

# Final Evidence Report

Submitted to: National Energy Board Environmental Assessment  
Process Hearings on Kinder Morgan Trans Mountain Expansion  
Project Application (KM-TMX)



Prepared by: The Board of the Friends of Ecological Reserves

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## Photo Credits

Top: Oil Tanker YASA Golden Horn passes Oak Bay Islands ER: photo by Phil Lambert.

Middle left: A large bulk carrier near the Race Rocks Ecological Reserve- Dec 12, 2014 - photo by Alex Fletcher.

Middle right: Black Oystercatchers and several species of gulls overwintering at Race Rocks Ecological Reserve. Photo by Alex Fletcher, 2011.

The bottom images are of oiled species from the Exxon Valdez Oil Spill. These species are at risk along the oil tanker route.

Oil Spill images available from:

<https://www.google.ca/search?q=images+of+exxon+valdez+oil+spill&biw=1038&bih=532&tbm=isch&tbo=u&source=univ&sa=X&ei=MNUeVfveIcPVoAS5koH4Bw&ved=0CDEQ7Ak> (accessed May 26, 2015)

# Final Evidence Report Submitted to the NEB from Board of FER for KM-TMX

## EXECUTIVE SUMMARY

This evidence report from Board of the Friends of Ecological Reserves ( Board of FER) is for the National Energy Board (NEB) to inform the decision on the Kinder Morgan Trans Mountain Permit (KM-TMX) Application.

FER is a small non-government organization (NGO) that through volunteer efforts supports Ecological Reserves (ERs) and BC Parks staff who have the legal responsibility to manage ERs. FER was formed 32 years ago with goals to maintain and enhance ERs so that they meet their intended legislated purposes as defined under the *Ecological Reserves Act of BC*. Those purposes are to serve as natural area benchmarks for research, education and monitoring for the benefit of British Columbians, government agencies, scientists and First Nations. We outline why monitoring and research in the 19 marine ERs along the tanker route is important to improve ecosystem understanding over the life of the KM-TMX project (30+years). Research and monitoring information (baseline and ongoing) is critical in the event of an oil spill and restoration. This report recommends to the NEB a number of permit conditions patterned after the permit conditions applied to the Enbridge Northern Gateway project. If this project is approved, the recommended conditions are intended to ensure that collection and maintenance of information about the natural environment will occur over the life of the KM-TMX project so that knowledge-based incremental improvements can be made.

**Chapter One** discusses the Board of FER's focus on marine ecosystems and the species associated with the 19 ERs situated along the oil tanker route. We present a case for pre- and post-spill monitoring in ERs as fundamental to understanding marine ecosystems under natural conditions and to learn of their resilience and/or restoration capability in the event of an oil spill. The Board of FER focused on three of the 11 issues identified by the NEB. These are:

- *Issue 4: cumulative environmental effects that are likely to result from the project;*
- *Issue 5: potential environmental and socio-economic effects of marine shipping activities including the potential effects of accidents or malfunctions that may occur;*
- *Issue 11: contingency planning for spills, accidents or malfunctions during operation of the project.*

We conclude that the environmental reports submitted by KM-TMX have failed to address these issues and that the KM-TMX project as submitted should not be approved. If the project is approved, our recommended conditions are intended to ensure that information to address Issues 4, 5 and 11 will be obtained during the life of project and inform emergency spill planning, habitat compensation, and species and ecosystem resilience susceptibility to the toxic effects of Dilbit.

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**Chapter Two** outlines how the Board of FER gathered evidence and participated in the NEB KM-TMX process. This was and continues to be a time-consuming process and our participation would not have been possible without support from the NEB Participant Funding Program. We learned that the NEB process is flawed, as it does not include the opportunity for intervenors to cross-examine the proponent nor pose questions of Canadian government agencies with legal responsibility for environmental monitoring and oil response. We trust that in the future there will be a national energy strategy with clear policies to meet carbon emissions targets within time limits in order to mitigate climate change, so that projects such as KM-TMX can be assessed in a broader context along with alternate energy investments and subsidies. We are unclear from information brought to the process, the extent to which KM-TMX contributes taxes in Canada and the extent to which Canadians subsidize oil energy in general and KM-TMX specifically.

**Chapter Three** lists the 19 marine ERs potentially impacted by the KM-TMX project. For each reserve there is a summary description of the values, a list of the threatened and endangered species, estimated shoreline lengths, and summary of current monitoring and research gaps. The Board of FER is concerned about the inadequacy of baseline monitoring in ERs as well as research and monitoring gaps in the broader marine ecosystem.

We understand that KM-TMX casts this project as a minor increase in tanker traffic from six to 14 per cent but we see this project as a very major increase (>360 per cent) in oil tanker traffic. In this respect, KM-TMX is the major player bringing the highest risk to British Columbians and coastal ecosystems and with that there must be concomitant responsibilities.

Also in Chapter Three, we review monitoring for species (some listed) such as: killer whale, elephant seal, California sea lion, northern (Stellers) sea lion, river and sea otter, marine birds, over-wintering birds, salmon, rockfish, forage fish and invertebrates associated with ERs. These sections highlight several intervenors' calls for better assessment of the potential damage to fish resources and others too identify huge gaps in what has been presented by KM-TMX. The proximity of a number of rockfish conservation areas along the tanker route has not been given the concern that it deserves. The diverse habitats of forage fish, invertebrates, sea grasses and marine algae appear to have been entirely discounted in assessments done by KM-TMX. Essential marine food webs have been ignored from the assessment. Lack of knowledge of the abundance and importance of the highly diverse community of invertebrates is a gap. A failure to consider any indicator species shows a lack of scientific rigour in the KM-TMX assessment reporting. On some of the island reserves, the rare terrestrial plant associations were not mentioned in KM-TMX impact reporting, even though air-borne dispersal of pollution from sea spray in the event of an oil spill would very likely lead to local extirpations. Even the Committee on the Status of Endangered Wildlife in

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Canada (COSEWIC)-listed “species at risk” in several ERs have not been addressed, so we include what species were absent from KM-TMX reports along with our concerns and we have provided references and excerpts from more recent studies to KM-TMX.

**Chapter Four** reviews lessons learned by the Board of FER through our review of the KM-TMX documents and Information Requests (IRs) #1 and #2. The text of communications between the Board of FER and KM-TMX is provided in table summaries in Appendices B (IR#1) and C (IR#2). We outline our experience through these two rounds of IRs and read the KM-TMX responses to other intervenors’ requests too. We filed motions to compel KM-TMX to provide full and adequate responses. We got little additional information as a result. We see a lack of leadership and commitment by KM-TMX to address our questions and to address NEB Issues 4, 5 and 11. We now understand KM-TMX is diligently working to *limit* their role in marine systems to solely support the Western Canada Marine Response Corporation (WCMRC) and are content to have agencies such as the Canadian Coast Guard (CCG), the BC Government, Department of Fisheries and Oceans (DFO) and volunteer groups such as FER, monitor and improve knowledge on how to manage the increased risk to marine ecosystems from the KM-TMX project. KM-TMX will be content if no multi-stakeholder forum is put in place to review and provide information that would in future compel changes in practices based advances in learning on how to best reduce risk. We concluded that KM-TMX has not accepted any level of responsibility or accountability for marine systems despite the NEB direction to address the marine environment and impacts.

During Information Requests #1 and #2, KM-TMX showed no interest in commitments and weak collaboration with a variety of stakeholders. No voluntary commitments were made by KM-TMX similar to those made by Enbridge. We have learned that KM-TMX is not interested in participating in acquiring knowledge in the marine environment, nor being involved in developing incremental improvements to tanker traffic and risk reduction strategies, nor having a structured forum in which to periodically review newer information, practices and plans. KM-TMX responses to many of our questions, has been to provide assurances that agencies such as WCMRC (a subsidiary of KM-TMX), CCG, Environment Canada and the BC Government have responsibilities for spilled oil clean-up and that tankers carry insurance. KM-TMX has convinced itself that it has no responsibility beyond the Westridge Terminal and none for oil in the marine environment. The Board of FER disagrees and sees KM-TMX as abdicating responsibility for marine transport while adding huge risk. We conclude that only through permit conditions can KM-TMX be brought to account for, and contribute to learning how to manage and mitigate the risk to marine ecosystem. KM-TMX expects to get a free ride for oil transport in the marine portion of their export business. Unless the NEB requires sufficiently stringent permit conditions, the Board of FER fears that this will come to pass.

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**Chapter Five** recommends to the NEB 12 Permit Conditions for the KM-TMX project. We argue these conditions (based on Enbridge conditions) need to be longer-lasting and at arms-length from KM-TMX. This is because the Salish Sea and Strait of Juan de Fuca have much higher population density, greater concentration of shipping (risk of accidents) and the higher concentration of environmental values linked to the Fraser River Estuary, Strait of Georgia and Strait of Juan de Fuca. These conditions need to be at arms-length from KM-TMX but involve KM-TMX. KM-TMX's lack of interest requires an arms-length arrangement to allow others interested and knowledgeable in marine ecosystems a collective role towards an uncertain possibly environmentally devastating future. An overview of the recommended conditions follows:

1. Establish a Research and Monitoring Endowment Fund to provide stable long term funding for research and monitoring over the life of the project (30+years), to learn how to make incremental improvements to practices, plans, marine ecosystem restoration, etc. The Endowment needed is estimated to be at least \$450 million. This could be achieved with a 1% environmental levy or the equivalent of an environmental surcharge equal to (\$0.25/barrel of oil). Such a levy would accrue the Endowment fund within a 6 to 10 year time period based on expected forecasted oil exports. This Endowment conservatively invested (2% return on investment) provides stable secure funding for a \$9 million marine research and monitoring program annual budget over the life of this project.
2. Form a multi-stakeholder Board of Trustees responsible for the management of the Endowment Fund and approval of annual expenditures of a Marine Research and Monitoring Program (MREMP). Trustees would represent the interests of First Nations, KM-TMX, Federal Government (DFO and Environment Canada), BC Environment, State of Washington, NGOs (FER and Pacific Salmon Foundation) and three other representatives selected by the Trustees.
3. Details on filing of progress for establishing the Endowment fund and the MREMP (Conditions 1 and 2) to the NEB.
4. Filing progress and results of monitoring and research done by the MREMP.
5. Set the boundaries of the MREMP to those equal to the size of the area identified as a High Spill Risk Zone for Western Canada) as identified by Tanker Safety Panel 2013 (see references for access to this report).
6. Conduct enhanced marine spill trajectory and fate modelling to support conditions 7, 8, 10 and 11. Modelling capacity needs to be maintained as part of the MREMP program to assess risks and support spill preparedness planning and understand how best to mitigate impacts.
7. Develop and maintain a Marine Habitat Compensation Plan and take responsibility for quality assurance and for up-dating shore zone mapping (to inform by condition 5, 10 and 12) and ensure that shore zone inventory is available as a coastal planning tool in general.
8. Conduct marine ecosystem research on potential impacts, mitigation, resilience

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and recovery to marine ecosystems and species including toxicological research on aquatic organisms as part of the MREMP.

9. Develop and maintain a Marine Mammal Protection Plan informed by Conditions 6, 7 and 8 as part of the MREMP.
10. Reporting details on the Marine Research Program Progress Reporting conditions 6, 7, 8 and 9.
11. Details of filing of Spill Preparedness Plans and consultation plans.
12. Participate in and filing updates on Spill Preparedness Plans and consultation plans.

**Chapter Six** is a tabular summary of the Conditions recommended by Board of FER to the NEB.

### **Appendices**

Appendix A is a letter of support to the BC Government for disclosure of spill preparedness plans and is included with this report.

Appendix B is a summary Information Request #1 and the KM-TMX response and a separate document.

Appendix C is a summary of Information Request #2 and a separate document.

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### GLOSSARY AND DEFINITION OF TERMS

Abbreviation	Full Name	Additional information
Aframax	Average Freight Rate Assessment Maximum	Size of the freighters that can access Westridge terminal. The average cargo carrying capacity of Aframax is approximately 750,000 barrels.
ATK	Aboriginal Traditional Knowledge	A term used in permit conditions for Enbridge with regard to inclusion of FN with research and monitoring and included with FER conditions.
Bbls	barrels	A non standardized unit used by KM TMX in their assessments. Thought to be 42 <a href="#">US gallons</a> , which is about 159 litres or 35 <a href="#">imperial gallons</a> .
CDC	Conservation Data Centre	<a href="http://www.env.gov.bc.ca/cdc/">http://www.env.gov.bc.ca/cdc/</a> . Provides information on species and ecosystems at risk in BC.
COSEWIC	Committee on the Status of Endangered Wildlife in Canada	Information on COSEWIC is managed by Environment Canada and available at <a href="http://www.cosewic.gc.ca/eng/sct5/index_e.cfm">http://www.cosewic.gc.ca/eng/sct5/index_e.cfm</a>
CWCS	Credible Worse Case Scenario	Used in KM TMX reports to model oil spill of 16,500 T or approx. 14% of an Aframax tanker's capacity.
Dilbit	Diluted Bitumen	<a href="#">bitumen</a> diluted with one or more lighter petroleum products to make it easier to transport.
ENGO	Environmental Non-Government Organization	An NGO with principal focus on environmental management and protection.
ER	Ecological Reserve	Defined in Legislation for British Columbia. <a href="http://www.bclaws.ca/civix/document/id/complete/statreg/96103_01">http://www.bclaws.ca/civix/document/id/complete/statreg/96103_01</a>
ERA	Enhanced Response Area	A zone identified as holding a higher risk of oil spills due to traffic convergence and volume of shipping.
ESSC	Endowment Stakeholder Steering Committee	Trustees overseeing a proposed Research and Monitoring Endowment and approving operational projects
FER	Friends of Ecological Reserves	A volunteer Board leading an organization supporting BC parks to safeguard BC's Ecological Reserves <a href="http://ecoreserves.bc.ca/">http://ecoreserves.bc.ca/</a> .
FN	First Nations	A term for Aboriginal Groups, specific FNs names are used when possible.
IR	Information Request	Intervenors provided an opportunity to ask KM for information about their TMX application.

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Abbreviation	Full Name	Additional information
KM	Kinder Morgan	Kinder Morgan is the largest energy infrastructure company in North America. Based in Texas. <a href="http://www.kindermorgan.com/">http://www.kindermorgan.com/</a> . The parent company operates in a Canadian subsidiary.
KM-TMX	Kinder Morgan Trans Mountain Expansion Project	The term used to apply to application for twining the current KM pipe line through BC and Alberta and resultant increases in Dilbit export from the Westridge Terminal in Burnaby.
LOG	News letter of FER	News letters at <a href="http://ecoreserves.bc.ca/news/newsletter-archive/">http://ecoreserves.bc.ca/news/newsletter-archive/</a> .
MREMEF	Marine Research and Environmental Monitoring Endowment Fund	A new endowment fund proposed as a permit condition by the Board of FER in this report.
MREMP	Marine Research and Environmental Monitoring Program	This is the name of a condition proposed based on similar research and monitoring conditions applied to the Northern Gateway permit.
NEB	National Energy Board	<a href="https://www.neb-one.gc.ca/index-eng.html">https://www.neb-one.gc.ca/index-eng.html</a> .
NGO	Non-government Organization	Non-for-profit organizations recognized by government and receiving different tax status.
NOAA	National Oceanic and Atmospheric Administration	A US agency <a href="http://www.noaa.gov/about-noaa.html">http://www.noaa.gov/about-noaa.html</a>
PFP	Participant Funding Program	A program of the NEB to help intervenors participate in NEB permit application reviews.
RCA	Rockfish Conservation Area	Areas designated by DFO with some fishing limitations. <a href="http://www.pac.dfo-mpo.gc.ca/fm-gp/maps-cartes/rca-acis/index-eng.html">http://www.pac.dfo-mpo.gc.ca/fm-gp/maps-cartes/rca-acis/index-eng.html</a>
RSA	Regional Study Area	An area chosen by KM to focus the Environmental Assessment for the TMX project.
SARA	Species at Risk Act	Species recognized under this Act have a legislated time line for activities as stated in a recovery plan.
TERMPOL	Technical Review Process of Marine Terminal Systems and Transhipment Sites	This group has provided reports to NEB on development proposals. Agencies included are: <ul style="list-style-type: none"> <li>• Transport Canada</li> <li>• Environment Canada</li> <li>• Fisheries and Oceans Canada</li> <li>• Canadian Coast Guard</li> <li>• Pacific Pilotage Authority Canada</li> </ul>

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Abbreviation	Full Name	Additional information
TLU	Traditional Land Use	A term applied to FN and used in permit conditions.
TMX	Trans Mountain Expansion Project	<a href="http://www.transmountain.com/proposed-expansion">http://www.transmountain.com/proposed-expansion</a> .
US EPA	United States Environmental Protection Agency	The Federal US agency with a mandate to protect human health and the environment. <a href="http://www.epa.gov">www.epa.gov</a>
WCMRC	Western Canada Marine Resources Corporation	A subsidiary of KM responsible for oil spill preparedness and clean-up <a href="http://wcmrc.com/">http://wcmrc.com/</a>

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## 1. INTRODUCTION

This report focuses on marine Ecological Reserves (ERs) in the Salish Sea and Strait of Juan da Fuca (see Figure 1 and Table 4 for a listing of potentially impacted ERs).

In 2014, the Board of Friends of Ecological Reserves (FER) received intervenor status from the National Energy Board (NEB) in the Kinder Morgan Trans Mountain Expansion Project (KM-TMX) application. The Board of FER is focused on baseline monitoring, research and spill preparedness in the context of protection of the values in the ERs along the tanker route and how to add incremental knowledge to management of marine ecosystems. The Board of FER has confined its input to issues that can be addressed and identified by the NEB as in scope of the Environmental Assessment of the KM-TMX application.<sup>1</sup>

FER has focused on three of the 11 issues identified by the NEB as being in scope for this project review. See Table 1.

**Table 1: Friends of Ecological Reserves Focus on Issues: 4, 5 and 11**

(Underlining is emphasis placed by FER)

***Issue 4.** The potential environmental and socio-economic effects of the proposed project, any cumulative environmental effects that are likely to result from the project, including those required to be considered by the NEB's Filing Manual.*

***Issue 5.** The potential environmental and socio-economic effects of marine shipping activities that would result from the proposed Project, including the potential effects of accidents or malfunctions that may occur.*

***Issue 11.** Contingency planning for spills, accidents or malfunctions, during construction and operation of the project.*

This report is a summary of the evidence that the Board of FER contributed to the NEB process. We have, to the extent possible, detailed the values at risk in each of the 19 Ecological Reserves along the tanker route. We are concerned that environmental baselines in general and within Ecological Reserves specifically, are not adequate to inform decision makers or the public with regard to pre- and post-spill conditions. Without proper baseline information, it is very difficult to assess and remediate if possible, any damage caused by an oil spill.

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<sup>1</sup> NEB terms of reference and issues in scope (<http://www.neb-one.gc.ca/pplctnflng/mjrpp/trnsmntnxpnsn/index-eng.html>) (accessed May 8, 2105)

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This report also clarifies the role of ERs in the greater landscape and as long term monitoring benchmarks for which ERs were established through the *Ecological Reserves Act*. Ecological Reserves were designated for scientific study and as representatives of specific ecosystems or important or unique landscape features. ERs are benchmark sites suited to long-term monitoring and are sites needed to understand the range of natural variation over space essential underpinnings for restoration of damaged habitat. See Table 3.

Potential permit conditions for the marine section of KM-TMX project are provided in the Chapter 5 of this report.

A review of the 209 permit conditions applied by the NEB to Northern Enbridge Project provided many specific conditions for environmental monitoring and spill preparedness that should also be applied as conditions to the KM-TMX project if approved. The ecological monitoring conditions and spill preparedness provide parity between Enbridge and Kinder Morgan which are two competing corporations. Many of the Enbridge provisions would provide an interagency/stakeholder framework for monitoring which is absent on the south coast of BC, but emerging on the north coast.

Development of proposed permit conditions was also informed by KM-TMX documents. The absence of any KM-TMX commitment to future engagement with marine system monitoring or spill preparedness was revealed by Information Requests # 1 and # 2 exchanges. Our conclusion is that KM-TMX is not interested in environmental monitoring and spill preparedness and is content to leave this to others and hopeful that the NEB will allow them a permit without marine environmental provisions.

This report is also informed by a review of information on marine oil spills such as; the Exxon Valdez, Gulf of Mexico and the Nuka reports 2013 Vol. #1, #2 and #3 on spill preparedness on the BC coast. The Nuka reports were prepared for the BC government and outline current spill preparedness and provide comparisons between Canadian and Provincial government's policies/programs for environmental monitoring and spill preparedness with those of that of the neighbouring United States as well as insights into what world class standards means and how to deliver this Federal and Provincial promise. Review of all information provided the Board of FER with insights on what constitutes a reasonable expectation of "world class" standards. Both National and Provincial governments aspire to and have communicated that tanker project approvals will depend on the project being held to "world class standards" for marine tanker transport.

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The *Oceans Act* pre-amble<sup>2</sup> has a number of overarching statements that show a desire by the Government of Canada for first class ocean ecosystem management. Table 2 is provided as context for decisions and permit conditions with regard to the Canadian national interest. The Board of FER believes the NEB needs to be held to account when issuing permits and the provisions in those permits need to meet the tests set out in the *Ocean's Act* Pre-amble in Table 2.

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<sup>2</sup> <http://laws-lois.justice.gc.ca/eng/acts/O-2.4/page-1.html>.

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**Table 2: Canadian Federal Governance *Oceans Act* Preamble**

Underlining provided by Board of FER for emphasis.

### Sections of the *Oceans Act* Preamble that are specific to environmental understanding and management. (Underlined sections highlighted by FER)

WHEREAS Parliament wishes to reaffirm Canada's role as a world leader in oceans and marine resource management;

WHEREAS Canada promotes the understanding of oceans, ocean processes, marine resources and marine ecosystems to foster the sustainable development of the oceans and their resources;

WHEREAS Canada holds that conservation, based on an ecosystem approach, is of fundamental importance to maintaining biological diversity and productivity in the marine environment;

WHEREAS Canada promotes the wide application of the precautionary approach to the conservation, management and exploitation of marine resources in order to protect these resources and preserve the marine environment;

WHEREAS Canada promotes the integrated management of oceans and marine resources; AND WHEREAS the Minister of Fisheries and Oceans, in collaboration with other ministers, boards and agencies of the Government of Canada, with provincial and territorial governments and with affected aboriginal organizations, coastal communities and other persons and bodies, including those bodies established under land claims agreements, is encouraging the development and implementation of a national strategy for the management of estuarine, coastal and marine ecosystems

The review of the significant number of reports generated during the NEB KM-TMX Environmental Assessment process hearings, made the Board of FER aware of issues that "world class standards" cannot be achieved through permit conditions applied to the KM-TMX project alone. There are other changes required such as enhanced coordination between a number of agencies, public engagement and funding mechanisms for environmental protection that are not yet fully in place. We believe in the stated "polluter pays" principle and the parallel principle that "risk bringer pays" for risk proportional to what they contribute. We advocate that the permit conditions include what we believe to be a modest but critical environmental monitoring and research program which is needed to secure information before an oil spill. We have learned from the Exxon Valdez spill that it is more costly and inconclusive to begin to monitor impacts post spill. From information requests to KM-TMX, we have concluded that KM-TMX believes and interprets their obligation as ending at the Westridge Terminal. KM-TMX then believes the onus is on tanker owners and Western Coast Marine Response Corporation (which is owned principally by KM but supported by tanker owners insurance) to look after spills through spill preparedness. We trust that

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the NEB believes that KM-TMX has a long term commitment to spill preparedness and monitoring. The Board of FER interprets Table 1, Issues 4, 5 and 11 to mean that Kinder Morgan has a long term commitment and a financial obligation to marine waters beyond the Westridge Terminal.

This report and participation in the review process has been aided by funding provided by the NEB Participant Funding Program.

FER is a non-government organization (NGO) with charitable status that was registered 32 years ago. The strategic plan for the Board of FER is to support staff of BC Parks in their role as stewards of BC's Ecological Reserves system. The FER Strategic Plan can be viewed at <http://ecoreserves.bc.ca/about-friends/strategic-plan/> and also on that site is information on all ERs, as well as the Board members and ER warden activities (see <http://ecoreserves.bc.ca/>).

BC is fortunate to have a system of Ecological Reserves and an *Ecological Reserves Act*<sup>3</sup> administered by BC Parks staff.

**Table 3: Purpose of Ecological Reserves as Stated in Provincial ER Act**

Section 2 of the Ecological Reserves Act: Purpose of Ecological Reserves
<p>(a) <i>Scientific research and educational purposes associated with studies in productivity and other aspects of the natural environment;</i></p>
<p>(b) <i>Representative examples of natural ecosystems in British Columbia;</i></p>
<p>(c) <i>Degraded ecosystems modified by human beings and offer an opportunity to study the recovery of the natural ecosystems.</i></p>
<p>(d) <i>Rare or endangered native plants and animals in their natural habitat may be preserved;</i></p>
<p>(e) <i>Unique and rare examples of botanical, zoological or geological phenomena.</i></p>

<sup>3</sup> *Ecological Reserves Act*. [http://www.bclaws.ca/civix/document/id/complete/statreg/96103\\_01](http://www.bclaws.ca/civix/document/id/complete/statreg/96103_01) (accessed March 2015)

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**Figure 1: Ecological Reserves with Marine Shoreline and Foreshore Habitat**

The ERs shown in this figure can potentially be impacted by an oil spill from oil (Dilbit) exported from the Westridge Terminal. The dotted line shows the limits of the Regional Study Area (RSA) used by KM-TMX within which it focused the environmental assessment studies. Six ERs are located outside the RSA. Oil spill simulations show oil extending beyond the RSA. See Figure 37 and 38 for two simulations showing oil spill oil destiny beyond the boundaries of the KM-TMX defined RSA.



This map was generated by KM-TMX consultants in response to a Board of FER IR1-1 (Mount Tuam ER, and San Juan River Estuary ER, were not shown though within the RSA). Despite adding six ERs outside the RSA as requested by the Board of FER, this map does not represent any longer term commitment by KM-TMX. Since all these ERs can potentially be impacted, we propose their inclusion as sites that form part of a longer term monitoring network. See permit conditions in Chapter 5.

Table 4 provides a brief summary of ERs that would be potentially impacted by an increase in oil tanker traffic as a result of this project. A more complete description of each ER is contained in Chapter 3 as is a list of species at risk in each ER.

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**Table 4: Summary of ERs Potentially Impacted by Oil Tankers Exporting Oil from the KM Westridge Terminal**

The values that are associated with each ER are described in Chapter 3.

Ecological Reserve	Shoreline exposure (km)	Upland (Ha)	Foreshore (ha) (sub-tidal)
1. Ambrose Lake	2	228	0
2. Baeria Rocks*	1.2	53	138
3. Ballingall Islets	1.3	0.2	0
4. Brackman Islands	1.3	5	25
5. Canoe Islets	2.5	0.6	0
6. Cleland Island *	1.8	7.7	0
7. Francis Point **	4	17	0
8. Hudson Rocks **	1.5	2.5	47
9. Lasqueti Island	2.5	201	0
10. Megin River	4	50	0
11. Mount Maxwell	3.5	390	0
12. Mount Tuam	1.3	362	0
13. Oak Bay Island	5.3	9	199
14. Race Rocks *	4	2	225
15. Rose Islets ER * ER	1.5	0.8	0
16. San Juan Estuary	2.5	185	16
17. Satellite Channel	0	0	343
18. Ten Mile Point	1	1	14
19. Trial Island	1.8	23	0
<b>Total ER Area</b>	<b>43 km</b>	<b>1176 ha</b>	<b>1007</b>

\* Access restricted

\*\* Some restrictions

## 2. METHODS USED TO GATHER EVIDENCE FOR THIS REPORT

The principal researchers of this report are Mike Fenger and Garry Fletcher. The authors reviewed many of the KM-TMX reports focusing on those that pertained to the marine Dilbit transport and potential risk to marine ecosystems. These reports were on the KM-TMX site maintained by the NEB at: [A054 - National Energy Board - Exhibit List for Hearing Order OH-001-2014 \(A61576\)](#). Review of these reports and emails began in early 2014 in order to understand the project and decide whether Information Requests would be made. Two information requests were made (IR1 in 2014 and IR2 in 2015). These IRs afforded Board of FER better understanding of the KM-TMX commissioned Environment Reports and the voluntary commitments that KM-TMX appeared to have made. The review also provided insight into apparent gaps in information and commitment to the management of longer term impacts and risks.

In addition to review of KM-TMX reports, the process allowed the Board of FER to review other intervenors' input such as IRs, letters of comment and motions. A great deal was learned about marine Dilbit transport, safeguards, oil spill preparedness, post spill activities and how these may impact the values in marine ERs and the extent to which KM-TMX has made commitments on behalf of environmental protection. We thank other intervenors for their insights.

In addition to reading prepared materials, Board of FER also contacted a number of other intervenors directly; First Nations, NGOs and staff in municipalities, provincial and Federal governments to seek and exchange information. Garry Fletcher attended the conference Salish Sea Ecosystem Conference where there were several presentations on the risks associated with the KM-TMX project<sup>4</sup>.

Hyper-linked references are provided within the text and footnotes. General internet searches were also done to learn from experiences in past oil spills and how other jurisdictions manage marine oil transport and environmental monitoring.

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<sup>4</sup>. The Salish Sea Ecosystem Conference is the largest most comprehensive event of its kind in the region. The purpose of the conference is to assemble scientists, First Nations and tribal government representatives, resource managers, community/business leaders, policy makers, educators and students to present the latest scientific research on the state of the ecosystem, and to guide future actions for protecting and restoring the Salish Sea Ecosystem.  
<http://www.imber.info/index.php/Meetings/IMBER-Relevant-Meetings/meetings-2014/April-2014/2014-Salish-Sea-Ecosystem-Conference-30-April-2-May-2014-Seattle-Washington>.

### 3. ECOLOGICAL RESERVES ALONG THE PROPOSED TANKER ROUTE

#### Chapter Layout

This chapter provides a description of the physical and biological features and the current state of and gaps in environmental monitoring for each Ecological Reserve along the tanker route. Reserves are listed alphabetically by name and information is included on their relative location. For each ER this is followed by a general physical description, then a biological description and a summary of monitoring/inventory that has been done currently, along with a statement of any gaps in information.

There are nineteen provincially established Ecological Reserves along the existing tanker route and this is the same route that will be used by tankers if this project is approved and fully developed. These ERs are located around the southern coast of British Columbia in the Salish Sea including reserves on southern Vancouver Island, Georgia Strait, Juan de Fuca Strait and the west Coast of Vancouver Island. Many of these reserves were established in the 1980s and have served as excellent examples of minimal encroachment of human development and therefore maintain the ecological integrity present at the time of their designation. These ERs were selected through a process of scientific review that determined their unique and representative features and whether they warranted ER status.

ERs are given the highest level of protection within the British Columbia Parks System. Following is a list of these Marine ERs and the features that make them valued for research and education. They are intended to remain in pristine condition in perpetuity and remain as the sites for research, study from which to extend of natural ecosystem information. The ER act states that ERs are the sites in which to learn how to do restoration when not in pristine condition.

Since the establishment of these reserves, there has been inadequate funding available to do extensive and detailed baseline studies and follow-up long-term monitoring. The fear in light of the KM-TMX is that there is risk of losing these values without properly recording ER features and without the possibility of knowing what was the criteria for setting end points for restoration in the event of a catastrophic spill. Despite assurances to the contrary there is absolute certainty that an oil spill will occur with the projected massive increases of oil tankers going out of the Port of Vancouver and transiting the full length of the Strait of Juan de Fuca along the coast of Vancouver Island, . Already the volume of vessel traffic along this route is considerable. With the projected increase in traffic of >360 per cent, if the Kinder Morgan proposal is accepted, the cumulative effects from the oil spilling of this additional traffic and the greatly increased potential for catastrophic spills as well as chronic oil releases. What is at risk is the loss of a valuable coastal resource and the biodiversity of our marine ecosystems.

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In the following tabulation of the nineteen marine ERs, we illustrate the locations of the reserves and the extent of the marine components where there would be exposure to direct oil spills or the effects from wind-blown aerosols.

One of the most comprehensive environmental impact studies with excellent baseline data collected for any ER was done in the Satellite Channel ER in the early 2000s. It is noteworthy that it was financed by the proponent of the construction of a potential gas line. We believe this level of detail may serve as a model for the baseline study of sub-tidal components for any project which has the potential to impact the sensitive marine ecosystems of the Ecological Reserves (see Satellite Channel ER for links to these detailed ER reports).

Refer also to Table 5 below which specifies the significant species identified for each of the Marine Ecological Reserves. This includes species listed by the Conservation Data Centre (CDC) and Committee on the Status of Endangered Wildlife in Canada (COSEWIC) listed *Species at Risk Act* (SARA) species.

### 3.1 Descriptions of Each Reserve

#### 3.1.1 AMBROSE LAKE ER # 28

Region	Location	Main Purpose	Land Size in Ha	Water Size in Ha	Shoreline exposure
Vancouver Area	Sechelt Peninsula	coastal western hemlock forests and a bog/lake complex	228	0	2 km

##### 3.1.1.1 Physical Description

Ambrose Lake ER was established to preserve a small coastal lake, adjacent bog-land, and surrounding forest. Its western boundary follows 2 kilometres of marine shoreline along Agamemnon Channel.

##### 3.1.1.2 Biological Components at Risk in the Marine Environment

Cutthroat Trout, *ssp. (Oncorhynchus clarkii ssp. lewisi)* is Blue Listed, (COSEWIC special concern), small streams flowing from bogs and the lake inland emerge on the coast.

##### 3.1.1.3 Ecological Monitoring

- A thorough assessment of cutthroat trout and their habitat is needed.
- Completed up to date baseline inventory of upland components adjacent to the shore line is needed.

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- Seasonal surveys for resident, over wintering and migratory birds are needed.
- Baseline inventories and an ecological monitoring program are needed for shoreline invertebrate and macro algal communities.
- Periodic surveys of other marine ecosystem components as needed.

### 3.1.2 BAERIA ROCKS ER # 24

Region	Location	Main Purpose	Land Size in Ha	Water Size in Ha	Shoreline exposure
Southern Vancouver Island	Barkley Sound	protects a seabird colony, preserves rich intertidal and subtidal communities	2 ha	138 ha	1.16 km

#### 3.1.2.1 Physical Description

Despite the predominantly bedrock substrates, a variety of intertidal habitats are present, including rock faces exposed to the surf, crevices, tide pools and a protected lagoon in the north island. The intertidal shoreline is almost completely covered with marine invertebrates and algae. Interesting examples of intertidal zonation are present. The surrounding sub-tidal area supports a diverse invertebrate fauna.

#### 3.1.2.2 Biological Components at Risk in the Marine Environment

Vascular plants are limited to a single species, hairy goldfields (*Lasthenia maritima*) found near the highest point of the north island. This species is rare in British Columbia. Several crustose lichens, adapted to salt spray, also occur. Nesting seabirds from the most recent surveys are the Pelagic Cormorant (30 pairs), Glaucous-winged Gull (210 pairs), Black Oystercatcher (15 pairs) and probably the Pigeon Guillemot. A few harbour seals haul out here. Intertidal invertebrates abound, the most common of which are barnacles, goose barnacles, mussels, sea anemones, starfish and seaweeds of the genera *Endocladia*, *Fucus*, *Ulva*, *Egregia* and *Alaria*. The surrounding sub-tidal area supports a diverse invertebrate fauna that is particularly abundant in hydroids, ascidians, and anemones (particularly *Tealia lofotensis*) and several species of algae. Common fishes are the black, yellowtail, copper, quillback and China rockfishes and the kelp greenling.

#### 3.1.2.3 Ecological Monitoring

- Biodiversity monitoring activities at the Baeria Rocks Ecological Reserve have been limited to boat visits, where bird and mammal surveys were done from the vessel, and in 2006, underwater and land species monitoring by volunteers and BC Parks personnel. At that time, two biodiversity inventory dives were made by volunteer divers. The first was done starting at the west point of the north islet and swimming northeast. Much of the divers time was spent in shallow water looking at abalone

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abundance. There were two objectives to the dives: 1) to specifically look at the abundance of abalone (*Haliotis kamstchatkana*) a federally listed Threatened Species; and 2) to do a precursory general inventory of sub-tidal biodiversity within the ER. The second dive was done just off the south islet on the lee (northeast) side by eight divers. Most of the divers did two swims and recorded species diversity and abundance as they went. Three individuals also conducted a Black Oystercatcher nest inventory on the south islet and did an inventory of the intertidal and birds.

- Completed up to date baseline inventory of upland components adjacent to the shore line is needed.
- Documentation and baseline studies on sub-tidal marine life are needed.
- Seasonal surveys for resident, over wintering and migratory birds are needed.
- Baseline inventories and an ecological monitoring program are needed for shoreline invertebrate and macro algal communities.
- Periodic surveys of other marine ecosystem components as needed.

### 3.1.3 BALLINGALL ISLANDS ER # 151

Region	Location	Main Purpose	Land Size in Ha	Water Size in Ha	Shoreline exposure
Southern Vancouver Island	7 km NNE of Ganges	established to protect sea bird nesting colonies	0.5	0	~1.25 km

#### 3.1.3.1 Physical Description

These semi-protected islets are barren except for a single dead juniper attached to one of the rocks. There is no surficial soil on the islets sufficient for vascular plant growth. Lichens and bryophytes are present on the islets.

#### 3.1.3.2 Biological Components at Risk in the Marine Environment

Despite the predominantly bedrock substrates, a variety of intertidal habitats are present, including rock faces exposed to the surf, crevices, tide pools and a protected lagoon in the north island. The intertidal shoreline is almost completely covered with marine invertebrates and algae, the most common of which are barnacles, goose barnacles, mussels, sea anemones, starfish and seaweeds of the genera *Endocladia*, *Fucus*, *Ulva*, *Egregia* and *Alaria*. Interesting examples of intertidal zonation are present. The surrounding sub-tidal area supports a diverse invertebrate fauna that is particularly abundant in hydroids, ascidians, and anemones (particularly *Tealia lofotensis*), and several species of algae. Common fishes are the black, yellowtail, copper, quillback and China rockfishes and the kelp greenling.

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The Ballingall Islets were originally designated as a nature park to protect colonies of Glaucous-winged Gulls, Double-crested and Pelagic Cormorants and Pigeon Guillemots. At the time of designation, 28 nests of double-crested cormorants and 11 nests of pelagic cormorants were observed. The reserve now serves as an historic nesting site and it is hoped that by preserving and possibly enhancing this habitat, they will repopulate the reserve. The reserve remains an important nesting site for Gulls and Pigeon Guillemots.

### 3.1.3.3 Ecological Monitoring

- Completed up to date baseline inventory of upland components adjacent to the shoreline is needed.
- Seasonal surveys for resident, over wintering and migratory birds are needed.
- Baseline inventories and an ecological monitoring program are needed for shoreline invertebrate and macro algal communities.
- Periodic surveys of other marine ecosystem components as needed.

### 3.1.4 BRACKMAN ISLAND ER # 121

Region	Location	Main Purpose	Land Size in Ha	Water Size in Ha	Shoreline exposure
Southern Vancouver Island. This island is now part of the Gulf Islands Marine Park.	North of Sidney	Un-grazed Gulf Islands vegetation and marine buffer	5	25	~1.27 km

#### 3.1.4.1 Physical Description

The reserve comprises a 5 ha island and surrounding marine habitats within 200 m of the high tide line. The island has thin soil cover over Cretaceous sandstones of the Nanaimo formation. Bedrock is exposed around most of the shoreline, and forms cliffs up to 15 m high along the NE edge of the island. Substrates in the intertidal zone are primarily rock; this probably applies to much of the sub-tidal as well.

This area has the mildest climate of BC, a pronounced summer drought and no streams or water on the island.

#### 3.1.4.2 Biological Components at Risk in the Marine Environment

River otter and mink are frequently sighted along the shores, and harbour seal occupy the adjacent kelp beds. Common birds include Bald Eagle, Black Oystercatcher, Great

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Blue Heron, Northwestern Crow, Cormorant and several kinds of Gulls. A variety of songbirds utilize the forest habitats on the island. Arbutus and rocky mountain juniper are along the cliffs and shorelines. Three forest communities have been recognized; Douglas-fir/arbutus-ocean spray-licorice fern, Douglas-fir/arbutus-ocean spray/moss, and Douglas-fir/arbutus-ocean spray-purple peavine. These communities could be impacted by wind driven aerosol contaminants from an oil spill.

Rich kelp beds are present off the southwest side of the island. Intertidal and shallow sub-tidal habitats are dominated by rocky shore invertebrates like barnacles, sea stars, sea urchins, anemones, chitons and mussels. Many other invertebrates occur as well as rockfish but these are undocumented.

### 3.1.4.3 Ecological Monitoring

- Brackman Island Phenology was done in 1995 and 1999.
- Research has been done by Simon Fraser University on Songbirds on the island.
- Completed up to date baseline inventory of upland components adjacent to the shoreline is needed.
- Documentation and baseline studies on subtidal marine life are needed.
- Seasonal surveys for resident, over wintering and migratory birds are needed.
- Baseline inventories and an ecological monitoring program is needed for shoreline invertebrate and macro algal communities.
- Periodic surveys of other marine ecosystem components as needed.

### 3.1.5 CANOE ISLETS ER # 17

Region	Location	Main Purpose	Land Size in Ha	Water Size in Ha	Shoreline exposure
Southern Vancouver Island	Near S. end of Valdes Island	originally established for the seabird colony, cormorants and sea mammal haul out	0.6	0	~2.5 km

#### 3.1.5.1 Physical Description

The reserve is two islands, 400m from the Valdes Island shoreline. These are composed of glacially smoothed sedimentary rocks of the Nanaimo Group, and lie at the eastern edge of the Strait of Georgia. Sub-tidally, strongly sloping bedrock substrates of irregular relief are interrupted by narrow sand-shell terraces. The channel between Canoe Islets and Valdes Island is about 20 m deep; depths increase rapidly to the northeast of the islets. Currents are often strong due to the proximity of Porlier Pass.

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### 3.1.5.2 *Biological Components at Risk in the Marine Environment*

No vascular plants are present, but crustose lichens are common in the splash zone which includes the entire rocks. Two species of seabirds, the Double-crested Cormorant and Glaucous-winged Gull, are known to have nested here. The rocks were not known as a cormorant nesting site until the 1960s, when 30 pairs were counted. These declined to 12 in the 1970s and none in 1981, possibly due to human disturbance. Glaucous-winged Gulls began to nest on the rocks in the 1970s and about 60 pairs were present in 1981, their nesting territories covering about 50 per cent of the land area.

Both Steller and California sea lions began using the Porlier Pass area about 1981, coincident with a general increase in numbers of both species in the Strait of Georgia during the winter, where they prey heavily on Pacific Herring. About 100 Steller and 400-800 California sea lions were present during 1982-1984 period, of which some have intermittently used Canoe Islets as a winter haul out, particularly when disturbed from more accessible rocks in Stuart and Trincomali channels.

### 3.1.5.3 *Ecological Monitoring*

- Roger Allen and Trudy Chatwin visited Canoe Islet in 2014.
- Completed up to date baseline inventory of upland components adjacent to the shore line is needed.
- Seasonal surveys for resident, over wintering and migratory birds are needed.
- Baseline inventories and an ecological monitoring program is needed for shoreline invertebrate and macro algal communities.
- Periodic surveys of other marine ecosystem components as needed.

### 3.1.6 CLELAND ISLAND ER # 1

Region	Location	Main Purpose	Land Size in Ha	Water Size in Ha	Shoreline exposure
Southern Vancouver Island	Clayoquot Sound, W of Tofino	seabird colony supporting over eleven species of seabirds	7.7	0	~1.75 km

#### 3.1.6.1 *Physical Description*

The reserve comprises a single low-lying basalt island with a central vegetated area rimmed by bare rock. Soils, mainly sands, are strongly affected by ocean spray.

#### 3.1.6.2 *Biological Components at Risk in the Marine Environment*

The vegetation consists of a central shrubby core and a surrounding belt of grasses. The exposed portions, especially on the outer edges of the island, have only scattered plant

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cover. The dense shrubs of the core are salmonberry, Nootka rose and coast black gooseberry, growing to two metres tall. The surrounding grassy belt is composed mostly of dune wildrye and broadleaved herbs. The rocky outcrops are characterized by Tracy's romanzoffia and villous cinquefoil. Three minor vegetation types are those of silverweed and sea beach sandwort on shell beaches, of slough sedge on a seepage site, and of salal on higher ground. The grass belt provides nesting sites for Leach's Storm-petrel, Fork-tailed Storm-petrel, Tufted Puffin, Rhinoceros Auklet and Cassin's Auklet, which tunnel into the sandy soil. The bare rocks, beach logs and general surface of the island are home to Pigeon Guillemot, Glaucous-winged Gull, Black Oystercatcher, Pelagic Cormorant and a few Common Murres. Oystercatchers feed on invertebrates found in great abundance in the intertidal zone. Beach logs provide habitat for the Wandering Salamander.

### 3.1.6.3 Ecological Monitoring

- Environment Canada Technical report 1988 – was done to obtain baseline estimates for burrowing species that could be used to monitor future population trends and identify current potential threats to those populations.
- Clarkson, P.; Bruhwiler, F.; Hunter, T. Ground 2004. Nest Survey of Cleland Island and Murre Reef.
- Extensive research has been done on this reserve see <http://ecoreserves.bc.ca/category/1/>.
- Completed up-to-date baseline inventory of upland components adjacent to the shore line is needed.
- Seasonal surveys for resident, over wintering and migratory birds are needed.
- Baseline inventories and an ecological monitoring program are needed for shoreline invertebrate and macro algal communities.
- Periodic surveys of other marine ecosystem components as needed.

### 3.1.7 FRANCIS POINT ER # 153

Region	Location	Main Purpose	Land Size in Ha	Water Size in Ha	Shoreline exposure
Vancouver Area	Sunshine Coast west of Pender Harbour	represents biogeoclimatic variants (CWH xm1) sensitive mosses and lichens on the shallow-soiled coastal bluffs	9.22	8	~4 km

#### 3.1.7.1 Physical Description

Not Listed

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### 3.1.7.2 *Biological Components at Risk in the Marine Environment*

Although there are no tracked occurrences on record with the BC Conservation Data Centre (CDC), a survey conducted in August 2001 noted the presence of the blue-listed dune bent grass. An unusual grass-moss/lichen community was also identified during the August 2001 survey, which forms the most sensitive part of the rock outcrop vegetation. Special mention is made of this community as it contains a combination of uncommon grasses that is not found elsewhere in the site series.

### 3.1.7.3 *Ecological Monitoring*

- Complete and maintain up-to-date baseline inventory of upland components adjacent to the shore line is needed.
- Conduct seasonal surveys for resident, over wintering and migratory birds are needed.
- Establish and maintain baseline inventories and an ecological monitoring for shoreline invertebrate and macro algal communities.
- Conduct periodic surveys of other marine ecosystem components as needed.

### 3.1.8 HUDSON ROCKS ER # 137

Region	Location	Main Purpose	Land Size in Ha	Water Size in Ha	Shoreline exposure
Southern Vancouver Island	25 km N of Newcastle Island	Nationally significant breeding colony of endangered Pelagic Cormorants.	2	48	1.5km ~

#### 3.1.8.1 *Physical Description*

The reserve is almost entirely sub-tidal and protects approximately 48 ha of sub-tidal coastal waters and four semi-exposed rocky islets totalling 2 ha. The waters are influenced by high turbidity and seasonally stratified water temperature in summer. The islets are comprised primarily of undifferentiated mudstone and sandstone bedrock characteristic of the Nanaimo Group of the Late Cretaceous age. The shorelines of the islets gently slope to sea level.

#### 3.1.8.2 *Biological Components at Risk in the Marine Environment*

The reserve is an important breeding and feeding ground for Glaucous-winged Gulls, Pelagic Cormorants, Black Oystercatchers, and Pigeon Guillemots. Other birds that use this area are loon, grebes, Bald Eagles, Harlequin Ducks, Mew Gulls, Common Murres and alcids. The rocks are also used as a haul out area for Harbour Seal, and the foreshore as a nursery area for salmon and herring. There is abundant shellfish habitat

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and neritic plankton communities. Harbour Porpoise use the marine protected area as well.

### 3.1.8.3 Ecological Monitoring

- Completed up to date baseline inventory of upland components adjacent to the shore line is needed.
- Documentation and baseline studies on sub-tidal marine life are needed.
- Seasonal surveys for resident, over wintering and migratory birds are needed.
- Baseline inventories and an ecological monitoring program are needed for shoreline invertebrate and macro algal communities.
- Periodic surveys of other marine ecosystem components as needed.

### 3.1.9 LASQUETI ISLAND ER # 4

Region	Location	Main Purpose	Land Size in Ha	Water Size in Ha	Shoreline exposure
Southern Vancouver Island	Strait of Georgia, N of Parksville	shoreline forest with Rocky Mountain junipers	201	0	~2.5 km

#### 3.1.9.1 Physical Description

A small peninsula and a cove are present along the eastern shoreline. As a result of southerly exposure, location at sea level and thin soils, the vegetation here is sparse.

#### 3.1.9.2 Biological Components at Risk in the Marine Environment

Seaside juniper, including specimens of record size, is common near the shoreline, in association with other dry-site plants like prickly-pear cactus, Puget Sound gumweed, and introduced species such as early hairgrass and soft brome representative of the very driest habitats within the Coastal Douglas-fir forest.

#### 3.1.9.3 Ecological Monitoring

- Monitoring of Insects - 1977 by R. Ring.
- Monitoring of Vertebrates - 1976 by E. South.
- Monitoring of Plants 1974 and 1976 by George and Clark
- Completed up to date baseline inventory of upland components adjacent to the shoreline is needed.
- Seasonal surveys for resident, over wintering and migratory birds are needed.
- Baseline inventories and an ecological monitoring program are needed for shoreline invertebrate and macro algal communities.

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- Periodic surveys of other marine ecosystem components as needed.

### 3.1.10 MEGIN RIVER ER # 105

Region	Location	Main Purpose	Land Size in Ha	Water Size in Ha	Shoreline exposure
Northern Vancouver Island	NW of Tofino	typical west coast alluvial and upland forest	50	0	~4 km

#### 3.1.10.1 Physical Description

The reserve occupies the lower kilometre of the Megin River valley, and mostly consists of level floodplain lands having alluvial surficial materials. Soils developed on these deposits are very rich regosols. The western side of the reserve encompasses valley slopes above the floodplain. The Megin River, subject to pronounced seasonal variations in flow, has a gravel-cobble bottom, extensive gravel bars along its margins, and many long pools. It has a very low gradient, dropping only 20 m along its 10 km course from Megin Lake to the sea.

#### 3.1.10.2 Biological Components at Risk in the Marine Environment

Alluvial lands support old-growth Sitka spruce trees reaching 1.5 m in diameter and 60 m in height, and Western red cedars up to two m in diameter and 50 m tall. Four plant communities have been described in the reserve. Tall shrub stands dominated by red alder, willows, and salmonberry occurs as riparian strips between gravel bars and the adjacent forest. The large island and downstream alluvial lands support tall Sitka spruce-Western red cedar stands having an understory of salmonberry, red-osier dogwood, devil's club, false bugbane, and lady fern. Slopes to the west of the river are dominated by Western red cedar-Western hemlock forest with an understory of shrubs such as Alaskan blueberry, red huckleberry, and evergreen huckleberry. On the ridge crest along the west boundary, the forest is dominated by Western red cedar and Lodgepole pine, and common understory species are salal, fern-leaved goldthread, and sphagnum mosses. The Megin River system supports significant spawning runs of sockeye, chinook, coho, pink, and chum salmon. Chum salmon, and perhaps other species, spawn within the reserve.

#### 3.1.10.3 Ecological Monitoring

- Completed up to date baseline inventory of upland components adjacent to the shore line is needed.
- Seasonal surveys for resident, over wintering and migratory birds are needed.
- Baseline inventories and an ecological monitoring program are needed for shoreline invertebrate and macro algal communities.

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- Periodic surveys of other marine ecosystem components as needed.

### 3.1.11 MOUNT MAXWELL ER # 37

Region	Location	Main Purpose	Land Size in Ha	Water Size in Ha	Shoreline exposure
Southern Vancouver Island	Saltspring Island	large Garry oak stand in the Gulf Islands	390	0	3.5 km

#### 3.1.11.1 Physical Description

Although the shoreline of Burgoyne Bay is typically rocky, the Ecological Reserve contains a few pocket beaches that are frequented by boaters, in particular kayakers, that use various open outcrop areas at the base of the Ecological Reserve along Burgoyne Bay. At least two low bluffs in the Ecological Reserve along Burgoyne Bay have been used as boating stops, including a site referred to as Maxwell Beach.

#### 3.1.11.2 Biological Components at Risk in the Marine Environment

Unknown and needs to be done.

#### 3.1.11.3 Ecological Monitoring

- Completed up to date baseline inventory of upland components adjacent to the shoreline is needed.
- Seasonal surveys for resident, over wintering and migratory birds are needed.
- Baseline inventories and an ecological monitoring program are needed for shoreline invertebrate and macro algal communities.
- Periodic surveys of other marine ecosystem components as needed.

### 3.1.12 MOUNT TUAM ER # 16

Region	Location	Main Purpose	Land Size in Ha	Water Size in Ha	Shoreline exposure
Southern Vancouver Island	South end Saltspring Island	Protects a large area of representative Gulf Islands forest ecosystems, with shoreline on Satellite Channel	254	0	1.25 km

#### 3.1.12.1 Physical Description

Exposed bedrock along a rocky shore.

**3.1.12.2 Biological Components at Risk in the Marine Environment**

Pure stands of arbutus, **probably the best representation of this species in the Ecological Reserve system**, are found on dry sites around upper elevation bedrock outcrops and near the shoreline.

**3.1.12.3 Ecological Monitoring**

- Completed up to date baseline inventory of upland components adjacent to the shoreline is needed.
- Seasonal surveys for resident, over wintering and migratory birds are needed.
- Baseline inventories and an ecological monitoring program is needed for shoreline invertebrate and macro algal communities.
- Periodic surveys of other marine ecosystem components as needed.

**3.1.13 OAK BAY ISLANDS ER # 94**

Region	Location	Main Purpose	Land Size in Ha	Water Size in Ha	Shoreline exposure
Southern Vancouver Island	E of Victoria	rare plants, sea birds and marine life	11	221	5.25 km

**3.1.13.1 Physical Components**

Islands and islets comprise about seven ha of the reserve, the remainder being subtidal. The islands are low, rounded and composed of Saanich grano-diorite bedrock. The three largest islands have a mantle of marine glacial drift upon which thin soils have developed, those in meadow situations being of sandy loam texture. Bedrock exposures are common and predominate around the shorelines. Shoreline features include a few steep faces, rocky outcrops, boulders, crevices, wave-cut chasms and small gravel beaches. At least 30 exposed rocky reefs occur in the Chain Islets area. Significant climatic features are frequent strong winds and a cool-summer Mediterranean climate.

**3.1.13.2 Biological Components at Risk in the Marine Environment**

The islands are treeless. The three largest, particularly Great Chain and Alpha, support a fairly continuous herbaceous cover, interrupted occasionally by shrub thickets and bedrock outcrops. Eight vegetation types have been described, their distribution being primarily determined by distance from shore, soil depth and moisture regime. Shrub stands dominated by baldhip rose and tall Oregon-grape occupy sheltered inland locations. Prominent species in meadows are the great camas, bracken, dune wildrye, fern-leaved desert-parsley and western buttercup. Also present is a vernal sward dominated by silver and early hairgrass, field chickweed and clover. Lance-leaved

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stonecrop, early hairgrass and prickly-pear cactus occur on soil pockets between rock outcrops and sea plantain, entire-leaved gumweed and thrift are found on rock outcrops receiving salt spray. The lichens *Xanthoria candelaria*, *Parmelia conspersa* and *Ochrolechia spp.* form an association on bare rock. Another lichen, *Haemotoma lapponicum*, is very rare. Local sites enriched by river otter and seabird droppings and food remains have distinctive plant species. Sixty-three species of vascular plants have been recorded on Alpha Island. The marine algae beds are also extensive with a substantial canopy of bull kelp providing valuable habitat.

### 3.1.13.3 Ecological Monitoring

- M. Lambert - field reports on numbers of cormorants and other species, 2000, 2010, 2007.
- Beckwith - 1999 - vegetation survey on Griffin Island.
- Roemer and Ceska - 1999 - Plants recorded on Griffin Island.
- Campbell et al. 1983 - Census of double crested and pelagic cormorants breeding on Chain islets.
- Carson and Milnes - 1977 - The vegetation of Alpha and Griffin Islands.
- Completed up to date baseline inventory of upland components adjacent to the shore line is needed.
- Documentation and baseline studies on subtidal marine life are needed.
- Seasonal surveys for resident, over wintering and migratory birds are needed.
- Baseline inventories and an ecological monitoring program is needed for shoreline invertebrate and macroalgal communities.
- Periodic surveys of other marine ecosystem components as needed.

### 3.1.14 RACE ROCKS ER # 97

Region	Location	Main Purpose	Land Size in Ha	Water Size in Ha	Shoreline exposure
Southern Vancouver Island	SW of Victoria	To protect intertidal and sub-tidal communities that are extremely rich as a result of strong tidal currents. Outstanding marine life, sea lion haul out, elephant seal and harbour seal birthing and sea birds nesting.	2	225	4 km

### 3.1.14.1 Physical Description

The reserve is almost entirely sub-tidal, but includes Great Race Island and 11 islets (based on 1:20,000 shorezone mapping) comprising approximately two hectares. Intertidal and sub-tidal zones have substrates primarily of continuous rock, and a rugged topography which includes cliffs, chasms, benches and surge channels. The location at the southern tip of Vancouver Island, plus the rugged shallow sea bottom, result in strong currents, eddies, and turbulence. It lies a few kilometres from the shipping lanes and is probably one of the most highly exposed reserves with the greatest risk of environmental impact in the event of an oil spill in the Strait of Juan de Fuca.

### 3.1.14.2 Biological Components at Risk in the Marine Environment

Energy and nutrient inputs attributable to the nearly continuous currents are large, and upwellings are large and light penetration in these shallow, clear waters is excellent. These factors result in a high production of algae and invertebrates, while the varied topography promotes ecological diversity. Consequently, the marine communities here are unusually luxuriant and rich. Many species of algae have been recorded, including extensive stands of bull kelp, and the perennial kelp *Pterygophora californica*. Invertebrate features include an surviving remnant population of abalone, very large long surviving specimens of mussels, an abundance of plumose and proliferating anemones, large numbers of sponges and ascidians, occurrence of soft pink coral, and presence of showy high-current species like the basket star. A complete list of known species is regularly being updated at: <http://www.racerocks.ca/wp/race-rocks-animals-plants/taxonomy-image-gallery/>

Marine mammals sighted in the reserve are the killer and gray whale, humpback whale, harbour seal, Steller and California sea lion, and elephant seal. Killer whales are regular visitors; humpback and gray whales are spotted occasionally. (see graphs in the following section). Harbour seals haul out on rocks here in summer and form a birthing colony of several hundred. Elephant seals started to have several young born each year since 2009. They can number well over 30 individuals at certain times of the year.

Both Steller and California sea lion number over 500, use Race Rocks as a winter haul out. Seabirds nest on eight islets in the reserve including Great Race Rock. Nesting seabirds include; Glaucous-winged Gulls, Pigeon Guillemots and Black Oystercatchers. In the recent past Pelagic Cormorants also nested in the reserve.

### 3.1.14.3 Ecological Monitoring

- Egg survey, 1977.
- Cormorant survey, 1983, 2000.
- Christmas Bird Counts at Race Rocks 1997-2014.
- Extensive research projects since 1980, indexed at

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<http://www.racerocks.ca/wp/research-and-publications/research/>

- Race Rocks Taxonomy and Image Gallery: <http://www.racerocks.ca/wp/race-rocks-animals-plants/taxonomy-image-gallery/>.
- Elephant seals at Race Rocks <http://www.racerocks.ca/wp/?p=2776>.
- Marine mammal and bird census now done on a regular weekly basis. <http://www.racerocks.ca/wp/category/ecoguardians-log/animal-census/>.
- Whale census at Race Rocks Ecological Reserve <http://www.racerocks.ca/wp/2015/04/23/2009-2014-whale-observations-from-race-rocks/>.
- Completed up to date baseline inventory of upland components adjacent to the shore line is needed.
- Continue the documentation and incremental improvements of the baseline studies on sub-tidal marine life.
- Continue the seasonal surveys for resident, over wintering and migratory birds.
- Incrementally improve baseline inventories and an ecological monitoring program for shoreline invertebrate and macro algal communities.
- Periodic surveys of other marine ecosystem components as needed.

### 3.1.15 ROSE ISLETS ER # 18

Region	Location	Main Purpose	Land Size in Ha	Water Size in Ha	Shoreline exposure
Southern Vancouver Island	N of Reid Island	originally established for a cormorant colony, still used by seabirds	1		1.5 km

#### 3.1.15.1 Physical Description

The three largest islets have small areas of shallow soil sufficient for vascular plant establishment. Intertidal shorelines are predominantly bedrock. Surrounding waters in Trincomali Channel are mostly 20 to 30 m in depth. Currents are minor, and wave action is tempered by the sheltered location among the Gulf Islands.

#### 3.1.15.2 Biological Components at Risk in the Marine Environment

Approximately 40 species of plants, including vascular species, bryophytes and lichens, are present on the three largest islets and are uniquely adapted for the extreme environment. These are species typical of shallow soil and rocky crevice habitats subjected to summer drought associated with the cool-summer Mediterranean climate. Herbs, grasses and a few shrubs are present, but no trees. Vegetation patterns appear to be greatly influenced by soil depth, exposure and possibly by nesting cormorants.

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About 180 pairs of Double-crested Cormorants nested here in 1968, but the number declined to 80 by 1975, 33 in 1981 and 12 in 1983. At least 20 pairs of Glaucous-winged Gulls nest on the islets. A few Pigeon Guillemots and Black Oystercatchers occur, and may nest. Several other species of seabirds utilize surrounding waters, especially in winter and spring.

Algae in adjacent intertidal-sub-tidal habitats include sea lettuce (*Ulva* sp.), five species of brown algae and 23 of red algae.

### 3.1.15.3 Ecological Monitoring

- R.W. Campbell - 1977 - Nesting seabirds on Rose Islets 1963-1968.
- R.W. Campbell - 1977 - Nesting seabirds on Rose Islets 1963-1968.
- A list of macrophytic Algae from June 1977.
- Roger Allen and Trudy Chatwin: July 11, 2014, seabirds recorded on Rose Islets.
- Completed up to date baseline inventory of upland components adjacent to the shore line is needed.
- Seasonal surveys for resident, over wintering and migratory birds are needed.
- Baseline inventories and an ecological monitoring program is needed for shoreline invertebrate and macroalgal communities.
- Periodic surveys of other marine ecosystem components as needed.

### 3.1.16 SAN JUAN RIVER ESTUARY ER # 141

Region	Location	Main Purpose	Land Size in Ha	Water Size in Ha	Shoreline exposure
Southern Vancouver Island	Near Port Renfrew BC	to serve as a benchmark for forest research and to protect early seral floodplain plant communities	185 ha	16 ha	~2.5 km

#### 3.1.16.1 Physical Description

The San Juan River splits into several channels that form the Port San Juan River Estuary. The reserve is segmented into two parts: one lies along the north bank of the most northerly segment of the San Juan River, while the other protects flood plains to the southwest, and is bordered by the most southerly distributary channel of the San Juan River. The second segment of the reserve is larger and encompasses six distributaries.

The reserve area is comprised of a flat alluvial flood plain, gravel bars, sloughs

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and flood channels of the San Juan River and a steep rocky ridge rising to 80m above sea level.

### **3.1.16.2 Biological Components at Risk in the Marine Environment**

The primary role of San Juan River Estuary Ecological Reserve is to serve as a benchmark for forest research and to protect early seral floodplain plant communities. This Ecological Reserve protects a portion of one of the large river deltas on the southwest coast of Vancouver Island. The reserve protects many sensitive plant species, including the tooth-leaved monkey flower, (*Mimulus dentatus*) which is endangered (red-listed) and only occurs in British Columbia in Canada. The San Juan River is an important salmon spawning river on the west coast of Vancouver Island and the delta represents a special habitat that is used by black bears for feeding during the autumn salmon spawning run and by bald eagles, mink and river otters. This area also preserves important wild habitat for animals such as Roosevelt elk.

The Conservation Data Center classifies the site as high in rarity, scarcity and uniqueness.

Rare species on this site include: angled bitter-cress, Smith's fairybells, tooth-leaved monkey-flower, Paintbrush Owl-clover, nodding semaphoregrass and pink fawn lilies. Black cottonwood - red alder - salmonberry - piggy-back plant, and red alder stink currant - salmonberry- lady fern communities can be found on young alluvial sand and silt deposits that are subject to frequent flooding. A Sitka spruce - red alder - fern community has been observed in a small area only on older alluvial sand and gravel deposits that rarely flood. On the steep terrain, hallow till and colluvium cover schist bedrock and substrate a western hemlock - deer fern - community can be found. American black bears are present in the area.

### **3.1.16.3 Ecological Monitoring**

- Since it is an estuarine habitat with low energy impact from the ocean, any chronic or catastrophic flooding with oil would have a long residence time leading to a long term impact. It needs to have a thorough fish, mammal and estuarine invertebrate and plant inventory as part of an Environmental Impact Assessment
- Completed up to date baseline inventory of upland components adjacent to the shore line is needed.
- Documentation and baseline studies on subtidal marine life are needed for this estuary.
- Seasonal surveys for resident, over wintering and migratory birds are needed.
- Baseline inventories and an ecological monitoring program are needed for shoreline invertebrate and macroalgal communities.
- Periodic surveys of other marine ecosystem components as needed.

**3.1.17 SATELLITE CHANNEL ER # 67**

Region	Location	Main Purpose	Land Size in Ha	Water Size in Ha	Shoreline exposure
Southern Vancouver Island	N of Saanich Peninsula	Satellite Channel ER conserves rich benthic communities typical of fine grained, level bottom environments in the southern Gulf of Georgia	Sub-tidal	340	0

**3.1.17.1 Physical Description**

The reserve consists only of sea floor habitat. Most of the width of Satellite Channel is included, the northern boundary coming within 200 m of the Salt Spring Island shoreline at Cape Keppel, the southern edge within 200 m of the Saanich Peninsula on the north side of Moses Point. Most of the reserve has a relatively level bottom under water depths of 55 to 80 m. The shallowest areas, about 18 m, are at the southwest corner. The fine-grained bottom sediments consist of 62 per cent sand, 24 per cent silt, and 14 per cent clay.

**3.1.17.2 Biological Components at Risk in the Marine Environment**

The benthic fauna is diverse in species and high in biomass. At least 67 species occur, of which bivalve and gastropod molluscs, errant and sedentary polychaetes and echinoderms are particularly diverse. Repeated sampling has indicated nine species to be ecologically significant, based on defined criteria. These nine are errant polychaetes of the genera *Lumbrinereis* and *Nephtys*; the sedentary polychaetes *Maldane glebifex*, *Sternaspis fossor*, and a *Prionospio*; the pelecypods *Compsomyax subdiaphana*, *Macoma elimata*, and *Yoldia ensifera*; and the brittle star *Ophiura sarsi*. Studies over time have shown this community to be stable. The benthic community has thousands of organisms per square metre largely due to thick masses of two tubicolous polychaetes, *Maldane glebifex* and *Prionospio sp.* It also has a heavy standing crop, with the dry-weight biomass of about 60 g/m<sup>2</sup>, largely attributable to the large pelecypod *Compsomyax subdiaphana* and other large species including *Lumbrinereis*, *Travisia*, *Macoma*, *Yoldia*, and a holothurian, *Molpadia intermedia*. Standing crops to the east and west of the reserve tend to be lower in standing crop.

**3.1.17.3 Ecological Monitoring**

This is the only completely sub-tidal reserve in British Columbia. Very high biodiversity and production of benthic infauna exists here. The contamination by an oil spill with components which sink means that the purpose of the reserve will be compromised.

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Because of the possible laying of a gas line in the early 2000s, extensive environmental impact studies were done, financed by the project proponent.

Access to these listed reports is at: <http://ecoreserves.bc.ca/category/67/>

- Research on faunal stability, diversity and biomass has been undertaken by University of Victoria biologists since 1965.
- Ellis, Benthic-biodiversity-and-stability-in-an-unpolluted-inlet - 1965-1974.
- Bisgrove, 1982 Bivalves-Annelids and Echinoderm species list.
- B.Burd , Ecostat research, R.Glaholt, Tera Env Consultants and Valerie MacDonald, biological Env. Services of Victoria BC, 2000: Reconnaissance Level Baseline Survey of Benthic Infaunal Communities at Ecological Reserve 67 and adjacent Satellite Channel.
- Terra Environmental Consultants, 2000: Environmental Assessment of the Ecological Significance of Installing a Natural Gas Pipeline around of through ER 67 (Satellite Channel).
- Follow-up research and surveys are needed against the elements included in the existing assessment reports.

### 3.1.18 TEN MILE POINT ER # 66

Region	Location	Main Purpose	Land Size in Ha	Water Size in Ha	Shoreline exposure
Southern Vancouver Island	Victoria	intertidal and subtidal marine ecosystem	1	14	~1 km

#### 3.1.18.1 Physical Description

The reserve includes about 450 m of intertidal shoreline along Cadboro Point, and extends seaward for 300-400 m. About 30 per cent of its area is above mean low water and 70 per cent below. Coastal features include a sheltered cove (Maynard Bay), rocky headlands, tide pools, rip-current channels and four barren islets accessible at low tide. Intertidal substrates are about 80 per cent bedrock, 10 per cent mixed sand-gravel-mud and 10 per cent sorted gravel. A large intertidal area is exposed at low tide.

#### 3.1.18.2 Biological Components at Risk in the Marine Environment

Forty-two species of algae have been noted at one to eight metre depths in Maynard Bay. The only common green alga is *Ulva* sp. Significant brown algae are *Costaria costata*, *Desmarestia intermedia*, *D. ligulata* and *Laminaria* spp. Among the 32 species of red algae, many of which form a low turf, *Ceramium* sp., *Odonthalia floccosa*, *Plocamium violaceum*, *P. tenue*, *Laurencia spectabilis* and *Callophyllis flabellulata* are quite widespread. Typical invertebrates on subtidal bedrock and boulder sites in Maynard Bay are

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barnacles (*Balanus cariosus*, *B. nubilus*), red sea cucumbers, ochre stars, black and gum-boot chitons, sea anemones, pinto abalone and giant red sea urchins. Inhabitants of mud, sand and shell substrates include the blood star, California cucumber, butter clam and cockle. At least 55 species of invertebrates have been recorded in the reserve, of which molluscs, crustaceans and echinoderms are notably diverse.

### 3.1.18.3 Ecological Monitoring

- Marine Flora of Ten Mile Point, Stewart, 1977.
- List of invertebrates was done by Bisgrove in 1988.
- ER warden Doug Biffard has laid out a set of transects for intertidal ecological monitoring, 2010.
- Completed up to date baseline inventory of upland components adjacent to the shore line is needed.
- Documentation and baseline studies on sub-tidal marine life are needed.
- Seasonal surveys for resident, over wintering and migratory birds are needed.
- Baseline inventories and an ecological monitoring program is needed for shoreline invertebrate and macro algal communities.
- Periodic surveys of other marine ecosystem components as needed.

### 3.1.19 TRIAL ISLANDS ER # 132

Region	Location	Main Purpose	Land Size in Ha	Water Size in Ha	Shoreline exposure
Southern Vancouver Island	S. of Oak Bay in Victoria	outstanding assemblage of rare plant species	23	--	1.75 km

#### 3.1.19.1 Physical Description

The open exposure to the ocean with vessel traffic lanes within a few kilometres makes this unique ecosystem extremely vulnerable to wind-blown contaminants in the event of an oil spill in the Straits. Even though it is a terrestrial reserve, the risk of storms from any direction blowing spray onto the island is of concern.

The reserve comprises parts of two elongate rocky islands and associated islets. Marine waters are not included. Shorelines on the southwest side are mostly steep and dissected but the rest of the shoreline is gently sloping with a few small pocket beaches, comprised mostly of gravel. The islands are of considerable interest for the interpretation of local and regional geology, being situated at or adjacent to a major suture between two crustal blocks, the Leach River Complex and Wrangellia Terrane. Soil cover is thin and incomplete on much of the island, consisting mostly of Brunisols

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lying on bedrock. Small areas of Regosolic soils and considerable exposed bedrock are present. The climatic regime here is the mildest in the province, and characterized by frequent wind and summer drought.

### **3.1.19.2 Biological Components at Risk in the Marine Environment**

Twenty-eight species of vascular plants listed as rare in British Columbia are present in the reserve, 15 of which are in the categories of greatest rarity in the province. The latter are mostly plants of a more southerly distribution, centred in northern California and in Oregon, and are at or near the northern limit of their range in the Victoria area. Many were once scattered along the Victoria waterfront prior to urbanization but are now found in only a few sites outside of the Trial Islands.

Shallow soils, summer drought and strong winds combine to prevent tree growth on these islands. Plant communities consist of herbaceous meadows, shrub thickets and sparse growth of lichens and other plants on bedrock.

Nine plant communities have been described. These would be highly vulnerable to wind-born aerosols coming from an oil spill. Two are dominated by lichens growing on bedrock, but contain other dry-site plants like stonecrops and a few species tolerant of salt spray. A community characterized by dune wildrye and beach pea occurs on gravel beaches and among driftwood. A small area of salt marsh contains salt-tolerant plants like Pacific glasswort, seashore saltgrass, Nutka alkaligrass and sea plantain. Four meadow communities occur on upland sites having the best soil development. The most important of these, a vernal pool community characterized by Bigelow's plantain and Scouler's popcornflower, contains 13 species of rare plants. Other meadow communities support showy stands of spring wildflowers such as common camas, death-camas, chocolate lily, shootingstar, sea blush, Hooker's onion and blue-eyed Mary. Dense, wind-pruned shrub thickets are dominated by Garry oak, aspen, snowberry and rose. One Glaucous-winged Gull nest has been reported, but the island is not a significant seabird site. A Turkey vulture nest was found in the early part of the century (mid- 2000s) but it has not been occupied since. Terrestrial birds and mammals have not been surveyed.

**Cultural:** The reserve encompasses a traditional First Nations and Songhees bulb harvesting site.

### **3.1.19.3 Ecological Monitoring**

- K. Coates and Dr. D. Ellis completed a preliminary littoral habitat survey in the area of Ten Mile Point in Victoria, April 19, 1976.
- V. Behan-Pelletier on Soil Invertebrates (oribatid mites) 1996 soil and litter sampling.
- M. Fairbarns - 2000 - Management for Rare plants.
- M. Fairbarns - 2002 - Stewardship accounts for Rosy-owl clover, *Orthocarpus bracteosus*.

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- Completed up to date baseline inventory of upland components adjacent to the shore line is needed.
- Seasonal surveys for resident, over wintering and migratory birds are needed.
- Baseline inventories and an ecological monitoring program are needed for shoreline invertebrate and macro algal communities.
- Periodic surveys of other marine ecosystem components as needed.

### 3.2 Species at Risk in Marine Ecological Reserves

The information in Table 5 was obtained through review of species lists for ERs and status of species as listed by the CDC using species explorer<sup>5</sup>. There are four different status classifications shown.

1. The BC Status List of species is managed by Ministry of Environment through the Conservation Data Centre. The 'RED' and 'BLUE' lists serve two purposes:
  - To provide a list of species for consideration for more formal designation as Endangered or Threatened, either provincially under the British Columbia Wildlife Act, or nationally by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) <http://www.cosewic.gc.ca/>.
  - To help inform setting conservation priorities for species/ecological communities considered at risk in British Columbia.

Yellow listed species are in a watch and monitor category. For more details on the these lists see <http://www.env.gov.bc.ca/atrisk/red-blue.htm>.

2. **COSEWIC:** This committee is composed of scientists both within government and outside government, who meet and recommend which species need to receive protection under the *Species at Risk Act*. The decision to accept the committee's recommendations lies with the Federal Minister of the Environment.
3. **SARA Status** means species are legally protected and recovery plans must be completed and measure taken to reverse trends affecting species declining status.
4. **Conservation Framework (CF)**<sup>6</sup> is a Provincial ranking tool that helps the BC government prioritize conservation efforts and take into account status of species globally, nationally and provincially with the greatest emphasis placed on species with global distributions restricted to BC.

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<sup>5</sup> <http://www.env.gov.bc.ca/atrisk/toolintro.html>

<sup>6</sup> <http://www.env.gov.bc.ca/conservationframework/>

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**Table 5: Significant Species and Conservation Status in 19 Marine Ecological Reserves**

ER#	Name	Species Scientific Name	Species Common Name	BC List Status	COSEWIC Status	SARA Status	CF Prov. Priority
28	<a href="#">Ambrose Lake</a>	<i>Oncorhynchus clarkii</i>	Coastal Cutthroat Trout, ssp. lewisi,	Blue Listed	Special concern		2
		<i>Gasterosteus aculeatus</i>	Threespine Stickleback	Yellow	Special concern		6
24	<a href="#">Baeria Rocks</a>	<i>Lasthenia maritima</i>	hairy goldfields	S2S3 (2000) Blue			3
		<i>Haliaeetus leucocephalus</i>	Bald eagle	S5B,S5N (2009) Yellow	NAR (1984)		6
		<i>Haematopus bachmani</i>	Black oystercatcher	S4 (2009) Yellow			5
		<i>Zalophus californianus</i>	California Sea Lion	S5N (2006) Yellow			6
		<i>Larus glaucescens</i>	Glaucous-winged gull	S5B (2009) Yellow			5
		<i>Phoca vitulina</i>	Harbour seal	S5 (2006) Yellow			6
		<i>Phalacrocorax pelagicus</i>	Pelagic cormorant	S2B (2005) Red			5
151	<a href="#">Ballingall Islets</a>	<i>Larus glaucescens</i>	Glaucous-winged gull	S5B (2009) Yellow			5
		<i>Phalacrocorax auritus</i>	Double-crested cormorant	S3S4B(2013) Blue			2
		<i>Cephus columba</i>	Pigeon guillemot	S4B (2009) Yellow			2
121	<a href="#">Brackman Island (to GINPR)</a>	<i>Phalacrocorax auritus</i>	Double-crested cormorant	S3S4B(2013)Blue			2
		<i>Larus glaucescens</i>	Glaucous-winged gull	S5B(2009) Yellow			5
17	<a href="#">Canoe Islets</a>	<i>Larus glaucescens</i>	Glaucous-winged gull	S5B(2009) Yellow			5
		<i>Zalophus californianus</i>	California Sea Lion	S5N (2006) Yellow			6
		<i>Eumetopias jubatus</i>	Steller Sea Lion	S3B,S3N(2014) Blue			1
		<i>Phoca vitulina</i>	Harbour Seal	S5(2006) Yellow			6
		<i>Clupea pallasii</i>	Pacific Herring	SNR			NA
1	<a href="#">Cleland Island</a>	<i>Uvia aalge</i>	Common Murre	S2B,S4N (2005) Red			2
		<i>Fratercula cirrhata</i>	Tufted Puffin	S3B,S4N (2011) Blue			2
		<i>Ptychamphus aleutius</i>	Cassin's Auklet	S2S3B,S4N (2005) Blue			2
		<i>Cerorhinca monocerata</i>	Rhinoceros Auklet	S4B (2005) Yellow			4
		<i>Romanzoffia tracyi</i>	Tracy's Mistmaiden	S3S4 (2006) Yellow			4
		<i>Oceanodroma leucorhoa</i>	Leach's Storm-petrel	S4B (2005) Yellow			4
		<i>Oceanodroma furcata</i>	Fork-tailed Storm-petrel	S4B (2005) Yellow			4
		<i>Haematopus bachmani</i>	Black Oystercatcher	S4 (2009) Yellow			5
		<i>Phalacrocorax pelagicus</i>	Pelagic Cormorant	S2B (2005) Red			2
		<i>Cephus columba</i>	Pigeon Guillemot,	S4B (2009) Yellow			2
		<i>Aneides vagrans</i>	Wandering Salamander	S3S4 (2010) Blue			2
153	<a href="#">Francis Point</a>	<i>Agrostis pallens</i>	Dune bentgrass	S3S4 (2008) Yellow			2
		<i>Eumetopias jubatus</i>	Steller Sea Lion	S3B,S3N(2014) Blue	SC (2013)	1-SC (2005)	2
		<i>Brachyramphus marmoratus</i>	Marbled Murrelet	S3B,S3N (2010) Blue	T (2012)	1-T (2003)	1
		<i>Thuja plicata</i>	Western redcedar	S5 (2000) Yellow	Threatened		5
		<i>Polystichum munitum</i>	Sword fern	S5 (2000) Yellow			6
		<i>Pseudotsuga menziesii var. menziesii</i>	Douglas-fir	S5 (2000) Yellow			6

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ER#	Name	Species Scientific Name	Species Common Name	BC List Status	COSEWIC Status	SARA Status	CF Prov. Priority
		<i>Pinus contorta</i> var. <i>latifolia</i>	lodgepole pine	S5 (2000) Yellow			5
			grey rock-moss				
			sensitive mosses & lichens on the shallow-soiled coastal bluffs				
			reindeer lichens				
137	<a href="#">Hudson Rocks</a>	<i>Phalacrocorax auritus</i>	Double-crested Cormorants	S3S4B(2013) Blue			2
		<i>Phoca vitulina</i>	Harbour seals	S5(2006) Yellow			6
		<i>Haematopus bachmani</i>	Black Oystercatchers	S4 (2009) Yellow			5
		<i>Cephus columba</i>	Pigeon Guillemots	S4B (2009) Yellow			2
4	<a href="#">Lasqueti Island</a>	<i>Juniperus maritima</i>	Seaside juniper	S3 (2008) Blue			3
		<i>Allium acuminatum</i>	Hooker's onion	S4 (2011) Yellow			4
		<i>Oncorhynchus spp.</i>	Salmon	S4 Yellow			1
		<i>Mimulus breweri</i>	Brewer's monkey-flower	S2S3 (2000) Blue			2
		<i>Toxicodendron diversilobum</i>	Poison oak	S2S3 (2000) Blue			2
		<i>Pseudotsuga menziesii</i> var. <i>menziesii</i>	Douglas-fir				6
		<i>Mahonia nervosa</i>	dull Oregon-grape	S5 (2000) Yellow			
		<i>Pseudotsuga menziesii</i> var. <i>menziesii</i>	Douglas-fir	S5 (2000) Yellow			6
		<i>Arbutus menziesii</i>	Arbutus	S4 (2014) Yellow			
		<i>Glaucidium gnoma</i>	Northern Pygmy-owl, ssp. <i>swarthi</i>	S3 (2009) Blue			1
		<i>Bubo virginianus</i>	Great Horned Owl	S5 (2009)			6
		<i>Cathartes aura</i>	Turkey Vulture	S4 (2009)			5
		<i>Haliaeetus leucocephalus</i>	Bald Eagle	S5B,S5N (2009)			6
		105	<a href="#">Megin River</a>	<i>Oncorhynchus tshawytscha</i>	Chinook Salmon	S4 Yellow	
<i>Oncorhynchus keta</i>	Chum Salmon			S4 Yellow			2
<i>Oncorhynchus kisutch</i>	Coho Salmon			S4 Yellow			2
<i>Oncorhynchus gorbuscha</i>	Pink Salmon			S5 Yellow			6
<i>Oncorhynchus nerka</i>	Sockeye Salmon			S4 (2000) Yellow			2
37	<a href="#">Mount Maxwell</a>		Unknown, 3.3 km of shoreline				
16	<a href="#">Mount Tuam</a>		Unknown, 1.25 km of shoreline.				
94	<a href="#">Oak Bay Islands</a>	<i>Rosa gymnocarpa</i>	Baldhip rose	S5 (2000) Yellow			6
		<i>Haematopus bachmani</i>	Black Oystercatcher	S4 (2009) Yellow			5
		<i>Pteridium aquilinum</i>	Bracken fern	(2001) Yellow			2
		<i>Phalacrocorax penicillatus</i>	Brandt's Cormorant	SHB,S4N (2011) Red			1
		<i>Opuntia fragilis</i>	Brittle prickly-pear cactus	S5 (2000) Yellow			6
		<i>Ranunculus californicus</i>	California buttercup	S1 (2003) Red	E- 2008	1-E(2011)	1
		<i>Fritillaria affinis</i>	Chocolate lily	S5 (2000) Yellow			6

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ER#	Name	Species Scientific Name	Species Common Name	BC List Status	COSEWIC Status	SARA Status	CF Prov. Priority
		<i>Phocoenoides dalli</i>	Dall's Porpoise		Not at risk 1989		4
		<i>Phalacrocorax auritus</i>	Double-crested cormorant	S3S4B (2013) Blue	Not at risk 1978		2
		<i>Spergularia macrotheca</i> ssp. <i>macrotheca</i>	Beach sand-spurry				4
		<i>Orcinus orca</i>	Southern resident Killer whale	S1 (2011) Red	Endangered (2008)	1-E (2003) Endangered	1
		<i>Orcinus orca</i>	Northeast Pacific transient population	S1 (2011) Red	T(2008)	1-T(2003)	1
		<i>Haliotis kamtschatkana</i>	Northern abalone	S2 (2002) Red	T-2000	1-T (2003) Endangered	2
		<i>Sebastes maliger</i>	Quillback rockfish	SNR	T (2009)	1 -Threatened	NA
		<i>Phalacrocorax penicillatus</i>	Brandt's Cormorant	SHB,S4N (2011) Red			1
		<i>Phalacrocorax auritus</i>	Double-crested Cormorant	S3S4B (2013) Blue	NAR (1978)		2
		<i>Acipenser trnasmontanus</i>	white sturgeon	S1 (2010)	Endangered (2003)	1-Endangered (2006)	2
		<i>Apodichthyes flavidus</i>	Penpoint gunnel	SNR			NA
		<i>Pelecanus occidentalis</i>	Brown pelican	SNRM (2009)			2
		<i>Ardea herodias</i>	Great Blue Heron	S3B (2009)			2
		<i>Calidris canutus</i>	Red knot	S1S2M (2009) Red	Endangered/ Threatened (2007)	1-T/E (2010)	1
		<a href="#"><u>Calidris alba</u></a>	Sanderling	S4S5M (2009) Yellow			2
		<a href="#"><u>Calidris alpina</u></a>	Dunlin	S4N (2009) Yellow			4
		<a href="#"><u>Calidris mauri</u></a>	Western Sandpiper	S4S5M (2009) Yellow			2
		<a href="#"><u>Calidris pillocnemis</u></a>	Rock Sandpiper	S4N (2009) Yellow			2
		<a href="#"><u>Calidris virgata</u></a>	Surfbird	S4M (2009) Yellow			4
		<a href="#"><u>Charadrius vociferus</u></a>	Killdeer	S4B (2009) Yellow			2
		<a href="#"><u>Gavia pacifica</u></a>	Pacific Loon	S4S5B,S4N (2009) Yellow			5
		<a href="#"><u>Gavia stellata</u></a>	Red-throated Loon	S4B (2011)			6
		<a href="#"><u>Hydroprogne caspia</u></a>	Caspian Tern	S3B (2011) Blue	NAR (1999)		2
		<a href="#"><u>Regulus satrapa</u></a>	Golden-crowned Kinglet	S5B (2009) Yellow			5
		<a href="#"><u>Strix varia</u></a>	Barred Owl	S5B (2011) Yellow			6
		<a href="#"><u>Histrionicus histrionicus</u></a>	Harlequin Duck	S4B,S3N (2011) Yellow			1
		<a href="#"><u>Romanzoffia tracyi</u></a>	Tracy's Mistmaiden	S3S4 (2006) Yellow			4
		<a href="#"><u>Lathyrus japonicus</u> var. <u>maritimus</u></a>	Beach pea	S5 (2000)			6
		<a href="#"><u>Phyllospadix scouleri</u></a>	Scouler's surf-grass	S5 (2000) Yellow			6
		<a href="#"><u>Sisyrinchium littorale</u></a>	shore blue-eyed-grass	S4 (2004) Yellow			3
		<a href="#"><u>Anthus rubescens</u></a>	American Pipit	35B (2009) Yellow			6
		<a href="#"><u>Zonotrichia atricapilla</u></a>	Golden-crowned Sparrow	S5B (2011) Yellow			6
		<a href="#"><u>Armeria maritima</u></a>	Thrift	S3S4 (2001) Yellow			6
97	<a href="#"><u>Race Rocks</u></a>						

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ER#	Name	Species Scientific Name	Species Common Name	BC List Status	COSEWIC Status	SARA Status	CF Prov. Priority
		<i>Anas crecca</i>	Green-winged teal	S5B, SSN (2009) Yellow			5
		<i>Anas platyrhynchos</i>	Mallard	S5B,S5N(2009) Yellow			5
		<i>Branta bernicla</i>	Brant	S3M (2009) Blue			2
		<i>Branta hutchinsii</i>	Cackling goose	S3M (2009) Blue			4
		<i>Cerorhinca monocerata</i>	Rhinoceros Auklet	S4B (2005) Yellow			4
		<i>Haematopus bachmani</i>	Black Oystercatcvher	S4 (2009) Yellow			5
		<i>Eschrichtius robustus</i>	Grey whale	S3 (2006)	Special Concern (2004)	1-SC (2005)	4
		<i>Phocoena phocoena</i>	Harbour porpoise	S3 (2006) Blue			4
		<i>Eumetopias jubatus</i>	Steller Sea lion	S3B,S3N (2014) Blue	Special Concern (2006)	1-SC (2005)	1
		<i>Haematopus bachmani</i>	Black Oystercatcher	S4 (2009) Yellow	NAR (2006)		5
		<i>Zalophus californianus</i>	California sea lion	S5N (2006) Yellow			6
		<i>Phocoenoides dalli</i>	Dall's Porpoise	S4S5 (2006) Yellow	NAR (1989)		4
		<i>Larus glaucescens</i>	Glaucous-winged gull	S5B (2009) Yellow			5
		<i>Larus californicus</i>	California gull	Blue listed			4
		<i>Larus heermanni</i>	Heermann's Gull	S4N (2009) Yellow			4
		<i>Larus occidentalis</i>	Western Gull	S4N (2009) Yellow			4
		<i>Larus thayeri</i>	Thayer's Gull	S5M (2009) Yellow			6
		<i>Limnodromus griseus</i>	Short-billed Dowitcher	S2S3B (2011) Blue			3
		<i>Tringa incana</i>	Wandering Tattler	S3S4B (2013) Blue			4
		<i>Troglodytes hiemalis</i>	Winter Wren	S5B (2009) Yellow			
		<i>Uria aalge</i>	Common Murre	S2B,S4N (2005) Red			2
		<i>Falco peregrinus pealei</i>	Peregrine falcon, ( <i>pealei</i> subspecies)	S3B (2010) Blue	Special Concern (2007)	1-T/E 2010	1
		<i>Enhydra lutris</i>	Sea Otter	S3 (2010) Blue	SC (2010)	1-SC (2003)	1
		<i>Bucephala albeola</i>	Bufflehead	S5B (2009) Yellow			6
		<i>Synthliboramphus antiquus</i>	Ancient Murrelet	S2S3B,S4N (2005) Blue	Special Concern (2004)	1-SC (2006)	1
		<i>Brachyramphus marmoratus</i>	Marbled Murrelet	S3B,S3N (2010) Blue	Threatened (2012)	1-T (2013)	1
		<i>Melanitta perspicillata</i>	Surf Scoter	S3B,S4N (2005) Blue			4
		<i>Melospiza melodia</i>	Song Sparrow	S5B (2010) Yellow			2
		<i>Haliaeetus leucocephalus</i>	Bald eagle	S5B,S5N (2009) Yellow	NAR (1984)		6
		<i>Phoca vitulina</i>	Harbour seal	S5 (2006) Yellow	NAR(1999)		6
		<i>Aechmophorus occidentalis</i>	Western Grebe	S1B,S2N (2009) Red	SC(2014)		1
		<i>Mirounga angustirostris</i>	Northern Elephant Seal	S1B (2014) Red	NAR (2006)		5
		<i>Callorhinus ursinus</i>	Northern Fur Seal	S2M (2006) Red	Threatened (2010)		2
		<i>Phalacrocorax pelagicus</i>	Pelagic Cormorant	S2B (2005) Red			5
		<i>Megaceryle alcyon</i>	Belted Kingfisher	S4S5B (2009) Yellow			2
		<i>Megaptera novaeangliae</i>	Humpback Whale	S3 (2006) Blue	SC (2011)	1-T (2005)	2
		<i>Sagina decumbens ssp. occidentalis</i>	Western pearlwort	S4 (2007) Yellow			4
		<i>Amsinckia spectabilis</i>	Seaside fiddleneck	S3S4 (2013) Yellow			4
		<i>Cephus columba</i>	Pigeon Guillemot	S4B (2009) Yellow			2

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ER#	Name	Species Scientific Name	Species Common Name	BC List Status	COSEWIC Status	SARA Status	CF Prov. Priority
18	<a href="#">Rose Islets</a>	<i>Phalacrocorax auritus</i>	Double-crested Cormorants	S3S4B(2013) Blue			2
		<i>Larus glaucescens</i>	Glaucous winged gull				5
		<i>Phalacrocorax pelagicus</i>	Pelagic Cormorant	S4B (2005) Yellow			5
		<i>Haematopus bachmani</i>	Black Oystercatcher	S4 (2009) Yellow	NAR (2006)		5
		<i>Cephus columba</i>	Pigeon Guillemot				
141	<a href="#">San Juan River Estuary</a>	<i>Mimulus dentatus</i>	tooth-leaved monkey flower	S2S3 (2013) Blue			3
		<i>Castilleja ambigua ssp. ambigua</i>	paintbrush owl-clover.	S2S3 (2007) Blue			2
		<i>Prosartes smithii</i>	Smith's fairybells,	S3 (2000) Blue			2
		<i>Cardamine angulata</i>	angled bitter-cress	S2S3 (2000) Blue			2
		<i>Pleuropogon refractus</i>	nodding semaphore-grass.	S3(2001) Blue			2
		<i>Cervus canadensis roosevelti</i>	Rooseveltdt Elk	S3S4 (2010) Blue			2
		<i>Haliaeetus leucocephalus</i>	Bald Eagle	S5B,S5N (2009) Yellow			6
		<i>Ursus americanus</i>	Black Bear	S5 (2010) Yellow			6
		<i>Neovision vision</i>	mink	S5 (2011) Yellow			6
		<i>Lontra Canadensis</i>	River otter	S4S5 (2010) Yellow			4
67	<a href="#">Satellite Channel</a>	<i>Maldane glebifex</i>	genera <i>Lumbrineris</i> and <i>Nephtys</i>				
		<i>Sternaspis fossor</i>	Sedentary polychaete				
		<i>Prionospio</i>	Sedentary polychaete				
		<i>Compsomyx subdiaphana</i>	pelecypods				
		<i>Macoma elimata</i>	pelecypods				
		<i>Yoldia ensifera</i>	pelecypods				
		<i>Ophiura sarsi</i>	brittle star				
66	<a href="#">Ten Mile Point</a>	<i>Haliotis kamschatkana</i>	Northern Abalone	S2 (2002) Red	T-2000	1-T (2003) Endangered	2
		<i>Artemisia alaskana</i>	Alaskan sagebrush	S2S3 (2001) Blue			3
		<i>Haematopus bachmani</i>	Black Oystercatcher	S4 (2009) Yellow	NAR (2006)		5
		<i>Phoca vitulina</i>	Harbour seal	S5 (2006) Yellow	NAR(1999)		6
132	<a href="#">Trial Island</a>	<i>Stumella neglecta</i>	Western Meadowlark (Georgia Depression population)	SXB (2010) Red			2
		<i>Coenonympha tullia ssp. insulana</i>	Common Ringlet, ssp. insulana	S1 (2013) Red			1
		<i>Alopecurus carolinianus</i>	Carolina meadow-foxtail	S2 (2000) Red			3
		<i>Castilleja levisecta</i>	golden paintbrush	S1 (2009) Red	E (2007)	1-E (2003) Endangered	1
		<i>Limnanthes macounii</i>	Macoun's meadow-foam	S2 (2007) Red	T (2004)	1-T (2006) Threatened	1
		<i>Lupinus densiflorus</i>	dense-flowered lupine	S1 (2009) Red	E (2005)	1-E (2006)	1
		<i>Lotus formosissimus</i>	seaside birds-foot trefoil	S1 (2000)	E (2010)	1-E (2003)	1
<i>Sanicula arctopoides</i>	snake-root sanicle	S1 (2011) Red	E (2001)	E (2001)	1		

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ER#	Name	Species Scientific Name	Species Common Name	BC List Status	COSEWIC Status	SARA Status	CF Prov. Priority
		<i>Sanicula bipinnatifida</i>	purple sanicle	S2 (2009) Red	T (2001)	1-T (2003) Threatened	1
		<i>Leymus triticoides</i>	creeping wildrye				
		<i>Orthocarpus bracteosus</i>	rosy owl-clover	S1 (2009) Red	E (2004)	1-E (2005) Endangered	1
		<i>Quercus garryana/Bromus carinatus</i>	Garry oak – California brome association				
		<i>Silene scouleri ssp. grandis</i>	coastal Scouler's catchfly	S1 (2000) Red	E (2003)	1-E (2005)	4
		<i>Castilleja victoriae</i>	Victoria's owl-clover	S1 (2009) Red	E (2010)	1-E (2012) Endangered	1
		<i>Entosthodon fascicularis</i>	banded cord-moss	S2S3 (2011) Blue	SC (2005)	1-SC (2006)	2
		<i>Anagallis minima</i>	chaffweed	S3 (2008) Blue			2
		<i>Aster curtus</i>	white-top aster	S2 (2008) Red	SC (2009)	1-SC (2003)	1
		<i>Isoetes nuttallii</i>	Nuttall's quillwort	S3 (2001) Blue			2
		<i>Sidalcea hendersonii</i>	Henderson's checker-mallow	S3 (2001) Blue			2
		<i>Crassula aquatica</i>	pigmyweed	S4 (2008) Yellow			2
		<i>Lupinus littoralis</i>	seashore lupine	S3S4 (2005) Yellow			4
		<i>Montia dichotoma</i>	dwarf montia	S3S4 (2001) Yellow			4
		<i>Fritillaria affinis var. affinis</i>	chocolate lily	S5 (2000) Yellow			6
		<i>Camassia quamash</i>	common camas	S4 (2000) Yellow			2
		<i>Poa macrantha</i>	dune bluegrass	S3S4 (2001) Yellow			4
		<i>Quercus garryana</i>	Garry oak	S5 (2000) Yellow			6

### References:

[Species at Risk Act \(SARA\) Consultations - Pacific Region](#)

[Search Aquatic Species at risk](#)

Friends of Ecological Reserves <http://ecoreserves.bc.ca/>

BC Parks Ecological Reserves [http://www.env.gov.bc.ca/bcparks/eco\\_reserve/](http://www.env.gov.bc.ca/bcparks/eco_reserve/)

### 3.3 The Special Case for Whales

**Figure 2: Vessel in the outbound lane and killer whales in the Strait of Juan de Fuca—Race Rocks Ecological Reserve in the Foreground** (Photo by A. Fletcher, 2015)



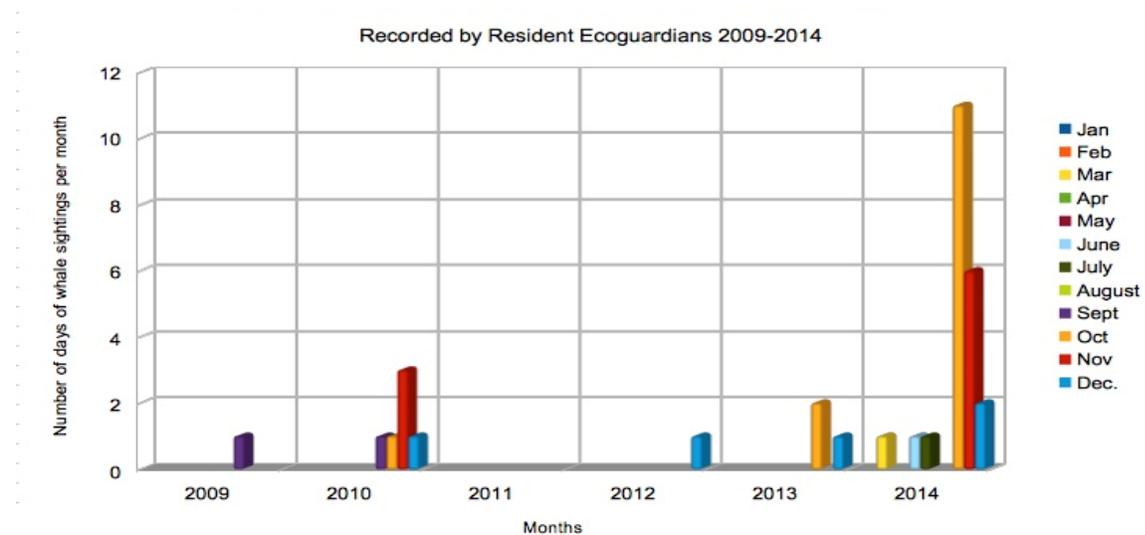
#### 3.3.1 Humpback Whales

In recent years Humpback whales have become more prevalent, as evidenced by the set of observations recorded in the logs (records) made by the Eco-guardians of the Race Rocks ER which is located in the Strait of Juan de Fuca <http://www.racerocks.ca/wp/tag/humpback-whale/>.

Figure 3: Humpback Whale in the Race Rocks Ecological Reserve (photo by Paul Pudgwell)



Figure 4: Humpback Whale Sightings in Days per Month at Race Rocks Ecological Reserve

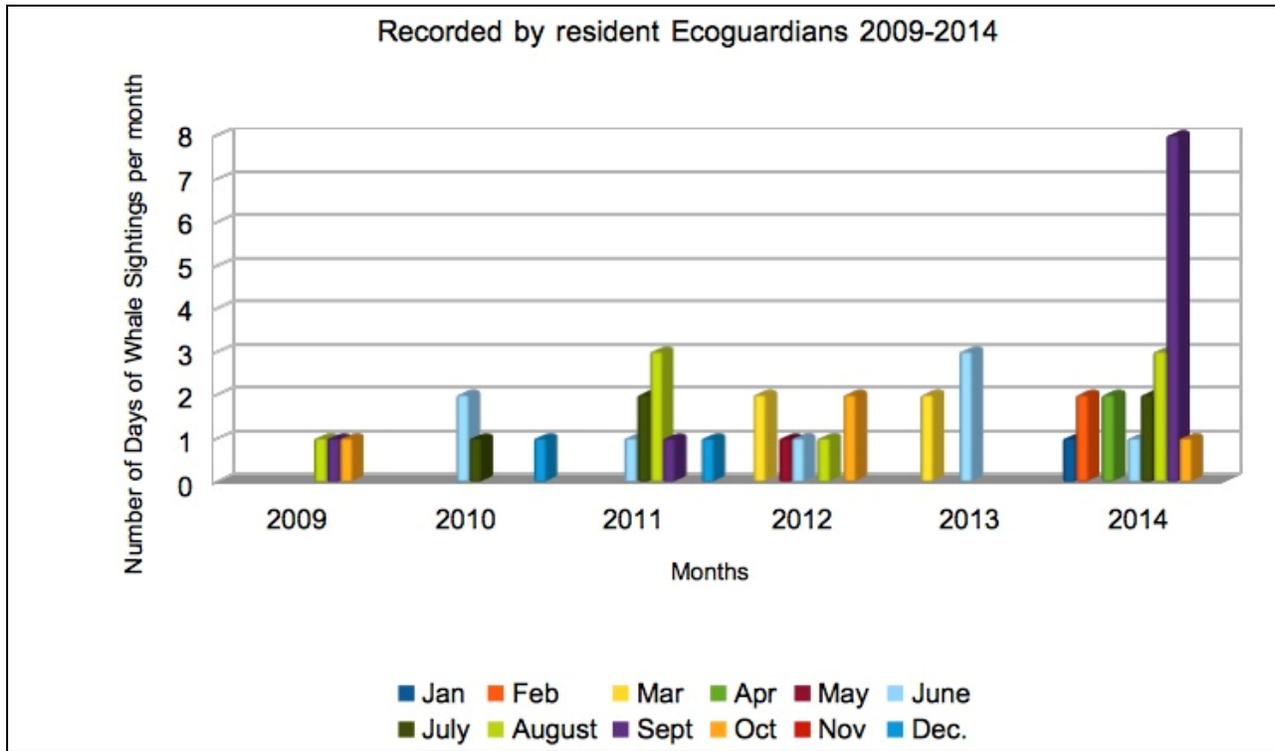


Records for whale sightings in the Race Rocks Ecological Reserve are the most up to date set of whale observations available for an Ecological Reserve. It helps that there is a research station on Race Rocks and monitoring equipment maintained and in place. The logs are kept by the resident Ecological Reserve (Eco guardian) who is provided courtesy of Lester Pearson College UWC.

3.3.2 Orcas in Marine Ecological Reserves

Since many of our Marine Ecological Reserves feature high biological productivity, the two kinds of Killer whale (*Orcinus orca*) are frequently reported within the reserve boundaries. The Southern Resident Killer whale and the Biggs (transient whale) are often observed foraging; the Southern resident whale forage for fish, and the Bigg’s whale forage for marine mammals. See <http://www.racerocks.ca/wp/tag/orca/> for Killer whales.

Figure 5: Killer Whale Sightings in Days per Month at Race Rocks Ecological Reserve



In light of the research available on the effects of ship-based acoustics on the long-term potential for survival of Killer Whales, we asked, in IR #2-30 what mitigation measures were going to be imposed on the speed and frequency of ships carrying KM-TMX products in the tanker traffic corridor through Killer whale habitat. (See Appendix 2 for the complete dialogue).

**Figure 6: Killer Whale Feeding on a Harbour Seal - Race Rocks Ecological Reserve** (photo by Ryan Murphy)



**The Context for this question was derived from the following:**

In the Recovery Strategy for Killer whales published by NOAA in 2008, The risk of Noise on Killer whales was outlined.

*“Since (1995), there has been a rapidly growing awareness that noise is a significant threat that degrades habitat and adversely affects marine life (IUCN 2004, IWC 2004). It is estimated that ambient (background) underwater noise levels have increased an average of 15 dB in the past 50 years throughout the world’s oceans (NRC 2003). Killer whales have evolved in the underwater darkness using sound much the way terrestrial animals use vision: to detect prey, to communicate and to acquire information about their environment. Anthropogenic noise can interfere with all these activities in critically important ways, such as disrupting communication, reducing the distance over which social groups can detect each other, masking echolocation and hence reducing the distance over which the animals can detect their prey, potentially displacing them from preferred feeding habitats, displacing prey, impairing hearing, either temporarily or permanently, and in extreme cases causing death (Bain and Dahlheim 1994, Barrett-Lennard et al. 1996; Erbe 2002, Bain 2002, NRC 2003, Au et al. 2004).*

*Shipping: Commercial shipping has increased dramatically in recent years. For example, between 1995 and 1999 the worldwide commercial shipping fleet increased 12% (NRC 2003). There are few studies that have measured changes in the background underwater noise levels over time, but those that do suggest that increased vessel traffic is responsible for the increase in ambient noise over the last 100 years (e.g. Andrew et al. 2002). In the northern hemisphere, shipping noise is the dominant source of ambient noise between 10 to 200 Hz (NRC 2003). While shipping energy is concentrated at low frequencies, ships produce significant amounts of high frequency noise as well.”*

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The consequences of these chronic sources of noise on Killer whales have not been assessed. At a presentation by Scott Veirs at the Salish Sea Ecosystem Conference in Seattle in May 2014 entitled “*Noise impacts in the Salish Sea under commercial shipping growth scenarios,*” the research of BEAM Reach has provided a stark picture of the threshold levels of acoustic noise from ships beyond which Killer whales can obtain food and communicate by echo-location allowing their survival.

<http://www.beamreach.org/2014/04/30/emaze-talk-fossil-fuel-ship-noisekiller-whales>

See more at: <http://www.beamreach.org/2014/04/30/emaze-talk-fossil-fuel-shipnoise-killer-whales#sthash.6DTS4jf7.dpuf> .

Another article entitled *Salish Sea Orca Whales Not Mating, Socializing in Polluted Soundscape* <http://www.desmog.ca/print/8076> states that:

*“Vessel noise is already hindering endangered southern resident Killer whales from communicating and finding fish and the noise bombardment will get worse if proposals for coal terminals and pipelines in B.C. and Washington State are approved.”*

Scott Veirs, Beam Reach Marine Sciences and Sustainability School program coordinator and professor, speaking at the Salish Sea Ecosystem Conference stated that:

*“Ships dominate the soundscape of Puget Sound.” Veirs and his students take underwater sound recordings off Limekiln Park on San Juan Island, an area where the Killer whales are known to spend time, and then model the echo-location and communication consequences for the resident Killer whales.”*

The resident Killer whale population has dropped this year to 80 animals in three pods, the lowest number in more than a decade. Sounds of swooshes, rattles and bangs echoed through the room as Veirs demonstrated noises surrounding the whales every day and audience members covered their ears as he played the screeching and metallic grindings made by a ship with a damaged propeller. Veirs said.

*“At least one ship is present about 40 per cent of the time and when that ship is going through it reduces the range that whales can communicate by 68 per cent,”*

That means the whales miss about 37 per cent of calls and, if traffic doubles – as it could with increases in oil tankers from twinning the Kinder Morgan pipeline from Alberta to Burnaby and with 21 per cent more carriers and barges from proposed coal terminal expansions in B.C. and Washington – it is estimated the whales will miss 44 per cent of the calls. Current noise levels mean whales are already finding almost 50 per cent less fish than they would otherwise and a doubling of traffic would increase that to 58 per cent. The noise is having a significant impact as Chinook salmon is already scarce.

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Canadian and U.S. government studies have pinpointed lack of salmon – and particularly the whales’ preferred diet of Chinook – noise and pollution as the major threats faced by the resident killer whales.

**Figure 7: Killer Whale Feeding off Race Rocks Ecological Reserves** (photo by Ryan Murphy)



KM-TMX in their answer on mitigating impacts was found to be inadequate, KM-TMX demonstrated an understanding of existing legislation and government responsibility. But we found no commitment in solving the problem for the Southern Killer whale. The statement supplied was:

*“the existing regulatory framework emphasizing navigational safety, accident prevention, emergency preparedness and response, and financial liability/compensation in the case of an oil spill in a marine environment in Canada governs existing and future marine vessel traffic calling at the Westridge Marine Terminal.”*

Neither the other responsibilities of DFO nor existing Acts have been entirely successful at stemming the slide toward extinction of this species. If KM-TMX does not follow the Precautionary Principle outlined in the Ocean Act and NEB chooses to not provide weight towards caution as directed by the Oceans Act, then there should be little doubt that the underwater sound emanating from the cumulative total of ship traffic will lead to extinction of this species.

In IR#2 we asked KM-TMX if they would provide the mitigation that must be adopted by tankers carrying its product to ensure survival of the Southern Killer whales and other Cetaceans in the Strait of Georgia, and Strait of Juan de Fuca. In the answers KM-TMX provided for our IR2 question on whales ( IR # 30, 31 and 32, there was no reference made to a new report from DFO dated January, 2015. We

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asked KM-TMX to re-evaluate their responses to these questions based on this report since it lays bare the wide range of deficiencies in the information that has so far been provided by KM-TMX.

The legislative tool they mentioned, *“the federal Species at Risk Act, 2002 (SARA), includes prohibitions against killing, harming, harassing, capturing or taking an individual of a wildlife species that is listed as endangered or threatened.”*

The NEB needs to see how this application can fully comply should this Endangered Species Act be fully enforced, it may mean that any level of increase in shipping through the habitat of this whale could only occur if there was NO NET LOSS of habitat, and that means no net loss of ability for the animals to echolocate, find food and reproduce in a healthy environment.

So we expect that NEB will assure through permit conditions that the:

1. KM-TMX operations (and this involves the transport component, not just the Westridge component) will be held to account so that there is no addition from their operation to the interference in the soundscape of the area (as referenced in IR#2-32).
2. KM-TMX operations be held to account so that there will not be any addition to the chronic oil pollution problem of the area.
3. KM-TMX operation will be able to show practices that guarantee zero collisions with marine mammals.
4. KM-TMX operations will cause no addition to atmospheric emissions in the waters of endangered species habitat. (For the problems with emissions, see: <http://ecoreserves.bc.ca/2008/06/30/a-model-based-approach-investigating-killer-whale-orcinus-orca-exposure-to-marine-vessel-engine-exhaust/>)

Here is a link to especially relevant excerpts of the DFO report of February, 2015. The complete report is also available at this hyperlink:

[\*\*SUFFICIENCY REVIEW OF THE INFORMATION ON EFFECTS OF UNDERWATER NOISE AND THE POTENTIAL FOR SHIP STRIKES FROM MARINE SHIPPING ON MARINE MAMMALS IN THE FACILITIES APPLICATION FOR THE TRANS MOUNTAIN EXPANSION PROJECT\*\*](#)

Figure 4.2-22 of the Stantec report, *“The extent of the Critical habitat for the Southern Resident Killer Whales,”* was clearly highlighted on Figure 2 of the DFO report and shown in Figure 8.

Figure 8: Critical Habitat and DFO Important Areas for Marine Mammals in the Marine RSA

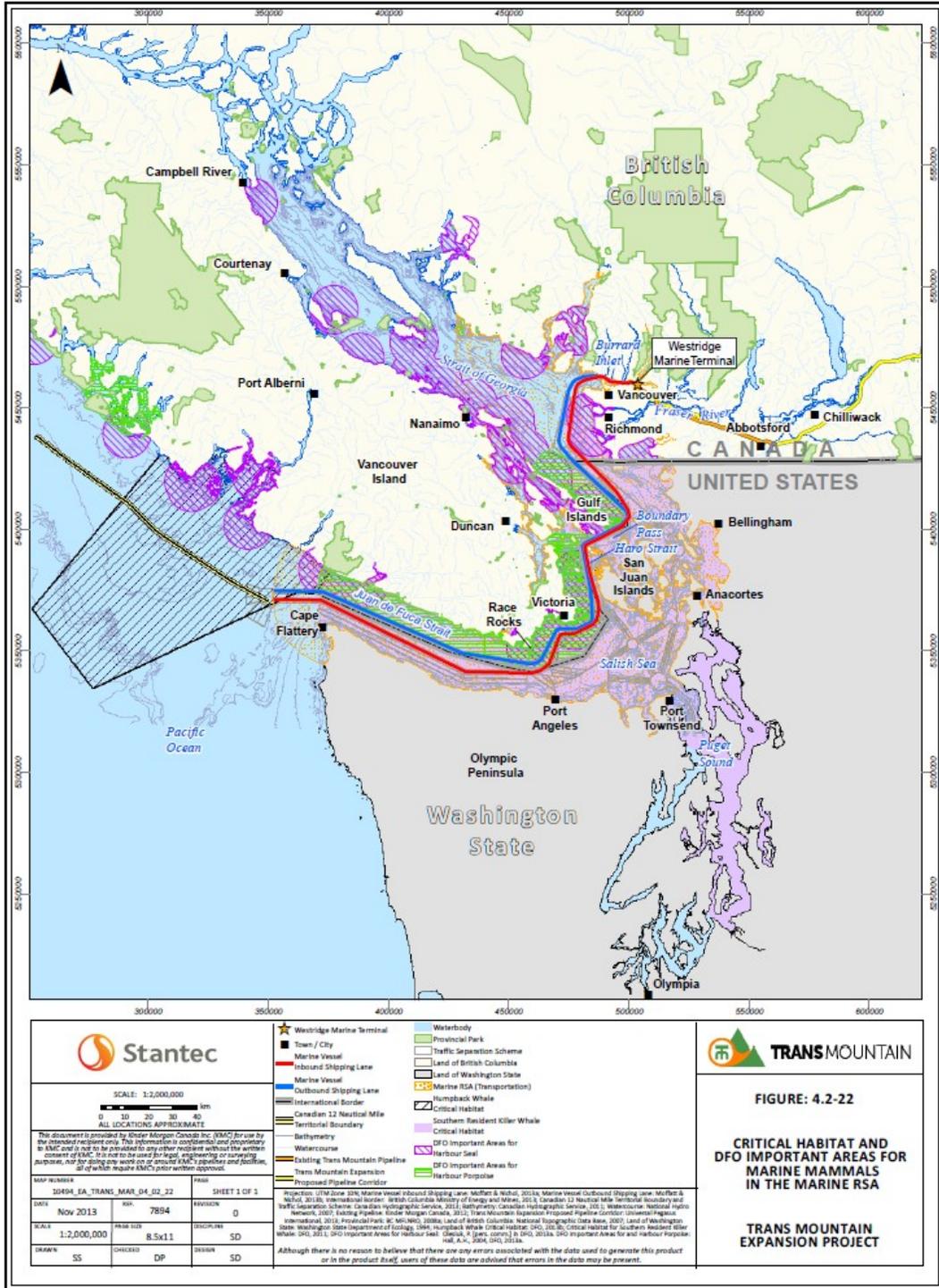


Figure 8 is taken from the DFO report: Figure 2. Critical Habitat for Southern Resident Killer Whales, proposed Critical Habitat for Humpback Whales and other important areas for marine mammals in the Marine RSA. (from Trans Mountain Pipeline ULC, 2013. Trans Mountain Expansion Project – An Application Pursuant to Section 52 of the National Energy Board Act, Volume 8A - Marine Transportation).

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In the DFO report several paragraphs are worth quoting as they attest to the seriousness of the situation with regard to increase marine underwater noise:

### Page 4:

*“The increase in marine vessel traffic associated with the proposed Project has the potential to result in sensory disturbance to marine mammals from underwater noise, and an increased risk of injury and mortality associated with mammal-vessel strikes.”*

### Page 4:

*“For example, for cetacean species listed as Threatened or Endangered under Canada’s Species at Risk Act, such an assessment would consider the risk of injury or mortality of an individual as a potential threat to the viability of already small populations (Williams and O’Hara 2009). Without such a structured qualitative/quantitative framework, the assessment is insufficient to evaluate the conclusion that the probability of a Project-related vessel striking and injuring a marine mammal is low, or that the occurrence of injury or mortality of a marine mammal would be infrequent.”*

### Page 7:

*“To evaluate the effect of potential ship strikes, related to the Project, on marine mammals, a risk assessment framework that considers the likelihood of a vessel strike to an individual of a specific cetacean population, the size and status of that particular cetacean population, and the propensity of that population for being struck by ships is necessary, but has not been completed. For example, for cetacean species listed as Threatened or Endangered under Canada’s Species at Risk Act, such an assessment would consider the risk of injury or mortality of an individual as a potential threat to the viability of already small populations (Williams and O’Hara 2009). Without such a structured qualitative/quantitative framework, the assessment is insufficient to evaluate the conclusion that the probability of a Project-related vessel striking and injuring a marine mammal is low, or that the occurrence of injury or mortality of a marine mammal would be infrequent.”*

For the issue of marine noise by increase in tanker traffic, the DFO had likewise critical condemnation of the research and modelling done by Kinder Morgan.

### Page 9:

#### **Under Marine Traffic and Underwater Noise:**

*“The assessment of effects from noise levels at or below the threshold for behavioural disturbance is not sufficient.”*

*“The assessment considers noise from a single Project-related ship, without taking into account the additive and cumulative effects of existing noise, or increased noise due to Project-related increases in vessel traffic. These omissions inhibit the assessment for*

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*potential residual effects from Project-related ship noise on indicator marine mammal species.”*

### Page 12:

*“The underwater noise environment in the Marine RSA is not adequately modelled in the Project Application; only Project-related ship noise is modelled, and not the additive and cumulative effects of existing ship source noise. The model is currently used only to assess the impact of a single Project-related ship passing a single stationary marine mammal. As the number of ships transiting the area from all sources increases, the frequency and duration of relative quiet will decrease correspondingly. Model outputs that include additive and cumulative effects of Project-related and existing ship noise would be a more accurate measure of the noise environment to which the marine mammals would be exposed.”*

### On Page 12: Conclusions:

*“There are deficiencies in both the assessment of potential effects resulting from ships strikes and exposure to underwater noise in the Trans Mountain Expansion Project Application documents.*

*There is insufficient information and analysis provided with which to assess ship strike risk in the Marine RSA from either existing or Project-related traffic. Ship strike is a threat of conservation concern, particularly for baleen whales such as Fin Whales, Humpback Whales and other baleen whales (Gregr et al. 2006). If shipping intensity increases as projected in Section 4.4 in the Marine RSA and the Strait of Georgia and Juan de Fuca Strait as a whole, the significance of this threat to cetacean populations that occupy the region will increase. Incidence of recovered whale carcasses is not considered to be an adequate measure of the frequency of ship strikes. No information is provided about the speed and maneuverability of Project-related ships or the distribution of whales in relation to the shipping lanes. Analyses that consider the statistical probability of ship-whale encounters and the risk of collisions are considered appropriate methodologies to assess this potential effect.*

*The JASCO MONM model, as it has been applied by the Proponent, is not adequate to assess the overall impact of noise from increased Project-related traffic. Although state-of-the-art acoustic modelling has been used to model the noise propagation associated with a single Project-related tanker in the Marine RSA, only four locations were chosen to represent the Marine RSA; therefore, the assessment does not adequately represent the noise exposure for the entire time a marine mammal would be in the RSA. The assessment represents only Project-related tanker traffic and not the current noise environment or the potential increase due to Project-related traffic. Finally, the method used to assess the significance of impacts from the modelled noise level contours resulting from a single Project-related tanker and tug on indicator cetacean and pinniped species is qualitative and the lack of an appropriate assessment framework reduces DFO’s ability to evaluate the assessment.”*

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Our initial fears as expressed in our information requests in Round 2 about the serious problems for the Cetaceans, have not been allayed given inadequate responses by KM-TMX as has been pointed out in the DFO report. The lack of accountability and scientific credibility demonstrated by the inadequate science in the KM-TMX applications is an important consideration. There remains serious concern for the welfare of Marine Mammals in the 19 Ecological Reserves and the Salish Sea in general. There are cumulative effects/impacts due to proposed increased tanker traffic from the Westridge terminal out through the Strait of Juan de Fuca and offshore of Vancouver Island on Killer whale and how to address this has not been clarified.

### 3.4 Other Marine Mammals in Ecological Reserves

In the book *Marine Mammals and the Exxon Valdez* by Thomas R. Loughlin<sup>7</sup>, the fate of marine mammals and other supporting parts of the marine ecosystem are documented with a unique longitudinal study of the demise of an ecosystem due to a single acute environmental perturbation. This publication provides a cautionary warning about what would happen to our marine mammal populations in the Strait of Georgia, southern Vancouver Island and the Strait of Juan de Fuca in the event of a catastrophe like the Exxon Valdez.

Thirteen species of marine mammals have been photographed in the Race Rocks Ecological Reserve alone.

#### 3.4.1 Harbour Seal

**Figure 9: Harbour seal (*Phoca vitulina*) Mother and Pup off the docks at Race Rocks Ecological Reserve** (photo by Ryan Murphy, 2010)



Harbour seals haul out and have young in several reserves along the tanker route.

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<sup>7</sup>Loughlin T. 1994. *Marine Mammals and the Exxon Valdez Spill*.  
[https://books.google.ca/books/about/Marine\\_mammals\\_and\\_the\\_Exxon\\_Valdez.html?id=74oRAAAYAAJ&hl=en](https://books.google.ca/books/about/Marine_mammals_and_the_Exxon_Valdez.html?id=74oRAAAYAAJ&hl=en)

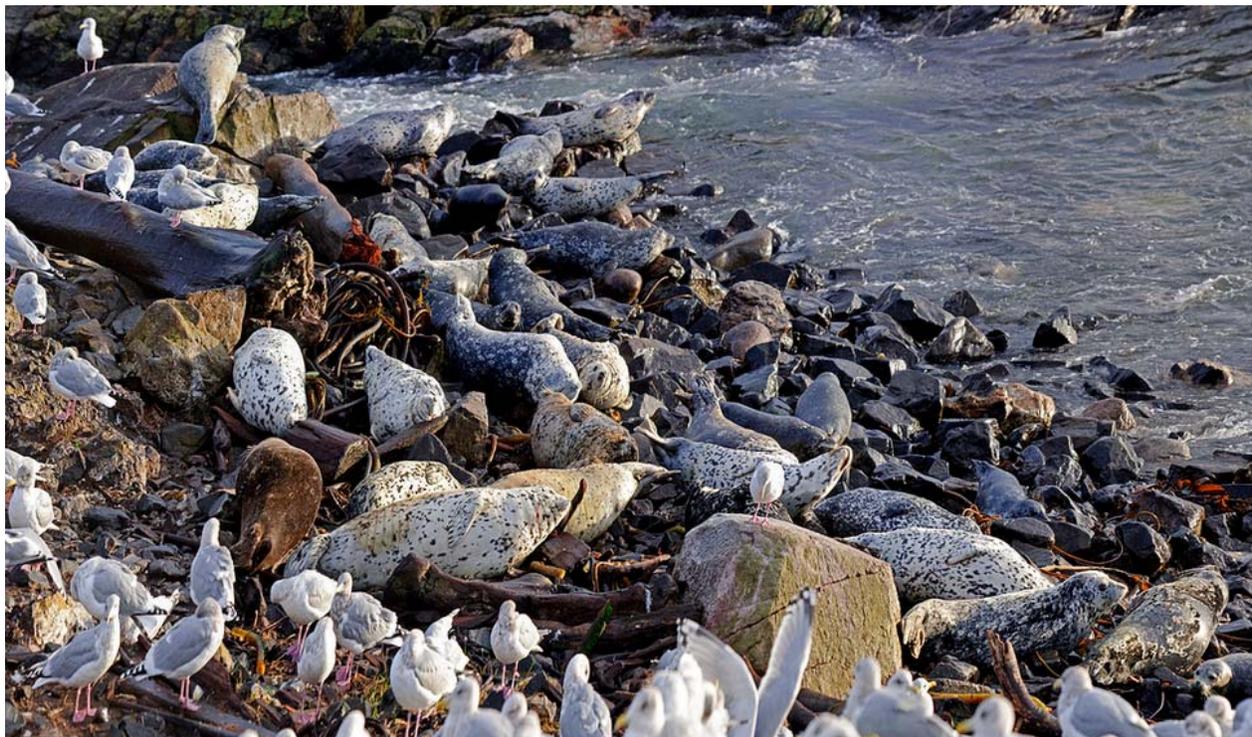
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They can be found as year round residents with breeding colonies in the following reserves:

- Hudson Rocks Ecological reserve
- Baeria Rocks ER
- Brackman Islands ER
- Race Rocks ER
- Ten Mile Point ER

The effects of oiling on the coats of these mammals are well known and since their pupping season can be from January to June, the pups have a wide period of vulnerability. Any rehabilitation of these animals would leave them as permanent “wards of the state” as pups are not easily returned to the wild.

**Figure 10: Harbour Seals (*Phoca vitulina*) and Seagulls on the Shore at Race Rocks ER** (photo by Ryan Murphy, 2010)



### 3.4.2 Elephant Seal

The only and most northerly breeding colony in Canada of Elephant seals started in 2009 at the Race Rocks Ecological Reserve (RRER) and has increased in numbers each year since. This significant occurrence has been considered inconsequential by Kinder Morgan TMX. In our opinion it merits a high level of consideration for protection from

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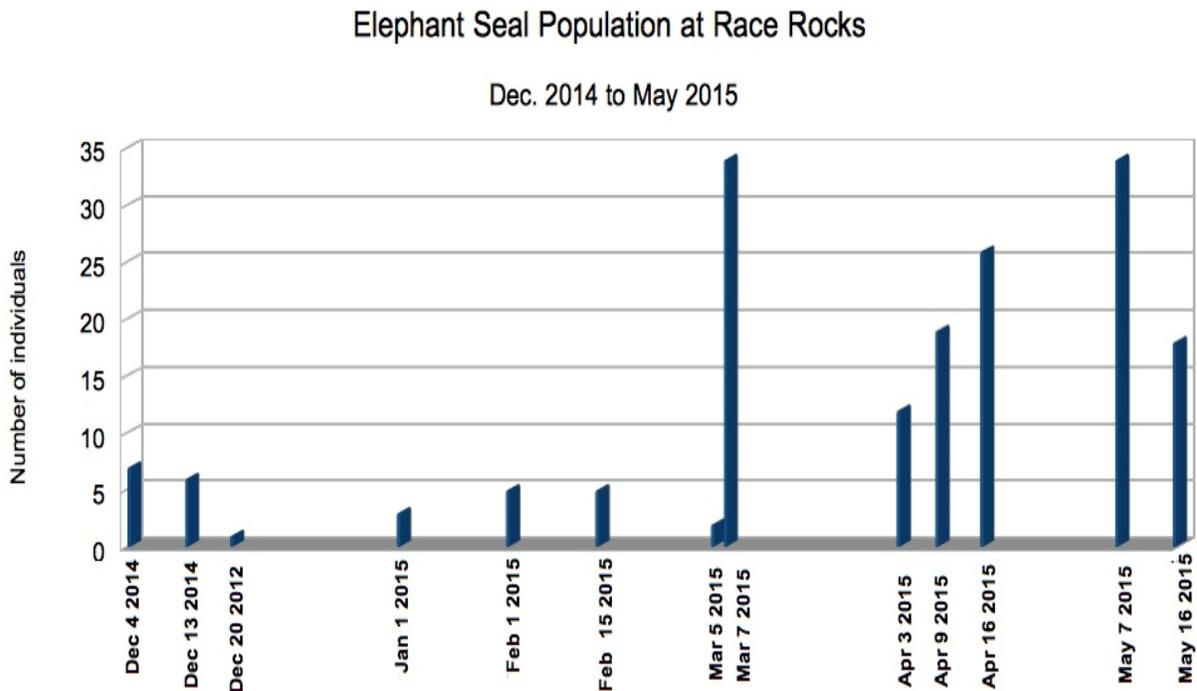
the incremental increase in chronic oil pollution and the catastrophic event which is highly likely to occur with an increase in oil transport past Race Rocks.

**Figure 11: Breeding Elephant seals at Race Rocks Ecological Reserve** (Photo by Ryan Murphy, 2010)



Figure 12 shows the most recent population levels from individual day counts of this year. Figure 13 shows the monthly maximum of elephant seals present at Race Rocks from 1990 to mid-2014 (with no data recorded for 2005 and 2006). The steady increase in that time, with elephant seals present now in every month of the year and at greater numbers, (this year with a high of 34 on May 7) shows a significant sized colony is developing.

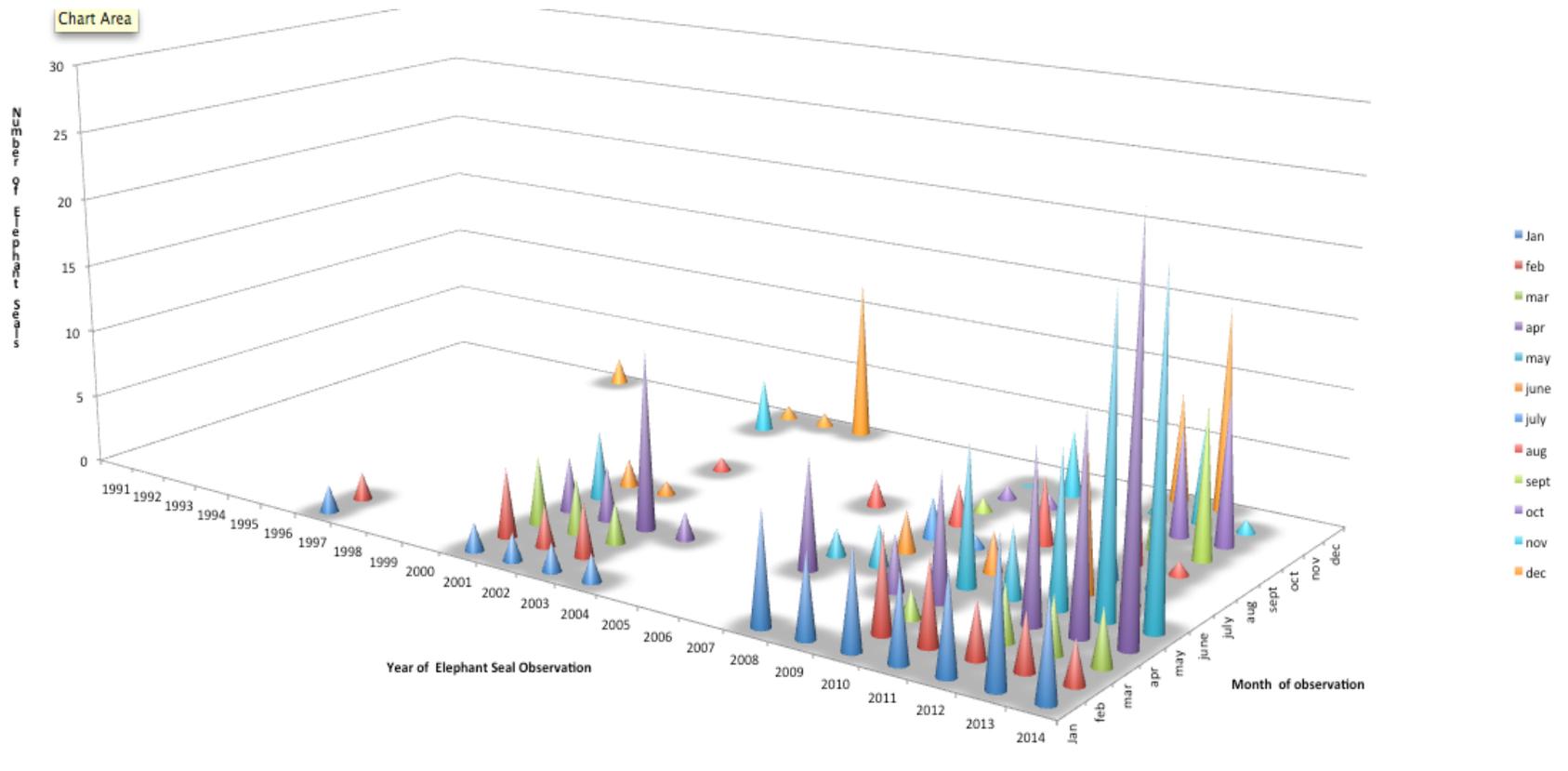
**Figure 12: Elephant Seal Population at Race Rocks - Winter/Spring 2015**



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**Figure 13: Population of Elephant Seals per Month at Race Rocks Ecological Reserve - 1990-2014**

KM-TMX consultants have relied on older information when better and newer information is available. The Board of FER is proposing long-term monitoring to inform incremental improvements in tanker operation commensurate with current data such as shown in Figure 13. This figure shows a significant recent increase in elephant seals at Race Rocks ERs. Only with such monitoring and over the long term can fluctuations of marine mammal populations be understood.



### 3.4.3 California Sea Lion

Figure 14: California Sea lion at Race Rocks (photo by Ryan Murphy 2010)



Over 400 California sea lions arrive in August and haul out in groups of up to 500 in the Race Rocks ER. Their numbers decline through the winter until late spring. They are also found in other ecological reserves throughout the fall and winter.

### 3.4.4 Northern Sea Lion (Steller)

Over 300 sea lions arrive in August and haul out in the Race Rocks ER. Their populations rise and fall during the winter.

- Northern or Steller sea lions are considered of special concern by COSEWIC and Red-listed by BC.
- Northern or Steller sea lions also haul out in the following Ecological Reserves: Francis Point ER, Ten Mile Point ER and Oak Bay Islands ER.

**Figure 15: Northern or Steller Sea Lion Male, Female and Pup at Race Rocks Ecological Reserve**  
(Photo by Ryan Murphy 2010)



### 3.4.5 River Otter and Sea Otter

**Figure 16: Sea Otter foraging in the intertidal zone at Race Rocks Ecological Reserve with Sea Lions Rafting in Background** (Photo by Nick Townley, 2015)



- River otters have dens in several of the Marine ERs, Race Rocks and Ten Mile Point ER for example.

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- Sea otters have started to show up regularly at the east entrance of the Strait of Juna de Fuca in the Race Rocks ER. In the spring of 2015, several individuals have stayed on as residents.

### 3.4.6 Failure of the Assessment Process to Deal with Marine Mammals

The selection of marine mammals in the initial assessment process of KM-TMX was very flawed. Whatever experts were consulted for advice on marine mammals were clearly not aware of the full extent of the distribution and reproductive status of the marine mammals of the Salish Sea, and had not done a thorough job of getting the most up-to-date data available on marine mammal populations.

From the KM-TMX assessment document:

*“Ultimately, the three indicator species selected to represent potential effects from the increase in Project-related marine vessel traffic are: Southern Resident Killer whale (*Orcinus orca*); Humpback whale (*Megaptera novaeangliae*); and Steller sea lion (*Eumetopias jubatus* ssp. *monteriensis*). These species are broadly representative of the three diverse taxonomic groups of marine mammals (i.e., toothed whales, baleen whales and pinnipeds) that are found in the Marine RSA and each indicator meets most or all of the criteria described above. All of the indicator species are highly mobile and are, at times, widely distributed throughout the Marine RSA.”*

Using Steller sea lion as representative of the pinnipeds is a gross oversimplification. This species is variable and seasonal in its haul out colonies, and does not have any pupping colonies within the RSA.

The fact that **two** pinnipeds, Elephant seals and Harbour seals have pupping colonies within the RSA exemplifies the short-sightedness of this limited selection of pinniped species. Nor do Steller sea lion populations and habitat have anything to do with the two other marine mammals, river otters which have birthing areas and sea otters which are also within the RSA.

In the Board of FER Information Request #1, we pointed out the significance of these other marine mammal species and asked for greater representation as indicator species.

*“Marine mammal pup nursery colonies exist in considerable numbers but are not mentioned. Reference by the consultant is to numerous sea mammal haul outs only. Within a short distance of proposed tanker routes are several pup nursery colonies of Harbour seals. They haul out on shallow intertidal areas from the Ten Mile Point to Race Rocks. The only pupping colony for the Northern Elephant seal in Canada started in 2009 at Race Rocks Ecological Reserve, after extirpation early in the 20<sup>th</sup> century. The significance of allowing this species, with such a limited range, to re-establish and the responsibility to protect this species is considerable. FER believes that these colonies need to be included as indicators as top predators are a good indicator of marine health. “*

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The answer from KM-TMX ignored the risk from oil spills and only considered the change in wave height and underwater noise.

*“However, while the zone of sensory disturbance from underwater noise is predicted to extend 7.1 km (in both directions) from the shipping lane at this location, elephant seals and harbour seals breed and pup onshore, and therefore are not expected to be disturbed by underwater noise while breeding.”*

KM-TMX refused to include in its assessment the concern for any marine mammal pupping colonies in the event of an oil spill. Their obvious denial of the likelihood of such a catastrophic event which would essentially eliminate the pupping colonies, shows the inadequacy of the assessment process.

### 3.5 Marine Birds

The effect of chronic and catastrophic oil spills has been well documented in many instances. The cost of rehabilitation is unacceptable and the likelihood of survival is minimal. In our Ecological Reserves, seabirds and shorebirds are present year round. There is no safe time of the year when oiling is acceptable. They may be present on the Ecological Reserves as over-wintering resident populations, summer nesting populations of spring and fall migrating populations.

From the World Wildlife Fund Publication Seabirds and Atlantic Canada's Ship-Source Oils Pollution we can see that:

*“Chronic oil pollution has not garnered enough attention in the media, government, industry, and the scientific community in the past, given the extent of the problem. It is imperative that more effort is made to prevent chronic marine oil pollution events that collectively have clear detrimental effects on our marine ecosystem”*

*“An estimated 300,000 seabirds, which breed all over the North and South Atlantic, are killed on average every year in Atlantic Canada, a death toll equivalent to that caused by the Exxon Valdez oil spill in 1989 (Chardine 1995). Chardine, J., and G. Pelly. 1994. Operation Clean Feather: Reducing oil pollution in Newfoundland waters. Canadian Wildlife Service Technical Report Series 198, 40pp.”*

<https://docs.neb-one.gc.ca/ll-eng/llisapi.dll/fetch/2000/90464/90552/548311/956726/2392873/2449925/2451210/2454470/C356-2-20 - WWF 2002 Seabirds and Atlantic Canada s Ship-Source Pollution - A3W8H7.pdf?nodeid=2454366&vernum=-2>

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### 3.5.1 Marine Birds Nesting in the Ecological Reserves

At least seven of our Marine Ecological Reserves in the path of tanker traffic provide habitat for nesting colonies for marine birds:

- Four seabird species nest on Ballingall Islands ER.
- Four seabird species nest on Baeria Rocks.
- Two seabird species nest at Canoe Islands ER.
- Up to 11 seabird species nest on Cleland Island ER.
- Four seabird species nest on Hudson Rocks ER
- Four seabird species nest and one shorebird (Black Oystercatcher) on The Oak Bay/Chain Islands ER.
- Three seabird species and one shorebird (Black Oystercatcher) nest on Race Rocks ER.
- Four seabird species and one shorebird (Black Oystercatcher) nest on Rose Islets ER.
- One shorebird species (Black Oystercatcher) nests on Ten Mile Point ER.

**Figure 17: Black Oystercatcher Adult and Chick. These birds nest in the upper intertidal zone of rocky islands of the Race Rocks Ecological Reserve** (Photo by Raisa Mirza 2010)



Currently several of the species of marine birds with nesting colonies in the Southern Strait of Georgia and the Strait of Juan de Fuca are already experiencing drastic declines in numbers. The number of human-induced stress factors will only be increased as they have to cope with all the added hazards introduced by the type of increase in tanker traffic inherent in this proposal. The incremental addition of tankers increasing the

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incidence of chronic oil spills alone, without waiting for a catastrophic spill, could push the level of tolerance beyond the capability of recovery for these nesting species.

**Figure 18: Double Crested Cormorants Nesting in the Oak Bay Islands Ecological Reserve** (Photo by Marilyn Lambert, 2009)



### 3.5.2 Over-wintering Birds in Marine Ecological Reserves

The important role of the many kilometres of shoreline in the southern Gulf Islands and the Strait of Georgia that provide habitat for over-wintering is often overlooked in environmental assessments. Many of the islands along the southern portion of the Salish Sea provide valuable winter habitat for a variety of species, often in very large numbers. One example:

- At Race Rocks ER the population levels and species diversity of seabirds is highest in the winter months with 55 species recorded in the [annual Christmas Bird Counts](http://www.racerocks.ca/wp/tag/christmas-bird-count/). (<http://www.racerocks.ca/wp/tag/christmas-bird-count/>).

Since the winter months are very likely the time when an oil spill could occur, we are particularly concerned for the welfare of the thousands of overwintering seabirds in the Southern Gulf Islands and Strait of Juan de Fuca.

Research from the Exxon-Valdez oil spill can be used in this case to demonstrate the risk to our overwintering Harlequin Ducks which frequent the shores of the Ecological Reserves of the Southern part of Vancouver Island.

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**Figure 19: Harlequin Ducks Overwintering in the Race Rocks Ecological Reserve** (Photo by Ryan Murphy, 2010)



From: <http://www.allaboutbirds.org/Page.aspx?pid=1935><sup>8</sup>

*“Twenty years after the Exxon-Valdes oil spill, work on Harlequin Ducks shows not just that oil remains, but that it is still toxic and still being ingested by wildlife. Dan Esler, of Simon Fraser University in British Columbia, Canada, and a host of colleagues used molecular analysis to detect the level of the exposure. On annual visits to Prince William Sound from 2005 to 2009, Esler found the small, charming ducks before they departed the coastline for breeding territories on mountain streams. Esler caught them, and a vet on his team took a tiny sample of liver tissue.*

*In the lab, the researchers analyzed the tissue for an enzyme made by a gene called CYP1A. Many vertebrates, including birds, make this enzyme only in response to toxins contained in oil: polycyclic aromatic hydrocarbons, PCBs, and dioxins. There are few natural sources of these compounds, especially in otherwise largely unpolluted Prince William Sound, so finding the enzyme indicates that the ducks have recently ingested some toxic oil.*

*In the late 1990s, researchers used this technique to pinpoint oil exposure in fish, river otters, Harlequin Ducks, Pigeon Guillemots, and Barrow’s Goldeneyes. They discovered that oil was buried in shallow, intertidal areas where it was sheltered from weathering or decay. But bottom-dwelling or burrowing invertebrates remained in contact with the oil, and storms periodically stirred the oil back into the water.*

*“Harlequin Ducks have a whole series of strikes against them here,” Esler says. “They’re so tightly linked to intertidal zones, where the oil is, and the fact they eat invertebrates instead of vertebrates.” Birds such as mergansers live in the same areas but*

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<sup>8</sup> Esler, D., et al. 2010. Cytochrome P4501A biomarker indication of oil exposure in Harlequin Ducks up to 20 years after the Exxon Valdez oil spill. *Environmental Toxicology and Chemistry* 29:1138–1145.

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*eat fish, which can detoxify and rid themselves of oil toxins. Harlequin Ducks eat mussels, which store the toxins without processing them. And Harlequin Ducks are much smaller, so they're less resilient in Alaska's cold climate than other sea ducks.*

*In the 2010 study, Harlequin Ducks in oiled areas had up to four times as much toxin-fighting enzyme activity as ducks from clean comparison areas—a clear signal they were still being exposed to toxins on a day-to-day basis. Fortunately, the level of exposure seems not to be toxic, and although Harlequin Ducks have yet to fully recover from the oil spill (when 7 percent of the Prince William Sound population died outright), their numbers are increasing.”*

— Hugh Powell

**Figure 20: Black Oystercatchers and Several Species of Gulls Overwintering at Race Rocks Ecological Reserve** (Photo by Alex Fletcher, 2011)



### 3.5.3 Migratory Birds

Most of the island Ecological Reserves harbour a great many species of terrestrial as well as marine birds in the spring and fall migrations. The only one where up-to-date records are available is the Race Rocks ER. The location of the Race Rocks Archipelago as the first stop in the Strait of Juan de Fuca makes it ever more crucial as a rest haven for migrating birds coming north from the Olympic Peninsula in the United States and a last stop for them going south before crossing the ten-kilometre stretch of ocean.

- 35 migratory bird species have been photographed at Race Rocks ER.

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Figure 21: The Whimbrel (*Numenius phaeopus*) is One of the Migratory Species Stopping Over at Race Rocks Ecological Reserve (Photo by Raisa Mirza)



**Figure 22: Red Knots (*Calidris canutus*) Stop on Their Annual Migration Through Race Rocks Ecological Reserve** (Photo by Raisa Mirza 2010)



The Red Knot shown here is listed as a Species at Risk. It is observed as an [annual migrant through](#) the Race Rocks Ecological Reserve, and therefore other areas of the Salish Sea as well. However, even though it is a COSEWIC Species at Risk, the Red Knot, like many other shorebird species, is not represented by any of the indicator bird species in the KM-TMX assessment process. This was a concern of our Information Request #1 since we have over 25 other shorebirds, all with different feeding habits, some shoreline, some offshore and some terrestrial, which migrate through many of our Ecological Reserves. The response from KM-TMX to our concern was that modelling had already been done for wave height so they considered this an insignificant problem. Again the potential for an oil spill was discounted. KM-TMX is not willing to accept that there is a realistic possibility of a spill. There is a belief it can never happen and therefore no preparation is needed. Board of FER disagrees. We need to be ready for spill and know the best possible measures to take. Denial is unrealistic.

These birds are highly vulnerable in the event of chronic or catastrophic oil spill. Ignoring the cumulative effect of adding the amount of marine vessels predicted, warrants careful consideration and monitoring of these shorebird populations, and good science would insist on adequate and representative indicator species from the

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shorebird community, with breeding residents, overwintering residents and migratory birds more represented in the environmental assessments.

### 3.6 Fish

#### 3.6.1 Salmon and Other Fish

The five main species of Pacific salmon frequent the waters of most of our Marine Ecological Reserves. The loss to the ecosystems of these reserves with the cumulative addition of chronic oil spills and high potential of a catastrophic oil spill would be considerable and depending on the time of year, impossible to mitigate.

- ▶ Twenty-six species of fish and ten species of Ascidiaceans have been recorded with images in the Race Rocks ER.
- ▶ The Ecological Reserve at Megin River was created with the intended purpose of protecting the estuary and habitat for spawning and migration of five species of salmon.

The research paper ["Ascites, premature emergence, increased gonadal cell apoptosis, and cytochrome P4501A induction in pink salmon larvae continuously exposed to oil-contaminated gravel during development"](#) by G.D. Marty, D.Hinton et al 1997 presents a dismal picture of the fate of spawning salmon when faced with an oil spill.

*"Development of pink salmon (Oncorhynchus gorbuscha) incubating in gravel contaminated with weathered Prudhoe Bay crude oil was retarded at concentrations as low as 55.2 µg oil/g gravel. Larvae exposed to various levels of oil contamination were sampled 4 weeks before emergence, at emergence, and 13 days after emergence for histopathology (quantitative and semi-quantitative) and cytochrome P4501A (CYP1A) induction (using immunohistochemical staining). A subset of post emergent fish was not fed. Hydrocarbon analysis by gas chromatography and mass spectroscopy revealed that tissue uptake of polynuclear aromatic hydrocarbons (PAH) was mediated by oil's dissolution in water, with significant biological effects when the peak total PAH concentration in water was as low as 4.4 µg/L. Oil-related effects included induction of CYP1A, development of ascites, and increased mortality. Several oil-related changes were indicative of premature emergence. Compared with control fish, for example, exposed fish of the same age and emerging on the same day had greater amounts of yolk and hepatocellular glycogen, increased apoptosis of gonadal cells and midventral skin cells, and less food in the gastrointestinal tract. Histological features were similar within groups of larvae sampled 4 weeks before and 13 days after emergence, and oil-induced changes were not affected by feeding during the first 13 days after emergence. Increased gonadal cell apoptosis may be related to later reproductive impairment documented in field studies of pink salmon up to 4 years after the Exxon Valdez oil spill."*

It therefore is imperative that special efforts must be planned to prevent contamination reaching the estuary. Specific plans for oil boom deployment are necessary and since

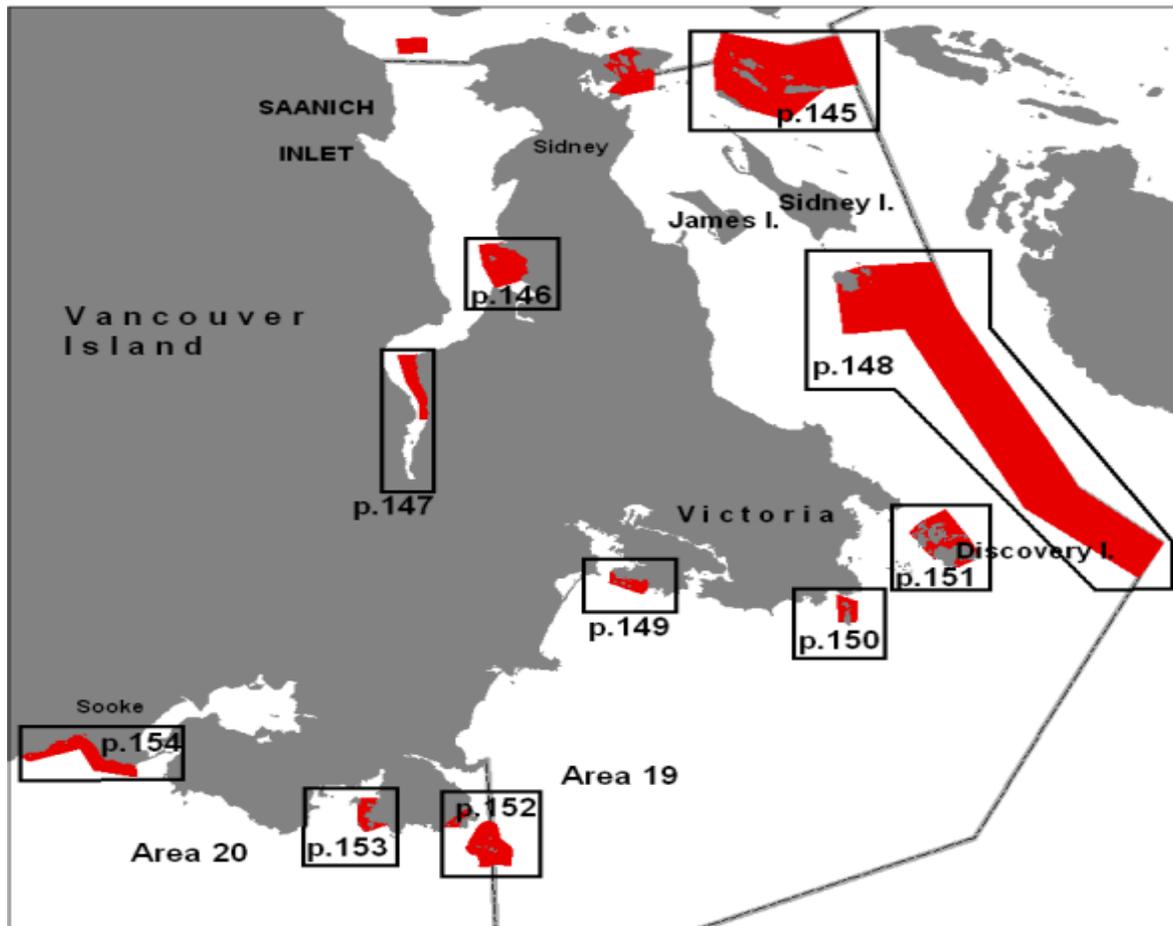
time is of the essence, there must be adequate facilities nearby where deployment of spill mitigation equipment is available.

### 3.6.2 Rockfish and Rockfish Conservation Areas

**Figure 23: Copper Rockfish (*Sebastes caurinus*), One of the Many Species of Rockfish in the Race Rocks Rockfish Conservation Area (RCA) (Photo by Ryan Murphy)**



Figure 24: Rockfish Conservation Areas 19 and 20



Several species of rockfish frequent the waters of many of our Marine Ecological Reserves. Rockfish Conservation Areas were created in many areas along our coast to attempt to recover the populations of rockfish that were once abundant. The loss to the ecosystems of these conservation areas from the cumulative addition of chronic oil spills from increased ship traffic, and the high potential of a catastrophic oil spill would be impossible to mitigate if Dilbit went to the benthic layers as predicted with wave action and sedimentation.

- Six species of Rockfish have been recorded in the Rockfish Conservation area at Race Rocks ER.
- Five species of Rockfish have been recorded in the Ballingall ER.
- Trial Islands and Oak Bay Islands reserves are also in Rockfish Conservation Areas.

### 3.6.3 Forage Fish

**Figure 25: Sand Lance that Died After Spawning on a Public Beach Next to an Ecological Reserve** (Photo by Garry Fletcher)



At the base of the marine fish, mammal and seabird energy flow are the [forage fish](#). Herring were the forage fish chosen as an indicator species in the Stantec reports. This species cannot adequately represent the habitat and distribution of some of the other forage fish such as Pacific Sand lance (*Ammodytes hexapterus*) and Surf Smelt (*Hypomesus pretiosus*). These forage fish are year-round beach spawners, not open water spawners like herring and thus would be affected in a totally different way in the event of an oil spill.

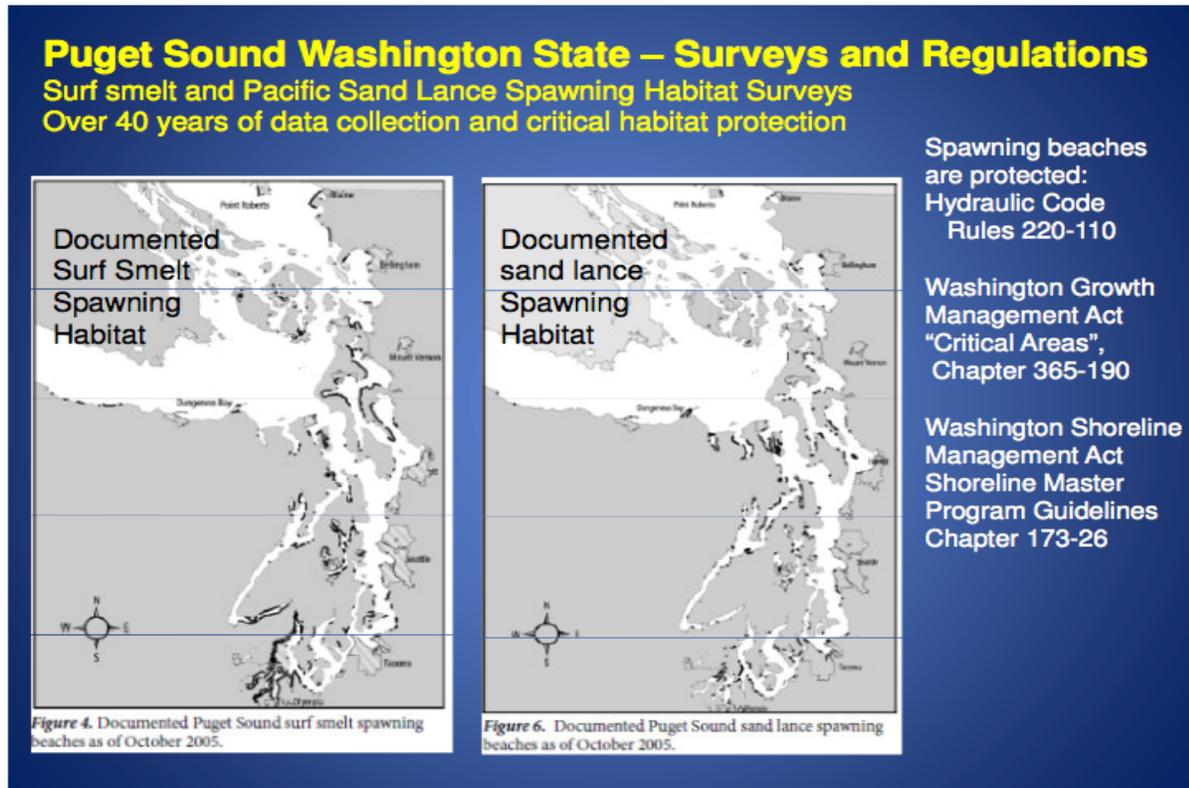
Figure 26: Spawning Sites for Forage Fish in BC



Due to the reluctance of governments to research and fund the occurrence of Pacific Sand lance (*Ammodytes hexapterus*) and Surf smelt, (*Hypomesus pretiosus*), thousands of hours of volunteer labour have been applied in the last few years to try to document the occurrence of these fish. Many of the beaches in the RSA serve as crucial habitat for the spawning of these fish. Chronic and catastrophic oil spills will destroy their habitat and more significantly, wipe out the important part of the food web for coastal seabirds, whales and other marine mammals and commercial stocks of fish and invertebrates. As a minimum level of ecological monitoring, no increase in transport of oil should ever be contemplated until there has been a full inventory of these species. Again this has not been recognized in the Stantec assessment reports.

In Washington State there is a record of over 40 years of collection of data on spawning forage fish. We cannot ignore the importance of a large gap in our knowledge base when it comes to this community of organisms.

Figure 27: Puget Sound Record of Surf Smelt and Pacific Sand Lance Spawning Habitat



### 3.7 Invertebrates and Ascidians

It is essential in any environmental impact assessment to recognize that there are many invertebrates in the waters of British Columbia which are important not only because of their use as a harvestable marine resource but ones that may be very limited in distribution, and are not considered under existing legislation of the *Species at Risk Act*.

Goose Neck barnacles (*Pollicipes polymerus*) are found in many of the rocky intertidal areas on the seashores of Ecological reserves, their populations around urban centres have been depleted by overharvesting. They would make an ideal example of an indicator species in the many areas that have been protected as ERs. In the 1988 research done on the Santa Barbara Oil spill, the damaging effect on Goose-neck barnacles was noted.

*“The gooseneck barnacle, Pollicipes polymerus, occurs at Stations A, B, C, and G on exposed rocky outcrops. Mid intertidal individuals received moderate doses of oil at Stations C and G, and oil tended to stick to their plates. As was the case with Chthamalus fissus, gooseneck barnacles were also killed, when the oil became thick enough to smother them physically. All dead individuals had a very heavy coating of oil over them, and in many instances, their cirri were encased in dried oil.”*

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**Figure 28: Goose Neck Barnacles in the Intertidal Zone** (Photo by Garry Fletcher)  
([M Foster et al, 1988](#))



In the assessment document done on contract for Kinder Morgan, invertebrates are completely ignored, (see table 4.3.1.3 of KM-TMX Assessment below) or at the minimum cast as part of “habitat.” It is clear that sub-tidal and intertidal invertebrates are difficult to monitor however, their role in marine ecosystems is crucial. Both mature and larval invertebrates contribute significantly to the food webs of the marine ecosystems. They are certain to be highly impacted by floating, suspended and sunken Dilbit in the event of an oil spill. This is why we have insisted on thorough ecological monitoring before a catastrophe happens in the Ecological Reserves. Protection of these resources is a prime goal of the system of marine Ecological Reserves. We therefore submit that a thorough baseline study of invertebrates must be done at least in the Ecological Reserves before any decision on increasing the traffic from oil transport.

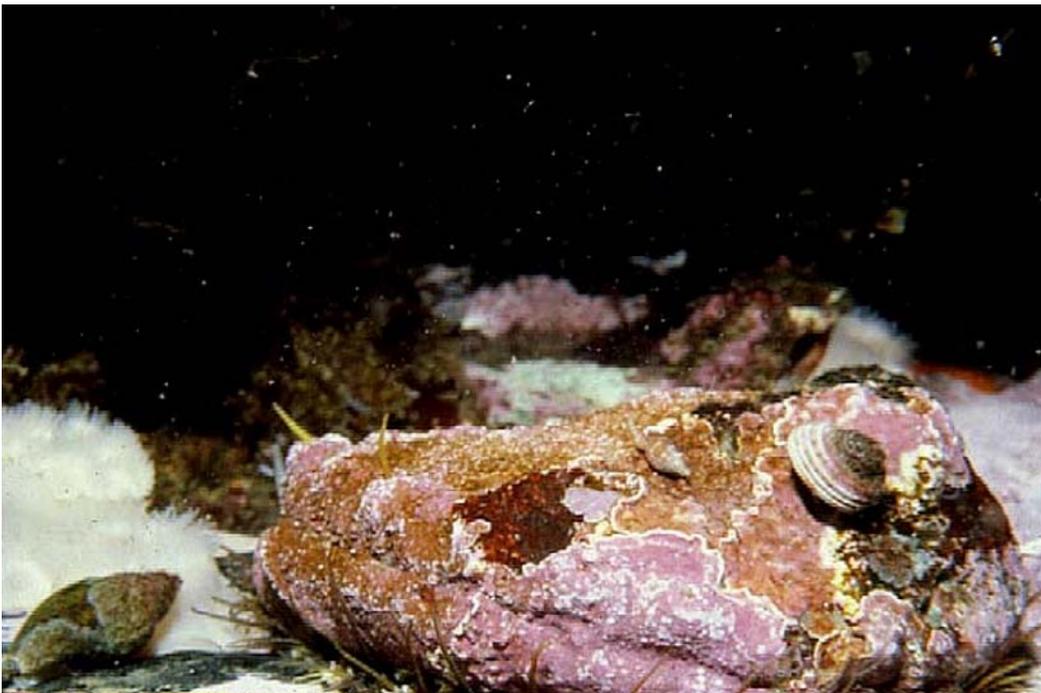
**Figure 29: The Nudibranch (*Dendrotus alba*) Feeding on the Colonial Ascidian (*Metanrocarpa taylori*)** (Photographed in the Race Rocks Ecological Reserve by Ryan Murphy, 2010)



**Figure 30: The Pink-Mouth Hydroid (*Ectopleura marina*)** (Photographed by Ryan Murphy underwater in the Race Rocks Ecological Reserve, 2010)



**Figure 31: The COSEWIC SARA Listed Northern Abalone (*Haliotis kamchatkana*) and Other Associated Invertebrates in the Race Rocks Ecological Reserve**



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Northern Abalone also have small populations in several other Ecological Reserves such as Baeria Rocks ER.

The occurrence of the COSEWIC- SARA listed Northern Abalone (*Haliotis kamchatkana*) in several reserves (Race Rocks and Ten Mile Point ER for example), means that special attention must be paid to prevention of spills and immediate remediation in these areas.

As a sample of what we have to lose in other Ecological Reserves, consider that:

- A rich association of invertebrates has been noted in the Ballingall ER.
- Invertebrates are essential to the food web of the many nesting seabirds on Cleland Island.
- One hundred and ninety-six species of marine invertebrates have been recorded with photos in the Race Rocks ER.
- Sixty-seven species of marine invertebrates have been recorded in the Satellite Channel ER.
- Fifty-five species of marine invertebrates have been recorded in the Ten Mile Point ER.
- The productivity of the oak bay islands reserve is dependent on a healthy invertebrate community in the surrounding waters.

**Table 6: TABLE 4.3.1.3 of KM-TMX Assessment criteria report, *Element Interaction with the Proposed Marine Transportation Component***

Element	Interaction with Marine Transportation	NEB Element(s) Considered
Marine Sediment and Water Quality	Yes	Water quality and quantity
Marine Air Emissions	Yes	Air emissions
Marine GHG Emissions	Yes	GHG emissions
Marine Acoustic Environment	Yes	Acoustic environment
Marine Fish and Fish Habitat	Yes	Fish and fish habitat; vegetation
Marine Mammals	Yes	Wildlife and wildlife habitat
Marine Birds	Yes	Wildlife and wildlife habitat
Marine Species at Risk	Yes	Wildlife and wildlife habitat; species at risk
TMRU	Yes	Vegetation; wildlife and wildlife habitat; traditional land and resource use

### 3.8 Invertebrates and Ascidians

The following is a quote from a KM TMX report and is reproduced as it outlines poor understanding of trophic levels and how ecosystems are structured.

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### *“3.3.6.1 Assessment Indicators and Measurement Endpoints*

*Indicators for the assessment of marine fish and fish habitat have been identified through consideration of marine fish species and habitats which occur in the Marine RSA and which could be affected by the increased Project-related marine vessel traffic. The list of candidate species and habitats was refined by focusing on those that support commercial, recreational and/or Aboriginal FSC fisheries. For the species-based indicators, marine fish and invertebrates representative of broader taxonomic groups were considered. Preference was given to species that are: 1) likely to occur seasonally or year-round in the Marine RSA; 2) sensitive to Project-related marine vessel traffic; and 3) considered to be of conservation concern. For the habitat-based indicators, all marine habitat types potentially affected by Project-related marine vessel traffic were considered. Preference was given to habitat types that could be sensitive to Project-related marine vessel traffic. The final selection of indicators took into consideration: experience gained during previous projects with similar ecological conditions and potential issues; feedback from regulatory authorities, Aboriginal communities and stakeholders; and the professional judgment of the assessment team.*

Not knowing how abundant and important the highly diverse community of invertebrates is one fault but not even considering any of them as indicator species truly shows a lack of scientific rigour of the assessment process.”

The line in the statement above: *“For the species-based indicators, marine fish and invertebrates representative of broader taxonomic groups were considered,”* it must be pointed out that this anthropogenic utility view does represent how all species contribute to ecosystem productivity and marine ecosystem integrity and productivity. By taking a narrow approach that only those species that are of immediate economic interest are worthy of protection and management is short-sighted and will lead to strategies that result in an unsustainable approach to conservation science.

In the Race Rocks Ecological Reserve, 196 species of invertebrates have been documented by images and video. According to the oil spill response times, it would take up to 72 hours to attend to a spill in this area. This response time is totally unacceptable, and inadequate to mitigate any large scale disasters in the marine Ecological Reserves.

We submit that a thorough inventory must be done on intertidal and subtidal invertebrate communities in the 19 Marine Ecological Reserves in order to be able to monitor and ensure the adequate level of restoration of habitat in the event of oil spills. There also has to be adequate plans for methods of dealing with oil in the water column and on the sea bottom as dispersants could irreparably harm sensitive ecosystems.

### 3.9 Marine Macro algal Communities

The role of Marine macro algae has also been ignored in the assessment document. As a source of primary productivity for our marine ecosystems, this is very short-sighted. Many of our intertidal habitats are covered in a highly diverse community of macro algae. These provide food and habitat including protective shelter for many invertebrate and fish species. The extensive kelp beds around many of our Ecological Reserves provide valuable habitat for fish, invertebrates, seabirds and marine mammals.

**Figure 32: Diver Under the Canopy of Bull Kelp (*Nereocystis leutkeana*) and Above the Canopy of Stalked Kelp (*Pterygophora californica*) in Shallow Water at the Race Rocks Ecological Reserve** (Photo by Jim Cribb 1979)



We submit that a thorough inventory of all macro algae communities within the Marine Ecological Reserves is essential in order to know what we stand to lose and what criteria can be used in the monitoring of restoration efforts in the event of a catastrophic oil spill as well as long term changes from the cumulative effect of increase in chronic oil pollution from the increase in tanker traffic. A survey of the *Nereocystis leutkeana* (bull kelp) distribution in the Oak Bay Islands Ecological Reserve from the aerial

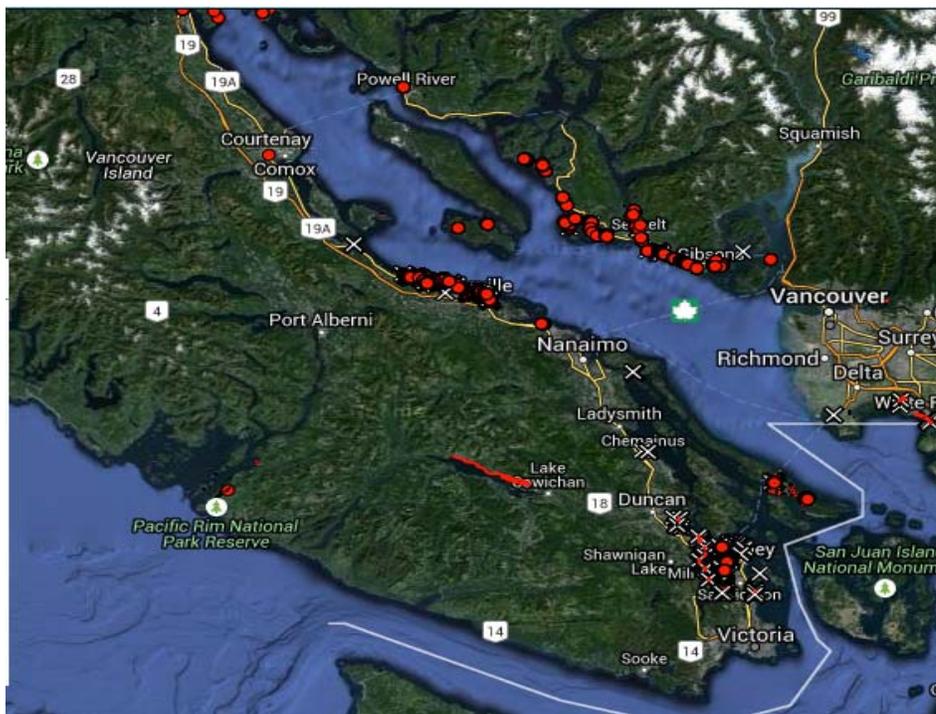
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photography provided by the CRD Natural Areas Atlas, shows that a large portion of the water surface area of 221 hectares is covered. This figure only represents the distribution as seen from the air, and does not include any of the macro algae attached to the substrate and growing completely sub-tidally. For instance, a survey of *Pterygophora californica* done by Coastal Oceans Resources in 1999 showed a large coverage in the benthic community in the Race Rocks Ecological Reserve.

- A rich association of marine algae has been noted in the Ballingall ER.
- Five species of brown algae and 23 species of red algae have been recorded at Rose Islets ER.
- Fifteen species of red algae, 17 species of brown algae and eight species of green algae have been photographed at Race Rocks ER.
- Four species of brown algae and 32 species of red algae have been recorded at Ten Mile Point ER.

### 3.10 Sea Grass Communities

Figure 33: Distribution of Sea Grass Mapping Projects to Date



The distribution of one of the most important marine habitat types for fish spawning, the eel grass communities, have been mapped in several areas of the province, but few have been done in the projected tanker route.

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*“Land use changes and developments have led to a loss of natural estuarine habitat in British Columbia. Agriculture, forestry, and dredging for commercial and residential development have all contributed to the loss. It is anticipated that the pressure to modify natural estuarine habitat for the development of commercial facilities and residential units within coastal areas will intensify in the near future. It is therefore necessary to identify, classify, quantify, and develop a scientifically defensible management strategy for estuarine habitat in order to protect and maintain these valuable areas.”*

See more at: [http://www.cmnbc.ca/atlas\\_gallery/eelgrass-bed-mapping](http://www.cmnbc.ca/atlas_gallery/eelgrass-bed-mapping)  
[http://www.cmnbc.ca/atlas\\_gallery/eelgrass-bed-mapping#sthash.ksIsfLJA.dpuf](http://www.cmnbc.ca/atlas_gallery/eelgrass-bed-mapping#sthash.ksIsfLJA.dpuf)

In addition to eel grass communities, a number of the ecological reserves with exposed rocky shores have another sea grass called surf grass (*Phyllospadix scouleri*). This grass forms a wide band at or below the zero tidal level and in mid-low tidal pools and makes up a further valuable nursery habitat for fish and invertebrates. In the research article, *The Santa Barbara Oil spill Part 2: (Foster et al. 1988). Initial Effects on Intertidal and kelp bed organisms*, *Phyllospadix* was found to be susceptible to desiccation and heat stress during low midday tides and oiling.

*“severe damage occurred in intertidal surf grass and barnacle populations as a result of the oil pollution. Potential long-term biological effects of the continuing pollution are discussed.”*

<https://mail.google.com/mail/u/0/?zx=w84o2t5utp0e#inbox/14d7c5b61cfd1b3b?projector=1>

**Figure 34: Surf Grass and Associated Community of Hydrocorals and Other Organisms Exposed at Low Tide at Race Rocks** (Photo by Garry Fletcher)



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A thorough understanding of these shallow-water communities that are very sensitive to contamination is essential. It takes funding for this research which should be a minimum requirement of environmental impact assessment. We submit that a commitment to fund and carry out a thorough inventory of this habitat must be done before committing to any increase in oil tanker traffic.

### 3.11 Rare Terrestrial Plants Affected by Sea Spray in Ecological Reserves

Several Ecological Reserves of those mentioned above border on the ocean but were mainly created as terrestrial reserves. This does not exempt them from the hazards of oil spills on the coastline. In the Trial Island Ecological Reserve, the survival of 28 species of rare plants when storms are blowing sea spray laden with toxic oil across the island is imperiled.

- Two species of rare sea-side plants are found in the Race Rocks ER within sea spray distance.
- Seven species of lichens are found in the spray zone of Race Rocks ER.
- Forty species of sea-side plants have been reported from Rose Islets ER.
- Twenty-eight species of rare plants are found in the Trial Islands ER.

**Figure 35: The Very Rare Rosy Owl-clover, (*Orthocarpus bracteosus*) Photographed in the Trial Island Ecological Reserve**



#### 4. OVERVIEW OF NEB KM-TMX APPLICATION PROCESS

The Board of Friends of Ecological Reserves (Board of FER) was pleased to have been admitted into the KM-TMX application process considering that 2,100+ applicants wanted to participate and only 400 were accepted. The US Environmental Protection Agency (US EPA) asked for an extension as they learned three days before the deadline and knew they could not process the application and meet internal US government protocols at such short notice. We believe the US EPA should have been granted their requested extension; instead it was denied.<sup>9</sup>

The US EPA exclusion, based on a procedural deadline, in our opinion, was a serious shortcoming as this project relates to oil tankers sailing through a shared international transport route between the USA and Canadian waters. The US EPA has considerable knowledge about management of oil tankers and marine ecosystems.<sup>10</sup> The US EPA has a response and restoration department, so Canadians and the NEB could have learned a great deal through their inclusion in this process.<sup>11</sup> Since the Canadian government departments such as Transport Canada, Department of Fisheries and Oceans, Canadian Coast Guard and Environment Canada all had input at the national level, we believe the NEB KM-TMX process needed US Federal agency engagement to best integrate information and conditions in order to move the process forward. The list of participants shows there were no US Federal agencies informing this process and the single state agency informing the process was the Washington State Department of Ecology.<sup>12</sup>

A significant lesson that we learned was that there is a great deal of information posted during this NEB KM-TMX process and keeping up with the postings from NEB, KM-TMX and other intervenors is very time consuming. The volume of documents filed and made available through the KM-TMX process has made it impossible to delve into as much detailed reading as we would have liked or needed, to be remain fully informed. Fortunately by taking a marine focus, the Board of FER was able to narrow the scope of our research. We took this focus because the risk to the marine Ecological Reserves

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<sup>9</sup> Ruling #2. [https://docs.neb-one.gc.ca/LL-ENG/llisapi.dll/fetch/2000/90464/90552/548311/956726/2392873/2394379/2419423/National\\_Energy\\_Board\\_-\\_Ruling\\_No.\\_2\\_-\\_United\\_States\\_Environmental\\_Protection\\_Agency\\_Request\\_for\\_Deadline\\_Extension\\_regarding\\_Application\\_to\\_Participate\\_-\\_Trans\\_Mountain\\_Expansion\\_Project\\_-\\_A3U7E2.pdf?nodeid=2419012&vernum=-2](https://docs.neb-one.gc.ca/LL-ENG/llisapi.dll/fetch/2000/90464/90552/548311/956726/2392873/2394379/2419423/National_Energy_Board_-_Ruling_No._2_-_United_States_Environmental_Protection_Agency_Request_for_Deadline_Extension_regarding_Application_to_Participate_-_Trans_Mountain_Expansion_Project_-_A3U7E2.pdf?nodeid=2419012&vernum=-2)

<sup>10</sup> US EPA emergency response to Exxon Valdez <http://www2.epa.gov/emergency-response/exxon-valdez-spill-profile>

<sup>11</sup> US EPA Spill Response and Restoration. <http://response.restoration.noaa.gov/oil-and-chemical-spills/significant-incidents/exxon-valdez-oil-spill>

<sup>12</sup> [A14-3 - Appendix I - List of Participants - Part A - Intervenors - Revised 16 April 2015 - A3V6I6](#)

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(ERs) is very high and we also feel that the management of the marine system is the weakest and least well-defined link in managing risks in this project. However, once we became part of the process, all posts needed to be read and understood, simply to find out whether issues raised pertained to areas of interest held by the Board of FER with regard to marine ecosystems. Keeping up was very time consuming for volunteers. Given time constraints, our first task was to have a strategic planning session to define the best outcome for Ecological Reserves and to get support from the NEB Participant Funding Program (PFP) in order to be able to adequately participate. We found as volunteers that we could not keep up with the volume of information and deliver useful, quality information back into the process. As a result, in May 2014, the Board of FER applied to the PFP. Meanwhile, we relied on volunteer time through 2014 and into January of 2105.

During the summer of 2014, FER learned other NGOs and First Nations had received funding but by December, 2014 (eight months after applying), we had not heard whether the PFP had made a decision in our case. This long delay provoked an internal discussion at the Board of FER on the benefits of continuing to participate and the need to withdraw due to lack of resources. We did make requests on the status of our application over the eight-month waiting period. We were informed in late January (nine months after applying for support), that FER could receive up to 66 per cent of what was originally applied for. We were pleased to have received reduced funding, even after a nine month waiting period, so we revised our work plan and resubmitted deliverables with a reduced scope.

The PFP accepted our revised work plan and we engaged at an appropriate level. The Friends of Ecological Reserves 2014 newsletter (called "The LOG") detailed some of the FER involvement in the process up to and including IR #1. The article entitled "*FER gains Intervenor status for New Review of Kinder Morgan's Proposed Pipeline Expansion*"<sup>13</sup> provides further background to the Board of FER involvement. Since 2014, the Board of Friends of Ecological Reserves has submitted two Information Requests (IRs) to KM-TMX for clarification of information.

IR #1 was made in May of 2014 and IR #2 in January of 2015. These information requests and the KM-TMX responses, as well as our assessments on the adequacy of the responses, our motions to compel better answers and the KM-TMX final conclusion to our IRs, are included in Appendix B (IR #1) and Appendix C (IR #2) of this report. The tables in these appendices show the entire communications between FER and KM-TMX. We felt it was important to file motions to compel KM-TMX to provide full and adequate responses to our initial information requests. We did not do that without

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<sup>13</sup> <http://ecoreserves.bc.ca/2014/07/15/fer-gains-intervenor-status-for-new-review-of-kinder-morgans-proposed-pipeline-expansion-compiled-by-louise-beinhauer/>

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considerable thought and a careful review of the NEB direction to guide intervenors on whether to file a motion. It is repeated here:

*“When considering such a motion, the NEB looks at the relevance of the information sought, its significance and the reasonableness of the request. It seeks to balance these factors to ensure that the purposes of the Information Request process are satisfied, while ensuring that an Intervenor does not engage in a “fishing expedition” that could unfairly burden the Applicant.”*

We were not on a “fishing expedition” but in need of greater clarity and transparency from KM-TMX to understand the marine component of this project and receive clarity on KM-TMX’s commitment towards long-term monitoring, habitat restoration and spill preparedness over the life of the project.

We came to the conclusion in IR #1 that none of the 33 questions we asked had been fully and completely answered. This need to file a motion to compel more information was not unique to the Board of FER and does not reflect well on KM-TMX. When requesting information in the form of a motion, we did provide a rationale to KM-TMX as to why we thought KM-TMX needed to provide follow-up information. Our motion and rationale was not compelling to KM-TMX as little new information resulted. We did get a standard answer for all the questions from KM-TMX which we repeat here.

*“The requested information has been provided and Trans Mountain’s response is full and adequate. The response provides the Board with all necessary information pertaining to this matter. There is no further response required and supplementing the original response will not serve any purpose. Trans Mountain notes that if the Intervenor disagrees with the information contained in the response, it may contest the information through evidence or final argument.”*

During the process, we also noted that a high profile intervenor, Marc Eliesen submitted a letter and rationale for withdrawing from the process. This received considerable press.<sup>14</sup> Eliesen cited process flaws such as the absence of cross-examination and NEB panel bias. We too wondered if the KM-TMX was engaged to a minimal level simply to keep the process going with the aim to provide as little information as needed and “run the clock down” to the end of the process since the procedural directions from NEB set hard deadlines. The Board of FER decided, after discussion, that it was better to follow the NEB process and meet the deadlines. We agree with Marc Eliesen on his reasons for leaving but we also noted that there was not a big exodus by other intervenors from the NEB process and we did not have the stature or profile of Marc to make a statement on a flawed process. Mr. Eliesen’s

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<sup>14</sup> <http://planetsave.com/2014/11/12/former-bc-hydro-ceo-calls-pipeline-hearings-public-deception/>

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withdrawal did, however, cause the Board of FER to step back and reassess the time and effort we contributed as unpaid volunteers and whether or not we were legitimizing a flawed process. When discussing whether to withdraw, the Board of FER noted that our only alternative once outside the process was to make concerns known through public media press releases. As we would be cut off from NEB information and the information to make such concerns known, we reluctantly voted to stay in the process.

Our IR #2 was submitted in January of 2015 with 32 requests for additional information or clarification. This was the second and final opportunity to seek information directly from the KM-TMX. We had, since our first IR in May of 2014, learned that there was new relevant information from agencies such as new Killer whale research information and draft species recovery plans. (See Chapter 3, "A Case for Whales," outlining some of the newest information from government scientists.) This information was not available and had not informed the KM-TMX consultants when KM-TMX filed their Marine reports in support of the application. IR #2 made it possible to make known more current information and test whether more recent information would or could influence the process. We did not, however, get any new commitment from KM-TMX in light of new and important information.

The Board of FER received a better response from KM-TMX to our IR #2 and we were satisfied with information KM-TMX provided on 12 of the 31 requests. The KM-TMX response to our motion linked to IR #2 was puzzling, however, as even with 12 requests that we had clearly indicated met the standard of an adequate response, the Board of FER got a standard "boiler plate" response from KM-TMX which is repeated here. This standard response was unnecessarily applied to 28 out of the 31 questions filed with the motion. It is repeated here. It only need to have been applied to 19 of our requests.

*"In accordance with Board Ruling No. 33 (Filing ID A63066), Trans Mountain's response provided sufficient information and detail for the Board in its consideration of the application and no further response is required."*

**or**

*In accordance with Board Ruling No. 33 (Filing ID A63066), the request is for new information. Seeking more specific information or more details in the motion to compel full and adequate responses is essentially a request for new information and is not permitted under Ruling No. 33. Rather than seeking to compel a further answer, the Intervenor may file its own evidence in response or provide its views during final argument."*

Since we were satisfied with 12 of KM-TMX responses, we were uncertain why we needed to be informed that no further information was required as we had already agreed with the KM-TMX response. We wondered if anyone was reading and taking in

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the dialogue or simply cutting and pasting the same standard response. This was disappointing and calls into question the engagement level of KM-TMX.

We did review the TERMPOL report from the agencies of the Government of Canada which was submitted in late December, 2014. It was not possible to find time to submit IRs specific to TERMPOL to KM-TMX (we had not heard if we had PFP support to participate and that was an influencing factor). We are thankful, however, to intervenors who did find the time to submit questions, but share their frustrations with regard to the inadequacy of responses and their need to also file motions to attempt to compel full and adequate responses, as well as their need to assess the follow-up responses to their motions. Truly we wanted to ask questions of Federal agencies and not what KM-TMX may do in response to Federal Agency reports. This goes to the heart of what is a world class standard and that is set in governments standards and companies comply. There is accountability when there is adequate enforcement and consequences. Some of these pieces are missing and we had not chance to ask agencies on their role and future intent.

We hope that the NEB will provide to all intervenors and to KM-TMX a summary showing the total number of IRs made to KM-TMX and the percentage of responses where intervenors had their information requests answered and the total number of unresolved information requests where the intervenors disagreed with the responses, and KM-TMX self-assesses on their adequacy of information.

Since the Board of FER did not engage with the requests to KM-TMX specific to TERMPOL, we hoped that we dealt adequately with some of the issues in IR #2 (which we had prepared in January even without knowing whether we had PFP support). We appreciate the need in this process for KM-TMX, NEB and intervenors to call a halt to the introduction of new information and the need to corral the best, most recent data available on which to make a determination on whether to issue a permit. Based on best available information then the NEB can issue a permit knowing, what conditions should be added to it.

We have been concerned that KM-TMX has relied significantly on out-of-date information and not engaged on how newer and better information will influence this project when it is available. We have included our IRs with this report, and for the record and for the benefit of KM-TMX, more recent and better information, so that KM-TMX would be aware of shifting knowledge. See the example of Killer Whale science which has evolved significantly and was appended to our IR #2. The willingness of KM-TMX to rely, in their application, on older and significantly out-dated information is of concern.

This reliance on older information by KM-TMX as “good enough,” re-enforces our belief that KM-TMX sees no role for itself in the longer-term and has little interest in

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learning how their practices can and should be amended to mitigate impacts. Needed is a process to continue to add better up-to-date knowledge and information on environmental values and environmental impacts to amend and improve tanker traffic management, spill recovery and restoration/mitigation understanding.

Over the course of the project, an approval sets the stage for a 30 year tanker export period possibly beyond the year 2046 (if approved in 2016). We want to make sure that during this period, learning and adapting operating procedures to minimize impacts to environmental resources is an on-going process and includes knowledge from organization like the FER so that continuation of our input is supported and used to shape incremental improvements in practices.

We have learned that KM-TMX is not interested in participating in acquiring knowledge in the marine environment nor being involved in incremental improvements to tanker traffic and risk reduction strategies. KM-TMX has stated, in their answers to IRs, that others such as WCMR Corporation (a subsidiary of KM that is financed by tanker owners insurance), the Coast Guard and Environment Canada will have sole responsibility once oil is in a tanker. KM-TMX sees itself as having no responsibility beyond the Westridge Terminal. The Board of FER disagrees with this view of no responsibility and no involvement in marine transport, and hopes the NEB also supports the need for long-term KM-TMX involvement and financial support toward environmental research and monitoring over the life of their project. We also trust that the NEB supports the need for incremental improvements in marine transportation safety as part of the KM oil export business and that Kinder Morgan must be given long-term responsibility to continually make incremental improvements.

At the end of the two rounds of IRs, the Board of FER continues to contest issues with KM-TMX and now rely on our final report to influence NEB. We have not re-iterated our rationale and logic as provided in information requests; instead we have used some of the in the text of this report IR. We encourage a brief review of Appendices B and C to better understand the grounds of the conditions proposed in Chapter 5.

We think that without such conditions, it will not be possible for the Government of Canada, the Province of BC, First Nations, local municipalities, and NGOs such as FER to engage and work with the proponent over the life of the project. We see real benefit and need for this type of dialogue transparent accountability and the way to form partnerships . There is a need for monitoring to provide best available information and establish a formal link in order in future to amend plans and operating procedures as needed safeguard environmental values and create a learning process that addresses the elements in the *Oceans Act*. This type of involvement and leadership from KM-TMX has been absent.

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Based on our IR and general level of understanding gained from participating in the process, the Board of FER has concluded that KM-TMX has not adequately demonstrated how they will address the following:

Issue 4: cumulative environmental effects that are likely to result from the project;  
Issue #5: potential environmental and socio-economic effects of marine shipping activities including the potential effects of accidents or malfunctions that may occur;  
Issue 11: contingency planning for spills, accidents or malfunctions, during operation of the project.

Based on what has been provided, KM-TMX is not ready and also possibly more importantly, not willing to take sufficient responsibility and adequately prepare, or proactively support, baseline environmental monitoring, habitat restoration and mitigation planning; nor has KM-TMX been able to demonstrate preparedness and operating procedures commensurate with a risk of a spill taking into account marine environmental values. If KM-TMX will not willingly become involved in management of marine ecosystems, it should be denied a permit or compelled by the NEB to engage through permit conditions.

### 4.1 Broad Implications of the NEB Process

We note that the National Energy Board is seeking input on a number of issues. The following sections outline some of the broader issues that have raised concern for the Board of FER. Perhaps these will help in this broader public review.

The Board of FER believes that the NEB terms of reference (TOR) were set too narrowly. We acknowledge that the NEB is provided TOR and must comply with these. This disclaimer is not aimed at the NEB, but with frustration that the process has been restricted from addressing the larger issues that a project of this magnitude is subjected to. Canada lacks a National Energy Strategy to address oil exports verses building Canadian oil refining capacity, review of taxation and subsidies across the energy section and non-carbon energy alternatives more suited to the 21<sup>st</sup> century challenges. We hope that private, for profit proposals such as the KM-TMX will, in future, be cast within a broader National Energy Policy which is inclusive of non-carbon sustainable energy options and includes measures on how to transition to these, should that be beneficial for the National Interest.

Within the current NEB process, there remains a lack of clarity on the KM corporate entities and the corporate restructuring that has taken place over the life of the project. The questions that have been raised in this process on whether KM has paid sufficient taxes in Canada have not been answered. Whether KM has or will pay sufficient taxes to offset the demands on Canadian-supported infra-structure that enable their private enterprise remain unclear. The NEB appears to have avoided such fundamental

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questions and these are beyond the expertise of the Board of FER, but they are not beyond our interest as we are Canadians and support infrastructure such as the Canadian Coast Guard, Environment Canada, Department of Fisheries and Oceans and provincial infra-structures such as BC Ministry of Environment Provincial Emergency Response programs through our taxes. The extent to which KM has been exempted has not been adequately addressed, yet appears to be within the TOR. It is unclear if there has been sufficient diligence in light of tax evasion and restructuring of KM so that the extent to which the Canadian KM operations are sheltered and the extent to which KM has deliberately reduced corporate liability in Canada in the event of a Canadian oil spill. Intervenor Robyn Allen raised many concerns within the process that were dismissed by NEB, but appeared to have substance and remain unaddressed. We note she has withdrawn (May 19<sup>th</sup>) and her rationale for doing so causes us concern on whether our involvement and recommendations will have any influence on the NEB outcome and shape the TMX project.

Questions were raised that this NEB process is a seriously flawed process as there is no opportunity for intervenors to cross examine the proponent. This level of imbalance caused excellent intervenors like Marc Eliesen to withdraw fairly early in the process. There is also no social license from most of the impacted communities in British Columbia such as Victoria, Vancouver and Burnaby. For example the City of Victoria conducted its own public forum specific to the KM-TMX project and found a 90 per cent disapproval rating.

It remains unclear, however, why some of the First Nations, Ditidaht, Scianew (Beecher Bay), Penelakut and Esquimalt FN sent letters part way through the process stating that they had no objections to the KM TMX project. We trust FN along the tanker route will participate and contribute their Traditional Knowledge in the process for spill preparedness planning. In the permit conditions we recommend, many are patterned after the Northern Gateway conditions and are inclusive of FNs.

Within this process there is also no opportunity for intervenors to ask questions of Canadian government agencies which have the legal responsibility for oil response and environmental monitoring. The authors of the (TERMPOL) are above questioning and intervenors could only direct questions to KM about TERMPOL. It appears that the government agencies are far from being well -coordinated with regard to environmental and emergency monitoring of marine systems. We are hopeful that the recent spill in Vancouver's English Bay and the response shows how badly the national government agencies are prepared, even for a relatively minor spill. A major shift will be needed in federal agencies and we sincerely hope that the NEB can be the catalyst moving west coast spill preparedness to a significantly improved condition.

We know that the NEB panel did not set the terms of reference for the scope of the review. The Board of FER chose to participate in a process even though it was restricted

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in scope. We have a narrow interest in Ecological Reserves and only through participation could we hope to influence the outcome. ERs do not exist in isolation of the larger ecosystems and management systems, so their management and contribution needs to be integrated and complementary to other monitoring initiatives and programs. We have proposed such a larger framework into which ERs can be accommodated.

We trust that in the future that there will be a national energy strategy with clear policies on how to meet carbon emissions within set time limits as are needed to mitigate unfettered climate change. We trust that in the future the NEB will include alternate energy investments to counter subsidies to oil energy as being in the national interest. We hope in the short term for transparency and multi-agency cooperation in environmental monitoring and emergency oil spill preparedness.

If this project is approved, the Board of FER sees that the best possible outcome will be to have permit conditions that shift some of the responsibility for costs directly to the private for profit companies and their shareholders who, without this shift, will have no obligation to manage the environmental impacts brought on by their investments. When environmental risks and impacts are separated from corporate responsibility, that responsibility is given to the people of BC and Canada. It is necessary, in the public interest, to ensure the risk bringer bears their fair share of the responsibility as part of their investment, and not at the expense of others. In our participation in this process, we believe the NEB has shown a bias towards such private interests as KM and their shareholders against the interests of Canadians who will, in essence, have to take the risks and absorb the costs in deferrant to KM's private interests. We trust the NEB will achieve a fairer balance and we will wait to the end of the process to evaluate that.

Finally, on private investments and shareholder interest, the Board of FER is not opposed to private initiative or investment. We have, however, found KM-TMX and their corporate culture unworthy of trust, as they have expressed little goodwill towards us during the IRs. We note a real contrast when we reviewed the voluntary obligations put forward by Enbridge during the Northern Gateway Process and an absence of these from KM-TMX. There is a need to shift responsibility for environmental management to KM-TMX.

Board of FER seeks from the NEB support for the establishment of an Endowment Fund at arms' length from KM-TMX to provide funds to offset the additional workload of KM-TMX's projects, rather than simply assuming that tax-payer supported institutions such as the governments of Canada and BC, and NGOs such as the FER who care for the environment, will pick up the environmental management costs. We believe that KM-TMX, with direction from the NEB, can become a corporation that is engaged with the environment management and will pay its way commensurate with the risk of its projects. Since KM-TMX appears to have no interest in BC ecosystems and no

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commitment to a process for incremental improvement of environmental management, nor an interest in multi-stakeholder inclusion and shared cooperative decision making, so we see that an arms' length and independent monitoring body will be needed.

Lastly, British Columbians live in ecosystems that most of the KM shareholders have long since lost, so there is a lack of comprehension of the benefits and values that these relatively intact ecosystems provide to British Columbians. We do not accept that our future prosperity on the west coast is dependent on economic agreements that result in the type of degraded and impoverished natural environments which dominate most of North America.

## 5. RECOMMENDED PERMIT CONDITIONS FOR KM-TMX PROJECT

Many of the permit conditions recommended for KM-TMX by the Board of FER are based on conditions applied to the Northern Gateway Project when approved on June 17, 2014. The 209 Enbridge permit conditions are listed in Appendix 1 on the NEB website.<sup>15</sup>

### 5.1 Endowment Fund to Support Long Term Marine Environmental Research and Monitoring

#### 5.1.1 Condition 1. Establish a Marine Environmental Research and Monitoring Endowment Fund

**Table 7: Recommended Permit Condition 1. Marine Environmental Research and Monitoring Endowment Fund**

KM-TMX must file with the NEB at least 1 year prior to commencing operations documents that confirm the placement of Funds of at least \$450,000,000 (four hundred and fifty million dollars) are in place for a Marine Research and Environmental Monitoring Endowment Fund (MREMEF). This endowment fund will support independent science-based information to meet conditions 2 through 12 and over time provide 9 million annually.

This Endowment Fund will be a permanent and directed to conduct, maintain and extend monitoring, research and shore zone inventory information for as long as oil is being transported in the Salish Sea and Strait of Juan de Fuca.

KM-TMX must file with NEB at least 2 years prior to commencing operations the Marine Research and Endowment Fund documents that confirm the arrangements are in place to build this fund and steering committee members are chosen to representing the interests of:

- 1) FN
- 2) KM TMX,
- 3) DFO and Environment Canada,
- 4) BC Environment,
- 5) State of Washington
- 6) Environmental Non-Government Organizations (FER and Pacific Salmon Foundation),
- 7) Three additional people appointed by the Board

##### 5.1.1.1 Rational

Condition 1 ensures that long term funding will be in place over the duration of KM-TMX project to address unresolved issues identified by NEB. KM-TMX provided no solution on how to gather credible information to address information on Issues 4, 5

<sup>15</sup> Enbridge Northern Gateway Project Joint Review Panel Appendices. <http://gatewaypanel.review-examen.gc.ca/clf-nsi/dcmnt/rcmndtnsrprt/rcmndtnsrprtvlm2ppndx-eng.html>

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and 11 and how to make incremental science-based improvements over life of the KM TMX project. This condition will enable that.

Not only were these issues not adequately addressed in the KM-TMX Environmental Assessment reports but these reports are not based on best available and current knowledge. The Board of FER provided more up-to-date information to KM TMX during IR 1 and IR 2 but this resulted in no shift in commitments or acknowledgement of how better information would influence practices in marine environments. KM-TMX wants NEB to accept that they have adequately addressed environmental impacts based on limited and dated information and a one-time review. KM-TMX wants no involvement over the next 30+ years and is content to dis-engage from monitoring and research if permitted to do so and focus on their oil export business solely. This conclusion is based response by KM-TMX to IR#1- 22. The Board of FER asked:

*“Do you plan to support financially the on-going costs of marine ecological monitoring in ERs and other contiguous sensitive areas?”*

And KM TMX responded:

*“Trans Mountain is responsible for ensuring the safety of the terminal operations but does not own or operate the vessels calling at the Westridge Marine Terminal and therefore has no plans to fund on-going monitoring in marine ecological reserves along the existing shipping route.”*

Chapter 3 of this report provides an ER specific summary of what knowledge exists for each reserve and identified knowledge gaps. This type of information is needed to address pre- and post-oil spill understanding and provide information to clarify how to deal with information needs raised in issue # 4, #5 and #11 (see Table 1 for full issue statements).

- *“on potential cumulative environmental effects including the potential effects of accidents or malfunctions potential;*
- *potential environmental and socio-economic effects of marine shipping activities including the potential effects of accidents or malfunctions;*
- *contingency planning for (an oil spill).*

The Board of FER is content with KM-TMX being relegated to participant rather than a lead role in marine environmental management. We base this on KM-TMX lack of long term interest the environment and with observation that KM-TMX's interest is restricted to getting in the short-term approval for their project with no long term marine related obligations. This indicates KM-TMX will not do an adequate job if left in charge in future of matters relating to environmental management. KM-TMX cannot simply be permitted to step away and leave for others to address the complex issues

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identified and unresolved in issues posed by NEB 4, 5 and 11. KM TMX must be made to provide funding and support infra-structure and participate with other agencies and groups more motivated to address issues of how best to manage environmental values in light of such risk.

The Board of FER also maintains that there is a serious flaw in the NEB process if approval for 30+ year projects is based on information provided only at the start of the project. Such logic wrongly assumes it is possible to address cumulative impacts and best practices needed for the management of environmental values solely based on limited information and understanding of how to do that at the start of a long term project. It also assumes operational procedures and restoration plans will be credible if developed on current knowledge at a point in time at the start of a project and remain robust three decades hence. To make this point more clearly is there anyone in NEB who today believes there has been no new knowledge and advancements made on environmental management since in 1985 (30 years ago)? We hope not. There really is a need for on-going investment to do the research, monitoring and up-date plans and shore zone inventories through incremental improvements practices as understanding increases throughout the life of the KM-TMX project.

The Board of FER also sees that extension of credible information is needed to build public confidence. An active focused on-going independent research program structured to learn how best to effectively manage complex problems of cumulative impacts to marine ecosystems and their recovery and how to make incremental improvements seems to be reasonable conditions to apply to KM-TMX who bring the risk to BC and Washington waters.

We are encouraged that Enbridge showed leadership and recognized and proposed a need for on-going commitments and financial support (corporate obligations) to constructively learn how to improvement marine environmental management. We are pleased that the NEB made binding obligations for Enbridge through permit conditions in favour or enhanced environmental management and accumulation of environmental information gained through research and monitoring. However on closer scrutiny the Enbridge research conditions end within a few years and there is no obligation to extend research and learning over the duration of their project. This is puzzling as it implies that within a few years there is no need acquire additional knowledge on which to base incremental improvements and that within a few years we will know all there know on how best to mitigate project impacts. We cannot see an end to monitoring and research programs with sunset provisions that will end in less than five years. Hence we propose something more lasting as appropriate.

**5.1.1.2 Endowment Board and Reporting Structure**

When considering how to structure an arms-length and credible marine research and monitoring program that encourages cross government, industry and stakeholder holder cooperation we are encouraged by the example of the Habitat Conservation Trust Fund (HCTF).<sup>16</sup> HCTF is supported by a surcharge on hunting and fishing licensees. HCTF focuses on projects that maintain and enhance fish and wildlife habitats, improve fish and wildlife management and support recreational and conservation opportunities. It is managed by a stakeholder board with representation from government, NGO, industry and others knowledgeable in conservation science. The HCTF board is comprised of:

- two people appointed from the Ministry of Environment,
- two people appointed from the BC Wildlife Federation,
- one person from the Guide Outfitters Association of BC,
- One person from the Trappers Association, and
- Four additional people appointed by the Board

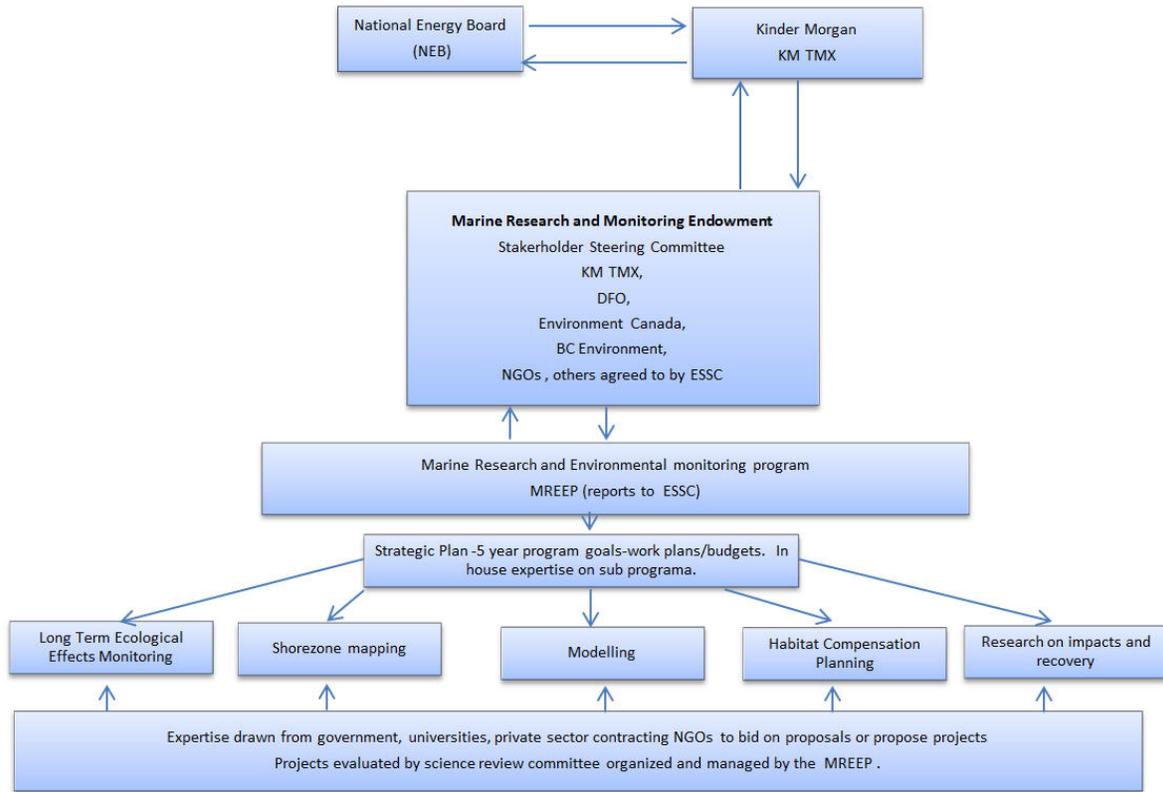
HCTF staff evaluates projects and recommend those that best address the strategic goals of the organization to their board for approval. HCTF is arms-length but complementary to government management agency for fish and wildlife and accountable to the stakeholders. The HCTF budget is independent of government and solely supported by hunting and fishing licenses.

Figure 36 outlines a board of Trustees for the Endowment Fund for research and monitoring.

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<sup>16</sup> <http://www.hctf.ca/>

Figure 36: Endowment Reporting and Multi Stakeholder Board.



A Board of stakeholders and agencies representing the following interests.

- First Nations,
- DFO
- Environment Canada,
- BC government,
- State of Washington,
- KM-TMX,
- ENGOs (FER and Pacific Salmon Foundation),
- Four representative groups/individuals as appointed by the Board.

### 5.1.1.3 Endowment Fund Size

The civil settlement that followed the Exxon Valdez Oil Spill was for \$US900 million. This was to oversee restoration of the injured ecosystems and to manage the funds for which the Exxon Valdez Trustee Council was created in order to have oversight and to make decisions on funding and restoration. After 25 years this council spends approximately \$8 million annually on projects related to the understanding and reporting on recovery in Prince William Sound.<sup>17</sup> The 2015 Annual Funding Overview

<sup>17</sup> Exxon ValdezSpill Trustee Council. <http://www.evostc.state.ak.us/>

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lists projects such as; Pigeon Guillemot Restoration, Herring and Validation of Acoustic Surveys, Long Term Monitoring (LTM Program) – Seabird Abundance in Fall & Winter etc. The Board of FER sees the need for a governance structure established in a pre-spill environment. Need for baselines study and pre-spill activities are provided in the rational with Condition 2.

The Endowment Fund proposed is for \$450,000,000. This is needed to provide stable secure funding and assumes a two per cent return can be maintained in perpetuity to provide an annual Research and Monitoring Program budget of nine million dollars. Table 8 shows that by using a one per cent environmental fee on KM-TMX oil exports , this Endowment can be accrued in six to eight years and thereafter be self-sufficient.

In IR#2 -5 the Board of asked what the export volume from this project would be. (See Appendix C for full dialogue). The more oil that is exported and the greater the tanker traffic, the greater the risk to marine ecosystems and more would be needed in an Endowment.

KM TMX stated in response to IR#2-5.

*“Please note that the design capacity of future Westridge Marine Terminal is 630,000 bbls/day, not 890,000 bbls/day as noted (in the Board of FER) preamble.”*

However this contrasts with earlier KM-TMX statements to NEB in the Application for Pipeline Facilities Certificate for the Trans Mountain Expansion Project, May 23, 2013 which state:

*“In response to growing market demand and customer contractual commitments, Trans Mountain proposes to expand the existing Trans Mountain Pipeline System by 93,800 m3/d (590,000 bbl./d) from 47,690 m3/d (300,000 bbl./d) to 141,500 m3/d (890,000 bbl./d).”*

The Board of FER is unsure of why there are two different production figures but suggest that a per-barrel environmental fee of one per cent be applied to all oil exports from Westridge. Table 8 shows the time needed to accrue an Endowment based on a one per cent per barrel environment fee.

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**Table 8: Time Estimated to Accrue an Environmental Endowment Fund on a 1% per Barrel Environmental Fee**

<b>Daily Capacity</b>	<b>Daily 1% environmental fee \$0.25 / bbl</b>	<b>Annual accumulated environmental fee \$0.25 / bbl</b>	<b>Years to build the Endowment To 450 million</b>
630,000/day	\$157,500	\$57.5 million	7.8
890,000/day	\$222,500	\$80.1 million	5.7

An Endowment Fund is needed so that monitoring and research have a sufficiently certain funding base that can be maintained for over a prolonged period. Several of the conditions outlined by the Board of FER go beyond what the Exxon Valdez Trustee Council show in their Annual Funding Overview 2015. The Board of FER for example includes a Habitat Compensation Plan and up-dating of shore zone inventory and maintaining shore zone inventory in the public realm. The proposal for a nine million dollar annual program is in fact modest. What is important however is a pre-spill fund for work in a pre-spill period. Once there are spill insurance claims and response organizations are already in place.

After the Exxon Valdez there was a great deal of acrimony during the post spill environment as detailed by Hunt 2009 and a distinct focus on litigation.<sup>18</sup> From this example the Board of FER understands that working on science to support environmental baselines and understand spill recovery is prudent in the pre-spill period. The pre-spill period is the time to build baselines and understand recovery and habitat compensation options. The Alaskan programs were borne out of legal settlements and not as well conceived as would have been possible had there been work done in a pre-spill environment. This is an important lesson for BC and the NEB has an opportunity to learn from the Exxon Valdez experience. The Exxon Valdez Trustee Council notes that:

*“the [Long-Term Monitoring Program, also known as GulfWatch Alaska](#) are administrated under five-year contracts, which include annual Council and Public Advisory Committee meetings to review the past-year’s results and future year’s requested funding. The current Council contemplates the Programs to be twenty-years in length, concluding in 2032.”*

In other industries there are surcharges of between two per cent and ten per cent are being applied for example to as gas sales and paint and bottle recycling to cover and manage impacts and support environmental management responsibilities. An

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<sup>18</sup> Joe Hunt 2009. "[Mission Without a Map,](#)" rev. 2009, by Joe Hunt (spill history & restoration perspective).

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Endowment can be built through a one per cent environmental surcharge ( \$ 0.25 per barrel) that would be set aside for Trustee management. Oil price net<sup>19</sup> forecasts the price for a barrel of oil at approximately \$70 for the coming year.

It is understood that in the past NEB worked with KM-TMX to structure accounts to enable KM-TMX to finance the back-ground reports in support of their application and that this arrangement provided \$146 million in a manner acceptable to KM-TMX and the NEB. The Board of FER is not aware of the details but heartened that funds of this magnitude were jointly agreed to between NEB and KM-TMX. The concept behind an Endowment is once established it is independent and able to manage projects and infrastructure through investments of capital and maintain the program on returns on investments.

Periodically pre-spill findings need to be incorporated into operational practices so there needs to be a system in place to supply sound research and monitoring information to make incremental improvements over the next 30+years. The monitoring research framework needs government, First Nations, industry and NGO guidance and Trustee oversight for accountability. The Trustees also needs to remain independent sufficient independent to not be captured by any single organization. Researchers, from government, universities, private sector and NGOs can apply for access funds through proposals that address strategic research goals.

Since a majority of British Columbians live within 50 km of the Salish Sea oil tanker route and environmental values in these waters are Nationally significant and the zone currently identified by Tanker Safety Panel 2013 is the highest risk oil spill zone in western Canada this warrants a higher level of commitment to environmental management than currently is present and envisaged by KM-TMX. This is especially true as there would be a 360%+ increase in oil tanker traffic.

There is an absence of a multi-stake holder multi-agency industry FN forum able foster cross agency cooperation and build strong long-term working relationships. The proposed Endowment Trustees would help foster such collaboration. A coast wide research and monitoring program with funds outside of agencies will help to coordinate efforts as provincial, federal agencies, FN, industry and ENGOS are involved collectively to set strategic program direction and set research and monitoring priorities. This is not happening now so there is an expectation of synergy and efficiency expected through an established Endowment and Trustee Council.

There are a number of agencies provincial and Federal as well as private and NGOs that are currently doing monitoring. For example there are whale watch tour operators who

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<sup>19</sup> <http://www.oil-price.net/> used to obtain current forecasts on a bbl of oil

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keep logs on where and when sightings are made, Christmas Bird Counts,<sup>20</sup> surveys of Important Bird Areas, migratory bird census, Wild whales sighting network<sup>21</sup> Coastal Observation and Seabird Survey Team.<sup>22</sup> Marine Water Quality Monitoring<sup>23</sup> Marine health<sup>24</sup> Fisheries monitoring<sup>25</sup> etc. A review of existing government, industry and NGOs monitoring will help define what is currently in place for marine ecosystems. The BC government reviewed its monitoring initiatives to look for synergies and opportunities for cooperation between the 50+ monitoring programs (Fenger and Bradford 2012).

### 5.2 Program for Marine Research and Environmental Monitoring Program

#### 5.2.1 Condition 2. Establish a Long-Term Program for Marine Research and Environmental Monitoring Program

**Table 9: Recommended Permit Condition 2. Marine Research and Environmental Monitoring Program**

KM-TMX will support a Marine Research and Monitoring Endowment Fund as outlined in Condition 1. This fund will be used to support a Marine Research and Environmental Monitoring Program(MREMP) that will conduct and report on:

- 1) Pre-spill monitoring of marine species and ecosystem indicators over the life of the KM-TMX project. This Long Term Ecological Effect Monitoring portion of MREMP will conduct periodic surveys to standardized protocols, retain and make available data over the long term to the public and government agencies.
- 2) Model oil spill and tanker drift as outlined in Conditions 5 and 9.
- 3) Research leading to a Habitat Compensation Plan, see Condition 6.
- 4) Research to inform Oil Spill Response Plan from increased tanker traffic and potential for species and ecosystems recovery from Dilbit oil spill impacts (toxicology) and ecosystem resilience recovery, see Condition 7.
- 5) Research to improve marine mammal protection, related to tanker speed, drift and weather, see Condition 9.
- 6) Participate and inform the Oil Spill Response Plan as developed and periodically updated, see Condition 10.
- 7) Other activities related to pre- and post-spill monitoring, plans and operational procedure up-dates needed to mitigate and recover ecosystems as needed.

<sup>20</sup> <http://www.audubon.org/conservation/science/christmas-bird-count>.

<sup>21</sup> <http://wildwhales.org/sightings-network/cetacean-and-turtle-research-in-bc/>.

<sup>22</sup> <http://depts.washington.edu/coasst/what/vision.html>

<sup>23</sup> [http://www.ecy.wa.gov/programs/eap/mar\\_wat/index.html](http://www.ecy.wa.gov/programs/eap/mar_wat/index.html)

<sup>24</sup> <http://pmel.noaa.gov/>

<sup>25</sup> <https://www.webapps.nwfsc.noaa.gov/>

**5.2.2 Condition 3. Filing Progress on Marine Research and Environmental Monitoring Program**

**Table 10: Recommended Permit Condition 3. Filing Progress on Environmental Monitoring**

Kinder Morgan TMX must file with the NEB for approval, within 1 year after the certificate date information and recommendations from the MREMP and Endowment Trustee endorsement of the following :

1. A list of species or species groups, habitat parameters, and environmental parameters to be surveyed, including for species at risk, data standards and data management and access.
2. The survey methods that will be used for the species (including species at risk) and species groups, habitat parameters, and environmental parameters to be surveyed and the survey/monitoring locations and frequency.
3. A summary of the outcomes of collaboration with stakeholder groups represented by Endowment Trustees: participating Aboriginal groups, research organizations, and public stakeholder groups on the survey framework; and areas of agreement and delegation between KM and other groups.
4. A description of the ESSC recommendations in developing the survey/monitoring
5. Letters of support from environmental groups and others who have reviewed the surveys.

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### 5.2.3 Condition 4. Reporting on Marine Research and Environmental Monitoring Program

**Table 11: Recommended Permit Condition 4. Reporting on Marine Research and Environmental Monitoring Program**

1. KM-TMX must file with the NEB, within Quarterly activities completed for each of the Marine Research and Environmental Monitoring Program (MREMP) surveys and reports whether done by KM-TMX consultants or surveys delegated to other NGOs or FNs, the survey results and evidence that data and survey results have been provided to the appropriate federal and provincial authorities.
2. KM-TMX must file with the NEB, and make available to the public on or before 31 January of each year for the duration of the Marine Research and Environmental Monitoring Program, the following:
  - a. Monitoring results, trends stemming from survey/monitoring results and how those will be incorporated into the program or, if no further monitoring is planned for certain species or species groups, habitat parameters, or environmental parameters, a rationale and agreement of the ESSC
  - b. A summary of the outcomes of KM-TMX collaboration with relevant government authorities, participating Aboriginal groups, research organizations, and public stakeholder groups on the monitoring plans
  - c. A description of how KM-TMX has taken available and applicable NGO, ATK and TLU studies into consideration in developing the monitoring.
3. Implications and assessment of information from surveys/monitoring on tanker traffic whether trends indicate a need to review and change operating procedures or other measures to change undesirable effects linked to the project.
4. Statements from agencies, FN and others on interpretation of operating implications for tankers in general and KM related tankers specifically.

### 5.2.4 Rational for a Long Term Independent Research and Environmental Monitoring Program

FER recommends to the NEB, if this project is approved, that conditions be applied to the KM-TMX permit to compel support and maintenance of a Marine Research and Environmental Monitoring Program (MREMP) over the life of their project.

From the IRs we conclude that KM has no interest or believes they have no obligation to support or collaborate with research and monitoring.

This permit condition would require KM-TMX to financially support and participate with others in a Marine Research and Environmental Monitoring Program. We propose permits condition similar to those applied to the Enbridge Northern Gateway Project. There is a precedence set by the NEB for a research and monitoring. There are stronger reasons to support a similar or enhanced program in the Salish Sea and Strait of Juan De Fuca due to the much higher population density, greater concentration of shipping (risk of accidents) and the higher concentration of environmental values linked to the Fraser River Estuary and Strait of Juan de Fuca. The Northern Enbridge permit conditions 36,

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37 and 38 contain a significant level of detail and thought on which help craft the proposed Conditions for KM-TMX. The same acronym used by for this program has not been used here to avoid future potential confusion. Northern Gateway used the term Environmental Effects whereas this report refers more simply to a similar concept but used the Environmental Monitoring.

### 5.2.5 Insights from IRs on Environmental Monitoring

Table 12 shows the exchange of information between FER and KM-TMX. KM-TMX shows no interest in support for a long term environmental monitoring program The Board of FER contests the response provided by KM-TMX that it has no role or financial responsibility for research and long-term ecological monitoring. The Board of FER sees the need for KM-TMX to be compelled to fund and participate in a marine research and monitoring in order to gain knowledge and help others gain knowledge to minimize and mitigate impacts of their project. This is entirely missing from the KM-TMX dialogue and KM-TMX sees “others” as responsible and will take no responsibility for or involvement for research and monitoring. This would be an off load to volunteers and Provincial and Federal agencies and tax payers solely. We contend that it is a corporate responsibility and that local organizations like FER who work with BC Parks, Canadian Wildlife Service, Department of Fisheries and Oceans and others should not provide a free ride for KM-TMX. We see that environmental management is and needs to be a cost of doing business for KM-TMX. We are also encouraged because the NEB in the list of issues does extends KM-TMX responsibility to the marine shipping and the preparation in the pre-spill period. KM-TMX is comfortable with waiting for a spill knowing that there are provisions and no liability or responsibility to themselves at that point in time.

There are precedents on environmental surcharges for recycling and environmental surcharges on hazardous materials like paint and the costs of recycling is passed on to consumers. The cost of adequate marine research and environmental management also needs to be passed on to KM-TMX and their investors so it is not entirely borne by the general public on behalf of KM-TMX and their shareholders.

This off-loading of both environmental management cost and all KM-TMX responsibilities is also unacceptable as long-term ecological monitoring is central to accumulating information to address NEB’s list of issues. Specifically relevant is Issue # 4: *potential environmental and socio-economic effects of the proposed project, including any cumulative environmental effects that are likely to result from the project*, and Issue 5: *potential environmental and socio-economic effects of marine shipping activities that would result from the proposed Project, including the potential effects of accidents or malfunctions that may occur*.

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**Table 12: Does KM-TMX Plan to Support Marine Ecological Monitoring?**

IR #	IR Wording	Trans Mountain’s response to IR
IR#1-22	Do you plan to support financially the on-going costs of marine ecological monitoring in ERs and other contiguous sensitive areas?	Trans Mountain is responsible for ensuring the safety of the terminal operations but does not own or operate the vessels calling at the Westridge Marine Terminal and therefore has no plans to fund on-going monitoring in marine ecological reserves along the existing shipping route.
IR#1-22	<b>Intervenor’s Explanation for Claiming IR Response to be Inadequate</b>	
	<p><b>This is not an adequate response.</b> We question this response for two reasons.</p> <p>First. Though KM does not own tankers, its responsibility should not end at their terminal. This transfer of risk to tanker operators with no further involvement from KM or responsibility is not justifiable. As stated earlier KM brings a 400% increase in tanker traffic into a high oil spill risk zone. We do not support KM in its answer when it chooses to absolve itself entirely from marine traffic responsibilities. There is a great deal that KM can do with regard to contracts for oil transport from its terminal if it chooses to do so. KM does have a role and in light of the risk of their business venture, this involvement needs to be substantial, formal, transparent and binding with “contracted tankers”. KM does have influence in who it hires and whether they perform to standards that can be set and audited by KM.</p> <p>Our second reason to question the rationale that KM proposes to not support marine monitoring is that KM appears to already be doing just that – monitoring marine systems. After the 2012 spill into Burrard Inlet a long term monitoring program was begun as the KM TMX report on Risk Assessment of spills in . Section 6.2.4 Page 7-85 which states</p> <p><i>“as a result of the third-party damage to the existing Trans Mountain pipeline, approximately 100m3of heavy crude oil reached Burrard Inlet, of which approximately 5.6 m3 was not recovered. The spill affected 15 km of shoreline east of Second Narrows,”</i></p> <p>We are not sure if this spill which is described as heavy crude behaves the same way in a marine environment as Dilbit. KM summarizes what they learned with regard to mortality as a result of the oil release and remediation as follows,</p> <p><i>“this area experienced habitat loss and death or removal of marine plants (primarily Fucus) as well as a likely loss of intertidal fauna such as starfish, barnacles and limpets. An analysis of mussels collected throughout the eastern part of the inlet indicated that only in the Westridge Marine Terminal area was there an amount and distribution pattern (fingerprint) of PAHs that could be associated with the release.</i></p> <p><i>Subtidal organisms may also have been affected by the release, but these effects appear to have been limited and localized. Red rock crabs from the Westridge area showed elevated PAH levels and a similar pattern of PAH to the released oil. However, none of the Dungeness crabs sampled at Westridge or crabs of either species from Barnet Marine Park and Berry Point and elsewhere in the Inlet (Indian Arm and Port Moody Arm) showed evidence of having taken up oil from the release. There was no evidence for direct effects on fin-fish species, including resident and juvenile salmon. PAH were not detected in starry flounder collected from</i></p>	

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IR #	IR Wording	Trans Mountain's response to IR
	<p><i>Westridge and Barnet Marine Park.</i></p> <p><i>PAH were not detected in starry flounder collected from Westridge and Barnet Marine Park. Following clean up, recovery endpoints were established and a long-term monitoring program was initiated. As of 2012, recovery endpoints for water quality, intertidal sediment, intertidal vegetation and crab tissue PAH concentrations were achieved. Monitoring of mussel tissue PAH concentrations continues in the Westridge area, as results are confounded by additional PAH sources in this area. Potential acute and chronic ecological effects of a hypothetical spill to Burrard Inlet during tanker loading at the Westridge Marine Terminal are discussed in Section 8.3."</i></p>	<p>We conclude that KM acknowledges the benefits of learning from oil spills and are willing to monitor to do this. This is exactly FER's point on marine shore zone and indicator monitoring. What does not make sense in the KM response is that they will wait until after a spill has occurred before beginning any marine monitoring. This means that this type of monitoring will be inconclusive with regard to impacts as they have already occurred. What FER is seeking is support from the NEB to compel KM to help organizations like FER establish pre-spill conditions. The current post-spill approach is not defensible with regard to learning anything about big or small spills into the marine environment. Since KM is proud of their monitoring strategy, it is of interest to the public that they supply what is being monitored in this new program and what their financial contributions are towards this and who the principal researchers are that are leading this initiative.</p> <p>We commend this initiative but know setting up monitoring after a spill has occurred, is inadequate as there is no pre-spill baseline information. Apparently recovery targets are part of this new monitoring program. KM needs to share this information. We hope in the long term that NEB will compel KM to take responsibility for the risk they bring and enable a formal arrangement to allow organizations like FER to work with KM to establish world class environmental standards grounded in environmental baselines established before, not after a spill occurs. We believe that it is defensible scientifically and socially to be pro-active with regard to monitoring baselines rather than re-active on monitoring. We know that organizations like FER can and should play a major role once afforded the infrastructure to do so. This infrastructure and formal arrangements are in the public interest and can be facilitated by NEB. We look forward to the day when this will be the new business model.</p>
IR#1-22	<b>Trans Mountain's response to Motion</b>	
	<p>The requested information has been provided and Trans Mountain's response is full and adequate. The response provides the Board with all necessary information pertaining to this matter. There is no further response required and supplementing the original response will not serve any purpose. Trans Mountain notes that if the Intervenor disagrees with the information contained in the response, it may contest the information through evidence or final argument.</p>	

In Table 12 we point out that KM-TMX is doing post-oil spill monitoring and are proud of their monitoring strategy. It is of interest to the public that they supply:

- What is being monitoring in this new program.

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- What their financial contribution towards this is.
- Who the principle researchers leading this initiative.

The point is that KM-TMX is doing monitoring but not supporting any pre-spill monitoring. We asked a similar but related question in IR#1-23 aimed at post spill monitoring. It is repeated in Table 13 below. We provide a rationale why post spill monitoring in itself is not adequate.

**Table 13: Ecological Monitoring and Recovery of Ecological Reserves Post Oil Spills**

IR #	IR Wording	Trans Mountain's response to IR
IR#1-23	Can you provide an estimate for thorough ecological monitoring of ERs through a recovery period?	Trans Mountain assumes FER is referring to recovery period after an oil spill in a marine environment. Long-term remediation of spill impacts is linked to monitoring plans agreed upon within the spill Incident Command structure and between participating entities in the response, including government authorities, Aboriginal communities, and scientific advisors. Those situation-specific plans are developed after emergency actions have been completed and take into account the actual post-emergency conditions, documented clean-up effectiveness, remaining areas affected, environmental and seasonal sensitivities, net environmental benefit analysis of remediation efforts, and numerous other considerations. As the emergency phase concludes, the net environmental benefit analysis could specify the need for remediation, followed by long-term monitoring. Each spill situation will be unique in this respect. Given the many variables and uncertainties surrounding any particular incident, there is no credible way of defining an expected monitoring time frame or cost at this time.
<b>Intervenor's Explanation for Claiming IR Response to be Inadequate</b>		
IR#1-23	<p><b>This is an inadequate answer.</b></p> <p>This approach to an oil spill is reactive. It should not be acceptable to the NEB to allow an oil spill response to wait until after an oil spill incident. This wait and see may be expedient for KM but inadequate. Societally we do not approach fighting house fires in this manner, if we did we would wait for the fire to start and then begin to plan to assemble resources to fight the fire. Why is it acceptable to begin to plan to address an oil spill after it happens? This is not reassuring to safeguarding public resources. It will be cost effective to have a strategic plan in place to address a number of oil spill scenarios. KM does bear responsibility for formulating much of this oil response plans together with government agencies. KM appears</p>	

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	<p>to hold the belief that once their oil is on the tanker they are no longer involved.</p> <p>FER also knows that there is a need to identify resource values in order to deploy oil spill response to most effectively address values and mitigate impacts.</p> <p>The oil spill that occurred into Burrard Inlet in 2012 and mentioned in IR 22 does include long term monitoring but the approach is to establish the baseline after the spill has occurred. This reactive approach of making up the environmental baseline after the fact cannot be supported. Situation-specific plans are fundamental inputs needed to pre-determine where oil spill resources are needed and how to prioritize where to deploy resources. Any oil spill is really an adaptive management experiment from which we can learn if we are sufficiently prepared. We do not see any learning and any outcomes that will boost public knowledge coming from what is being proposed.</p>
IR#1-23	<b>Trans Mountain’s response to Motion</b>
	<p>The requested information has been provided and Trans Mountain’s response is full and adequate. The response provides the Board with all necessary information pertaining to this matter. There is no further response required and supplementing the original response will not serve any purpose. Trans Mountain notes that if the Intervenor disagrees with the information contained in the response, it may contest the information through evidence or final argument.</p>

Enbridge developed and volunteered to do marine environmental effects monitoring during the course of the hearings and the NEB did take this voluntary commitment and shift it to a binding permit condition. KM-TMX during the review process, has volunteered nothing towards marine environmental effects monitoring or impacts research. This makes it necessary for NEB to compel a level of commitment onto KM-TMX.

The Enbridge Marine 2015 working draft of their Marine Environmental Effects monitoring program (MEEP) can be found at [http://www.gatewayfacts.ca/~media/GatewayFacts/documents/engagement/Marine\\_EEMP\\_WorkingDraft\\_10April2015.pdf?la=en](http://www.gatewayfacts.ca/~media/GatewayFacts/documents/engagement/Marine_EEMP_WorkingDraft_10April2015.pdf?la=en).

**5.2.6 Lessons on Pre-Spill Monitoring From the Exxon Valdez Oil Spill**

Robert B. Spies the key note speaker in the 1993 Symposium held four years after the Exxon Valdez oil spill titled his talk *Why Can’t Science Tell Us More about the Effects of the Exxon Valdez Oil Spill?* (<http://www.arlis.org/docs/vol1/A/31970650.pdf>). He goes on to answer his own question. Here are some excerpts on what was learned in the four years after the spill and regrets over lack of basic and relatively in expensive information. (underlining emphasis added by FER).

*“there was virtually no information on the status of the intertidal and subtidal communities in Prince William Sound”*

*“Because of the great variability in populations from place to place and at different times, scientists aim to have enough pre-impact data in a variety of areas and in enough years to*

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*be able to understand how populations change naturally. This allows a comparison of pre-impact population data to post impact population data in both affected and non-affected areas”.*

This is a significant statement that places importance of sustained ecosystem and species baselines distributed along the tanker route and maintained over many years and this type of data is hugely beneficial in a post spill environment. He goes on to state: (underling emphasis added by FER).

*The consequences of being un-prepared seem to be greater costs and greater uncertainty about the injured resources, their recovery and need for restoration. What should we be doing now in order to be better prepared to assess damages resulting from the next oil spill? The answer seems clear in retrospect – on-going monitoring programs collecting data on intertidal and subtidal zones, annual counts of sea otters, eagles, murrees and gathering more information on toxicology of common species. A basic and relatively inexpressive monitoring program carried out over many years might tell enough ...to get better injury information at lower cost. In the process we would also learn more about the natural resources we are trying to protect.*

These statements of regret from senior government staff reviewing the Exxon spill, strengthens the rationale the Board of FER is putting to the NEB to begin a relatively inexpensive environmental monitoring program as a KM-TMX permit condition. Such a monitoring program can deliver three things:

- 1) we learn more about the environment we are trying to protect;
- 2) we will lay the foundation for damage assessment; and
- 3) we will develop creditable baseline data over the life of the project and against which to measure recovery.

Spies 1993 aptly notes there was very poor understanding of the many species and the natural fluctuation of populations in species in ecosystems and between years due to an absence of the baseline monitoring in Prince William Sound. After 25 years it is believed that some species like sea otter populations have recovered to pre-spill levels while species such as herring, crabs and salmon apparently have not. Had there been reasonable pre-spill monitoring in place, we would now know with much greater certainty just which species and what ecosystem elements of Prince William Sound have recovered and which remain at reduced levels and productivity. This is important in light of planning marine ecosystem restoration and recovery initiatives. Marine ecosystems and species vary naturally and a long-term monitoring program would establish elements of the range of natural variability against which to measure impacts and recovery. We believe that impacts to commonly shared resources need to be made known to those who not only enjoy the natural environment but to those who depend on it for their livelihood.

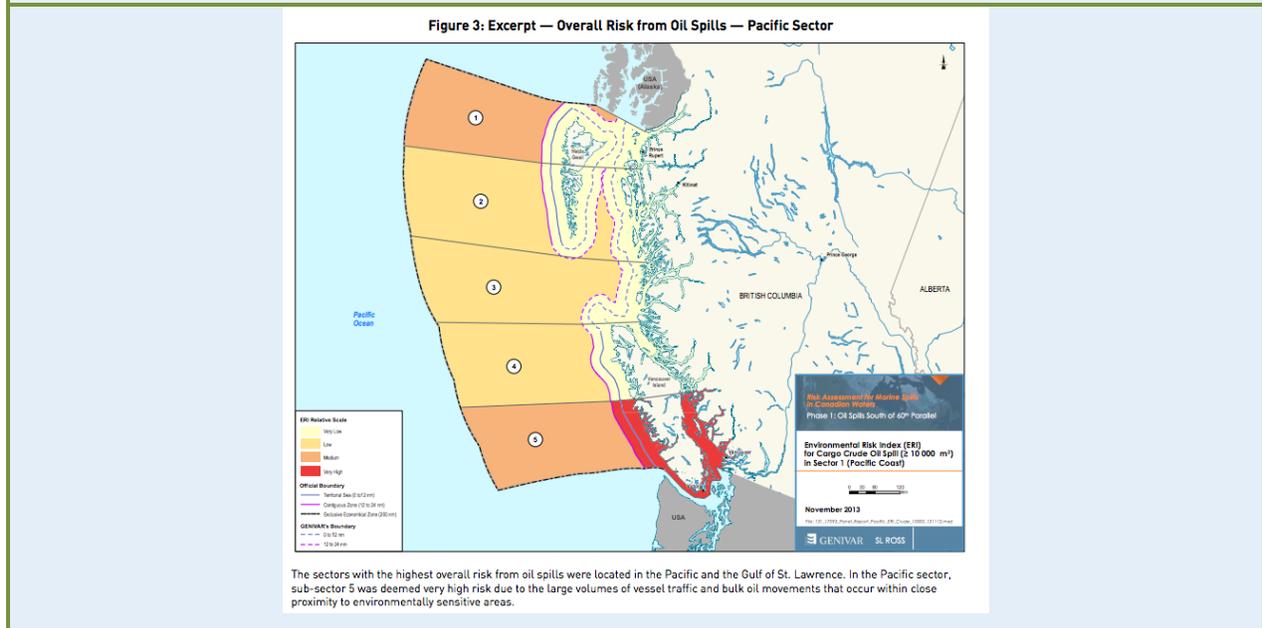
### 5.3 Boundaries for a Marine Research and Environmental Monitoring Program

#### 5.3.1 Condition 5. Boundaries for a Marine Research and Environmental Monitoring Program

**Table 14: Recommended Permit Condition 5 . Boundaries of a Marine Research and Environmental Monitoring Area**

KM-TMX must establish a Marine Research and Environmental Monitoring Program with boundaries coincident with the high risk spill area identified in the Oil Tanker Safety Panel 2013 report for the West Coast of Canada and shown in the map below.

This boundary can be refined based on enhanced marine spill trajectory and fate modelling (Condition 6)



#### 5.3.2 Rational

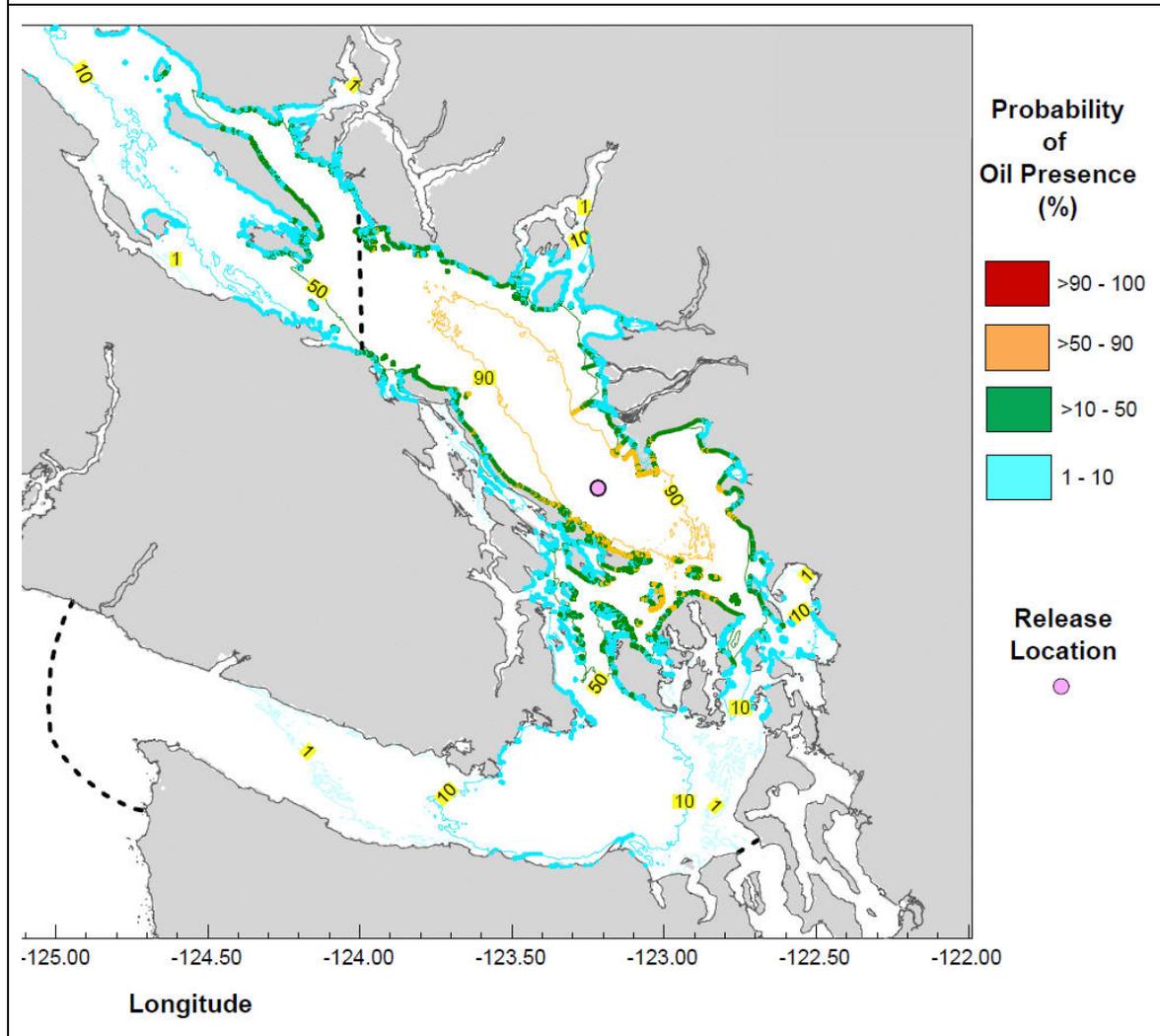
KM-TMX when applying for the permit, KM-TMX set the boundaries of their Regional Study Areas (RSA) boundary to focus their impacts studies. The Board of FER contests the size of the Regional Study Area (RSA). KM-TMX modelled hypothetical spills at three locations within the RSA boundaries and simulations show that oil will be distributed along the shore zones beyond the RSA both on the West Coast and in the Salish Sea. Figure 37 shows the modeling simulations used for the release site in the Strait of Georgia between Active Pass and Point Roberts. Figure 38 shows the modelling simulation from the release site near Race Rocks ER. Both figures show shore lines oiled outside of the RSA. Restricting the RSA meant that a number of ERs were not identified though they are at risk in the event of an oil spill. The Hypothetical release sites are also

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well within the RSA and no release sites were modelled for the western exit of tankers or closer to Vancouver. The need for additional spill modelling is discussed in Condition 6 which addresses the need for enhanced marine spill trajectory and fate modelling.

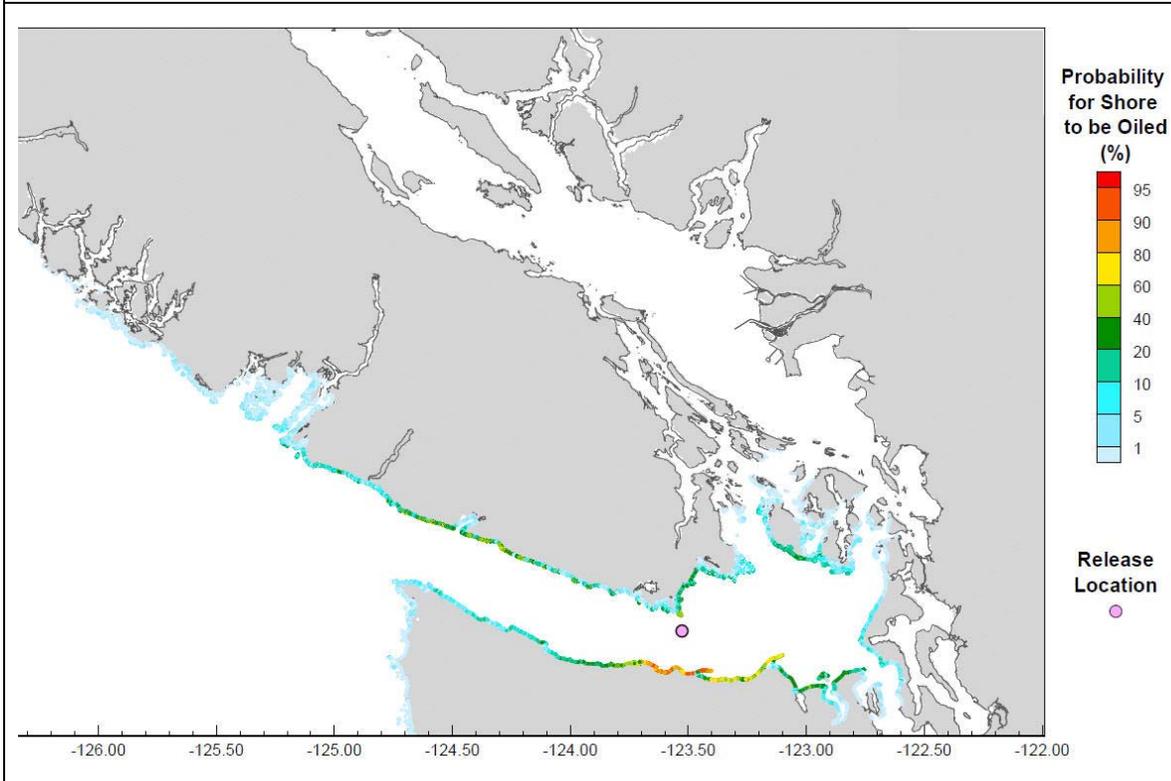
**Figure 37: Probability of Shore to be Oiled Strait of Georgia Spill - Winter Spill Simulation**

This worst case simulation shows that at the end of 15 day simulation it is predicted that oil will extend outside of the RSA (dark dashed line). This Figure is included to support the recommendation to establish and maintain pre-spill monitoring sites outside of the RSA.



**Figure 38: Probability of Oil Spill at Race Rocks Reaching West Coast of Vancouver Island.**

The Credible Worst Case oil spill simulation (modelled for release of 15 per cent of an Aframax tank or 16,500 tons). This simulation predicts that after two weeks 66 per cent of the oil spilled would reach the areas shown on the map (2.6 million gallons) and 4 per cent remain on the water the rest would evaporate or biodegrade. Most of the oil would reach the shore within 4 to 8 days. This simulation was from a hypothetical spill and release site was the Race Rocks ER. It is included as there is a high probability of oil occurrence along the west coast of Vancouver Island outside the RSA boundary. This map is from the KM-TMX spill simulations and did not have a RSA boundary shown. See previous Figure for the RSA boundary.



### 5.3.3 Insights from IRs on Regional Study Area Boundaries used by KM-TMX Project

IR#1-2 is shown in Table 15 (the entire dialogue is in Appendix B). As shown in Table 14, KM-TMX generated a new map showing ERs outside of the RSA boundary but made no commitment or acknowledgement that the projects has impacts beyond the RSA. Table 15 allows a comparison of Regional Study Areas (RSA) and High Risk Spill Area identified by the Tanker Panel.

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**Table 15: Which Ecological Reserves are Potentially Impacted by an Oil Spill?**

IR #	IR Wording	Trans Mountain's response to IR
IR#1-2.	<p>Can KM demonstrate that it knows the location of all 17 ERs by amending their project maps to include all potentially impacted ERs? Tanker Safety Panel Map of High Spill Risk  <a href="http://www.tc.gc.ca/eng/tankersafetyexpertpanel/menu.htm">www.tc.gc.ca/eng/tankersafetyexpertpanel/menu.htm</a></p> <p>The sector with the highest overall risk from oil spills is located in the Pacific and the Gulf of St. Lawrence. In the Pacific sector, the sector has been designated as high risk due to the large volumes of vessel traffic and bulked movement of fuel oils within close proximity to environmentally sensitive areas.</p>	<p>GIS data sources used to identify the biological resources and protected habitats within the Regional Study Area (RSA) are presented in Table 4.4 of Technical Report 8B-7 of Volume 8B Ecological Risk Assessment of Marine Transportation Spills Technical Report (Stantec Consulting Ltd. December 2013). The data identifying Ecological Reserves is publicly available, and was provided by DataBC (2011); the website for DataBC access is provided in the attachment to this request. A figure showing the location of each of the Ecological Reserves listed in Table 1 (DataBC 2011) is provided in the response to FER IR No. 1.01.01 (FER IR No. 1.01.01- Attachment 1).                      Reference: DataBC. 2011. BC Parks, Ecological Reserves, and Protected Areas. Website: <a href="http://www.data.gov.bc.ca/dbc/catalogue/detail.page?config=dbc&amp;P110=recorduid:173844&amp;recorduid=173844&amp;title=BC Parks">http://www.data.gov.bc.ca/dbc/catalogue/detail.page?config=dbc&amp;P110=recorduid:173844&amp;recorduid=173844&amp;title=BC Parks</a> . Accessed May 2014</p>
2	<b>Intervenor's Explanation for Claiming IR Response to be Inadequate</b>	
	<p><b>This is not an adequate response.</b>                      Table 4.4 does represent biological data sources but this is only half the information needed to define the Regional Study Area Boundary. The other half is based on risk to marine resources. The KM Marine consultants did identify risk from this project in Table 3.2 in their report but limited this to "vessel wake and underwater noise and omitted oil spills". MARINE CONSULTANT V8B_TR_8B1_MAR_RESOURCE_-_A3S4J5.pdf.                      The Regional Study Area (RSA) is inadequate to address oil spill impacts, as it is too small.</p>	

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	<p>Compare the RSA chosen by KM against that high oil spill risk zone identified by the Tanker Safety Panel cited above. As noted, the oil spill simulations also expand beyond the RSA boundaries. <a href="http://www.tc.gc.ca/eng/tankersafetyexpertpanel/menu.htm">www.tc.gc.ca/eng/tankersafetyexpertpanel/ menu.htm</a></p> <p>More work is needed to address the resources at risk from the anticipated 400% increase in tanker traffic linked to this project and the much larger area that is affected. Though there is a new map including all ERs in the high risk zone, these ERs remain outside the KM Regional Study Area. We support and hope the NEB will compel an expansion of a Regional Study Area to include all shore zones identified in the oil spill simulations and at high risk from oil spill identified by the Tanker Safety Panel.</p>
	<p><b>Trans Mountain’s Response to Motion</b></p>
	<p>The requested information has been provided and Trans Mountain’s response is full and adequate. The response provides the Board with all necessary information pertaining to this matter. There is no further response required and supplementing the original response will not serve any purpose. Trans Mountain notes that if the Intervenor disagrees with the information contained in the response, it may contest the information through evidence or final argument.</p>

We acknowledge that KM has no intention to redo or redefine the RSA at this stage in their permit application. As stated in their response to the FER motion, KM-TMX believes the NEB has enough information to make a decision. In the event that this project is approved, FER sees a need for a condition so that, in future, a monitoring framework and research includes all shoreline potentially impacted and not continue to restrict monitoring and research to the RSA boundary chosen by KM\_TMX.

## 5.4 Enhanced Marine Spill Trajectory and Fate Modelling

### 5.4.1 Condition 6. Enhanced Marine Spill Trajectory and Fate Modelling

**Table 16: Recommended Permit Condition 6. Enhanced Marine Spill Trajectory and Fate Modelling** (based on Northern Gateway Enbridge permit condition # 169)

KM-TMX must file with the NEB for approval, at least 3 years prior to commencing operations, a plan to prepare enhanced marine spill trajectory and fate modelling for the Westridge Terminal and marine tanker traffic from the terminal.

Enhanced spill modelling is needed as part of the MREMP and is needed to inform the Boundary adjustments for MREMP program (Condition 5), Habitat Compensation Plans (Condition 7), Marine Research Program (Condition 10), and Oil Spill Response Plan (Condition 11).

The plan must be coordinated with the MREMP and include:

1. A summary of KM-TMX consultation with Environment Canada regarding the scope of work to be undertaken. This summary must include issues or concerns raised regarding the scope of work and how KM-TMX has addressed or responded to them;
2. A summary of KM-TMX consultation with the State of Washington regarding the scope of work to be undertaken. This summary must include any issues or concerns raised regarding the scope of work and how KM-TMX has addressed or responded to them;
3. A summary of KM-TMX consultations with the stakeholders regarding the scope of the work undertaken. This summary must include any issues or concerns raised regarding the scope of work and how KM-TMX has addressed or responded to them;
4. The membership of a Scientific Marine Modeling Committee and its Terms of Reference;
5. A schedule for completing the work and confirmation that it will be completed prior to commencing operations and in sufficient time to inform oil spill preparedness and monitoring programs;
6. The scenarios to be modelled, at minimum, must include Credible Worse Case (CWC) scenarios that define a Credible Worse Case Scenario on par with that used in the State of Washington (entire vessel cargo with a cap of 35,632t) with spill locations included in TMX modelling work (Race Rocks, Strait of Georgia, and Archane Reef) and with at least three additional locations: Oak Bay Islands, Spanish Banks, and J Buoy (Juan du Fuca entrance).
7. How the models will be used to inform decision-making during spill preparedness planning and response exercises and actual spill events.
8. Communicate and make available to stakeholders and the public the plans submitted to the NEB.
9. Clarification of how KM-TMX will include the following in its enhanced modelling:
  - a) stochastic calculations and visual representations;
  - b) how the model will be adapted to different physical and chemical characteristics of the oil that is intended to be shipped from the Westridge Terminal, with particular reference to density, viscosity, emulsion formation, adhesion properties, and evaporation rates;
  - c) oil remobilization from the shorelines due to tidal or other influences, such as varying adhesion properties of the oil intended to be shipped from the Westridge Terminal, and oil retention times;
  - d) submerged or entrained oil resurfacing;
  - e) potential for oil to sink based on weathering and adhesion to sediment;

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- f) how weathering and trajectory models will be integrated to provide an accurate representation of the potential fate of oil within the environment;
- g) how the models will be adaptable to any time of the year and to varying meteorological and hydrological conditions.

### 5.4.2 Rationale for Better Credible Worse Case Scenario

The computer simulations modelled numerous seasonal scenarios at three hypothetical release points: 1) Strait of Georgia (near the BC Ferry crossing Tsawwassen to Swartz Bay); 2) Archane Reef (near Swartz Bay); and 3) Race Rocks west of Victoria. Two different levels of hypothetical release were modelled. FER remains concerned with the Credible Worse Case Scenario (CWCS) that assumes only 14 per cent of an Aframax tankers capacity (16,500 T) would ever be spilled if there were a marine oil tanker accident. The extent of oil shores using this CWCS of 16,500 T is shown in Figures 37 and 38. The Board of FER remains concerned with size of spill used as the Credible Worse Case Scenario. FER is supported in our concern by the definition of CWCS set to total loss as modelling and planning assumption for a CWCS Nuka 2013 Vol. 3 page 35<sup>26</sup> (emphasis provided by FER).

*But to accurately assess response capacity, it is also critical to have a clear understanding of worst-case spill risks (OGP, 2011). The “worst-case” should consider not only the total loss of fuel from a vessel, but also weather conditions, location, and the maximum quantity that could potentially be spilled from the cargo and fuel tanks of a vessel or shore based storage facility. But the timing of spill response is just as critical as the quantity of equipment, because the opportunity to contain and recover a marine oil spill diminishes quickly over the first few hours and days.*

Another indicator that the KM-TMX spill simulations understates is the volume of oil that could be spilled compared to the CWC scenarios used by the US government and in effect in the State of Washington. The differences are shown in Nuka 2013 Vol. 3, Table 4.1 entitled *Response planning standards in Canada, US, Washington, and Alaska*. This table shows that the spill modelling and preparedness is based on the entire cargo being released but there is a cap set at 35,632 Ts. This amount of oil modelled for spill preparedness is more than double what was modelled by KM-TMX. To their credit KM-TMX did exceed the Canadian on-scene standard which Nuka indicates is 10,000Ts.

FER recommends a permit condition to include Worse Case Spill Modelling for KM-TMX and WCMRC be applied to KM-TMX to achieve parity of that used by the State of Washington. The tanker route is water shared between Canada and the US, so it is prudent for future cooperation that Canada be able to bring to the table modelling that will be needed to integrate with Washington State.

#### **Table 17: Shows IR#2-6 Questioning the Definition of CWC**

<sup>26</sup> West Coast Spill Response Study BC Ministry of Environment.  
<http://www.env.gov.bc.ca/main/west-coast-spill-response-study/>

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IR #	IR Wording	Trans Mountain's response to IR
IR#2-6	<p>Please clarify why the “credible worst case scenario” (CWC) modelled and referenced above assumes that only a relatively low percent of a medium size tanker capacity is spilled and provide equivalent modelling for informed risk management, using future potentials as has been done in the research from George Washington University, 2013.</p> <p><b>Context:</b> In the VTRA 20Int 10 – SYNOPSIS OF RMM SCENARIO COMPARISON APPLIED TO CASE T: GW – KM – DP ( George Washington University, 2013), <a href="http://www.seas.gwu.edu/~dorpjr/VTRA/PSP/CASES/VT_RA%202010%20Master%20Comparison%20-%20T%20-%20RMM.pdf">http://www.seas.gwu.edu/~dorpjr/VTRA/PSP/CASES/VT_RA%202010%20Master%20Comparison%20-%20T%20-%20RMM.pdf</a> . A completely different set of models is presented because they do not follow from historical data but rather consider 2010 as the base Case year and a base case year is evaluated. Following that, What-if scenarios are developed from the base case by adding additional hypothetical traffic (upcoming if major vessel transport projects go ahead) and a “What-if” potential is evaluated and compared relative to the base case to inform risk management.</p>	<p>The identification of credible worst case scenario follows direction from the NEB’s “Filing Requirements Related to the Potential Environmental and Socio-economic Effects of Increased Marine Shipping Activities, Trans Mountain Expansion Project” (Filing ID A3V6I2).<sup>27</sup> Please see Volume 8C, Termpol 3.15, Section 9 (Filing ID A3S5F8)<sup>28</sup> for more information on the credible worst case scenario. <a href="#">Robyn Allan</a>, 28 May 2014, TheTye.ca <b>Kinder Morgan Pipeline Expansion Designed to Carry Much More Oil</b> Trans Mountain would be built with room to largely increase expt capacity.</p>
<b>Intervenor’s Explanation for Claiming IR Response to be Inadequate</b>		
IR#2-6	<p>This is not an adequate answer. <b>Concern:</b> Two references provided do not mention CWC scenario.</p> <p>We re-read the Hearing process order referenced in the answer (footnote 6). We find no reference to tanker capacity or limits on modelling credible worse case scenarios in the filing order. We are unclear where or who defined the size of the spill for the CWC scenario. It is implied that KM-TMX was directed by the NEB but that direction has not been provided. Where NEB has determined that a CWCS is 15 per cent of an Aframax tanker’s capacity? It is unclear whether the NEB could advise a risk strategy given the <i>Ocean Act</i> direction (End</p>	

<sup>27</sup> Hearing Order [https://docs.neb-one.gc.ca/II-eng/IIisapi.dll/fetch/2000/90464/90552/548311/956726/2392873/2449981/2445930/A15-3\\_-\\_Hearing\\_Order\\_OH-001-2014\\_-\\_A3V6I2.pdf?nodeid=2445615&vernum=-2](https://docs.neb-one.gc.ca/II-eng/IIisapi.dll/fetch/2000/90464/90552/548311/956726/2392873/2449981/2445930/A15-3_-_Hearing_Order_OH-001-2014_-_A3V6I2.pdf?nodeid=2445615&vernum=-2)

<sup>28</sup> Route Segments. [https://docs.neb-one.gc.ca/II-eng/IIisapi.dll/fetch/2000/90464/90552/548311/956726/2392873/2451003/2393359/B21-3\\_-\\_V8C\\_TR\\_8C\\_12\\_03\\_OF\\_03\\_TERMPOL\\_3.15\\_RISK\\_ANAL\\_-\\_A3S5F8.pdf?nodeid=2393795&vernum=-2](https://docs.neb-one.gc.ca/II-eng/IIisapi.dll/fetch/2000/90464/90552/548311/956726/2392873/2451003/2393359/B21-3_-_V8C_TR_8C_12_03_OF_03_TERMPOL_3.15_RISK_ANAL_-_A3S5F8.pdf?nodeid=2393795&vernum=-2)

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	<p>Note ii)</p> <p>We remain unclear about the size and number of tanks and capacity of the project. This concern is heightened by the article in footnote<sup>29</sup></p> <p>The second reference (footnote 7) provides no mention of CWC scenario. It is a summary of observation and photos made by an observer on a passage of an out- bound laden Greek tanker. The reference appears to bear no relevance to the request.</p>
	<b>Trans Mountain's Response to Motion</b>
IR#2-6	<p>In accordance with Board Ruling No. 33 (Filing ID <a href="#">A63066</a>), Trans Mountain's response provided sufficient information and detail for the Board in its consideration of the application and no further response is required.</p> <p>There was an error in one of the NEB ID links. Please note that the corrected section of our IR round 2 response should read: The identification of credible worst case scenario follows direction from the NEB's "Filing Requirements Related to the Potential Environmental and Socio- economic Effects of Increased Marine Shipping Activities, Trans Mountain Expansion Project" (Filing ID <a href="#">A3V6I2</a>). Please see Volume 8C, Termpol 3.15, Section 9 (Filing ID <a href="#">A3S5F6</a>) for more information on the credible worst case scenario.</p>

### 5.4.3 Hypothetical Oil Spill Release Points

Three release points were modelled Strait of Georgia (near the BC Ferry crossing Tsawwassen - Swartz Bay), Archane Reef (near Swartz Bay) and Race Rocks west of Victoria. FER sought additional spill modelling through IR#2-8. Understanding and developing world class spill preparedness for a worst case scenario off Oak Bay Islands will be needed.

Though we do not know where and when an oil spill will occur, modelling is the only way to anticipate the potential magnitude and impacts and prepare where to monitoring and how to prepare to respond. Spill modelling is needed to guide future decision making and is forecasting tool that will be needed over the life of the project. It is needed to inform environmental monitoring framework, optimize emergency response preparedness plans and communication between agencies and the public.

Table 15 is an IR by the Board of FER to KM-TMX requesting modelling simulations of oil shores and time lapsed if there was oil release nearer Oak Islands ER. KM-TMX did not provide additional modeling. This type of modeling will be needed so a condition to compel this will be needed. By putting this off to the future it becomes the responsibility and a cost and obligation to others.

<sup>29</sup> 28 May 2014, TheTyee.ca Kinder Morgan Pipeline Expansion Designed to Carry Much More Oil Trans Mountain would be built with room to largely increase export capacity.  
<http://thetyee.ca/Opinion/2014/05/28/Kinder-Morgan-Pipeline-Expansion/>

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**Table 18: Shows IR#2-8 Questions of Modelling Oil Spill Release Points**

IR #	IR Wording	Trans Mountain's response to IR
IR#2-8	<p>Will KM provide a model that shows a release point closer to Victoria and the Oak Bay Islands ER to understand how much oil can potentially reach the shore in this section of the shipping route?</p> <p><b>Context.</b> Three release points were modelled; Strait of Georgia, Archane Reef (near Swartz Bay) and Race Rocks west of Victoria. To understand and develop world class spill preparedness a worst case scenario off Oak Bay Islands will be needed. New modelling has to reflect a new Worst Case oil spill based on increases in tanker sizes and daily output to be considered credible.</p>	<p>From a practical perspective, the strength of the stochastic approach is that it shows where spilled oil could go in the event of an accident, but the resulting probability contours are not a reliable guide as to where crude oil would go in the event of a single unique accident. However the probability contours generated through stochastic modelling are valuable for informing spill response and preparedness planning. They also provide a transparent and defensible basis for describing the range of environmental effects that could result from a spill along the marine shipping route. It is not practical to assess every conceivable accident and malfunction scenario. Evaluation of potential environmental effects at other sites would not have changed assessment conclusions or identified the need for additional preparedness and response planning measures. Therefore a model that shows a release point closer to Victoria and the Oak Bay Islands ER is not contemplated. Trans Mountain is confident that the evaluation of potential environmental effects at representative locations fulfills National Energy Board filing requirements (Filing ID A3V612) and describes the range of environmental effects that could result from an oil spill along the marine shipping route.</p>
<b>Intervenor's Explanation for Claiming IR Response to be Inadequate</b>		
IR#2-8	<p>This is not acceptable answer.</p> <p>We understand that KM may not wish to complete additional modelling of oil spills having completed modelling for Archane Reef and Race Rocks. However there remains a need to model an oil spill closer to Victoria and the Oak Bay Island Ecological Reserve.</p> <p>We believe this to be true first because the report by DNV advising TMX did identify several potential accident sites one of which is off the Victoria water front. [see end note for a map of accident sites iii] DNV anticipated an accident off the Victoria waterfront but none was modelled. This is not appropriate.</p>	

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	<p>In addition Archane Reef is 32 km east of Oak Bay Islands ER and Race Rocks ER is 23 km west of Trial islands. FER does not understand why an oil spill off Oak Bay Island and impacting the shoreline of the most densely populated stretch of tanker route on Vancouver Island was not modelled.</p> <p>Therefore we believe it is a responsibility of KM to model a CWCS close to where most of the people on Vancouver Island live.</p>
	<b>Trans Mountain's Response to Motion</b>
IR#2-8	<p>In accordance with Board Ruling No. 33 (Filing ID <a href="#">A63066</a>), Trans Mountain's response provided sufficient information and detail for the Board in its consideration of the application and no further response is required.</p>

## 5.5 Marine Habitat Compensation Plan

### 5.5.1 Condition 7. Marine Habitat Compensation Plan

**Table 19: Recommended Permit Condition 7. Marine Habitat Compensation Plan** (based on Northern Gateway Enbridge permit condition # 122)

KM-TMX must file the MREMP developed Marnie Habitat Compensation Plan with the NEB, at least 30 days prior to commencing construction. With this plan, the following must be included:

1. A letter from Fisheries and Oceans Canada indicating its approval of the plan.
2. A summary of consultations with Fisheries and Oceans Canada, Environment Canada, Canadian Wildlife Service, BC Ministry of Environment, other appropriate stakeholders, and potentially-affected Aboriginal groups regarding the Marine Habitat Compensation Plan. This summary must include any issues or concerns raised by stakeholders regarding the plan and how KM-TMX has addressed or responded to them.
3. Letters of endorsement of the plan from other Environment Canada, Canadian Wildlife Service and provincial Ministry of Environment and stakeholders engaged with the MREMP.
4. This plan must be reviewed and refiled with the NEB file at least every five years to identify incremental improvements possible through the MREMP program and in cooperation with government agencies and stakeholders.
5. KM-TMX must make the Habitat Compensation Plan publically available if not done so by MREMP.

### 5.5.2 Rational: Northern Gateway Habitat Compensation Plan Precedent

The marine habitat compensation/mitigation plan is based on the Enbridge Northern Gate Project Condition 122. There are lessons on restoration versus mitigation that can be learned from oil spills and there is a need to identify enhancement opportunities pre spill. It may not be possible to restore some ecosystems after an oil spill, so enhancing others areas is often the next best option to compensate for lost biological productivity, diversity or harm to endangered species habitats. Given the nature of Dilbit it may sink to the ocean floor and so may persist there for an unknown length of time. FER sees this as a realistic scenario for a Dilbit spill along the BC tanker route. The tanker route is over or through Rock Fish Conservations Areas as shown in Figure 24. Impacts on Rock Fish and their recovery or resilience of their habitat is not currently known. FER advocates for baseline monitoring to assess what was lost and we advocate for pre-spill identification of habitats that could be enhanced as is required of the Northern Gateway project.

### 5.5.3 A Lesson from the Gulf of Mexico and Habitat Compensation Plans

The 2005 sinking of an oil barge in the Gulf of Mexico was followed by a Net Environmental Assessment which concluded that removal of oil from the ocean floor and returning the ocean floor habitat to pre-spill productivity and diversity was not

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practical. Instead enhancement of habitat in other areas was identified as best approach to compensate losses of productive from the marine environment. Figure 39 provides some background on this double hulled tanker and resulting sunken oil.

**Figure 39: Damaged Tank Barge DBL 152 after a Hurricane in Gulf of Mexico in 2005**

Double-hull Tank Barge DBL 152 collided with the submerged remains of a pipeline service platform that collapsed during Hurricane Rita. As a result of the incident, an estimated 1,925,532 gallons of a blended mixture of heavy oil were discharged into federal waters of the Gulf of Mexico, West Cameron Block 229. The majority of the released oil was denser than sea water causing it to sink to the seafloor.



From <http://subseaworldnews.com/2013/03/19/noaa-proposes-plan-to-address-environmental-injuries-from-tank-barge-dbl-152-gulf-oil-spill/>

*“Sometimes effects of oil spills are immediate and clearly visible, but often the effects are less obvious and require expertise and time to properly evaluate,”* **said Troy Baker, NOAA’s Assessment and Restoration Division acting southeast branch chief who has been leading this project,**

*In March 2013, NOAA released the [Damage Assessment and Restoration Plan](#) [PDF] for the DBL 152 [incident](#), which demonstrates that restoration is possible for this oil spill period for it is the next step in an ongoing process. The plan outlines injuries to natural resources and proposes a restoration project to implement estuarine shoreline protection and salt marsh creation at the Texas Chenier Plain National Wildlife Refuge Complex in Galveston Bay, Texas. The preferred shoreline protection and marsh restoration project proposed in the draft plan is designed to replenish the natural resources lost due to the oiling during the period both when they were injured and while they recovered.*

FER notes that the phrase restoration is possible applied to shoreline habitat which will receive enhanced protection as the oil is being left on the ocean floor but restoration is not practical on the ocean floor.

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This same approach for enhancement of a different habitat was also applied to the Enbridge spill in the 2010 on the Kalamazoo River.<sup>30</sup> These Habitat Compensation Plans support the need for identification of Habitat Compensation options as part of permit conditions. It is understood that until there is a spill, the details and appropriate plan for implementation cannot be finalized. The Habitat Compensation Plan will inform and set expectations before a spill occurs (Nuka 2013 Vol 3). This is a prudent step and superior to postponing the compensation/restoration discussion to a post spill period (Hunt 2009).<sup>31</sup>

This condition ensures that environmental assets are identified and options for enhancement understood should restoration prove untenable and compensation for habitat occur on a different site than the one damaged. A Habitat Compensation Plan grounded in the concept of 'no net loss of habitat', aims to retain productivity lost. This approach has been used on fish and wetland habitat but applies equally well to marine and oil spill damaged habitat. If habitat is damaged it is either restored or investments are made in alternate site and maintain overall productivity.

### 5.5.4 Shore Zone Biological Classification

The Board of FER reviewed all of the Shore Zone Sensitivity Ratings for all ERs that can be potentially oiled by the KM-TMX project. Some examples of shoreline sensitivity maps are included in Figures 41 to 44. The factors used and the relative weighting behind these shoreline oil sensitivity ratings is unclear and does not align with known environmental values for ERs as outlined in Chapter 3.

Figure 42 shows the Oak Bay/Chain Islands ER, a sea bird colony and an Important Bird Area rated as low sensitivity to an oil spill and Figure 43 of the Megin River ER, a pristine west coast estuary, is ranked as moderate to low sensitivity to an oil spill. We are not sure why these biologically areas are ranked on oil sensitivity maps are low or moderate. Therefore there is have no confidence in the shore zone oil spill sensitivity maps for the entire BC coast, the rankings need be up dated and reviewed. We are unsure of how interpretative maps housed at GEO BC we made. There is in the BC government no longer any dedicated shore zone staff to keep the information up dated. We are fearful on how they may potentially be used to mis-inform spill preparedness plans and emergency spill deployment and Habitat Compensation plans.

The Board of FER believes that more thorough rating system is warranted and it also needs to be ground-truthed before there could ever be acceptance as a planning aid.

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<sup>30</sup> Enbridge, Michigan reached a settlement over 2010 oil spill - See more at: <http://www.timescolonist.com/enbridge-michigan-reach-settlement-over-2010-oil-spill-1.1933173#sthash.Dotou7o4.dpuf> .

<sup>31</sup> Hunt 2009. Mission without a map. <http://www.evostc.state.ak.us/Store/FinalReports/2002-02535-Final.pdf> .

We submit that a comprehensive analysis of shoreline sensitivity to Dilbit in the Ecological Reserves, including marine and terrestrial organisms, is a minimum requirement of adequacy in terms of environmental impact assessment.

Figure 40: Legend for Analysis of Shoreline Sensitivities to Bunker C Spills



5.5.4.1 Examples of the Geo BC analysis of Shoreline sensitivities to bunker C spills

The following maps show the sensitivities as being moderate and very low on several of the Ecological Reserve shorelines. The ratings in no way reflect the biological sensitivity of the depicted areas in our opinion. We submit that a much more thorough rating system has to applied and ground-truthed before acceptance as a legitimate analysis of ecosystem sensitivity.

Figure 41: An Example of Sensitivity to Bunker C in the Mount Tuam Ecological Reserve

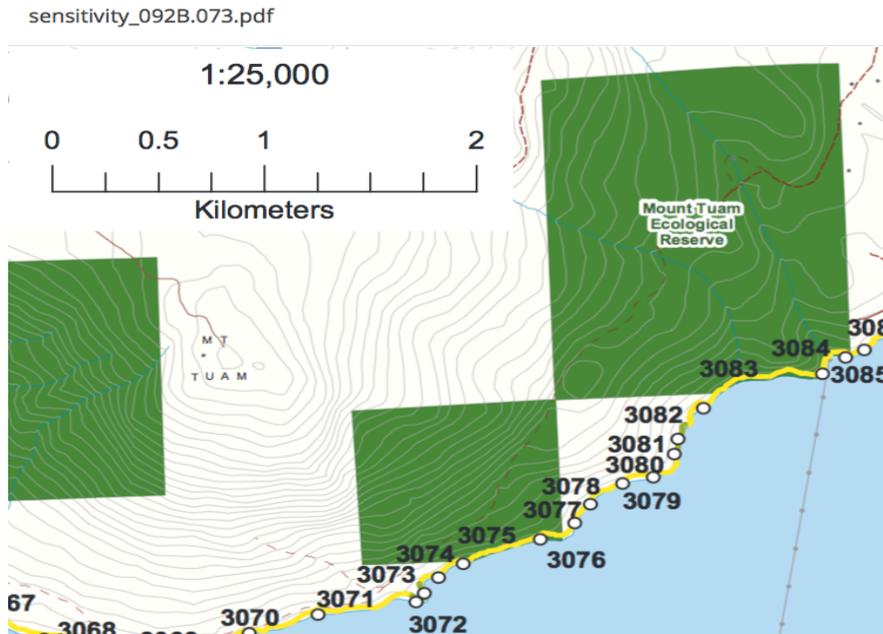


Figure 42: An Example of Sensitivity to Bunker C in the Oak Bay/Chain Islands Ecological Reserve.

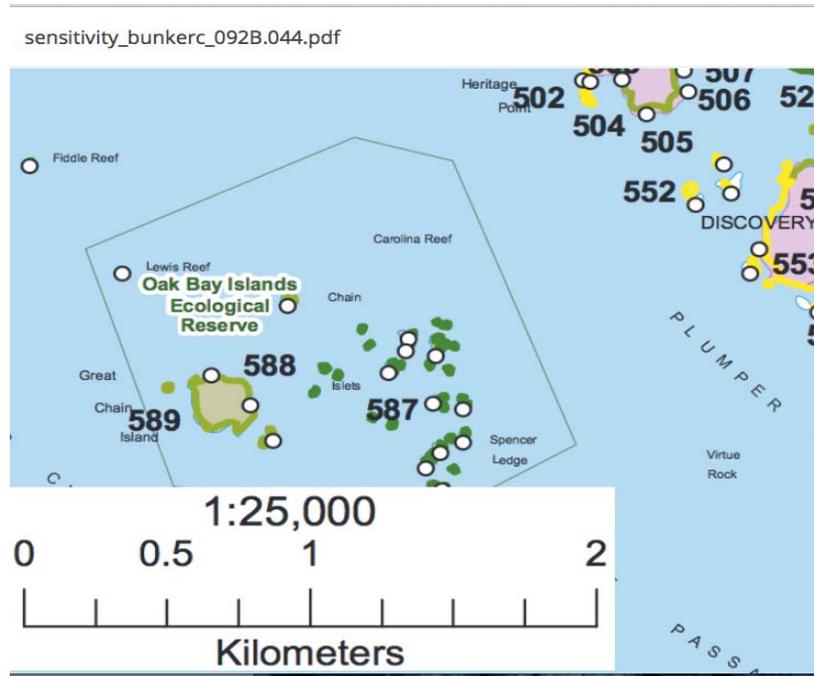


Figure 43: An Example of Shoreline Sensitivity to Bunker C in the Megin River Ecological Reserve

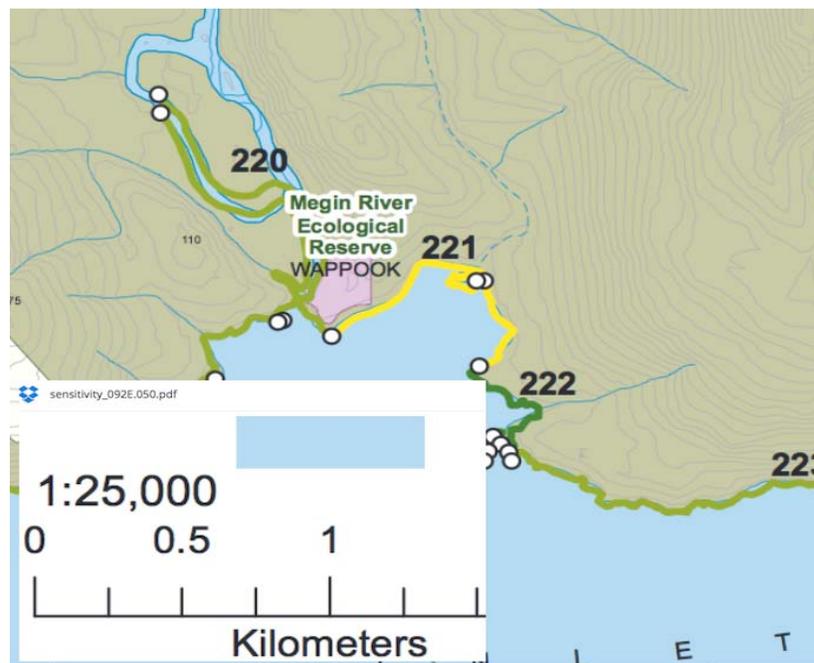
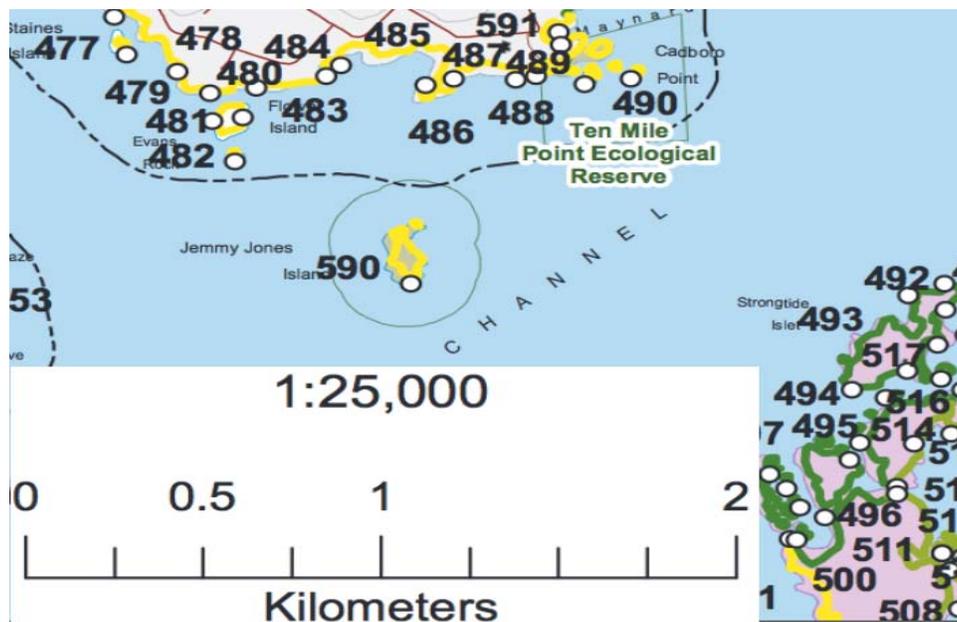


Figure 44: An Example of Shoreline Sensitivity to Bunker C in the Ten Mile Point Ecological Reserve



Board of FER in our IR#2-17 asked for clarification on productive and sensitive ecosystems. Our question was:

*What baseline studies of sensitive ecological areas does TMX plan to establish or use as scientific evidence to quantify ecological restoration or recovery trends, in the event of an oil spill? Context: A fundamental tenant of restoration or recovery is to understand reference ecosystems which is why Ecological Reserves have been designated and exist within the Salish Sea and along the tanker route*

KM-TMX answer:

*In 2013, WCMRC initiated the development of a new coastal mapping system. This new system, still under development, will house not only coastal sensitivities and associated Geographic Response Strategies (GRS) but also all associated logistical support information. Shoreline sensitivities, as noted above, form part of WCMRC's mapping database. GRS is a plan used for the initial nearshore response in an emergency situation. The program utilizes local knowledge to assist in shoreline sensitivity classification to possible oiling. As for shoreline protection strategies, these are built, in conjunction and/or reviewed with local stakeholders (e.g., Emergency Planners/First Nations) to address the sensitivities that have been identified as part of the coastal mapping project. Each sensitivity has a corresponding geographic response strategy and protective assignment developed and ready to be implemented in the event of a spill. Each feature is then field- tested and a two-page reference document is developed and reviewed with government agencies. The goal of a GRS is to protect sensitive natural and cultural*

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*features while reducing decision-making time during an actual spill. GRSs are designed to provide all the necessary information required to carry out an efficient and rapid shoreline response. Cleanup endpoints and post-spill monitoring regarding ecological restoration or recovery are typically set to best restore habitat use. These incident-specific goals are determined by a Net Environmental Benefit Analysis as detailed in the response to FER IR No. 2.01/*

The response designed to be reassuring the Board Response was:

**“This is not an adequate response.**

*Have the documents provided on June 16 been made available? If so please provide a hyperlink.”*

No further information was provided.

The Board of FER has not been invited to review and comment on the work of WCMRC and the *development of a new coastal mapping system* but we are aware of the history of the shore zone mapping information held at GEO BC and that the oil industry considers this information proprietary as they provided funds towards the inventory when it was done in the 1990’s. It is hard to accept that information on public assets is privately held and considered and treated as proprietary especially in light of oils spills.

We see history repeating itself with regard to shore zone maps as KM-TMX stated during the proceedings.

*“emergency management plans are proprietary and of a sensitive nature and due to security concerns are not publicly available nor will they be made available.”*

See Appendix A for the Board of FER letter of support for the BC government motion calling for disclosure of spill preparedness information.

The Board FER contests the need for shoreline inventory to be proprietary. There should be no corporate secrecy over what is an inventory of public assets. This is why the Board of FER has placed the shore line mapping into preview of the proposed MREMP and seeks NEB support to transfer shore zone inventory to management under a wider stakeholder organization at arms-length from KM-TMX and their WCMRC subsidiary. This is in the public interest. We are pleased WCMRC is working to develop a *new coastal mapping system* but the information must be available in the public realm and must be developed to serve a wider interest and so requires broader multi agency and stakeholder input. There is no indication this is occurring.

Manuals for the process for gathering and recording baseline data in British Columbia were completed in 1997 by the Resources Inventory Committee (RISC).

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1. The [BC Biological Shore-Zone Mapping System](https://www.for.gov.bc.ca/hts/risc/pubs/coastal/bioshore/index.htm) :
2. [The Physical Shore-zone Mapping in British Columbia](https://www.for.gov.bc.ca/hts/risc/pubs/coastal/pysshore/index.ht) :
3. [British Columbia Estuary Mapping System Version 1.0](https://www.for.gov.bc.ca/hts/risc/pubs/coastal/estuary/index.htm):

These manuals in their introductions state the shore zone inventory was a database and mapping system for the descriptive biota of the British Columbia shoreline designed to include the following details:

1. The biotic mapping system was intended to provide a structure for the description and mapping of the marine shore zone of British Columbia.
2. It was developed as a means of recording the distribution of biological resources along the coast and as a tool for identifying biological communities and community-based relationships with physical and oceanographic processes.
3. As with the physical shore-zone mapping system, the biotic mapping system was essentially independent of scale and lends itself to data collected at all levels of detail.
4. It was intended to meet a wide-ranging need for resource information including land-use planning, oil-spill response and management, resource conservation and management and environmental impact assessment.

The system integrates directly with the physical shore-zone mapping system for British Columbia by linking data tables in the biological database with data tables in the physical database.

1. The boundaries for units and components in the physical system, based on geomorphological parameters, are used to define boundaries for species assemblages (bands) in the biological system.
2. The biological database is designed to accept data collected by a range of sampling methods and levels of effort. This is accomplished without the loss of information by the inclusion of a methods code.
3. The biological database intentionally does not include a hierarchical structure above the shore unit level so that users can summarize shore unit data within areas of their choosing. Summary areas can be added to a digital map at any time.
4. A hierarchical coding system for biota is included and is based on taxonomic groupings. A more versatile code which includes other groupings requires further development and user consultation.

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5. Two new fields, freshwater influence and land use, are suggested for inclusion in the physical database. Also, modifications and additions are suggested for the physical database to compliment the biological database.

This BC Estuary mapping System manual (Howes, Morris and Zacharias 1999) provides a mapping and database system and methodology for large scale (typically 1:5,000) mapping of estuaries. This standard provides an overview of the mapping system, and describes the methodology, database structure and mapping procedures of the system. The system builds upon an estuarine classification developed by the Ministry of Environment in 1983 (Hunter et al 1983) and integrates components from the other RIC standards. This standard is composed of seven databases that separate biotic from abiotic attributes and point from polygon attributes. The design of this system permits the comparison of estuaries throughout the province, and can easily be updated to incorporate changes in any of the existing standards this work is based upon. It has been developed and structured in a manner that facilitates the incorporation of data from this standard into a GIS. Lastly, this standard is applicable for research or scientific applications, as data collection methods are rigorous and the database and mapping structure has been designed with research needs in mind.

## 5.6 Marine Effects and Restoration Research

### 5.6.1 Condition 8. Marine Effects Research Program

**Table 20: Recommended Permit Condition 8. Marine Effects Research Program** (based on Northern Gateway Enbridge permit condition # 169 and 170)

KM-TMX must file with the NEB, at least 3 years prior to commencing operations, a research plan from the MREMP for improving understanding of Dilbit impacts on the natural marine environment. This research plan is to focus on:

The Dilbit toxicology research in the marine environment and lethal dosages for species and the degree to which research priorities clarified in Table 18 Table 21: Research Recommendation from the Dupuis, A., and Ucan-Marin, F. 2015 publication will be addressed.

1. Understanding resilience and recovery of a variety of marine ecosystems from varying levels of hypothetical spills. The program is to test the hypothesis that ecosystems and species will fully recover from a Dilbit spill and clarify expected recovery periods.

With this MREMP research, KM-TMX must include:

1. A letter from Fisheries and Oceans Canada indicating its approval of the research plan and any role or commitment for participation provided;
2. A letter from the Environment Canada and Canadian Wildlife Service indicating its approval of the research plan and any role or commitment for participation provided;
3. A summary of KM-TMX consultation with Fisheries and Oceans Canada, Environment Canada, Canadian Wildlife Service, BC Ministry of Environment, other appropriate stakeholders, and potentially-affected Aboriginal groups regarding the Marine Habitat Compensation Plan. This summary must include any issues or concerns raised by stakeholders regarding the plan and how KM-TMX has addressed or responded to them;
4. KM-TMX must file with the NEB annual progress reports on projects under the marine MREMP research program.
5. The MREMP program must establish and support a science advisory panel to review the Research plan

KM-TMX must make Research plan and project findings program publically available when reporting to NEB or indicate where the MREMP Program has made available Research Program

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### 5.6.2 Condition 9. Marine Mammal Protection, Tanker Speed, Drift and Weather Conditions Research

**Table 21: Permit Condition 9. Marine Mammal Protection, Tanker Speed, Drift and Weather Conditions**

KM-TMX must demonstrate how the research is mitigating impacts on marine mammals that is linked to the Marine transport from the Westridge terminal and what has changed with regard to operating procedures related to:

1. Tankers' speed and reduced risk of marine mammal strikes and noise;
2. The tanker drift study and appropriate mitigation based on the results of the study;
3. Establishing vessel operational safety limits that address visibility, wind, and sea conditions;
4. Sensitive areas for oil spill response in Geographic Response Plans developed in consultation with the Province of British Columbia and communities, FN and NGOs that could be affected in the event of a spill;
5. Community Response Plans for participating coastal communities in the Salish Sea and Strait of Juan de Fuca.

### 5.6.3 Condition 10. Marine Research Program Progress Reporting

**Table 22: Permit Condition 10. Marine Research Program Reporting**

KM-TMX must file the MREMP research program progress reports with the NEB and make public, on or before 31 January of each year for the duration of the research program if this has not been done by the Program. This includes an overview of the progress on the toxicology and resilience and recovery of marine habitats and the extent to which the objectives of the research program have been achieved. This includes:

1. An update on timing and the status of the work undertaken that year;
2. Results from research conducted during the calendar year prior to filing;
3. Work plan budget estimates and partnership contributions to be undertaken in the upcoming year;
4. Research findings and implications for incremental improvements in spill response and monitoring;
5. Any other matters that the MREMP and KM-TMX want to bring to the NEB's attention related to the research project and recovery of ecosystems.

### 5.6.4 Rationale for Research into Environmental Impacts and Ecosystem Resilience

The Northern Gateway Project was approved June 17, 2014 and with an obligation (condition) for a research program as described in (Conditions 169 and 170). Since then, the ground work for this program has been laid and progress can be reviewed on the

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Northern Gateway site.<sup>32</sup> The action and focus of the science team are shown in Table 23.

**Table 23: Royal Society of Canada (RSC) Mandate - The Behaviour and Environmental Impacts of Crude Oil Released into Aqueous Environments**

Research Program Mandate: accessed at <https://rsc-src.ca/en/expert-panels/rsc-reports/behaviour-and-environmental-impacts-crude-oil-released-into-aqueous>

*The Expert Panel was set-up in response to a request from the Canadian Energy Pipeline Association (CEPA) and the Canadian Association of Petroleum Producers (CAPP). The panel is asked to address the following questions:*

- 1. How do the various types of crude oils compare in the way they behave when mixed with surface fresh, brackish or sea waters under a range of environmental conditions?*
- 2. How do the various crude oils compare in their chemical composition and toxicity to organisms in aquatic ecosystems?*
- 3. How do microbial processes affect crude oils in aquatic ecosystems, thereby modifying their physical and chemical properties and toxicity?*
- 4. Is the research community able to relate, with reliable predictions, the chemical, physical and biological properties of crudes to their behaviour, toxicity and ability to be remediated in water and sediments?*
- 5. Given the current state of the science, what are the priorities for research investments?*
- 6. How should these scientific insights be used to inform optimal strategies for spill preparedness, spill response and environmental remediation.*

The results of the Enbridge-led research will be to improve industry understanding on whether it is possible remove different types of oil products from the environment, how to do this and to suggest additional research. These are worthwhile research aims and it is important for the oil industry to learn and adapt through research and shared finding for greater public understanding. But Enbridge research conditions do not address effects of Dilbit in ecosystems and resilience and toxicology of Dilbit to organisms. Therefore additional research is needed and this is what is proposed for a research program linked to a KM TMX permit condition.

The Board FER is a strong supporter of natural ecosystems research and believes that Enbridge condition addresses important knowledge gaps primarily to inform the oil industry and secondarily to inform the public, national and provincial interest.

The Board FER does not see benefit in a permit condition for KM-TMX addressing the same questions addressed by Enbridge Research as shown in Table 23.

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<sup>32</sup> <http://www.gatewayfacts.ca/Engagement.aspx#research>

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The Board FER does see benefit for additional research/studies to address environmental impacts of oil and recovery on ecosystems and species. We see this as a knowledge gap about which the public and FNs are interested and concerned. The Enbridge research condition ends in a few years. After the science panel turns in its report(s) there is no remaining research infra-structure or framework and no obligation to support further research. It is inconceivable that at that time there will be no need to learn how to make incremental improvements to practices, plans and operations based on better information. An on-going marine oil spill restoration and resilience research program is needed as a KM-TMX obligation focused on recovery over the life of the project.

The Board of FER sees a real distinction between what the public wants to know with some certainty and what the industry wants to know with some certainty. Northern Gateway Research is designed for the benefit of industry first and the issue of environmental impacts and recovery are not addressed at all. It is also troubling that research terms of reference were solely set by the oil industry. This is not to demean this oil-industry research initiative even if motivated to comply with a NEB permit condition. We do need to know how and whether there are opportunities not known now removal of Dilbit from water and how and over what time period microbes alter Dilbit for a toxic to a benign substance.

After study of the Northern Gateway Research Program, the Board of FER sees that it will not lead to accelerated learning and collaboration between agencies, stakeholders and industry and it will not increase public confidence through understanding with regard to oil tanker transport and add insight on recovery and resilience of marine systems post oil spills. This remains a huge gap. A natural areas marine research is needed. We recommend a permit condition to ensure this gap in understanding will be filled. This research does not duplicate what is being addressed by the now established studies initiated by Northern Gateway a Research Program.

The permit condition for research though modelled after the Enbridge Northern Gate Way condition 170 is different because in has a focus on the impacts from oil on the marine environment, resilience and recovery of the marine environment. This resilience of the environment is a matter of highest public and First Nations interest.

Some of the work begun by DFO in their 2015 report has a focus consistent with issues of public concern on impacts of oil on elements of the natural marine ecosystems. Table 18 shows what DFO has recommendation on additional research needed to address Dilbit toxicology. This table is from Research Recommendation provided by Dupuis, A., and Ucan-Marin, F. 2015 and in a DFO Can. Sci. Advisory document<sup>33</sup> states that:

*“The purpose of this review is to provide an overview of the biological effects of petroleum*

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<sup>33</sup> [http://www.dfo-mpo.gc.ca/csas-sccs/Publications/ResDocs-DocRech/2015/2015\\_007-eng.pdf](http://www.dfo-mpo.gc.ca/csas-sccs/Publications/ResDocs-DocRech/2015/2015_007-eng.pdf)

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*oil on aquatic biota. The majority of the information presented pertains to finfish but also includes information on other aquatic biota such as shellfish and marine mammals. The review includes crude oils and petroleum products derived from crude oils but does not include natural gas and natural gas liquids or processed waters resulting from exploration and production activities. Throughout the review the term “oil” is used as a general term to describe a wide variety of petroleum oil.”*

Table 2 from Dupius et al. 2015 below includes research results for a wide range of petroleum products but does not include research results on any of the Diluted Bitumen products that will be used in this project.

Table 2. Physical properties of petroleum product categories ordered by density

Physical properties									
Property	Units	Gasoline <sup>a</sup>	Diesel <sup>a</sup>	Light Crude <sup>a</sup>	Heavy Crude <sup>a</sup>	Diluted Bitumen <sup>b</sup>		Intermediate Fuel Oil <sup>a</sup>	Heavy Fuel Oil <sup>a</sup>
						Access Western Blend	Cold Lake Blend		
Viscosity	mPa·s at 15°C	0.5	2	5-50	50-50,000	347	285	1,000-15,000	10,000-50,000
Density	g/mL at 15°C	0.72	0.84	0.78-0.88	0.88-1.00	0.9253	0.9249	0.94-0.99	0.96-1.04
API gravity	°	65	35	30-50	10-30	20.9	21.0	10-20	5-15
Flash Point	°C	-35	45	-30 to 30	-30 to 60	<-5	<-5	80 to 100	>100
Pour point	°C	-	-35 to -1	-40 to 30	-40 to 30	<-25	<-25	-10 to 10	5 to 20
Interfacial tension	mN/m at 15°C	27	27	10-30	15-30	24.2	27.7	25-30	25-35

Sources: a: Range of values for petroleum product category. Modified from Fingas 2011a.

b: Values for two blends (not weathered) from Government of Canada 2013. Values presented here do not reflect range of possible values for diluted bitumen (range in values may exist due to differences in source, processing by different companies and changes in seasonal blends, i.e., winter vs. summer blends).

The report concludes by looking at the oil sands products and their toxicity and makes recommendations for research that needs to be done in this area:

### “3.7 TOXICITY OF OIL SANDS PRODUCTS

*There is currently a lack of research assessing the potential effects of diluted bitumen and synthetic crude oil (upgraded bitumen) on aquatic organisms. In contrast, work is ongoing for monitoring the environment near oil sand activities. In 2012, the Governments of Canada and Alberta implemented an environmental monitoring and research plan for the oil sands region which was designed to enhance existing monitoring activities. As part of this program, monitoring of aquatic biota (i.e., fish and invertebrates) health is ongoing upstream and downstream of oil sands developments and also, in mining development areas. Also, laboratory-based experiments on fish were conducted to test the toxicity of melted snow collected from sites near oil sands mining and upgrading facilities and from reference locations away from the influence of mining activities. Activity summaries and data are made available via [a publically accessible web portal](http://www.ec.gc.ca/pollution/EACB8951-1ED0-4CBB-A6C9-84EE3467B211/Final%20OS%20Plan.pdf). (<http://www.ec.gc.ca/pollution/EACB8951-1ED0-4CBB-A6C9-84EE3467B211/Final%20OS%20Plan.pdf>)*

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*As with other oils, the primary component of concern in oil sands products are PAHs and particularly alkylated PAHs (Colavecchia et al. 2004). Several studies have investigated the toxicity of natural oil sands deposits on fish (Tetreault et al. 2003; Colavecchia et al. 2004; Colavecchia et al. 2006; Colavecchia et al. 2007). In the Athabasca oil sands region, these natural bitumen deposits can be found exposed in the banks of rivers where natural erosion processes can allow leaching of these compounds. In the laboratory, these natural oil sands deposits were shown to cause toxicity in early-life stages of fish (Colavecchia et al. 2004; Colavecchia et al. 2006). In these experiments, fathead minnow and white sucker eggs and embryos were exposed to oil sands sediments. Compared to controls, the fish eggs and embryos showed increased mortality, reduced hatching success, delayed timing of hatching, abnormal embryo development, larval deformations and reduced size of larvae (Colavecchia et al. 2004; Colavecchia et al. 2006). Larval deformities included exposure-related increases in the prevalence of spinal defects, edemas (pericardial, yolk sac, and sub-epidermal), and hemorrhages (Colavecchia et al. 2004; Colavecchia et al. 2006). These toxicological responses were noted by the authors to be similar to that previously described for other weathered crude oils.*

*Studies of wild fish in the oil sands region found that exposure to natural bitumen caused sublethal biochemical and hormonal responses (T etreault et al. 2003). Common species in the Athabasca watershed such as slimy sculpin (*Cottus cognatus*) and pearl dace (*Margariscus margarita*) showed reductions in steroid production and increases in EROD activity compared to fish in reference areas (T etreault et al. 2003). For early-life stages of fish, it is suggested that these biochemical responses can be related to the observed deformities in embryos and larvae following exposure to oil sands affected waters (Colavecchia et al. 2007). “*

**Table 24: Research Toxicology Gaps Identified by DFO** (Dupuis and Ucan-Marin. 2015)

**RESEARCH RECOMMENDATIONS**

Research recommendations were developed based on the existing knowledge gaps on the biological effects of oil on aquatic organisms. This section was developed as a result of discussions with participants at a Canadian Science Advisory Secretariat (CSAS) workshop for identifying research requirements for the biological effects of oil on aquatic ecosystems (DFO 2015).

**Oil Toxicity Research Recommendations**

1. Toxicological studies on oil sands-related products such as natural bitumen, diluted bitumen, synthetic crude oil and bitumen blended with synthetic crude oil. a. Determine appropriate study species for standardised testing
  - a. Conduct lethal and sublethal toxicity tests, early-life stages tests
  - b. Compare the toxicity of Dilbit, synbit, and syncrude relative to other products; if they are uniquely toxic, determine mechanisms of effect
  - c. Establish a reference Dilbit product for standardised toxicity testing using a standard suite of chemical analyses and effects endpoints
2. Assessment of fate and behaviour of diluted bitumen following a spill in aquatic environments a. Identify areas and habitats of greater risk of oil spill, and fate of oil within these systems
  - a. Improve modelling capacity
  - b. Developing clean-up methods appropriate to unique ecosystem characteristics
  - c. Ecotoxicology of conventional and unconventional crude oil products in ice-covered Canadian waters
3. Assessment of potential consequences of a condensate spill to aquatic organisms
  - a. Validation of existing acute toxicity models and/or development of new models as required
  - b. Determine exposure potential - fate and behaviour in the aquatic environment
4. Improved ecological relevance of oil and gas toxicity studies
  - a. Establish cause and effect in field-based studies
  - b. Validate laboratory studies using field-based approaches
  - c. Identify susceptible life-history traits and relate to oil fate characteristics
  - d. Extend research beyond individual-effects to population, community, ecosystems
  - e. Develop the capacity to assess biological effects during and after spill events, especially recovery times
5. Demonstrate mechanisms of chronic toxicity in support of improved predictive models
  - a. Identify characteristic exposure responses
  - b. Identify unique biomarkers of exposure to bitumen
  - c. Conduct pharmacokinetic studies
  - d. Identify unique chemistry profiles of oil products, including geochemical markers
  - e. Determine the role of oil droplets (residual oil) in estimating toxicity
  - f. Establish the relative importance of photo-toxicity after an actual oil spill.
6. Assessment of biological effects of chemically dispersed bitumen
7. Potential effects of metals in bitumen to benthic organisms if sinking occurs

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The Board of FER supports the recommendations of this report to do research to fill the gaps of knowledge on finfish and other aquatic biota such as shellfish and marine mammals as well as marine birds and recommend it be accepted by the NEB and we have recommended this a part of the research condition needed by KM-TMX project. We also recommend to the NEB that this research is best done through a research program and framework as outlined in our recommended condition. We lack confidence as should the NEB in KM-TMX when it comes to interest and commitment in marine ecosystems.

The Board of FER appreciates the focus on Dilbit on ecosystems and need for better toxicology on species critical to understand ecosystem resilience and set the context for recovery. The Board of FER strongly recommends the work be included under the independent research program over the life of the project this understanding that we are recommending.

### **5.6.5 Rational for Research into Mammal Protection, Tanker Speed, Drift and Weather Limitations**

Board of FER sought information in IR#2-32 of KM TMX and their understanding and solution to mitigating the impacts on Marine mammals and address cumulative effects. Board of FER notes the Northern Gateway condition 18 addresses operational measures on tanker speed and noise to mitigate marine mammal strikes. Despite mention of tanker speed and marine noise reported by KM TMX in their filing documents, we are unable to find commitments to reduce speeds nor windows of inoperability due to visibility, wind and sea conditions. We also believe that this is a subject that needs further study and monitoring to arrive at a tanker speed and noise levels that favour marine mammal's safety from strikes and noise reductions to allow for whale communications. The pre-amble to the *Oceans Act* states that a precautionary approach needs to be taken. <http://laws-lois.justice.gc.ca/eng/acts/O-2.4/FullText.html>. The Northern Gateway condition 18 also addresses the need for tanker drift studies under different conditions due to a need to establish vessel operational safety limits that address visibility, wind, and sea conditions and that also address conditions for enhanced oil spill response capabilities.

## 5.7 Spill Preparedness Plans

### 5.7.1 Condition 11. Oil Spill Response Plan

**Table 25: Permit Condition 11. Oil Spill Response Plan**

KM-TMX must file with the NEB, at least 30 days prior to commencing construction, a plan for preparing the following documents:

1. Marine Oil Spill Response Plan including a net environmental benefit analysis framework;
2. All related and accompanying plans, such as Pre-SCAT (Shoreline Clean-Up Assessment Technique) and Marine Reserves Substrate Surveys, Response Tactics for Floating Oil, Response Tactics for Submerged and Sunken Oil, Control Points, Access Plans, Geographic Response Plans, an Oil Pollution Prevention Plan, and an Oil Pollution Emergency Plan;
3. How the plan will be informed by Enhanced Spill Monitoring (Condition 5) and other MREMP monitoring and research projects;
4. The plan must include the following information in relation to the above documents and steps to be undertaken in completing them; including consultation with the interested parties; and included in review of plans such as: Fire Departments, police, marine related industries, NGOs, police, staff from Federal Environmental agencies (DFO, TC, DND, Environment Canada) and staff from provincial Ministry of Environment and Emergency Management BC (the Provincial Emergency Program), willing First Nations and independent scientists). The consultation must include a cross section of public, private, FNs similar to Area Committee representatives involved with emergency planning in the marine environment.
5. Approximate timing for the Emergency plan completion and a date for completion no later than a year prior to increasing tanker traffic;
6. A description of all federal and provincial regulations that need to be adhered to;
7. A list of interested individuals and stakeholder groups willing to review and provide improvements in Spill Plans;
8. How the review by independent non-government individuals has influenced the spill plan;
9. Enhanced oil spill response capabilities, including identification and prioritized sensitive areas for oil spill response in Geographic Response Plans developed in consultation with the Province of British Columbia and communities that could be affected in the event of a spill; and Community Response Plans for participating coastal communities in the Salish Sea and Strait of Juan De Fuca;
10. KM-TMX through its subsidiary WCMR Corp. must plan for thorough simulations and drills for a Worse Case Oil Spill equivalent to that in the State of Washington, and maintain equipment on scene equivalent to the on-hand resources called for in the State of Washington. KM-TMX must submit these for public and stakeholder input and revision.

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### 5.7.2 Condition 12. Consultation with Interested Parties on Emergency Preparedness and Marine Spill Response Framework

**Table 26: Condition 12. Consultation with Interested Parties on Emergency Preparedness and Marine Spill Response Framework**

KM-TMX or its subsidiary WCMR Corp must file with the NEB, at least 3 years prior to commencing operations, a plan for consulting on emergency preparedness and response for marine oil tankers:

1. The consultation plan's scope;
2. The consultation plan's objectives include the marine spill response framework;
3. A preliminary list of regulatory authorities to be consulted;
4. A preliminary list of communities and Aboriginal groups to be consulted;
5. A preliminary list of consultation locations and timing;
6. The methods to track commitments made during consultation and incorporation of them into final Emergency Preparedness and Response Plans;

### 5.7.3 Response Times for Emergencies

The Board of FER is concerned about the stated response times for the WCMRC to get to areas of oil spills. This concern was heightened due the recent Vancouver oil spill and Coast Guard statements that the response times were "World Class". WCMRC has published the following information for response times for oil spill emergencies on the BC coast. <http://wcmrc.com/response-time-standards/>.

#### Primary Area of Response (PAR)

*Because a majority of large spills (>1,000 tonnes) occur outside port boundaries where vessels converge, the Coast Guard identified Primary Areas of Response (PARs) as areas associated with Designated Ports that require a specific level of response capability and mobilization within designated times. The PAR for the Port of Vancouver is defined as "All of the Canadian waters between the northern boundary of a line drawn from the point 49° 46.5'N, 124° 20.5'W on the mainland, through Texada Island, to the point 49° 22.5'N, 124° 32.4'W on the shore of Vancouver Island and the southern boundary consisting a line running along the 48° 25'N parallel from Victoria, eastward, to the Canada-United States border."*

- *UNDER 2500 TONS: Deployed On Scene Within 18 Hours*
- *OVER 2500 TONS: Deployed On Scene Within 72 Hours*

#### Enhanced Response Area (ERA)

*Marine areas not covered under the above designation, but holding a higher risk of oil spills due to traffic convergence and volume of shipping were identified as Enhanced Response Areas (ERA). The Strait of Juan de Fuca ERA comprises "All the Canadian waters between*

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*the western boundary of a line drawn from Carmanah Point on Vancouver Island to Cape Flattery, Washington State, and the eastern boundary consisting of a line running along the 48° 25'N parallel from Victoria, eastward, to the Canada-United States border."*

- *UNDER 2500 TONS: Deployed On Scene Within 18 Hours*
- *OVER 2500 TONS: Deployed On Scene Within 72 Hours"*

**Figure 45: Area Map from WCMRC site**



The WCMRC shows the marine response equipment [currently in Esquimalt is as follows:](http://wcmrc.com/vessels/)  
From (<http://wcmrc.com/vessels/>)

- Burrard Cleaner (BC) #9 : A skimming vessel of 105.3 Tons (speed 11knots =20 km/hr)
- Burrard Cleaner #10 : A barge of 889 Tons
- Burrard Cleaner (BC) #11: A response Vessel of 19.9 Tons (speed of 18 knots =32 km/hr)

**Figure 46: An Example of the Ecological Reserves on the Southern and Western parts of Vancouver Island with the Approximate Distance by sea from Esquimalt and Travel Times**

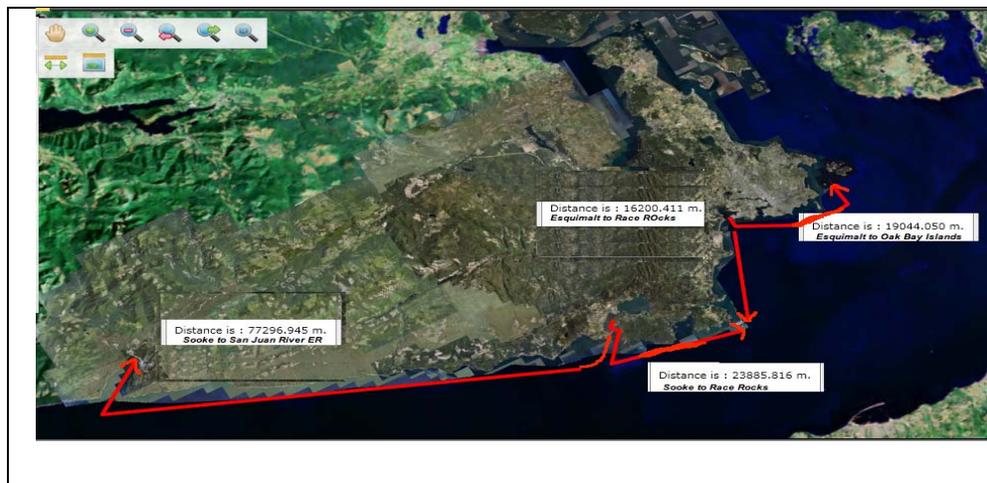
Distance from WCMRC equipment in Esquimalt to some ERs S. Vancouver Is.	Travel distance	Travel Time For Burrard Cleaners in Esquimalt		Mandated Response Time to be on scene Based spill size		Response time needed compared to response time required by government
		BC#9	BC#11	<2500	>2500	
		BC#9	BC#11	<2500	>2500	BC #9 and BC #11
Race Rocks ER	16 km	0.8 hr	0.5 hr	18 hrs	72 hrs	~ < 5% of the time
Oak Bay Islands ER	19 km	1 hr	0.6 hr	18 hrs	72 hrs	~ < 5% of the time
San Juan River Estuary ER	~115 km	5.75 hr	3.6 hr	18 hrs	72 hrs	~ 33% of the time
Baeria Rocks ER	~ 150 km	7.5 hr	4.6 hr	No limit	No limit	No standard to get to scene
Cleland Island ER	~ 290 km	14.5 hr	9.0 hr	No limit	No limit	No standard to get to scene

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Why are larger the spills allowed a 5 times longer response time? Currently there are only two boats in Esquimalt that can respond. The size of the spill would seem to be irrelevant but the speed of response is critical. No response is available for these areas shown in Figure 45 red band on outer Vancouver Island.

Figure 46 shows the actual time needed to motor Esquimalt to Oak Bay Islands ER and Race Rocks. Why is this 72 hours allowed for a location of extreme vulnerability such as Race Rocks ER that is only 16 km away from the response resources and the actual travel time needed is less than an hour. This is why we advocate for involvement and review of spill preparedness plan and the need. Figure 47 shows a map and distances used in 46.

**Figure 47: Map showing distances to Race Rocks and Oak Bay Island ERs from Esquimalt**



West coast ERs from Race Rocks to Baeria Rocks are in the “enhanced response times.” This means that they will get a response within 18 hours if under 2500 tons and 72 hours if over 7200 Tons. These times and distances shown are the absolute folly of such an inadequate commitment from the WCMRC coupled with inadequate standards of the federal government and Coastguard.

We submit that the National Energy Board must not accept these response times with such an increase in tanker traffic. Clearly this is not a “World Class Response System” even on paper. Changes need to be implemented immediately so that appropriate response times are developed. These examples are provided on why their needs to be inclusion of the wider public with development of spill preparedness.

### **5.7.4 The Spill Response Framework: Consultation, Collaboration and Transparency**

It is encouraging to know permit conditions for Northern Enbridge require the company to prepare and disclose their Emergency preparedness and response plans.

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The following permit condition for KM-TMX are modelled after the Enbridge Northern Gateway permit Conditions 117-119 and aimed at providing an equivalent or better preparedness between these two projects. Because of the tanker route is shared with Washington State there will need to added information on coordination across the international boundary.

The frustration we had with NEB and KM and the example that KM believes spills plans are proprietary to itself and WCMRC. Appendix A is our letter of support for the BC Government motion.

## 6. SUMMARY OF RECOMMENDED PERMIT CONDITIONS

This chapter summarizes permit conditions recommended by the Board of FER to the NEB in Table 27. The rationale and evidence provided to support these conditions are provided in Chapters 5 and 6. Most of the permit conditions were modelled on conditions that have been applied to the Enbridge Northern Gateway Permit and available on the NEB site.<sup>34</sup> The Board of FER sees the precedent of the NEB approval of the Enbridge project as significant and expects, at a minimum, parity for the KM-TMX project. We present arguments in earlier chapters that KM-TMX will need to support a higher level of obligations due to higher nationally significant environmental values in the Salish Seas (Fraser River estuary and salmon) as well as the population density of the Lower Mainland that will potentially be impacted by the KM-TMX project. We estimate that >50 per cent of the population of BC live within 50km of tide water from the tanker route and will suffer negative impacts.

The funding structure and delivery of the program differs between what is required of the Enbridge project and what the Board of FER deems as more appropriate to the KM-TMX project. This difference is an “*arms-length*” funding structure is necessary because KM-TMX has offered nothing tangible and appropriate for monitoring and research proportional to the scale of their project, and has not addressed some of the issues identified by the initial NEB statement of issues. If these issues are to be pushed off to the future and the permit issued by NEB without clarity on how issues that were identified at the start of the hearings will be dealt with. There is a long term need to address environmental impacts and fill knowledge gaps and this means significant investment is required to be maintained over the life of the project by KM.

Ecological Reserves are small but highly productive and environmentally important areas legally designated for the strongest environmental protection. The conditions proposed and the programs of research and environmental effects monitoring provided in Table 27 are not solely for the benefit of ERs but would provide a framework for research and monitoring that is sufficiently robust for the entire KM-TMX impact area. We acknowledge that ERs are a minor but important player across the broader marine ecosystems. If conditions proposed by Board of FER to the NEB are accepted and applied, FER, like others who manage and contribute to environmental management, can propose projects for monitoring and research within the proposed Marine Research and Environmental Monitoring Program (MREMP) supported by the Marine Research and Monitoring Endowment Fund (MRMEF). FER would be a participant able to propose projects and eligible for funding based on merit, cost effectiveness and how well project proposals address priorities for research and monitoring within the lens of oil and tanker impacts and as agreed to by a multi-stakeholder board of Trustees. The

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<sup>34</sup> Enbridge Northern Gateway Project Joint Review Panel Appendices. <http://gatewaypanel.review-examen.gc.ca/clf-nsi/dcmnt/rcmndtnsrprt/rcmndtnsrprtvlm2ppndx-eng.html>

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conditions in Table 27 set out a framework to allow a number of researchers and those interested in monitoring to do projects based on merit, and the ability to address high priority questions of public interest. It would seem fair and appropriate that KM-TMX be expected to support marine research and long term monitoring in light of the risk they bring to endangered species and marine ecosystems in general.

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**Table 27: Summary of Recommended Permit Conditions**

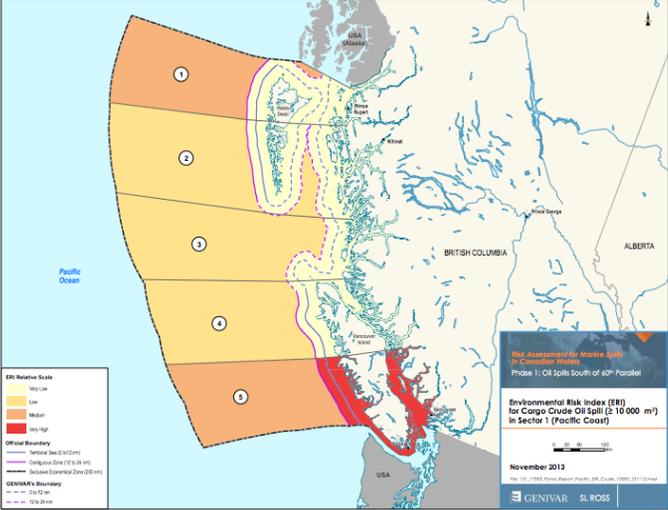
Condition	Title of Condition	Measurable outcomes for each condition and time lines.
1.	Endowment fund to support Long term Marine Research and Monitoring	<p>KM-TMX must file with the NEB at least 1 year prior to commencing operations documents that show the placement in trust of \$150,000,000.00 (one hundred and fifty million dollars) to support an arms-length Marine Research and Environmental Effects Monitoring Endowment Fund to support MREMP and contribution credible independent science based information to conditions 2 through 12.</p> <p>This Endowment is to remain as a permanent endowment to serve monitoring and research for as long as oil is being transported in the Salish Sea and Strait of Juan De Fuca.</p> <p>KM-TMX must file with NEB at least one year prior to commencing operations a list of agencies and organizations willing to guide the Endowment Fund to its intended purpose as stated in Condition 1.</p> <p>Funds for the Endowment Trust Funds can be establish over a few years but must be fully in place one year prior to completion of the project.</p>
2.	A Marine Research and Environmental Monitoring Program (MREMP)	<p>These proposed conditions were inspired by Northern Enbridge condition 36, 37 and 198 <sup>35</sup></p> <p>KM-TMX will support a Marine Research and Monitoring Endowment Fund as outlined in Condition 1. This fund will be used to support a MREMP that will conduct and report on:</p> <ol style="list-style-type: none"> <li>1. Pre-spill monitoring of marine species and ecosystem indicators over the life of the project. The Long Term Ecological Effect Monitoring portion of MREMP will conduct periodic surveys to standardized protocols, retain and make available data over the long term to the public and relevant agencies.</li> <li>2. Model oil spill and tanker drift as outlined in Condition 6 and 11.</li> <li>3. Research leading to a Habitat Compensation Plan, see Condition 7.</li> <li>4. Research to inform Oil Spill Response Plan, see Condition 11.</li> <li>5. Research on impacts to marine ecosystems from increased tanker traffic and potential for species and ecosystems recovery from Dilbit oil spill impacts (toxicology) and ecosystem resilience recovery, see Condition 8.</li> </ol>

<sup>35</sup> <http://www.gatewayfacts.ca/en/Engagement/Phase-1/Marine-Environmental-Effects-Monitoring-Program>

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Condition	Title of Condition	Measurable outcomes for each condition and time lines.
		<p>6. Research to improve marine mammal protection, related to tanker speed, drift and weather, see Condition 9.</p> <p>7. Participate and inform the Oil Spill Response Plan as developed and periodically updated, see Condition 10.</p> <p>8. Other activities related to pre- and post-spill monitoring, plans and operational procedure updates needed to mitigate and recover ecosystems as needed.</p>
3.	Filing progress and details on MREMP	<p>MREMP is arms-length from KM-TMX, government agencies, FNs and NGOs. It has a management structure inclusive of these multi- stakeholders. Since it is being established as permit condition, KM-TMX will within one year after the certificate date, file the outcomes of KM-TMX collaboration with relevant government authorities, participating Aboriginal groups, research organizations, and Environmental NGOs.</p> <p>KM-TMX must file the MEEPR management framework with the program goals, 5 year work plan and budget estimates. It will obtain letters of support and willingness to participate from agencies, NGOs and FNs.</p>
4.	Reporting on Marine Research Environmental Effects Monitoring Program (MREMP)	<p>The NEB and the public need to know the MREMP program progress and effectiveness.</p> <ol style="list-style-type: none"> <li>1. KM-TMX must file with the NEB, quarterly activities completed by the Marine Research Environmental Effects Monitoring Program surveys and reports outlined in the management plan.</li> <li>2. KM-TMX must file with the NEB, and make available to the public on or before 31 January of each year for the duration of the Marine Research Environmental Effects Monitoring Program, the following: <ul style="list-style-type: none"> <li>o Monitoring results, trends stemming from survey/monitoring results and research projects</li> <li>o A summary of the collaboration within MREMP with relevant government authorities, participating First Nations groups, research organizations, and public stakeholder groups</li> </ul> </li> <li>3. Implications and assessment of research and monitoring information will be reported, and whether trends indicate a need to review or change operating procedures if there are manageable but undesirable effects linked to the KM-TMX project. This would include statements from agencies, FN and others on the interpretation of implications for tankers in general and to KM-TMX related tankers specifically.</li> </ol>

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Condition	Title of Condition	Measurable outcomes for each condition and time lines.
5.	Boundaries of Marine Environmental Effects Monitoring <sup>36</sup>	<p>KM-TMX must establish the MREMP Marine Research and Ecological Effects monitoring Program (Condition 2) with boundaries coincident with the Oil Tanker Panel High Risk Zone for the West Coast of Canada as shown below. This boundary can be refined based on Enhanced marine spill trajectory and fate modelling (Condition 6).</p> <p style="text-align: center;"><b>Figure 3: Excerpt — Overall Risk from Oil Spills — Pacific Sector</b></p>  <p>The sectors with the highest overall risk from oil spills were located in the Pacific and the Gulf of St. Lawrence. In the Pacific sector, sub-sector 5 was deemed very high risk due to the large volumes of vessel traffic and bulk oil movements that occur within close proximity to environmentally sensitive areas.</p>
6.	Enhanced marine spill trajectory and fate modelling	<p>KM-TMX must file with the NEB for approval, at least 3 years prior to commencing operations, a plan to prepare enhanced marine spill trajectory and fate modelling for the Westridge Terminal and marine tanker traffic from the terminal.</p> <p>Enhanced spill modelling is needed as part of the MREMP and is needed to inform the Boundary adjustments for MREMP program (Condition 4), Habitat Compensation Plans (Condition 7), Marine Research Program (Condition 8), and Oil Spill Response Plan (Condition 11).</p>

<sup>36</sup> [http://wcel.org/sites/default/files/file-downloads/131-17593-00\\_ERA\\_Oil-Spill-South\\_150116\\_pp1-124.pdf](http://wcel.org/sites/default/files/file-downloads/131-17593-00_ERA_Oil-Spill-South_150116_pp1-124.pdf)

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Condition	Title of Condition	Measurable outcomes for each condition and time lines.
		<p>The plan must be coordinated with the MREMP and include:</p> <ol style="list-style-type: none"> <li>1. A summary of KM-TMX consultation with Environment Canada regarding the scope of work to be undertaken. This summary must include issues or concerns raised regarding the scope of work and how KM-TMX has addressed or responded to them;</li> <li>2. A summary of KM-TMX consultation with the State of Washington regarding the scope of work to be undertaken. This summary must include any issues or concerns raised regarding the scope of work and how KM-TMX has addressed or responded to them;</li> <li>3. A summary of KM-TMX consultations with the stakeholders regarding the scope of the work undertaken. This summary must include any issues or concerns raised regarding the scope of work and how KM-TMX has addressed or responded to them;</li> <li>4. The membership of a Scientific Marine Modeling Committee and its Terms of Reference;</li> <li>5. A schedule for completing the work and confirmation that it will be completed prior to commencing operations and in sufficient time to inform oil spill preparedness and monitoring programs;</li> <li>6. The scenarios to be modelled, at minimum, must include Credible Worse Case (CWC) scenarios that define a Credible Worse Case Scenario on par with that used in the State of Washington (entire vessel cargo with a cap of 35,632t) with spill locations included in TMX modelling work (Race Rocks, Strait of Georgia, and Archane Reef) and with at least three additional locations: Oak Bay Islands, Spanish Banks, and J Buoy (Juan du Fuca entrance).</li> <li>7. How the models will be used to inform decision-making during spill preparedness planning and response exercises and actual spill events.</li> <li>8. Communicate and make available to stakeholders and the public the plans submitted to the NEB.</li> <li>9. Clarification of how KM-TMX will include the following in its enhanced modelling: <ol style="list-style-type: none"> <li>a. stochastic calculations and visual representations;</li> <li>b. how the model will be adapted to different physical and chemical characteristics of the oil that is intended to be shipped from the Westridge Terminal, with particular reference to density, viscosity, emulsion formation, adhesion properties, and evaporation rates;</li> <li>c. oil remobilization from the shorelines due to tidal or other influences, such as varying adhesion properties of the oil intended to be shipped from the Westridge Terminal, and oil retention times;</li> <li>d. submerged or entrained oil resurfacing;</li> </ol> </li> </ol>

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Condition	Title of Condition	Measurable outcomes for each condition and time lines.
		<ul style="list-style-type: none"> <li>e. potential for oil to sink based on weathering and adhesion to sediment;</li> <li>f. how weathering and trajectory models will be integrated to provide an accurate representation of the potential fate of oil within the environment;</li> <li>g. how the models will be adaptable to any time of the year and to varying meteorological and hydrological conditions.</li> </ul>
7.	Marine Habitat Compensation Plan	<p>KM-TMX must file with the NEB, at least 30 days prior to commencing construction, a Marine Habitat Compensation Plan as outlined by MREMP. With this plan, the following must be included:</p> <ol style="list-style-type: none"> <li>1. A letter from Fisheries and Oceans Canada indicating its approval of the plan;</li> <li>2. A summary of consultations with Fisheries and Oceans Canada, Environment Canada, Canadian Wildlife Service, BC Ministry of Environment, other appropriate stakeholders, and potentially-affected Aboriginal groups regarding the Marine Habitat Compensation Plan. This summary must include any issues or concerns raised by stakeholders regarding the plan and how KM-TMX has addressed or responded to them.</li> <li>3. Letters of endorsement of the plan from other Environment Canada, Canadian Wildlife Service and provincial Ministry of Environment and stakeholders engaged with the MREMP.</li> <li>4. This plan must be reviewed and refiled with the NEB file at least every five years to identify incremental improvements possible through the MREMP program and in cooperation with government agencies and stakeholders.</li> <li>5. KM-TMX must make the Habitat Compensation Plan publically available if not done so by MREMP.</li> </ol>
8.	Marine Research Program	<p>KM-TMX must file with the NEB, at least 3 years prior to commencing operations, a research plan from the MREMP for improving understanding of Dilbit impacts on the natural marine environment. This research plan is to focus on:</p> <ol style="list-style-type: none"> <li>1. The Dilbit toxicology research in the marine environment and lethal dosages for species and the degree to which research priorities clarified in Table 18 Table 28: Research Recommendation from the Dupuis, A., and Ucan-Marin, F. 2015 publication will be addressed.</li> <li>2. Understanding resilience and recovery of a variety of marine ecosystems from varying levels of hypothetical spills. The program is to test the hypothesis that ecosystems and species will fully recover from a Dilbit spill and clarify expected recovery periods.</li> <li>3. With this MREMP research, KM-TMX must include:</li> <li>4. A letter from Fisheries and Oceans Canada indicating its approval of the research plan and any</li> </ol>

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Condition	Title of Condition	Measurable outcomes for each condition and time lines.
		<p>role or commitment for participation provided;</p> <ol style="list-style-type: none"> <li>5. A letter from the Environment Canada and Canadian Wildlife Service indicating its approval of the research plan and any role or commitment for participation provided;</li> <li>6. A summary of KM-TMX consultation with Fisheries and Oceans Canada, Environment Canada, Canadian Wildlife Service, BC Ministry of Environment, other appropriate stakeholders, and potentially-affected Aboriginal groups regarding the Marine Habitat Compensation Plan. This summary must include any issues or concerns raised by stakeholders regarding the plan and how KM-TMX has addressed or responded to them;</li> <li>7. KM-TMX must file with the NEB annual progress reports on projects under the marine MREMP research program.</li> <li>8. The MREMP program must establish and support a science advisory panel to review the Research plan</li> <li>9. KM-TMX must make Research plan and project findings program publically available when reporting to NEB.</li> </ol>
9.	Mammal protection, tanker speed, drift and weather limitations operational measures	<p>KM-TMX must demonstrate how the MREMP research is mitigating impacts on marine mammals that is linked to the Marine transport from the Westridge terminal and what has changed with regard to operating procedures related to:</p> <ol style="list-style-type: none"> <li>1. Tankers' speed and reduced risk of marine mammal strikes and noise;</li> <li>2. The tanker drift study and appropriate mitigation based on the results of the study;</li> <li>3. Establishing vessel operational safety limits that address visibility, wind, and sea conditions;</li> <li>4. Sensitive areas for oil spill response in Geographic Response Plans developed in consultation with the Province of British Columbia and communities, FN and NGOs that could be affected in the event of a spill;</li> <li>5. Community Response Plans for participating coastal communities in the Salish Sea and Strait of Juan de Fuca.</li> </ol>

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Condition	Title of Condition	Measurable outcomes for each condition and time lines.
10.	Marine Research Program Progress Reports	<p>KM-TMX must file the MREMP research program progress reports with the NEB and make public, on or before 31 January of each year for the duration of the research program an overview of the progress on the toxicology and resilience and recovery of marine habitats and the extent to which the objectives of the MREMP program have been achieved. This includes:</p> <ol style="list-style-type: none"> <li>1. An update on timing and the status of the work undertaken that year;</li> <li>2. Results from research conducted during the calendar year prior to filing;</li> <li>3. Work plan budget estimates and partnership contributions to be undertaken in the upcoming year;</li> <li>4. Research findings and implications for incremental improvements in spill response and monitoring;</li> <li>5. Any other matters that the MREMP and KM-TMX want to bring to the NEB's attention related to the research project and recovery of ecosystems.</li> </ol>
11.	Oil Spill Response Plan	<p>KM-TMX must file with the NEB, at least 30 days prior to commencing construction, a plan for preparing the following documents:</p> <ol style="list-style-type: none"> <li>1. Marine Oil Spill Response Plan including a net environmental benefit analysis framework;</li> <li>2. All related and accompanying plans, such as Pre-SCAT (Shoreline Clean-Up Assessment Technique) and Marine Reserves Substrate Surveys, Response Tactics for Floating Oil, Response Tactics for Submerged and Sunken Oil, Control Points, Access Plans, Geographic Response Plans, an Oil Pollution Prevention Plan, and an Oil Pollution Emergency Plan;</li> <li>3. How the plan will be informed by Enhanced Spill Monitoring (Condition 5) and other MREMP monitoring and research projects;</li> <li>4. The plan must include the following information in relation to the above documents and steps to be undertaken in completing them; including consultation with the interested parties; and included in review of plans such as: Fire Departments, police, marine related industries, NGOs, police, staff from Federal Environmental agencies (DFO, TC, DND, Environment Canada) and staff from provincial Ministry of Environment and Emergency Management BC (the Provincial Emergency Program), willing First Nations and independent scientists). The consultation must include a cross section of public, private, FNs similar to Area Committee representatives involved with emergency planning in the marine environment.</li> </ol>

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Condition	Title of Condition	Measurable outcomes for each condition and time lines.
		<ol style="list-style-type: none"> <li>5. Approximate timing for the Emergency plan completion and a date for completion no later than a year prior to increasing tanker traffic;</li> <li>6. A description of all federal and provincial regulations that need to be adhered to;</li> <li>7. A list of interested individuals and stakeholder groups willing to review and provide improvements in Spill Plans;</li> <li>8. How the review by independent non government individuals has influenced the spill plan.</li> <li>9. Enhanced oil spill response capabilities, including identification and prioritized sensitive areas for oil spill response in Geographic Response Plans developed in consultation with the Province of British Columbia and communities that could be affected in the event of a spill; and Community Response Plans for participating coastal communities in the Salish Sea and Strait of Juan De Fuca;</li> <li>10. KM-TMX through its subsidiary WCMR Corp. must plan for thorough simulations and drills for a Worse Case Oil Spill equivalent to that in the State of Washington, and maintain equipment on scene equivalent to the on-hand resources called for in the State of Washington. KM-TMX must submit these for public and stakeholder input and revision.</li> </ol>
12.	Consultation with interested parties on emergency preparedness and marine spill response framework	<p>KM-TMX or its subsidiary WCMR Corp must file with the NEB, at least 3 years prior to commencing operations, a plan for consulting on emergency preparedness and response for marine oil tankers:</p> <ol style="list-style-type: none"> <li>1. The consultation plan's scope;</li> <li>2. The consultation plan's objectives include the marine spill response framework;</li> <li>3. A preliminary list of regulatory authorities to be consulted;</li> <li>4. A preliminary list of communities and Aboriginal groups to be consulted;</li> <li>5. A preliminary list of consultation locations and timing;</li> <li>6. The methods to track commitments made during consultation and incorporation of them into final Emergency Preparedness and Response Plans;</li> <li>7. How the elements of a world class spill response as outlined in the Nuka report 2013 Volume 3 have been addressed;</li> <li>8. How the spill preparedness framework and spill response plan and resources are equal to those State of Washington, and are equally accessible to the interested public.</li> </ol>

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## 7. REFERENCES

Note all references cited in this report are not in this reference section. Reports for specific ERs noted in Chapter three are accessible on the FER website <http://ecoreserves.bc.ca/> within each ER and are not repeated here. Also note that many references appear in footnotes with web links. Many are not repeated here.

The KM-TMX reports we reviewed are on the NEB site and more specific references were made to these in the IRs and not repeated here.

Most significant references are repeated here.

[A054 - National Energy Board - Exhibit List for Hearing Order OH-001-2014 \(A61576\)](#)

Date March 2015 Accessed just before we submit in May)

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# Final Evidence Report Submitted to the NEB from Board of FER for KM-TMX

## Appendices

### Appendix A: Letter of Support for BC Motion to Release Oil Spill Preparedness Plans to Intervenor



FRIENDS OF ECOLOGICAL RESERVES  
BOX 8477, VICTORIA, B.C. V8W 3S1  
CANADA

National Energy Board  
444 Seventh Avenue SW  
Calgary, AB T2P 0X8  
ATTN: Sheri Young, Secretary

Sent Dec 17 2014

Dear Ms. Young,

**RE: Notice of Motion by the Province of British Columbia submitted December 5, 2014 OH-001-2014 Trans Mountain Pipeline ULC ("Trans Mountain") Trans Mountain Expansion Project (the "Project") File Number OF-Fac-Oil-T260-2013-03 02**

As an Intervenor in the above mentioned application, the Board of Friends of Ecological Reserve's (Board of FER) provides the following comments in support for BC's Motion submitted by the Province of British Columbia on December 5, 2014.

Please be advised that the Board of FER supports the order sought in the Province of British Columbia's Notice of Motion dated December 5, 2014:

- a. An order that, by a fixed date, Trans Mountain file the information, identified herein, that was redacted from the Emergency Management Program documents filed on October 17, 2014;
- b. An order that Trans Mountain file the Oil Spill Response Plan of Western Canada Marine Response Corporation, by a fixed date;
- c. An order that, by a fixed date, Trans Mountain file responses to the outstanding items in Information Request No. 1 of the Province of British Columbia, as committed to in its response to the Notice of Motion of the Province of British Columbia dated July 4, 2014;
- e. Such other relief as the Board may consider appropriate in the circumstances.

The Board of FER supports the BC Government Order of Motion for the following reasons:

There are 17 Ecological Reserves along the tanker route with significant ecological values that are potentially impacted by an oil spill. Ecological Reserves (ERs) are managed by BC Parks

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and have the highest protection in the BC Parks System. For the BC government in general and in the case of ERs in particular we believe it is in the public interest to understand the state of preparedness and the role that KM together with the subsidiary company Western Canada Marine Response Corporation (WCMRC) intend to perform and what their emergency spill plan(s) looks like. We believe that organizations like FER and the ER wardens should be consulted on emergency planning with regard to oil spills and ERs. Silence or a lack of disclosure implies a lack of preparedness to respond in a timely and effective manner. As has been experienced in the past in BC, the public care deeply about their local environment. Whether First Nations or local residents, we share a common future and it is part of our west coast identity as well as how many draw their livelihood.

When the Nestucca oil spill occurred in Gray's Harbour Washington it was the residents of Tofino and Ucluelet together with other volunteers who did the oil removal from Long Beach. The Board of FER believes when there is an oil spill along the tanker route it will be the residents of Mayne Island, Galiano Island, Pender Island, Salt Spring Island, Saanich Peninsula, Victoria, Metchosin, Sooke, Port Renfrew, Ucluelet and Tofino and the many First Nations whose traditional lands border the tanker route who will suffer the impacts and who will desperately want to restore the marine ecosystems to a semblance of their former productivity. It is uncertain for example that the three days provided in the WCMRC handbook for response to a spill at Race Rocks is adequate and should be accepted. (Source <http://wcmrc.com/wp-content/uploads/2013/06/WCMRC-Information-Handbook-2012.pdf>) Without disclosure of the emergency spill plan the knowledge of how to augment a recovery is not possible.

FER does not accept the statements that “*emergency management plans are proprietary and of a sensitive nature and due to security concerns are not publicly available nor will they be made available.*” Nor can we accept the approach advocated by Trans Mountain (TM) that TM can dictate who is allowed to see the level of preparedness and even then only if those allowed by TM through signed confidentiality agreements.

There is also a serious disconnect between what WCMRC professes to be as a Corporation and as stated in their 2012 handbook (link above).

*We (Western Canada Marine Response Corporation) value:*

- 1. Open and honest communication that fosters a climate of trust.*
- 2. Integrity in all our business practices*
- 3. Being a steward of the environment*
- 4. Success through competency, creativity and teamwork*
- 5. Celebrating individual and team successes.*

To have these good values announced as the corporate culture does mean a great deal with regard to social license. There is a serious level of duplicity by TM when they seek to deny access through the NEB process to emergency plans on how a spill may be managed. To keep this from the government of BC who represent the citizens shows these as hollow pledges to the public and undermines public trust including that of Board of FER.

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On the December 11<sup>th</sup> TM made their intentions known with regard to information when they asked NEB to dismiss the BC motion seeking discourse. The BC government in our opinion is correctly following a course of due diligence with regard to understanding risk and liabilities for all British Columbians. We trust that the NEB will be able to support the BC government's request and force disclosure. We believe this is needed so all intervenors as well the general public understand what level of preparedness now exists, what will happen when there is an oil spill. This can only occur if there is a thorough review of adequacy in an open and transparent manner within the NEB process.

In the filing of Dec. 11 by Trans Mountain [B296-1 - Response to Province of British Columbia Notice of Motion dated December 5, 2014 - A4F9H5](#) we see the following: “ *Numerous other intervenors, as well as the Board (NEB), submitted IRs regarding various aspects of Trans Mountain's existing and future emergency management and emergency response plans for the land and marine aspects of the Project. In Intervenor IR round 1 Trans Mountain responded to over 1000 IR's regarding this issue.*”

The Board of FER was one of those Intervenor who did indeed submit IR's in round one on that subject. See Trans Mountain Response to Board of Friends of Ecological Reserves Round 1 Intervenor IR Motion (<https://docs.neb-one.gc.ca/11-eng/11isapi.dll/Open/2487006>)

For instance we submitted the following IRs and two examples are repeated below with TM answers to illustrate why we support for the BC government motion.

The Board FERs Information Request (#14) sought information on emergency planning and the TM role. Our IR stated “What does KM plan for euthanizing and disposal of oiled marine animals? Removal of contaminated birds from Ecological Reserves may be needed. We are concerned that if they remain in the marine ecosystem they will continue to pass their toxicity through the food web. These contaminated animals will need to be removed and we are unsure of training and resources for this. We are concerned with public safety around possible contact with toxic contaminated wildlife”.

Trans Mountain replied “*The Responsible Party (RP) will work through the Incident Command System (ICS) to manage an oil spill; this includes procurement of wildlife rehabilitation organizations through the Logistics Section and demobilization of those resources through the Demobilization Unit. Within the ICS, wildlife rehabilitation efforts are organized under the Wildlife Branch Director; those activities are permitted and supervised by the resource trustee agencies. It is common practice worldwide to remove oiled wildlife mortalities from the environment*”.

When Trans Mountain was challenged on the adequacy of this answer TM responded with the boiler plate answer that we understand was used for many other the intervenor's as well: “*The requested information has been provided and Trans Mountain's response is full and adequate. The response provides the Board with all necessary information pertaining to this matter. There is no further response required and supplementing the original response will not serve any purpose. Trans Mountain notes that if the Intervenor disagrees with the information contained in the response, it may contest the information through evidence or final argument.*”

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Our second example of the TM response to emergency planning is from IR (#15). We asked, “What are the plans for public education to avoid hazard to human health? We are concerned that information regarding chemical make-up of products transported at sea is not known to the public and that there will be insufficient time and resources on hand to address a worst case toxic spill.”

*“Information about the products that are shipped on Trans Mountain Pipeline is publicly available and can be found as per the response to City Burnaby IR No.1.25.05b. Section 5.7 of Volume 8 discusses a hypothetical oil spill scenario in the marine environment. Included in this section is an analysis and summary of effects on marine shoreline habitats, marine birds, marine fish and marine mammals. Please refer to Section 8.8.2 of Volume 5B of the Application for a summary of the anticipated human health effects assessment resulting from spills at Burnaby or Westridge Terminals. A detailed Human Health Risk Assessment (HHRA) will be completed and submitted to the NEB on June 16, 2014 to corroborate these conclusions and inform mitigation and emergency response plans. Also refer to Section 6.3.2 of Volume 7 which highlights the HHRA completed for past incidents of oil spills.”*

This response effectively said to us that it was someone else’s responsibility and not theirs. When TM was challenged on the inadequacy of this answer, they responded with the same generic boiler-plate answer often used for many of the Intervenor.

*The requested information has been provided and Trans Mountain’s response is full and adequate. The response provides the Board with all necessary information pertaining to this matter. There is no further response required and supplementing the original response will not serve any purpose. Trans Mountain notes that if the Intervenor disagrees with the information contained in the response, it may contest the information through evidence or final argument.”*

We have interpreted the responses to our questions on what will TM do about emergency oil spills to mean that there will be no TM resources made available and in the case of toxic wildlife that the Ministry of Environment will need to deal with this problem under the Wildlife Act. We do not support this cost if transferred to BC. Similarly on public safety and education TM is prepared to do nothing so it will transfer costs to emergency responders and local governments.

The Board of Friends of Ecological Reserves sought and received Intervenor standing. We understood this would be a transparent and open process. We have used volunteer time without financial compensation, to ensure that there would be minimal risk of oil spills contaminating the 17 Marine Ecological Reserves of Southern Vancouver Island and an emergency and restoration plan in place prior to project approval was publically transparent and understood. We look to the NEB to provide openness and transparency and to making a ruling to support the government motion and make spill plan available to all concerned intervenors.

In the months of the past year, we have witnessed refusals by Trans Mountain to provide information in a transparent manner but to rather obscure or withhold information. Intervenor like Robyn Allen are to be commended in trying to ensure public accountability of TM and challenge the NEB to be even handed and fulfill its mandate. We are perplexed by the continual

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efforts to withhold information from BC citizens through non-cooperation with the Province of British Columbia who are on paper a supposed partner.

The BC government has the ability to require an independent Environmental Assessment 2 it be unable to obtain the information through the NEB process so they can assess whether this project is in the BC's public interest. The Board of FER believes that BC government is concerned about its role and the role of Kinder Morgan/Trans Mountain in oil spill response and the extent to which it will be required to pick up oil spill liability. It seems reasonable for the Province of BC to conduct its own Environmental Assessment if the NEB process is incapable of supporting a call for this information from the proponent. This information is needed to assess the liability and risk and the question of whether or not the public interest of BC citizens is being served by this project.

In conclusion:

The Board of the Friends of Ecological Reserves fully supports the Province of British Columbia's Notice of Motion and requests an order that :

Requires Trans Mountain to file on or before January 12, 2015, the information that was redacted from the Emergency Management program documents filed on October 17, 2014.

Trans Mountain file, on or before January 12, 2015, the Oil Spill Response Plan of WCMRC and any other outstanding WCMRC information:

The Deadline for round 2 Information Requests shall be extended by at least three weeks .We must have a reasonable opportunity to review and consider Trans Mountains EMP documents, WCMRC's oil spill response plan, as well as the other information requested in order to develop information requests relating to these documents.

Such relief as the Board deems appropriate in these circumstances

Respectfully yours and on behalf of the Board of the Friends of Ecological Reserves.



Mike Fenger  
RP Forester  
President  
Friends of Ecological Reserves



Garry Fletcher  
Board member

Cc: Marilyn Lambert (Board member)

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