OH-001-2014
Trans Mountain Pipeline ULC (Trans Mountain)
Trans Mountain Expansion Project (Project)
File OF-Fac-Oil-T260-2013-03 02

Raincoast Conservation Foundation Information Request No. 1 to Trans Mountain Pipeline ULC

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QUALIFICATIONS OF TECHNICAL REPORT AUTHORS

1.1 Identification and qualification of technical report authors

References: i) National Energy Board, *Intervenor Workshop, Part 1: Written Submissions, Trans Mountain Expansion Project*, April 2014, online at http://www.neb-one.gc.ca/clf-nsi/rthnb/pplctnsbfrthnb/trnsmntnxpnsn/trnsmntnxpnsnprsnttn/ntrvnrwrkshp-eng.pdf, at 11.

ii) References identified in Tables A and B below.

Preamble: For the technical reports identified in Table A below, a corporate author is identified, but the individual authors of the report are not identified. Therefore, it is impossible for Interveners or the Board to assess the qualifications and expertise of the authors of the technical report.

Similarly, for the technical reports identified in Table B below, individual authors are identified but no information is provided on the qualifications of the authors of the report.

It is impossible for the Interveners and the Board to determine the relative weight to be assigned to expert reports and opinions when the qualifications of the authors are not set out in the technical reports.

In Reference (i), the Board has indicated that Interveners should set the context for their written submission by describing their expertise. Fairness would dictate that Trans Mountain also establish the expertise of their consultants.

Request: a. For the technical reports identified in Table A below, please provide the names of the individual authors and curriculum vitae setting out the author(s)' qualifications.

b. For the technical reports identified in Table B below, please provide curriculum vitae setting out the qualifications of the named authors.

Table A

Ref. No.	Report Title	Corporate Author
A3S1U8 through A3S1W4	*Groundwater Technical Report for Trans Mountain Pipeline ULC, Trans Mountain Expansion Project*	Waterline Resources Inc.
A3S1W6 through A3S1Z6	*Fisheries (Alberta) Technical Report for Trans Mountain Pipeline ULC, Trans Mountain Expansion Project*	TERA Environmental Consultants
A3S2C1 through A3S2G5	*Fisheries (British Columbia) Technical Report for Trans Mountain Pipeline ULC, Trans Mountain Expansion Project*	Triton Environmental Consultants Ltd.
A3S2H5 through A3S2I5	*Wetland Evaluation Technical Report for Trans Mountain Pipeline ULC, Trans Mountain Expansion Project*	TERA Environmental Consultants
A3S2I7 through A3S2Q2	*Vegetation Technical Report for Trans Mountain Pipeline ULC, Trans Mountain Expansion Project*	TERA Environmental Consultants
A3S2Q3 through A3S2R4	*Wildlife Technical Report for Trans Mountain Pipeline ULC, Trans Mountain Expansion Project*	TERA Environmental Consultants
A3S2R5	*Wildlife Modelling and Species Accounts Technical Report for Trans Mountain Pipeline ULC, Trans Mountain Expansion Project*	TERA Environmental Consultants
A3S2R6	*Marine Sediment and Water Quality, Westridge Marine Terminal, Technical Report for Trans Mountain Pipeline ULC, Trans Mountain Expansion Project*	Stantec Consulting Ltd.
A3S2R7	*Marine Resources, Westridge Marine Terminal, Technical Report for Trans Mountain Pipeline ULC, Trans Mountain Expansion Project*	Stantec Consulting Ltd.
A3S2R8	*Marine Birds, Westridge Marine Terminal, Technical Report for Trans Mountain Pipeline ULC, Trans Mountain Expansion Project*	Stantec Consulting Ltd.
A3S4J5 Pages 1 - 118	*Marine Resources, Marine Transportation Technical Report for the Trans Mountain Pipeline ULC Trans Mountain Expansion Project*	Stantec Consulting Ltd.
A3S4J6	*Marine Birds*, *Marine Transportation Technical Report for the Trans Mountain Pipeline ULC Trans Mountain Expansion Project*	Stantec Consulting Ltd.
A3S4K3	*Traditional Marine Resource Use – Marine Transportation Technical Report for Trans Mountain Pipeline ULC Trans Mountain Expansion Project*	TERA Environmental Consultants

Ref. No.	**Report Title**	**Corporate Author**
A3S4K4 A3S4K5 A3S4K6	*Marine Commercial, Recreation and Tourism Use - Marine Transportation Technical Report for Trans Mountain Pipeline ULC Trans Mountain Expansion Project*	TERA Environmental Consultants
A3S4K7	*Ecological Risk Assessment of Marine Tanker Spills, Technical Report for Trans Mountain Pipeline ULC Trans Mountain Expansion Project*	Stantec Consulting Ltd.
A3S4R1	*Screening Level Human Health Risk Assessment of Marine Transportation, Technical Report for Trans Mountain Pipeline ULC Trans Mountain Expansion Project*	Intrinsik Environmental Sciences Inc.
A3S4R2	*Qualitative Human Health Risk Assessment of Marine Transportation Spills, Technical Report for Trans Mountain Pipeline ULC Trans Mountain Expansion Project*	Intrinsik Environmental Sciences Inc.
A3S4R8 Pages 50-74	*Projections of Vessel Movements Report*	Seaport Consultants Canada Inc.
A3S4S0 through A3S4S7	*TERMPOL 3.3 – Fishery Resources Survey, Trans Mountain Expansion Project*	TERA Environmental Consultants Stantec Consulting Ltd.
A3S4T0	*Trans Mountain Pipeline ULC, Trans Mountain Expansion Project Simulation Study, Analysis of Second Narrows Transits*	Ausenco
A3S4X4, pages 39-40; A3S4X5 through A3S4Y2; A3S4Y3, pages 1-285	*Application, Vol. 8A – Marine Transportation, Section 4.0, Environmental and Socio-Economic Assessment*	Rowan Williams Davies and Irwin Inc. Stantec Consulting Ltd. TERA Environmental Consultants Intrinsik Environmental Services Inc. Vista Strategy Corp.
A3S5G2 A3S5G4 A3S5G5	*A Study of Fate and Behavior of Diluted Bitumen Oils on Marine Waters*	Witt Obrien’s Polaris Applied Sciences Western Canada Marine Response Corporation
A3S5G7	*A Comparison of the Properties of Diluted Bitumen Crudes with Other Oils*	Polaris Applied Sciences Inc.

Ref. No.	Report Title	Corporate Author
A3S5I9	*Review of Trans Mountain Expansion Project Future Oil Spill Response Approach Plan Recommendations on Bases and Equipment*	Western Canada Marine Response Corporation

Table B

Ref. No.	Report Title	Corporate Author	Personal Author(s)
A3S1T3	*Trans Mountain Pipeline ULC, Trans Mountain Expansion Project, Acid Rock Drainage and Metal Leaching Potential*	BGC Engineering Inc.	Tracye Davies Alex Baumgard Rob Marsland
A3S1T4 A3S1T5 A3S1T6	*Soils Technical Report for the Trans Mountain Expansion Project*	Mentiga Pedology Consultants Ltd.	A.G. Twardy B. Cernipeski
A3S1T7 A3S1T8 A3S1T9	*Terrestrial Noise and Vibration Technical Report for the Trans Mountain Pipeline ULC Trans Mountain Project*	RWDIAIR Inc.	Teresa Drew Craig Vatcher Aaron Haniff Gillian Redman Gerrit Atkinson Erica Stolp Matthew Johnston Nghi Nguyen Matthew Sawycky Dave Horrocks
A3S1U0 A3S1U1 A3S1U2 A3S1U3, pages 1-33 A3S1U4, pages 11-53, A3S1U5 A3S1U6 A3S1U7	*Air Quality and Greenhouse Gas Technical Report for the Trans Mountain Pipeline ULC Trans Mountain Project*	RWDIAIR Inc.	David Chadder Craig Vatcher Christian Reuten Nancy Chan Julia Veerman Jyotsna Kashyap Golnoosh Bizhani Noam Bar-Nahoum
A3S1U3, pages 34-53 A3S1U4, Pages 1-10	*Community Multi-scale Air Quality (CMAQ) Modelling for the Trans Mountain Expansion Project*	RWDIAIR Inc.	David Chadder Jeff Lundgren Martin Gauthier Saba Hajaaghassi Christian Reuten

Ref. No.	Report Title	Corporate Author	Personal Author(s)
A3S4J5 Pages 119-173	*Underwater Noise Modelling for Trans Mountain Expansion Project, Burrard Inlet, Gulf Islands and Juan de Fuca Strait*	Jasco Applied Sciences	Zizheng Li Alexander MacGillivray
A3S4J7 A3S4J8 A3S4J9 A3S4K0	*Marine Air Quality and Greenhouse Gas Marine Transportation Technical Report for Trans Mountain Pipeline ULC Trans Mountain Expansion Project, Final Report*	RWDIAIR Inc.	David Chadder Craig Vatcher Nancy Chan Trudi Trask Alena Saprykina Michelle Seguin Julia Veerman
A3S4K1	*Community Multi-scale Air Quality (CMAQ) Modelling for Trans Mountain Expansion Pipeline Project: Final Report*	RWDIAIR Inc.	David Chadder Jeff Lundgren Martin Gauthier Saba Hajaghassi Christian Reuten
A3S4K2	*Marine Noise (Atmospheric) – Marine Transportation Technical Report for Trans Mountain Pipeline ULC Trans Mountain Expansion Project, Final Report*	RWDAIR Inc.	Teresa Drew Craig Vatcher Nghi Nguyen
A3S4R6	*TERMPOL 3.1 – Introduction, Trans Mountain Expansion Project*	Moffatt & Nichol	James Traber Ron Byres
A3S4R7 A3S4R8 pages 1-49	*TERMPOL 3.2 – Origin, Destination and Marine Traffic Volume Survey*	Moffatt & Nichol	James Traber Ron Byres
A3S4R9	*Traffic Statistics for 2012*	Det Norske Veritas	Vincent Demay Ole Oystein Aspholm Nick Roper
A3S4S8	*TERMPOL 3.6 – Special Underkeel Clearance Survey, Trans Mountain Expansion Project*	Moffatt & Nichol	James Traber Ron Byres
A3S4S9	*TERMPOL 3.7 – Transit Time & Delay Survey, Trans Mountain Expansion Project*	Moffatt & Nichol	James Traber Ron Byres
A3S4T1	*TERMPOL 3.8 – Casualty Data Survey, Trans Mountain Expansion Project*	Det Norske Veritas (U.S.A.) Inc.	Vincent Demay Ole Oystein Aspholm Nick Roper
A3S4T2	*TERMPOL 3.9 – Ship Specifications, Trans Mountain Expansion Project*	Moffatt & Nichol	James Traber Ron Byres

Ref. No.	**Report Title**	**Corporate Author**	**Personal Author(s)**
A3S4T3	*TERMPOL 3.10 – Site Plans and Technical Data, Trans Mountain Expansion Project*	Moffatt & Nichol	James Traber Ron Byres
A3S4T4	*Westridge Marine Terminal 2013 Interm*[sic] *Meteorological Report*	EBA	Robert E Draho James Stronach
A3S4T5	*Oceanographic Observations at Trans Mountain's Westridge Marine Terminal*	EBA	Justin Rogers James Stronach
A3S4T6	*TERMPOL 3.11 – Cargo Transfer and Transshipment Systems, Trans Mountain Expansion Project*	L.J. Swann & Associates Moffatt & Nichol	Capitan John Swann James Traber Ron Byres
A3S4T7	*TERMPOL 3.5 & 3.12 – Route Analysis & Anchorage Elements, Trans Mountain Expansion Project*	L.J. Swann & Associates Moffatt & Nichol	Capitan John Swann James Traber Ron Byres
A3S4U0 through A3S4U4	*Summary Report of Manoeuvring Assessment, Westridge Terminals Vancouver Expansion, Design Options 11 and 12*	LANTEC Marine Inc.	Garland Hardy Bikramjit Kanjilal
A3S4U6 through A3S4U9	*Meteorological and Oceanographic Data Relevant to the Proposed Westridge Terminal Shipping Expansion*	EBA	Albert Leung Travis Miguez James Stronach
A3S4V0	*TERMPOL 3.13 – Berth Procedures and Provisions, Trans Mountain Expansion Project*	Moffatt & Nichol	James Traber Ron Byres
A3S5F4 A3S5F6 A3S5F8	*TERMPOL 3.15 – General Risk Analysis and Intended Methods of Reducing Risks, Trans Mountain Expansion Project*	Det Norske Veritas (U.S.A.) Inc.	Ole Aspholm Vincent Demay Tim Fowler Per Sollie Nick Roper
A3S5G0	*An Evaluation of Local Escort and Rescue Tug Capabilities in Juan de Fuca Strait*	Robert Allan Ltd.	Mike Phillips Robert G. Allan
A3S5G9 through A3S5I7	*Modelling the Fate and Behaviour of Marine Oil Spills for the Trans Mountain Expansion Project*	EBA	Aurelien Hospital Travis Miguez James Stronach
A3S5I8	*Methods for Estimating Shoreline Oil Retention*	Coastal and Ocean Resources	John R. Harper

Ref. No.	Report Title	Corporate Author	Personal Author(s)
A3S5J0 through A3S5J5	*Trans Mountain Expansion Project Oil Spill Response Simulation Study, Arachne Reef and Westridge Marine Terminal*	EBA Western Canada Marine Response Corporation	Aurelien Hospital James Stronach M.W. McCarthy Mark Johncox
A3S5J7	*TERMPOL 3.16 & 3.17 – Port Information and Terminal Operations Manual, Trans Mountain Expansion Project*	Moffatt & Nichol	James Traber Ron Byres
A3S5J9	*TERMPOL 3.18 – Contingency Planning*	Moffatt & Nichol	James Traber Ron Byres
A3S5K1	*TERMPOL 3.19 – Oil Handling Facilities Requirements*	Moffatt & Nichol	James Traber Ron Byres

MARINE ENVIRONMENTAL IMPACTS

1.2 Marine environmental impacts: assessment of alternative shipping routes

References: i) A3S4X4, Application Volume 8A – Marine Transportation, Section 2.2.2, PDF page 21 of 40.

ii) National Energy Board, "Filing Requirements Related to the Potential Environmental and Socio-Economic Effects of Increased Marine Shipping Activities, Trans Mountain Expansion Project", (10 September 2013), PDF page 1 of 3.

iii) *Canadian Environmental Assessment Act, 2012*, SC 2012, c 10, s 52, at s 19(1) (a), (g).

Preamble: Reference (i) states, "Alternatives related to the tanker shipping lanes and traffic patterns were not considered as the shipping lanes established in the Salish Sea region have proven effective at safely managing the existing volumes of marine traffic in this region." The basis for this statement is not provided.

Reference (ii) requires that the proponent provide information on the potential environmental and socio-economic effects of marine shipping activities, including the potential effects of accidents or malfunctions that may occur.

Section 19(1)(a) of *CEAA, 2012* (Reference (iii)) requires that the environmental assessment of the Project must take into account the cumulative environmental effects likely to result from the Project in combination with other physical activities.

Section 19(1)(g) of *CEAA, 2012* (Reference (iii)) requires that the environmental assessment of the Project must take into account alternative means of carrying out the Project.

Request: a. Please provide evidence that existing shipping lanes and traffic patterns can cope safely with the anticipated *higher* levels of shipping traffic arising from the proposed Project, as well as expansion of Port Metro Vancouver and other projects.

b. Please provide an analysis of the relative safety of alternate shipping lanes and traffic patterns in the Salish Sea given Project-related marine traffic and other anticipated increased marine traffic.

1.3 Marine environmental impacts: atmospheric sound emissions

Reference: A3S4X8, Application Volume 8A – Marine Transportation, Section 4.2.5.3, Table 4.2.5.1, PDF pages 10, 11 of 23.

Preamble: Reference (i) states, "Current marine traffic levels in the Marine RSA are high, with a small contribution from marine vessels associated with existing Trans Mountain operations."

Table 4.2.5.1 (Reference (i)) as presented is unclear. The column header reads, "Octave Spectrum (dB)", but the numbers in the following rows (31.5, 63, 125 etc.) are in Hz, not dB. These are the centre frequencies (in Hz) for standard octave bands. The values under each row (e.g., 127.8, 115.2 etc) are in dB. Those are meant to be received levels at some range.

The accompanying text for Table 4.2.5.1 (Reference (i)) reads, "The estimated sound emission levels from the tugs and tankers for use in calculation of sound levels at distance calculations are listed in Table 4.2.5.1."

Request: a. Did Trans Mountain also consider anthropogenic noise from small boats, which are already named as a threat to recovery of southern resident killer whales at existing traffic levels, or was only noise from tankers without other vessel traffic considered?

b. Please provide details as to which anthropogenic noise sources are included in the assessment, and the references for these sources, should they exist.

c. Please clarify the units of measurement in Table 4.2.5.1 (Reference (i)).

d. What was the distance at which the received level was modeled (Reference (i))?

1.4 Marine environmental impacts: Marine RSA boundaries

References: i) A3S4K7, Application Vol. 8B – Technical Report, Ecological Risk Assessment of Marine Transportation Spills, PDF pages 27, 28 of 116.

ii) A3S4K8, Application Vol. 8B – Technical Report, Ecological Risk Assessment of Marine Transportation Spills, PDF pages 1, 2, 5, 6 of 9.

Preamble: Trans Mountain identified the Marine RSA as being "the area of ecological relevance where environmental effects could potentially result from accidents and malfunctions. This area is effectively established by the limits of the domain for the stochastic oil spill modeling" (Reference (i)). Trans Mountain did not include northern parts of the Strait of Georgia, Puget Sound and open Pacific Ocean waters westward of the 12 nautical mile limit of Canada's territorial sea (Reference (i)). However, a large number of hypothetical oil spill scenarios demonstrate that the probability of oil presence and the probability for the shore to be oiled is greater than 0% in areas outside the Marine RSA (i.e. Figures D.1-2, D.1-3, D. 2-2, D.2-3, Reference (ii).

Request: a. Please provide the number of hypothetical oil spill scenarios that resulted in the probabilities of oil presence and shore oiling being greater than 0% *outside* of the Marine RSA.

b. Please provide the number of hypothetical oil spill scenarios that resulted in the probabilities of oil presence and shore oiling being 0% *outside* of the Marine RSA.

c. Given that multiple hypothetical oil spill scenarios resulted in probabilities of oil presence and shore oiling being greater than 0% outside the Marine RSA, please provide additional justification for the existing Marine RSA boundaries.

1.5 Marine environmental impacts: intertidal and subtidal habitat near the Westridge Marine Terminal

References: A3S1R0 Application Volume 5A – Environmental and Socio-Economic Assessment - Biophysical
i) PDF page 46 of 260
ii) PDF page 47 of 260.

Preamble: Reference (i) states that 5,470 m^2 of intertidal habitat will be lost in the vicinity of the Westridge Marine Terminal due to construction of additional berths, but that this loss will be offset by the creation of 3,770 m^2 of rip rap (rubble) intertidal habitat. It is not clear from the reference what the original 5,470 m^2 of intertidal habitat lost during construction consisted of. Intertidal habitats of different substrate types and grain sizes may support very different intertidal communities, and infilling of rip rap will only serve as an appropriate offset for some types of intertidal habitat.

Reference (ii) states that 17,100 m^2 of soft sediment subtidal habitat will be lost as a consequence of Westridge Marine Terminal expansion, but that this will also be offset by the construction of 5,550 m^2 of subtidal rip rap habitat. Soft sediment habitat and rip rap will likely support vastly different faunal and algal communities

Request: a. Please provide details on the type of intertidal habitat lost during terminal expansion and how the communities supported by this habitat compare to those supported by rip rap.

b. Please justify why creation of rocky subtidal (rip rap) habitat is expected to provide a reasonable offset for the destruction of soft-sediment habitat.

1.6 Marine environmental impacts: impact of Project-related vessel wake on structure-forming intertidal organisms

Reference: i) A3S4Y3 Application Volume 8A – Marine Transportation, Section 4.3.6.4.2, PDF page 55 of 294.

Preamble: Reference (i) notes that wake caused by Project-related vessels could lead to the dislodgement of structure-forming intertidal organisms (algae and sessile invertebrates) along the shoreline. Such reductions in the cover of structure-forming organisms may lead to indirect effects on intertidal biodiversity through destruction of habitat. Reference (i) states that no measures are necessary to mitigate these impacts of vessel wake, but provide no estimates of what the impact of wake on structure-forming intertidal organisms would be.

Request: a. Please provide a quantitative assessment of the impact of vessel wake on structure-forming intertidal organisms (e.g., in terms of percent cover lost due to Project-related vessel activity).

b. Please provide justification for the recommendation that no mitigation measures be taken to limit the effects of vessel wake.

1.7 Marine environmental impacts: effects of increased vessel wake frequency on the intertidal community

References: i) A3S4Y3, Application Volume 8A – Marine Transportation, Section 4.4.4.3.1, PDF page 239 of 294.

ii) A3S4X4, Application Volume 8A – Marine Transportation, Table 4.1.1.1, PDF page 40 0f 40.

Preamble: Reference (i) notes that wake heights from Project-related vessel traffic "are predicted to be within the range of natural wave conditions" and are therefore unlikely to negatively affect biophysical characteristics of intertidal habitat along the marine transport route.

Reference (ii) notes that, as a result of the Project, vessel traffic leaving the Westridge Marine Terminal and transiting through the Salish Sea will increase from 5 to 34 vessels per month.

The focus on wake height in Reference (i) does not take into consideration the 580% increase in the frequency of Project-related vessel traffic along the marine transport route (Reference (ii)) and the concomitant increase in exposure of intertidal habitats to vessel wake. This increase in wake frequency will increase the occurrence of periods of high turbidity (particle suspension) – which may interfere with filter feeding organisms such as barnacles and mussels – and will increase the frequency of both displacement of settling invertebrate larvae and physical disturbance to fish and invertebrates using shoreline habitats.

Request: a. Please provide an assessment of the cumulative effects of increased Project-related vessel wake frequency on the biophysical characteristics of intertidal habitat.

1.8 Marine environmental impacts: recovery of oiled shoreline habitat

References: i) A3S5Q3, Volume 8A – Marine Transportation, Section 5.6.2.1.1, PDF page 15 of 29.

ii) Harwell, M.A. and Gentile, J.H. 2006. Ecological significance of residual exposures and effects from the Exxon Valdez oil spill. *Integrated Environmental Assessment and Management* 2, 204 - 246.

iii) Peterson, C.H., Rice, S.D., Short, J.W., Esler, D., Bodkin, J.L., Ballachey, B.E. & Irons, D.B. 2003. Long-term ecosystem response to the Exxon Valdez oil spill. *Science*, 302, 2082-2086.

Preamble: Reference (i) states that "recovery of oiled shoreline habitat within 2 to 5 years following a large oil spill is a reasonable expectation…". This statement is based on Reference (ii), which reviewed the recovery of shoreline habitat in Prince William Sound, Alaska following the Exxon Valdez Oil Spill (EVOS). However the conclusions of Reference (ii) are highly controversial, and in direct contradiction of several other studies, notably those reviewed in Reference (iii), which found substantial residual effects of oil on shoreline habitats lasting at least a decade following EVOS. These residual effects include changes in community structure following initial die-offs of the habitat-providing alga *Fucus gardneri*, and chronic exposure of sediment-affiliated species (bivalves and the mammals and birds that feed on them) to oil-related toxins.

Request: a. Please provide a detailed justification or revision of the predicted 2 to 5 year recovery time for oiled shoreline habitat that takes into consideration not only the persistence of oil along the shoreline, but also the community-level and indirect effects of initial oiling and persistent toxicity considered in Reference (iii).

1.9 Marine environmental impacts: persistence of oil in shoreline habitats

References: i) A3S4Y9, Application Volume 8A – Marine Transportation, Section 5.6.2.5.1, PDF page 18 of 28.

ii) Hayes, M.O. and Mitchell, J. 1999. Factors determining the long-term persistence of Exxon Valdez oil in gravel beaches. *Marine Pollution Bulletin*, 38, 92-101.

Preamble: Reference (i) states that shoreline habitats consisting of low exposure cobble/boulder veneer over sand (a common shoreline type along the marine transportation route) are "readily restored if oiled, and would recover in a relatively short period of time."

Reference (ii) notes that the shoreline type described above (cobble/boulder veneer over sand) is known to sequester oil for extended periods of time (i.e., at least 8 years following EVOS).

Request: a. Please provide justification for the conclusion that shoreline habitats consisting of low exposure cobble/boulder veneer over sand will recover quickly, despite evidence that this shoreline type sequesters oil for extended periods following a large oil spill.

1.10 Marine environmental impacts: chronic small discharges of oil

References: i) A3S4Y3, Application Volume 8A – Marine Transportation, Section 4.3.2, PDF pages 17, 18, 19 of 294.

ii) A3S4Y3, Volume 8A – Marine Transportation, Section 4.3.13, PDF pages 196, 197 of 294.

iii) MacDuffee, M., Rosenberger, A. R., Dixon, R., Price, M. H. H., Paquet, P. C. 2013. Embroiled, Volume 1: Salmon, tankers and the Enbridge Northern Gateway Proposal. Raincoast Conservation Foundation. Sidney, British Columbia. Vers 01-13, pp. 107.

iv) Serra-Sogas, N., O'Hara, P. D., Canessa, R., Keller, P., Pelot, R. 2008. Visualization of spatial patterns and temporal trends for aerial surveillance of illegal oil discharges in western Canadian marine waters. Marine Pollution Bulletin. 56(5): 825-833.

Preamble: References (i) and (ii) cross reference each other with respect to release of low volumes of hydrocarbons through bilge water and routine operations, but neither addresses the ecological impacts of the cumulative effects of these small releases. Studies from Exxon Valdez revealed clearly that spilled hydrocarbons are lethal to pink salmon and Pacific herring eggs at much lower concentrations than previously thought.

Request: a. Given the evidence in Reference (iii) that the cumulative effects of oil releases can have significant ecological effects, please provide referenced justification for why the cumulative ecological effects of small discharges of oil likely to occur with Project-related marine traffic was not included in the submission?

b. Given the evidence in Reference (iv) and elsewhere, please provide additional information on chronic small discharges of oil as an existing habitat disturbance in the Marine and Terminal RSAs.

c. Please provide additional information regarding the potential effects of Project-related vessel chronic oils spills (e.g. routine discharge of <15 mg/L or accidental/malfunction-related discharge of >15 mg/L oil into marine environments) to Pacific herring and associated habitats.

1.11 Marine environmental impacts: chronic small discharges of oil

References: i) A3S4X6, Application Vol. 8A – Marine Transportation, Section 4.2.2.1, PDF pages 10-11 of 11.

ii) U.S. Environmental Protection Agency. 2013. Vessel General Permit for Discharges Incidental to the Normal Operation of Vessels (VGP): Authorization to discharge under the National Pollution Discharge Elimination System, Section 2.2.9. Controllable Pitch Propeller and Thruster Hydraulic Fluid and Other Oil-to-Sea Interfaces. p 47, Available at http://cfpub.epa.gov/npdes/vessels/vgpermit.cfm

Preamble: Reference (i) states: "Shipping activities have the potential to affect water quality through release of ballast or bilge water….. Bilge water must be treated to remove oils and grease prior to discharge. Therefore, any releases of oily water would be due to an accident or malfunction (Section 4.3.13) **and not routine operations**. Reports of marine oil spills and sheens are addressed through the Regional Marine Information Centre, which coordinates a response through various agencies, including the CCG. Given that spills and sheens can originate from land or sea (commercial or recreational marine vessels), it can be challenging to identify a source." (Emphasis added)

The operation of freighters and tankers with oil lubricated external propellers and parts is a known chronic source of oil pollution that adversely affects marine life, particularly marine birds.

In December 2013, the U.S. Environmental Protection Agency (EPA) eliminated the allowance of petroleum lubricants in all oil-to-sea interfaces in ships calling in US waters and mandated the use of 'Environmentally Acceptable Lubricants' ("EALs") (Reference (ii)). Approved lubricants include those made from vegetable oils, bio-synthetic esters, polyalkykene glycols and sea water (Reference (ii)).

While welcomed, it is likely the EPA's criteria to qualify vegetable-based oils as EALs are too lenient to eliminate chronic oiling mortality of marine birds, and vegetable oils too, must be eliminated as lubricants in oil-to sea interfaces.

Request: a. Please provide an assessment of the risks to marine birds (and other wildlife) from chronic oiling from oil-to sea lubricated parts (eg. propellers) in tankers entering the Marine RSA.

b. Please provide an assessment of the risks to shoreline habitats from chronic oiling from oil-to sea lubricated parts (eg. propellers) in tankers entering the Terminal RSA.

FISH – PACIFIC HERRING

1.12 Pacific herring: underwater noise

References: i) A3S4Y3, Application Volume 8A – Marine Transportation, Section 4.3.6.4.1, PDF pages 54, 55 of 294.

ii) Kuznetsov, Y. A., Bocharov, L. N., Akulin, V. N., Kuznetsov, M. Y. 2012. Marine Bioacoustics and the Regulation of Fisheries. *In* The Effects of Noise on Aquatic Life. Springer New York. pp 575-577.

Preamble: Reference (i) states, "Underwater noise from vessel traffic could; however, potentially trigger behavioural responses by marine fish. Consequently, this potential effect was considered for inclusion in the assessment."

Reference (i) goes on to state, "For the reasons discussed above and according to the judgment of the assessment team, behavioural disturbance to marine fish and invertebrates due to underwater noise from vessel traffic was not considered further in this assessment."

Pacific herring have been demonstrated to react to approaching vessels of differing underwater acoustic transmissions (Reference (ii)) but no fish species are identified by Trans Mountain as being potentially negatively affected by underwater noise.

Request: a. Without empirical data (and given studies from elsewhere suggesting that noise affects other fish species), how did Trans Mountain reach the conclusion that it was acceptable to ignore effects of underwater noise on fish? Please provide supporting references.

b. Given the scientific evidence that noise can affect fish, why did Trans Mountain not conduct additional research to quantify responses of Canadian Pacific fishes to ship noise? Please provide supporting references.

c. Please include at least one marine fish as an indicator species representing the potential effects of auditory injury or sensory disturbance due to underwater noise.

1.13 Pacific herring: indicator species and habitat

References: i) A3S4X8, Application Vol. 8A – Marine Transportation, PDF page 17 of 23.

ii) A3S4J5, Application Vol. 8B, Technical Report, Marine Resources, PDF pages 22, 23, 69 of 173.

iii) A3S4X9, Application Vol. 8A – Marine Transportation, PDF pages 1-33 of 33.

iv) McKechnie, I., Lepofsky, D., Moss, M. L., Butler, V. L., Orchard, T. J., Coupland, G., Foster, F., Caldwell, M., Lertzman, K. 2014. Archaeological data provide alternative hypotheses on Pacific herring (*Clupea pallasii*) distribution, abundance, and variability. Proceedings of the National Academy of Sciences. 111(9): E807-E816.

v) Stick, K. C. and Lindquist, A. 2009. 2008 Washington State herring stock status report. Washington Department of Fish and Wildlife, Fish Program, Fish Management Division. pp 111.

vi) Fisheries and Oceans Canada. 2012. Pacific Herring Important Areas. MAPSTER. Available: http://pacgis01.dfompo.gc.ca/Mapster30/#/SilverMapster. Acquired by Raincoast Conservation Foundation: April 2014.

Preamble: Pacific herring was selected by Trans Mountain to be an indicator species representing the "potential effects from Project-related increased marine vessel traffic on marine fish and fish habitat" (Reference (i)). One of the criteria used to select indicator species includes that the species has "an established baseline information in biology, population abundance and distribution" (Reference (ii)). For Pacific herring, the stated rationale for selection as an indicator species does not include an established baseline of information (Reference (ii)).

In the description of the species, Trans Mountain states that Pacific herring reached a "historical high in 2003" (Reference (iii)) but makes no reference to the temporal length or quality of the historical baseline employed to make this evaluation. Recently, an archaeological study of ancient human settlements along the Pacific coast of North America (Reference (iv)) suggested that Pacific herring were far more abundant in the past than at present and in particular, were considered superabundant in midden sites located around the perimeter of the Salish Sea. Further, combined evidence derived from oral historical knowledge, early historical observations and archaeological study suggests that Pacific herring were already significantly impacted by industrial fishing *prior to* the development of the historical baseline used to assess current herring population benchmarks (Reference (iv)) that were initiated in BC in the mid 1900s.

Trans Mountain also includes maps of "Pacific herring spawning habitat and DFO Important Areas for Pacific herring in the Marine RSA" (Figures 4.3 and 4.2-20, References (ii) and (iii)). In this map, with the exception of a very small spawning area located on the US-side of Point Roberts/Boundary Bay, the spawning areas mapped are all located in Canadian waters. Pacific herring spawn in numerous areas along US shorelines within the Marine RSA (e.g. Cherry Point, San Juan Islands and Portage Bay (Reference (v)). These spawning areas were not included by Trans Mountain in Figures 4.3 and 4.2-20 (References (ii) and (iii)).

In the same map (Figure 4.3 and Figure 4.2-20, References (ii) and (iii)), Trans Mountain relies exclusively on the DFO-identified Important Areas for Pacific herring to delineate the marine areas important for Pacific herring. These "DFO Important Areas for Pacific herring" were generated by four DFO employees or former employees drawing "polygons on paper maps to denote Important Areas for herring" which were then digitized for subsequent use in GIS applications (Reference (vi)). This identification of "Important Areas for Pacific herring" is exclusively restricted to Canadian waters and no important areas for Pacific herring were identified by Trans Mountain for US waters in the Marine RSA (References (ii) and (iii)).

Request: a. Please include a description of the "historical low" (a population collapse) and its suspected drivers (overfishing) that occurred in the 1960s to complement Trans Mountain's description of the Strait of Georgia Pacific herring population "historical high".

b. Please provide additional information regarding Strait of Georgia herring populations derived from additional sources (e.g. oral historical knowledge, early historical observations, marine sediment analyses and archaeological studies) to complement the relatively short-term Fisheries and Oceans Canada baseline information that Trans Mountain relies upon in their application.

c. Please include US Pacific herring spawning areas and holding site information in the Application including written text and figures (Figures 4.3 and 4.2-20, References (ii) and (iii)).

d. Please confirm that no information similar to "DFO Important Areas for Pacific herring" identified in Figure 4.2-20 (Reference (iii)) is available for areas important to Pacific herring in US waters. If so, please correct Figures 4.3 and 4.2-20 (References (ii) and (iii)) to reflect that no information is available in US waters to identify Important Areas for Pacific herring in the Marine RSA.

e. Please confirm that the “DFO Important Areas for Pacific herring”, which were generated by four experts drawing on paper before being digitized, represent the best-available information for Pacific herring important areas in Canadian waters of the Marine RSA.

f. Please confirm whether an established baseline of information exists for Pacific herring in the Marine RSA with particular reference to Pacific herring distribution.

g. Do the “DFO Important Areas for Pacific herring” referenced by Trans Mountain include areas important to the small populations of non-migratory Pacific herring described by Trans Mountain (References (ii) and (iii))?

h. Please describe in more detail and indicate the annual migratory route used by the majority of Strait of Georgia Pacific herring on the Pacific herring map (Figures 4.3 and 4.2-20, References (ii) and (iii)).

1.14 Pacific herring: measurement endpoints

References: i) A3S4J5, Application Vol. 8B, Technical Report, Marine Resources, PDF pages 24, 96 of 173.

Preamble: Trans Mountain states “measurement endpoints facilitate quantitative or qualitative measurement of potential residual and cumulative effects, and provide a means to determine the level or amount of change to an indicator” (Reference (i)).

Pacific herring and salmon are selected as indicators of potential injury and mortality to marine fish due to vessel wake and Trans Mountain states that “the key issue for marine fish and fish habitat is the potential for wake waves generated by Project-related tankers and tugs to disturb intertidal habitats and potentially injure or kill” marine fish, including Pacific herring and Pacific salmon. The only other marine transport-related potential environmental effects identified as potentially affecting marine resources are (1) disturbance to marine fish habitat due to vessel wake and (2) auditory injury or sensory disturbance to marine mammals due to underwater noise (Reference (i)). Intertidal habitats are selected as an indicator species for vessel wake effects and three marine mammals are selected as indicator species for underwater noise effects (Reference (i)).

Request: a. Please identify which marine mammal species represents the forage fish Pacific herring as an indicator species for auditory injury or sensory disturbance due to underwater noise (Reference (i)).

b. In addition to predicted wave height, length of shoreline affected and length of shore types affected by vessel wake (Reference (i)), please rate the potential severity of disturbance to marine fish habitat (intertidal indicator species) by shore type and length of shoreline type affected.

c. Please provide additional information on which marine fish species the indicator species Pacific herring and Pacific salmon are considered to represent, respectively.

1.15 Pacific herring: Quantitative Ecological Risk Assessment

References: i) A3S4K7, Application Vol. 8B – Technical Report, Ecological Risk Assessment of Marine Transportation Spills, PDF pages 18, 34, 56, 57, 65, 66, 67, 70 of 116.

ii) A3S4Q4, Application Vol. 8B – Technical Report, Ecological Risk Assessment of Marine Transportation Spills, PDF Page 1 (Figure C.3) of 3.

iii) A3S4J5, Application Vol. 8B, Technical Report, Marine Resources, PDF page 69 of 173.

iv) A3S4X9, Application Vol. 8A – Marine Transportation, PDF pages 1, 2 and 3 of 33.

Preamble: Trans Mountain states that “a Detailed Quantitative Ecological Risk Assessment (DQERA) for a CWC spill and a smaller spill for one selected spill location will be filed as a supplemental study in early 2014” (Reference (i)).

For the Preliminary Quantitative Ecological Risk Assessment (PQERA), Biological Sensitivity Factors (BSF) for marine fish and habitats were based, in part, on the assumption that species sensitivity (the “synthetic sensitive species”) is the same regardless of the specific habitat being considered and thus the “sensitivity of the community becomes a function of the degree of exposure of the particular habitat to dissolved hydrocarbons” (Reference (i)).

The marine fish BSF classification relies heavily on bathymetry, particularly for BSF values 1 (>30 m depth), 2 (10- 30 m depth) and 3 (<10 m) (Reference (i)). The highest BSF (value of 4) includes a selection of defined areas for fish (Pacific herring spawning areas, Dungeness crab important habitat, rockfish conservation areas, eulachon Critical Habitat, salmon streams and other areas important to salmon (Reference (i)). No other "fish" species or important areas were included in the description of BSF 4 communities, some of which have been described (e.g. DFO Important Areas for Pacific herring; Reference (ii)). Further, in Figure C.3 (Reference (ii)), much of the open waters of the Marine RSA are described as BSF 1, even though those areas contain waters classified as BSF 1, 2 and 3. Trans Mountain deems each BSF classification as "exclusive with no overlap in area", with exception to BSF 4, which can overlap with areas with other BSF values (Reference (i)). For areas with overlapping BSF values, no description of BSF ranking priority is provided.

Trans Mountain lists "Herring Spawning and Holding Areas (US)" GIS data from the Washington Department of Fish and Wildlife as a data source for biological resource evaluation in the PQERA (Reference (i)). This same US herring spawn area information was not used in the Pacific herring species description and maps of herring spawning areas or other areas identified as important to herring located elsewhere in the document (i.e. Figure 4.3 and Figure 4.2-20, References (iii) and (iv)). In addition, the "DFO Important Areas for Pacific herring" that were identified and used for mapping elsewhere in Trans Mountain's document (References (iii) and (iv)) were excluded from the PQERA analysis (Reference (i)).

Unlike the marine bird section of the PQERA, which provided estimates of the number of marine bird colonies oiled under the various modeled oil spill scenarios (i.e. Table 6.9 and 6.10, Reference (i)), the marine fish and habitat section only describes the area and percent area according to BSF that are exposed to oil under the various oil spill scenarios (Reference (i)). Trans Mountain does not provide a summary of effects for Pacific herring spawning areas, rockfish conservation areas or any other areas important included in the high sensitivity ranking BSF 4 (Reference (i)).

Request: a. Please provide the date when the Detailed Quantitative Ecological Risk Assessment (DQERA) will be filed on the public registry.

b. Please provide supporting scientific evidence that the sensitivity of marine fish and associated habitat is a function of the degree of exposure of the particular habitat to dissolved hydrocarbons.

c. Other than the five marine fish and fish habitat data sources listed in Table 4.4. (Reference (i)), please list any additional GIS data sources used in Figure C.3 (Reference (ii)).

d. Please include “Herring Spawning and Holding Areas (US)” in the description of Pacific herring and associated maps (e.g. text and Figures 4.3 and 4.2-20, References (iii) and (iv)).

e. Please provide a detailed justification for the exclusion of the “DFO Important Herring Areas” from the PQERA and associated map (References (i) and (ii)).

f. Please provide a list of the fish and invertebrate species within the Marine RSA that are without any delineated habitat in classification BSF 4 (References (i) and (ii)).

g. Please provide tables which summarize the area and percent of Pacific herring spawning areas (US and Canada), DFO Important Herring Areas (Canada) and holding areas (US) within the Marine RSA that will be exposed to oil under the various oil spill scenarios in the PQERA as opposed to the current oil spill scenario tables that only list the area and percent area of fish habitat oiled (i.e. Table 6.5, Reference (i)).

h. Please provide a detailed explanation as to why much of the open waters of the Marine RSA are described as BSF 1 (References (i) and (ii)), even though those areas contain habitat classified as BSF 1, 2 and 3. Is Trans Mountain using the presence of the lowest ranking BSF as representative for the entire water column BSF?

1.16 Pacific herring: Pacific herring and other marine fish habitat recovery from oil spills

References: i) A3S4K7, Application Vol. 8B – Technical Report, Ecological Risk Assessment of Marine Transportation Spills, PDF page 96, 97, 98, 103, 104 of 116.

ii) EVOSTC. 2010. Exxon Valdez oil spill restoration plan: 2010 update injured resources and services. Exxon Valdez Oil Spill Trustee Council, Anchorage, Alaska.

Preamble: Trans Mountain relies on just four EVOS-focused scientific sources to evaluate the potential for marine fish and marine fish habitat to recover from an oil spill in the Marine RSA (Reference (i)). Trans Mountain also states that the “effects of the EVOS on marine fish populations … were either not significant to begin with, or recovery occurred within one or two years at most” (Reference (i)).

Relying on Reference (ii) to assign injury to marine fish and marine fish habitat following the EVOS in Prince William Sound, Trans Mountain lists two marine fish as "recovered", sediments as "recovering", rockfish and subtidal communities as "very likely recovered" and *Pacific herring as "not recovered"* (emphasis ours; Reference (i)). In terms of Pacific herring, Trans Mountain uses just three scientific sources to assert that, despite an abundance of studies suggesting that Pacific herring were negatively impacted by EVOS, there are "no remaining ecologically significant effects" on Pacific herring following the spill (Reference (i)). Trans Mountain does not provide a timeframe for their assertion that there are "no remaining ecologically significant effects" on Pacific herring (Reference (i)).

Following Trans Mountain's four-source literature review on EVOS-related effects on marine fish and marine fish habitat and their own PQERA, Trans Mountain states that: "due to the generally low potential for the spill scenarios to cause wide-spread mortality of fish, recovery of the marine fish community would be expected to be rapid. Even under a worst-case outcome event where localized fish kills might be observed, it is expected that natural processes would compensate for the lost biological productivity within one to two years. By comparison, effects of the EVOS on marine fish populations, were either not significant to begin with, or recovery occurred within one or two years at most" (Reference (i)).

Request: a. In terms of marine fish and marine fish habitat recovery from a large oil spill, please justify Trans Mountain's reliance on only four EVOS-focused scientific sources given the wealth of scientific literature available on marine fish and marine fish habitat exposed to oil in cold-water environments.

b. Please elaborate on how the lack of quantitative baselines for marine fish and habitat in pre-EVOS Prince William Sound complicated scientific investigations that sought to detect and measure the specific effects of the EVOS on marine fish, marine fish habitat and other marine species.

c. Please state, given the weight of evidence derived from numerous scientific studies relating to the effects of EVOS on Pacific herring, whether EVOS significantly impacted Prince William Sound Pacific herring in the two year post-spill period and afterwards.

d. Please clarify Trans Mountain's statement that there are "no remaining ecologically significant effects" on Pacific herring following the EVOS (Reference (i)). In particular, answer and provide supporting evidence for:

(i) whether the EVOS ever had ecologically significant effects on Pacific herring; and

(ii) the approximate year(s) when those ecologically significant effects became "insignificant".

e. Please provide additional supporting scientific evidence for Trans Mountain's statement that the "effects of the EVOS on marine fish populations … were either not significant to begin with, or recovery occurred within one or two years at most" (Reference (i)).

f. Please reconcile Trans Mountain's statement that the "effects of the EVOS on marine fish populations … were either not significant to begin with, or recovery occurred within one or two years at most" (Reference (i)) with the findings of the Reference (ii).

g. Please reconcile Trans Mountain's expectation in the event of a large oil spill in the Marine RSA that "recovery of the marine fish community", including Pacific herring, would be rapid and any lost productivity would be "compensated for by natural processes within one to two years" (Reference (i)) with the Reference (ii) conclusion that Pacific herring in Prince William Sound have not recovered.

h. Other than evidence from the EVOS, is there any evidence from cold-water oil spills to suggest that the marine fish community or marine fish habitat was impacted for any period greater than two years? Please describe this evidence.

i. Please list and describe in additional detail the "natural processes" that would compensate for any lost productivity for marine fish and marine fish habitat caused by a large oil spill in the Marine RSA (Reference (i)).

j. Please define the term "productivity" as Trans Mountain uses it in the response to the above question (g).

k. Please define the term "recovery", as it is applied for marine fish and marine fish habitat recovery following an oil spill (Reference (i)).

FISH – PACIFIC SALMON

1.17 Pacific salmon: migration routes

Reference: i) A3S4X9, Application Vol. 8A – Marine Transportation, Section 4.2.6.5.3, PDF page 6 of 33.

Preamble: Figure 4.2-21 in Reference (i) shows important salmon areas and migration routes for Pacific Salmon. Notably, migration routes are not shown at the mouth of the Fraser River and the southern Strait of Georgia (other than those in the Gulf Islands). In addition, no migration routes are shown in the Strait of Juan de Fuca or in the RSA that leads to Puget Sound.

Request: a. Clarify why the migration routes shown on the map do not include known migration routes to the Fraser River and Puget Sound area.

b. Provide information addressing whether the migration routes are those of adult salmon entering their respective spawning streams/areas or those of smolts leaving their spawning streams.

1.18 Pacific salmon: habitat in US waters

Reference: i) A3S4X9, Application Vol. 8A – Marine Transportation, Section 4.2.6.5.3, PDF page 6 of 33.

Preamble: As a result of the US Magnuson-Stevens Fishery Conservation and Management Act, essential fish habitat for Pacific Salmon is: "In the estuarine and marine areas, salmon EFH extends from the near-shore and tidal submerged environments within state territorial waters out to the full extent of the exclusive economic zone (370.4 km) offshore of Washington, Oregon, and California north of Point Conception."

As DFO Important Salmon Areas are shown in Figure 4.2-21, it would be prudent to include essential fish habitat in the US, to reflect the importance of near-shore waters to salmon in the US waters of the marine RSA.

Request: a. Please amend Figure 4.2-21 to reflect the essential fish habitat in US waters.

1.19 Pacific salmon: Puget Sound

Reference: i) A3S4X9, Application Vol. 8A, Volume 8A – Marine Transportation, Section 4.2.6.5.3, PDF page 5 of 33.

Preamble: Reference (i) lists a number of Canadian salmon stocks of conservation concern or Species of Conservation Concern as designated by COSEWIC, including coho, sockeye and chinook stocks. However, there is no mention of threatened salmon in Puget Sound, including Hood Canal summer-run ecologically significant unit (ESU) chum salmon or Puget Sound ESU Chinook salmon. These stocks migrate through the RSA, and portions of the Puget Sound Chinook ESU (where critical habitat has been defined) lie within the marine RSA.

Request: a. Please identify the threatened salmon stocks in the US waters.

MARINE MAMMALS

1.20 Marine mammals: consultation with the Department of Fisheries and Oceans

References: i) National Energy Board, *Filing Manual*, Release 2014-1, Section 3.4.2, page 3-6 and Table 3.1, page 3-15.

ii) A3S4X4, Application Vol. 8A – Marine Transportation, Section 3.1.1, Table 3.1.1, PDF page 23 of 40.

iii) A3S4Y3, Application Vol. 8A – Marine Transportation, Section 4.3.7.1, PDF page 69 of 294.

Preamble: Reference (i) states that a project proponent must ensure that appropriate government authorities are included in the consultation process. Reference (i) indicates that consultation with the Department of Fisheries and Oceans (“DFO”) may be needed where the project could affect wildlife species at risk or their critical habitat.

In Reference (ii), Trans Mountain identifies federal Government of Canada agencies as stakeholders for consultation with respect to marine shipping lanes.

In Reference (iii), Trans Mountain states that a meeting was held with DFO in Kamloops on September 25, 2013 to present a high level overview of the Marine ESA approach.

Request: a. Please identify all representatives of Trans Mountain, Trans Mountain’s consultants and DFO that attended the September 25, 2013 meeting in Kamloops.

b. Please provide a copy of the agenda and any notes arising out of the September 25, 2013 meeting in Kamloops.

c. Please identify any other meetings between Trans Mountain and/or Trans Mountain’s consultants and DFO, the dates and locations of such meetings, the list of attendees, the agenda and notes arising out of such meetings that occurred during the preparation of the Project Application.

d. Specifically, please identify any meetings between Trans Mountain and/or Trans Mountain’s consultants and DFO with respect to acoustic impacts on marine mammals. For any such meetings, please provide the date and location of such meetings, the list of attendees, the agenda and any notes arising out of such meetings.

1.21 Marine mammals: field data collection

References: i) A3S4X8, Application Volume 8A – Marine Transportation, Section 4.2.6.2, PDF page 15 of 23.

ii) A3S4X9, Application, Volume 8A – Marine Transportation, Section 4.2.7.6.1, PDF page 18 of 33.

iii) A3S4J5, Application Volume 8B – Marine Resources, Marine Transportation Technical Report, Section 4.3.4, PDF pages 77, 78, 79 of 173.

iv) BC Cetaceans Sighting Network. Wild whales: how sightings are used. Available at: http://wildwhales.org/sightings-network/how-sightings-are-used/.

Preamble: Reference (i) states, "Information on marine resources within the Marine RSA is readily available in published literature and is deemed to be sufficient to assess potential effects of the increased Project-related marine vessel traffic on marine fish and fish habitat. Therefore, Project-specific field studies for this aspect of data gathering were not considered warranted."

Reference (ii) states "…(note that sightings presented on this map do not differentiate between potential killer whale populations). Data obtained from the BC Cetacean Sightings Network were collected opportunistically with limited knowledge of the temporal or spatial distribution of observer effort. As a result, absence of sightings at any location does not demonstrate absence of cetaceans."

Further, Section 4.3.4 (Reference iii), which relates to Steller sea lions, relies heavily on opportunistic data derived from Reference (iv). The BC Cetaceans Sighting data cannot be used to distinguish between places that animals do not use and places where people have not looked and carries a strong disclaimer: "However, the way sightings network data is collected, creates a puzzle that limits the usefulness of the data. We know where areas of high sightings concentrations are, but we don't know whether high concentrations of sightings in these areas are due to more observers or to higher concentrations of cetaceans and sea turtles" (reference iv).

Request: a. Please provide details supporting the assertion in Reference (i) that field studies were not warranted.

b. Given the known inadequacy of opportunistic data identified in

References (ii) and (iv) and the lack of abundance estimates for most marine mammal species in the area, how does Trans Mountain justify its decision that new field studies were not required?

c. Please describe how a quantitative assessment of the impacts on exposed populations of marine mammals and other taxa can be conducted in the absence of quantitative population abundance estimates.

1.22 Marine mammals: acoustic disturbance

References: i) A3S4Y3, Application Volume 8A – Marine Transportation, Section 4.3.7.5.1, PDF page 88 of 294.

ii) Williams, R., Erbe, C., Ashe, E., Beerman, A., Smith, J. 2014. Severity of killer whale behavioral responses to ship noise: a dose response study. Marine Pollution Bulletin. Severity of killer whale behavioral responses to ship noise: a dose-response study. 79(1-2): 254-60.

iii) Williams, R., Krkošek, M., Ashe, E., Branch, T.A., Clark, S., et al. 2011. Competing Conservation Objectives for Predators and Prey: Estimating Killer Whale Prey Requirements for Chinook Salmon. PLoS ONE. 6(11): e26738.

iv) Erbe, C., MacGillivray, A., Williams, R. 2012. Mapping cumulative noise from shipping to inform marine spatial planning. JASA Express Letters. 132(5): 1-6.

v) Williams, R., Clark, C. W., Ponirakis, D. Ashe, E. 2014. Acoustic quality of critical habitats for three threatened whale populations. Animal Conservation. 17: 174–185.

vi) Erbe, C., Williams, R., Sandilands, D., Ashe, E. 2014. Identifying Modeled Ship Noise Hotspots for Marine Mammals of Canada's Pacific Region. PLoS ONE. 9(3).

Preamble: Reference (i) states, "It is not possible to quantify how much time an individual or population of marine mammals may be exposed to noise resulting specifically from increased Project-related marine vessels, as both the vessels and marine mammals are in a near constant state of motion, and at any one time, their occurrence may or may not overlap."

Although whales and ships move, it is common in spatially explicit risk assessments to estimate the average overlap of marine mammals and noise. Previous studies have shown that resident killer whales follow a stereotypical dose-response relationship to passage of large ships at received levels of 120-130dB (Reference (ii)). Trans Mountain's assessment ignores the increased number of times that whales will be exposed to such disturbance, which is likely to come at the cost of feeding activity. That is problematic for a population like southern resident killer whales that are already prey-limited (Reference (iii)).

Previous studies (Reference (iv)) have predicted and demonstrated empirically (Reference (v)) that Haro Strait and Georgia Strait are among the noisiest sites in BC. When overlaying that noise surface with average density of marine mammals (Reference (vi)), Haro Strait emerged as an acoustically degraded habitat. Ship noise causes a 62-97% loss of communication space for vocal killer whales under median and noisy conditions, respectively. The Project can only increase behavioural responses and acoustic masking.

Request: a. Please provide a referenced rationale for the basis on which Trans Mountain concludes that increasing the risk of behavioural responses and acoustic masking is negligible?

b. Given that Project-related impacts include increases in large vessel traffic, please provide details of the extent to which the Trans Mountain's findings and conclusions would change if Trans Mountain assessed how killer whales respond to large ships (Reference (ii)), rather than small boats.

1.23 Marine mammals: acoustic disturbance

References: i) A3S4Y3, Volume 8A – Marine Transportation, Section 4.3.7.6.1, PDF page 94 of 294.

ii) Tougaard, J., Carstensen, J., Teilmann, J., Skov, H. Rasmussen, P. 2009 Pile driving zone of responsiveness extends beyond 20 km for harbor porpoises (*Phocoena phocoena* (L.). Journal of the Acoustical Society of America. 126(1): 11-14.

Preamble: Reference (i) states, "While species such as harbour porpoises may be somewhat more sensitive than southern resident killer whales to high frequency sounds and may show more pronounced responses to disturbance, acoustic modelling of harbour porpoises suggest that the extent of sensory disturbance is expected to be generally comparable across all toothed whale species found within the Marine RSA."

Some research (Reference (ii)) suggests that harbour porpoise are particularly sensitive to noise, showing responses to pile driving noise at ranges beyond 20 km (when received levels are below 160 dB and the high frequency energy will have attenuated). The literature would suggest that porpoise are far more vulnerable to ship noise than this assessment would suggest.

Request: a. Please provide a detailed referenced rationale for the basis on which Trans Mountain concludes that vulnerability of harbour porpoise (and other small cetaceans) to ship noise is adequately captured by killer whales.

b. Please provide a detailed referenced rationale for the basis on which Trans Mountain did not conduct field studies to measure responses of BC marine mammals to ship noise, rather than relying entirely on published literature.

1.24 Marine mammals: mitigation measures for acoustic disturbance

Reference: i) A3S4Y3, Application Vol. 8A – Marine Transportation, Section 4.3.7.1, PDF page 85 of 294.

Preamble: In Reference (i), Trans Mountain states that it has little direct control over the operating practices of tankers or tugs as Project-related marine vessels are owned and operated by a third party. Therefore, Trans Mountain states that it has prepared no direct mitigation measures for effects associated with increased Project-related marine transportation.

Trans Mountain relies on a project being developed by the Port of Metro Vancouver to address issues of underwater noise in the Strait of Georgia and surrounding waters.

Request: a. In Trans Mountain's opinion, which party or government agency is responsible for the environmental assessment of the acoustic disturbance impacts on marine mammals caused by the Project?

b. In Trans Mountain's opinion, which party or government agency is responsible for identifying technically and economically feasible mitigation measures for the impacts of acoustic disturbance on marine mammals caused by the Project?

c. In Trans Mountain's opinion, which party or government agency is responsible for ensuring that the mitigation measures identified for acoustic disturbance of marine mammals caused by the Project are consistent with the recovery strategy for southern resident killer whales?

d. For the parties or government agencies identified in the responses to questions a-c, have those parties or government agencies confirmed to

Trans Mountain that they will accept the responsibilities identified in questions a-c?

1.25 Marine mammals: impacts of an oil spill

References: i) A3S4Y7, Application Volume 8A – Marine Transportation, Section 5.6.2.2.5, PDF page 18 of 19.

ii) Matkin, C. O., Saulitis, E. L., Ellis, G. M., Olesiuk, P., Rice, S. D. 2008. Ongoing population-level impacts on killer whales *Orcinus orca* following the 'Exxon Valdez' oil spill in Prince William Sound, Alaska. Marine Ecology Progress Series. 356: 269–281.

iii) Williams, R., Gero, S., Bejder, L., Calambokidis, J., Kraus, S. D., Lusseau, D., Read, A. J., Robbins, J. 2011. Underestimating the damage: interpreting cetacean carcass recoveries in the context of the Deepwater Horizon/BP incident. Conservation Letters. 4(3): 228-233.

iv) Williams, R., Lusseau, D., Hammond, P. S. 2009. The role of social aggregations and protected areas in killer whale conservation: the mixed blessing of critical habitat. Biological Conservation. 142(4): 709-719.

v) Schwacke, L. H., Smith, C. R., Townsend, F. I., Wells, R. S., Hart, L. B., Balmer, B. C., Collier, T. K., De Guise, S., Fry, M. M., Guilette, L. J., Lamb, S. V., Lane, S. M., McFee, W. E., Place, N. J., Tumlin, M. C., Ylitalo, G. M., Zolman, E. S., Rowles, T. K. 2013. Health of Common Bottlenose Dolphins (*Tursiops truncatus*) in Barataria Bay, Louisiana, Following the Deepwater Horizon Oil Spill. Environmental Science and Technology. 48(1): 93–103.

Preamble: Reference (i) notes, "Therefore, there is a relatively high probability of exposure for whales should an oil spill occur at this location. Some level of negative effect would be expected for animals exposed to oil, but the effects would not likely be lethal, except in the case of weaker animals such as calves or older and diseased animals, or animals that were exposed to heavy surface oiling and inhalation of vapours from fresh oil, as could occur in the immediate vicinity of the spill location."

This statement runs counter to the observed effects of oiling on killer whales after Exxon Valdez (Reference (ii)). Except in the unusual case of killer whale populations that are completely censused, effects of oiling on other cetaceans is always underestimated due to low carcass recovery rate (Reference (iii)).

By relating effects to the proportion of area or shoreline that would be oiled, Trans Mountain ignores the more likely scenario that animals are clustered in high-density areas (Reference (iv)). The reliance on opportunistic data (i.e. assuming uniform distribution throughout the range) underestimates risk if a spill occurs in a high-density area, and reiterates the point that field surveys would have been preferable to using existing reports.

Request: a. Please provide scientific evidence supporting Trans Mountain's statements in Reference (i) and reconcile these conclusions with the observed effects of oiling on killer whales after the EVOS (Reference (ii)).

b. Please provide scientific evidence supporting Trans Mountain's statement that cetaceans are more robust to oiling than previously thought.

c. Please provide information with regard to the considerations Trans Mountain gave to the lagged effects of oiling on marine mammals, which can cause death years following an oil spill (Reference (v)).

d. Please provide details of the potential overall significance of impacts when also considering lagged effects.

1.26 Marine mammals: Humpback whales

References: i) A3S4X9, Application Volume 8A – Marine Transportation, Section 4.2.7.6.2, PDF pages 21, 22 of 33.

ii) Williams, R., Thomas, L. 2007. Distribution and abundance of marine mammals in the coastal waters of British Columbia, Canada. Journal of Cetacean Research and Management. *9*(1):1-15.

iii) Williams, R., O'Hara, P. 2010. Modelling ship strike risk to fin, humpback and killer whales in British Columbia, Canada. Journal of Cetacean Research and Management. 11(1): 1-8.

iv) The Splash Program (www.cascadiaresearch.org).

Preamble: Trans Mountain relies exclusively on BC Cetaceans Sightings Network information for humpbacks in the Marine RSA, which are opportunistically collected sightings which are not corrected for effort (Reference (i)). The last systematic survey for marine mammals in BC's coastal waters covered the Strait of Georgia in 2004 (Reference (ii)). At that time, humpback whales were not seen in Strait of Georgia. A decade later, humpback whale sightings are now far more common in Haro Strait and the Strait of Juan de Fuca. As a result, previous ship strike risk models based on data from 2004 (e.g., Reference (iii)) underestimate ship strike risk to humpback whales in this region. That survey did not cover the west coast of Vancouver Island. Therefore no quantitative information is available to assess ship strike risk to humpback whales in that region.

Reference (iv), The SPLASH Program, suggested two populations of humpback whales in BC: a north coast stock and a southwest Vancouver Island (SWVI) stock. The Project would increase ship strike risk to the putative SWVI stock, which is estimated to be very small and unable to cope with even modest levels of anthropogenic mortality.

Request: a. Given the lack of current humpback whale data for the west coast of Vancouver Island, please provided a detailed justification, including scientific evidence, outlining why Trans Mountain decided that new fieldwork was not necessary.

b. Please provide additional supporting evidence for the exclusion of the SWVI stock from the risk assessment and provide a justification for not conducting field work for the SWVI stock.

1.27 Marine mammals: “minimum number alive”

References: i) A3S4Y3, Application Volume 8A – Marine Transportation, Section 4.3.7.6.2, PDF pages 95, 96 of 294.

ii) Hilborn, R., Redfield, J. A., Krebs, C. J. 1976. On the reliability of enumeration for mark and recapture census of voles. Canadian Journal of Zoology 54: 1019-1024.

iii) Efford, M. 1992. Comment—Revised estimates of the bias in the “minimum number alive” estimator. Canadian Journal of Zoology. 70: 628–631.

Preamble: As Trans Mountain notes in Reference (i), there is no audiogram for humpback whales. The report notes the inadequacies of this information, but fails to fill any of the data gaps.

In one instance, Trans Mountain estimates the "risk" associated with the Project in terms of the proportion of BC's humpback whale population that could be exposed to Project-related noise (or worse, oil spills). But this estimate of risk relies on a DFO estimate of the "minimum number alive". That estimator was proposed in 1976 (Reference (ii)), and has not been in common use since 1992, when it was shown to give a very biased estimate of population size (Reference (iii)). It is insufficient to note the limitations of using existing data when field data could fix those limitations.

Request: a. Please provide a referenced rationale for why Trans Mountain did not conduct studies to gauge the sensitivity of BC humpback whales to ship noise (e.g., estimating a source level for vocalizing humpback whales in BC; assessing whether humpback whales demonstrate a Lombard effect to compensate for increased background noise; behavioural dose-response studies).

b. Please provide a referenced rationale for the lack of field surveys to estimate how many of these marine mammal species would be exposed to various noise levels or oil spills.

1.28 Marine mammals: humpback whale as an indicator species for fin whales.

References: i) A3S4Y3, Application Volume 8A – Marine Transportation, Section 4.3.7.1, PDF pages 67, 68, 69 of 294.

ii) Williams, R., Clark, C. W., Ponirakis, D. and Ashe, E. 2014. Acoustic quality of critical habitats for three threatened whale populations. Animal Conservation. 17: 174–185.

iii) Williams, R., O'Hara, P. 2010. Modelling ship strike risk to fin, humpback and killer whales in British Columbia, Canada. Journal of Cetacean Research and Management. 11(1): 1-8.

Preamble: Reference (i) suggests fin whale sensitivity is assumed to be captured by humpback whales. However, fin and humpback whales are likely to differ in terms of:

a. their conservation status (i.e., current abundance relative to pre-whaling abundance);

b. their sensitivity to ocean noise (i.e., humpback whale feeding calls are far more likely to be masked than those of fin whales (Reference (ii));

c. fin whales are far more commonly killed by ships than humpback whales and the ability of BC's fin whale population to withstand ship strike mortality is far lower than that of humpback whales (Reference (iii)).

Request: a. Given their difference in conservation status, sensitivity to ocean noise and strike mortality, why does Trans Mountain believe that humpback whales serve as an appropriate proxy species for fin whales? Please provide detailed supporting references.

b. Please provide a detailed, referenced assessment of the instances in which humpback whales do not serve as an indicator for fin whale sensitivity to Project-related activities and potential accidents.

MARINE BIRDS

1.29 Marine birds: field data collection

Reference: i) A3S4Y0, Application Volume 8A – Marine Transportation, Section 4.2.8.3, PDF page 1 of 34.

Preamble: Reference (i) states, "The abundant literature and data resources currently available for marine ecological information within the Marine RSA is deemed sufficient for the assessment of potential effects of the increased Project-related marine traffic on indicator species. Studies to pursue the collection of additional marine bird biological field data were considered unnecessary."

However, quantitative at-sea marine bird distribution and abundance information, which is required for the assessment of the consequences of oil spills on marine birds, is lacking.

Request: a. Given the general lack of quantitative information regarding at-sea distribution and abundance of marine birds in the Marine RSA, please provide a referenced justification for why Trans Mountain decided that additional fieldwork was not necessary.

b. Please provide an indication of the levels of uncertainty in associated risk assessments in the absence of these quantitative data.

1.30 Marine birds: shorebird sensitivity to oiling

Reference: i) A3S4Y8, Application Volume 8A – Marine Transportation, Section 5.6.2.3.4, PDF page 11 of 19.

Preamble: Reference (i) states, "Shorebirds generally have low sensitivity to oiling when compared to other guilds, and it is unlikely that lightly oiled individuals would die as a result of low or moderate exposure." No supporting citation is provided.

Request: a. Please provide a detailed referenced evidence base for the conclusion that shorebirds can tolerate low to moderate exposure to oil.

b. Please define the term “lightly oiled” as used in Reference (i).

OIL SPILL RISK ASSESSMENT

1.31 Oil spill risk assessment: probability of an oil spill

References: i) A3S4Y4, Application Volume 8A – Marine Transportation, Section 5.2.5, Table 5.2.4, PDF page 1 of 7.

ii) A3S4Y3, Application Volume 8A – Marine Transportation, Section 5.2.1.6, PDF pages 290, 291 of 294.

Preamble: Reference (i) states that the risk of an accidental cargo oil spill of any size from a Project-related tanker given existing navigation safety measures is 1 in 46 years.

Reference (ii) states "With respect to tankers in the US waters of the Salish Sea region, DNV noted that the annual number of incidents ranged from eight in 2006 to three in 2007/2008. Most of these incidents occurred in the vicinity of terminals at Cherry Point and Anacortes, Washington. DNV indicated since the data reported covers only five years and the number of vessels is relatively low in the US waters of the Salish Sea, the validity of frequency estimates is low.

It is difficult to reconcile the occurrence of three to eight tanker incidents per year given the relatively low numbers of tankers in the US Salish Sea with Trans Mountain's estimate of a probability of 1 in 46 years for a spill of any size from Project related traffic.

Request: a. Please provide a detailed referenced rationale for the basis on which Trans Mountain reconciles empirical evidence of several incidents per year in the US Salish Sea with a model prediction of one spill of any size in 46 years from Project related traffic.

1.32 Oil spill risk assessment: oil spill modeling

References: i) A3S5G9, Application Volume 8C - Technical Report, Modeling the Fate and Behavior of Marine Spills for the Trans Mountain Expansion Project, PDF pages 18-35.

ii) Baschek, B., Farmer, D. M., and Garrett, C.. 2006. Tidal fronts and their role in air-sea gas exchange. Journal of Marine Research. 64(4): 483-515.

iii) Farmer, D., Pawlowicz, R. and Jiang, R. 2001. Tilting separation flows: a mechanism for intense vertical mixing in the coastal ocean. Dynamics of Atmospheres and Oceans, 36(1): 43–58.

Preamble: Reference (i) uses 3D hydrodynamic circulation models with an embedded oil spill model (SPILLCALC) to create marine oil spill scenarios. Models incorporate vertical and horizontal forces driven by tides, currents and wind to determine probabilities for the distribution and movement of oil. The resulting scenarios and descriptors from the Turn Point spill scenario show that spilled oil travels primarily on the water's surface until it is either recovered with skimmers or strands on shorelines.

Oceanographic research in Haro Strait has identified the presence of energetic tidal fronts that create strong down-welling currents that can carry light particles (such as air bubbles) to depths up to 160 metres with vertical velocities of up to 0.75 m/s (References (ii) and (iii)). These fronts weaken stratification and aerate water masses passing through the sea.

The presence of these fronts in Haro Strait, Boundary Pass, Turn Point and elsewhere along the tanker route have substantial implications for the fate and transport of spilled oil products, oil spill response methods and marine organisms that may be exposed to submerged, water soluble oil components.

Request: a. Please explain how Trans Mountain will incorporate the presence of these hydrodynamic fronts in its spill scenarios for Georgia and Haro Straits.

b. Please explain how Trans Mountain's spill response methods will provide for the recovery of oil that is submerged by adduction processes.

c. Please provide an assessment of the toxicity risks to finfish and other aquatic organisms from submerged, water-soluble oil fractions such as benzene.

1.33 Oil spill risk assessment: oil spill modeling scenarios

Reference: i) A3S5G9, Application Vol. 8C, Modelling the Fate and Behaviour of Marine Oil Spills for the Trans Mountain Expansion Project, Section 7.0, PDF page 42 of 72.

ii) A3S4Z4 through A3S5H5, Application Vol. 8C, Appendix D, Parts 1-56, Modelling the Fate and Behaviour of Marine Oil Spills for the Trans Mountain Expansion Project.

Preamble: As a result of the stochastic oil spill simulations introduced in Reference (i), various statistical products are presented throughout the Figures in Reference (ii). These include probability of oil presence, probability for shore to be oiled, time to first contact for shoreline segments, and P50 and P90 after various lengths of time post spill, at numerous sites.

We would like to be able to complete our own quantitative risk assessment, and in an effort to ensure that the same data are being used, shapefiles including the statistical products listed above for the various marine spill locations would be beneficial.

Request: a. Please provide access to the shapefiles used to produce the maps for all locations and spill scenarios, and in particular, the spill scenario shapefiles at Arachne Reef.

1.34 Oil spill risk assessment: fate and behaviour of diluted bitumen

References: i) A3S5J0, Application Volume 8C – Trans Mountain Expansion Project Oil Spill Response Simulation Study Arachne Reef and Westridge Marine Terminal, Sections 2.5 and 3.0, PDF pages 14-17 of 42.

ii) A3S5G9, Application Volume 8C - Technical Report, Modeling the Fate and Behavior of Marine Oil Spills for the Trans Mountain Expansion Project, Table 8.3.4, PDF page 50 of 72.

iii) A3S5G9, Application Volume 8C - Technical Report, Modeling the Fate and Behavior of Marine Oil Spills for the Trans Mountain Expansion Project, Sections 5.2.7.3 and 5.2.7.6, PDF pages 34-35 of 72.

iv) Michel, J. 2010. Submerged Oil. In Oil Spill Science and Technology, Ed. M. Fingas, Elsevier Inc., Oxford, UK, pp. 959-981.

v) A3S5G9, Application Volume 8C - Technical Report, Modeling the Fate and Behavior of Marine Oil Spills for the Trans Mountain Expansion Project, Sections 5.2.7.4, PDF pages 34-35 of 72.

vi) A3S5G9, Application Volume 8C - Technical Report, Modeling the Fate and Behavior of Marine Oil Spills for the Trans Mountain Expansion Project, Table 5.2.1, PDF pages 31-32 of 72.

Preamble: Spill response methods and technology proposed by WCMRC and Trans Mountain are predicated on the assumption that diluted bitumen and similar products will float (Reference (i)). Modeling initiated by Trans Mountain has simulations suggesting roughly 20% of oil evaporates and 70% reaches shorelines (Reference (ii)). Two factors have been identified that would influence the floating or sinking of diluted bitumen - the density of seawater and the presence of sediment (Reference (iii)).

Sediment has been an important factor in most spills where oil has sunk (Reference (iv))). At temperatures between 0 and 15°C, the density of weathered diluted bitumen may exceed that of estuarine or brackish waters. It is possible that factors such as cold rainfall in estuarine waters carrying sediment will make weathered dilbit far more prone to sinking.

Request: a. Please identify the suspended sediment concentrations at which diluted bitumen is likely to sink?

b. Please identify the suspended sediment concentrations likely to be found throughout the Burrard Inlet, Georgia Strait and the Salish Sea.

c. Please provide the Test Simulation described for March 2002 in Reference (v).

d. Please provide the Effective Density of oil components described in Reference (vi) at 10^0 C vs. 25^0 C

1.35 Oil spill risk assessment: impacts of an oil spill

References: i) A3S4Y4, Application Volume 8A – Marine Transportation, Section 5.2.5, Table 5.2.4, PDF page 1 of 7.

ii) Burger, A. E. 1993. Estimating the mortality of seabirds following oil spills: effects of spill volume. Marine Pollution Bulletin. 26(3): 140-143.

iii) Szaro R. C. 1977. Effects of Petroleum on Birds, Reprinted from transactions of the 42nd American Wildlife Natural Resources Conference. Published by the Wildlife Management Institute, Washington, D.C.

iv) Heintz, R. A., Short, J. W., Rice, S. D. 1999. Sensitivity of fish embryos to weathered crude oil: Part II. Increased mortality of pink salmon (*Oncorhynchus gorbuscha*) embryos incubating downstream from weathered *Exxon Valdez* crude oil. Environmental Toxicology and Chemistry. 18: 494–503.

Preamble: The implication of Reference (i) is that the volume of oil spilled is a good predictor of ecological impacts of a spill. There is very weak evidence for a relationship between spill volume and number of birds killed (Reference (ii)). Small spills seem to be downplayed entirely in the Application, despite very small volumes of oil having reproductive consequences for seabirds (Reference (iii)) and salmon (Reference (iv)).

The oil spill fate models in Section 5, Volume 8A, would be more accurate if they were combined with spatially explicit estimates of marine mammals and birds that would be exposed to oil.

Request: a. Please provide spatially explicit estimates, supported by population estimates, of the numbers of marine mammals and birds that would be exposed to oil in each spill scenario.

MARKETS

1.36 Petroleum exports to North Korea

References: i) A3S0R0, Application, Vol. 2, Project Overview, Economics and General Information, Section 3.2.1, PDF page 8 of 43.

ii) A3S0R1, Trans Mountain Expansion Project, Direct Written Evidence of Steven J. Kelly, PDF pages 37-39, 55-56.

iii) Nanto, D.K. and Manyin, M.E. 2010. China-North Korea Relations. U.S. Congressional Research Service, pp. 16-17. Available at: https://www.fas.org/sgp/crs/row/R41043.pdf.

Preamble: Reference (i) indicates that 13 companies have entered into binding transportation service agreements for the Project.

The economic benefits of the Project, as asserted by Trans Mountain, rely heavily on higher netback prices on deliveries to Asian markets, including China (Reference (ii)).

China is a major source of North Korean imports of petroleum products (Reference (iii)).

Request: a. Please identify any companies that have entered into transportation service agreements for the Project that are Chinese state-owned or state-controlled companies or are companies in which Chinese state-owned or state-controlled entities have an interest.

b. Please confirm whether or not any companies identified in response to question (a), or any entities related to or supplied by such companies, exported crude oil or petroleum products from China to North Korea during the period 2010 to 2013.

c. Can Trans Mountain assure the Board that no crude oil or petroleum products transported by the Project, and no petroleum products derived from those substances, will be exported by Chinese state-controlled entities to North Korea?