Tanker Risks and the Enbridge Northern Gateway proposal

Summary of Raincoast's written evidence to the NEB Joint Review Panel for the Enbridge Northern Gateway proposal

Marine transport related incidents

This document provides a brief summary of Raincoast's written evidence concerning marine transport. Our original analysis focused on material presented by Enbridge in the Marine Shipping Quantitative Risk Analysis (QRA) by Det Norske Veritas[1] and material presented in the TERMPOL studies. In summary we found that the QRA gives a cursory, superficial, and even a misrepresentation of issues, including:

- No assessment of environmental consequence was associated with marine transport
- No suitable risk assessment for marine transport incidents was undertaken
- Insufficient collection and treatment of data by Enbridge
- Methods chosen for the QRA were inappropriate
- Enbridge's putative risk analysis was inappropriate for a project of such broad geographic extent and potential adverse environmental consequences
- Conclusions of the QRA and TERMPOL studies were not supported by empirical data or evidence

Tanker spill frequency - Tanker spill frequency has been extensively studied.[2] Using the *Per Volume Oil Transported* methodology[3] the Enbridge Northern Gateway project would be expected to experience seven spills from tankers and the port operation over 1,000 barrels during its 30-year life.[4] Table 1 below indicates return periods and the number of spills over the lifetime of the ENGP.

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[1] Enbridge Northern Gateway Pipelines. 2010. Exhibit B23–B34 - Gateway Application – TERMPOL TDR Marine Shipping Quantitative Risk Analysis – A1Z6L8.

[2] Van Hinte, T., Gunton, T.I. and J.C. Day. 2007. Evaluation of the assessment process for major projects: a case study of oil and gas pipelines in Canada. Impact Assessment and Project Appraisal, 25:123-137.

[3] Anderson, C.M., Labelle, R.P. 2000. Update of comparative occurrence rates for offshore oil spills. Spill Science and Technology Bulletin 6:303-321.

[4] Gunton, Thomas I, T Van Hinte and J C Day 2005. Managing Im-pacts of Major Projects: an Analysis of the Enbridge Gateway Pipeline Project. Burnaby BC: Simon Fraser University, School of Resource and Environmental Management.

Table 1: Return periods of spills from tankers based on spill rate (per billions of barrels shipped) data from literature [5] and proposed oil transport rates from the ENGP.

	Spill Size (bbls)	Rate[a]	Return Period (Years)[b]	Number of Spills Over Project Lifespan[c]
1985-1999 Globally	>1000	0.82	6.4	4.7
	>10000	0.37	14.1	2.1
	>100000	0.12	43.5	0.7
1985-1999 US	>1000	0.72	7.2	4.1
	>10000	0.25	20.9	1.4
1985-1999 ANS	>1000	0.92	5.7	5.3
	>10000	0.34	15.3	2.0

[a] rate is expressed in spills / billion barrels transported

[b] return period is calculated based on 525000 bbls per day through pipeline

[c] project lifespan used in calculation is 30 years

Notably, using these data, the return period for a spill of greater than 1,000 barrels (159 m^3), is approximately 6.5 years based on proposed production volumes. This is in stark contrast to the unmitigated return period of an incident resulting in a spill (of any size, oil or condensate) of 78 years, and the mitigated return period of 250 years presented in the QRA.[6]

Assessment of natural conditions and hazards - Raincoast identified a number of inadequacies related to the assessment of waves, wind, currents and visibility, hazard identification and simulations.

Waves, Wind and Current - The parameters used in the simulations (voyage and spill) are not based on the likely maximums, and subsequently increase the inaccuracy and detract from the credibility of the simulations.

[5] C. Anderson, Labelle R.P., Update of Comparative Occurrence Rates for Offshore Oil Spills, *Spill Science & Technology Bulletin*, Vol. 6, No. 5/6, pp. 303-321, 2000 Elsevier Science Ltd.
[6] Enbridge Northern Gateway Pipelines. 2010. Exhibit B23–B34 - Gateway Application – TERMPOL TDR Marine Shipping Quantitative Risk Analysis – A1Z6L8, pg. 7-110.

Winds - The stated maximum operational wind speed limit for berthing and deberthing worldwide of 25-40 knots is frequently exceeded in Douglas Channel. During the winter months, the average daily wind gusts at Nanakwa Shoals (in Kitimat Arm/Douglas Channel near the site of the proposed marine terminal) exceed 10 m/s (~ 20 knots) about 12% of the time.[7] This is approaching the low end of operational wind speed limits. Because this value is presented as a mean with no estimate of error, gusts will on occasion likely exceed operational limits for berthing and deberthing.

The QRA states that strong outflow and inflow winds in the channel will seldom pose a risk for navigation, as they run parallel to the channels and therefore the ship.[8] However, a number of turns of large magnitude (greater than 100 degrees) are in extremely confined channels over short distances, and must be accomplished with the vessel aspect not always parallel to the wind. The lack of acknowledgement of these conditions and the lack of assessment of their effect on the risk is a serious deficiency of this assessment.

Waves - The wave data in QRA only take into account significant wave height. Wave period and the confused nature of seas combined with hurricane force winds are not considered. Significant wave height is defined as "the average of the one-third largest measured waves".[9] Again, this is an average measure, and individual waves can be much higher. The QRA does not mention that similar wave conditions have resulted in many founderings, groundings and other weather related tanker casualties, and subsequent oil spills.

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[7] Enbridge Northern Gateway Pipelines. 2010. Exhibit B17-18 – Gateway Application - Weather and Oceans Conditions TDR - Part (1 of 1) - A1V8J0. Table 2-4, page 2-3.
[8] Enbridge Northern Gateway Pipelines. 2010. Exhibit B23–B34 - Gateway Application – TERMPOL TDR Marine Shipping Quantitative Risk Analysis – A1Z6L8, pg. 4-46.
[9] Enbridge Northern Gateway Pipelines. 2010. Exhibit B17-18 – Gateway Application - Weather and Oceans Conditions TDR - Part (1 of 1) - A1V8J0, pg. v.

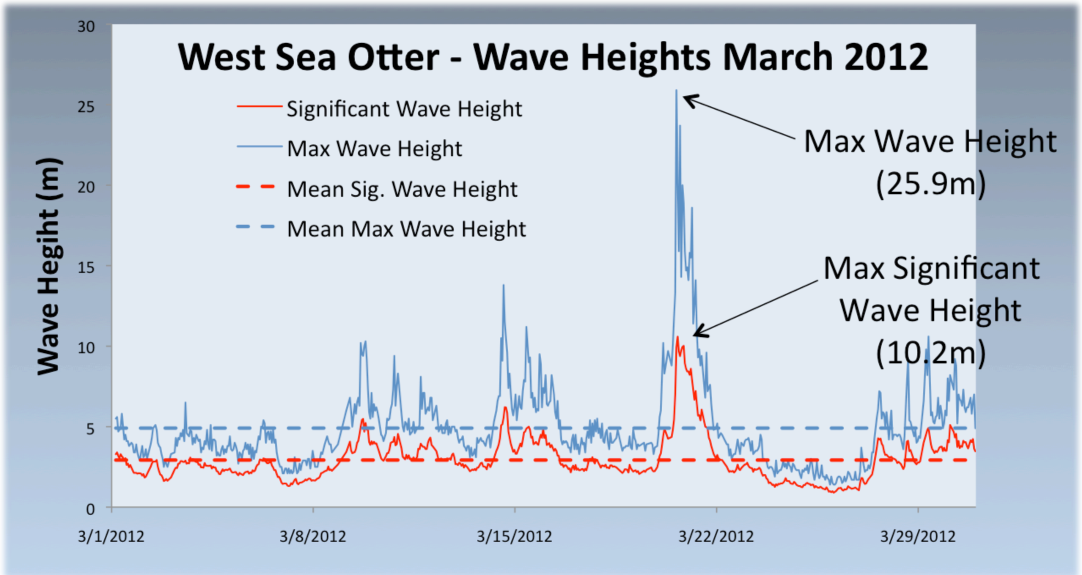

Figure 1. West Sea Otter Weather Buoy Data, March 2012.

Data from the weather buoy at West Sea Otter routinely recorded waves heights above 9 m with a maximum wave height of just less than 26m for March 2012. Enbridge, however, represented all its weather data as "Significant Wave Height" to present maximum wave height data. Accordingly, the Maximum Significant Wave is only 10.2 m, not 25.9 m. These methods, also used for wind and fog, are used to imply a much lower risk hazard than reasonable.

Currents - Although currents can make controlling an emergency more problematic, no discussion of foreseeable 'risks' is made and there is no additional discussion of emergencies and currents.

Visibility - Judging the correctness of sound, distance, and movement in conditions of reduced visibility increases the difficulty of navigation. Generally, visibilities lower than one nm (~1.85 km) are regarded as problematic for navigation and are reflected in the safety limitations for tanker and terminal operations. The operational limit for tanker manoeuvres will be in the range of 1 to 2 nm and will be defined during detailed design and the development of safe operating criteria with the involvement of pilots. This is one of the areas of the weather assessment where lack of appropriate data and the practice of averaging present a false impression of much lower levels of risk. The application of average conditions to assess risk is an obvious inadequacy. As confirmed by the experience of local mariners[10], tankers may be forced to wait longer periods in reduced visibility conditions. Local experienced mariners have reported periods of visibilities less than one nm for up to 48 hours in the CCAA.[11]

During discussions with local participants, reduced radar visibility due to heavy snow was identified[12]. Common during the winter in Douglas Channel and often lasting for many hours, heavy snow has the capacity to limit the quality of, or completely disable, radar performance. Visibilities during snowfalls are near zero and much of the channel is less than 1 nm wide. It is highly unlikely that a tanker would stop operations because of forecast snowfall. No discussion of this possibility is included in the QRA.

The lack of data on visibility conditions in the CCAA and neglect by Enbridge to collect it, demonstrate another significant failure to properly assess this risk to tanker transit. Reduced visibility and human error was the cause of the 2007 *Cosco Busan* accident that spilled more than 200,000 L of oil into San Francisco Bay after a collision with a well-known and marked bridge pier.

Hazard Identification - Worldwide frequencies are scaled to the British Columbia coast environment and traffic volumes using factors developed during the gathering of local knowledge and a peer review by DNV. One of the major failings of the methodology used is the failure to consider hazards in combination. By partitioning individual hazards, the QRA has consistently ignored the probability of simultaneously encountering more than one (in fact all of them) and thus has under represented the cumulative hazard.

Participants in local meetings and interviews failed to identify 'hidden' rocks or shoals that would be a concern for navigation. Some of the participants also noted that the current communications infrastructure in some areas, including Douglas Channel, could be improved and that radio communication and GPS sometime do not work near the steep mountains that rise

[10] Brian Falconer, personal communication, December 2011.
[11] Brian Falconer, personal communication, December 2011.
[12] Enbridge Northern Gateway Pipelines. 2010. Exhibit B23–B34 - Gateway Application – TERMPOL TDR Marine Shipping Quantitative Risk Analysis – A1Z6L8, pg. 4-46.

from the channels.[13] Although the area is reasonably well charted and charts are being updated, many rocks and shoals are unmarked. The possibility of radar and GPS being simultaneously inoperative, combined with possible limited visibility, presents considerable risk.

Simulations - Fast time and Full Bridge simulations were conducted and reported[14] but no accompanying discussion was included in the route evaluation. Although a reasonable range of simulations was conducted, serious deficiencies occurred in their reporting. A number of simulations were given low safety ratings by the participants. Some indicated that the voyages would be successful only if unrealistic parameters were applied. In one instance, a vessel was assisted (in the simulation) but the breaking strength of the towline was exceeded.

Hazards have been assessed in the QRA in a cursory and dismissive fashion. Thus, we stress that weather and navigational hazards interact synergistically, amplifying the potential for problems related to transport of oil by tankers.

The presentation of many of these risks in the form of averages instead of likely extremes is misleading and inappropriate. Mitigation of these hazards, especially with the use of escort tugs, is controversial. The lack of assessment in terms of combinations of extremes and worst-case scenarios make it likely that 'manageable' hazards in isolation will become unmanageable in combination or with the addition of confounding variables and unpredicted situations.

Is the Enbridge 'risk' analysis appropriate? - No. Given the availability of other statistical approaches, we question whether the choice of presenting spill or incident return periods is an appropriate or useful accounting of risk. Any assessment of risk for activities with such a high level of consequence should include the periods for which an incident **might** occur and the consequences of that risk. Although the QRA does calculate the probability of a spill occurring, a risk assessment includes the consequences of that event, not just the occurrence. In risk assessment studies, the objective is to assess the potential consequences if a spill were to occur.

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[13] Enbridge Northern Gateway Pipelines. 2010. Exhibit B23–B34 - Gateway Application – TERMPOL TDR Marine Shipping Quantitative Risk Analysis – A1Z6L8, pg. 4-47.

[14] Enbridge Northern Gateway Pipelines. 2010. Exhibit B23-18 – Gateway Application - TERMPOL TDR - Maneuvering Study of Escorted Tankers to and from Kitimat Part 1 Executive Summary (FORCE Technology) A1Z6K2

Accordingly, oil spill risk is defined as the likelihood (i.e. probability) of spills occurring multiplied by the consequences (impacts) of those incidents.[15] Enbridge simply quantified the probability of oil, bunker fuel, or condensate spills occurring during marine transport. They did not assess the consequences of these hypothetical spills, either qualitatively or quantitatively.

What risk and environmental impacts do marine transport incidents pose? - The environmental risks introduced by tankers are first associated with the transportation of petroleum products such as bitumen, condensate, light fuel, bunker oil and crude. The spill of these substances from catastrophic or chronic releases threatens the presence of countless species, food webs and ecosystems that are relied upon for subsistence, cultural, social, economic, physical and spiritual well being by an untold number of individuals and communities. In many cases, hydrocarbon impacts to species and habitats are additive in terms of the cumulative impacts and stressors that coastal ecosystems are under.

Many other contributors to environmental risk exist, such as garbage disposal, sewage discharge, water ballast, noise, ship wake and anti-fouling substances that are again cumulative to the existing pressures. The focus of this rapid risk assessment is limited only to accidental spills of persistent oil and condensate.

Risk assessment of to marine birds, marine mammals and salmon are also available on the Raincoast website.

[15] French-McCkay, D., Beegle-Krause, C.J., Etkin, D.S. 2009. Oil Spill Risk Assessment – Relative Impact Indices by Oil Type and Location. In Proceedings of the 32nd AMOP Technical Seminar on Environmental Contamination and Response, Emergencies Science Division, Environment Canada, Ottawa, ON, Canada, pp. 655-681. Available online at <http://www.asascience.com/about/publications/publications09.shtml>, Accessed December 11, 2011.