitat or the species' distribution. The threat of an oil spill is likely and will reduce the potential habitat and ability of

the sei whales to return to previously occupied habitat. The project is not acceptable or compatible with the goals laid out in the recovery strategy. Trans Mountain has not offered mitigations from these threats for sei whales. The Wilderness Committee submits that the Board should recommend against the approval of the TMX project due to impact to potential habitat of sei whales.

## Species at risk impacts from the Trans Mountain expansion project – Short-tailed albatross and Pink-footed shearwaters

### a) Ecology, biology and distribution

*Unless otherwise stated, all information presented in this section is based on the federal Recovery Strategy for the Short-tailed Albatross (Phoebastria albatrus) and Pinkfooted Shearwater (Puffinus creatopus) in Canada.* [50]

Short-tailed albatrosses are large seabirds in the order procellariiformes. They breed in nesting colonies in Japan and range all over the north Pacific ocean, including off the coast of BC. These birds spend most of their time at sea foraging at the sea surface for squid, fish, shrimp and bait tossed off fishing vessels, but not much is known about their marine habitat requirements. “The bones of Short-tailed Albatrosses have been found in middens from St. Lawrence Island to California, suggesting that this species represented an important and abundant food source to the Native people of the west coast of the Pacific.”[51] These birds often gather into rafts on the ocean surface, including with other seabird species.

Pink-footed shearwaters are medium-sized procellariiform seabirds that nest in colonies in Chile and range across the north Pacific ocean, including off the coast of BC. They eat mainly sardines and anchovies, but also other forage fish and squid.

### b) Critical habitat and habitat areas

Canada’s recovery strategy for these birds highlights a knowledge gap that requires identifying their important foraging habitats in Canadian waters. Figure 10 shows the distribution of Short-tailed Albatross sightings in Canada and adjacent waters. The breeding grounds of short-tailed albatrosses are in international waters (Japan). They range and forage throughout the north Pacific, especially in Alaska.  Its marine range in Canada includes Canada's 200 nm Exclusive

[50] Environment Canada. "Recovery Strategy for the Short-tailed Albatross (Phoebastria Albatrus) and Pinkfooted Shearwater (Puffinus Creatopus) in Canada." Species at Risk Act Recovery Strategy Series, 2008.

[51] Short-tailed Albatross species profile, Government of Canada https://wildlife-species.canada.ca/species-risk-registry/species/speciesDetails_e.cfm?sid=797

Economic Zone (EEZ), Dixon Entrance, Queen Charlotte Sound, and Hecate Strait. It may also have occurred in the Strait of Juan de Fuca and in coastal inlets.

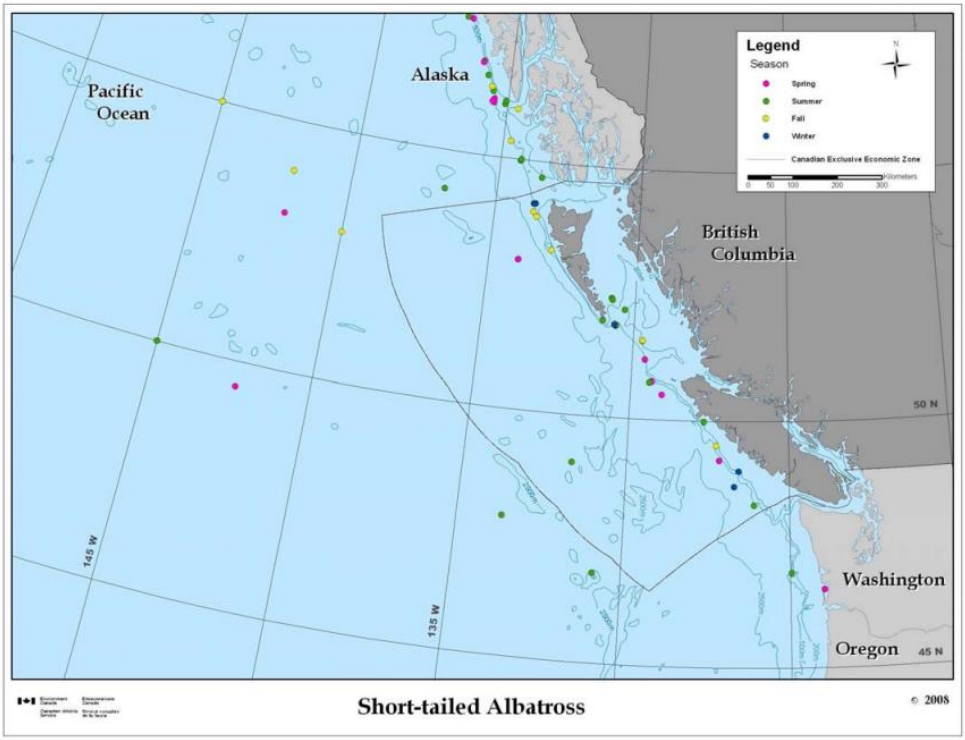


**Figure 10.** Distribution of short-tailed Albatross in Canada and adjacent waters (1960-2008). [52]

Pink-footed shearwaters breed in Chile and range northward across Chile, Central America and the pacific coast of Turtle Island. Although Pinkfooted Shearwaters have been observed in coastal BC as far north as the west side of Dixon Entrance, relatively few birds are encountered north of the southern tip of the Queen Charlotte Islands.. In Canada, Pink-footed Shearwaters occur from late March through late October, with the majority of birds observed from late June through early September. There are no winter records of Pink-footed Shearwaters in Canadian waters. Based on the density of birds observed during Environment Canada's pelagic surveys and the geographic extent of the species' occurrence, possibly between 10,000 and 20,000 Pinkfooted Shearwaters may occur within Canadian waters for varying lengths of time. Figure 11 and 12 show the densities of habitat use in spring and summer months.

[52] Environment Canada. "Recovery Strategy for the Short-tailed Albatross (Phoebastria Albatrus) and Pinkfooted Shearwater (Puffinus Creatopus) in Canada." Species at Risk Act Recovery Strategy Series, 2008.

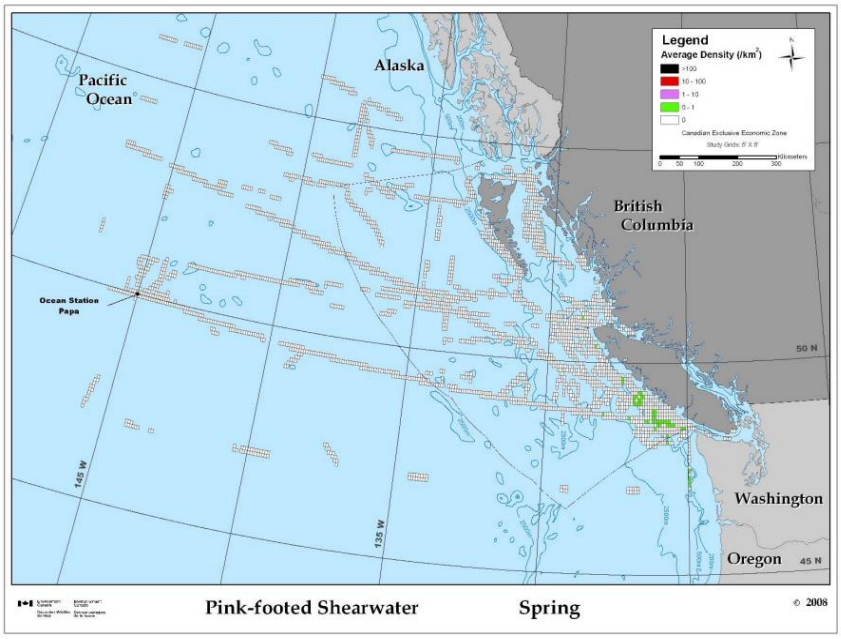


**Figure 11.** Average grid cell densities of Pink-footed Shearwaters during spring (March 16 - June 15, 1982- 2005).[53]

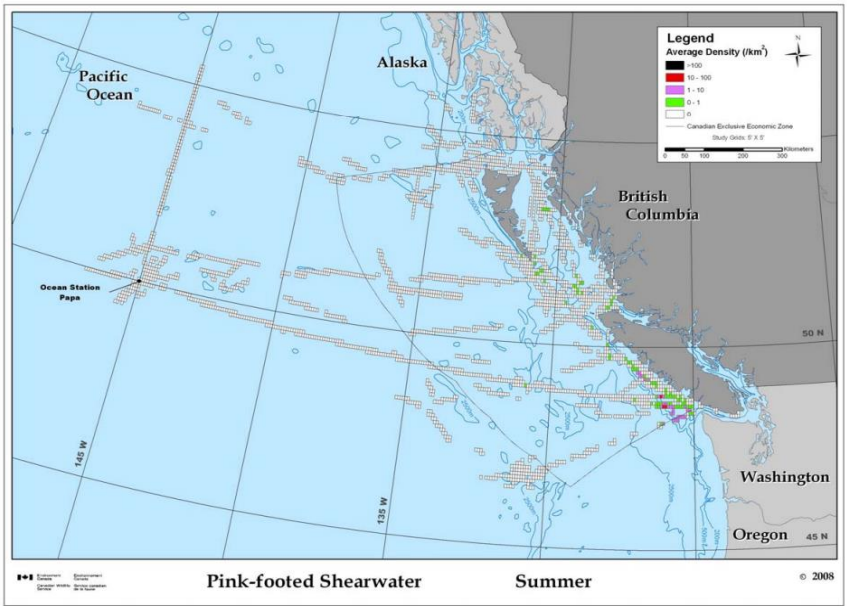


**Figure 12**. Average grid cell densities of Pink-footed Shearwaters during summer (June 16 - September 15, 2982 - 2005).[54]

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[53] Environment Canada. "Recovery Strategy for the Short-tailed Albatross (Phoebastria Albatrus) and Pinkfooted Shearwater (Puffinus Creatopus) in Canada." Species at Risk Act Recovery Strategy Series, 2008.

[54] Environment Canada. "Recovery Strategy for the Short-tailed Albatross (Phoebastria Albatrus) and Pinkfooted Shearwater (Puffinus Creatopus) in Canada." Species at Risk Act Recovery Strategy Series, 2008.

Both birds depend on access to large areas of biologically productive coastline for foraging. Some critical habitat research objectives were put forth in Canada's recovery strategy for these two species. Specifically, the recovery team called for studies to elucidate how and where the birds' critical habitat applies in Canada. Decision makers need to see if that work has been done, as part of their due diligence for marine species affected by the TMX project. Canada's recovery strategy for these birds highlights a knowledge gap that requires identifying their important foraging habitats in Canadian waters.

## c) Trans Mountain expansion project threats to short-tailed albatrosses and pink-footed shearwaters

*Unless otherwise stated, all information presented in this section is based on the federal Recovery Strategy for the Short-tailed Albatross (Phoebastria albatrus) and Pinkfooted Shearwater (Puffinus creatopus) in Canada.* [55]

### 1. Toxic Spill

Both short-tailed albatrosses and pink-footed shearwaters are threatened by oil pollution and bioaccumulation of other pollutants like heavy metals. These birds are sensitive to oil spills. Offshore oil & gas activities also pose a threat. At the time of release, climate change was a known threat but it was not well understood. Now we know that climate change has the capacity to drastically adversely affect seabirds because it destabilizes atmospheric and oceanic conditions.

Procellariiforms in general are "very sensitive" to oil spills at sea.[56] Petroleum exposure harms albatrosses physiologically through direct toxicity and disrupting their thermoregulation. Small, frequent discharges of petroleum or its byproducts harm these birds through chronic exposure. Negative impacts of crude oil exposure on procellariiform breeding success are well documented.[57][58] Catastrophic spills occur less often but the presence and transit of tankers in

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[55] Environment Canada. "Recovery Strategy for the Short-tailed Albatross (Phoebastria Albatrus) and Pinkfooted Shearwater (Puffinus Creatopus) in Canada." Species at Risk Act Recovery Strategy Series, 2008.

[56] 2008. Recovery strategy for short-tailed albatross and pink-footed shearwater, Government of Canada https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/plans/rs_short_tailed_albatross_and_pink_footed_shearwater_final_0408_e.pdf

[57] Fry, D.M., Swenson, J., Addiego, L.A. et al. Arch. Environ. Contam. Toxicol. (1986) 15: 453. https://doi.org/10.1007/BF01066414

[58] R. G. Butler, A. Harfenist, F. A. Leighton and D. B. Peakall

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the continental shelf area that short-tailed albatrosses and pink-footed shearwaters forage in poses a risk of such exposure.

Existing oil tanker traffic already posed a threat to these birds in 2008, due to collisions, running aground and bilge discharge. Most tanker traffic stays well offshore the west coast of BC due to a voluntary exclusion zone, which mitigates these risks somewhat. However, the TMX project proposes a 7-fold increase in tanker traffic coming through offshore and nearshore areas all the way into Vancouver harbour, bisecting procellariiform distribution at least twice on the way in and out of Canada's Economic Exclusion Zone (Figure 1). Each additional tanker adds to the risk for short-tailed albatrosses of encountering an acute spill and chronic exposure from small leakages.

Short-tailed albatrosses depend on productive oceanographic zones to forage for their food. The young begin to forage in springtime after they fledge their nests. Already climate change is having an effect on ocean temperatures and productivity, the timing of climatic events like El Nino, and seasonal emergence of prey in the oceans. This is an ongoing area of research. Climate change also affects short-tailed albatross breeding habitat. What is certain is that the upstream and downstream carbon emissions resulting from the TMX project will exacerbate climate change and increase the associated risks to survival for short-tailed albatrosses and pink-footed shearwaters.

**Magnitude**

Impacts to individual:

A trans mountain tanker vessel carrying 750,000 barrels has the potential to spill almost three times as much oil as the Exxon Valdez (which spilled 257,000 barrels). The Exxon Valdez oil spill impact to seabirds is known and this is the best available knowledge. More than 30,000 dead birds of 90 species were retrieved from polluted areas by 1 August 1989. Because only a fraction of the birds who were killed were retrieved, the USGS estimated that 250,000 seabirds died in total as a result of this spill[59]. This research is illustrative of the impacts to seabirds if a large tanker spill occurred again off the coast of B.C.

Impacts to critical habitat:

The presence of TMX-related diluted bitumen tankers within short-tailed albatross range in Canada will increase the birds' risk of exposure to toxic petrochemicals. In the likely event of a large spill and the almost certain event of operational leakages, short-tailed albatrosses will be poisoned, freeze to death and/or be unable to successfully breed.

The trans mountain pipeline would have the potential to spill as much as 750,000 barrels of diluted bitumen into the marine environment. The Tsleil-Waututh Nation did an extensive

[59] J. F. Piatt and R. G. Ford. "How many seabirds were killed by the Exxon Valdez Oil Spill?" Am. Fish. Soc. Symp. 18, no. 712 (1996).

assessment of the proposal and found a 79 to 87 per cent likelihood of a spill in their waters over the span of fifty years if the pipeline went ahead.The Kalamazoo river spill on June 2010 spilled 257,000 barrels of crude oil into the river. Research was done to measure the lasting environmental impacts which found that “after nearly 4 years of continuous remediation, measurable concentrations of PAHs (Polycyclic Aromatic Hydrocarbons) remain in Kalamazoo River sediments within the spill area.” The PAHs were the ones consistent with hydrocarbons found in diluted bitumen.[60] Further research regarding diluted bitumen spills has proven “spills of diluted bitumen pose particular challenges when they reach water bodies. In some cases, the residues can submerge or sink to the bottom of the water body.” It was also concluded that spill response approaches are based on past experiences which involve crude oil. Specifically given the difference regarding how the diluted bitumen performs when spilled, “spills of diluted bitumen should entail special immediate actions in response, for example, that the properties of diluted bitumen and weathered bitumen put such spills in a class by themselves.”[61] When applied to a marine ecosystem spill “If the bitumen sinks in addition to intertidal and shallow subtidal systems, subtidal ecosystems and pelagic fish will also be at risk of oil exposure.”[62] We currently do not have the experience and technology available to deal with a diluted bitumen spill that sinks. Until we have such a protocol that has been proven to be effective in cleaning up dil bit, the trans mountain pipeline poses an unacceptable risk to the critical habitat of short-tailed albatrosses and pink-footed shearwaters.

Impacts to food source:

Of 36,000 bird carcasses gathered for seven months after the Exxon Valdez spill, over 3,000 were procellariiforms who died of starvation[63]. If a diluted bitumen spill happened along the tanker route there is an extremely high chance it would impact the food resources for short-tailed albatrosses and pink-footed shearwaters, specifically small fish and marine invertebrates, through a slew of detrimental impacts from interrupting mucous membranes to causing cancer[64]. The recovery and survival of these seabirds is therefore threatened by the trans mountain pipeline and its significant impacts on valuable prey populations.

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[60] Tara A Kneeshaw, and Kayla A Lockmiller. "Persistence of Polycyclic Aromatic Hydrocarbons (PAHs) in Sediments Following a Tar Sands Oil Spill." SciFed Journal of Petroleum, July 2, 2018.

[61] Spills of Diluted Bitumen from Pipelines: A Comparative Study of Environmental Fate, Effects, and Response. National Academies Press, 2016.

[62] Chang, Stephanie E., Jeremy Stone, Kyle Demes, and Marina Piscitelli. "Consequences of Oil Spills: A Review and Framework for Informing Planning." Ecology and Society, (2014).

[63] Piatt, John F., Calvin J. Lensink, William Butler, Marshal Kendziorek, and David R. Nysewander. "Immediate Impact of the 'Exxon Valdez' Oil Spill on Marine Birds." The Auk 107, no. 2 (1990): 387-97. doi:10.2307/4087623.

[64] Tanaka, M and Islam, Shahidul. “Impacts of pollution on coastal and marine ecosystems including coastal and marine fisheries and approach for management: a review and synthesis.” Marine Pollution Bulletin 49, no. 7-8 (2004): 624-649. https://doi.org/10.1016/j.marpolbul.2003.12.004

**Frequency and Duration**

The risk of an oil spill is continuous over the operation of the project. Spill events could be acute or chronic. There could be random leaks, continual contamination from diluted bitumen residue in the water, or a single large event in the case that a tanker carrying diluted bitumen capsizes. Unless the project is shut down once a spill or contamination has been observed, the risk of a diluted bitumen spill will persist. The risk of a diluted bitumen spill will continue throughout the entire lifespan of the project (50 years) or until the project is terminated. If a major spill occurs, the effects on the marine ecosystem will last into the foreseeable future, as they did with the Exxon Valdez[65]. Even if only small spills occur, these will have a chronic effect on pink-footed shearwaters and short-tailed albatrosses as described in the recovery strategy.

**Reversibility**

There is no way to clean up diluted bitumen that is known of. Therefore, this threat is not reversible. The impacts to seabirds and the marine environment can never be reversed. The only way to preclude this harm is to reject this project so its risks are avoided.

***Conclusion***

Under SARA this project poses a risk to the individual short-tailed albatrosses and pink-footed shearwaters, their populations and their critical habitat. SARA prohibits the killing, harming or harassing of a species at risk. The threat of a diluted bitumen spill from the Trans Mountain tankers poses a high risk that these procellariiforms could be killed or harmed. The magnitude of harm that would come from a diluted bitumen spill is significant because impacts range from direct lethal impacts to individual whales, to the depletion of critical habitat, to the collapse of the local food web. Currently, there is a lack of expertise and effectiveness on cleaning up diluted bitumen spills which means impacts can last indefinitely. The risk of a toxic spill is 79-87% throughout a 50 year life span. Due to the extremely high magnitude of harm that would come from a TMX tanker spill and considering that the likeliness of a spill is 79-87%, the only sound conclusion is that the threat of a diluted bitumen spill from the project will likely cause significant adverse effects to short-tailed albatrosses and pink-footed shearwaters, their population and their critical habitat.

These birds are protected under Schedule 1 of SARA as well as the Migratory Birds Convention Act (1994). “Recovery objectives for the species in Canada are to: minimize or remove threats under Canadian jurisdiction; identify and conserve Canadian marine habitats of importance; promote, support and augment international initiatives contributing to the recovery throughout their range; develop and implement educational activities that support recovery in Canada; and address knowledge gaps concerning threats and Short-tailed Albatross and Pink-footed Shearwater ecology in Canada.”[66]

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[65] CHARLES H. PETERSON, STANLEY D. RICE, JEFFREY W. SHORT, DANIEL ESLER, JAMES L. BODKIN, BRENDA E. BALLACHEY, DAVID B. IRONS. “Long-Term Ecosystem Response to the Exxon Valdez Oil Spill.” SCIENCE 203, no. 5653 (2003): 2082-2086 DOI: 10.1126/science.1084282

[66] Ibid, 2008

Another knowledge gap in the recovery strategy requires Canada to "evaluate the frequency and impact of petroleum discharges in the Canadian waters used by Short-tailed Albatross and Pink-footed Shearwater, and determine additional ways Canada can help to reduce these discharges."[67]

Canada has international obligations to recover these great seabirds as part of the Migratory Birds Convention Act with the United States and as part of the UN Convention on Biological Diversity to which 195 fellow countries are party. Furthermore, the stated intent of the recovery strategy is to "support international efforts to restore and increase populations by reducing potential mortalities while the birds are in Canadian territory."[68] The recovery objectives prioritize removing the threats to these birds that are under Canadian jurisdiction, and also to identify and protect important habitat areas for them. In the absence of scientific certainty about short-tailed albatross critical habitat, the precautionary principle of Canada's SARA applies.

A repeatedly recommended approach to reaching the recovery objectives is to "Assess potential for impacts to these species and/or their habitats during Environmental Impact Assessments," which notably has not adequately happened for the TMX project since marine tanker traffic was originally excluded from the scope of environmental reviews. An action plan for short-tailed albatrosses and pink-footed shearwaters was to follow the recovery strategy by July 2009. However, this document is overdue and still has not been completed nine and a half years after that.

## 2. Climate Change

Climate change is a system-level phenomenon. The magnitude of climate change impacts to at-risk seabirds depends on how humanity responds to the climate crisis. Already the IPCC warns that we are headed towards at least 1.5 degrees C of global warming[69]. Earlier (less urgent) research showed that climate change will disrupt ocean circulation, plankton communities, fish communities and seabird ecology[70]. The frequency of these disruptions is increasing as fossil fuel combustion emissions drive climate change faster and faster. The duration of the impacts is going to be long-term, as the increasing amount of atmospheric carbon dioxide stores up in the

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[67] Ibid, 2008

[68] Ibid, 2008

[69] IPCC, 2018: Summary for Policymakers. In: Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [V. Masson-Delmotte, P. Zhai, H. O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J. B. R. Matthews, Y. Chen, X. Zhou, M. I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, T. Waterfield (eds.)]. World Meteorological Organization, Geneva, Switzerland, 32 pp.

[70] Lech Stempniewicza, Katarzyna Błachowiak-Samołyk, and Jan M.Węsławski. "Impact of climate change on zooplankton communities, seabird populations and arctic terrestrial ecosystem—A scenario." Deep Sea Research Part II: Topical Studies in Oceanography 54, no. 23-26 (2007): 2934-2945.

atmosphere, continuing to alter biological systems that evolved for millenia in a relatively cooler, stable climate.

***Conclusion***

The impacts of climate change are not reversible over the lifetime of the TMX project, or any scale that the NEB or CEAA considers. Because of the large magnitude, frequency, duration and irreversibility of these impacts, this project poses significant adverse risks and should not be approved. The emissions resulting from TMX must not be allowed to enter the atmosphere. Canada must keep the dilbit in the ground in order to stay on track with our international emissions targets, and as part of short-tailed albatross and pink-footed shearwater recovery (and our international commitments thereto).

## d) Conclusion of impacts from Trans Mountain expansion project to pink-footed shearwater and short-tailed albatross recommendations

Marine tanker traffic associated with TMX will bisect these threatened birds' habitat, potentially causing significant harm to them in the event of a spill or even small chronic leakages. The lifetime emissions resulting from the export of dilbit on the tankers will definitely add to global climate change, adverse effects to pink-footed shearwaters, short-tailed albatrosses, and the food webs in which they are embedded. The unavoidable climate change impacts of the project will destabilize their ability to feed themselves and their young. There is also a knowledge gap in how climate change will affect prey availability in critical pink-footed shearwater and short-tailed albatross habitat. Changing oceans and atmospheres will also affect fish, crustacean and squid species living in those oceans. In this time of ecological crisis and looming mass extinction, fossil fuel exports like those proposed by TMX are mortally irresponsible on the part of Canada. The TMX expansion project will likely cause significant adverse harm to short-tailed albatrosses and pink-footed shearwaters habitat areas in B.C. Furthermore, the TMX pipeline project does not align with objectives to reach the goals set out in the recovery strategy. The recovery strategy prioritizes removing threats to these birds and the TMX project would significantly increase these threats. The Wilderness Committee submits that the Board should recommend against the approval of the Trans Mountain pipeline expansion project.

## Final conclusion and recommendations for the project

The TMX project will likely cause significant adverse harm to humpback whales, blue whales, fin whales, short-tailed albatross and pink-footed shearwater. Further, this project will negatively impact the ability to meet recovery objectives laid out in the recovery strategy for the sei whale. This project and its associated risks threatens the survival and/or recovery of these six federally listed marine species at risk. The wilderness committee submits that the board should recommend against the approval of the TMX.

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