EVALUATION OF THE NATIONAL ENERGY BOARD'S TRANS MOUNTAIN EXPANSION PROJECT REPORT:

ASSESSMENT OF OIL SPILL RISKS

Prepared by
Dr. Thomas Gunton

School of Resource and Environmental Management

Simon Fraser University

for
Tsleil-Waututh Nation

November 23, 2016

TABLE OF CONTENTS

Page

EXECUTIVE SUMMARY 1

1. INTRODUCTION 3

2. NEB MANDATE 4

3. THE NEB'S RATIONALE AND CONCLUSIONS ON OIL SPILLS FROM THE TMEP 5

   3.1 NEB Conclusions on Oil Spills from Pipeline, Storage Tanks and Terminal 5
   3.2 NEB Conclusions on Oil Spills from Marine Traffic 6
   3.3 NEB Conclusions on Compensation and Liability for Oil Spills 7

4. DEFICIENCIES AND OMISSIONS IN NEB ANALYSIS OF OIL SPILLS 7

   4.1 Failure to Define Size of Oil Spills Causing Significant Adverse Effects 8
   4.2 Failure to Assess Impacts of Spills Below Credible Worst Case 8
   4.3 Failure to Provide Rationale for Conclusion that Spills are Unlikely 9
   4.4 Failure to Consider Evidence Showing that Pipeline, Storage and Terminal Spills are Likely 10
   4.5 Failure to Consider Evidence Showing that Marine Tanker Spills are Likely 10
   4.6 Failure to Consider Compensation and Damage Costs of a Tanker Spill 12
   4.7 Deficiencies in Determining Public Interest 13

5. PROFESSIONAL OPINIONS ON OIL SPILLS FROM TMEP 14

EXECUTIVE SUMMARY

1. I was retained by the Tsleil-Waututh Nation (**TWN**) to provide my professional opinion on the conclusions on oil spills from the Trans Mountain Expansion Project (**TMEP**) reached by the National Energy Board (**NEB**) in its May 2016 report.

2. In its May 2016 report, the NEB concludes that oil spills from:

   (a) the pipeline, storage tanks, and Westridge Marine Terminal components of the TMEP will cause significant adverse environmental effects; and

   (b) TMEP-related oil tankers will cause adverse and significant (i) environmental and socio-economic effects in Burrard Inlet, (ii) effects on heritage resources, and (iii) effects on the current use of lands, waters and resources for traditional purposes by Aboriginal peoples.

3. However, the NEB concludes that such oil spills are unlikely, and on that basis recommends that:

   (a) the level of risk from both categories of oil spills is acceptable in its determination of the public interest under the *National Energy Board Act* (**NEBA**); and

   (b) the significant adverse environmental effects of oil spills from the pipeline, storage tanks, Westridge Marine Terminal, and marine shipping components of the TMEP are unlikely under the *Canadian Environmental Assessment Act, 2012* (**CEAA 2012**).

4. The NEB does not provide the Governor in Council (**GIC**) with a recommendation in its 2016 report about whether the significant adverse environmental effects of oil spills are justified in the circumstances because it concluded that such oil spills are unlikely.

5. The GIC should not rely on the NEB's 2016 report and recommendations under CEAA 2012 and NEBA in relation to oil spills. They are unfounded and unreliable because the NEB:

   (a) failed to:

      (i) define the size of oil spills that will have a significant adverse effect and failed to consider the impact of oil spills smaller than what it terms a "credible worst case scenario";

      (ii) define "likely" and "unlikely," and an acceptable and unacceptable level of risk;

(iii) consider relevant evidence on the probability of oil spills from the TMEP;

(iv) cite estimates of the probability of occurrence of oil spills it relied on to reach its conclusions on the likelihood of oil spills;

(b) underestimated the frequency of tanker spills by omitting consideration of a large range of tanker spills smaller than a credible worst case spill that would cause significant adverse effects; and

(c) ignored evidence on the probability of occurrence which shows that pipeline, marine terminal, and oil tanker spills are likely.

6. It is my professional opinion that:

(a) oil spills from the TMEP are likely. I conclude that:

(i) even though it underestimates the likelihood of oil spills from the TMEP, Trans Mountain's own analysis that was filed with the NEB shows that the likelihood of oil spills from the TMEP is high (99%);

(ii) the evidence in the NEB's hearing record for the TMEP establishes that the likelihood of an oil spill from the TMEP is high. For example, I previously estimated in my 2015 report on this issue that there is a high likelihood of a tanker spill (58% to 98%);

(b) the NEB's recommendations that (i) significant adverse environmental effects from TMEP oil spills are unlikely under CEAA 2012, and (ii) the level of risk from TMEP oil spills is acceptable under NEBA, are unfounded and should not be relied upon; and

(c) the evidence in the NEB's hearing record for the TMEP establishes that significant adverse environmental effects from TMEP oil spills are likely.

7. In that regard, TWN submitted another expert report by Dr. Short entitled *Fate and Effect of Oil Spills from the Trans Mountain Expansion Project in Burrard Inlet and the Fraser River Estuary* as part of its written evidence in the NEB hearing.[1] In that report, Dr. Short concludes as follows:

[1] C358-13-17: TWN Assessment, Appendix 3: *Fate and Effect of Oil Spills from the Trans Mountain Expansion Project in Burrard Inlet and the Fraser River Estuary*, prepared by Jeffrey W. Short, dated May 11, 2015 [TWN Record, Vol 7, Tab 4C at 1118] (A4L6A8).

> Finally, even spills considerably smaller than the credible worst-case scenario of 16,000 m^3 can have substantial adverse effects on sea- and shorebirds as well as marine mammals and other organisms inhabiting the sea surface, shorelines and the water column if the oil submerges. Even small to medium sized oil spills on the order of 100 to 1,000 m^3 can cause substantial mortalities to seabirds, and estimated effects for small to medium spills in Canada and Alaska have the potential to contaminate tens of kilometres of shorelines on time scales of decades.[2]

1. INTRODUCTION

8. I co-authored, along with Dr. Sean Broadbent, a May 2015 report entitled *An Assessment of Spill Risk for the Trans Mountain Expansion Project* (**May 2015 Report**) that TWN, Tsawout First Nation, and Upper Nicola Band submitted as written evidence in the NEB hearing for the TMEP.[3] My qualifications and expertise in assessing the risks of oil spills are described on pages 2–3 of my May 2015 Report and my *curriculum vitae* is attached as Appendix "B" to that report.

9. Since preparing my May 2015 Report, I have reviewed the relevant evidence that was filed during the NEB's hearing for the TMEP as well as the NEB's May 2016 report and recommendations.[4]

10. The purpose of this report is to evaluate the conclusions in the NEB's May 2016 report on oil spills. In this report, I: (i) review the mandate of the NEB panel as set out in the NEBA and CEAA 2012; (ii) summarize the NEB's conclusions in relation to oil spills; (iii) evaluate the NEB's rationale and conclusions and identify any omissions and deficiencies in the NEB's analysis of oil spills; and (iv) provide my professional opinion on the validity of the NEB's conclusions on oil spills.

11. I have prepared this report in accordance with my duty as an expert to assist: (i) TWN in conducting its assessment of the TMEP; (ii) provincial or federal authorities with powers, duties, or functions in relation to an assessment of the environmental and socio-economic effects of the TMEP; and (iii) any court seized with an action, judicial review, appeal, or any other proceeding in relation to the TEMP.

---

[2] C358-13-17: TWN Assessment, Appendix 3: *Fate and Effect of Oil Spills from the Trans Mountain Expansion Project in Burrard Inlet and the Fraser River Estuary*, prepared by Jeffrey W. Short, dated May 11, 2015 at para 50 [TWN Record, Vol 7, Tab 4C at 1132] (A4L6A8).

[3] C358-13-15: TWN Assessment, Appendix 1: *An Assessment of Spill Risk for the Trans Mountain Expansion Project*, prepared by Drs. Gunton and Broadbent [TWN Record, Vol 5, Tab 4A at 806] (A4L6A6).

[4] Canada, National Energy Board (NEB), *National Energy Board Report, Trans Mountain Expansion Project*, OH-001-2014 (Calgary: NEB, May 2016), online: NEB <https://docs.neb-one.gc.ca/ll-eng/llisapi.dll/fetch/2000/90464/90552/548311/956726/2392873/2969696/2969867/National_Energy_Board_Report_-_OH-001-2014_-_A5A9H1.pdf?nodeid=2969681&vernum=-2> ("**NEB, 2016**").

12. In preparing this report, I acknowledge that it is my duty to:

    (a) provide evidence that is fair, objective, and non-partisan;

    (b) provide evidence that is related only to matters within my area of expertise; and

    (c) provide such additional assistance as may reasonably be required to determine a matter in issue.

13. I acknowledge that my duty is to assist the entities listed in paragraph 11, not to act as an advocate for any particular party. This duty prevails over any obligation that I may owe any party, including TWN on whose behalf I have been engaged.

2. NEB MANDATE

14. The NEB's mandate for reviewing the application is set out in the NEBA and CEAA 2012. The NEB describes its mandate under CEAA as follows:

> As a responsible authority under the CEAA 2012, the Board must, in its report to the Governor in Council, set out its recommendation regarding the environmental effects of a project. Specifically, the NEB provides a recommendation that a project is likely, or is not likely, to cause significant adverse environmental effects after taking into account the implementation of mitigation measures. For effects that are likely to be significant, the Board must also recommend whether or not they are justified in the circumstances. As part of the Board's environmental assessment under CEAA 2012, the Board considers any cumulative effects that are likely to result from the Project in combination with environmental effects from other physical activities that have been or will be carried out. The Board also considers the environmental effects of accidents and malfunctions that may occur in connection with the Project.[5]

15. The NEB describes its mandate under section 52 of the NEBA as follows:

> Section 52 of the NEB Act requires the Board to make a recommendation to the Governor in Council (GIC) on whether to approve the Project. In making its section 52 recommendation, the Board must have regard to all considerations that appear to be directly related and relevant to that project. The NEB Act provides the Board with flexibility and broad powers, but the Board must interpret and implement the Act in ways that serve the Canadian public interest. Part III of the NEB Act provides a test for the Board to apply when making its assessment of a project and providing its recommendation to the GIC. When applying the "present and future public convenience and necessity" test under Part III of the NEB Act, the Board makes a recommendation in the overall Canadian "public interest". In its consideration of an application, the Board is required to weigh all

[5] NEB, 2016, *supra* note 4 at 159.

> relevant evidence on the record and come to a recommendation whether, overall, the project is in the public interest. This is referred to in the NEB Act as the present and future public convenience and necessity.
>
> The Board has described the public interest in the following terms:
>
> > The public interest is inclusive of all Canadians and refers to a balance of economic, environmental and social interests that change as society's values and preferences evolve over time. As a regulator, the Board must estimate the overall public good a project may create and its potential negative aspects, weigh its various impacts, and make a decision.
>
> In section 52 of the NEB Act, Parliament has given direction about the factors relevant to the Board's consideration in reaching its public interest determination.[6]

16. The NEB's mandate as described above requires the NEB to consider the impact of oil spills under both its CEAA 2012 and NEBA mandates. Under CEAA 2012, the NEB is required to determine whether the adverse impacts of an oil spill are **significant** and **likely** after taking into account mitigation measures. If it finds that the adverse effects are significant and likely, the NEB is required to consider whether the adverse effects are **justified in the circumstances**. Under its NEBA mandate, the NEB is required to consider the effect of oil spills on the public interest. As the NEB states:

> However, the Board determined that potential environmental and socio-economic effects of Project-related tanker traffic, including the potential effects of accidents or malfunctions that may occur, are relevant to the Board's consideration of the public interest under the NEB Act.[7]

3. THE NEB'S RATIONALE AND CONCLUSIONS ON OIL SPILLS FROM THE TMEP

3.1 NEB Conclusions on Oil Spills from Pipeline, Storage Tanks and Terminal

17. The NEB divided its assessment of the impacts of oil spills into two sections: one section dealing with spills from the pipeline, storage tanks and the marine terminal (Sec.10.2.11)[8] and the other section dealing with spills from marine traffic (Chapter 14). After a lengthy review of the evidence on the impact of oil spills from pipelines, storage tanks, and the terminal, the NEB concludes that the adverse effects of a large oil spill would be significant. As the NEB states:

---

[6] NEB, 2016, *supra* note 4 at 13–14.
[7] NEB, 2016, *supra* note 4 at 323.
[8] NEB, 2016, *supra* note 4 at 226–236.

> For the purposes of CEAA 2012, the Board finds that effects from a credible worst case spill would be adverse and significant.[9]

18. While the NEB concludes that the adverse effects of a large oil spill from the pipeline, storage tanks, and marine terminal are significant, it concludes that "there is a very low probability of a Project spill (i.e., from pipeline, tank terminals, pump stations, or WMT) that may result in a significant effect (high consequence)."[10] Based on this finding, the NEB concludes that the level of risk from an oil spill from the pipeline, storage tanks, and marine terminal is acceptable in its determination of the public interest under the NEBA. The NEB also concludes under its CEAA 2012 mandate that significant adverse consequences from a pipeline, storage tank, and terminal spill are not likely. As the NEB states:

> However, as discussed in Chapter 9 with regard to the likelihood of spills, the Board finds that such events are not likely. Therefore, the Board recommends that there are not likely significant adverse effects for the purposes of CEAA 2012.[11]

19. *Importantly, the NEB does not cite any probability estimates it relies on to reach this conclusion*.

20. The NEB does not provide any assessment as to whether the significant adverse effects of a pipeline, storage tank, or marine terminal oil spill are justified in the circumstances because it concludes that an oil spill causing significant adverse effects is unlikely.

3.2 NEB Conclusions on Oil Spills from Marine Traffic

21. The NEB concludes that the adverse effects of a large spill from marine traffic (oil tankers) are significant as follows:

> As discussed further in this chapter and Chapter 10, the Board finds that based on evidence filed by Trans Mountain and intervenors, a large spill in Burrard Inlet would result in significant adverse environmental and socio-economic effects.[12]
>
> The Board is of the view that the effects of a credible worst-case spill on heritage resources could be adverse and significant.[13]
>
> The Board is of the view that the effects of a credible worst-case spill on the current use of lands, waters and resources for traditional purposes by Aboriginal people would likely be adverse and significant.[14]

---

[9] NEB, 2016, *supra* note 4 at 236.
[10] NEB, 2016, *supra* note 4 at 17.
[11] NEB, 2016, *supra* note 4 at 236.
[12] NEB, 2016, *supra* note 4 at 377.
[13] NEB, 2016, *supra* note 4 at 399.

22. While the NEB concludes that the adverse effects of a large oil spill from a tanker would be significant, it concludes that "there is a very low probability of a marine spill from a Project-related tanker that may result in a significant effect (high consequence)."[15] Based on this finding, the NEB concludes that the level of risk from an oil spill from a tanker is acceptable in its determination of the public interest under the NEBA. The NEB also concludes under its CEAA 2012 mandate that significant adverse consequences from a tanker spill are unlikely.

23. *The NEB does not cite the probability estimates it relies on to reach this conclusion.*

24. The NEB does not provide any assessment as to whether the significant adverse effects of marine traffic oil spill are justified in the circumstances because it concludes that an oil spill causing significant adverse effects is unlikely.

3.3 NEB Conclusions on Compensation and Liability for Oil Spills

25. In its September 10, 2013 "Filing Requirements Related to the Potential Environmental and Socio-Economic Effects of Increased Marine Shipping Activities," the NEB required Trans Mountain to provide a description of the liability and compensation regime that would apply in the case of an oil spill. The NEB concludes that the cost of a credible worst case pipeline spill could be $1.1 billion. Consequently, the NEB recommends that Trans Mountain be required to document financial capacity to cover a pipeline oil spill damage cost equivalent to this amount ($1.1 billion).[16]

26. The NEB concludes that the compensation resources available for a marine tanker spill are approximately $1.3 billion.[17] However, although the NEB summarizes evidence from intervenors on the costs of marine oil spills, *the NEB does not provide any conclusions as to the estimated cost of a marine tanker spill*. The NEB concludes that the issue of compensation for marine oil spill costs is under the jurisdiction of others and the NEB states that it has "no reason to believe that this regime is not functioning as designed."[18]

4. DEFICIENCIES AND OMISSIONS IN NEB ANALYSIS OF OIL SPILLS

27. There are a number of deficiencies and omissions in the NEB's analysis of oil spills. Omissions and deficiencies include:

---

[14] NEB, 2016, *supra* note 4 at 401.
[15] NEB, 2016, *supra* note 4 at 17.
[16] NEB, 2016, *supra* note 4 at 319.
[17] NEB, 2016, *supra* note 4 at 405.
[18] NEB, 2016, *supra* note 4 at 407.

(a) failure to define the size of oil spills that will have a significant adverse effect and failure to consider the impact of oil spills smaller than what it terms a "credible worst case scenario";

(b) failure to define likely and unlikely and failure to define acceptable and unacceptable risk;

(c) failure to consider relevant evidence on probability of spills;

(d) failure to cite estimates of the probability of occurrence of oil spills it relies on to reach its conclusions on spill likelihood; and

(e) failure to provide estimates of the damage costs of marine oil spills.

28. Each of these omission and deficiencies are discussed below.

4.1 Failure to Define Size of Oil Spills Causing Significant Adverse Effects

29. The NEB employs two terms in categorizing oil spills that will cause significant adverse effects: large and credible worst case. However, although the NEB refers to Trans Mountain's definition of credible worst case spill sizes, the NEB does not state what definition of large and credible worst case it uses in its determination of significant adverse effects. By failing to provide the definition of the spill size that it uses in its determination of likelihood of significant adverse effects, it is not possible for the NEB to make any determination on likelihood and therefore it is not possible for the NEB to conclude that significant adverse consequences of a spill are unlikely.

4.2 Failure to Assess Impacts of Spills Below Credible Worst Case

30. The NEB relies on the modeling of the spill sizes assessed by Trans Mountain as well as other intervenor evidence to reach its conclusion that the adverse environmental effects of a large or credible worst case spill are significant. In the case of tanker spills, Trans Mountain uses two spill sizes to assess impacts: 8,250 m^3 and 16,500 m^3.[19] Trans Mountain uses a credible worst case terminal spill of 160 m^3 and credible worst case pipeline spills ranging from 1,250–2,700 m^3.[20]

31. A major omission in Trans Mountain's approach, which was subsequently adopted and applied by the NEB, is that there is no analysis of the impact of smaller spills and therefore no conclusion on whether spills smaller than the credible worst case spill evaluated by Trans Mountain will also have significant adverse effects.

---

[19] NEB. 2015, *supra* note 4 at 372.
[20] NEB, 2016, *supra* note 4 at 227.

32. The NEB is ambiguous on the significance of smaller marine spills, noting only that if a small spill is quickly contained it may not have significant adverse effects. However, the NEB makes no determination of whether a small spill that is not quickly contained could have significant adverse effects. As the NEB states:

> …the Board is of the view that the environmental effects of a spill from a tanker would be highly dependent on the particular circumstances, such as the amount and the type of product(s) spilled, location of the spill, response time, the effectiveness of containment and clean up, the valued components that are impacted, and the weather and time of year of the spill. For example, a small spill that is quickly contained could have adverse effects of low magnitude, whereas a credible worst-case spill could have adverse effects of larger geographic extent and longer duration, and such effects would probably be significant. Moreover, spills could impact key marine habitats, such as salt marshes, eelgrass beds and kelp forests, which could, in turn, affect the numerous species that rely upon them. Spills could also affect terrestrial species along the coastline, including SARA-listed terrestrial plant species.[21]

33. By failing to assess the impact of spills smaller than a credible worst case spill, the NEB has omitted consideration of a large range of spills that could have significant adverse effects. Therefore the NEB's conclusion that significant adverse consequences of a spill are unlikely is unfounded because it is based on an underestimate of the number of spills that could have significant adverse effects.

4.3 Failure to Provide Rationale for Conclusion that Spills are Unlikely

34. The NEB's conclusion that a credible worst case tanker oil spill that will have significant adverse effects is unlikely does not rely on or cite any NEB conclusion regarding the probability of tanker spills. Without referring to the probability of a spill that it relies on to reach its conclusion, the NEB has not provided any basis for its conclusion that significant adverse consequences of a spill are unlikely and therefore its conclusion is unfounded.[22]

35. The NEB's conclusion that a credible worst case pipeline, storage tank, and terminal oil spill that will have significant adverse effects is unlikely does not rely on or cite any conclusion regarding the probability of pipeline, storage tank, or terminal spills that are used to reach its determination. Without referring to the probability of a spill that it relies on to reach its conclusion, the NEB has not

---

[21] NEB, 2016, *supra* note 4 at 397.

[22] In its review of the evidence, the NEB does reference Trans Mountain's estimate of return periods for tanker spills (NEB, 2016, *supra* note 4 at 397) but does convert any of these estimates into a spill probability. Further, while the NEB summarizes a number of concerns regarding the reliability of Trans Mountain's estimates expressed by intervenors (NEB, 2016, *supra* note 4 at 374), the NEB not does not state whether it concludes that the Trans Mountain's estimates are reliable and does not state what probability estimates it (the NEB) relies on to reach its conclusion that credible worst case marine oil spills are unlikely.

provided any basis for its conclusion that significant adverse effects from oil spills from pipelines, storage tanks, and the terminal are unlikely and therefore its conclusion is unfounded.

4.4 Failure to Consider Evidence Showing that Pipeline, Storage and Terminal Spills are Likely

36. Trans Mountain and several intervenors submitted evidence on the likelihood of pipeline and terminal spills that show that a large pipeline and terminal spill are likely. The probability of a large pipeline spill (rupture) estimated by Trans Mountain and intervenors over a 50 year operating life is 99.9%, while the probability of a terminal spill over a 50 year operating life is estimated by Trans Mountain to be 77% (Table 1 and 2, below). The NEB's conclusion that pipeline and marine terminal spills are unlikely is in direct contradiction of the evidence that shows that spills are in fact likely.

Table 1: Probability of Pipeline Spills[23]

Method	Size and Type of Spill	Return Period (in years)	Spill Probability over 30 Years (%)	Spill Probability over 50 Years (%)
TMEP Application	Line 1 Leak or Rupture	4	99.9	99.9
	Line 2 Rupture	2	99.9	99.9
	Line 1 or Line 2 Spill	1	99.9	99.9
NEB (2000-2009)	Line 1 spill (> 9 bbl)	2	99.9	99.9
	Line 2 spill (> 9 bbl)	2	99.9	99.9
	Line 1 or Line 2 spill (> 9 bbl)	1	99.9	99.9
Enbridge (1998-2010)	Line 1 spill (any size)	0.3	99.9	99.9
	Line 2 spill (any size)	0.3	99.9	99.9
	Line 1 or Line 2 spill (any size)	0.1	99.9	99.9
PHMSA (2002-2012)	Line 1 spill (any size)	0.5	99.9	99.9
	Line 2 spill (any size)	0.5	99.9	99.9
	Line 1 or Line 2 spill (any size)	0.2	99.9	99.9

4.5 Failure to Consider Evidence Showing that Marine Tanker Spills are Likely

37. The NEB omits consideration of evidence submitted by intervenors and Trans Mountain based on three different models that shows that marine tanker spills are likely.

---

[23] C358-13-15: TWN Assessment, Appendix 1: *An Assessment of Spill Risk for the Trans Mountain Expansion Project*, prepared by Drs. Gunton and Broadbent at 91 [TWN Record, Vol 5, Tab 4A at 913] (A4L6A6).

38. For example, my colleague Dr. Sean Broadbent and I assessed the probability of marine tanker spills from TMEP in our May 2015 Report, where we reached the following conclusions (which are summarized in Table 2 below):

(a) all size tanker spills have a probability ranging from 16.2% to 97.5% over a 50 year operating life;

(b) the lower end estimate of 16.2% provided by Trans Mountain is unreliable due to a number of deficiencies; and

(c) the reliable range of probability of a tanker spill is between 58.6% and 97.5% over a 50 year operating life.

Table 2 :Tanker Spill Probability Estimates[24]

Method	Size and Type of Spill	Return Period (in years)	Spill Probability (%)	
			30 Years	50 Years
TMEP Application	Any size tanker spill	46 – 284	10.0 – 48.3	16.2 – 66.7
	Any size tanker spill (in harbor)	580	5.0	8.3
	Mean tanker spill (35,900 bbl or 51,900 bbl)	91 – 568	5.1 – 28.2	8.4 – 42.4
	Worst case tanker spill (99,100 bbl or 103,800 bbl)	456 – 2,841	1.1 – 6.4	1.7 – 10.4
	Any size tanker or terminal spill	20 – 31	62.8 – 78.7	80.8 – 92.4
OSRA Model (International)	Tanker spill in port ≥ 1,000 bbl	25	71.1	87.4
	Tanker spill at sea ≥ 1,000 bbl	32	61.9	80.0
	Tanker spill in port/at sea ≥ 1,000 bbl	14	89.0	97.5
	Tanker spill in port/at sea ≥ 10,000 bbl	40	53.2	71.8
	Tanker spill in port/at sea ≥ 100,000 bbl	145	18.7	29.2
VTRA	TMEP spill greater than 6,290 bbl (73%)	57	41.1	58.6
	TMEP spill greater than 6,290 bbl (100%)	42	51.6	70.2
	TMEP spill greater than 6,290 bbl (tug mitigation)	58	40.6	58.1

Note: Spill probabilities for TMEP application computed based on return periods from TM (2013, Termpol 3.15) and Trans Mountain (2015). The Inner Harbour in the TMEP application represents segments 1 and 2 in the Termpol 3.15 study; this corresponds to the geographic region between English Bay and Westridge Terminal. Spill probabilities for tanker spill of 35,900 bbl or 51,900 bbl represent mean outflow for grounding and collision, respectively. Spill probabilities for tanker spill of 99,100 bbl or 103,800 bbl represent worst case outflow for grounding and collision, respectively. Spill probabilities for VTRA 2010 any size spill computed based on return period from Merrick and van Dorp (2015). Spill probabilities for OSRA model computed from Anderson et al. (2012).

39. The NEB makes no attempt to explain the inconsistency between its conclusion that that tanker spills that would cause significant adverse effects are unlikely and the evidence showing that tanker spills are likely.

[24] C358-13-15: TWN Assessment, Appendix 1: *An Assessment of Spill Risk for the Trans Mountain Expansion Project*, prepared by Drs. Gunton and Broadbent at 95 [TWN Record, Vol 5, Tab 4A at 917] (A4L6A6).

4.6 Failure to Consider Compensation and Damage Costs of a Tanker Spill

40. The NEB states that it requested Trans Mountain to submit information of the liabilities and compensation regime that applies in the case of accidents and malfunctions such as oil spills. Trans Mountain submitted evidence on the costs of pipeline spills and the NEB reached a conclusion and made a recommendation on pipeline spill compensation requirements of $1.1 billion.[25] However, the NEB provides no comparable assessment of the costs of a marine tanker oil spill and no recommendation on the level of compensation that should be available despite the fact that tanker spill costs could be much higher than pipeline spill costs and could exceed available compensation.

41. The NEB references tanker spill cost estimates by other intervenors including the City of Vancouver, Conversations for Responsible Economic Development, and Gunton and Broadbent.[26] *The NEB notes that the damage estimates provided in this evidence exceed the available compensation of $1.3 billion*. However, the NEB concludes that the damage estimates provided by these intervenors are unreliable and inflated for the following reasons: (1) the costs are based on spill costs that are not tanker based; (2) the costs are based on an assumption that a large spill is likely; (3) the cost estimates include hypothetical passive values, and; (4) costs are based on extreme spill size estimates.[27]

42. All of these criticisms as applied to the damage estimates provided in our May 2015 Report are incorrect for the following reasons:

    (a) *Criticism*: Tanker spill costs estimates use estimates based on non-tanker spills.

        Response: This is incorrect. All the tanker spill cost estimates are based on tanker spill costs.

    (b) *Criticism*: Tanker spill costs are based on the assumption that a large tanker spill is likely.

        Response: This is incorrect. The tanker spill cost estimates are not based on the assumption that a large spill is likely. Compensation and damage analysis is based on a credible worst case scenario, which is used to ensure that there are sufficient resources to cover costs of worst case events. This is the approach that the NEB uses in its own analysis of the compensation and damage analysis for a credible worst case pipeline spill.

    (c) *Criticism*: The tanker cost estimates use hypothetical passive values.

---

[25] NEB, 2016, *supra* note 4 at 319.
[26] NEB, 2016, *supra* note 4 at 406.
[27] NEB, 2016, *supra* note 4 at 407.

Response: This is incorrect. The cost estimates of $4.4 billion to calculate the compensation shortfall of $2.9 billion referenced by the NEB do not include any passive use values. If passive use values are included, the cost estimate increases from $4.4 billion to between $5.8 and $25.8 billion.

(d) *Criticism*: The spill volume estimates use spill cost estimates based on an extreme spill size.

Response: This is incorrect. The spill volume estimates are based on the credible worst case size estimate (16,500 m^3) and the mean estimate (8,250 m^3) provided by Trans Mountain in its application and referenced by the NEB.[28]

4.7 Deficiencies in Determining Public Interest

43. In determining the public interest under the NEBA, the NEB compares the benefits and burdens of the TMEP and reaches the conclusion that the benefits exceed the burdens and the TMEP is consequently in the public interest.

44. Oil spills are listed as a burden by the NEB in its determination of the public interest. The NEB's assessment of the role of oil spills in its determination of the public interest has the following deficiencies:

(a) the NEB's states that its conclusion is based on the assumption that the probability of an oil spill that will have significant effects and a high consequence is "very low" without citing any evidence on the probabilities of oil spills to support this assumption, and in direct contradiction of evidence that shows that the probability of oil spills that could cause significant adverse effects is high; and

(b) the NEB does not provide any definition of acceptable risk on which to base its conclusion that the risk of an oil spill is acceptable. The NEB does note that risk is a function of both the likelihood of an event and the consequence of an event. Therefore, a high consequence event such as a credible worst case spill could still pose an unacceptable risk even if the probability was low.

45. For these reasons, the NEB's determination of the public interest is deficient because it is based on an underestimate of the risk and burden posed by oil spills.

---

[28] NEB, 2016, *supra* note 4 at 272.

5. PROFESSIONAL OPINIONS ON OIL SPILLS FROM TMEP

46. The NEB's mandate under CEAA 2012 requires it to determine the likelihood of significant adverse effects and, if there are, to assess whether these effects are justified in the circumstances.

47. The NEB concludes that:

    (a) a credible worst case marine oil spill will have significant adverse effects but is unlikely; and

    (b) a credible worst case pipeline and marine terminal spill will have significant adverse effects but is unlikely.

48. The NEB's rationale for its conclusion that significant adverse effects from marine tanker oil spills are unlikely is deficient and incomplete because the NEB:

    (a) underestimates the frequency of tanker spills by omitting consideration of a large range of tanker spills smaller that a credible worst case spill that would have significant adverse effects;

    (b) does not state probabilities of occurrence of tanker oil spills that it relies on to assess likelihood and does not provide its definition of likely; and

    (c) ignores evidence on the probability of occurrence that shows that tanker spills are likely.

49. For these reasons, the NEB's conclusion that significant adverse effects from a tanker oil spill are unlikely is unfounded and should not be relied on.

50. The NEB's rationale for its conclusion that significant adverse effects from pipeline, storage tanks, and marine terminal oil spills are unlikely is deficient and incomplete because the NEB:

    (a) does not state probabilities of occurrence of oil spills that it relies on to assess likelihood and does not provide its definition of likely; and

    (b) either ignores or incorrectly rejects evidence on the probability of occurrence that shows that pipeline and marine terminal oil spills are likely.

51. For these reasons, the NEB's conclusion that significant adverse consequences from a pipeline and marine terminal oil spill are unlikely is unfounded and should not be relied on.

52. The NEB's assessment of the compensation and liability system for marine oil spills is deficient and incomplete because the NEB provides no estimates of the

damage costs of a credible worst case marine oil spill and, by making errors in fact and logic, incorrectly concludes that the damage cost estimates provided by intervenors are inflated.

53. The evidence presented by intervenors clearly and conclusively shows that the damage costs of a credible worst case tanker spill exceed the capacity of the current compensation regime for tanker spills.

54. The NEB's determination that the TMEP is in the public interest is deficient and incomplete because it is based on an underestimate of the risk of oil spills and does not clearly state its definition of acceptable risk that it uses to reach its conclusion. In the case of marine tanker spills, the NEB does not even provide an estimate of damage costs to assess risk.

55. It is my professional opinion that:

(a) oil spills from the TMEP are likely. I conclude that:

(i) even though it underestimates the likelihood of oil spills from the TMEP, Trans Mountain's own analysis that was filed with the NEB shows that the likelihood of oil spills from the TMEP is high (99%);

(ii) the evidence in the NEB's hearing record for the TMEP establishes that the likelihood of an oil spill from the TMEP is high. For example, I previously estimated in my May 2015 Report on this issue that there is a high likelihood of a tanker spill (58% to 98%);

(b) the NEB's recommendations that (i) significant adverse environmental effects from TMEP oil spills are unlikely under CEAA 2012, and (ii) the level of risk from TMEP oil spills is acceptable under NEBA, are unfounded and should not be relied upon; and

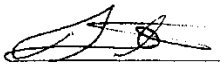
(c) the evidence in the NEB's hearing record for the TMEP establishes that significant adverse environmental effects from TMEP oil spills are likely.

56. In that regard, TWN submitted another expert report by Dr. Short entitled *Fate and Effect of Oil Spills from the Trans Mountain Expansion Project in Burrard Inlet and the Fraser River Estuary* as part of its written evidence in the NEB hearing.[29] In that report, Dr. Short concludes as follows:

[29] C358-13-17: TWN Assessment, Appendix 3: *Fate and Effect of Oil Spills from the Trans Mountain Expansion Project in Burrard Inlet and the Fraser River Estuary*, prepared by Jeffrey W. Short, dated May 11, 2015 [TWN Record, Vol 7, Tab 4C at 1118] (A4L6A8).

Finally, even spills considerably smaller than the credible worst-case scenario of 16,000 m^3 can have substantial adverse effects on sea- and shorebirds as well as marine mammals and other organisms inhabiting the sea surface, shorelines and the water column if the oil submerges. Even small to medium sized oil spills on the order of 100 to 1,000 m^3 can cause substantial mortalities to seabirds, and estimated effects for small to medium spills in Canada and Alaska have the potential to contaminate tens of kilometres of shorelines on time scales of decades.[30]

November 23, 2016



Dr. Thomas Gunton

[30] C358-13-17: TWN Assessment, Appendix 3: *Fate and Effect of Oil Spills from the Trans Mountain Expansion Project in Burrard Inlet and the Fraser River Estuary*, prepared by Jeffrey W. Short, dated May 11, 2015 at para 50 [TWN Record, Vol 7, Tab 4C at 1132] (A4L6A8).