Trans Mountain Pipeline ULC
Trans Mountain Expansion Project
NEB Hearing Order OH-001-2014
Responses to Information Request from
Province of British Columbia

2.01 Geohazard management during pipeline construction and risk acceptability criteria

Reference:

i. A3Z2A6, Trans Mountain Response to BC Motion to Compel Full and Adequate Answers to BC IR No. 1, Organization Chart entry 1.2 b)

ii. Association of BC Professional Engineers and Geoscientists. 2008. Guidelines for the Management of Terrain Stability in the Forest Sector, sections 4.3.7 and 4.3.8. https://apeg.bc.ca/Resources/Professional-Practice/Practice-Related-Documents

iii. Association of BC Professional Engineers and Geoscientists. 2010. Guidelines for Legislated Landslide Assessments for Proposed Residential Developments in BC. p.52. https://apeg.bc.ca/Resources/Professional-Practice/Practice-Related-Documents

Preamble:

In reference (i), Trans Mountain states as follows:

> There is [*sic*] no documented risk acceptance "criteria" for LVP [Low Vapour Pressure] pipelines. Risk acceptance criteria exists [*sic*] for Natural Gas Pipelines in the Netherlands and UK, with a focus on rupture, thermal radiation zones, and loss of life.
>
> Best practices will be adopted during construction to ensure that the potential for geohazards to be initiated, or where already occurring to be exacerbated, is minimised during pipeline construction or operation.
>
> In all cases, recognized standards of practice and Codes for the relevant jurisdiction will be adhered to, including the incorporation of appropriate factors of safety specific to mitigate against the various types of geohazards, both for the protection of the pipeline and public and natural resources. [emphasis added]

Reference (ii) indicates that professional forestry practice identifies elements at risk (including public safety, infrastructure, the property of others, and legislated values (i.e. environmental elements), and then identifies appropriate levels of acceptable risk for these elements.

Reference (iii) is an example of landslide safety acceptance criteria. The British Columbia Ministry of Transportation set a maximum annual hazard of 1/475 for a damaging landslide, and 1/10,000 for a life-threatening landslide. Subdivision and development are not permitted if hazards exceed these levels.

References (ii) and (iii) indicate that geohazard acceptability criteria are commonly applied in the Province of British Columbia.

Request:

a) Please provide specific references for the "standards of practice and Codes" and the "appropriate factors of safety" for geohazards referred to in reference i) that Trans Mountain will adhere to during construction and operation of the Project.

b) How will Trans Mountain determine whether the residual geohazard risk to public safety, infrastructure, private property, and environmental resources is acceptable?

c) Does Tran Mountain agree that, while there may be no risk acceptance criteria for LVP pipelines, the use of risk acceptance criteria in other industries is common in geohazard management in B.C.?

d) Will Trans Mountain adopt levels of acceptable risk for landslides and other geohazards caused by pipeline construction or operation that may directly affect public safety, infrastructure, private property, and environmental resources? If so, what are these criteria?

e) Will Trans Mountain re-align sections of the pipeline route if geotechnical assessments show that significant levels of hazard will remain even if best practices are followed? If yes, please describe the process that will be followed to identify the appropriate route revision.

Response:

a) Specific references to the primary standards of practice and Codes that will be adhered to during construction and operation of the Project are provided in the references list that follows. Trans Mountain will apply the most recent and relevant guidelines for each jurisdiction and as related to the specific geohazard type and construction or operational scenario encountered.

Wherever possible, geohazard management will be guided by probabilistic, risk-based analyses and engineering judgement, rather than by deterministic evaluation of factors of safety. Where appropriate for a specific situation (*e.g.,* construction of an engineered cut or fill) factors of safety (FoS) will be determined based on the guidelines and codes applicable in the given jurisdiction, or based on engineering judgement if FoS targets are not explicitly stated.

References:

Alberta Environment (2013). Code of Practice for Pipelines and Telecommunication Lines Crossing a Water Body. Government of Alberta. Edmonton, AB. 36 pp. http://www.qp.alberta.ca/documents/codes/PIPELINE.PDF

Association of Professional Engineers and Geoscientists of British Columbia (2008). Guidelines for Management of Terrain Stability in the Forest Sector. Dated September 2008. http://www.abcfp.ca/regulating_the_profession/documents/Management_Terrain_Stability.pdf

Association of Professional Engineers and Geoscientists of British Columbia (2010). Guidelines for Legislated Landslide Assessments for Proposed Residential Developments in BC. https://www.apeg.bc.ca/getmedia/5d8f3362-7ba7-4cf4-a5b6-e8252b2ed76c/APEGBC-Guidelines-for-Legislated-Landslide-Assessments.pdf.aspx

British Columbia Ministry of Environment, Lands and Parks (1999). Guidelines for Management of Flood Protection Works in British Columbia. Province of British Columbia http://www.env.gov.bc.ca/wsd/public_safety/flood/pdfs_word/gd_mgt_fld_pro_bc.pdf

British Columbia Ministry of Environment (2015). BC Water Act. Province of British Columbia. http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_96483_01

British Columbia Ministry of Forests (1994). A guideline for Management of Landslide-Prone Terrain in the Pacific Northwest. http://www.for.gov.bc.ca/hfd/pubs/Docs/Lmh/Lmh18-01.pdf

British Columbia Ministry of Forests (2000). Range Use Plan Guidebook. Province of British Columbia. http://www.for.gov.bc.ca/tasb/legsregs/fpc/FPCGUIDE/RANGE/rupguide.pdf

British Columbia Ministry of Water, Land and Air Protection (2004). Flood Hazard Area Land Use Management Guidelines. 35 p. http://www.env.gov.bc.ca/wsd/public_safety/flood/pdfs_word/guidelines-2011.pdf

C-Core, D.G. Honegger Consulting and SSD, Inc., (2009). Guidelines for Constructing Natural Gas and Liquid Hydrocarbon Pipelines Through Areas Prone to Landslide and Subsidence Hazards – FINAL REPORT. Prepared for the Design, Materials, and Construction Committee of Pipeline Research Council International Inc., dated January 2009.

Canadian Association of Petroleum Producers, Canadian Energy Pipeline Association and Canadian Gas Association (2012). Pipeline Associated Watercourse Crossings 4th Edition. Prepared by TERA Environmental Consultants, Salmo Consulting Inc. and Applied Aquatic Research Ltd. Calgary AB. 217 pp. http://www.cepa.com/wp-content/uploads/2014/01/FourthEdition_WatercourseCrossingManual_Nov2012.pdf

Canadian Standards Association (CSA). Z662-11 Oil and gas pipeline systems and Special Publication Z662.1-11 Commentary on CSA Z662-11, Oil and gas pipeline systems. http://www.csagroup.org/ca/en/services/codes-and-standards

Duncan, J.M. (2000). Factors of safety and reliability in geotechnical engineering, Journal of Geotechnical and Geoenvironmental Engineering, American Society of Civil Engineers, p. 307-316.

Harper, W.L., J.M. Cooper, K. Simpson, J. Hamilton, K.A. Dunham and D.S. Eastman, (2001). Guidelines for Evaluating, Avoiding and Mitigating Impacts of Major Development Projects on Wildlife in British Columbia. Draft dated May 2001. 204 pp.

Honegger D.G. and Nyman, D.J. (2004). Seismic Design and Assessment of Natural Gas and Liquid Hydrocarbon Pipelines, Pipeline Research Council International, Inc., No. L51927.

NBCC (National Building Code of Canada) (2010). Published by the National Research Council of Canada, Ottawa. *(Recognised to be revised in 2015, and for implementation on TMEP)*

West Coast Environmental Law (2001). Guide to Forest Land Use Planning. http://wcel.org/sites/default/files/publications/Guide%20to%20Forest%20Land%20Use%20Planning%20-%20Updated%202001.pdf

b) This issue is addressed in the response to Province of BC IR No. 2.01d.

c) To Trans Mountain's knowledge there are very few instances where quantitative risk acceptance criteria are used by other industries in geohazard management in B.C. Trans Mountain agrees that there are many examples where qualitative risk tolerance criteria are used (where measures of hazard likelihood and severity of consequence are combined qualitatively using a risk matrix). These matrices are typically developed by companies and the risk tolerance criteria embedded within them reflect each company's level of risk tolerance which varies according to industry type, and other factors. These matrices are intended to support risk management efforts according to the As Low As Reasonably Practicable (ALARP) principle. There are other examples of use of quantitative hazard or partial risk tolerance criteria in B.C., such as those by the Ministry of Transportation of British Columbia as reported in Reference (iii), but these do not quantify factors such as vulnerability of the elements at risk and the expected degree of loss should an element at risk be impacted by a geohazard.

   An exception to the above is the life safety risk tolerance criteria formally adopted by the District of North Vancouver as part of their Natural Hazards Management Program (also reported in Reference (iii)).

   Please refer to the response to Province of BC IR No. 2.01d for a fulsome description of the ALARP principle and Trans Mountain's approach to risk assessment and risk management as it pertains to geohazards.

d) The risk assessment methodology for the Trans Mountain Expansion Project does not adopt levels of acceptable risk for landslides or other geohazards caused by pipeline construction or operation. Widely adopted environmental risk evaluation criteria (excluding those relating to human health) are not established in any jurisdiction. In the absence of such criteria Trans Mountain is ensuring that risk is managed to levels that are As Low As Reasonably Practicable (ALARP) so as to promote safe and reliable operation.

   The issue of risk evaluation criteria was addressed in Section 5.1 of the report that accompanies the Preliminary Risk Results for TMEP Line 2 and New Delivery Lines (Filing ID A3Z8G1). As stated in that section:

The chiefly environmental and socio-economic consequences that are associated with a crude oil pipeline spill do not lend themselves to absolute quantification and expression in terms of a universally recognized unit of measure. In addition, as highlighted by the European Commission's Land Use Planning Guidelines3, there are practical limitations associated with expressing absolute measures of environmental risk, owing to:

- *Advanced complexity of modelling and lack of agreement on basic assumptions;*
- *Lack of data, with regards to response of environmental receptors to toxic loads;*
- *Lack of understanding and difficulty of modelling of the reactions within the components of the ecosystem.*

Furthermore, there are no environmental risk evaluation criteria for pipelines that have been established in any jurisdiction, and those risk criteria that do exist relate to human life. For instance, the reliability limits that are provided in Annex O of CSA Z662-11 are safety-related, and are applicable only to natural gas pipelines.

Therefore, in the absence of a widely-adopted set of risk evaluation criteria, the types of risk mitigation measures that are being considered by Trans Mountain include both failure prevention and spill mitigation measures to ensure that risk is managed to levels that are As Low As Reasonably Practicable (ALARP).

The ALARP principle has been adopted by other jurisdictions, such as the British Health and Safety Executive. The definition of 'Reasonably Practicable' set out by the British Court of Appeal is as follows:

> *'Reasonably practicable' is a narrower term than 'physically possible' … a computation must be made by the owner in which the quantum of risk is placed on one scale and the sacrifice involved in the measures necessary for averting the risk (whether in money, time or trouble) is placed in the other, and that, if it be shown that there is a gross disproportion between them – the risk being insignificant in relation to the sacrifice – the defendants discharge the onus on them.*

Essentially, making sure that a risk has been reduced to ALARP involves weighing the risk against the incremental expenditure of resources to further reduce it. The ALARP principle dictates that risk mitigation should be considered until a point of diminishing returns has been reached with respect to the expenditure of further resources. Once it has been established that risk reduction in one area is not sensitive to further implementation of risk-mitigation measures, resources are more appropriately directed at reducing risk in other areas.

Risk mitigation decisions that are based on ALARP promote safe and reliable operation because the presumption is that an operator is bound by duty to implement the risk reduction measure. To avoid having to implement risk-mitigation measures, the duty-holder must be able to show that it would be grossly disproportionate to the benefits of risk reduction that would be achieved. Thus, the process is not one of balancing the costs and benefits of measures but, rather, of adopting measures except where they are

ruled out because they involve resource allocations that are grossly disproportionate to the benefits achieved. Using the test of 'reasonably practicable' allows an operator to set goals for itself as a duty-holder, rather than being prescriptive. This flexibility is a great advantage, as it allows duty-holders to choose the method that is best for them and it supports innovation.

Inherent within the ALARP principle is acknowledgement that risk is associated with virtually all human endeavours. The management of risk to levels that are commensurate with ALARP requires a systematic means of identifying and measuring risks, along with the associated drivers of risk so that risk-appropriate means can be selected to manage those risks. The semi-quantitative risk assessment (SQRA) method that is described in this report and its associated Attachments serves as the vehicle through which this is achieved.

Although acceptable risk levels will not be adopted, Trans Mountain will utilise the results of the SQRA to help prioritise mitigation efforts at geohazard sites in accordance with the ALARP principal.

References:

British Health and Safety Executive website, http://www.hse.gov.uk/risk/theory/alarpglance.htm, accessed July 22, 2014.

e) Route realignment due to geohazard(s) is within the range of options potentially available in completing the design of the Project.

Typically, geohazards will be identified by the geotechnical consultant at site specific locations along the Trans Mountain Expansion Project pipeline alignment. The first step in the pipeline design process will be to undertake a detailed assessment of the geohazard where appropriate and model and analyze the implications of the geohazard induced stress on the pipeline. The outcome of this analysis is to determine if the pipeline remains within the allowable design limits according to industry codes and standards. If the pipeline response is outside the allowable design limits, then design mitigation measures will be reviewed. Examples of potential mitigation measures include methods to reduce the activity or potential effect of the geohazard, such as through water management, adjustment of slope angle or through reinforcement, or through material considerations, pipe wall thickness considerations, mechanical protection and construction methodology considerations. Re-alignment of the pipeline route at site specific locations would be the last design solution employed to address geohazard mitigation.

If route realignment is required, Trans Mountain will adopt the same route alignment criteria as as documented in the Application. Trans Mountain's approach for the corridor route selection process has been described in previous filings including:

- Section 4.2.2 of Volume 2 (Filing ID A3S0R0)
- Section 2.8.1 of Volume 4A (Filing ID A3S0Y8)
- Section 4.3 of Volumes 5A/5B (Filing ID A3S1L4 and A3S1R6, respectively)

2.02 Terrain mapping and terrain stability management

Reference:

i. A3S1C5. Application Volume 4A, Project Design & Execution – Engineering, Appendix H, PDF p. 12 and 13 of 29, Table 2-1 in particular.

ii. A3Z4T9. Trans Mountain Response to NEB IR No. 2.097, PDF p. 375 of 478

iii. A3Y2Z1. Trans Mountain Response to Province of BC IR No. 1.2 e), PDF p. 7 of 187.

iv. A3Y2Z1. Trans Mountain Response to Province of BC IR No. 1.2 c), PDF p. 7 of 187.

Preamble:

Reference (i) shows that polygons identified as Class III have a failure rate of up to 30%. Considering the aggregated risk for all Class III polygons along the British Columbia portion of the pipeline (approximately 300), and assuming, for the sake of this IR, that landslides will occur in 15% of the Class III polygons, dozens of landslides could result from construction of the Project.

Reference (ii) presents new definitions of terrain stability classes used for terrain mapping. No quantitative criteria for landslide likelihood are presented.

Reference (iii) states that “Class III terrain is typically not included in a TSA [Terrain Stability Assessment]”, thus indicating that terrain stability assessments will not be carried out for polygons identified as Class III prior to pipeline construction.

Reference (iv) indicates that “the results from the geohazard assessment (including those polygons identified as moderate and low hazard categories [Class III]) become part of the Natural Hazards Management Program”.

Request:

a) Reference (ii) presents the new definitions of terrain stability classes, without numerical failure rates. Does this mean that the numerical criteria in reference (i) are no longer applicable?

b) The Province seeks to understand the likely effects of pipeline development and operations on terrain stability both upslope and downslope of the pipeline. If the old numerical criteria no longer apply, are there new quantitative criteria to replace the old criteria?

c) If the old numerical criteria still apply, then, relying on Trans Mountain’s evidence, dozens of landslide are likely to occur. Since, as is stated in reference (iii), Trans Mountain will not be doing TSAs on this terrain, what steps will Trans Mountain take to avoid landslides?

d) Will Trans Mountain commit to carrying out TSAs for all Class III polygons since they may, by definition, be subject to a moderate likelihood of landslides? If not, why not?

e) If TSAs will not be carried out for Class III polygons, please explain how Class III terrain will become part of the Natural Hazards Management Program.

Response:

a) Reference (i) referred to numerical failure rates quoted in a Ministry of Forests guidebook (1995) that has been superseded by a newer version that no longer quotes failure rates (Forest Practices Code 1999).

References:

Forest Practices Code, 1995. Mapping and Assessing Terrain Stability Guidebook. British Columbia, Ministry of Forests and Ministry of Environment. 34pp.

Forest Practices Code, 1999. Mapping and Assessing Terrain Stability Guidebook. 2nd edition, British Columbia, Ministry of Forests and Ministry of Environment. 43pp. http://www.for.gov.bc.ca/TASB/LEGSREGS/FPC/FPCGUIDE/terrain/zipped/terrain.pdf

b) Quantitative criteria for terrain stability can only be developed for specific areas with similar terrain and climatic conditions, and would be expected to vary for similar landforms in different physiographic / climactic regions. FPC 1999 states “The criteria for terrain stability classes are typically qualitative and depend on the knowledge and experience of the terrain mapper.” The current guidance for terrain mapping in BC therefore does not provide for quantification of landslide frequency associated with development.

Reference:

Forest Practices Code, 1999. Mapping and Assessing Terrain Stability Guidebook. 2nd edition, British Columbia, Ministry of Forests and Ministry of Environment. 43pp. http://www.for.gov.bc.ca/TASB/LEGSREGS/FPC/FPCGUIDE/terrain/zipped/terrain.pdf

c) The likelihood of landslides initiating due to pipeline development activity can be reduced through careful construction practices (Ministry of Forests 1994). The following management activities will be used to minimize landslides associated with pipeline construction:

- Use of experienced grading foremen.
- Management of surface and subsurface drainage to avoid erosion, ponding and piping (internal erosion).
- Avoid placement of fill on potentially unstable slopes.
- Minimize the height of cut slopes.

Trans Mountain will develop a management plan for terrain stability to be implemented during construction and to continue through operation once construction is completed.

Reference:

Ministry of Forests. 1994. A Guide for Management of Landslide-Prone Terrain in the Pacific Northwest. 2nd Edition. Land Management Handbook number 18. http://www.for.gov.bc.ca/hfd/pubs/docs/Lmh/Lmh18.pdf

d) Trans Mountain will carry out Terrain Stability Assessment (TSA) for selected Class III polygons where desktop study suggests that TSAs are warranted, such as steeper or wetter slopes, or slopes potentially impacted by geohazards. Following a construction management plan as described in the response to Province of BC IR No. 2.02c and by using good construction practices including management of drainage and fill placement as described in Land Management Handbook 18 (MOF 1994) will minimize the likelihood of landslides on Class III slopes.

Reference:

Ministry of Forests (1994) A Guide for Management of Landslide-Prone Terrain in the Pacific Northwest. 2nd edition. Land Management Handbook Number 18. 220pp. http://www.for.gov.bc.ca/hfd/pubs/docs/Lmh/Lmh18.pdf

e) As noted in the Trans Mountain response to Province of BC IR No 2.02d, Trans Mountain will carry out Terrain Stability Assessment (TSAs) for selected Class III polygons where desktop study suggests that TSAs are warranted. The Terrain Stability classes rate only the likelihood of slope failures initiating as a response to clearing and construction, and do not specifically identify existing natural geohazard processes that are identified in other components of the terrain mapping. The Natural Hazards Management Program aims to identify all natural geohazards that could impact the pipeline, including both those that may originate as a result of pipeline construction and those that have occurred or will occur naturally, independent of pipeline construction. For example a fan or cone may be mapped as Terrain Stability Class I, II or III, but if it is subject to debris flows or debris floods it may have a high or moderate natural hazard rating, and will be included in the Natural Hazards Management Program. Class I, II and III slopes that are potentially subject to natural geohazards will be identified as part of this program.

Summary of New Commitments:

- Develop a TMEP management plan for terrain stability prior to start of construction.

2.03 Design criteria for hydrotechnical hazards

Reference:

i. A3X6G0, Trans Mountain response to Natural Resources Canada IR No. 1.03.7, PDF p. 40 of 74.

ii. A3Y2Z1.Trans Mountain response to Province of BC IR No. 1.1 f), PDF p. 2 of 187.

Preamble:

Reference (i) indicates that the erosion/scour modelling used a 1/100 year flow.

Reference (ii) indicates that Trans Mountain has adopted a design hazard level of the 1/200 year event.

Request:

Why did the erosion/scour modeling use the 1/100 year flow, whereas the stated design flow is 1/200? Please discuss the implications of the use of the 1/100 year flow for erosion/scour modeling, and how these will be addressed.

Response:

Trans Mountain has adopted the magnitude of the 200-year flow event as design basis. Reference (i) was in error and should have read that erosion and scour potential were estimated based on the 200-year flow event.

2.04 Risk assessment terminology

Reference:

A3Y3V1, Trans Mountain response to Upper Nicola Band IR No. 1.02 i)

Preamble:

Reference (i) states that geohazards will be “or-gated” in the risk assessment.

Request:

Please define “or-gated” and describe how the concept is used in the risk assessment methodology.

Response:

In probability, the term “AND” is used to denote the likelihood of concurrence of two or more independent events, and is calculated as the product of the individual probabilities of occurrence of those independent events. The term “OR” is used to denote the likelihood of occurrence of at least one of two or more independent events, and is calculated as:

$$1-[(1-Pa)x(1-Pb)x(1-Pc)x...x(1-Pn)], \text{ where 'P'}$$

represents the probability of occurrence of ‘n’ independent events. The term ‘OR-Gate” is a term used in logic to denote the “OR” function, as defined above.

2.05 Geohazard Event Inventory – consequences and response

Reference:

A4A2Z4, Trans Mountain Follow-Up Response to BC IR No. 1.1 a), PDF p. 2-3 of 3.

Preamble:

The Geohazard Inventory provided in the reference above shows the location, geohazard type, and the year for each geohazard event. No information is provided regarding the consequences of the event on the pipeline or pipeline facilities, whether a loss of containment occurred, or whether the pipeline or pipeline facilities required repair.

Request:

Please provide, for each geohazard event in the Geohazard Event Inventory, a description of the consequences of the event on the pipeline or pipeline facilities, whether a loss of containment occurred, and whether the pipeline or pipeline facilities required repair.

Response:

The following table provides a description of the consequences of the event on the pipeline or pipeline facilities, whether a loss of containment occurred and a description of required repairs. Note that some corrections were required from Table F-IR 1.1.01a-1 and those changes are indicated in brackets. With the exception of the Ward Road release in 2005 due to compaction and lateral displacement from fill placed by a landowner near to the pipeline, no geohazard events listed in the inventory have caused a loss of containment in the past 44 years.

TABLE 2.05-1

GEOHAZARD EVENT INVENTORY FOR TRANS MOUNTAIN PIPELINE (TMPL)

Site Name	TMPL Kilometre Post	Hazard	Year of Event	Repair & Consequence Summary
KP 82 (event missing from prior list)	82	Earth Slide	1954	Loss of containment resulted in release of 2697 m3 (16,940 bbl). Failure was from a compression fracture due to slide. Pipe replacement was required.
Pyramid Creek Slide	558.9	Earth Slide	1967	No loss of containment. Line was relocated in 1967 due to earth slide in lower slope during Hwy#16 construction.
KP 935 (event missing from prior list)	935	Washout	1971	Loss of containment of 478 m3 (3000 Bbl) A section of pipe was replaced.
Pocahantas Valve Debris Flow	335.2	Debris Flow	1973	No loss of containment. A debris flow protection berm was constructed to protect a block valve at this location

TABLE 2.05-1

GEOHAZARD EVENT INVENTORY FOR TRANS MOUNTAIN PIPELINE (TMPL) (continued)

Site Name	TMPL Kilometre Post	Hazard	Year of Event	Repair & Consequence Summary
Unnamed Slope Slide	570.7	Earth Slide	1975	No loss of containment. Pipeline was exposed with minor damage. Pipe repairs were required, re-established cover over the pipe, and removed debris from the channel.
KP 965 (event missing from prior list)	965	Heavy Rain	1980	No loss of containment Pipe exposed by heavy rains with no damage to pipe. Pipeline depth of cover was restored.
KP 1005 (event missing from prior list)	1005	Heavy Rain	1980	No loss of containment Pipe exposed by heavy rains. No damage to pipe. Pipeline depth of cover was restored.
Coquihalla River (event missing from prior list)	1003	Washout	1983	No loss of containment River overtopped bank and washed out a 260 m of the right of way exposing the pipeline. Extensive recoating and right of way repairs were required.
Klapperhorn Creek Debris Flow	466.4	Debris Flow	Est. 1985-2000	No loss of containment. Pipeline was not damaged. Berms were constructed on both banks for 200m upstream of the crossing to protect pipeline.
Ted Creek Debris Flow	1039.2	Debris Flow	1983 (previously listed as 1987)	No loss of containment. A concrete structure was constructed to protect the pipeline from debris flows at this location.
Pocahantas Valve Debris Flow	335.2	Debris Flow	1989	No loss of containment See 1973 event for mitigation
Hope Debris Slide	1014	Debris Slide	1989	No loss of containment Pipeline was damaged. A section of pipe was replaced. The crossing was armoured with riprap to protect the pipeline.
Two Fans Debris Flow	1021	Debris Flow	1989	No loss of containment Pipeline was not exposed and no damage occurred. No repairs were required.
Pocahantas Valve Debris Flow	335.2	Debris Flow	1990	No loss of containment See 1973 event for mitigation
Rockingham Creek	411.6	Avulsion (previously listed as Debris Flood)	1990	No loss of containment Pipeline was not affected. Avulsion on right of way was repaired.

TABLE 2.05-1

GEOHAZARD EVENT INVENTORY FOR TRANS MOUNTAIN PIPELINE (TMPL) (continued)

Site Name	TMPL Kilometre Post	Hazard	Year of Event	Repair & Consequence Summary
Coquihalla River 14	996.3	Scour	1989 (previously listed as 1990)	No loss of containment Pipe repairs were required. Pipeline was temporarily repaired and protected using concrete saddles. This river crossing was eliminated by relocating the pipeline through a tunnel in 1991.
French's Hill Landslide	551	Earth Slide	1994	No loss of containment Pipeline was relocated to the east side of Hwy 5 in 1994.
Sager Creek Debris Flow	637.6	Debris Flow	Est. 1994-1998	No loss of containment Pipeline was not damaged. Pipeline depth of cover was restored.
Coldwater River 4	942.9	Scour	1995	No loss of containment Minor pipeline damage. Pipeline repairs were completed. Depth of burial was restored and riverbed and bank were armoured with riprap. This crossing was replaced with 2.5m depth of cover in 1997.
Coldwater River 6	951	Bank Erosion	1995	No loss of containment Pipeline was exposed for 10m with minor damage. Pipe was repaired. A rock apron was installed to prevent erosion. This crossing was replaced in 1998.
Coldwater River 7	953.2	Bank Erosion	1995	No loss of containment Pipeline was exposed. Pipeline burial depth was restored and the banks were armoured with riprap to prevent erosion.
Coldwater River 8	954.4	Bank Erosion	1995	No loss of containment Pipeline was exposed. Pipeline depth of cover was restored and the channel was armoured with riprap to prevent erosion. This crossing was replaced in 1997.
Hope Creek Debris Flow	1012.8	Debris Flow	1995	No loss of containment The pipeline was not damaged. The crossing was armoured with riprap and concrete to protect the pipeline.
Unnamed Creek Debris Flow	357	Debris Flow	1997	No loss of containment Pipe exposed. Burial depth was restored and the crossing was armoured with riprap to protect the pipeline.
Campbell Bennett Hill Slope	555	Debris Flow (previously listed as Earth Slide)	Prior to 1998	No loss of containment Engineered surface water drainage side slope channels were installed to protect the pipeline.

TABLE 2.05-1

GEOHAZARD EVENT INVENTORY FOR TRANS MOUNTAIN PIPELINE (TMPL) (continued)

Site Name	TMPL Kilometre Post	Hazard	Year of Event	Repair & Consequence Summary
Hope Creek Debris Flow	1012.8	Debris Flow	2002	No loss of containment Pipeline was not damaged. The crossing was extensively armoured with riprap and concrete to protect the pipeline.
Corral Creek Debris Flow	352.7	Debris Flow	2003	No loss of containment The pipe was exposed. The pipeline burial depth was restored. Channel was armoured with riprap to protect the pipeline.
French's Hill Landslide	551	Earth Slide	2003	No loss of containment The pipeline was not damaged. No repairs were required.
Coquihalla Headwater Debris Flow	962.4	Debris Flow	2003	No loss of containment Pipeline was exposed. The burial depth was restored and the crossing was armoured with riprap to protect the pipeline.
Roche Miette Debris Flow Creek	333.4	Debris Flow	2004	No loss of containment Pipeline was exposed. The burial depth was restored and the crossing was armoured with riprap to protect the pipeline.
Ward Road Slide	1085.1	Earth Slide	2005	Loss of containment of 247 m3 (1550 Bbl). Tank transfer line failed in 2005 due to a crack that formed in a buckle from lateral ground movement caused by a nearby landfill in a compressible soil location. The damaged pipe section was replaced. Extensive post incident monitoring was conducted to monitor for additional ground movement. The entire Trans Mountain system was assessed for threats due to compressible soils. Susceptible soils hazard was incorporated into the natural hazard database.
Pocahantas Valve Debris Flow	335.2	Debris Flow	2006	No loss of containment See 1973 mitigation
Coquihalla Headwater Debris Flow	962.4	Debris Flow	2006	No loss of containment Pipe was protected with concrete saddles and riprap
Messiter Debris Slide	608.7	Debris Slide	2007	No loss of containment Slide did not cross the pipeline. Bank pins were installed to monitor the slide and a rock buttress was constructed to protect the pipeline.
Whispering Pines	769.8	Debris Flow	2007	No loss of containment Line was exposed. Pipe burial depth was restored and the channel was armoured.

TABLE 2.05-1

GEOHAZARD EVENT INVENTORY FOR TRANS MOUNTAIN PIPELINE (TMPL) (continued)

Site Name	TMPL Kilometre Post	Hazard	Year of Event	Repair & Consequence Summary
Phillips Creek Debris Flow	1034.2	Debris Flow	2007	No loss of containment Debris flow did not affect the pipeline.
Lemieux Creek	722.5	Bank Erosion	2009	No loss of containment Bank erosion threatened to expose the pipeline on one bank. The bank was restored with soil and riprap protection.
Miledge Creek	567.1	High Flow Event	2010	No loss of containment Pipe was not damaged. Bank and channel were armoured to prevent loss of cover..
Cheam Creek Debris Flow	1042.6	Debris Flow	2010	No loss of containment The pipe was not damaged. Crossing depth of cover was restored to 1.5m and armoured with riprap.
Unnamed Slope	410	Debris Slide	2012	No loss of containment The pipeline was not damaged. The slope was armoured with riprap.
North Miledge Hill	568.5	Debris Slide	2012	No loss of containment Pipeline was not affected. No repairs were required.
Tum Tum Creek Avulsion	622	Avulsion	2012	No loss of containment The pipeline was not affected. A beaver dam was removed to restore normal creek flow as a preventive measure.
Salem Debris Flow	918.6	Debris Flow	2012	No loss of containment The pipeline was not affected. No repairs were required.
Coquihalla Fan Debris Flow	967.8	Debris Flow	2012	No loss of containment The pipeline was not affected. A diversion channel and dyke were constructed to protect the pipeline.
Concrete Flume Creek	1040.1	Debris Flow	2012	No loss of containment The pipeline was not affected. This concrete flume is in place to protect the pipeline from debris flows.
Unnamed Rockfall	361.7	Rockfall	2013	No loss of containment The pipeline was not affected. No repairs were required.
Unnamed Creek Debris Flow	452.7	Debris Flow	2013	No loss of containment Inactive line is partially exposed. Will be repaired during reactivation.

2.06 Level of geohazard mitigation

Reference:

A3Z8G1, Technical Update #1, Preliminary Risk Results for TMEP Line 2 and New Delivery Lines, Table 4, Ten Highest-Ranked Individual Discrete Geohazards, PDF p. 24 of 62.

Preamble:

Table 4 in the reference above sets out the ten highest risk geohazard sites that may pose a threat to the pipeline. The table indicates that all of these sites are to be mitigated so the maximum "Post-Mitigation FLOC Estimate for Discrete Geohazard" likelihood is 1E-05.

Request:

a) Does Trans Mountain plan to apply mitigation to all other geohazard sites in order to reduce risk to a maximum post-mitigation risk score of 1E-05?

b) If not, which risk scores will Trans Mountain aim to achieve for other geohazard sites? What criteria will Trans Mountain use to determine which risk score to achieve for a particular site?

Response:

a) It is important to make a distinction between failure likelihood (*i.e.,* the likelihood, on an annual basis of a threat precipitating a loss-of-containment incident on the pipeline) and risk. These terms are not interchangeable, and so a failure likelihood value of 1E-05 (as cited in the Preamble to this request) is not the same as a risk score of 1E-05 (as cited in the request itself).

As indicated in Section 2 of the Preliminary Risk Report for Line 2 and the New Delivery Lines (Filing ID A3Z8G1), risk is expressed as the product of failure frequency and consequences of failure. Because estimates of failure frequency are quantitatively expressed, and the socio-economic consequences of a pipeline failure are evaluated by means of a qualitative index score out of 100, the risk scores that are generated by means of the approach described in the above reference are semi-quantitative.

The process of risk evaluation and mitigation is described fully in Section 5 of the above-referenced document. As described in that Section, it is a process whereby potential risks (defined as a compound measure of both failure likelihood and consequences of failure) are pre-emptively identified so that appropriate mitigation measures can be implemented at the design phase to address those risks. These mitigation measures, once incorporated into the final design, will reduce failure likelihood and/or consequence (and hence risk) by targeting risk mitigation strategies directed at the principal drivers of risk that have been identified in the risk assessment.

Table 4, referenced in the Preamble is illustrative only, and provides examples of how the Preliminary Risk values that are characteristic of the tabular risk results presented in Filing IDs A3Z8G5 (pages 11-37), A4F5G8, and A4F5F9 can and will be mitigated

before arriving at a final design. In the examples shown in Table 4, risk is mitigated through the implementation of measures that lower risk through a reduction in failure likelihood. It should not be inferred that on the basis of this illustrative example that failure likelihood is the sole focus of risk mitigation. In other cases, risk will be mitigated through measures that target a reduction in consequence (such as valve design optimization). The examples shown in Figure 4 were in no way intended to suggest that there is a threshold or limit on failure likelihood, as that would be contrary to the philosophy of risk-based design, which is focused on risk, rather than failure likelihood alone.

b) As indicated in the response to Part a) of this request, the risk-based design approach that is being adopted by Trans Mountain for Line 2 and the new delivery lines is focused on risk (defined as a compound measure of both the likelihood of pipeline failure and the consequences of failure), rather than failure likelihood alone, or consequence alone. As such, there is no 'threshold' value for either failure likelihood or consequence.

The topic of risk evaluation criteria was addressed in Section 5 of the Preliminary Risk Report for Line 2 and the New Delivery Lines (Filing ID A3Z8G1). As highlighted in that Section,

The chiefly environmental and socio-economic consequences that are associated with a crude oil pipeline spill do not lend themselves to absolute quantification and expression in terms of a universally recognized unit of measure. In addition, as highlighted by the European Commission's Land Use Planning Guidelines[3], there are practical limitations associated with expressing absolute measures of environmental risk, owing to:

- *Advanced complexity of modelling and lack of agreement on basic assumptions;*
- *Lack of data, with regards to response of environmental receptors to toxic loads;*
- *Lack of understanding and difficulty of modelling of the reactions within the components of the ecosystem.*

Furthermore, there are no environmental risk evaluation criteria for pipelines that have been established in any jurisdiction, and those risk criteria that do exist relate to human life. For instance, the reliability limits that are provided in Annex O of CSA Z662-11 are safety-related, and are applicable only to natural gas pipelines.

Therefore, in the absence of a widely-adopted set of risk evaluation criteria, the types of risk mitigation measures that are being considered by Trans Mountain include both failure prevention and spill mitigation measures to ensure that risk is managed to levels that are As Low As Reasonably Practicable (ALARP).

The ALARP principle has been adopted by other jurisdictions, such as the British Health and Safety Executive. The definition of 'Reasonably Practicable' set out by the British Court of Appeal is as follows[4]:

'Reasonably practicable' is a narrower term than 'physically possible' … a computation must be made by the owner in which the quantum of risk is placed on one scale and the sacrifice involved in the measures necessary for averting the risk (whether in money, time or trouble) is placed in the other, and that, if it be shown that there is a gross disproportion between them – the risk being insignificant in relation to the sacrifice – the defendants discharge the onus on them.

Essentially, making sure that a risk has been reduced to ALARP involves weighing the risk against the incremental expenditure of resources to further reduce it. The ALARP principle dictates that risk mitigation should be considered until a point of diminishing returns has been reached with respect to the expenditure of further resources. Once it has been established that risk reduction in one area is not sensitive to further implementation of risk-mitigation measures, resources are more appropriately directed at reducing risk in other areas.

Risk mitigation decisions that are based on ALARP promote safe and reliable operation because the presumption is that an operator is bound by duty to implement the risk reduction measure. To avoid having to implement risk-mitigation measures, the duty-holder must be able to show that it would be grossly disproportionate to the benefits of risk reduction that would be achieved. Thus, the process is not one of balancing the costs and benefits of measures but, rather, of adopting measures except where they are ruled out because they involve resource allocations that are grossly disproportionate to the benefits achieved. Using the test of 'reasonably practicable' allows an operator to set goals for itself as a duty-holder, rather than being prescriptive. This flexibility is a great advantage, as it allows duty-holders to choose the method that is best for them and it supports innovation.

Inherent within the ALARP principle is acknowledgement that risk is associated with virtually all human endeavours. The management of risk to levels that are commensurate with ALARP requires a systematic means of identifying and measuring risks, along with the associated drivers of risk so that risk-appropriate means can be selected to manage those risks. The semi-quantitative risk assessment (SQRA) method that is described in this report and its associated Attachments serves as the vehicle through which this is achieved.

2.07 Pipeline Risk Assessment and groundwater protection

Reference:

i. A3S4V6, Application Volume 7 – Risk Assessment and Management of Pipeline and Facility Spills, Section 6.2.2.1, PDF p. 19 of 137.

ii. A3W9H9, Trans Mountain Response to NEB IR No. 1.81a, PDF p. 430 of 481

iii. A3S0Z5, Application Volume 4A, Project Design and Execution, Appendix D - Tables, Table 5.1.8 – Preliminary Pipe Wall Thickness, PDF p. 16 of 93.

iv. A3S4V5, Application Volume 7 – Risk Assessment and Management of Pipeline and Facility Spills, Section 3.1.5, PDF p. 42 of 84.

v. A3Z8G1, Technical Update #1, Part 2: Risk Update, Preliminary Risk Results for TMEP Line 2 and New Delivery Lines, PDF p. 18-22 of 62.

vi. A3Z8G5, Technical Update #1, Part 2: Risk Update, Preliminary Risk Results for TMEP Line 2 and New Delivery Lines, Attachment C – Line 2 Consequence Report, Section 2.1.3, Drinking Water Source Score, PDF p. 8 of 37.

vii. Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators, BC Ministry of Environment, October 9, 2012, Appendix 8 – Hydrogeology Rationale: http://www.env.gov.bc.ca/epd/industrial/mining/pdf/water_air_baseline_monitoring.pdf

Preamble:

Reference (i) states:

> Residents of the Fraser River valley noted the importance of aquifers that provide domestic and community water sources. During detailed engineering, Trans Mountain will complete a pipeline risk assessment and evaluate the need for additional mitigation measures (e.g., valve spacing, deeper burial or thicker-walled pipe) to reduce threats and associated risk.

In reference (ii), Trans Mountain commits to provide a risk ranking for the various wall thicknesses (reference iii) for the new pipeline segments.

In reference (iv), High Consequence Areas (HCAs) are defined as

> areas which, if a release were to occur, would have elevated consequences due to land use or location with respect to water bodies such as rivers, streams and lakes. These are defined as HCAs. HCAs include the following:
>
> …
>
> - An area which contains drinking water sources or an aquifer that could be impacted by release.

In reference (v), the risk value for each pipeline segment is expressed as the product of failure likelihood and failure consequence.

In reference (v), HCAs of the 'Aquifer' type are defined as: "below-ground drinking water sources that are derived from Provincial Ground Water Management information" (Table 1).

In reference (vi), the Drinking Water Source Score is based on whether the spill plume corresponding to the outflow volume intersects a drinking water source (including aquifers).

In some instances, including Reference Kilometer segments from 526 to 530 km (Aquifer #800), 748 to 757 km (Aquifer #296), 758 to 769 km (Aquifer #293), 811 to 836 km (Aquifer #283), 1108 to 1116 km (Aquifer #21 – Sumas Prairie), 1122 to 1129 km (Aquifer #22 – Matsqui Prairie), moderately vulnerable aquifers are intersected by the proposed route, yet a value of '0' for Aquifer-type HCAs is tabulated.

Reference (vii) explains that the Government of British Columbia has primary jurisdiction over the management and protection of water, including groundwater in BC. The Ministry of Forests, Lands and Natural Resource Operations (MFLNRO) and the Ministry of Environment (MOE) are the main agencies that share this provincial responsibility. The following principle guides MOE's and MFLNRO's groundwater policies;

> Groundwater is a valued resource in and of itself, and irrespective of existing use. It is not necessary to show how groundwater is currently used in order for it to be included as a valued component in an environmental assessment under the EAA [*Environmental Assessment Act*]; it is automatically included.

The Province is concerned about the impacts of a slow undetected leak on groundwater. A slow, undetected leak (i.e., a pin-hole leak whose volume is below the detection threshold of the leak detection equipment) would allow for product to slowly dissolve into the groundwater and contaminate a vast area before detection.

Request:

a) In reference (vi), HCAs (including Aquifers) are tabulated by pipeline segment (typically each 1 km long). How were the aquifers located beneath the proposed pipeline segment that "could be impacted by release", as defined in reference (iv), identified? In other words, how did Trans Mountain determine if an aquifer located beneath any given pipeline segment "could be impacted by a release"?

b) The likelihood of an aquifer being impacted by release is largely related to the type and thickness of the overlying materials. During pipeline installation, pipeline burial can remove some of those overlying materials, thereby increasing the vulnerability of the aquifer. Was the depth of burial considered in determining whether an aquifer "could be impacted by a release"? If yes, how? If not, why not?

c) What precautions will Trans Mountain take to avoid increasing the vulnerability of an aquifer in determining the depth of pipeline burial in locations where aquifers are near the surface?

d) In reference (vi), an Aquifer-type HCA is recorded for several pipeline segments, yet a Drinking Water Area-type HCA is not recorded. Why is that?

e) In reference (vi), the consequence is scored using an expression that includes a Drinking Water Source Score (assigned in Table 3). How was it determined if a well used as a drinking water source was downstream of the pipeline? Since the locations of all water wells are not known, how was this uncertainty dealt with in assessing Drinking Water Area-type HCAs and Drinking Water Source Scores? Given the widespread use of private wells, especially in the Fraser Valley, wouldn't a more conservative approach be to assume that all pipeline segments over mapped aquifers are upstream of a drinking water source?

f) Given that aquifer vulnerability is highly variable geographically (i.e., confining layers can vary substantially in thickness and extent), does Trans Mountain agree that a more conservative approach would define all but the low vulnerability aquifers as having the potential to be impacted by a pipeline release? If yes, will Trans Mountain commit to doing so?

g) In a slow, undetected leak scenario, the risk cannot be decreased by reducing the drivers of consequence (i.e., decreased valve spacing cannot reduce outflow volumes, as a full-bore rupture would not occur in this scenario). Instead, risk can only be decreased by reducing the failure frequency. What measures will Trans Mountain take to reduce the failure frequency in areas over aquifers, so as to reduce the overall risk and better protect the water resource?

h) Would an increase in pipe wall thickness render slow, undetected leaks less likely and reduce overall failure frequency?

Response:

a) For HCA identification purposes, aquifers are defined as below-ground drinking water sources that are derived from Provincial Ground Water Management information.

Therefore, aquifers that are considered "high vulnerability" or "moderate vulnerability with high production" that are either directly intersected by the pipeline alignment, or potentially could be intersected by means of overland spill trajectory, were identified as HCAs.

Three key considerations with respect to HCAs are as follows.

1. There is no current regulation within Canada that defines High Consequence Areas (HCAs), and that require pipeline operators to identify them along their pipeline routes. Kinder Morgan Canada has adopted an internal corporate standard that aligns with US regulatory requirements, which provides objectivity and consistency in assessing potential consequences associated with a pipeline leak, and which in many regards is considered best practice. As outlined in Section 3.5.1 in the Line 2 Risk Report (Filing ID A3Z8G1):

Trans Mountain has adopted HCA definitions that are as similar as possible to those defined under the US Part 195 Regulations.

The CFR 49 §195.6 (a) (2) regulations provide the following definition for Unusually Sensitive Areas (USAs):

The Source Water Protection Area (SWPA) for a CWS or a NTNCWS that obtains its water supply from a Class I or Class IIA aquifer and does not have an adequate alternative drinking water source. Where a state has not yet identified the SWPA, the Wellhead Protection Area (WHPA) will be used until the state has identified the SWPA;

Therefore, in keeping with best practice and guided by US HCA regulations, aquifers that are considered "high vulnerability" or "moderate vulnerability with high production", that are either directly intersected by the pipeline alignment, or potentially could be intersected by means of overland spill trajectory, were identified as HCAs and assessed to be impacted by a release.

2. As indicated above, for the purpose of HCA identification, Trans Mountain considers not only those locations that are intersected by the physical alignment of the pipeline, but also those that could be impacted by an overland spill. For the purposes of spill modeling, as is described in Section 3.1.6 of Volume 7 of the Application (Filing ID A3S4V5), a most-credible worst-case scenario, full-bore rupture was used to establish outflow volumes. This outflow model does not take account of any response, intervention, or of any attenuation of volumes prior to reaching a high consequence area. In this respect the volumes modeled are highly idealized and conservative, and a review of information relating to past incidents would support the contention that these should not be taken to be representative of expectations for real-life spill events.

3. Within the risk assessment that is being used to guide risk-based design, there is a distinction between HCA definitions and Consequence Scores. As is described in the Consequence Report (Filing ID A3Z8G5), while HCA lists are used for generating consequence scores, the rules for generating those consequence scores are separate from the rules for assigning HCAs. As will be described further in the response to Province of BC IR No. 2.07d with respect to aquifers, it is possible for some areas to be assigned high consequence scores even though they may not be classified as HCAs. Within the context of a risk-based design, this is an important distinction, since it is the risk score (defined for each pipeline segment as the product of failure likelihood and the consequence score), and not HCA designation, that drives priorities for mitigation.

Through the risk-based design process, potential risks along Line 2 and the new delivery lines are identified and prioritized. Working in order of risk priority, mitigation measures that are appropriate to the factor that is responsible for influencing risk at each specific location are developed and incorporated into final design. These mitigation measures, once incorporated into the final design, will reduce failure

likelihood and/or consequence (and hence risk) by targeting risk mitigation strategies directed at the principal drivers of risk that have been identified in the risk assessment.

The Preliminary Results of the risk analysis that has been performed on Line 2 and the new delivery lines were provided in tabular format, showing risk at 1 km spacing in NEB Filing IDs A3Z8G5 (pages 11-37), A4F5G8, and A4F5F9. These results are characterized as 'Preliminary' because they represent the results of a risk analysis of a baseline design (*i.e.,* prior to the implementation of all the risk mitigation measures that will ultimately be incorporated into the final design). These risk results serve as a 'starting point' for the risk-based design process, which as is discussed in Section 5 of the Line 2 Risk Report (Filing ID A3Z8G1) is an iterative process of Risk Assessment / Identify & Prioritize Risk / Develop Mitigation Plans / Re-evaluate Risk.

The iterative risk-based design approach described above is currently underway, and will continue to progress through to detailed design. Until this process is completed, a full list of detailed and specific risk mitigation measures that will be incorporated into the final design, and the risk that is associated with that final design will not be available. Examples of typical risk mitigation strategies include the mitigation of 3rd Party damage through increased depth of cover, increased wall thickness or pipeline markers, the mitigation of environmental consequences through the installation of mainline valves, and the mitigation of geotechnical threats through threat avoidance.

b) Depth of pipeline burial was not considered. This is because for the purpose of HCA identification, Trans Mountain considers not only those locations that are intersected by the physical alignment of the pipeline, but also those that could be impacted by an overland spill. Depth of pipeline burial is not a factor for those aquifers that are intersected by overland flow and not by direct intersect with the pipeline alignment.

For the purposes of spill modeling, as is described in Section 3.1.6 of Volume 7 of the Application (Filing ID A3S4V5), a most-credible worst-case scenario, full-bore rupture was used to establish outflow volumes. This outflow model does not take account of any response, intervention, or of any attenuation of volumes prior to reaching a high consequence area. In this respect the volumes modeled are highly idealized and conservative, and a review of information relating to past incidents would support the contention that these should not be taken to be representative of expectations for real-life spill events.

Vulnerability of an aquifer is a function of aquifer type, thickness and extent of overlying materials, depth to water (or depth to top of confined aquifers), and type of aquifer material (Berardinucci and Ronneseth, 2002).

As committed to in the response to Province of BC IR No. 2.07f, for the purposes of the risk-based design process that is more fully described in the response to Province of BC IR No. 2.07g, Trans Mountain will ensure that all but low vulnerability aquifers will be assigned higher levels of priority for consideration of additional risk mitigation measures.

Reference:

Berardinucci, J. and Ronneseth, K. 2002. Guide to Using the BC Aquifer Classification Maps For the Protection and Management of Groundwater. accessed: http://www.env.gov.bc.ca/wsd/plan_protect_sustain/groundwater/aquifers/reports/aquifer_maps.pdf

c) Aquifer vulnerability is a function of: depth to water table; permeability of the materials above the aquifer; and thickness and extent of confining sediments (Berardinucci and Ronneseth 2002). These external factors are managed through the implementation of standard environmental protection measures for trenching, materials handling, backfilling, and clean-up, as well as water quality-specific mitigation measures described in Volume 6B (Filing ID A3S2S3). In addition, a Hydrogeological Professional will be involved where springs and wells used for domestic purposes are located in the immediate vicinity of the right-of-way. The Hydrogeological Professional will provide advice on specific measures (*e.g.,* well points or other dewatering methods, installation of subdrains, trench breakers, *etc.*) needed to maintain cross-drainage and avoid water table changes. Decisions on the appropriate pipeline burial depth must balance risks from third party excavation activities, effects on the water table as well as other factors that dictate the depth the pipeline must be installed below the surface (refer to Section 3.2.17 and Table 5.1.13 [Appendix D] of Volume 4A [Filing ID A55999] for a discussion of minimum depths of cover). In floodplains, where the risk of damage from third party activities is lower, the depth of excavation may be reduced so that it does not extend into the water table, or it may be increased to protect against scour. The mitigation measures for third party damage or line-strikes include increased use of pipeline markers, installing the pipe at greater depth or installing pipe with increased wall thickness. Trans Mountain will determine which mitigation measure or measures to utilize based on location-specific risk rankings, the characteristics of the specific aquifer, and advice of the Hydrogeolgical Professional

Reference:

Berardinucci, J. and K. Ronneseth. 2002. Guide to Using the BC Aquifer Classification Maps For the Protection and Management of Groundwater. BC Ministry of Water, Land and Air Protection. 54 pp.

d) The Drinking Water Area definition provided in Table 1 of the Line 2 Risk Report (Filing ID A3Z8G1) warrants further explanation. For the purposes of defining Drinking Water Area HCAs, 8km buffers were placed around all ‘High Population Area’ and ‘Other Population Area’ HCAs (as defined in the Table referenced above). Secondly, 250 m buffers were placed around all rivers and streams (this buffer is intended to account for errors in watercourse alignment). Where a buffered Population Area overlaps with a buffered watercourse area, this is designated as a Drinking Water Area HCA if it is either directly intersected by the pipeline alignment, or could potentially be intersected by an overland spill plume, as identified by means of overland spill trajectory.

As can be seen from the above definition, aquifers are not used in the Drinking Water Area HCA definition (although some aquifers may be listed as Drinking Water Area HCAs by virtue of co-association with surface watercourses). The rationale for this is that the Drinking Water Area HCA designation is intended to identify locations where downstream contamination of surface watercourses could occur.

As was stated in the response to Province of BC IR No. 2.07a, however, there is a distinction between HCA definitions and Consequence Scores. While HCA lists are used for generating consequence scores, the rules for generating consequence scores are separate from the rules for assigning HCAs. Within the context of a risk-based design, this is an important distinction, since it is the risk score (defined for each pipeline segment as the product of failure likelihood and the consequence score), and not HCA designation, that drives priorities for mitigation.

While aquifer locations are not used for defining Drinking Water Area HCAs, the fact that aquifers are used as drinking water sources ***is considered*** in assigning consequence scores, and aquifers are weighted heavily in the consequence scoring calculation.

As is outlined in Section 2 of the Consequence Report (Filing ID A3Z8G5), there are two approaches for assigning consequence scores. The 'Watercourse Intersect' approach (Section 2.1 of the above reference) assigns consequence scores from 10-100, whereas the 'Non-Watercourse Intersect' approach (Section 2.2 of the above reference) assigns consequence scores from 1-10. This is consistent with the fact that oil spills that impact watercourses are associated with greater environmental and socio-economic impacts than oil spills that do not. As can be seen from Equation 1 in the Consequence Report, Watercourse Intersect Scores are assigned on the basis of an evaluation of three variables:

1. Outflow Volume Score (a function of modeled full-bore rupture spill volume);
2. Watercourse Sensitivity Rating (a function of the type of watercourse riparian class (in the case of surface watercourses) - and, as can be seen from Table 2, aquifers are also considered;
3. Drinking Water Source Score

With respect to the latter variable, a Drinking Water Source Score of 100 (*i.e.,* the maximum potential score) is assigned to all Drinking Water Area HCAs, ***as well as all aquifer HCAs*** (defined as described in the response to Province of BC IR No. 2.07a) that are either directly intersected by the pipeline alignment, or could potentially be intersected by an overland spill plume, as identified by means of overland spill trajectory.

As described above, while aquifers are not used in the Drinking Water HCA definition, they are considered in the assignment of the Drinking Water Source Score for the purposes of consequence and risk calculations, and they are weighted heavily in those calculations.

e) The process for identifying Drinking Water Area HCAs was described in the response to Province of BC IR No. 2.07d. As was outlined in that response, aquifers are not used in the definition of Drinking Water Area HCAs, since the Drinking Water Area HCA designation is intended to identify locations where downstream contamination of surface watercourses could occur. Nevertheless, as was also outlined in that response, while aquifer locations are not used for defining Drinking Water Area HCAs, the fact that aquifers are used as drinking water sources ***is considered*** in assigning consequence scores, and aquifers are weighted heavily in the consequence scoring calculation. Within the context of a risk-based design, this is an important distinction, since it is the risk score (defined for each pipeline segment as the product of failure likelihood and the consequence score), and not HCA designation, that drives priorities for mitigation.

As was further described in the response to Province of BC IR No. 2.07d, and as is outlined in Section 2 of the Consequence Report (Filing ID A3Z8G5), a Drinking Water Source Score of 100 (i.e., the maximum potential score) is assigned to all Drinking Water Area HCAs, ***as well as all aquifer HCAs*** (defined as described in the response to Province of BC IR No. 2.07a) that are either directly intersected by the pipeline alignment, or could potentially be intersected by an overland spill plume, as identified by means of overland spill trajectory.

With respect to the last of the three questions asked in this request: “Given the widespread use of private wells, especially in the Fraser Valley, wouldn’t a more conservative approach be to assume that all pipeline segments over mapped aquifers are upstream of a drinking water source?”, Trans Mountain believes that the approach that it has adopted incorporates greater levels of conservatism. This is because the consequence scoring approach considers not only those aquifers that are directly intersected by the pipeline alignment, but those that could potentially be intersected by an overland spill trajectory from a full-bore rupture.

Reference:

Preliminary Risk Results for TMEP Line 2 and New Delivery Lines, B248-18 (Filing ID A3Z8G1)

f) As was outlined in the response to Province of BC IR No. 2.07a, in the design of Line 2 and the new delivery lines, Trans Mountain is undertaking a risk-based design process so that mitigation measures can be pre-emptively identified and incorporated at the design stage to address the principal risks.

The iterative risk-based design approach described above is currently underway, and will continue to progress through to detailed design. Until this process is completed, a full list of detailed and specific risk mitigation measures that will be incorporated into the final design, and the risk that is associated with that final design will not be available. Examples of typical risk mitigation strategies include the mitigation of Third Party damage through increased depth of cover, increased wall thickness or pipeline markers, the mitigation of environmental consequences through the installation of mainline valves, and the mitigation of geotechnical threats through threat avoidance.

As is described in the Consequence Report (Filing ID A3Z8G5), for the purposes of the risk assessment that guides the risk-based design process, watercourses, including aquifers, are treated by a special consequence scoring approach (known as the 'watercourse intersect' approach) that assigns higher consequence scores. This is consistent with the fact that these locations have greater potential to be adversely impacted by an oil spill.

g) Trans Mountain agrees with the assertion embedded within the request that under the leak scenario described, risk would not be sensitive to consequence mitigation by means of valve placement. The risk assessment described in Reference v) of the Preamble was developed for the sole and express purpose of supporting the risk-based design of Line 2 and the new delivery lines. The hazard scenario that is assumed in such a risk assessment should ideally be one that is both plausible, as well as sensitive to both failure likelihood and consequence aspects of risk. For this reason, a rupture scenario was used as the basis of the consequence modeling that is part of the risk calculation, since the objective of risk-based design is to mitigate risk through the reduction of both failure likelihood and consequence. The development of such risk mitigations within the context of a risk-based design entails an iterative approach that is described in Section 5 of the Line 2 Risk Report (Filing ID A3Z8G1).

Risk-based design goes beyond the requirements of CSA Z662 and is an iterative approach in which risks are evaluated, and primary drivers of risk are identified. Using this approach, mitigation measures can be pre-emptively identified and incorporated at the design stage to address the principal risks. Because risk-based design is a process that focuses on identifying and pre-empting risk, it is a more rigorous approach than more traditional design approaches that don't incorporate the findings of specific risk assessments to identify and pre-empt risks.

This iterative risk-based design approach is currently underway, and will continue to progress through to detailed design. Until it is completed, a list of detailed and specific risk mitigation measures that will be incorporated into the final design will not be available. Nevertheless, examples of typical risk mitigation strategies include the mitigation of Third Party damage through increased depth of cover, increased wall thickness or pipeline markers, the mitigation of environmental consequences through the installation of mainline valves, and the mitigation of geotechnical threats through threat avoidance.

Reference:

Preliminary Risk Results for TMEP Line 2 and New Delivery Lines, B248-18 (Filing ID A3Z8G1)

h) An increase in pipe wall thickness would increase the damage tolerance of the pipe and reduce the overall failure frequency. The failure modelling described in Attachment A of the Risk Report (Filing ID A3Z8G1) considers the influence of wall thickness on failure likelihood. As indicated in the response to Province of BC IR No. 2.07g, increasing wall thickness is one of the risk mitigation options that are being considered within the context of risk-based design. Through the implementation of the risk-based design

process, where high-risk segments have been identified for which an increase in wall thickness is the most appropriate mitigation measure, then increases in wall thickness beyond the requirements of CSA Z662 code will be incorporated into the final design.

In fracture mechanics terms the mode of failure (leak vs. rupture) is distinguished by stability at the tips of a flaw. For a given operating stress level, as flaw length increases, the stress intensification factor at the tips of the flaw increases. Eventually, at a critical flaw length, the stress intensification factor becomes large enough that instability at the flaw tips occurs, and the pipe opens up rapidly, creating a rupture. At smaller flaw lengths, even though that flaw may be through-wall, the flaw is stable, and a leak occurs. Therefore, increased pipe wall thickness increases the likelihood that any failure will be by leak, rather than rupture.

2.08 Hypothetical spill scenarios and impacts on groundwater

Reference:

i. A3S4V6, Application Volume 7, Risk Assessment and Management of Pipeline and Facility Spills, Section 7.1, Pipeline Release Reaching Waterbodies, PDF p. 36 of 137.

ii. A3Z8C3, Trans Mountain Follow-Up Response to BC IR No. 1.16 b), Attachment 1, Transportation Safety Board of Canada, Pipeline Investigation Report P05H0044.

iii. A3S1L1, Application Volume 4C, Project Design and Execution – Operations and Maintenance, Section 7.1.11, Leak Prevention, Detection, and Response to Probable Leaks. PDF p. 47 of 102.

iv. A3S1L1, Application Volume 4C, Project Design and Execution – Operations and Maintenance, Section 8.1.4, In-line Inspection Program. PDF p. 51 of 102.

v. A3Z8G1, Technical Update #1, Part 2: Risk Update, Preliminary Risk Results for TMEP Line 2 and New Delivery Lines.

Preamble:

Reference (i) provides in depth assessments of several credible worst case scenarios for pipeline spills and leaks, but focuses solely on the discharge of transported hydrocarbons to surface waters.

Reference (ii) indicates that in 2005, a third party intrusion caused an underground rupture (the "Ward Road release"), which went undetected for 7 days despite a number of odour complaints.

References (iii) and (iv) describe Trans Mountain's leak detection system.

Reference (v) reports the failure frequency estimates for various factors such as third party failures, human error during operations failures, materials defects failures, and construction defects failures. For each of these factors, the failure frequencies reported are significantly higher for pipeline leaks than for full bore ruptures.

Chemicals released as a result of a pipeline spill, particularly in areas where the pipeline intersects highly vulnerable aquifers, have the potential to result in both free-phase and dissolved-phase contaminants moving through permeable aquifers towards downstream environmental receptors such as water supply wells, wetlands, and streams. Either a large leak, or a small leak (which is more difficult to detect and may continue unnoticed for a significant period of time) could render a drinking water source completely unusable.

Request:

a) Given that underground leaks from pipelines can, and do, occur, why was a slow leak below ground not included as a credible worst case scenario in the risk assessment?

b) Please provide a hypothetical worst case scenario for a small pipeline leak to groundwater, where the volume of the leak is below the detection limit of the leak

detection system. The scenario should include the results of a numerical model, delineating the transport of released hydrocarbons over time. The scenario could rely on a generic model (i.e. using an idealized aquifer system), or, ideally, utilize a real world example, using an existing numerical model for areas along the pipeline corridor (e.g. numerical models in existence for the Township of Langley (Golder Associates, 2004), the City of Abbotsford (Scibek & Allen, 2005; Piteau Associates, 2010) or the City of Chilliwack (Emerson Groundwater Consultants, 2000)).

The contaminant transport scenario should be bound by the following credible worst case constraints:

1) Leak occurring at a volume slightly below the detection limits of the leak detection system discussed in references iii) and iv); and

2) Leak occurring over a shallow, highly vulnerable aquifer (i.e. an unconfined aquifer composed of sand and gravel) that has a relatively high transmissivity.

c) Once a calibrated model is completed, please run a number of scenarios and conduct a sensitivity analysis by varying the input parameters within reasonable bounds (to be determined by a qualified professional).

d) Based on the results, please construct a map that shows the variability of the estimated potential hydrocarbon travel zones for a continuing leak that has gone undetected for 1 year, 5 years and 10 years (i.e., show the maximum and minimum estimated potential extent of these zones).

Response:

a) As was asserted by the Province of British Columbia in its IR No. 2.07g, “in a slow, undetected leak scenario, the risk cannot be decreased by reducing the drivers of consequence” (*i.e.,* decreased valve spacing). Trans Mountain notes however that as described in responses to Province of BC IR No. 2.14 that Trans Mountain’s procedures and application of technologies and in particular improved inline inspection tools reduce the risk of cracks being undetected.

The spill outflow modelling that was described in Section 3.1.6 of Volume 7 of the Application (Filing ID A3S4V5) (cited in Reference i in the Preamble to this request) was undertaken to support the consequence analysis component of a risk assessment. This risk assessment was developed for the sole and express purpose of supporting the risk-based design of Line 2 and the new delivery lines.

Risk-based design is a rigorous design approach that goes beyond the minimum requirements of the CSA Z662 code. It is an industry-leading, world class design approach that will enable the design team to identify potential risks along Line 2 and the new delivery lines and to pre-emptively adopt mitigation measures at the design phase to address those risks. These mitigation measures, once incorporated into the final design, will reduce failure likelihood and/or consequence (and hence risk) by targeting

risk mitigation strategies directed at the principal drivers of risk that have been identified in the risk assessment.

The hazard scenario that is assumed in a such a risk assessment should ideally be one that is sensitive to both failure likelihood and consequence aspects of risk, since the objective of risk-based design is to advance options for risk mitigation through the reduction of failure likelihood and/or consequence.

One of the principal methods of mitigating consequence is through the optimization of valve placement and design. Unlike the consequences that are associated with full-bore ruptures, which are sensitive to valve location and spacing, the consequences that are associated with slow leaks are not. Therefore, within the context of a risk-based design, the use of a hazard scenario that involves a slow leak does not serve the purposes of guiding risk reduction through mitigation of both failure likelihood and consequences. On the other hand, this objective is well-served by a hazard scenario that involves a full-bore rupture hazard scenario as the basis of the risk assessment.

As is described in greater detail in the response to Province of BC IR No. 2.10c, no hypothetical scenario can represent all potential environmental and socio-economic outcomes, but scenario-based hydrocarbon spill evaluations can provide decision makers and resource managers with a clearer understanding of potential effects pathways, the range of potential outcomes, vulnerable resources, and spill preparedness and response priorities and capabilities. Although TMPL's operating history and the risk assessment overview provided in Section 3.1 of Volume 7 (Filing ID A3S4V5), demonstrate that the probability of a large pipeline spill is low, Aboriginal groups and the public-at-large consulted about this Project were concerned about catastrophic spills – those that are least likely but of highest consequence. To address this concern, four credible worst-case pipeline spill scenarios were identified. The spill assessment team concluded that the worst-case scenario for environmental and socio-economic receptors would be an oil spill that reaches a large river and is subsequently transported downstream.

The outflow model does not take account of any response, intervention, or of any attenuation of volumes prior to reaching a high consequence area. In this respect the volumes modeled are highly idealized and conservative, and a review of information relating to past incidents would support the contention that these should not be taken to be representative of expectations for real-life spill events.

The results of the outflow model are used as input to the overland and stream flow model. This model predicts overland spill trajectories that correspond to the full projected extent, without curtailment after a set time period. Again, as no mitigation, response or intervention is assumed, this adds another layer of conservatism to the analysis.

The above, conservatively calculated spill trajectories are then used for the purpose of HCA identification and consequence scoring within the risk model. As an additional layer of conservatism, Trans Mountain considers not only those locations that are intersected

by the physical alignment of the pipeline, but also those that could be impacted by these spill trajectories.

The net result of adopting a risk approach that is predicated upon a full-bore release as described above, is that it is sensitive to potential impacts to HCAs, including aquifers, that are located at distances that are further away from the pipeline centerline than if a slow below ground leak scenario was assumed.

As committed to in the response to Province of BC IR No. 2.07f, for the purposes of the risk-based design, Trans Mountain will assign consequence scores to all but low vulnerability aquifers that are commensurate with aquifer HCAs. These locations will therefore be assigned higher levels of priority for consideration of additional mitigation measures in the risk-based design process.

Given this commitment, it should be noted that Vulnerability of an aquifer is a function of aquifer type, thickness and extent of overlying materials, depth to water (or depth to top of confined aquifers), and type of aquifer material (Bernaducci and Ronneseth, 2002). By ensuring that all but low vulnerability aquifers will be assigned higher levels of priority for consideration of additional risk mitigation measures, this will in effect assign higher levels of priority to shallow aquifers.

b) Trans Mountain cannot answer the question as posed by the Province including follow-up parts c) and d) for the following reasons:

1. The analysis requires the use and calibration of a transient numerical model that Trans Mountain has not developed. The results of such an analysis would do little to inform decision making for the proposed Trans Mountain Expansion Project (TMEP) as a location specific model or generic model, would only provide hypothetical information on hydrocarbons in an aquifer environment. Given the low likelihood frequency of leaks, and the unpredictability as to where they can occur, the modelling would be in essence an academic exercise with little benefit to providing guidance within the scope of the risk-based design.

   As discussed in the response to Province of BC IR No. 2.08a, by adopting a risk approach that is predicated on a full-bore release, the risk assessment that Trans Mountain is using to inform risk-based design is sensitive to potential impacts to HCAs, including aquifers, that are located at distances that are further away from the pipeline centerline than if a slow below ground leak scenario was assumed.

   As committed to in the response to Province of BC IR No. 2.07f, for the purposes of the risk-based design, Trans Mountain will assign consequence scores to all but low vulnerability aquifers that are commensurate with aquifer HCAs. These locations will therefore be assigned higher levels of priority for consideration of additional mitigation measures in the risk-based design process.

   Given this commitment, it should be noted that Vulnerability of an aquifer is a function of aquifer type, thickness and extent of overlying materials, depth to water (or depth to top of confined aquifers), and type of aquifer material (Bernaducci and

Ronneseth, 2002). By ensuring that all but low vulnerability aquifers will be assigned higher levels of priority for consideration of additional risk mitigation measures, this will in effect assign higher levels of priority to shallow aquifers.

2. The premise for a worst case scenario referencing the detection limit of the leak detection system (threshold) is not credible for a 1 to 10 year period as premised in Province of BC IR No. 2.08d. As described in Province of BC IR No. 2.15b even though the threshold(s) for the proposed Line 2 have not yet been determined, they could be in the range of 2% to 5% of the pipeline flow rate or approximately 75 m^3/hr to 180 m^3/hr. In Trans Mountain's view it is not a credible worst case constraint that a leak from the pipeline at a volume slightly below this range would go undetected for more than a very short period at which point the pipeline would be shutdown and response and remediation would be carried out as required.

In Trans Mountain's view, the results produced from the requested scenario would be so wide ranging and not credible to be of any technical value. Furthermore, the results would do nothing to inform the risk-based design for the Project.

In response to another other leak scenario posed by the Province that could occur below leak detection threshold for the existing pipeline (refer to Province of BC IR No. 2.19d), Trans Mountain estimated a theoretical volume release that could theoretically go undetected of 40 m^3 – 80 m^3 over a 2-year period. This is much larger than the 1.6 m^3 release at KP 150 which may have leaked for longer than 2 years.

In Trans Mountains view it is clear that estimating leak volumes with arbitrary and wide inputs to estimate groundwater migration could yield almost any result. As noted above and elsewhere in other IR responses such analysis does nothing to inform the risk based design for the project. In Trans Mountain's view targeted groundwater modelling for specific locations that yield credible results could be beneficial for assisting with the commitment made in Province of BC IR No. 2.12 to work with communities that have specific concerns related to protection of municipal water sources. In recognition of this Trans Mountain will include in its commitment made in Province of BC IR No. 2.12 to have discussions about how groundwater modelling could be undertaken to help inform the groundwater concerns.

Reference:

Bernaducci, J. and Ronneseth, K. 2002. Guide to Using the BC Aquifer Classification Maps For the Protection and Management of Groundwater. http://www.env.gov.bc.ca/wsd/plan_protect_sustain/groundwater/aquifers/reports/aquifer_maps.pdf

c) Please refer to Trans Mountain's response to Province of BC IR No. 2.08b.

d) Please refer to Trans Mountain's response to Province of BC IR No. 2.08b.

2.09 Releases reaching groundwater

Reference:

i. A3S4V6, Application Volume 7, Risk Assessment and Management of Pipeline and Facility Spills, Section 6.2.2.1, Soil and Groundwater, PDF p. 19 of 137.

ii. A3Y3W1, Trans Mountain Response to Waterwealth IR No. 1.V(s), PDF p. 20 of 29.

iii. A4D3F2, Trans Mountain EMP documents, Attachment 2.3 – Pipeline Emergency Response Plan.

Preamble:

Trans Mountain's application (reference (i)) states as follows with respect to groundwater contamination:

> Without treatment or physical removal, oil would be a long-term source of groundwater contamination if it contacted the water table. For this reason, spill response efforts aim to reduce potential for groundwater contamination by removing pooled oil and affected surface materials as quickly as possible, and as deeply as needed to remove contamination so that aquifers are not affected. Residents of the Fraser River valley noted the importance of aquifers that provide domestic and community water sources. During detailed engineering, Trans Mountain will complete a pipeline risk assessment and evaluate the need for additional mitigation measures (*e.g.*, valve spacing, deeper burial or thicker-walled pipe) to reduce threats and associated risk to aquifers. [emphasis added]

While the Application acknowledges the risk that spilled oil could pose to groundwater, and highlights the need to prevent or mitigate contamination, it fails to address the actions Trans Mountain would take in the event of groundwater contamination.

In reference (ii), Trans Mountain is asked to "describe the behaviour that would be expected of bitumen products in a large release from a pipeline in contact with an unconfined aquifer and the clean-up techniques that would be applied in that situation".

Trans Mountain responds as follows:

> In the very unlikely event that oil were to be released from a pipeline, the processes that may be expected include oil infiltration into the surrounding trench soils. Depending on numerous variables, including spill volume, properties of the oil, the oil may accumulate and migrate to the surface and or to groundwater. As stated in the Application (Vol. 7, S5.3), "hydrocarbons would tend to fill pore spaces in the fill provided adequate relative permeability of the soil with respect to the released oil. As the soils surrounding the release point become saturated, oil would tend to flow to adjoining media along the trench fill and following general surface and subsurface topography. If soils are saturated, oil may become evident on the ground surface and extend downward to an impermeable layer or groundwater."

> Should oil be released from a pipeline especially over an unconfined aquifer, cleanup options would be evaluated and approved by the Unified Command, and would be very dependent on the nature of the specific site conditions. Spill response efforts would "aim to reduce potential for groundwater contamination by removing pooled oil and affected surface materials as quickly as possible, and as deeply as needed to remove contamination so that aquifers are not affected. [emphasis added]

While the response considers the transport of oil extending downward to an impermeable layer or groundwater, it makes no mention of the fate and behaviour of the oil once it has reached the groundwater.

The response also fails to describe any treatment techniques, as requested, for bitumen that has reached the water table.

Similarly, Trans Mountain's Pipeline ERP (reference (iii)) makes no mention of groundwater contamination and does not identify any steps to be taken in the event of groundwater contamination.

Request:

a) Please describe the fate and behaviour of spilled oil once it has reached the groundwater.

b) Will Trans Mountain commit to the use of monitoring wells as an early leak detection technique in high consequence areas?

c) Will Trans Mountain commit to including a plan for the recovery of diluted bitumen from groundwater in its EMP documents?

d) In the event of the significant contamination of an aquifer, what remediation techniques would Trans Mountain apply? Will these remediation techniques be included in Trans Mountain's EMP documents?

e) In Trans Mountain's estimation, how long would it take to return the contaminated groundwater to a quality adequate for agricultural and drinking water use?

f) What is Trans Mountain's plan for mitigating the impacts of groundwater contamination on communities (including residents, agricultural operations and other businesses) that rely on that groundwater?

g) Please provide examples of previous aquifer contaminations and describe the following:

   i) the steps taken to recover the spilled product from the groundwater,
   ii) the success of remediation, and
   iii) the time it took to remediate the aquifer.

Response:

a) Oil in contact with groundwater will undergo transport, dilution, weathering and biodegradation similar to a spill on land but at much slower rates. Spill response measures are focused to recover spilled oil and to reduce the amount of time that groundwater might be exposed to oil. Depending on prior weathering and the time the oil is exposed to ground water, some constituents in the oil can dissolve into and migrate with the groundwater, according to a variety of chemical and hydrogeologic properties such as: oil or groundwater temperatures, chemical solubility, hydraulic conductivity, effective porosity, surrounding natural hydraulic gradients and flow patterns. Groundwater movement may transport oil down the hydraulic gradient in the form of a plume. The plume typically has higher hydrocarbon concentrations near the oil-saturated soils that are in contact with groundwater and decreasing concentrations down gradient and with depth into the aquifer. The actual fate and behavior of each spill is dependent on numerous factors, including spill volumes and oil types, and the local conditions such as air, ground and groundwater temperatures, soil saturation, and hydraulic gradients.

   Please also refer to the response to Government of Canada Natural Resources Canada IR No. 1.04a (Filing ID A3X6G0).

b) Trans Mountain notes that the Province has asked a very similar question with the same intent in Province of BC IR No. 2.12 – Groundwater Quality Monitoring. Please refer to Trans Mountain's response to that IR and its commitment to engage with communities.

c) EMP documents are designed to apply only to the initial spill containment and recovery phase of an incident. They include a variety of methods available to Unified Command (UC) for the recovery of petroleum during this initial phase. The UC selects the appropriate methods for the initial response.

   Trans Mountain assumes the question posed refers to the longer term recovery and treatment of diluted bitumen (more generally petroleum) in the event groundwater is impacted by a spill. These activities occur following the initial response so are not captured in the EMP documents. Longer term plans are developed and executed in accordance with the National Energy Board Remediation Process Guide (2011). In developing the plan Trans Mountain will hire specialized consultants with technical expertise in petroleum recovery from groundwater and treatment of contaminated groundwater. Plans are situationally specific and depend on many variables. Trans Mountain consults with affected parties including the Province and will seek approval of the plan by the National Energy Board.

   In Trans Mountain's view it is not appropriate to include the longer term plans in the EMP documents which are designed to guide only the initial response. During the consultations planned with stakeholders for the development of the new EMP documents for the Project including the Province, Trans Mountain will more fully review these procedures.

Reference:

National Energy Board. 2011. Remediation Process Guide. Calgary, AB. 23pp.

d) In the event of substantial contamination of an aquifer, Trans Mountain would first conduct an assessment to determine the hydrogeological conditions and source and extent of contamination. Once this information has been obtained, Trans Mountain would aim to remove the source of the contamination usually by remedial excavation. Remedial strategies for treating groundwater would then be determined. Potential remedial strategies include pump and treat systems using various filtering or cleaning methods such as activated carbon, clay, oxidisers or air strippers. Remediation often involves the use of a combination of these strategies. These strategies have been proven to be effective as remediation techniques.

Please refer to Trans Mountain's response to Province of BC IR No. 2.09d describing the process for developing the longer term remediation plans and why longer term strategies will not be included in the EMP documents.

e) The length of time required to return contaminated groundwater to applicable standards for agricultural or drinking water use may take under a year to over a decade and is dependent on numerous factors. These factors include, but are not limited to volume of groundwater impacted, soil characteristics (physical and chemical); groundwater characteristics (chemistry, flow rate and direction); contaminant characteristics (type, concentrations, reactions with surrounding soil and water). In circumstances where ground water contamination occurs, Trans Mountain Pipeline ULC (Trans Mountain) would follow the National Energy Board (NEB) Remediation Process Guide (2011). This would involve an initial assessment of the site and contaminant conditions, and then development of a remedial action plan which is appropriate for the landuse and potential receptors.

Reference:

National Energy Board. 2011. Remediation Process Guide. Calgary, AB. 23pp.

f) Trans Mountain Pipeline ULC's (Trans Mountain) first priority is to prevent pipeline releases and allocates considerable resources to its pipeline integrity program. Trans Mountain also recognizes that where communities depend on an aquifer near the proposed pipeline that the Company can better understand the quality of the aquifer through proactive monitoring. The response to Province of BC IR No. 2.12 discusses the Trans Mountain pipeline integrity program and the use of monitoring wells in targeted locations along the pipeline where communities depend of the groundwater to provide an additional detection method for pipeline release.

In the event of a leak or rupture from a pipeline or facility, Trans Mountain will follow the remedial steps outlined in the National Energy Board (NEB) Remediation Process Guide (2011) to ensure that the groundwater contamination is remediated to applicable remediation standards. Remediation would involve an initial assessment of the site and contaminant conditions, development of a remedial action plan which will be reviewed by

the NEB and other interested parties, followed by remediation work and closure reporting to NEB. The typical remedial strategy for remediation of groundwater is a pump and treat system in which water is extracted and run through an appropriate treatment system to remove contaminants and then released to surface or re-injected back into the ground.

If a pipeline release impacts a community's use of an aquifer, Trans Mountain will source and pay for an alternate water supply to meet the needs of area residents. This would continue until treatment is complete and groundwater quality meets government criteria for its intended use.

Reference:

National Energy Board. 2011. Remediation Process Guide. Calgary, AB. 23pp.

g) Although the information requested is not within the scope of this proceeding and not relevant to the National Energy Board's (NEB) List of Issues, Trans Mountain Pipeline ULC (Trans Mountain) offers the following response to your question:

Trans Mountain puts considerable effort in to preventing releases. When releases occur, timely and effective emergency response prevents impacts to groundwater in most cases. Currently, Trans Mountain has one operating groundwater treatment system. Groundwater and soil contamination were discovered at a Trans Mountain facility in Jasper Alberta in 1992. After assessment, it was determined that contamination consisted of hydrocarbon constituents and methyl tert-butyl ether (MTBE). MTBE, which is no longer transported through the pipeline system, is much more difficult to remove when dissolved in groundwater than conventional petroleum compounds transported in the pipeline system. The groundwater in this area is not used as a drinking water source.

(i)–(iii) Soil contamination was addressed through remedial excavation and soil vapour extraction. Groundwater recovery wells and a water treatment system were installed in 1994 to address groundwater contamination. The pump and treat system has been modified over the years to improve efficiency. The system is basically comprised of passive free-phase recovery, bag filters and air strippers for particulate and dissolved hydrocarbon and MTBE removal. Pumping from the ground water recovery well creates a depression in the water table which causes free product in the area to migrate to the well. The free product is then recovered using a skimming pump. The table below provides details on the steps taken to recover hydrocarbon and MTBE from the groundwater.

Year	Steps Taken
1994	Water treatment system (bag filters, activated carbon filters, and air strippers) installed to extract and treat impacted groundwater.
1994 - 1999	Regular operation & routine maintenance
1999	Remediation system upgraded to improve efficiency and flow rates. Larger air stripper units installed.
1999 - 2008	Regular operation and routine maintenance
2008 - 2014	Regular operation, routine maintenance and system upgrades to improve efficiency; electronic water softener to reduce mineral buildup and installation of an automated free phase product recovery pump.

Remediation of the aquifer at this site has been ongoing since 1994. The aquifer remediation at this site has been a success due to large reduction in contaminant concentrations to very near guidelines and reduction of the size of the contaminant plume to just a few wells. The extent of contamination has been steadily decreasing over time and current predictions are that the site will be remediated within the next few years.

2.10 Groundwater aquifers

Reference:

i. A3Y3W1, Trans Mountain Response to Waterwealth IR No. 1.I(g), PDF p. 4 of 29

ii. A3S1U8, Application Volume 5C, Groundwater Technical Report, PDF p. 39 of 84

iii. A3S1U8, Application Volume 5C, Groundwater Technical Report, PDF p. 58 of 84

iv. A3S1U8, Application Volume 5C, Groundwater Technical Report, PDF p. 59 of 84

Preamble:

The Province of British Columbia is concerned about the risk posed by Project related spills to aquifers and withdrawal wells serving British Columbia communities.

In reference (i), Trans Mountain states:

> With respect to the Sardis-Velter aquifer, the pipeline traverses north and down-gradient of the capture zone of existing City of Chilliwack municipal wells according to available aquifer modelling (AMEC, 2007).
>
> Overland and Stream Flow Modeling of Potential Full-Bore Ruptures included in Volume 7, Appendix C (Page 89 of 97) indicates that surface releases along the pipeline in this area would tend to continue downslope generally to the north and away from the municipal wells in this area. [emphasis added]

Reference (ii) states as follows:

> Aquifer #8, the 'Vedder River Fan Aquifer', is located at approximately RK 1094 and is also known locally as the Sardis Aquifer. The Vedder River Fan Aquifer is described as a sand and gravel deposit with high demand, productivity and vulnerability. The City of Chilliwack community wells are located within this aquifer and the mapped well capture zones cross the proposed pipeline corridor. [emphasis added]

Similarly, references (iii) and (iv) state that the mapped well capture zones cross the proposed pipeline corridor.

If, as stated in references (ii), (iii), and (iv), the well capture zones cross the proposed pipeline corridor, then the groundwater from the area inside the mapped capture zone, where it intersects the proposed corridor, contributes to the water supply well that is attached to the mapped capture zone.

Further, the Overland and Stream Flow Modeling of Potential Full-Bore Ruptures referred to in reference (i) show results of surface water flow. Surface water does not necessarily flow in the same direction as groundwater, especially where groundwater flow directions may be significantly influenced by the pumping of large water supply wells.

Request:

a) In light of the preamble above, how can it be said, as stated in reference (i), that the pipeline traverses down-gradient of the capture zone?

b) In light of the preamble above, and the fact that surface water does not always flow in the same direction as groundwater, please explain the statement in reference (i) that "surface releases along the pipeline in this area would tend to continue downslope generally to the north and away from the municipal wells in the area".

c) Has Trans Mountain assessed the potential consequences of Projectrelated groundwater contamination on a community? If not, why not?

d) If Trans Mountain has assessed the potential consequences of Projectrelated groundwater contamination on a community, has a mitigation plan been developed to address such effects? If yes, please provide a copy of such plan. If not, why not?

Response:

a) In the area of Chilliwack, the proposed revised pipeline corridor deviates to the north from the existing pipeline as well as the originally proposed pipeline corridor. With respect to the Sardis-Vedder aquifer, the existing pipeline is located along the northern limits of the capture zone of existing City of Chilliwack municipal wells according to available aquifer modelling (AMEC 2007). The proposed revised pipeline corridor traverses north and down-gradient of the capture zone of existing City of Chilliwack municipal wells (AMEC 2007).

Groundwater flows from areas of higher pressure to areas of lower pressure. The flow of groundwater in the vicinity of the Chilliwack water supply wells is to the north from the Vedder River toward the wells and the proposed pipeline corridor.

Pumping water from these supply wells induces a hydraulic (or pressure) gradient toward the wells. Most of the water coming toward the wells comes from the south in the direction of the Vedder River. Some of the water will come from the north, but available modelling (AMEC, 2007) suggests this local well capture does not extend as far as the proposed pipeline corridor.

In addition, local surface topography in the vicinity of the proposed pipeline alignment decreases to the north, such that surface drainage in the vicinity of the pipeline is also down-gradient of the municipal wells.

The context applied here reflects that the proposed pipeline corridor is down-gradient of the municipal wells from both a surface topography and groundwater flow perspective.

Reference:

AMEC Earth and Environmental. 2007. City of Chilliwack Sardis Aquifer 60-Day Capture Zone Figure 1.

b) Please refer to the response to Province of BC IR No. 2.10a.

The spill modelling (in Volume 7, Appendix C (Page 89 of 97) Filing ID A3S4W5) suggested that spilled fluids in the Chilliwack area closest to the municipal wells would flow northward from the proposed revised pipeline corridor following local topography. This direction is away from the municipal wells and their associated capture zones, as indicated in Reference (i).

The capture zone modelling completed by AMEC (2007) identifies the zone of groundwater that is captured by the pumping wells. Because the boundary of the capture zone lies outside the proposed pipeline corridor, groundwater from beneath the corridor would not likely be captured by the pumping wells.

Reference:

AMEC Earth and Environmental. 2007. City of Chilliwack Sardis Aquifer 60-Day Capture Zone Figure 1.

c) Trans Mountain has not completed a formal assessment for the Project, but realizes a release from the pipeline system could significantly impact communities in various ways. In response to Province of BC IR No. 2.12 Trans Mountain commits to engage with communities regarding possible installation of groundwater monitoring wells. During these engagements Trans Mountain anticipates that potential consequences of groundwater contamination will be discussed along with a review of the maintenance policies, systems, programs, procedures, practices, and activities to prevent pipeline releases as noted in Province of BC IR No. 2.12.

d) Please refer to the response to Province of BC IR No. 2.10c.

2.11 Municipal drinking water sources

Reference:

i. A3Y2X5, Trans Mountain Response to NDP IR No. 1.1.7(g), PDF p. 52-53 of 68

ii. A3S1L5, Application Volume 5A: Environmental and Socio-Economic Assessment – Biophysical, Section 5.3.1, Surface Water Quality, PDF p. 35 to 74 of 74

iii. 2012 Water System Report, District of Clearwater: http://www.districtofclearwater.com/ attachments/article/ 16/2013%20Annual% 20Water%20System%20Report-%20Draft.pdf

iv. Bi-Monthly Water Report – December 2013/January 2014, Abbotsford Mission Water & Sewer Commission: https://abbotsford.civicweb.net/Documents/ DocumentList.aspx?ID= 40355

v. Township of Langley Water Management Plan: http://www.tol.ca/Services- Contact/ Document-Library/fid/229

vi. A4D3E9, A4D3F0, A4D3F1, A4D3F2, A4D3F3, A4D3F4, Follow-up to Intervenor Information Request No. 1 Motions – Redacted Emergency Management Program documents

Preamble:

In reference (i), Trans Mountain is asked to list the municipalities which source their municipal drinking water downstream or in the vicinity of the proposed pipeline. In response, Trans Mountain refers to section 5.3.1 of the Environmental and Socio- Economic Assessment (reference (ii)), and provides tables listing municipal drinking water supply sources for British Columbia communities located along the proposed Hargreaves to Darfield, Black Pines to Hope, and Hope to Burnaby Segments.

It appears to the Province of British Columbia that the ESA and tables provided in reference (i) contain the following inaccuracies and omissions:

1. The District of Barriere, which has a community groundwater supply, is not listed.

2. For the Community of Blue River, District of Clearwater, and City of Merritt, locations are provided for surface water sources, but not groundwater supply sources.

3. In reference (ii), Trans Mountain states at PDF p. 64 that there are no community-owned drinking water supply wells in the District of Clearwater. Further, the table in reference (i) does not list any community-owned drinking water supply well locations for the District of Clearwater. However, according to reference (iii), the District of Clearwater draws its community water supply from a combination of surface water and groundwater, with 56% of the supply sourced from Well No. 1, 28% sourced from Well No. 2, and the remaining 16% sourced from the Russell Creek intake.

4. Reference (i) states as follows:

> The main sources of drinking water for municipalities in the Lower Mainland, including the Township of Langley and cities of Abbotsford, Surrey, Coquitlam and Burnaby, is provided by the Capilano, Seymour and Coquitlam Mountain reservoirs operated by Metro Vancouver. Water is conveyed from these reservoirs by regional water mains to member municipalities for distribution to homes, businesses and industry. The Township of Langley also receives some drinking water from municipal wells. The City of Chilliwack receives most of its drinking water from municipal wells as well, specifically the Sardis Aquifer (refer to Section 5.3.3.4 of Volume 5A of the application for additional information).

However, the City of Abbotsford does not obtain any water from the Metro Vancouver system, and the Township of Langley is only partially reliant on water sourced from the Metro Vancouver system. The response also omits the fact that, as described in references (iv) and (v), both of these municipalities rely heavily on groundwater. Further, the City of Chilliwack receives all, not most, of its drinking water from municipal wells.

5. The response fails to include information about the municipal supply sources for the Hope to Burnaby Segment, as is done for the other segments.

It is critical that Trans Mountain address these apparent inaccuracies and omissions in order to adequately protect municipal drinking water sources in the event of a spill.

Further, the redacted Emergency Management Program (EMP) documents Trans Mountain filed on October 17, 2014 (reference (vi)) do not identify municipal drinking water supply sources. It is unknown to the Province whether the Field Guide, or any other EMP document which Trans Mountain has declined to file, contains such information.

Request:

a) Does Trans Mountain acknowledge the inaccuracies and omissions outlined in the preamble?

b) If yes, does Trans Mountain commit to correcting the inaccuracies and omissions identified above by providing a more comprehensive and accurate list of municipal drinking water supply sources, including their locations?

c) Please provide a table listing municipal drinking water supply sources for communities located along the entire proposed pipeline corridor in the Hope to Burnaby Segment.

d) Will Trans Mountain commit to ensuring that its Emergency Management Program documents accurately reflect the location of all municipal drinking water supply sources? If not, why not?

Response:

a) Trans Mountain acknowledges inaccuracies for items 2 through 5 listed in the preamble. Item 1 regarding the District of Barriere was not included in the original assessment because it was beyond the proposed pipeline corridor. The existing Trans Mountain pipeline between Darfield and Black Pines which passes Barriere on the opposite side of

the North Thompson River will be reactivated; there is no plan for pipeline construction along this segment.

b) Trans Mountain has prepared the revised table below correcting the inaccuracies in items 2 through 5 in the preamble for municipalities that source their drinking water in the vicinity of or downstream of the proposed pipeline corridor.

Hargreaves to Darfield

MUNICIPAL DRINKING WATER SOURCES FOR COMMUNITIES LOCATED ALONG THE PROPOSED HARGREAVES TO DARFIELD SEGMENT

Community	Source(s)	Location Relative to Proposed Pipeline Crossing
Village of Valemount	Swift Creek (information from Valemount Community Workshop).	Approximately 2 km upstream of the proposed watercourse crossing.
Community of Blue River	Groundwater	3 wells 650 to 700 m west of the proposed pipeline corridor.
Community of Avola	Avola Creek.	Approximately 630 m upstream of the proposed watercourse crossing.
Community of Vavenby	North Thompson River.	Approximately 680 m south of the proposed pipeline corridor.
District of Barriere	Groundwater	3 wells approximately 2.5 km east of existing pipeline; opposite side of north Thompson River and Barriere River
District of Clearwater	Both groundwater and surface water (Hascheak Creek).	20% from Hascheak Creek source located approximately 1 km upstream from the North Thompson River on opposite side of proposed pipeline corridor. 84% from two groundwater wells west of Dutch Lake, 500-900 m NW of the proposed pipeline corridor

Black Pines to Hope

MUNICIPAL DRINKING WATER SOURCES FOR COMMUNITIES LOCATED ALONG THE PROPOSED BLACK PINES TO HOPE SEGMENT

Community	Source(s)	Location Relative to Proposed Pipeline Crossing
City of Kamloops	South Thompson River	Approximately 8.5 km upstream of the proposed watercourse crossing.
City of Merritt	Groundwater	4 wells 2.0 to 3.2 km NW of proposed pipeline corridor
District of Hope	Groundwater	4 one well 450 m north of proposed pipeline corridor
Coldwater 1 Indian Reserve	Kwinshatin Community Watershed	Crosses from RK939.4 to 942.7
Coldwater 1 Indian Reserve	Skuagam Community Watershed	Crosses from RK942.7 to 943.9
Various	Kopp Creek Community Watershed	Crosses from RK1039.2 to 1039.8; intake is approximately 400 m NW of corridor at Kopp Creek

Hope to Burnaby

MUNICIPAL DRINKING WATER SOURCES FOR COMMUNITIES LOCATED ALONG THE PROPOSED HOPE TO BURNABY SEGMENT

Community	Source(s)	Location Relative to Proposed Pipeline Crossing
Township of Langley	Groundwater (50%), Metro Vancouver (50%)	18 active municipal wells, number of community well systems; Capilano, Seymour and Coquitlam mountain reservoirs operated by Metro Vancouver
Fraser Valley Regional District	Groundwater (77%); Surface water (23%)	Community supply well at West Popkum near corridor; also at Hope Air Park
City of Abbotsford	Groundwater (5%); Surface water (95%)	19 municipal wells; Dickson Lake NE of Mission and Cannell Lake north of Mission
City of Burnaby	Surface water	Capilano, Seymour and Coquitlam mountain reservoirs operated by Metro Vancouver
City of Chilliwack	Groundwater	municipal wells specifically the Sardis Aquifer (refer to Section 5.3.3.4 for additional information)
City of Surrey	Surface water	Capilano, Seymour and Coquitlam mountain reservoirs operated by Metro Vancouver
City of Coquitlam	Surface water	Capilano, Seymour and Coquitlam mountain reservoirs operated by Metro Vancouver

c) Province of BC IR No. 2.11c - Attachment 1 to this response is a tabulated listing of water sources and locations for each municipality along the pipeline within the Coastal Region section of the Project corridor.

In generating this tabulated list, it has been assumed that within Fraser Valley Regional District (FVRD) (Electoral E), there is a small parcel of land impacted by the Project. However early indications suggest that the water source for this property is groundwater. This information was gathered through publicly available sources, and has not been verified through contacting the relevant agencies. A detailed study of the alignment would be required to provide a more informed list.

d) The Application, Volume 7, Section 4.8 outlines the process to enhance Kinder Morgan Canada's (KMC) existing emergency management programs (EMP) as they relate to the Trans Mountain Pipeline system to address the needs of the Project (Filing ID A3S4V5). The final programs will be developed in a manner consistent with the National Energy Board's (NEB or Board) draft conditions related to emergency response (Filing ID A3V8Z8).

Although the planned document revisions to accommodate the Project have not yet been determined, Trans Mountain will accurately reflect the location of drinking water supply sources within 100 m of the pipeline, its facility, or areas that could be impacted from a release as modeled in Application Volume 7, Section 3 (Filing ID A3S4V5) based on information available from Provincial and Municipal permitting agencies.

Summary of New Commitments:

- Trans Mountain will accurately reflect the location of drinking water supply sources within 100m of the pipeline, its facility, or areas that could be impacted from a release as modelled in Application Volume 7, Section 3 (Filing ID A3S4V5) based on information available from Provincial and Municipal permitting agencies.

2.12 Groundwater quality monitoring

Reference:

i. A3Z8G5, Technical Update #1, Part 2: Risk Update, Preliminary Risk Results for TMEP Line 2 and New Delivery Lines, Attachment C – Line 2 Consequence Report, Section 2.1.3, Drinking Water Source Score, PDF p. 11 to 37 of 37.

ii. A3Y2Z1, Trans Mountain Response to BC IR No.1.36, PDF p. 99 of 187.

iii. A3Z2A6, Trans Mountain Response to BC Motion to Compel Full and Adequate Answers to BC IR No. 1, Organization Chart entry 1.36, PDF p. 43 of 76.

iv. A3Z2C0, Trans Mountain Response to BC Motion to Compel Full and Adequate Answers to BC IR No. 1, Attachment - 1.36, Kinder Morgan Canada Environment Manual, 3.6 Groundwater Monitoring, 3.6.1 Groundwater Monitoring Program.

v. A3S1U8, Application Volume 5C, Groundwater Technical Report, Section 5.1.4, PDF p. 69 of 84.

vi. A3S1L1, Application Volume 4C, Project Design and Execution – Operations and Maintenance, Section 7.1.11, Leak Prevention, Detection, and Response to Probable Leaks. PDF p. 47 of 102.

vii. A3S1L1, Application Volume 4C, Project Design and Execution – Operations and Maintenance, Section 8.1.4, In-line Inspection Program. PDF p. 51 of 102.

Preamble:

Reference (i) tabulates several HCAs of the 'Aquifer' type that are intercepted by the proposed pipeline corridor. Several other aquifers are believed to be omitted from this list (see IR 2.11).

Reference (ii) states that "Kinder Morgan Canada Inc. (KMC) has established groundwater monitoring programs at selected facilities along the system".

Reference (iii) lists 19 of Trans Mountain facilities where groundwater monitoring is conducted regularly (annually, tri-annually, bi-annually or semi-annually).

Reference (iv) is a generalized standard operating procedure for the operation of Trans Mountain's groundwater monitoring program. It does not outline the details of the existing or proposed groundwater monitoring program along the pipeline corridor.

Reference (v) outlines pre and post-construction monitoring of water wells within the Water Quality and Quantity LSA (local study area), along the proposed pipeline corridor. Post construction monitoring is only to take place if a concern is raised by a well owner.

Reference (vi) and (vii) outline the leak detection equipment and methods at the disposal of Trans Mountain.

The proposed pipeline corridor intercepts many important aquifers (reference (i)) that are relied on heavily for drinking water in BC. References (ii), (iii) and (iv) outline the monitoring efforts undertaken by Trans Mountain to protect groundwater quality around their facilities, but no mention is made of monitoring along the proposed pipeline corridor other than the proposed monitoring described in reference (v). A small leak of the proposed pipeline could continue undetected, if the release volume is below the detection limits of the methods outlined in reference (vi) and (vii). Without long term monitoring of groundwater quality, a small leak of this kind could go unnoticed for years.

Request:

In addition to monitoring groundwater quality at its facilities and at private water wells during pre-construction along the pipeline corridor, will Trans Mountain initiate long-term groundwater quality monitoring along the entire pipeline corridor, and particularly in HCAs where community water supply wells obtain their drinking water from highly vulnerable aquifers that are intercepted by the proposed pipeline corridor?

Response:

Trans Mountain has not used monitoring wells as a technique for early leak detection in high consequence areas in the past. Monitoring wells have been used in targeted locations along the pipeline in the event of a spill reaching groundwater.

Trans Mountain recognizes that where communities depend on an aquifer near the proposed pipeline that the Company can make a contribution to better understand the quality of the aquifer through proactive monitoring. As described in Province of BC IR No. 2.10c Trans Mountain has not had significant engagement with communities regarding such monitoring wells to date for the Project. Trans Mountain will commit to engage with communities that have specific concerns related to protection of municipal water sources and will consider installation of monitoring wells in strategic locations.

While there may be benefits of using monitoring wells at strategic locations to detect a spill, Trans Mountain's primary focus is on preventing pipeline releases.

Trans Mountain allocates considerable resources to its pipeline integrity program, used to identify and repair anomalies in the pipe before leaks occur. It has developed a robust integrity management program for both its existing pipeline system and for its facilities, including the terminals and pumps stations. Volume 7, Section 2 (Filing ID A3S4V5) identifies programs to Prevent and Mitigate Oil Spills. Volume 7, Section 3.0 (Filing ID A3S4V5) provides information on Oil Spill Risk Assessments and the commitment to Risk Based Design of the Project to minimize Risk to As Low as Reasonable Practical (ALARP).

Volume 4C (Filing ID A3S1L1) provides an overview of KMC operations and maintenance policies, systems, programs, procedures, practices, and activities that are currently in place for the existing TMPL system and that will be enhanced and implemented for the expanded TMPL system. The information provided in Volume 4C clearly defines KMC's commitment to safe pipeline operation.

In addition to preventing releases from the pipeline system, Trans Mountain has developed and implemented a systematic approach to leak detection. A computational pipeline monitoring (CPM) system is used in combination with other monitoring methods, such as surveillance patrols, regular in-line inspections using smart pigs and smart ball tools (acoustical leak detection technology), Control Centre Operator (CCO) monitoring using the supervisory control and data acquisition (SCADA) system, and scheduled line balance calculations. In the unlikely event that released petroleum impacts groundwater, Trans Mountain will implement a remediation program to recover petroleum and treat contaminated water to meet stringent government criteria. Information regarding leak detection and response to probable leaks is included in Section 7.1.11, Volume 4C of the Facilities Application (Filing ID A3S1L1).

Summary of New Commitments:

- Trans Mountain will work with communities that have specific concerns related to protection of municipal water sources and will consider installation of monitoring wells in strategic locations.

2.13 Risk mitigation and pipeline design features

Reference:

i. A3W9H8. Trans Mountain Response to NEB IR No. 1.10 b), PDF p. 33 of 421.

ii. A3S4V7, Application Volume 7, Risk Assessment and Management of Pipeline and Facility Spills, Appendix A – Threat Assessment Report, Section 1.1, Risk Approach, PDF p. 7 of 60.

iii. A3S0Y8, Application Volume 4A – Project Design and Execution – Engineering, section 3.2.12, Pipe Wall Thicknesses, PDF p. 51 of 110

iv. A3S0Z5, Application Volume 4A – Project Design and Execution – Engineering, Appendix D, PDF p. 16 of 93

v. Review of the Enbridge Northern Gateway Pipeline Project (OH-4-2011), Northern Gateway Response to JRP IR No. 12.2 – Heavy Wall and Valve Spacing, PDF p. 7-10 of 46: https://docs.neb-one.gc.ca/lleng/llisapi.dll/fetch/2000/90464/90552/384192/620327/624798/861762/B109-2_-_Northern_Gateway_Pipelines_Limited_Partnership_-_NGP_Response_to_JRP_IR_12_-_A3A0T7.pdf?nodeid=861766&vernum=-2.

vi. A3S0Y8, Application Volume 4A, section 3.2.15.1, Remote Mainline Block Valve Locations, PDF p. 52 of 110.

vii. A3W9H8. Trans Mountain Response to NEB IR No. 1.10, PDF p. 33 of 421.

viii. A3Z4T9. Trans Mountain Response to NEB IR No. 2.110 b), PDF p. 411 of 478.

ix. Review of the Enbridge Northern Gateway Pipeline Project (OH-4-2011), Northern Gateway Response to JRP IR No. 3.3 c.1) and c.2), PDF p. 16 of

x. 68: https://docs.neb-one.gc.ca/lleng/llisapi.dll/fetch/2000/90464/90552/384192/620327/624798/711062/B32-2__-_Northern_Gateway_Response_to_JRP_IR_No._3__A2C5T3.pdf?nodeid=710963&vernum=1

xi. Review of the Enbridge Northern Gateway Pipeline Project (OH-4-2011),Update to JRP PR 12.2 c), Preliminary Valve Location Engineering Assessment (Route Rev. V), Rev. F, Date: January 2013: https://docs.nebone.gc.ca/lleng/llisapi.dll/fetch/2000/90464/90552/384192/620327/624798/915645/B190-3_-_Update_to_JRP_IR_12_2_c_Preliminary_Valve_Location_Engineering_Assessment_Rev_F_Jan_2013_-_A3F1X2.pdf?nodeid=915548&vernum=1

Preamble:

In reference (i), Trans Mountain sets out the rationale for selecting the size of the six hypothetical spills included in the cleanup and damage cost estimate. Trans Mountain explains why the largest spill for which costs are estimated occurs in a non-high consequence area as follows: “The rationale for not including a 4,000 m3 spill into a HCA is that the outflow models suggested that such spill event was highly unlikely”.

Reference (ii) states:

> Risk can be expressed as the product of failure likelihood, and the consequences of failure.
>
> $$R = FF \times C$$
>
> **Equation 1**
>
> Where,
>
> R = Risk
>
> FF = Failure Frequency
>
> C = Consequences

If risk is a function of both likelihood and consequence, then an event with catastrophic consequences may be a high-risk event, even if it is relatively unlikely. Such an event ought to be considered in the assessment of cleanup and damage costs included in the Application.

In reference (iii), Trans Mountain describes pipe wall thickness along Line 2 as follows:

> The formula in Clause 4.3.5.1 of CSA Z662 will be used to determine the minimum wall thickness of the line pipe used for the Line 2 pipeline.
>
> The line pipe wall thickness will be selected in accordance with a maximum design stress level of 80 per cent of the SMYS [Specified Minimum Yield Strength]. A risk assessment will be undertaken and it is expected that heavier wall pipe will be specified at specific locations, such as at highway and road crossings, larger watercourse crossings, and for some areas designated as high consequence areas (HCAs).
>
> The wall thickness at the proposed HDD crossings will be determined through stress analysis to comply with maximum stresses allowed for in CSA Z662.
>
> The NPS [Nominal Pipe Size] 36 line pipe will have a minimum pipe wall thickness of 11.8 mm and the NPS 30 line pipe will have a minimum pipe wall thickness of 9.8 mm. Table 5.1.8 in Appendix D outlines the preliminary pipe wall thicknesses for the various applications that are to be utilized in constructing the TMEP Line 2 pipeline and the Burnaby to Westridge Marine Terminal pipelines.

Preliminary pipe wall thicknesses are set out in reference (iv). For the Edmonton to Burnaby portion of Line 2, the thickness of the line pipe is 11.8 mm, that of the heavy wall pipe, to be installed at road and watercourse crossings, is 14.7 mm, and that of the extra heavy wall pipe, to be used at HDD and uncased railway crossings, is 19 mm. Thicknesses for the Burnaby to Westridge portion of Line 2 are lower.

In reference (v), Northern Gateway Pipelines Inc. (NGP) is asked a series of questions by the Joint Review Panel with respect to specific design features aimed at enhancing pipeline safety and mitigating risk – pipe wall thickness and valve spacing. The preamble to the IR states as follows:

> In reference i) Northern Gateway indicates that in addition to the quantities of line pipe specified in Table 5-1 and 5-2 short lengths of heavy wall pipe will be needed for crossing railways, roads and major rivers. The lengths and wall thickness of these additional heavy wall sections will be determined on the basis of engineering assessments performed during detailed engineering.
>
> In reference ii) Northern Gateway's typical crossing drawings show heavy wall installed to the edge of the road allowance or railway right of way but no heavy wall is specified on the typical water crossing drawing.
>
> "Major rivers" are not defined in Exhibit B1-5 however the Panel notes that Clause 4.4.8 of CSA Z662-11, which deals with valve placement, provides a definition of a major water crossing as a water crossing that in the event of an uncontrolled product release poses a significant risk to the public or the environment.
>
> In reference iii) Northern Gateway states that it has identified a variety of design features that will enhance the safety and reliability of the pipelines over and above standard industry practice. Specifically, Northern Gateway indicates it will: increase the wall thickness of the oil pipeline; increase wall thickness for major tributaries to the Fraser, Skeena and Kitimat Rivers; add new isolation valves to be placed on each side of major tributaries to the Fraser, Skeena and Kitimat Rivers to provide enhanced protection of high value salmon habitat. [emphasis added]

In response, Northern Gateway states as follows:

> a) The term "major river" has been used in two different contexts. The first use of "major river" (Application, Volume 3, Section 5.1) was related to the anticipated wall thicknesses that would be required at watercourse crossings for pipe strength to accommodate HDD's, aerial crossings, and long pipeline sections to be pulled across the river for a trenched crossing. The second use of "major river" (Application, Volume 3, Section 5.5) was related to valve site location selection as further discussed in Northern Gateway's response to JRP 12.2(c). Additionally, Northern Gateway will install heavy wall pipe at major tributaries to the Fraser, Skeena and Kitimat Rivers. Major tributaries are defined as those that have a channel width equal or greater than ten meters and high fisheries sensitivity.

> b) Please see the table: "Preliminary List of Watercourse Crossings for Heavy Wall Pipe", provided as Attachment JRP IR 12.2(b). For these locations the oil pipeline heavy wall pipe will have a minimum wall thickness of 22.2 mm and the condensate pipeline heavy wall pipe will have a minimum wall thickness of 9.5 mm.
>
> …
>
> d) Further to the requirements defined in the response to JRP IR 12.2(a) above, Northern Gateway will be installing heavy wall pipe at other watercourse crossings in consideration of:
>
> - protection against hydrological threats (e.g. scour or avulsion);
> - HDD or other trenchless design requirements where heavier wall pipe is typically required;
> - aerial crossings;
> - other major tributaries to the Fraser, Skeena and Kitimat Rivers.
>
> …
>
> [emphasis added]

Comparing the latter two references, it becomes clear that the wall thicknesses of the pipes Trans Mountain proposes to install at watercourse crossing locations are significantly lower than those proposed by NGP.

In reference (vi), Trans Mountain refers to the preliminary locations of the proposed valves for Line 2 and of the new valves for the reactivated segments for Line 1, and provides the following description of the valve location process:

> The proposed locations of RMLBVs [Remote Mainline Block Valves], those MLBVs [Mainline Block Valves] not located at pump stations, will initially bedetermined in accordance with CSA Z662, Clause 4.4, Valve Location and Spacing. To limit the consequences associated with a pipeline break or rupture, the following additional factors will also be considered in selecting the proposed RMLBV locations: topography, the location of environmentally sensitive features and terrain, population density, accessibility of electrical power, maintenance flexibility, release volume analyses, release volume dispersion modelling, and the risks to HCAs.

Trans Mountain goes on to explain that “final valve site locations will be established during the detailed engineering and design phase”.

In reference (vii), Trans Mountain sets out the rationale behind the size of the hypothetical spills relied upon in the clean-up and damage costs estimate:

> Reference ii) [Application Volume 7, Appendix G] describes generally the rationale for selecting the 2,000 m3 outflow as a scenario for High Consequence Areas (HCA) and 4,000 m3 as a scenario for non-HCAs. Selection of these benchmarks was informed by the outflow analysis for the corridor. Inspection of the outflow analysis for the corridor as

> a whole showed that 99% of the outflows in the entire corridor were less than 4,000 m3; 90% were less than 2,700 m3. This implies that if a rupture occurs (itself a rare event), only about 1 in 100 would be greater than 4,000 m3. The incidence of such large spills in HCAs is even lower because of the additional design measures in place to reduce potential outflows. [emphasis added]

In reference (viii), Trans Mountain explains why it does not rely on outflow volume as the basis for identifying proposed valve locations:

> … Trans Mountain is using an evaluation of the *Risk Score* (defined as the product of failure likelihood and consequence) as the basis of the risk evaluation, and for the purposes of assigning risk mitigation measures, rather than outflow volume. Trans Mountain feels that this is a more rigorous approach than simply limiting outflow volumes to some fixed value, since a criterion that is based solely on outflow volume is not capable of evaluating other factors that would otherwise be salient to a risk assessment, such as environmental sensitivity or likelihood of occurrence. By using risk score as the basis of the evaluation, a number of different strategies can be used to mitigate risk, depending on the factors that have been identified as being the principal drivers of risk, thereby enabling the selection of optimal risk mitigation strategies that are best suited for each circumstance.
>
> By way of example, there are some circumstances where, due to the position within a pipe segment and its associated elevation profile, that [*sic*] outflow volume is relatively insensitive to the addition of block valves. Under such circumstances, there may be much more effective measures available to mitigate risk (such as increasing wall thickness, or increasing the depth of cover, where risk magnitude is governed principally by 3rd Party Damage). [emphasis added]

In reference (ix), the Joint Review Panel asked Northern Gateway Pipelines Inc. (NGP) for "an assessment of the suitability and relative importance of [limiting spill volume] in determining valve spacing". NGP stated as follows:

> Limiting potential spill volume, specifically in relation to consequence areas identified in the risk assessment, is a key factor in determining valve spacing. Northern Gateway used proprietary OILMAPLAND™ software provided by Applied Sciences Associates Inc. Rhode Island (ASA) to estimate the potential spill volume from locations along the pipeline. [emphasis added]

In reference (x), NGP proposes to place valves along its pipeline to limit the potential volume release to less than 2,000 m3 at locations meeting certain criteria, including watercourses with a channel width greater than 10 meters and with high fish sensitivity, as well as those zones where a spill could impact tributaries to high sensitivity rivers.

In comparing the evidence submitted by NGP during the Joint Review Panel review process to the application under review in this process, it is apparent to the Province that NGP intends to include a significantly greater number of valves in British Columbia (providing an average of approximately one valve every 8 kilometers, as opposed to TMEP's proposed average of one

valve every 13 kilometers). Further, Trans Mountain's preliminary valve placement shows over 11 stretches in British Columbia where the distance between valves equals or exceeds 20 or more kilometers, whereas NGP's application featured only four such stretches.

Request:

a) Will Trans Mountain commit to enhancing the safety and reliability of Line 2 over and above industry standards by installing pipe of a wall thickness similar to that proposed by Northern Gateway at watercourse crossings of similar sensitivity? If not, please explain.

b) Will Trans Mountain commit to the use of best available technology with respect to the design, engineering, materials and construction methods used for the Project, so as to reduce failure frequency and, as a result, the risk associated with the Project to the fullest extent possible? For the purpose of this request, "best available technology" should be understood as state of the art technology that is both commercially available and proven to be effective, as demonstrated by its adoption by other industry members.

c) If the answer to request b) above is yes, please describe the specific technology Trans Mountain commits to using.

d) What is the maximum outflow volume possible if preliminary valve locations and spacing are implemented?

e) What are the "additional design measures" that are in place to reduce potential outflows in HCAs, as set out in reference (vii)?

f) Would Trans Mountain commit to reducing possible outflow volumes in HCAs to 2,000 m^3?

g) Reference (ii) appears to indicate that outflows exceeding 4,000 m^3 are a possibility in non-HCA areas. Why are the additional design measures, including valve spacing, proposed for HCAs not being contemplated for non- HCAs, so as to limit potential outflows to 2,000 m^3 along the entire length of the pipeline?

h) Would Trans Mountain commit to limiting the risk associated with Line 2 over and above standard industry practice by installing isolation valves limiting potential outflows to 2,000 m^3 along the entire length of the pipeline?

i) While the Province understands that numerous factors come into play in the determination of valve locations, limiting outflow volumes is, as was recognized by NGP in reference (iv), "a key factor in determining valve spacing". In reference (iii), Trans Mountain states that reliance on risk score (instead of outflow volume) will enable it to develop "optimal risk mitigation strategies that are best suited for each circumstance". Will Trans Mountain commit to both limiting outflow volumes (as an initial mitigation step) and relying on risk scores to develop further risk mitigation measures where required?

j) How do the valve locations and spacing proposed for the Project compare to the valve spacing requirements imposed by the US Department of Transportation's Pipeline and

Hazardous Materials Safety Administration (PHMSA)? Are they more conservative, less conservative, or comparable?

k) Do PHMSA requirements apply to the Trans Mountain Pipeline – Puget Sound that crosses the border into Washington State?

l) Considering similar existing or proposed heavy oil pipelines across North America and Europe, what is the smallest maximum draindown volume identified and planned for in valve placement? Would Trans Mountain commit to installing isolation valves limiting potential outflow volumes to that volume along the entire length of Line 2? If not, why not?

m) Does the volume of product identified in reference (vi) represent the full release of oil, including draindown, or the pre-shut-in volume only?

n) Please model and identify any and all locations along the pipeline right-of-way within British Columbia where an unmitigated significant release of oil (defined for the purposes of this request as the entire draindown volume between valves) would reach a HCA within a six hour response window.

Response:

a) From the onset in developing the Project Trans Mountain had regard for increased safety and reliability of Line 2. For this reason Trans Mountain has applied a rigorous risk based design approach which in itself is over and above industry standards (as more fully described in Province of BC IR No. 2.07a). Examples of typical risk mitigation strategies include the mitigation of 3rd Party damage through increased depth of cover, increased wall thickness or pipeline markers, the mitigation of environmental consequences through the installation of mainline valves, and the mitigation of geotechnical threats through threat avoidance.

With regard to extra wall thickness, the safety and reliability of Line 2 will be enhanced over and above industry standards. Trans Mountain is specifying 14.7 mm heavy wall pipe at all major and most minor watercourse crossings and road crossings where only 11.8 mm is required for the 36-inch pipe. For the same crossings on the 42-inch section to be constructed Trans Mountain has specified 17.2 mm wall thickness which is over and above the code requirement of 13.8 mm. This represents approximately 25% increase above code requirements. Based on preliminary engineering, the TMEP also contains an approximate 28 km section with higher pressure that will require 19.0 mm heavy wall pipe at watercourse crossings.

With regard to the the Northern Gateway proposal, Trans Mountain has not done a rigorous review of all the design characteristics but notes that the Northern Gateway pipeline would operate at higher pressures then the TMEP pipeline thereby requiring that Northern Gateway be designed with thicker wall pipe. Northern Gateway has pump station discharge pressures as high as 14,679 kPa and maximum design pressures up to 16,755 kPa. This compares to a maximum discharge pressure of 9,930 kPa and a maximum design pressure of 15,306 kPa for the TMEP.

Trans Mountain has also incorporated an additional steel pipe safety measure over and above what is required for the design of liquids pipelines. Trans Mountain has specified Category II pipe for Line 2 as required by the more stringent gas pipeline code. The same code being used for the design of LNG pipes in British Columbia. Category II pipe has a proven notch toughness which will provide additional resistance to failure over Category I pipe that does not have a proven notch toughness as typically specified for liquids pipelines including the Northern Gateway pipeline.

In Trans Mountain's view it has incorporated significant enhanced safety measures over and above already stringent code requirements for the Project and has done so in a focussed and rigorous manner. While comparisons can be drawn between different pipeline designs such comparison must reflect the distinct operating characteristics of each system.

b) Trans Mountain has already and will continue to commit to the use of "best available technologies" that is both commercially available and proven to be effective, as demonstrated by its adoption by other industry members with respect to the engineering design, materials and construction of the Trans Mountain Expansion Project.

c) Some of the major commitments being made by Trans Mountain that address the use of "Best Available Technologies" with respect to engineering design, materials and construction include:

- A commitment to implement Risk-Based Design for TMEP. This will include urban areas, agricultural lands, High Consequence Areas (HCAs) that include high environmental sensitivities, and for seismically prone areas where slope instability may be an issue. The Risk-Based Design will inform additional mitigation measures such as extra pipe wall thickness, increased depth of cover, and other mitigation measures where appropriate, and will be implemented to enhance the safety and reliability of the Line 2 (TMEP) pipeline.

- A commitment to use heavy wall pipe at all major and most minor watercourse crossings, road crossings, and pipeline facilities when not required by CSA Z662 for LVP pipelines.

- A commitment to use Cat II pipe, over and above industry standards, for all belowground Line 2 (TMEP) piping, and to develop equivalent and compatible welding procedures with proven notch toughness, even though Cat II pipe and proven notch toughness is not required for LVP pipelines.

- A commitment to use Strain-Based Design and Engineering Critical Assessment (ECA) for large soil displacement loadings and muskeg areas when required.

- A commitment to use a two (2) stage screening and review process to determine the most suitable crossing methodology for each watercourse based upon fish and fish habitat sensitivity, engineering, constructability, environmental and a number of other significant factors.

- A commitment to update and implement Trans Mountain Natural Hazard Management Program for geohazards along the Line 2 (TMEP) pipeline.
- A commitment to inspect 100% of all production welds when not required by CSA Z662 (Clause 7.10.3.1) for LVP pipelines.
- A commitment to develop and implement state-of-the art Engineering Specifications for engineering design, materials and construction.

d) The outflow volumes for the entire length of Line 2 and the new delivery lines, based on preliminary valve locations and spacings are contained in Technical Update #1, Volume 7 Appendix B Update (Filing ID A3Z8G6), and in Technical Update #4, Hargreaves to Blue River Update (Filing ID A4F5G7). From these plots, it can be seen that the maximum outflow volume possible, based on the preliminary valve locations, occurs in the Edson, Alberta to Hinton, Alberta segment, and is approximately 4,600 m^3.

Trans Mountain notes that the average TMEP Line 2 outflow volume is approximately 1,500 m^3 ranging from a low of 500m^3 to 4,600 m^3 as noted above.

e) The risk-based design of Line 2 and the new delivery lines is currently underway, and will continue to progress through to detailed engineering and design. Until it is completed, a list of detailed and specific risk mitigation measures that will be incorporated into the final design will not be available. Nevertheless, some examples of typical risk mitigation strategies include the mitigation of Third Party damage through increased depth of cover, increased wall thickness or pipeline markers, the mitigation of environmental consequences through the installation of mainline valves, and the mitigation of geotechnical threats through threat avoidance. Please also refer to Trans Mountain's response to Province of BC IR No. 2.07 for further discussion regarding HCAs.

f) As is further explained in the response to Province of BC IR No. 2.13g, this maximum possible outflow volume of 2,000 m^3 is not practical based on the specific characteristics of the Trans Mountain Expansion Project including pipeline diameter, hydraulics, terrain, locations of river and stream crossings, and urban densification and existing infrastructure which limits siting of valves.

g) Before responding to the question specifically, Trans Mountain wishes to correct what appears to be incorrect premises that are embedded within the preamble and the question itself. The preamble to the question draws comparisons between certain design features associated with the Northern Gateway pipeline and facilities that are the focus of this question. Trans Mountain wishes to point out that design attributes such as wall thickness, the locations of valves and potential outflow volumes are a function of other design variables, such as hydraulic profile, design pressure and operating environment, including elevation profile, terrain and characteristics, as well as the threat environment. Pipelines must be carefully designed to account for all relevant variables and conditions, and it is not accurate to represent that the design attributes and operating characteristics of one pipeline must necessarily be appropriate for another pipeline.

Within the question itself, there appears to be an embedded premise that Trans Mountain has taken design measures to limit potential outflows to 2,000 m^3 within *all* HCAs. To be clear, this is what was stated in Reference x) of the Preamble:

A further consideration for identification of valve locations was the requirement to limit the potential spill volume at these watercourses to less than 2,000 cubic metres. As discussed previously, a volume out calculator was developed to enable the project to determine, at any location along the pipeline, what the potential maximum spill volume would be based on product flow rate, spill detection and valve closure times, pipeline profile and natural topographic constraints. In some cases the local topographic profile at a watercourse may naturally limit the spill volume to less than 2,000 cubic metres, in which case no valve was identified for that location.

While watercrossings might lend themselves to this goal (in part, due to the fact that watercrossings tend to be at the lowest-elevation point on either side of the watercrossing and check valves can be employed to prevent reverse drain back), the goal of limiting potential spill volumes to 2,000 m^3 at watercrossings is not achievable in a practical sense for all HCAs (*i.e.,* non-watercrossing HCAs), or to non-HCA areas, as is explained below.

Outflow volumes for Line 2 were provided in Technical Update #1 (Filing ID A3Z8G6). On those plots, elevation profile is plotted on the light-green line. Shutdown volumes are plotted using light-blue markers, and combined (i.e., shutdown and draindown) volumes are plotted using dark-blue markers. Update graphs of a similar nature were provided for the Hargreaves to Blue River segment in Technical Update #4, Hargreaves to Blue River Update (Filing ID A4F5G7).

Shutdown volumes are limited by technological capabilities for leak identification, confirmation and initiation of isolation commands including valve closure. As can be seen from the charts provided in the above reference, shutdown volumes on Line 2 are assumed to be 500 m^3 based on spill recognition, pump shutdown, and isolation valve closure. This is considered to be representative of the current state of the art, assumes a full bore 36 inch rupture which will be recognized immediately but assumes 10 minutes recognition to pump shutdown, and realistically, no improvement can be made to reduce the assumed shutdown volumes.

Drain-down volumes are those volumes that occur after system shut-down and valve isolation, and for a given pipe diameter, they are primarily a function of the topography of the isolating valve section, the elevation at the location of the failure relative to the topography of the isolating valve section, and the ability of pipeline operators to respond and contain the drain-down. In the limit, where the leak location coincides with the highest elevation point within an isolating valve section, drain-down volumes can approach zero. Conversely, in the other extreme, while it is not common for pipelines to be located on steady, non-undulating slopes, where such a circumstance presents itself, it is theoretically possible for the entire contents between isolating valves to be drained

from the pipeline, should a rupture occur immediately uphill of the lowest-elevation valve. Recognizing that Line 2 will comprise both NPS 36 and NPS 42 pipe, the drain-down volume ranges from approximately 700 m^3 to 900 m^3 per kilometre respectively. Therefore, in order to limit outflow volumes to 2,000 m^3, and accounting for the 500 m^3 pre-isolation volume, valves would need to be spaced as close as 1.7 km to 2.3 km apart, depending on diameter. This is extremely close valve spacing, recognizing that there are practical limitations with respect to the siting of valves, such as the presence of rivers, steep ravines, avalanche slopes, accessibility, landowner constraints, and practical feasibility of bringing power into a valve site. Trans Mountain notes that one mitigating procedure that can use used in some circumstances not described in the example above is when a CCO will continue to operate pumping units downstream of the outflow location (please refer to Province of BC IR No. 2.20g) which could have the effect of reducing the outflow volume calculated in the example above.

Finally, it should be noted that the outflow volumes reported in NEB Filing IDs A3Z8G6, A4F5F8, and A4F5G7 represent the results of a model that was developed to support a consequence analysis within a risk model that is being used to inform the risk-based design of Line 2 and the new delivery lines. The hazard scenario that is assumed in such a risk assessment should ideally be one that is sensitive to both failure likelihood and consequence aspects of risk.

For this reason, an unmitigated, full-bore rupture scenario was used as the basis of the consequence modeling that is part of the risk calculation, since the objective of risk-based design is to mitigate risk through the reduction of both failure likelihood and consequence. The outflow volumes reported in the above references are unmitigated, and do not take account of any response, intervention, or of any attenuation of volumes prior to reaching a high consequence area. In this respect these volumes are highly idealized and a review of information relating to past incidents would support the contention that these should not be taken to be representative of expectations for real-life spill events.

h) No. Please refer to the response to Province of BC IR No. 2.13g.

i) The goal of the valve optimization aspect of the risk-based design process that is currently being undertaken for Line 2 and the new delivery lines is to achieve risk reduction by limiting outflow volumes in an optimized manner. A description of the approach by which that is occurring was provided in the response to NEB IR No. 3.50b (Filing ID A4H1V2).

j) The risk-based valve optimization approach that is being undertaken for Line 2 and the new delivery lines as described in the response to NEB IR No. 3.50b (Filing ID A4H1V2) is more rigorous and more conservative than that required by the US Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA).

The PHMSA requirements for valve location are provided in 49 CFR Part 195 §195.260, as follows:

A valve must be installed at each of the following locations:

(a) On the suction end and the discharge end of a pump station in a manner that permits isolation of the pump station equipment in the event of an emergency.

(b) On each line entering or leaving a breakout storage tank area in a manner that permits isolation of the tank area from other facilities.

(c) On each mainline at locations along the pipeline system that will minimize damage or pollution from accidental hazardous liquid discharge, as appropriate for the terrain in open country, for offshore areas, or for populated areas.

(d) On each lateral takeoff from a trunk line in a manner that permits shutting off the lateral without interrupting the flow in the trunk line.

(e) On each side of a water crossing that is more than 100 feet (30 meters) wide from high-water mark to high-water mark unless the Administrator finds in a particular case that valves are not justified.

(f) On each side of a reservoir holding water for human consumption.

k) Yes.

l) Trans Mountain has not done the analysis requested. The analytical effort required to undertake the requested evaluation taking into account the many variables of each pipeline would be onerous and in Trans Mountain's view of little technical value. For the reasons cited in response to the Province of BC IR No. 2.13a and elsewhere Trans Mountain believes it has applied a rigorous risk based design approach which in itself is over and above industry standards resulting in a safe and reliable pipeline system.

m) No product volumes are cited in Reference vi) of the preamble. Outflow volumes for the entire length of Line 2 and the new delivery lines, based on preliminary valve locations and spacings are contained in Volume 7 Appendix B Update (Filing ID A3Z8G6), and in the Hargreaves to Blue River Update (Filing ID A4F5G7). These volumes represent the full release of oil, including drain-down.

n) Trans Mountain provided the results of outflow modelling for the entire pipeline route in 30 m intervals, as well as overland and stream flow mapping using the OilMAP land model that shows how an unmitigated release from the proposed pipeline would interact with overland and downstream pathways including watercourses along the pipeline route. As discussed in the Applied Science Associates report included in Technical Update No. 1 (Filing ID A62087), there are a number of simplifying and conservative assumptions that result in the spill path trajectories being significantly longer and thus more conservative than can be reasonably expected in a real spill situation. The overland and stream flow mapping was presented with spill points created at the outflow location nearest the midpoint of each 1-kilometre segment of pipeline and at each stream crossing. For the updated version of the outflow modelling, refer to Filing IDs A4F5F8 (Westridge Delivery Pipelines), A4F5G7 (Hargreaves to Blue River), A4F5A3

(Finn Creek to Froth Creek, A3Z8G6 (remainder of proposed Line 2). For the updated version of the overland and stream flow mapping, refer to Filing IDs A4F5G0 (Westridge Delivery Pipelines), A4F5G4 (Hargreaves to Blue River), A4F5A4 (Finn Creek to Froth Creek), A3Z8G6, A3Z8G7, A3Z8G8, A3Z8G9, A3Z8H0, A3Z8H1, A3Z8H2, A3Z8H3, A3Z8H4, A3Z8H5, A3Z8H6, A3Z8H7, A3Z8H8, A3Z8H9, A3Z8I0, A3Z8I1, A3Z8I2, A3Z8I3, A3Z8I4, A3Z8I5, A3Z8I6, A3Z8I7, A3Z8I8 (remainder of proposed Line 2).

Trans Mountain has not modelled the scenario proposed in this question at the present time but will be undertaking substantively the same analysis requested by the Province. The analysis will be done in part to help inform the new Emergency Response Plans (ERPs) that will be developed for the Project. Trans Mountain will include a review of the results of the modelling for the 6 hour time step with all stakeholders engaged in consultation for Emergency Response planning, including the Province of British Columbia.

The results of the outflow model developed for the Project to date are used as input to the overland and stream flow model. This model predicts overland and stream flow spill trajectories over the full length of the TMEP Line 2, without curtailment in the model for terrestrial spill travel, and a 24-hour travel time limit for downstream pathways (Section 3.16 incorrectly identifies the streamflow time travel as 12 hours). The modelling completed to date conservatively calculates spill trajectories which are then used for the purpose of HCA identification and consequence scoring. With the HCAs identified, the focus of the planned future modelling will be to limit the outflow for specified time periods so as to assist with developing the new ERPs.

2.14 Lifespan of a pipeline

Reference:

i) A3X5Y6, Trans Mountain Response to C. Amy IR No. 1.6 d), PDF p. 24 of 32.

ii) A3S1Q9, Application Volume 5A, Section 7.1.3, Spatial and Temporal Boundaries, PDF p. 4 of 403.

iii) A3Y3A0, Trans Mountain Response to BC IR No. 1.6 a) – Attachment 9, Trans Mountain Pipeline ULC (TMPL), NPS 24 Mainline – Liquids Leak, Order SO-T260-005-2013, dated 2 August 2013.

Preamble:

In reference (i), Trans Mountain states as follows:

> The existing pipeline does not have a predetermined lifespan. With the continuing application of the programs and procedures described in Volume 4C of the Facilities Application, Trans Mountain anticipates that the existing pipeline will be able to safely operate for many more years.

However, the Application (reference (ii)) indicates otherwise:

> The operations phase commences following completion of construction in Q4 2017 and is anticipated to extend for 50 years or more. The decommissioning and abandonment phase would occur at the end of the useful life of the pipeline (50 to 70 years). [emphasis added]

Reference (iii) is a letter enclosing a Safety Order issued by the National Energy Board following two corrosion leaks that occurred on Line 1 near Merritt, BC in June 2013. The NEB states as follows:

> On 12 and 26 June 2013, Kinder Morgan Canada Inc. (KMC) identified and reported two separate leaks stemming from crack features on the Trans Mountain Pipeline. These crack features were discovered as a result of inline inspections conducted by KMC in compliance with the National Energy Board (Board) letter issued 16 March 2012 directing KMC to complete baseline assessments on cracking features that may eventually lead to leaks.
>
> [emphasis added]

Request:

a) Please reconcile the statements in references (i) and (ii).

b) Given that Line 1 does not have the benefit of modern pipe steel strength, welding methods, protective coatings, and construction methods (e.g. bedding, handling, placement), please provide a rationale for the statement in reference (i) that “the existing pipeline will be able to safely operate for many more years”.

c) Please reconcile the statement in reference (i) with the leaks described in reference (iii).

d) Please explain why the leaks described in reference (iii) were not discovered until Kinder Morgan Canada was directed by the Board to complete baseline assessments on cracking features.

e) In light of the circumstances that lead to the leaks described in reference (iii), how can Trans Mountain be confident that there are no more unidentified cracking features along Line 1 that could lead to similar events?

Response:

a) The response provided by Trans Mountain in reference i) was in regard an IR that asked "What is the average life expectancy of a section of pipe within this pipeline, given the proposed volume and rate of diluted bitumen to be transported".

Reference ii) relates to the specific temporal boundaries assessment as part of the Environmental and Socio-economic Assessment (ESA) for the Project.

The statements in references (i) and (ii) are correct within the context in which they were provided. In order for the ESA to consider the duration of events and reversibility of potential residual effects as part of the required significance evaluation, a useful life of the pipeline must be defined. For assessment purposes 50 to 70 years was used. This temporal boundary does not define or in any way predetermine the lifespan of the pipeline (or any section of pipe) from a safe operating perspective.

The IR response simply stated that the pipeline does not have a predetermined lifespan and that it will be able to safely operate for many years.

To be of further assistance Trans Mountain draws the attention of the Province to an earlier section of the Application in Volume 5A Section 2.4 for the ESA (Filing ID A3S1L3) where Trans Mountain discussed issues relating to decommissioning and abandonment in the Application:

"It is difficult at this time to predict when or how the pipeline and facilities will be decommissioned and abandoned at the end of the Project's useful life. The existing TMPL system has been operating successfully for 60 years and will be safe and reliable for many more as a result of continuing proactive maintenance and integrity programs. The operational life of the new pipeline is anticipated to be as long or longer."

b) Pipeline safety is Trans Mountain's number one priority, and through the experience gained in 60 years of operation, a mature suite of programs has been developed to maximize the safety of the existing pipeline. The existing pipeline does not have a predetermined lifespan and, with proper maintenance and monitoring, it can be safely operated indefinitely.

Trans Mountain has provided extensive information on its ongoing integrity management programs, which will apply to the existing pipeline segments as well as the proposed new pipeline segments, in Volume 4C, Section 8.0 (Filing ID A3S1L1) of the Facilities

Application. Additional information on the programs and procedures that Trans Mountain currently uses and will enhance to ensure the safety of the expanded pipeline system, including the existing segments are included throughout Volume 4C. With the continuing application of the programs and procedures described in Volume 4C, Trans Mountain anticipates that the existing pipeline will be able to safely operate for many more years.

The following tools and processes have been used to assess all of the original pipe in the in-service segments of Line 1:

- High resolution Axial Magnetic Flux Leakage (MFL tool) - metal loss assessment, dent sizing, run to run corrosion growth rate determination, pipe strain and movement assessment, enhanced assessment for potential gouges, inertial positioning
- High resolution Circumferential MFL (AFD tool) – axial flaw detection, KMAP seam weld assessment, metal loss assessment, enhanced assessment for potential gouges
- High resolution caliper tools with inertial positioning unit (Geometry tool) – deformation assessment, inertial positioning, pipe strain and movement assessment
- Electromagnetic Acoustical Transducer (EMAT tool) – cracking assessment, gouge assessment, external coating assessment
- Shearwave Ultrasonic (USCD tool) – cracking assessment. Note that the USCD tool baseline assessment is still underway with all tool runs completed but with analysis and investigation work still required to be completed. This work is expected to be completed by the end of 2015.

KMC has developed and implemented conservative processes for the investigation and repair of anomalies identified by ILI. Features selected for investigation include repair conditions listed in CSA Z662 -11 as well as features selected from additional engineering analysis. This engineering analysis includes examining the risk from corrosion growth between scheduled ILI runs , for all detected corrosion features, using corrosion growth rates determined by run-to-run ILI comparison. Features exceeding a defined threshold are investigated and repaired. Similar engineering analysis approaches are being developed and will be applied to the ongoing crack assessments.

Assessment processes continue to be improved and updated in pursuit of goals to prevent ruptures and leaks and for continuous improvement. In response to the discovery of a leaking feature identified using the EMAT tool, field inspection data was fed back to the MFL and AFD tool vendors and they were able to develop enhanced data analysis protocols to identify this feature in existing data. All existing data for the entire pipeline system was reanalyzed by both ILI vendors using these enhanced protocols.

In addition to improving assessment processes, KMC is also examining new ILI technologies. For example, a pilot assessment was recently completed on a segment of

Trans Mountain using a new multi data set (MDS) tool to evaluate its stated capability to detect shallow dents with susceptibility for cracking from pressure cycling. If the evaluation of this tool demonstrates improved effectiveness for identifying shallow dent threats, compared to existing ILI tools and processes presently being applied, a baseline assessment of the TMPL system using this ILI technology will be completed.

KMC has developed an Integrated Safety and Loss Management System (ISLMS) with fundamental goals of ensuring the safety and security of people and protecting the environment. The Integrity Management Program is now an element of the ISLMS. The ISLMS has quality assurance processes in place to monitor the performance of the Integrity Management Program toward meeting its specific objectives including objectives for continuous improvement. Please refer to NEB IR 3.002a (Filing ID A4H1V2) for a detailed description of the ISLMS and how it drives a culture of safety at KMC.

c) Because the fundamental material properties of steel do not change appreciably with time, steel pipelines are normally designed with an indefinite design life, and it is common for pipeline operators to manage their assets as such by implementing Integrity Management Programs to address time-dependent degradation mechanisms such as corrosion and cracks. This strategy of indefinite operating life span is not unique to steel pipelines, and similar operating philosophies are applied to other types of long life steel structures, such as bridges and buildings.

In the case of the leaks described in reference (iii), both were crack features that were initiated from the manufacture and original construction of the pipe, and eventually became through-wall defects that leaked. As part of its Integrity Management Program, Kinder Morgan Canada had just begun to run in-line inspection tools to detect crack features as part of its baseline assessments and it was during these inspections that the two leaks were discovered. After these two features were discovered in June 2013, the company took a voluntary pressure restriction until the entire pipeline could be in-line inspected for similar features. No other similar features were discovered and the last of the pressure restrictions was lifted by the National Energy Board on October 24, 2014.

As part of its Integrity Management Program, Kinder Morgan Canada will to continue to run crack detection in-line inspection tools on the existing Trans Mountain pipeline system on a scheduled basis such that any crack features would be detected and repaired prior to becoming a threat to fail. The three baseline assessments for cracking using the AFD, EMAT, and USCD tools and related processes have resulted in the investigation of all features meeting assessment criteria based on tool reported sizing and engineering analysis to ensure fitness for service. A goal has been established to incorporate the crack ILI data into the semi-quantitative risk program and to develop an algorithm to calculate the probability of failure due to cracking in consideration of ILI reported sizing, ILI measurement uncertainty, fatigue cycling induced crack growth, and other relevant factors. Outputs from the risk program will be used to confirm that the planned crack ILI tool runs which are currently planned to be completed on a maximum

5 year interval are completed on time to effectively manage the risk of failure due to cracks in a similar way to how risk of failure due to corrosion is managed now.

d) In April 2011, Kinder Morgan Canada discovered a small leak on the Trans Mountain system at KP 150.4 (near Chip Lake, Alberta) due to a hairline crack in the long seam weld. Prior to this event and prior to the Board Safety Order, Kinder Morgan Canada had already initiated a seam weld baseline assessment program and had made plans to run the Axial Flaw Detection (AFD) in-line inspection tool on the Trans Mountain system.

After the April 2011 release, certain portions of the Trans Mountain pipeline system were put under a pressure restriction. The pressure restriction was lifted by the NEB on March 16, 2012 with the conditions that Kinder Morgan Canada file a baseline assessment for long seam cracking on all pre-1970's pipe by December 31, 2013 and a baseline assessment for time dependent cracking on all pre-1970's pipe by December 31, 2014 (now extended to the end of 2015).

Kinder Morgan Canada continued to complete the AFD tool runs (as started in 2011) to detect seam weld cracking on the Trans Mountain system and it was this tool that detected the seam weld crack that resulted in the leak in a seam weld in June 2013. As part of the baseline assessment for time dependent cracking, Kinder Morgan Canada made a decision to run two separate in-line inspection tools (Electromagnetic Acoustic Technology – EMAT; and Ultrasonic Crack Detection – USCD) on the Trans Mountain system instead of only the USCD tool as suggested by the NEB. It was the EMAT tool that discovered the second leak in a gouge/dent in June 2013. Since the discovery of the two leaks in 2013, Kinder Morgan Canada has completed the baseline assessment of the Trans Mountain pipeline system using the AFD and EMAT tools, and is in the process of completing the assessment with the USCD tool. It has been Kinder Morgan Canada's experience to date that each tool has unique capabilities and that overlaying the data from all three tools provides enhanced crack detection reliability.

e) The two leaking defects that were discovered in June 2013 were found using in-line inspection (ILI). All of the in service Trans Mountain original main line pipe has now been inspected with these ILI processes. Trans Mountain has committed to continually assessing the entire pipeline system using several ILI processes as outlined in Section 8.1 of Volume 4C of the application. Each assessment process considers the potential growth of time dependent flaws to ensure that the next inspection interval is completed before features that were below detection thresholds would grow to failure using industry established growth rates.

2.15 Automated leak detection

Reference:

i. A3X5Z2, Trans Mountain Response to City of Abbotsford IR No. 1.15 d).

ii. A3Z4Y6, Trans Mountain Response to NEB IR No. 2.134 a), Attachment 1, Anchor Loop Project – Design Basis Memorandum, Valve Locations & Draindown Volumes, section 5.1, Pre-shut-in volumes.

iii. A3Z2A6, Trans Mountain Response to BC Motion to Compel Full and Adequate Answers to BC IR No. 1 - IR No. 1.4 b), PDF p. 4 of 76.

iv. A3Z2A6, Trans Mountain Response to BC Motion to Compel Full and Adequate Answers to BC IR No. 1 – Attachment, IR No. 1.4 b).

v. A3S1L1, Application Volume 4C, Project Design and Execution – Operations and Maintenance, Section 7.1.2, Control Centre Procedures, PDF p. 42 of 402.

vi. A3X6G6, Trans Mountain Response to GoC Parks IR No. 1.1.06, PDF p. 4 of 14.

vii. A3Z7Z7, Trans Mountain Follow-up Response to E. Farquhar IR No. 1.06 e2), PDF p. 2 of 2.

Preamble:

In reference (i), Trans Mountain explains that no specific leak volume threshold can be set for the purposes of triggering an alarm:

> Within the CPM [Computational Pipeline Monitoring] system, the thresholds are dynamic over time and location. For this reason, there is no single defined “threshold level” that would generate alarms that can be stated. It is changing constantly as it is calibrated to the flow dynamics in the pipeline and various factors affecting accuracy of the instrumentation readings. [emphasis added]

In short, Trans Mountains states that, as flow rates and volumes are constantly changing, there is no single identifiable threshold level for spill detection by automated systems.

However, the reference goes on to state that annual testing is performed so as to confirm the effectiveness of the CPM system:

> While not prescribed, Trans Mountain generally follows the Recommended Practice API RP 1130, Computational Pipeline Monitoring for Liquids. This includes testing on an annual basis to confirm the effectiveness of the leak detection CPM. The testing verifies the sensitivity and accuracy of the leak detection system. Weekly checks of the CPM system are also performed and documented to ensure the system is operating within design specifications. [emphasis added]

Further, Trans Mountain stated in the 2007 Design Basis Memorandum for the Anchor Loop Project (reference (ii)) that "KMC's leak detection system will detect a leak of about 100 m^3/hr (1.7 m^3/min)".

In reference (iii), Trans Mountain states as follows with respect to the spill events documented in response to NEB IR No. 1.70 a):

> Of the seven spills described in NEB IR No. 1.70 a) only one, the Tank 121 release was initially identified by SCADA [Supervisory Control And Data Acquisition]. For this incident 566 barrels was spilled into the containment area before the tank roof drain line was closed by the technician.

In reference (iv), Trans Mountain explains that "since 2009, the Trans Mountain pipeline system has averaged approximately 150,000 SCADA alarms per year". Reference (vi) further states: "For the existing Trans Mountain pipeline system, the CCO [Control Centre Operator] responds to an average of 0.4 possible leak alarms per shift". [emphasis added]

In reference (v), Trans Mountain describes its Control Centre Procedures as follows:

> The existing TMPL system is operated using comprehensive Control Centre Procedures which will be enhanced and implemented sufficiently in advance of start-up of the expanded TMPL system to allow for appropriate training to take place. The Control Centre operating procedures include step by step instructions and guidelines for normal operating modes, abnormal conditions, and emergencies.

Control Centre Procedures are further discussed in reference (vi):

> The CPM system will not automatically shutdown a pipeline but will generate an alarm that notifies the CCO [Control Centre Operator] of a possible leak. As described in Section 7.1.11.5, Volume 4C of the Facilities Application, the CCO will use prescribed procedures to determine the cause of the leak alarm. A Simulation Specialist will be on call 24 hours a day, 365 days a year to assist the CCO in the analysis of the leak alarm. [emphasis added]

As is explained by Trans Mountain in reference (vii) the existing system will be extended to the Project, and new technology will be implemented:

> As described in Section 7.1.11.2, Volume 4C of the Facilities Application, the existing CPM system will be extended to the proposed Line 1 and Line 2 and will be in accordance with Canadian Standards Association (CSA) Standard Z662, Oil and Gas Pipeline Systems, Annex E. The latest technological advancements will be used to reduce detection thresholds to the extent practical. [emphasis added]

Request:

a) If there is no single threshold sensitivity level for leak detection, please explain how, as is stated in the second paragraph quoted from reference (i), Trans Mountain conducts "testing [to] verif[y] the sensitivity and accuracy of the leak detection system".

b) If there is indeed no single threshold sensitivity level for leak detection, please provide the various thresholds that apply, or, alternatively, the highest applicable threshold.

c) Please provide the annual test results referred to in reference (i) for the past 5 years.

d) Please explain why, if, as is stated in reference (i), there is no single defined threshold sensitivity level, a threshold is identified in reference (ii).

e) Please describe how, if, as is stated in reference (i), the thresholds for alarm setoff are dynamic over time and location, leaks are identified by the automated leak detection system.

f) For the six spills that were not identified by SCADA out of the seven spills referred to in reference (iii), were any other leak detection alarms triggered? If yes, when?

g) If, as stated by Trans Mountain,

- only one of the spills set out in reference (v) was identified by SCADA, and
- SCADA generates approximately 150,000 alarms per year and Control Centre Operators respond, on average, to 0.4 possible leak alarm per shift (reference (iv)),

what additional leak detection systems will Trans Mountain implement to complement SCADA and ensure all spills are detected?

h) Please provide a copy of the Control Centre Procedures and "prescribed procedures" referred to in references (v) and (vi).

i) Please describe the "technological advancements" referred to in reference (vii) that will be used to reduce detection thresholds.

Response:

a) Trans Mountain conducts performance tests of the computational pipeline monitoring (CPM) system by loading supervisory control and data acquisition (SCADA) system data, from recent steady-state historical pipeline operational periods, into a pipeline simulator. Process variables are manipulated to simulate a leak. The tests are performed annually using various pipeline locations in the simulator.

CPM sensitivity is a measure of the size of a leak that a CPM system is capable of detecting. Sensitivity verification includes comparison of the most recent test results to previous results. If there are material deviations between results, an investigation is initiated to determine the cause of the deviation.

CPM accuracy is a measure of the CPM system's ability to estimate parameters such as leak flow rate, total volume lost, type of fluid lost, and leak location. Accuracy verification assesses the CPM system's ability to calculate theses parameters. The test results are compared to the known test values.

b) During the detailed engineering and design phase, Trans Mountain will follow the accepted industry approach for estimating sensitivity thresholds by performing the calculations described in American Petroleum Institute (API), Publication 1149, Pipeline Variable Uncertainties and Their Effects on Leak Detectability. The API 1149 calculations have not yet been performed, as they rely on pipeline and facility design details which are currently under development. When the expanded pipeline system is in service, the methodology described in Province of BC IR No. 2.15a will be used to test the accuracy and sensitivity of the CPM system.

For proposed Line 2, threshold sensitivities in the range of 2% to 5% are expected from both the API 1149 calculations and the in-service testing. Please refer to the response to Province of BC IR No. 2.15i. The application of current technology at closely spaced intervals as well as the advancement of technology, may reduce the upper end of the sensitivity range. Please refer to the response to Province of BC IR No. 2.15c for the most recent results of the CPM system testing for the existing pipeline, most of which will be reconfigured to form Line 1.

c) Although the information requested may not be within the scope of this proceeding, Trans Mountain offers the following response:

The annual leak testing referred to in Reference (i) has only been in place for two years; therefore, information is only available for 2013 and 2014. The accuracy and sensitivity testing was performed with the pipeline simulator replicating steady-state operation for two hours prior to the start of the tests and for the duration of the tests. All of the simulation data was collected when the pipeline instrumentation was functioning normally and the pipeline was operating at close to its design flow rate. In the 2013 tests the computation pipeline monitoring (CPM) system declared leaks from 3% to 7% of the pipeline flow rate. In the 2014 tests the CPM system declared leaks from 4% to 5% of the pipeline flow rate. A sensitivity range is provided because multiple locations were tested and the range represents the highest and lowest sensitivities established.

The CPM system is an element of the Kinder Morgan Canada (KMC) Integrated Safety and Loss Management System (ISLMS), and follows American Petroleum Institute (API), Recommended Practice 1130, Computational Pipeline Monitoring for Liquids. The ISLMS has a fundamental philosophy of continuous improvement and requires program managers in all areas of operations, including system control, monitoring, and leak detection to set specific goals each year commensurate with the philosophy. Any physical or technological issues that are identified through periodic inspection or testing of the equipment and systems are addressed and the lessons learned are applied to locations across the system.

The CPM system testing is done, in part, to verify the effectiveness of the CPM continuous improvement program. It also provides information to establish focus areas to improve the CPM system for the following year.

d) The sensitivity value of 100 m^3/hr, identified in Reference (ii), was stated as being approximate and was based on a review of historical computational pipeline monitoring

(CPM) system test results obtained for the pipeline configuration prior to the Anchor Loop Project. It was not intended to address the potential range of threshold sensitivities that may exist along the pipeline under varying operating conditions. The 100 m^3/hr value represents approximately 5% of the existing pipeline design flow rate and is within the ranges provided in the response to Province of BC IR No. 2.15c for the recent testing of the existing pipeline system

e) Trans Mountain uses real-time transient modelling (RTTM) in the computational pipeline monitoring (CPM) system. RTTM is complex, but provides one of the most sensitive leak detection methods available. Detailed computer models of the pipeline system are developed using engineering data, including pipeline lengths, diameters, elevation profiles, fluid properties, and instrumentation accuracy / repeatability. The models are used to simulate pipeline conditions using advanced fluid mechanics and hydraulic modelling. The RTTM method automatically adjusts sensitivity based on supervisory control and data acquisition (SCADA) data quality, operational events such as pump starts / stops, valve movements, shut-in conditions, and batch changes along the pipeline, so that the best balance of leak detection performance and minimum false alarms can be achieved. The RTTM calculations are driven by fluid parameters, such as flow, pressure, temperature, and physical characteristics (*i.e.,* density and viscosity), collected from instruments along the pipeline.

RTTM software can estimate the size and location of leaks as follows:

1. A complete theoretical hydraulic state of the pipeline is calculated by the RTTM, assuming no leaks are present.
2. The RTTM checks for variations between calculated values and process measurements, that cannot be explained by instrument error. If variations are identified, the RTTM attempts to remove them by simulating leaks at different locations.
3. When the RTTM has successfully removed the variations, the size and location of the simulated leak is reported.

Based on the process described, if the simulated leak is larger than the dynamic threshold, an alarm is triggered and the Control Centre Operator (CCO) will respond, beginning with the Procedure for SCADA System Leak Alarms in the Kinder Morgan Canada (KMC) Control Centre General Procedures, an excerpt of which is included in the response to Province of BC IR No. 2.15h.

f) Although the information requested is not within the scope of this proceeding, Trans Mountain offers the following response:

Of the six spills referred to, five were from pipeline leaks and one occurred during maintenance work on Tank 82 in Burnaby. No computational pipeline monitoring (CPM) system alarms were triggered by the pipeline leaks, but the Tank 82 spill triggered the hydrocarbon detector in the secondary containment area. Table 2.15f-1 below summarizes the leak events and describes why alarms were not triggered and how the spills were identified.

TABLE 2.15F-1

SUMMARY OF HISTORICAL LEAKS NOT DETECTED BY SCADA/CPM

Leak	Notes
Ward Road	• Below threshold, no leak detection alarms triggered • Leak identified in the field while investigating an odour complaint
Westridge Delivery Line (WDL)	• WDL not included in the CPM model at the time of incident, no leak detection alarms triggered • Leak reported by emergency call to Control Centre
Burnaby Tank 82	• Tank isolated for maintenance at time of incident • Hydrocarbon detector in tank secondary containment area triggered • Release identified immediately by field personnel onsite
kmP 150	• Below threshold, no leak detection alarms triggered • Leak detected in the field while investigating an odour complaint
Kingsvale North	• Below threshold, no leak detection alarms triggered • Leak identified in the field during pipeline anomaly inspection
kmP 966	• Below threshold, no leak detection alarms triggered • Leak identified in the field during pipeline anomaly inspection

g) As stated in the response to Province of BC IR No. 2.16d, Trans Mountain has investigated and continues to review complementary leak detection systems.

Trans Mountain uses a computational pipeline monitoring (CPM) system for leak detection. While current regulations in Canada require only a single leak detection system, regulations in Germany require two systems running in parallel on a single pipeline. In recognition of this higher standard and in an effort to continuously improve leak detection, Trans Mountain will, in 2015, be installing a second complementary CPM system that will operate in parallel with the existing system. The new CPM system will use a different technology to recognize leaks. If the application on the existing Trans Mountain pipeline system proves successful, the new CPM system will also be implemented for the Project, ensuring that Trans Mountain not only meets, but exceeds regulatory requirements and maximizes CPM leak detection capability.

In addition, Trans Mountain is currently participating in two joint industry projects, using large scale testing, to investigate the viability of commercially available external leak detection systems and aerial surveillance systems for detection of oil spills. The testing is being completed using a test apparatus that is the first of its kind and enables testing of commercially available products under real-world conditions in a lab environment. The testing will help Trans Mountain and the pipeline industry determine which technology is optimal for external leak detection on liquids pipelines.

The first project is testing four external leak detection technologies: vapour-sensing tubes, fibre-optic distributed temperature sensing (DTS) systems, hydrocarbon-sensing cables, and distributed acoustic sensing (DAS) systems. The second project is testing aerial surveillance systems that provide the ability to sense oil spills from a helicopter or fixed-wing aircraft flying over a pipeline. Two different technologies, volatile organic compound (VOC) sensing and temperature sensing, are being studied. As described in

Province of BC IR No. 2.15i, Trans Mountain will seek to appropriately apply the above technologies, within the framework of continuous improvement, as the results of these projects (and other future projects, not yet identified) become known.

h) Trans Mountain has over 250 Control Centre procedures to ensure safe, effective, and consistent operation of the existing pipeline system. Control Centre Operators (CCOs) receive training in hydraulics, leak detection, and emergencies. CCOs are trained to immediately assess and respond to any type of emergency or abnormal operating condition.

The current Control Centre procedures will be reviewed and revised and / or new procedures will be developed as may be needed for the Project. An excerpt from one of the existing Kinder Morgan Canada (KMC) Control Centre General Procedures, for supervisory control and data acquisition (SCADA) system leak alarms, is provided in Figure 2.15h-1, below.

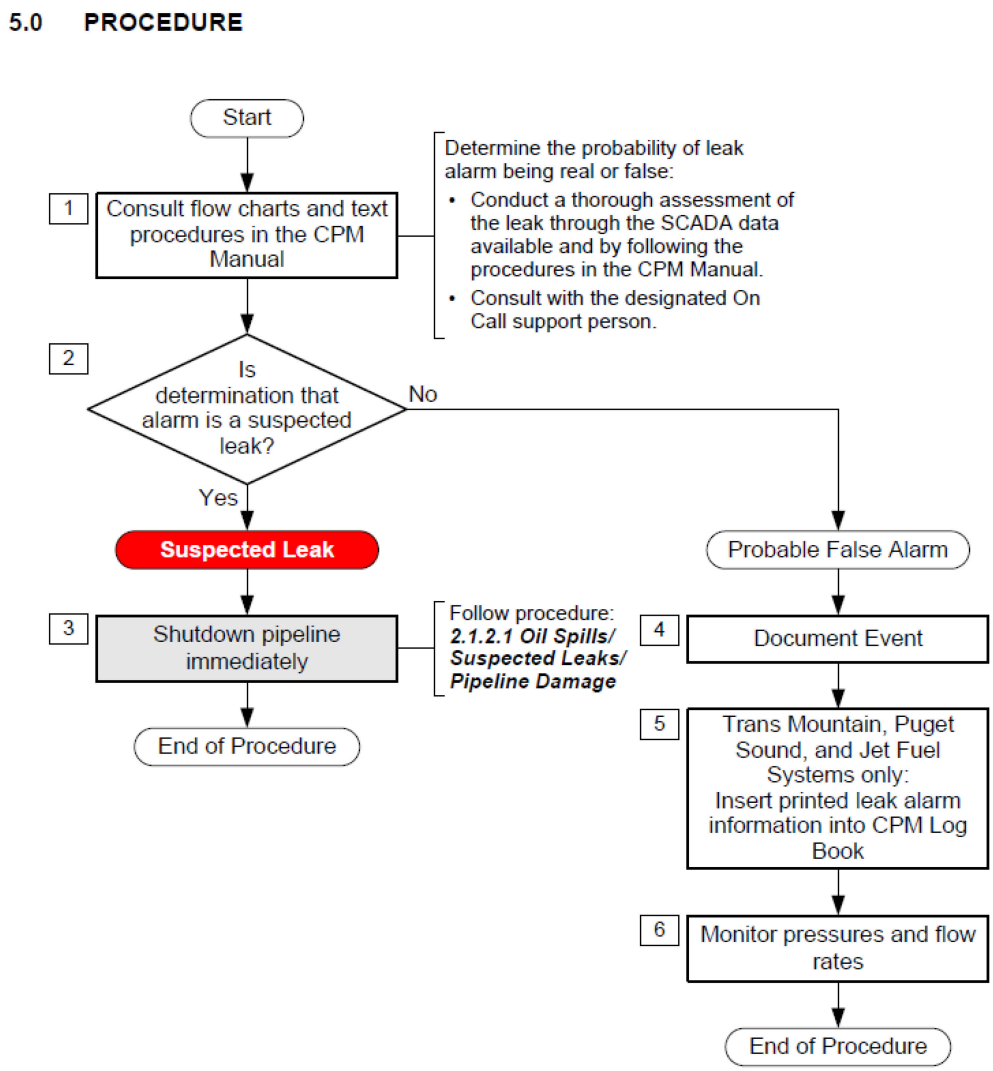


Figure 2.15h-1 Excerpt from Control Centre Gen

i) The Kinder Morgan Canada (KMC) quality assurance program, the Integrated Safety and Loss Management System (ISLMS) follows American Petroleum Institute (API), Recommended Practice 1130, Computational Pipeline Monitoring for Liquids. The ISLMS has a fundamental philosophy of continuous improvement and requires program managers in all areas of operations, including system control, monitoring, and leak detection, to set specific goals each year commensurate with the philosophy. Any physical or technological issues that are identified through periodic inspection or testing of the equipment and systems are addressed and the lessons learned are applied to locations across the system.

The ISLMS, therefore, ensures that technology advancements and improvements to existing technology are constantly evaluated and adopted, where practical and applicable to the Trans Mountain pipeline system. For the new Line 2 pipeline segments Trans Mountain intends to employ:

- Custody transfer quality ultrasonic flow meters at all pump stations and at all injection and delivery locations, to improve leak detection sensitivity.
- Pressure and temperature measurement at all remote mainline block valve (RMLBV) sites, to improve leak detection sensitivity.
- Pipeline fluid and ground temperature measurements below grade, to improve modelling of temperature for both steady state operations and pipeline shut-down / start-up events.
- Online density and viscosity measurement at all injection locations, to improve fluid property modelling.
- Density measurement at all pumps stations, to improve batch alignment modelling.
- The latest version of CPM software, which includes all of the most recent enhancements developed by the CPM vendor.

All of these technology advancements and improvements in the application of existing technology will result in Trans Mountain implementing significantly advanced leak detection for the Project.

2.16 Complementary leak detection methods

Reference:

i. A3Y2S8, Trans Mountain Response to C. Jensen IR No. 1.2.2 a).

ii. A3Z8C3, Trans Mountain Follow-up Response to BC IR No. 1.16 b) – Attachment 1, Pipeline Investigation Report P05H0044.

iii. A3X6F0, Trans Mountain Response to E. Farquhar IR No. 1.07 a) and b).

Preamble:

In reference (i), Trans Mountain provides the following evidence with respect to the detection of pinhole leaks:

> A small leak below the CPM threshold could potentially remain undetected for an extended period, depending on the soil and ground water conditions. The most likely way for a very small leak to be detected is by observation of odours, stained soil on the ground, or a sheen on surface water. Trans Mountain has processes to conduct regular aerial patrols that include observation for potential releases. Trans Mountain has personnel working regularly on the pipeline that are trained to observe and respond to the potential indicators of a release. Trans Mountain has implemented a public awareness program to inform the public residing near the pipeline on how to recognize and safely react to potential indicators of a release. [emphasis added]

In reference (ii), the Transportation Safety Board of Canada (TSB) describes Trans Mountain's (then Terasen's) detection of and response to the 15 July 2005 Ward Road release, and notes as follows at PDF p. 4:

> During the week leading up to the discovery of the location of the rupture, Terasen received five odour complaints from the area immediately south of the Sumas Tank Farm. Each complaint was investigated by a Burnaby operations employee without determining the cause of the odours. [emphasis added]

The TSB goes on to describe the identification of the location of the leak at PDF p. 15- 16:

> Terasen's response and identification of the location of the leak was delayed by a number of factors that were within the company's capacity to manage and remediate. Vegetation along the ROW [right-of-way] was dense. Vegetation clearing had been changed from twice to once a year and was not scheduled until October. Deploying a single Terasen operations employee at midnight did not lend itself to easy and early detection of product loss at the occurrence site because of both overgrown vegetation and darkness.
>
> Terasen employees responding to the odour complaints would have found walking the ROW difficult, with wet, soft footing, and dense, tall vegetation hampering visibility. The employee that discovered the release was not equipped with the PPE [Personal Protective Equipment] and gas detection equipment required by company procedures,

> although they were available. The employees were not well equipped to perform a thorough investigation of the ROW to find the source of the odour.
>
> Unlike PLM [Pipeline Maintenance Division] employees, the Burnaby operations employees had limited knowledge of PPE and of the location of the pipelines in the ROW. Because no Odour Complaint Follow-Up Form was available from previous visits to the same location, responding operations employees were handicapped with respect to specific knowledge of the ROW and the location of the pipeline.
>
> This lack of follow-up did not permit employees on subsequent complaint investigations in the same area to explore other avenues. Because of the extensive history of previous odour complaints related to the Sumas Tank Farm, Burnaby operations employees may have underestimated the issue and were therefore reluctant to call for local PLM technical assistance. This incomplete response to the odour complaints led to delays in identifying the occurrence and to an increased impact of the leak on the surrounding environment. [emphasis added]

At PDF p. 17, the TSB makes the following findings:

> 3. The response to the leak was delayed because of a lack of an effective leak detection system and an effective response to odour complaints.
>
> 4. Because the frequency of vegetation clearing had been reduced, the Terasen Pipelines (Trans Mountain) Inc. employee responding to the complaints was impeded by dense growth on the right-of-way.
>
> 5. The delays in emergency response, as well as the time taken to identify the leak, increased the severity of the accident. [emphasis added]

Finally, Trans Mountain states as follows with respect to the use of complementary leak detection methods (reference (iii)):

Trans Mountain has investigated and continues to review complementary leak detection systems. Trans Mountain is currently participating in a joint industry project, using large scale testing, to investigate the viability of commercially available aerial surveillance systems for detection of oil spills. Trans Mountain has some direct experience using inline inspection tools that have the capability for the acoustical detection of pipeline leaks. [emphasis added]

Request:

a) How would Trans Mountain detect small leaks (which, as stated in reference (i), are most likely to be identified visually) in areas that may be under snow cover for much of the year? How would aerial surveillance be of any assistance in such circumstances?

b) In light of the multiple failures to respond to odour complaints identified by the TSB in reference (ii), please discuss the effectiveness of leak detection through, as is stated in reference (i), “the observation of odours, stained soil on the ground, or a sheen on surface water”.

c) Has Trans Mountain addressed the concerns identified by the TSB in reference (ii)? If yes, please describe how.

d) Please describe the "complementary leak detection systems" currently contemplated by Trans Mountain, as referred to in reference (iii).

e) Will Trans Mountain commit to the use of best available technology for leak detection throughout the life of the Project? For the purpose of this request, "best available technology" should be understood as state of the art technology that is both commercially available and proven to be effective, as demonstrated by its adoption by other industry members.

Response:

a) Small leaks in areas that experience prolonged snow cover would present challenges for visual detection during aerial surveillance. Trans Mountain is investigating the potential to improve leak detection capabilities through participation in joint industry projects to test and evaluate among other things, aerial leak detection technologies as described in Trans Mountain's response to Province of BC IR No. 2.15g. The projects are advanced to the point to understand how the technology may perform for snow covered conditions. Trans Mountain notes while it is committed to pursue the application of these technologies to further enhance leak detection, that over its operating history it has no record that snow cover was the cause for a small leak not being detected. Also, the Trans Mountain main line has been inspected for small leaks using an acoustic leak detection in-line inspection tool with a stated capability to detect leaks as small as 0.1 L/min. No leaks have been identified using this tool.

b) The observation of odours, stained soil on the ground or a sheen on surface waters can be effective methods for the detection of releases but have limitations based on environmental conditions. In the particular Ward Road case referenced in the TSB report the pipeline was routed through a deep deposit of peat with significant vegetation cover which limited the ability to visually observe any oil staining or sheen on surface water. The location was near a crude oil storage facility where odours occasionally result from normal operations so the odour complaints were mistakenly interpreted to be due to operations of the nearby terminal.

In contrast to the Ward Road incident, the KP 150 release in April 2011 that leaked 1.6 m^3 of oil was detected by observation of oil staining on the ground surface and hydrocarbon odours. No wildlife or watercourses were impacted by the KP 150 release and it was fully remediated during the following summer season. Several changes were made in response to the Ward Road incident as outlined in the response to Province of BC IR 2.16c.

c) Trans Mountain formally addressed all the concerns raised by the TSB from their investigation of the Ward Road Release in 2005.

Right of way (ROW) clearing is carefully managed to control vegetation growth. Routine ROW patrols observe and report any vegetation that restricts access to the ROW, restricts visibility, or presents other hazards.

The odour complaint investigation and response procedure is a multi-step procedure that involves the Control Centre, Field Personnel, Environment Health and Safety Personnel, and the local Operations Supervisor and Director. The requirements for field investigation of odour complaints lists requirements for personal protective equipment and air monitoring equipment. This procedure is part of core training for field personnel. The procedure includes steps for following up on each odour complaint and sign off is required by the Regional Operations Director. If at any point in the odour complaint notification and investigation process, the Control Centre Operator (CCO) feels that further operation is unsafe, they have the authority and responsibility to shut down the affected operation.

A computational pipeline monitor based material balance leak detection system has been implemented on the Sumas Crude transfer line where the Ward Road Release took place.

d) Please refer to Trans Mountain's response to Province of BC IR No. 2.15g.

e) Trans Mountain's responses to Province of BC IR No. 2.15c and 2.15g, demonstrate our continued commitment to deploy leading CPM systems that meet and exceed regulatory requirements in this area. KMC's ISLMS (refer to Province of BC IR No. 2.15c) has a philosophy of continuous improvement. Trans Mountain notes that 'proven to be effective, as demonstrated by its adoption by other industry members' is not a best available technology test that can be applied when it comes to the blanket acceptance of leak detection technologies and in particular CPM systems. The reason being that different pipelines vary significantly from length and diameter to topography and the types of liquids transported. Simply stated: what works for one pipeline may not work for another. Trans Mountain cannot commit to deploy technology that could have the unintended consequence of reducing the effectiveness and reliability of its leak detection technologies. Trans Mountain will commit however to evaluate available technologies as they develop with a goal for continually improving leak detection including non-CPM based systems for the Trans Mountain pipeline system and will implement technologies that we determine to be viable and effective for our operations.

Summary of New Commitments:

- Trans Mountain commits to evaluate available technologies as they develop with a goal for continually improving leak detection including non-CPM based systems for the Trans Mountain pipeline system and will implement technologies that we determine to be viable and effective for our operations.

2.17 Aerial patrol

Reference:

A4D3F2, Trans Mountain EMP documents, Attachment 2.3 – Pipeline Emergency Response Plan, Section 2.1.3, Early Detection Methods, PDF p. 21 of 191.

Preamble:

The Pipeline Emergency Response Plan (ERP) describes the purpose of aerial patrol flights as follows:

> Aerial patrol flights are made on a regular basis along the right-of-way. The intent of the patrol is to observe the area directly over the pipeline right-ofway for leaks, exposed pipes, washes, missing markers and other unusual conditions. Construction on the right-of-way, or adjacent to the right-of-way is also closely monitored.

Request:

a) Please specify the annual frequency of aerial patrol flights along the entire pipeline right-of-way.

b) Please provide records for the aerial patrol flights of the existing pipeline for the last three years.

c) Does Trans Mountain have a policy prescribing the frequency of aerial patrol flights for the entire pipeline right of way?

d) Are aerial patrol flights conducted at Trans Mountain's discretion, or is there a regulatory requirement that such overflights be carried out? Please provide a reference for any regulatory requirement(s) that may apply.

e) What technology (e.g. state of the art remote-sensing gear, side-looking airborne radar, ultraviolet infrared line scanners, electro-optical infrared camera systems, trained visual observers) does Trans Mountain rely upon to detect leaks or anomalies along the right-of-way during aerial patrol flights?

f) Does Trans Mountain take and keep video of the right-of-way during aerial patrol flights?

g) Will Trans Mountain commit to a specific frequency and to the use of the technology described in request e) above for aerial patrols of the entire pipeline right-of-way?

h) Please provide the results of NEB audits, pursuant to the *National Energy Board Onshore Pipeline Regulations*, of Trans Mountain's surveillance and monitoring program for the past five years.

Response:

a) Although the information requested is not within the scope of this proceeding and not relevant to the National Energy Board's (NEB's) List of Issues (Filing ID A3V6I2), Trans Mountain offers the following response to your question.

Kinder Morgan Canada (KMC) regularly conducts both aerial and ground patrols on the existing pipeline system to look for signs of activity or events that may compromise the safety of the pipelines, right-of-way, or other facilities and report any findings. As is the case for the existing system, patrol activities along the expanded Trans Mountain system will include regular aerial and surface surveillance patrols to identify encroachments, ground disturbances, security concerns, and natural hazards. Patrol frequency is determined based on factors such as population and activity near the right-of-way. Additional patrols are conducted as required for reasons such as abnormal operating conditions, third party activity or weather advisories. Helicopter operations over urban areas are regulated by Transport Canada and KMC is committed to ensure aerial patrol contractors working on our behalf meet all applicable regulations.

Kinder Morgan's Canadian Integrity Management Program (IMP) document provides the methods to assess and evaluate risks, allocate resources, and improve pipeline safety including aerial patrols. Trans Mountain's aerial patrol scope of work document prescribes the current frequency of patrol for the entire Trans Mountain pipeline right-of-way an excerpt from which is provided in Table 2.17a-1. Presently, over 100 patrol flights are flown each year over various segments of the pipeline right-of-way.

TABLE 2.17A-1

PATROL SECTIONS AND FREQUENCIES

PATROL SECTIONS AND FREQUENCIES			
Pipeline System	**Section**	**Frequency**	**Patrols Per Year**
Trans Mountain	Edmonton to McClure	Once per month winter Twice per month summer	18
Trans Mountain	McClure to Kingsvale	Once per month winter Once per week summer	32
Trans Mountain	Edmonton to Hope	Twice per month year round	24
Trans Mountain	Hope to Burnaby	Once per week year round Additional once per month in winter and twice per month summer	70

b) Please also refer to Province of BC IR No. 2.17a. A summary of the aerial patrol flights of the existing Trans Mountain system for 2013 and 2014 is provided in Table 2.17b-1.

TABLE 2.17B-1

2013-2014 MONTHLY AERIAL SUMMARY REPORTS

Date of Flight	Pipeline	Zone	Zone Description	KMC Follow-up
January 2013 Kinder Morgan Monthly Aerial Report Summary				
02-Jan-13	TMPL	ZONE 1n (NEB) - BB	YTM Mainline N of Hwy 1	Received & Filed
		ZONE 2 - SUR/LAN	Km: 1107 (264 St.) > Fraser River	Received & Filed
		ZONE 3n (NEB) - C	OQTM Mainline between Fraser River & Hwy 1	Received & Filed
		ZONE 4 - FV	Hope > 264th St.	Received & Filed
		ZONE 5 - KINGSVALE	Coq Jump-off to Kingsvale Station	Received & Filed
10-Jan-13	TMPL	ZONE 1n (NEB) - BB	YTM Mainline N of Hwy 1	Received & Filed
		ZONE 2 - SUR/LAN	Km: 1107 (264 St.) > Fraser River	Received & Filed
		ZONE 3n (NEB) - C	OQTM Mainline between Fraser River & Hwy 1	Received & Filed
		ZONE 4 - FV	Hope > 264th St.	Received & Filed
14-Jan-13	TMPL	ZONE 4 - FV	Hope > 264th St.	Received & Filed
		ZONE 5 - KINGSVALE	Coq Jump-off to Kingsvale Station	Received & Filed
15-Jan-13	TMPL	ZONE 5 - McCLURE	Kingsvale Station to McClure	Received & Filed
		ZONE 5 - ALBREDA	McLure to Albreda Station	Received & Filed
16-Jan-13	TMPL	ZONE 7-JASPER	Albreda Station to KM 215.4	Received & Filed
		ZONE 8 - STONY	KM 215.4 TO 40.4 Century Road west side	Received & Filed
		ZONE 9 -EDMONTON	Century Road to Edmonton Refinery	Received & Filed
17-Jan-13	TMPL	ZONE 1n (NEB) - B	BY TM Mainline N of Hwy 1	Received & Filed
		ZONE 2 - SUR/LA	N Km: 1107 (264 St.) > Fraser River	Received & Filed
		ZONE 3n (NEB) - C	OQ TM Mainline between Fraser River & Hwy 1	Received & Filed
		ZONE 4 - FV	Hope > 264th St.	Received & Filed
24-Jan-13	TMPL	ZONE 1n (NEB) - B	BY TM Mainline N of Hwy 1	Received & Filed
		ZONE 2 - SUR/LA	N Km: 1107 (264 St.) > Fraser River	Received & Filed
		ZONE 3n (NEB) - C	OQ TM Mainline between Fraser River & Hwy 1	Received & Filed
		ZONE 4 - FV	Hope > 264th St.	Received & Filed
28-Jan-13	TMPL	ZONE 1n (NEB) - B	BY TM Mainline N of Hwy 1	Received & Filed
		ZONE 2 - SUR/LA	N Km: 1107 (264 St.) > Fraser River	Received & Filed
		ZONE 3n (NEB) - C	OQ TM Mainline between Fraser River & Hwy 1	Received & Filed
		ZONE 4 - FV	Hope > 264th St.	Received & Filed
February 2013 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY				
04-Feb-13	TMPL	ZONE 1n (NEB) - BBY/COQ	TM Mainline N of Hwy 1	Received & Filed
		ZONE 2 - SUR/LAN	Km: 1107 (264 St.) > Fraser River	Received & Filed
		ZONE 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		ZONE 4 - FV	Hope > 264th St.	Received & Filed
		Zone 4 Ð FV	Hope to Coquihalla Jump-off	Received & Filed
		ZONE 5 - KINGSVALE	Coq Jump-off to Kingsvale Station	Received & Filed
05-Feb-13	TMPL	ZONE 5 - McCLURE	Kingsvale Station to McClure	Received & Filed
		ZONE 5 - ALBREDA	McLure to Albreda Station	Received & Filed
		ZONE 7-JASPER	Albreda Station to KM 215.4	Received & Filed
06-Feb-13	TMPL	ZONE 8 - STONY	KM 215.4 TO 40.4 Century Road west side	Received & Filed
		ZONE 9 - EDMONTON	Century Road to Edmonton Refinery	Received & Filed
12-Feb-13	TMPL	ZONE 1n (NEB) - BBY/COQ	TM Mainline N of Hwy 1	Received & Filed
		ZONE 2 - SUR/LAN	Km: 1107 (264 St.) > Fraser River	Received & Filed
		ZONE 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		ZONE 4 - FV	Hope > 264th St.	Received & Filed
18-Feb-13	TMPL	ZONE 1n (NEB) - BBY/COQ	TM Mainline N of Hwy 1	Received & Filed
		ZONE 2 - SUR/LAN	Km: 1107 (264 St.) > Fraser River	Received & Filed
		ZONE 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		ZONE 4 - FV	Hope > 264th St.	Received & Filed
20-Feb-13	TMPL	ZONE 1n (NEB) - BBY/COQ	TM Mainline N of Hwy 1	Received & Filed
		ZONE 2 - SUR/LAN	Km: 1107 (264 St.) > Fraser River	Received & Filed
		ZONE 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		ZONE 4 - FV	Hope > 264th St.	Received & Filed

TABLE 2.17B-1

2013-2014 MONTHLY AERIAL SUMMARY REPORTS (continued)

Date of Flight	Pipeline	Zone	Zone Description	KMC Follow-up
27-Feb-13	TMPL	ZONE 1n (NEB) - BBY/COQ	TM Mainline N of Hwy 1	Received & Filed
		ZONE 2 - SUR/LAN	Km: 1107 (264 St.) > Fraser River	Received & Filed
		ZONE 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		ZONE 4 - FV	Hope > 264th St.	Received & Filed
		ZONE 4 - FV	Hope to Coquihalla Jump-off	Received & Filed
		ZONE 5 - KINGSVALE	Coq Jump-off to Kingsvale Station	Received & Filed
March 2013 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY				
04-Mar-13	TMPL	ZONE 1n (NEB) - BBY/COQ	TM Mainline N of Hwy 1	Received & Filed
		ZONE 2 - SUR/LAN	Km: 1107 (264 St.) > Fraser River	Received & Filed
		ZONE 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		ZONE 4 - FV	Hope > 264th St.	Received & Filed
		Zone 4 Ð FV	Hope to Coquihalla Jump-off	Received & Filed
		ZONE 5 - KINGSVALE	Coq Jump-off to Kingsvale Station	Received & Filed
07-Mar-13	TMPL	ZONE 1n (NEB) - BBY/COQ	TM Mainline N of Hwy 1	Received & Filed
		ZONE 2 - SUR/LAN	Km: 1107 (264 St.) > Fraser River	Received & Filed
		ZONE 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		ZONE 4 - FV	Hope > 264th St.	Received & Filed
13-Mar-13	TMPL	ZONE 1n (NEB) - BBY/COQ	TM Mainline N of Hwy 1	Received & Filed
		ZONE 2 - SUR/LAN	Km: 1107 (264 St.) > Fraser River	Received & Filed
		ZONE 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		ZONE 4 - FV	Hope > 264th St.	Received & Filed
18-Mar-13	TMPL	ZONE 1n (NEB) - BBY/COQ	TM Mainline N of Hwy 1	Received & Filed
		ZONE 2 - SUR/LAN	Km: 1107 (264 St.) > Fraser River	Received & Filed
		ZONE 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		ZONE 4 - FV	Hope > 264th St.	Received & Filed
19-Mar-13	TMPL	ZONE 5 - KINGSVALE	Coq Jump-off to Kingsvale Station	Received & Filed
		ZONE 5 - KINGSVALE	Kingsvale Station to McClure	Received & Filed
		ZONE 5 - McCLURE	Kingsvale Station to McClure	Received & Filed
		ZONE 5 - ALBREDA	McLure to Albreda Station	Received & Filed
		ZONE 7-JASPER	Albreda Station to KM 215.4	Received & Filed
		ZONE 8 - STONY	KM 215.4 TO 40.4 Century Road west side	Received & Filed
		ZONE 9 - EDMONTON	Century Road to Edmonton Refinery	Received & Filed
26-Mar-13	TMPL	ZONE 1n (NEB) - BBY/COQ	TM Mainline N of Hwy 1	Received & Filed
		ZONE 2 - SUR/LAN	Km: 1107 (264 St.) > Fraser River	Received & Filed
		ZONE 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		ZONE 4 - FV	Hope > 264th St.	Received & Filed
		ZONE 4 - FV	Hope to Coquihalla Jump-off	Received & Filed
		ZONE 5 - KINGSVALE	Coq Jump-off to Kingsvale Station	Received & Filed
April 2013 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY				
02-Apr-13	TMPL	ZONE 5 - McCLURE	Kingsvale Station to McClure	Received & Filed
		ZONE 5 - McCLURE	Kingsvale Station to McClure	Received & Filed
		ZONE 5 - ALBREDA	McLure to Albreda Station	Received & Filed
		ZONE 5 - ALBREDA	McLure to Albreda Station	Received & Filed
		ZONE 7-JASPER	Albreda Station to KM 215.4	Received & Filed
		ZONE 8 - STONY	KM 215.4 TO 40.4 Century Road west side	Received & Filed
		ZONE 9 - EDMONTON	Century Road to Edmonton Refinery	Received & Filed
		ZONE 9 - EDMONTON	Century Road to Edmonton Refinery	Received & Filed
		ZONE 9 - EDMONTON	Century Road to Edmonton Refinery	Received & Filed
04-Apr-13	TMPL	ZONE 1n (NEB) - BBY/COQ	TM Mainline N of Hwy 1	Received & Filed
		ZONE 2 - SUR/LAN	Km: 1107 (264 St.) > Fraser River	Received & Filed
		ZONE 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		ZONE 4 - FV	Hope > 264th St.	Received & Filed
08-Apr-13	TMPL	ZONE 1n (NEB) - BBY/COQ	TM Mainline N of Hwy 1	Received & Filed
		ZONE 2 - SUR/LAN	Km: 1107 (264 St.) > Fraser River	Received & Filed
		ZONE 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
09-Apr-13	TMPL	ZONE 5 - McCLURE	Kingsvale Station to McClure	Received & Filed
11-Apr-13	TMPL	ZONE 1n (NEB) - BBY/COQ	TM Mainline N of Hwy 1	Received & Filed
		ZONE 2 - SUR/LAN	Km: 1107 (264 St.) > Fraser River	Received & Filed
		ZONE 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		ZONE 4 - FV	Hope > 264th St.	Received & Filed

TABLE 2.17B-1

2013-2014 MONTHLY AERIAL SUMMARY REPORTS (continued)

Date of Flight	Pipeline	Zone	Zone Description	KMC Follow-up
15-Apr-13	TMPL	ZONE 5 - KINGSVALE	Kingsvale Station to McClure	Received & Filed
		ZONE 5 - ALBREDA	McLure to Albreda Station	Received & Filed
		ZONE 5 - ALBREDA	McLure to Albreda Station	Received & Filed
		ZONE 7-JASPER	Albreda Station to KM 215.4	Received & Filed
April 2013 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY (continued)				
16-Apr-13	TMPL	ZONE 8 - STONY	KM 215.4 TO 40.4 Century Road west side	Received & Filed
		ZONE 7-JASPER	Talisman Condensate Line	Received & Filed
		ZONE 9 - EDMONTON	Refinery Construction Update Photography	Received & Filed
		ZONE 9 - EDMONTON	Century Road to Edmonton Refinery	Received & Filed
17-Apr-13	TMPL	ZONE 1n (NEB) - BBY/COQ	TM Mainline N of Hwy 1	Received & Filed
		ZONE 2 - SUR/LAN	Km: 1107 (264 St.) > Fraser River	Received & Filed
		ZONE 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		ZONE 4 - FV	Hope > 264th St.	Received & Filed
		ZONE 4 - FV	Hope to Coquihalla Jump-off	Received & Filed
		ZONE 5 - KINGSVALE	Coq Jump-off to Kingsvale Station	Received & Filed
22-Apr-13	TMPL	ZONE 1n (NEB) - BBY/COQ	TM Mainline N of Hwy 1	Received & Filed
		ZONE 2 - SUR/LAN	Km: 1107 (264 St.) > Fraser River	Received & Filed
		ZONE 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		ZONE 4 - FV	Hope > 264th St.	Received & Filed
23-Apr-13	TMPL	ZONE 5 - McCLURE	Kingsvale Station to McClure	Received & Filed
30-Apr-13	TMPL	ZONE 1n (NEB) - BBY/COQ	13-04-30-05-1n	Received & Filed
		ZONE 2 - SUR/LAN	Km: 1107 (264 St.) > Fraser River	Received & Filed
		ZONE 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		ZONE 4 - FV	Hope > 264th St.	Received & Filed
May 2013 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY				
02-May-13	TMPL	ZONE 5 - McCLURE	Kingsvale Station to McClure	Received & Filed
		ZONE 1n (NEB) - BBY/COQ	TM Mainline N of Hwy 1	Received & Filed
		ZONE 2 - SUR/LAN	Km: 1107 (264 St.) > Fraser River	Received & Filed
		ZONE 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		ZONE 4 - FV	Hope > 264th St.	Received & Filed
06-May-13	TMPL	ZONE 1n (NEB) - BBY/COQ	TM Mainline N of Hwy 1	Received & Filed
		ZONE 2 - SUR/LAN	Km: 1107 (264 St.) > Fraser River	Received & Filed
		ZONE 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		ZONE 4 - FV	Hope > 264th St.	Received & Filed
		ZONE 4 - FV	Hope to Coquihalla Jump-off	Received & Filed
		ZONE 5 - KINGSVALE	Coq Jump-off to Kingsvale Station	Received & Filed
08-May-13	TMPL	ZONE 5 - KINGSVALE	Kingsvale Station to McClure	Received & Filed
		ZONE 5 - ALBREDA	McLure to Albreda Station	Received & Filed
		ZONE 8 - STONY	KM 215.4 TO 40.4 Century Road west side	Received & Filed
		ZONE 7-JASPER	Albreda Station to KM 215.4	Received & Filed
		ZONE 7-JASPER	Talisman Condensate Line	Received & Filed
		ZONE 9 - EDMONTON	Refinery Construction Update Photography	Received & Filed
		ZONE 9 - EDMONTON	Century Road to Edmonton Refinery	Received & Filed
09-May-13	TMPL	ZONE 1n (NEB) - BBY/COQ	TM Mainline N of Hwy 1	Received & Filed
		ZONE 2 - SUR/LAN	Km: 1107 (264 St.) > Fraser River	Received & Filed
		ZONE 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		ZONE 4 - FV	Hope > 264th St.	Received & Filed
13-May-13	TMPL	ZONE 5 - KINGSVALE	Coq Jump-off to Kingsvale Station	Received & Filed
15-May-13	TMPL	ZONE 1n (NEB) - BBY/COQ	TM Mainline N of Hwy 1	Received & Filed
		ZONE 2 - SUR/LAN	Km: 1107 (264 St.) > Fraser River	Received & Filed
		ZONE 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		ZONE 4 - FV	Hope > 264th St.	Received & Filed
		ZONE 5 - McCLURE	Kingsvale Station to McClure	Received & Filed
22-May-13	TMPL	ZONE 1n (NEB) - BBY/COQ	TM Mainline N of Hwy 1	Received & Filed
		ZONE 2 - SUR/LAN	Km: 1107 (264 St.) > Fraser River	Received & Filed
		ZONE 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		ZONE 4 - FV	Hope > 264th St.	Received & Filed

TABLE 2.17B-1

2013-2014 MONTHLY AERIAL SUMMARY REPORTS (continued)

Date of Flight	Pipeline	Zone	Zone Description	KMC Follow-up
May 2013 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY (continued)				
23-May-13	TMPL	ZONE 5 - McCLURE	Kingsvale Station to McClure	Received & Filed
		ZONE 4 - FV	Hope to Coquihalla Jump-off	Received & Filed
		ZONE 5 - KINGSVALE	Coq Jump-off to Kingsvale Station	Received & Filed
		ZONE 5 - ALBREDA	McLure to Albreda Station	Received & Filed
		ZONE 7-JASPER	Albreda Station to KM 215.4	Received & Filed
		ZONE 8 - STONY	KM 215.4 TO 40.4 Century Road west side	Received & Filed
		ZONE 7-JASPER	Talisman Condensate Line	Received & Filed
		ZONE 9 - EDMONTON	Century Road to Edmonton Refinery	Received & Filed
		ZONE 9 - EDMONTON	Refinery Construction Update Photography	Received & Filed
27-May-13	TMPL	ZONE 1n (NEB) - BBY/COQ	TM Mainline N of Hwy 1	Received & Filed
		ZONE 2 - SUR/LAN	Km: 1107 (264 St.) > Fraser River	Received & Filed
		ZONE 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		ZONE 4 - FV	Hope > 264th St.	Received & Filed
28-May-13	TMPL	ZONE 5 - McCLURE	Kingsvale Station to McClure	Received & Filed
30-May-13	TMPL	ZONE 1n (NEB) - BBY/COQ	TM Mainline N of Hwy 1	Received & Filed
		ZONE 2 - SUR/LAN	Km: 1107 (264 St.) > Fraser River	Received & Filed
		ZONE 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		ZONE 4 - FV	Hope > 264th St.	Received & Filed
June 2013 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY				
03-Jun-13	TMPL	ZONE 4 - FV	Hope to Coquihalla Jump-off	Received & Filed
		ZONE 5 - KINGSVALE	Coq Jump-off to Kingsvale Station	Received & Filed
		ZONE 5 - KINGSVALE	Kingsvale Station to McClure	Received & Filed
		ZONE 5 - ALBREDA	McLure to Albreda Station	Received & Filed
		ZONE 7 - JASPER	Albreda Station to KM 215.4	Received & Filed
		ZONE 7 - JASPER	Talisman Condensate Line	Received & Filed
		ZONE 8 - STONY	KM 215.4 TO 40.4 Century Road west side	Received & Filed
		ZONE 9 - EDMONTON	Refinery Construction Update Photography	Received & Filed
		ZONE 9 - EDMONTON	Century Road to Edmonton Refinery	Received & Filed
06-Jun-13	TMPL	ZONE 1 NEB -BBY	TM Mainline N of Hwy 1	Received & Filed
		Zone 2 Ð SUR LAN	KM 1107 (264 St.) > Fraser River	Received & Filed
		Zone 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		Zone 4 - FV	Hope > 264th St.	Received & Filed
10-Jun-13	TMPL	ZONE 1 NEB -BBY	TM Mainline N of Hwy 1	Received & Filed
		Zone 2 Ð SUR LAN	KM 1107 (264 St.) > Fraser River	Received & Filed
		Zone 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		Zone 4 - FV	Hope > 264th St.	Received & Filed
12-Jun-13	TMPL	ZONE 1 NEB -BBY	TM Mainline N of Hwy 1	Received & Filed
		Zone 2 Ð SUR LAN	KM 1107 (264 St.) > Fraser River	Received & Filed
		Zone 2 Ð SUR LAN	KM 1107 (264 St.) > Fraser River	Received & Filed
		Zone 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		Zone 4 - FV	Hope > 264th St.	Received & Filed
13-Jun-13	TMPL	ZONE 5 - KINGSVALE	Kingsvale Station to McClure	Received & Filed
17-Jun-13	TMPL	ZONE 1 NEB -BBY	TM Mainline N of Hwy 1	Received & Filed
		Zone 2 Ð SUR LAN	KM 1107 (264 St.) > Fraser River	Received & Filed
		Zone 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		Zone 4 - FV	Hope > 264th St.	Received & Filed
18-Jun-13	TMPL	ZONE 5 - KINGSVALE	Kingsvale Station to McClure	Received & Filed
		ZONE 5 - ALBREDA	McLure to Albreda Station	Received & Filed
		ZONE 7 - JASPER	Albreda Station to KM 215.4	Received & Filed
		ZONE 7 - JASPER	Talisman Condensate Line	Received & Filed
19-Jun-13	TMPL	ZONE 8 - STONY	KM 215.4 TO 40.4 Century Road west side	Received & Filed
		ZONE 9 - EDMONTON	Refinery Construction Update Photography	Received & Filed
		ZONE 9 - EDMONTON	Century Road to Edmonton Refinery	Received & Filed
24-Jun-13	TMPL	ZONE 4 - FV	Hope to Coquihalla Jump-off	Received & Filed
		ZONE 5 - KINGSVALE	Coq Jump-off to Kingsvale Station	Received & Filed

TABLE 2.17B-1

2013-2014 MONTHLY AERIAL SUMMARY REPORTS (continued)

Date of Flight	Pipeline	Zone	Zone Description	KMC Follow-up
June 2013 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY (continued)				
25-Jun-13	TMPL	ZONE 1 NEB -BBY	TM Mainline N of Hwy 1	Received & Filed
		Zone 2 Đ SUR LAN	KM 1107 (264 St.) > Fraser River	Received & Filed
		Zone 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		Zone 4 - FV	Hope > 264th St.	Received & Filed
		ZONE 5 - KINGSVALE	Kingsvale Station to McClure	Received & Filed
27-Jun-13	TMPL	ZONE 1 NEB -BBY	TM Mainline N of Hwy 1	Received & Filed
		Zone 2 Đ SUR LAN	KM 1107 (264 St.) > Fraser River	Received & Filed
		Zone 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		Zone 4 - FV	Hope > 264th St.	Received & Filed
		ZONE 4 - FV	Hope to Coquihalla Jump-off	Received & Filed
July 2013 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY				
02-Jul-13	TMPL	ZONE 1 NEB -BBY	TM Mainline N of Hwy 1	Received & Filed
		Zone 2 Đ SUR LAN	KM 1107 (264 St.) > Fraser River	Received & Filed
		Zone 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		Zone 4 - FV	Hope > 264th St.	Received & Filed
		ZONE 4 - FV	Hope to Coquihalla Jump-off	Received & Filed
		ZONE 5 - KINGSVALE	Coq Jump-off to Kingsvale Station	Received & Filed
03-Jul-13	TMPL	ZONE 5 - KINGSVALE	Kingsvale Station to McClure	Received & Filed
04-Jul-13	TMPL	ZONE 1 NEB -BBY	TM Mainline N of Hwy 1	Received & Filed
		Zone 2 Đ SUR LAN	KM 1107 (264 St.) > Fraser River	Received & Filed
		Zone 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		Zone 4 - FV	Hope > 264th St.	Received & Filed
08-Jul-13	TMPL	ZONE 1 NEB -BBY	TM Mainline N of Hwy 1	Received & Filed
		Zone 2 Đ SUR LAN	KM 1107 (264 St.) > Fraser River	Received & Filed
		Zone 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		Zone 4 - FV	Hope > 264th St.	Received & Filed
09-Jul-13	TMPL	ZONE 5 - KINGSVALE	Kingsvale Station to McClure	Received & Filed
		ZONE 5 - ALBREDA	McLure to Albreda Station	Received & Filed
		ZONE 7 - JASPER	Albreda Station to KM 215.4	Received & Filed
		ZONE 7 - JASPER	Talisman Condensate Line	Received & Filed
		ZONE 8 - STONY	KM 215.4 TO 40.4 Century Road west side	Received & Filed
		ZONE 9 - EDMONTON	Refinery Construction Update Photography	Received & Filed
		ZONE 9 - EDMONTON	Century Road to Edmonton Refinery	Received & Filed
15-Jul-13	TMPL	ZONE 1 NEB -BBY	TM Mainline N of Hwy 1	Received & Filed
		Zone 2 Đ SUR LAN	KM 1107 (264 St.) > Fraser River	Received & Filed
		Zone 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		Zone 4 - FV	Hope > 264th St.	Received & Filed
		ZONE 4 - FV	Hope to Coquihalla Jump-off	Received & Filed
		ZONE 5 - KINGSVALE	Coq Jump-off to Kingsvale Station	Received & Filed
		ZONE 5 - KINGSVALE	Kingsvale Station to McClure	Received & Filed
17-Jul-13	TMPL	ZONE 1 NEB -BBY	TM Mainline N of Hwy 1	Received & Filed
		Zone 2 Đ SUR LAN	KM 1107 (264 St.) > Fraser River	Received & Filed
		Zone 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		Zone 4 - FV	Hope > 264th St.	Received & Filed
23-Jul-13	TMPL	ZONE 1 NEB -BBY	TM Mainline N of Hwy 1	Received & Filed
		Zone 2 Đ SUR LAN	KM 1107 (264 St.) > Fraser River	Received & Filed
		Zone 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		Zone 4 - FV	Hope > 264th St.	Received & Filed
24-Jul-13	TMPL	ZONE 5 - KINGSVALE	Kingsvale Station to McClure	
		ZONE 5 - ALBREDA	McLure to Albreda Station	Received & Filed
		ZONE 7 - JASPER	Albreda Station to KM 215.4	Received & Filed
		ZONE 7 - JASPER	Talisman Condensate Line	Received & Filed
		ZONE 8 - STONY	KM 215.4 TO 40.4 Century Road west side	Received & Filed
25-Jul-13	TMPL	ZONE 9 - EDMONTON	Refinery Construction Update Photography	Received & Filed
		ZONE 9 - EDMONTON	Century Road to Edmonton Refinery	Received & Filed
29-Jul-13	TMPL	ZONE 5 - KINGSVALE	Kingsvale Station to McClure	Received & Filed

TABLE 2.17B-1

2013-2014 MONTHLY AERIAL SUMMARY REPORTS (continued)

Date of Flight	Pipeline	Zone	Zone Description	KMC Follow-up
July 2013 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY (continued)				
31-Jul-13	TMPL	ZONE 1 NEB -BBY	TM Mainline N of Hwy 1	Received & Filed
		Zone 2 Ð SUR LAN	KM 1107 (264 St.) > Fraser River	Received & Filed
		Zone 3n (NEB) - COQ	TM Mainline between Fraser River & Hwy 1	Received & Filed
		Zone 4 - FV	Hope > 264th St.	Received & Filed
August 2013 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY				
06-Aug-13	TMPL	1 NEB Ð BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
		4 Fraser Valley	TM Hope to Coq Jump Off	Received & Filed
		5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
07-Aug-13	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
08-Aug-13	TMPL	1 NEB Ð BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
12-Aug-13	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
		5 Kamloops N	McLure to Albreda	Received & Filed
		7 Jasper	Albreda to KM 215	Received & Filed
		7 Talisman	Talisman 3 " Condensate	Received & Filed
		8 Stony	KM 215 to KM 40	Received & Filed
		9 Edmonton	KM 40 to Edmonton Refinery	Received & Filed
		9 Ed Terminal	KM 0	Received & Filed
14-Aug-13	TMPL	1 NEB Ð BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
20-Aug-13	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
21-Aug-13	TMPL	1 NEB Ð BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
		4 Fraser Valley	TM Hope to Coq Jump Off	Received & Filed
		5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
26-Aug-13	TMPL	1 NEB Ð BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
27-Aug-13	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
		5 Kamloops N	McLure to Albreda	Received & Filed
		7 Jasper	Albreda to KM 215	Received & Filed
		7 Talisman	Talisman 3 " Condensate	Received & Filed
		8 Stony	KM 215 to KM 40	Received & Filed
		9 Edmonton	KM 40 to Edmonton Refinery	Received & Filed
		9 Ed Terminal	KM 0	Received & Filed
29-Aug-13	TMPL	1 NEB Ð BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
September 2013 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY				
03-Sep-13	TMPL	1 NEB Ð BBY TM Mainline N of Hwy 1 13-09-03-02-1n		Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
		4 Fraser Valley	TM Hope to Coq Jump Off	Received & Filed
		5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
		5 Kamloops M	Kingsvale to McLure	Received & Filed

TABLE 2.17B-1

2013-2014 MONTHLY AERIAL SUMMARY REPORTS (continued)

Date of Flight	Pipeline	Zone	Zone Description	KMC Follow-up
September 2013 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY (continued)				
05-Sep-13	TMPL	1 NEB Ð BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
		5 Kamloops M	Kingsvale to McLure	Received & Filed
09-Sep-13	TMPL	5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
		5 Kamloops M	Kingsvale to McLure	Received & Filed
		5 Kamloops N	McLure to Albreeda	Received & Filed
		7 Jasper	Albreda to KM 215	Received & Filed
		7 Talisman	Talisman 3 Ò Condensate	Received & Filed
		8 Stony KM 215 to KM 40	13-09-09-05-8	Received & Filed
		9 Edmonton	KM 40 to Edmonton Refinery	Received & Filed
		9 Ed Terminal	KM 0	Received & Filed
11-Sep-13	TMPL	1 NEB Ð BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
16-Sep-13	TMPL	1 NEB Ð BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
18-Sep-13	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
24-Sep-13	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
		5 Kamloops N	McLure to Albreda	Received & Filed
		7 Jasper	Albreda to KM 215	Received & Filed
		7 Talisman	Talisman 3 Ò Condensate	Received & Filed
		8 Stony	KM 215 to KM 40	Received & Filed
24-Sep-13	TMPL	9 Edmonton	KM 40 to Edmonton Refinery	Received & Filed
		9 Ed Terminal	KM 0	Received & Filed
26-Sep-13	TMPL	1 NEB Ð BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
		4 Fraser Valley	TM Hope to Coq Jump Off	Received & Filed
		5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
30-Sep-13	TMPL	1 NEB Ð BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
October 2013 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY				
02-Oct-13	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
07-Oct-13	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
08-Oct-13	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
		5 Kamloops N	McLure to Albreeda	Received & Filed
		7 Jasper	Albreda to KM 215	Received & Filed
		7 Talisman	Talisman 3 " Condensate	Received & Filed
		8 Stony	KM 215 to KM 40	Received & Filed
		9 Edmonton	KM 40 to Edmonton Refinery	Received & Filed
		9 Ed Terminal	KM 0	Received & Filed
15-Oct-13	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
		4 Fraser Valley	TM Hope to Coq Jump Off	Received & Filed
		5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed

TABLE 2.17B-1

2013-2014 MONTHLY AERIAL SUMMARY REPORTS (continued)

Date of Flight	Pipeline	Zone	Zone Description	KMC Follow-up
October 2013 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY (continued)				
23-Oct-13	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
30-Oct-13	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
		4 Fraser Valley	TM Hope to Coq Jump Off	Received & Filed
		5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
November 2013 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY				
04-Nov-13	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
		5 Kamloops N	McLure to Albreeda	Received & Filed
		7 Jasper	Albreda to KM 215	Received & Filed
		7 Talisman	Talisman 3 " Condensate	Received & Filed
		8 Stony	KM 215 to KM 40	Received & Filed
		9 Ed Terminal	KM 0	Received & Filed
		9 Edmonton	KM 40 to Edmonton Refinery	Received & Filed
07-Nov-13	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
13-Nov-13	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
		4 Fraser Valley	TM Hope to Coq Jump Off	Received & Filed
		5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
18-Nov-13	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
20-Nov-13	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
26-Nov-13	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
		4 Fraser Valley	TM Hope to Coq Jump Off	Received & Filed
		5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
28-Nov-13	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
December 2013 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY				
04-Dec-13	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
09-Dec-13	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed

TABLE 2.17B-1

2013-2014 MONTHLY AERIAL SUMMARY REPORTS (continued)

Date of Flight	Pipeline	Zone	Zone Description	KMC Follow-up
December 2013 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY (continued)				
16-Dec-13	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
		4 Fraser Valley	TM Hope to Coq Jump Off	Received & Filed
		5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
17-Dec-13	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
18-Dec-13	TMPL	5 Kamloops N	McLure to Albreda	Received & Filed
		7 Jasper	Albreda to KM 215	Received & Filed
		7 Talisman	Talisman 3 " Condensate	Received & Filed
		8 Stony	KM 215 to KM 40	Received & Filed
		9 Edmonton	KM 40 to Edmonton Refinery	Received & Filed
		9 Ed Terminal	KM 0	Received & Filed
19-Dec-13	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
23-Dec-13	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
30-Dec-13	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
		4 Fraser Valley	TM Hope to Coq Jump Off	Received & Filed
		5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
January 2014 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY				
06-Jan-14	TMPL	7 Jasper	Albreda to KM 215	Received & Filed
		7 Talisman	Talisman 3 " Condensate	Received & Filed
		8 Stony	KM 215 to KM 40	Received & Filed
		9 Edmonton	KM 40 to Edmonton Refinery	Received & Filed
		9 Ed Terminal	KM 0	Received & Filed
09-Jan-14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
14-Jan-14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
		4 Fraser Valley	TM Hope to Coq Jump Off	Received & Filed
		5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
22-Jan-14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
28-Jan-14	TMPL	4 Fraser Valley	TM E of 264 to Hope	Received & Filed
		4 Fraser Valley	TM Hope to Coq Jump Off	Received & Filed
		5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
31-Jan-14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
February 2014 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY				
03-Feb-14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed

TABLE 2.17B-1

2013-2014 MONTHLY AERIAL SUMMARY REPORTS (continued)

Date of Flight	Pipeline	Zone	Zone Description	KMC Follow-up
February 2014 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY (continued)				
06-Feb-14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
		5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
		5 Kamloops M	TM Hope to Coq Jump Off	Received & Filed
11-Feb-14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
		4 Fraser Valley	TM Hope to Coq Jump Off	Received & Filed
		5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
17-Feb-14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
18-Feb-14	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
		5 Kamloops N	McLure to Albreda	Received & Filed
		7 Jasper	Albreda to KM 215	Received & Filed
		7 Talisman	Talisman 3 " Condensate	Received & Filed
		8 Stony	KM 215 to KM 40	Received & Filed
		9 Edmonton	KM 40 to Edmonton Refinery	Received & Filed
20-Feb-14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
25-Feb-14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
March 2014 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY				
7/Mar/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
10/Mar/14	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
		5 Kamloops N	McLure to Albreda	Received & Filed
		7 Jasper	Albreda to KM 215	Received & Filed
		7 Talisman	Talisman 3 " Condensate	Received & Filed
		8 Stony	KM 215 to KM 40	Received & Filed
		9 Edmonton	KM 40 to Edmonton Refinery	Received & Filed
		9 Edmonton Terminal	0	Received & Filed
13/Mar/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
		4 Fraser Valley	Hope to Coq Jump Off	Received & Filed
		5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
19/Mar/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
24/Mar/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
		5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
		5 Kamloops M	TM Hope to Coq Jump Off	Received & Filed

TABLE 2.17B-1

2013-2014 MONTHLY AERIAL SUMMARY REPORTS (continued)

Date of Flight	Pipeline	Zone	Zone Description	KMC Follow-up
March 2014 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY (continued)				
27/Mar/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
April 2014 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY				
1/Apr/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
3/Apr/14	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
7/Apr/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
8/Apr/14	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
		5 Kamloops N	McLure to Albreda	Received & Filed
		7 Jasper	Albreda to KM 215	Received & Filed
		7 Talisman	Talisman 3 " Condensate	Received & Filed
		8 Stony	KM 215 to KM 40	Received & Filed
		9 Edmonton	KM 40 to Edmonton Refinery	Received & Filed
10/Apr/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
14/Apr/14	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
		5 Kamloops N	McLure to Albreda	Received & Filed
		7 Jasper	Albreda to KM 215	Received & Filed
		7 Talisman	Talisman 3 " Condensate	Received & Filed
		8 Stony	KM 215 to KM 40	Received & Filed
		9 Edmonton	KM 40 to Edmonton Refinery	Received & Filed
16/Apr/14	TMPL	5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
		5 Kamloops M	TM Hope to Coq Jump Off	Received & Filed
21/Apr/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
23/Apr/14	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
25/Apr/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
28/Apr/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
		5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
		5 Kamloops M	TM Hope to Coq Jump Off	Received & Filed
29/Apr/14	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
30/Apr/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
May 2014 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY				
5/May/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed

TABLE 2.17B-1

2013-2014 MONTHLY AERIAL SUMMARY REPORTS (continued)

Date of Flight	Pipeline	Zone	Zone Description	KMC Follow-up
May 2014 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY (continued)				
6/May/14	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
		5 Kamloops N	McLure to Albreda	Received & Filed
		7 Jasper	Albreda to KM 215	Received & Filed
		7 Talisman	Talisman 3 " Condensate	Received & Filed
		8 Stony	KM 215 to KM 40	Received & Filed
		9 Edmonton	KM 40 to Edmonton Refinery	Received & Filed
8/May/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
		4 Kamloops M	TM Hope to Coq Jump Off	Received & Filed
		5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
12/May/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
13/May/14	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
14/May/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
20/May/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
		4 Kamloops M	TM Hope to Coq Jump Off	Received & Filed
		5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
21/May/14	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
		5 Kamloops N	McLure to Albreda	Received & Filed
		7 Jasper	Albreda to KM 215	Received & Filed
		7 Talisman	Talisman 3 " Condensate	Received & Filed
21/May/14	TMPL	8 Stony	KM 215 to KM 40	Received & Filed
		9 Edmonton	KM 40 to Edmonton Refinery	Received & Filed
26/May/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
27/May/14	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
29/May/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
June 2014 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY				
2/Jun/14	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
		5 Kamloops N	McLure to Albreda	Received & Filed
		7 Jasper	Albreda to KM 215	Received & Filed
		7 Talisman	Talisman 3 " Condensate	Received & Filed
		8 Stony	KM 215 to KM 40	Received & Filed
		9 Edmonton	KM 40 to Edmonton Refinery	Received & Filed
4/Jun/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
9/Jun/14	TMPL	5 Kamloops M	MERRITT to McLure	Received & Filed
		5 Kamloops N	McLure to Albreda	Received & Filed
		7 Jasper	Albreda to JASPER TOWNSITE	Received & Filed

TABLE 2.17B-1

2013-2014 MONTHLY AERIAL SUMMARY REPORTS (continued)

Date of Flight	Pipeline	Zone	Zone Description	KMC Follow-up
June 2014 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY (continued)				
10/Jun/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
		4 Kamloops M	TM Hope to Coq Jump Off	Received & Filed
		5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
11/Jun/14	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
12/Jun/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
16/Jun/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
17/Jun/14	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
		5 Kamloops N	McLure to Albreda	Received & Filed
		7 Jasper	Albreda to KM 215	Received & Filed
		7 Talisman	Talisman 3 " Condensate	Received & Filed
		8 Stony	KM 215 to KM 40	Received & Filed
		9 Edmonton	KM 40 to Edmonton Refinery	Received & Filed
23/Jun/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
24/Jun/14	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
		5 Kamloops N	McLure to Albreda	Received & Filed
		7 Jasper	Albreda to KM 215	Received & Filed
		7 Talisman	Talisman 3 " Condensate	Received & Filed
		8 Stony	KM 215 to KM 40	Received & Filed
		9 Edmonton	KM 40 to Edmonton Refinery	Received & Filed
26/Jun/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
		4 Kamloops M	TM Hope to Coq Jump Off	Received & Filed
		5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
30/Jun/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
July 2014 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY				
2/Jul/14	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
		5 Kamloops N	McLure to Albreda	Received & Filed
		7 Jasper	Albreda to KM 215	Received & Filed
		7 Talisman	Talisman 3 " Condensate	Received & Filed
		8 Stony	KM 215 to KM 40	Received & Filed
		9 Edmonton	KM 40 to Edmonton Refinery	Received & Filed
7/Jul/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
		4 Kamloops M	TM Hope to Coq Jump Off	Received & Filed
		5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
8/Jul/14	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
10/Jul/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed

TABLE 2.17B-1

2013-2014 MONTHLY AERIAL SUMMARY REPORTS (continued)

Date of Flight	Pipeline	Zone	Zone Description	KMC Follow-up
July 2014 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY (continued)				
14/Jul/14	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
		5 Kamloops N	McLure to Albreda	Received & Filed
		7 Jasper	Albreda to KM 215	Received & Filed
		7 Talisman	Talisman 3 " Condensate	Received & Filed
		8 Stony	KM 215 to KM 40	Received & Filed
		9 Edmonton	KM 40 to Edmonton Refinery	Received & Filed
16/Jul/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
18/Jul/14	TMPL	4 Kamloops M	TM Hope to Coq Jump Off	Received & Filed
22/Jul/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
		4 Kamloops M	TM Hope to Coq Jump Off	Received & Filed
		5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
28/Jul/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
29/Jul/14	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
31/Jul/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
August 2014 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY				
5/Aug/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
		4 Kamloops M	TM Hope to Coq Jump Off	Received & Filed
		5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
6/Aug/14	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
		5 Kamloops N	McLure to Albreda	Received & Filed
		7 Jasper	Albreda to KM 215	Received & Filed
		7 Talisman	Talisman 3 " Condensate	Received & Filed
		8 Stony	KM 215 to KM 40	Received & Filed
		9 Edmonton	KM 40 to Edmonton Refinery	Received & Filed
11/Aug/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
14/Aug/14	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
18/Aug/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
19/Aug/14	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
		5 Kamloops N	McLure to Albreda	Received & Filed
		7 Jasper	Albreda to KM 215	Received & Filed
		7 Talisman	Talisman 3 " Condensate	Received & Filed
		8 Stony	KM 215 to KM 40	Received & Filed
		9 Edmonton	KM 40 to Edmonton Refinery	Received & Filed

TABLE 2.17B-1

2013-2014 MONTHLY AERIAL SUMMARY REPORTS (continued)

Date of Flight	Pipeline	Zone	Zone Description	KMC Follow-up
August 2014 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY (continued)				
21/Aug/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
		4 Kamloops M	TM Hope to Coq Jump Off	Received & Filed
		5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
26/Aug/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
26/Aug/14	TMPL	3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
27/Aug/14	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
28/Aug/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
September 2014 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY				
2/Sep/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
3/Sep/14	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
		5 Kamloops N	McLure to Albreda	Received & Filed
		7 Jasper	Albreda to KM 215	Received & Filed
		7 Talisman	Talisman 3 " Condensate	Received & Filed
		8 Stony	KM 215 to KM 40	Received & Filed
		9 Edmonton	KM 40 to Edmonton Refinery	Received & Filed
8/Sep/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
		4 Kamloops M	TM Hope to Coq Jump Off	Received & Filed
		5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
10/Sep/14	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
11/Sep/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
15/Sep/14	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
		5 Kamloops N	McLure to Albreda	Received & Filed
		7 Jasper	Albreda to KM 215	Received & Filed
		7 Talisman	Talisman 3 " Condensate	Received & Filed
		8 Stony	KM 215 to KM 40	Received & Filed
		9 Edmonton	KM 40 to Edmonton Refinery	Received & Filed
17/Sep/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
23/Sep/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
		4 Kamloops M	TM Hope to Coq Jump Off	Received & Filed
		5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
25/Sep/14	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
30/Sep/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed

TABLE 2.17B-1

2013-2014 MONTHLY AERIAL SUMMARY REPORTS (continued)

Date of Flight	Pipeline	Zone	Zone Description	KMC Follow-up
October 2014 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY				
2/Oct/14	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
		5 Kamloops N	McLure to Albreda	Received & Filed
		7 Jasper	Albreda to KM 215	Received & Filed
		7 Talisman	Talisman 3 " Condensate	Received & Filed
3/Oct/14	TMPL	8 Stony	KM 215 to KM 40	Received & Filed
		9 Edmonton	KM 40 to Edmonton Refinery	Received & Filed
7/Oct/14	TMPL	4 Kamloops M	TM Hope to Coq Jump Off	Received & Filed
		5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
16/Oct/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	*
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	*
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	*
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
21/Oct/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
22/Oct/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	*
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	*
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	*
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
		4 Kamloops M	TM Hope to Coq Jump Off	Received & Filed
		5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
28/Oct/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
30/Oct/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
*= Segments unable to complete due to bad wx.				
November 2014 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY				
4/Nov/14	TMPL	5 Kamloops M	Kingsvale to McLure	Received & Filed
		5 Kamloops N	McLure to Albreda	Received & Filed
		7 Jasper	Albreda to KM 215	Received & Filed
		7 Talisman	Talisman 3 " Condensate	Received & Filed
		8 Stony	KM 215 to KM 40	Received & Filed
		9 Edmonton	KM 40 to Edmonton Refinery	Received & Filed
4/Nov/14	TMPL	5 Kamloops N	McLure to Albreda	Received & Filed
6/Nov/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
12/Nov/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
		4 Kamloops M	TM Hope to Coq Jump Off	Received & Filed
		5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
18/Nov/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
24/Nov/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed

TABLE 2.17B-1

2013-2014 MONTHLY AERIAL SUMMARY REPORTS (continued)

Date of Flight	Pipeline	Zone	Zone Description	KMC Follow-up
November 2014 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY (continued)				
27/Nov/14	TMPL	4 Kamloops M	TM Hope to Coq Jump Off	Received & Filed
		5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
28/Nov/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
		4 Kamloops M	TM Hope to Coq Jump Off	Received & Filed
December 2014 KINDER MORGAN MONTHLY AERIAL REPORT SUMMARY				
2/Dec/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
3/Dec/14	TMPL	4 Kamloops M	TM Hope to Coq Jump Off	Received & Filed
		5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
		5 Kamloops M	Kingsvale to McLure	Received & Filed
		5 Kamloops N	McLure to Albreda	Received & Filed
		7 Jasper	Albreda to KM 215	Received & Filed
		7 Talisman	Talisman 3 " Condensate	Received & Filed
		8 Stony	KM 215 to KM 40	Received & Filed
		9 Edmonton	KM 40 to Edmonton Refinery	Received & Filed
8/Dec/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
11/Dec/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
16/Dec/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
		4 Fraser Valley	TM E of 264 to Hope	Received & Filed
		4 Kamloops M	TM Hope to Coq Jump Off	Received & Filed
		5 Kamloops S	Coq Jump Off to Kingsvale	Received & Filed
22/Dec/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed
22/Dec/14	TMPL	4 Fraser Valley	TM E of 264 to Hope	Received & Filed
30/Dec/14	TMPL	1 NEB – BBY	TM Mainline N of Hwy 1	Received & Filed
		2 Surrey Lang	KM1107 (264 West to Fraser Rvr)	Received & Filed
		3 NEB Coquit	TM Mainline tween Hwy 1 and Fraser	Received & Filed

c) Please also refer to Province of BC IR No. 2.17a. Yes. The existing Integrity Management Program (IMP) document and aerial patrol scope of work document will be updated for new segments constructed as part of the Project. The frequencies are expected to be similar to the existing system.

d) Please also refer to Province of BC IR No. 2.17a. Aerial patrol is mandated by regulation. Kinder Morgan Canada (KMC) meets the *National Energy Board Onshore Pipeline Regulations 39. SURVEILLANCE and MONITORING and CSA Z662-11, Oil and Gas Pipeline Systems 10.6.1, Pipeline Patrolling* by regularly conducting both aerial and ground patrols on the existing pipeline system to look for signs of activity or events

that may compromise the safety of the pipelines, right-of-way, or other facilities and report any findings.

e) Please also refer to Province of BC IR No. 2.17a. Kinder Morgan Canada (KMC) employs trained visual observers during aerial patrol flights of the existing system to look for leaks or anomalies along the right-of-way. It is expected that this will continue for the new segments of the expanded system should it be approved. Trans Mountain is currently participating in joint industry initiatives to investigate the viability of commercially available aerial surveillance systems for detection of oil spills as described in Trans Mountain's response to Province of BC IR No. 2.15g.

f) Please also refer to Province of BC IR No. 2.17a. Yes, Kinder Morgan Canada (KMC) aerial patrol contractors video aerial patrol flights and make these recordings available to KMC upon request. At least once per year, a video recording is made of the entire right-of-way which is kept by KMC. It is expected that this requirement will also be applicable for the new and expanded pipeline segments should the project be approved.

g) Please also refer to Province of BC IR No. 2.17a. Trans Mountain will update its existing Integrity Management Program (IMP) and scope of work document (refer to Province of BC IR No. 2.17a) that prescribes the frequency of patrol for the entire Trans Mountain pipeline right-of-way as necessary for the Project. Regarding the use of technology; please refer to Province of BC IR No. 2.16e for Trans Mountain's commitment to evaluate available technologies as they develop with a goal for continually improving leak detection including non-CPM based systems.

h) Please also refer to Province of BC IR No. 2.17a. KMC's patrol activity has met the *National Energy Board Onshore Pipeline Regulations 39 SURVEILLANCE and MONITORING* for the past five years. The most recent National Energy Board audit of Kinder Morgan Canada's Damage Prevention Program did not include any findings or required corrective actions on the surveillance and monitoring program.

Summary of New Commitments:

- Trans Mountain will update its existing Integrity Management Program (IMP) and scope of work document that prescribes the frequency patrol for the entire Trans Mountain pipeline right-of-way as necessary for the Project.

2.18 In-line inspections

Reference:

i. A3S1L1, Application Volume 4C, Project Design and Execution – Operations and Maintenance, Section 8.1.4, In-Line Inspection Program, PDF p. 52 of 102.

ii. A3Y3A0, Trans Mountain Response to BC IR No. 1.6 a), Attachment 9 – letter dated August 2, 2013 from NEB to Trans Mountain enclosing Order SO-T260- 005-2013, PDF p.1 of 5.

Preamble:

The Application (reference (i)) describes Trans Mountain's In-Line Inspection (ILI) program as follows:

> ILI programs are continual assessment processes. A baseline inspection is first completed on each pipeline for each ILI tool used. The ILI findings and the field investigations are analyzed to confirm that the standard ILI interval of five years is adequate to ensure the integrity of the pipeline system. This is done by taking the population of features identified through the assessment process and simulating the growth of these features using well-established engineering methods. Any anomalies that may be at risk to become an integrity threat before the next scheduled ILI run are either repaired or scheduled to be reassessed with an earlier ILI run.

Reference (ii) is a letter from the NEB enclosing a Safety Order directing Kinder Morgan Canada to maintain a pressure restriction until the commitments outlined in KMC's Integrity Assurance Plan have been fulfilled. The Safety Order appears to have been triggered by two separate leaks stemming from crack features on the Trans Mountain Pipeline, on June 12 and June 26, 2013. In the letter, the NEB notes as follows:

> These crack features were discovered as a result of inline inspections conducted by KMC in compliance with the National Energy Board (Board) letter issued 16 March 2012 directing KMC to complete baseline assessments on cracking features that may eventually lead to leaks.
>
> [emphasis added]

Request:

a) Please file a copy of the March 16, 2012 letter from the NEB referred to in reference (ii).

b) In light of the claim in reference (i) that ILI is typically carried out every five years, unless anomalies requiring reassessment are detected, please explain why, as is stated in reference (ii), KMC was directed by the NEB to "complete baseline assessments on cracking features that may eventually lead to leaks" (and which, as is noted in reference (ii), resulted in two separate leaks on June 12 and 26, 2013).

c) In the case of a slow leak that remains undetected by other leak detection systems, how much oil would leak out of the line at average pipeline pressure during the five year interval between ILIs?

Response:

a) Attached is the March 16, 2012 letter from the National Energy Board (Province of BC IR No. 2.18a - Attachment 1).

b) In April 2011, Kinder Morgan Canada discovered a small leak on the Trans Mountain system at KP 150.4 (near Chip Lake, Alberta) due to a 20 mm long hairline crack in a longitudinal seam weld. Prior to this incident, Kinder Morgan Canada had already initiated a seam weld baseline assessment program and had made plans to run the Axial Flaw Detection (AFD) in-line inspection tool on the Trans Mountain system.

After the April 2011 release, certain portions of the Trans Mountain pipeline system were put under a pressure restriction until completion of a seam weld baseline assessment and validation of the assessment by an independent third party expert. The pressure restriction was lifted by the National Energy Board on March 16, 2012 with the conditions that Kinder Morgan Canada file a baseline assessment for long seam cracking on all pre-1970's pipe by December 31, 2013 and a baseline assessment for time dependent cracking on all pre-1970's pipe by December 31, 2014 (now extended to the end of 2015).

Kinder Morgan Canada continued to complete the seam weld assessments and identified the seam weld crack that resulted in the leak in a seam weld in June 2013 using the axial flaw detection ILI process. As part of the baseline assessment for time dependent cracking, Kinder Morgan Canada evaluated two in-line inspection tools (Electromagnetic Acoustic Technology – EMAT; and Ultrasonic Crack Detection – USCD). The evaluation showed that each tool had unique capabilities and a decision was made to use both tools for the baseline crack assessment. The EMAT tool discovered the second leak in a gouge/dent in June 2013. Since the discovery of the two leaks in 2013, Kinder Morgan Canada has completed the baseline assessment of the Trans Mountain pipeline system using the AFD and EMAT tools, and is in the process of completing the assessment with the USCD tool.

As part of its Integrity Management Program, Kinder Morgan Canada has committed to continuing crack assessments and axial flaw assessments on a maximum interval of 5 years following the baseline assessments with an objective to detect and repair any features of concern before they become a threat to fail in service.

c) The volume that could leak from a small release will vary depending on the assumptions used. Trans Mountain responded to a similar Province of BC IR No. 2.19d requesting quantification over a 2 year period for which Trans Mountain estimated 40 m^3 – 80 m^3. A simple extrapolation to 5 years would yield a result range of 100 m^3 – 200 m^3. However for the reasons stated in Province of BC IR No. 2.19d it is likely that a spill of this size would be detected sooner than 5 years by other means.

Trans Mountain has processes to conduct regular aerial patrols that include observation for potential releases. Trans Mountain has personnel working regularly on the pipeline that are trained to observe and respond to the potential indicators of a release. Trans Mountain has implemented a public awareness program to inform the public residing near the pipeline on how to recognize and safely react to potential indicators of a release. Information regarding leak detection and response to probable leaks is included in Section 7.1.11, Volume 4C of the Facilities Application. In addition to these activities, a SmartBall® inspection technology is now being utilized on the Trans Mountain system to inspect for small leaks.

Kinder Morgan follows an Integrity Management Program that includes continual assessments accomplished by running different in-line inspection tool technologies, optimized for specific pipeline integrity threats. The intention is that these routine inspections will detect all anomalies of concern, allowing them to be repaired prior to failure. Note that each of the in-line inspection technologies are run on independent 5 year continual assessment cycles, with the net result that it would be rare for a segment of pipe to experience a 5 year gap between in-line inspection runs.

In the case of the two leaks discovered in June 2013, both were discovered while completing baseline crack detection in-line inspections. These inspections will continue to be run on a scheduled basis such that any crack features would be detected and repaired prior to becoming critical defects.

Reference:

Trans Mountain Pipeline (ULC). December 2013. Volume 4C – Project Design and Execution – Operations and Maintenance. Section 7.1.11 (Filing ID A3S1L1)

2.19 Hydrostatic testing

Reference:

A3X6G6, Trans Mountain Response to GoC Parks IR No. 1.1.11, PDF p. 5 of 14.

Preamble:

When asked by Parks Canada whether stress corrosion cracking had been identified in the 24 inch pipeline, Trans Mountain responds as follows (reference (iii)):

> Yes. The active sections of pipeline are currently assessed and managed through the use of in-line inspections, monitoring and repair programs. The reactivation sections of 24-inch pipeline will undergo a hydrostatic test prior to reactivation and will be inspected with crack detection technologies within the first two years of operation. Once in service, the pipeline segment will continue to be managed through the use of ongoing in-line inspection, monitoring and repair programs. [emphasis added]

Request:

a) Is the hydrostatic test referred to in the reference above a leak test, or a strength test?

b) If it is a strength test, does Trans Mountain plan to conduct leak tests before recommissioning the previously deactivated sections?

c) If the answer to either request a) or request b) above is yes, what is the lowest pressure drop a hydrostatic test can detect?

d) In the case of a slow leak causing a pressure drop falling below the threshold identified in response to request c) above, how much oil would leak out of one of the reactivated sections of the line referred to in reference (iii) at average pipeline pressure over a period of two years?

Response:

a) The hydrostatic testing will include both a strength test and a leak test. The hydrostatic tests will be conducted in accordance with the Kinder Morgan Canada Mainline Hydrostatic Test standard which meets the requirements of the OPR-99 and CSA Z662 standard and that is based on extensive experience completing hydrostatic testing.

b) Yes. Please refer to Province of BC IR No. 2.19a.

c) During a hydrostatic test the pressures are monitored continuously with precision instruments. Temperatures are also monitored continuously since small changes in temperature will result in pressure changes during the test. Calculations are performed when measured temperatures change to reconcile the resulting change in pressure. Based on assumptions detailed below, a maximum pressure drop of approximately 6kPa can result from uncertainties in measured variables and result in a successful test.

Hydrostatic Testing Details:

In accordance with CSA Z662-11 a successful test equal to or greater than 100% SMYS for buried pipelines must include the following requirements:

- A pressure volume (P-V) plot starting at a pressure low enough to establish straight-line proportionality (*i.e.,* confirms that the test pressure does not exceed a pressure that yields a deviation of 0.2% from straight line proportionality).
- A 4 hour strength test to a minimum of 125% of the intended MOP and a maximum pressure equal to the lesser of 0.2% deviation on a P-V plot and 110% of SMYS of the pipe.
- A 4 hour leak test to a minimum of 110% of the intended MOP and a maximum pressure of the lesser of the qualification pressure and the pressure corresponding to 100% SMYS of the pipe.
- Test records shall include the reconciliation of any significant pressure deviations experienced (i.e. due to temperature changes) during the test.

Where inaccuracies or questionable results cannot be reconciled, test shall be considered unsuccessful.

To estimate the maximum pressure loss that could be accepted as a successful test, the assessment must consider a number of variables. The following assumptions have been made to calculate the uncertainty in test pressure:

- The temperature measurement error potential is 0.5 °C
- The ground temperature is assumed to be 10 °C

Over the course of a four hour leak test, the line temperature and ground temperature is monitored at multiple locations along the test segment. To determine whether a pressure drop is associated with a leak, Trans Mountain uses the following uncertainty equation to reconcile pressure fluctuations due to small temperature changes:

$$\delta P = \Delta P \left[\delta T \left\{ \frac{(17.0105 - 0.40738T + 0.004815T^2)10^{-6}}{\beta - 2\alpha} \right\} - \delta D \left\{ \frac{\frac{(1-v^2)}{Et}}{\frac{D(1-v^2)}{Et} + C} \right\} + \delta t \left\{ \frac{\frac{D(1-v^2)}{Et^2}}{\frac{D(1-v^2)}{Et} + C} \right\} \right]$$

Where :

δP = Uncertainty in ΔP calculation (kPa)
δT = Uncertainty in temperature measurement (°C)
δt = Manufacturing tolerance on pipe wall thickness (mm)
δD = Manufacturing tolerance on pipe diameter (mm)

ν = Poissons Ratio (0.30)
t = Wall thickness (mm)
D = Outside diameter (mm)
E = Elastic Modulus (207 x 10^6 kPa)
C = Water compressibility (kPa^{-1}) = 4.22 x 10^{-7} + 4.6 x 10^{-11} (T - 38)^2
T = Temperature of water (°C)

β = Water volumetric expansion coefficient ($°C^{-1}$)
= (-64.268 + 17.0105 T - 0.20369 T^2 + 0.001605 T^3) x 10^{-6}

α = Steel linear expansion coefficient

For the reactivation sections the following values were used in the uncertainty equation:

δT = 0.5 °C
δt = 0 - 0.792 mm
δD = 0 – 3.048 mm
t = 7.92 mm
D = 609.6 mm
T = 10 °C
α = 1.12 x (10^{-5}) $°C^{-1}$ @ 10 °C

The value of 0.5 °C chosen for temperature measurement uncertainty is a conservative value. Temperature measurement instruments can individually measure within an accuracy of +/- 0.1 °C but the higher value accounts for potential error in measurement accuracy for the entire test segment by averaging values measured at several locations. The pipe wall thickness and diameter uncertainties are based on standard acceptability thresholds for pipe fabrication.

The result of the uncertainty calculation using these assumptions indicates that a pressure drop lower than or equal to 5.03±0.8 kPa would fall within the uncertainty band. Therefore a pressure drop associated with a leak would have to be greater than 5.03±0.8 kPa. To confirm that a leak was likely would require that an additional pressure drop of 1 kPa above the aforementioned value, which would result in the lowest detectable pressure drop of 6.03±0.8 kPa.

d) In the event of a 6.03±0.8 kPa pressure loss that resulted from a small leak, the release volume over the course of a 4 hour leak test would depend upon the length of the test segment. For a 10 km long test segment a 6.03±0.8 kPa pressure loss would be equivalent to the loss of 0.0133±0.0018 m^3 of test water as detailed below. For a 20 km long test segment the water loss would be 0.0265±0.0035 m^3.

The minimum allowable pressure during a leak test exceeds the maximum allowable operating (MOP) pressure by 10%. Normal operating pressure in a pipeline segment will typically range from close to MOP near the discharge of pump stations and reduce down to near the minimum suction pressure upstream of the next pump station. Average pressures are therefore approximately 50% of MOP or approximately 45% of the minimum leak test pressure. Depending on the nature of the leaking defect in the proposed scenario, the leak rate at the average operating pressure could be as low as zero in the case of a tight crack that only opens at higher pressures, up to the value calculated for a circular orifice that would leak continuously at any pressure. Based on these assumptions, the volume that would leak in 2 years from a 10 km test section at average pressure is estimated to range from zero to approximately 38.8±5.3 m^3. The amount that could leak from a 20km test section at average pressure could range from zero to approximately 77.7±10.6 m^3. Calculated leak volume ranges at MOP are tabulated along with average values in the table below.

Trans Mountain experienced a small leak at KP 150 in 2011 that may have been leaking at an undetectable rate during a hydrostatic test performed in 1999. This release was discovered following a report from a landowner of oil staining on the ground surface and hydrocarbon odours on the right of way. The total release volume from this incident was 1.6 m^3. Given that a release volume of 1.6 m^3 from a very slow leak is readily apparent by observation it would be extremely unlikely that a leak as large as the values calculated for the proposed scenario could remain undetected for an extended period of time. Trans Mountain has processes to conduct regular aerial patrols that include observation for potential releases. Trans Mountain has personnel working regularly on the pipeline that are trained to observe and respond to the potential indicators of a release. Trans Mountain has implemented a public awareness program to inform the public residing near the pipeline on how to recognize and safely react to potential indicators of a release. Information regarding leak detection and response to probable leaks is included in Section 7.1.11, Volume 4C of the Facilities Application (Filing ID A3S1L1).

Since the KP150 incident two other leaking defects were discovered on Trans Mountain pipeline during investigative digs targeted at the leaking features which were identified

using two different ILI technologies. All in-service segments of the Trans Mountain main line have been inspected with these tools and two other ILI technologies. These same tools are planned to be run in the proposed reactivation segments either prior to the hydrostatic testing or within the first two years of operation as outlined in Section 3.6.5 of Volume 4 (Filing ID A3S0Y9).

Hydrostatic testing has been an accepted practice to confirm the structural integrity of pipelines for more than 50 years. The requirements for hydrostatic testing are incorporated in the NEB Onshore Regulations, with detailed requirements contained in the CSA Z662 Oil and Gas Pipeline Systems code. Trans Mountain has had a successful record of hydrostatic testing of the TMPL with the initial testing of the system in the early 1950's, and successive retesting programs of multiple segments of the pipeline systems in the 1960's, 1970's, 1980's, and the latter half of the 1990's. Trans Mountain most recently tested a 34.8km segment spanning the Coquihalla summit in 5 test sections in 2013. While the vast majority of hydrostatic tests were completed successfully, a few instances of failed tests did occur and in some cases the failure was associated with a slow leaking defect. In all cases, repairs were made and the re-test successfully completed.

One other factor to consider regarding the plausibility of an undetected leak equivalent to the maximum pressure uncertainty surviving a hydrotest as proposed in this scenario is that immediately prior to the leak test, the pipeline segment must first successfully pass the strength test which is conducted to a pressure of 125% MOP. The same monitoring of pressures and temperatures is conducted during the strength test and any leak would occur at a higher rate at the higher pressure increasing the likelihood of detection.

The change in volume required to cause a change of pressure by 6.03±0.8 kPa is given in the following equation:

$$\Delta V = V\left(\frac{D}{Et}\left(1-v^2\right)+C\right)$$

Where:

ΔV = Volume change required to change pressure by 1 kPa (m^3)

V = Total fill volume of water (m^3) = π [(D-2t)/(2*1000)]^2 x L

L = Length of the test section (m) = 10,000 - 20,000 m

D = Outside diameter of the pipeline (mm) = 609.6 mm

E = Elastic modulus (207 x 10^6) kPa

t = Wall thickness of the pipeline (mm) = 7.92 mm

v = Poissons ratio (0.3)

T = Minimum water temperature (^oC) = 10 ^oC

C = Water compressibility (kPa^{-1}) = 4.22 x 10^{-7} + 4.6 x 10^{-11} x $(T - 38)^2$ = 4.58064 x 10^{-7}

For the 10 km test section, a 6.03±0.8 kPa pressure drop could be caused by a loss of 0.0133±0.0018 m^3 of water over four hours (0.0033±0.0005 m^3/hr). For a 20km test section the pressure drop could be caused by a loss of 0.0265±0.0036 m^3 of water over four hours (0.0067±0.0009 m^3/hr). These leak rates would occur at the pressure held during the hydrostatic test; however, by using the leak rate proportion to the square root of the pressure ratio, the leak rate can be calculated for different pressures. The table below contains the leak rates at the maximum operating pressure (MOP) and average pressure (0.5xMOP).

Test Segment Length	**Leak Rate at MOP**	**Leak Rate at Avg P.**
10,000 m	0.0031±0.0004 m^3/hr	0.0022±0.0003 m^3/hr
20,000 m	0.0063±0.0009 m^3/hr	0.0044±0.0006 m^3/hr

Extrapolating the leak rates above over a period of two years would yield the following leak volumes:

Test Segment Length	**Leak Volume at MOP**	**Leak Volume at Avg P.**
10,000 m	54.9±7.5 m^3	38.8±5.3 m^3
20,000 m	109.9±14.9 m^3	77.7± 10.6 m^3

2.20 Shutdown procedures

Reference:

i. A3Y2Z1, Trans Mountain Response to BC IR No. 1.4 c), PDF p. 14 of 187.

ii. A3Y2Z1, Trans Mountain Response to BC IR No. 1.17 a), PDF p. 54 of 187.

iii. A3Z2A6, Trans Mountain Response to BC Motion to Compel Full and Adequate Answers to BC IR No. 1, Organization Chart entry 1.4 c), PDF p. 6 of 76.

iv. A3S1L1, Application Volume 4C, Section 7.1.11.5, Response to Leak Alarms, PDF p. 48-49 of 102.

v. A3Y2Z2, Trans Mountain Response to BC IR No. 1.6 a), Attachment 1 – Investigation under the *National Energy Board Act* in the Matter of 2012-01- 24 Trans Mountain Pipeline ULC Sumas Tank 121 Leak, PDF p. 9-10 of 28.

vi. A3W9H8, Trans Mountain Response to NEB IR No. 1.70 a), PDF p. 397-403 of 421.

Preamble:

In reference (i), Trans Mountain states: “If a potential pipeline leak was identified or suspected, the pipeline would be immediately shutdown and isolated according to procedures.” [emphasis added]

Trans Mountain reiterates its commitment to the immediate shutdown of the line in reference (ii): “A report of a release related to the Trans Mountain terminals or pipelines received by our control centre would result in the immediate shut down of pumps.” [emphasis added]

According to reference (iii), the following formal shutdown procedure is being contemplated: “Trans Mountain will consider formalizing the existing procedures at the control centre to require a pipeline shutdown should the absence of a leak not be confirmed within 10 minutes of initial detection.” [emphasis added]

In the same reference, having confirmed in response to a request by the Province that Trans Mountain will not consider a shutdown procedure causing the automated shutdown of the line whenever a leak is suspected and not ruled out by an operator, Trans Mountain asserts that "automatic shutdown of the pipeline without operator initiation and control has the potential to damage the pipeline or exacerbate a spill."

For the sake of clarification, the Province in its request sought to ascertain whether Trans Mountain would commit to the automatic shutdown of the line by the control system without shutdown being initiated by an operator. The Province did not intend to imply that the entire shutdown procedure should be conducted without operator control.

The Application (reference (iv)) describes Trans Mountain’s response to leak alarms as follows:

> If a leak alarm is triggered by the CPM system, the CCO will then follow a documented procedure, within the Control Centre Procedures, to determine if the alarm is a probable

false alarm or a probable leak. If the evaluation leads to a determination of a probable leak, the CCO will use the SCADA system to shut down the pipeline and immediately dispatch field operations personnel to verify if there is a leak or otherwise identify the cause of the alarm.

As discussed in Section 7.1.5, a leak at a facility will typically trigger an alarm by activating a level transmitter or switch, a hydrocarbon detector, or a combustible gas detector. In most cases this will cause an ESD [Emergency Shut Down] of the facility or the area within the facility where the transmitter of detector was activated. If a leak is not intended to cause an ESD by design and an alarm is triggered in the PCC [Primary Control Centre], the CCO will take appropriate action to shut down and isolate the facility or the area within the facility following the Control Centre Procedures. In the case of an ESD, the CCO may take actions to create additional isolation. In either case, the CCO will dispatch field operations personnel to the facility to investigate the cause of the alarm.

Reference (v) describes the sequence of events leading to the discovery of the Sumas Tank 121 leak on January 24, 2012.

In reference (vi), Trans Mountain provides a brief description of seven hydrocarbon releases experienced on its facilities in Canada in the past 10 years, all of which required activation of the company's emergency response plan.

Request:

a) What is meant in reference (i) by "if a potential leak was identified or suspected"? Similarly, what is meant in reference (ii) by "a report of a release"? Please clarify the instances in which the line would be shut down.

b) What is meant by the statement in reference iii) that "Trans Mountain will consider formalizing the existing procedures"? Have no procedures been formalized? If yes, what procedures have been formalized? Please provide copies of any existing formalized procedures.

c) Is the 10 minute shutdown procedure described in reference (iii) current practice?

d) If yes, please reconcile such practice with the sequence of events eventually leading to the isolation of the release during the Sumas Tank 121 leak, as described in reference (v).

e) If the 10 minute shutdown procedure is current practice, will Trans Mountain establish a formal 10 minute rule?

f) Please explain how automatic shutdown without operator initiation (but with operator control once the shutdown procedure has been initiated) could damage the pipeline.

g) Please explain how automatic shutdown without operator initiation (but with operator control once the shutdown procedure has been initiated) could exacerbate a spill.

h) For the seven spills referred to in reference (vi), what shutdown procedures were initiated? How soon after the spill occurred were they initiated?

Response:

a) i. "Identified" means that the Control Centre Operator (CCO) has evidence to support the existence of a leak either by: a credible report from a direct observation of a leak along the pipeline, or unambiguous indications of a leak on the SCADA/CPM systems. "Suspected" means that the CCO cannot rule out a leak when following any of the established procedures for responding to an abnormal operating condition. In any case where a leak is identified or suspected, the pipeline must be shutdown.

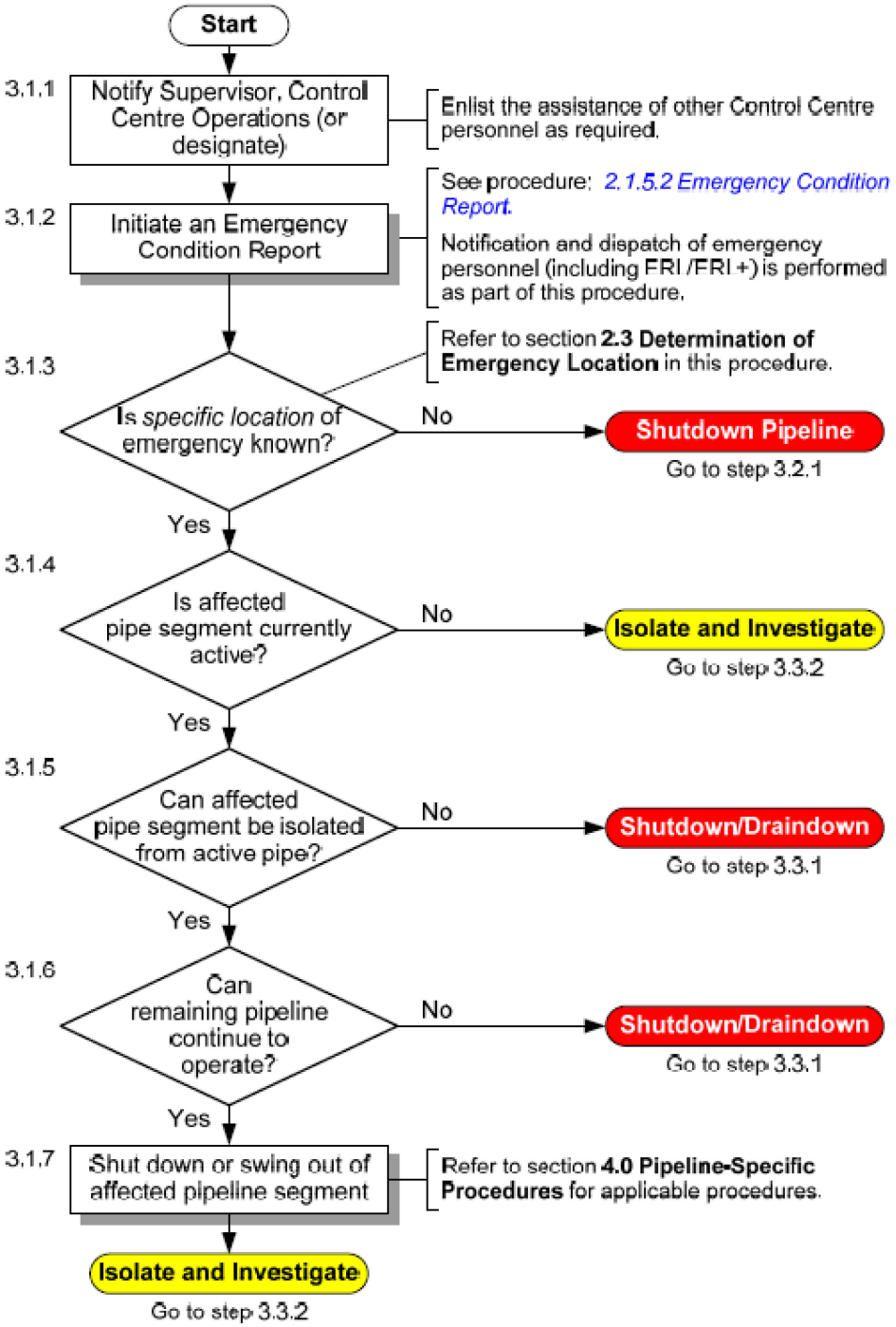
ii. "Report of a release" means a credible report of a possible leak. Credible reports may come from Trans Mountain employees and contractors, local authorities (fire, police, *etc.*), or members of the public. Indicators of a possible leak include signs of hydrocarbons on land or water, or strong hydrocarbon odours in the vicinity of the pipeline or Trans Mountain facility. In all cases, the CCO must follow established procedures to respond to the report. In any case where a leak is identified or suspected, the pipeline must be shutdown.

b) Trans Mountain has over 250 Control Centre procedures to ensure safe, effective, and consistent operation of the existing pipeline. Control Centre Operators (CCOs) receive training in hydraulics, leak detection, and emergency procedures. CCOs are trained to immediately assess and respond to any type of emergency or abnormal operating condition.

Those procedures will be reviewed and revised and new procedures will be developed as may be needed for the Project. Provided below is an excerpt from one of the existing Trans Mountain Control Centre General Procedures for Pipeline Safety Shutdown.

3.0 PROCEDURE

3.1 Determine Appropriate Response



c) No. Trans Mountain's experience has shown that the majority of pipeline shutdowns commence earlier than 10 minutes. The current practice provides the Control Centre Operator (CCO) the authority and the responsibility to shut down a pipeline during an emergency or as a precaution when, in his or her judgment, further operation of the

pipeline is or may be unsafe. The CCO will not be faulted for shutting down a pipeline under these circumstances. However, further to the BC Motion in reference iii) Trans Mountain believes that including a prescribed shutdown initiating time will enhance the existing procedures. Trans Mountain is currently reviewing its procedures to introduce a rule directing the CCOs to perform a controlled shutdown of the pipeline when a leak cannot be ruled out in a given time period after initial indication. That procedure will apply to the actions in the decision tree provided in Trans Mountain's response to Province of BC IR No. 2.15h. Trans Mountain commits to having revised procedures in effect to support the Project. Trans Mountain will also ensure a review of shutdown procedures including the rationale for selecting a 10 minute threshold or other times as may be appropriate to ensure safety of the pipeline system, is part of the consultation program undertaken with the Province as part of developing the updated EMP as described in the NEB draft conditions related to emergency management.

d) Please refer to Province of BC IR No. 2.20h for a description of the Tank 121 failure response sequence. At the time of the failure, Tank 121 was isolated from the mainline so the current pipeline safety shutdown procedure as described in Province of BC IR No. 2.20b and 2.20c is not applicable for this incident. As described in reference (v) the delayed response to the leak stemming from the failure of the roof water drain was the result of delayed recognition of the tank creep alarms.

Investigation into the delayed Control Centre recognition of the tank release identified needed improvements to the alarm configurations for tank level deviation alarms, improvements to procedures for response to unexpected tank level deviations, and further clarification to Control Centre Operators (CCOs) regarding a SCADA upgrade project that was underway at the time of the incident and the importance of not relying on alarms from the test SCADA platform for operations. The following corrective actions were completed to reduce the risk of failing to recognize release incidents from inactive tanks in the future.

- A study was completed to determine the cause of frequent false tank creep alarms and to develop a more reliable tank level deviation alarm methodology.
- The tank level deviation alarm function was reconfigured from being a SCADA based alarm set by CCOs to a field controls based alarm with standardized settings on all tanks based on the results of the above study.
- Revised tank level deviation alarms were commissioned and tested to ensure effective operation.
- Control Centre procedures for unexpected tank level deviation changes and tank leak were updated.
- CCOs were trained and qualified on the updated procedures.
- CCOs were reminded that alarms from the test SCADA platform were to be monitored for testing purposes only and were not to be used for operations.

e) Trans Mountains commitment is described in Province of BC IR No. 2.20c.

f) Effective shut downs in response to leaks or ruptures require the isolation of the leaking section of the pipeline or facility that is experiencing the release. Any automatic shutdown of the pipeline that involves isolating the pipeline by closing valves introduces the threat of potentially overpressuring sections of the pipeline. Isolation must always be managed by a qualified operator after a shutdown sequence is complete.

g) Pumps downstream of the release location need to be left running to drain hydrocarbons away and reduce pressure from the site of release. This mitigation is central to the operator's shutdown response to a suspected leak.

Automated shutdown (even with operator control) shuts down all pumps including those downstream of the release and therefore does not give the operator adequate control when responding to an actual leak. The increased pressure of hydrocarbons at the release site could result in a larger release than would otherwise be the case.

Having to restart the downstream pumps after an automated shutdown would result in an unnecessary delay in responding to a leak.

h) Although the information requested is not within the scope of this proceeding, Trans Mountain offers the following response to your question:

Sumas, Ward Road: A release was detected along the right of way for two Tank Transfer lines near Sumas Tank farm on July 15, 2005 by workers investigating recurrent odour complaints over the past week. The release was eventually determined to be on the NPS20 Sumas Tank Transfer line due to a crack in a buckle that resulted from soil displacement from loading due to a landfill in a neighboring property.

- On July 15 at 10:30 MST, a Trans Mountain worker investigating recurring odour complaints discovered oil in a creek near the tank transfer lines.
- The Control Centre Operator shut down the delivery that was underway on the NPS24 Tank Transfer line after the release was reported at 10:31 MST. At the time of the report the NPS20 Tank Transfer line (which was the affected pipe) was inactive.
- The procedure to shut down the NPS24 tank transfer line involved the shutdown of pumps at Sumas Station and the isolation of the lines at the Sumas Tank Farm. The two tank transfer lines were later drained down by pumping from Sumas Station.
- Later at 12:10 MST the TMPL main line which is located nearby the tank transfer lines right of way was also shut down as a precautionary measure until the source of the release was confirmed.

Westridge Delivery Line: A release occurred on the Westridge delivery line on July 24, 2007 when a third party contractor repeatedly struck and punctured the NPS24 pipeline with an excavator tooth.

- At 12:33 MST, a call was received on the Trans Mountain Control Centre emergency line from a private citizen saying there was a pipeline break and oil on the ground at Inlet Drive.
- The Control Centre Operator (CCO) immediately shut down the jet fuel pipeline which is located near the report location.
- At 12:37 MST, the CCO notified the Burnaby Terminal Operator (BTO) to shut down the loading that was underway on the Westridge delivery line.
- By 12:39 MST, the BTO stopped the tanker loading that was underway by shutting down the Westridge booster pumps and closing the valve upstream of the Westridge loading facility.
- At 12:49 MST the CCO had confirmed that the release point was not at the Westridge loading facility but on the pipeline upstream of the loading dock and notified the BTO to isolate at Burnaby Terminal and to reopen the dock isolation valve to drain the line to the tanker that was being loaded.
- By 12:55 MST the BTO had closed the isolation valve at Burnaby and reopened the valve upstream of Westridge to drain the line into the tanker being loaded.

Burnaby, Tank 82 Release: On May 6, 2009 a contractor experienced an equipment failure while cleaning Tank 82 causing oil to be released into the tank 82 secondary containment area.

- At 22:00 MST, the Burnaby Terminal Operator (BTO) received alarms from the SCADA system that indicated an oil-on-water condition in the Tank 82 tank bay.
- At that time, Tank 82 was isolated from the operating system and was being jet-mixed by a contractor as part of the process to clean the tank in preparation for an out of service inspection.
- At 22:10 MST, the BTO received notification by radio indicating that there was a leak at Tank 82.
- Burnaby Terminal personnel evaluated the situation and determined it was not safe to enter the tank bay where oil was spraying from the damaged pump in order to isolate the leaking equipment from the tank.
- A tank to tank transfer was used to drain tank 82 to stop the release by approximately 05:00 MST the following day.

KP 150 Release: Small (pinhole) leak found on April 21, 2011, after investigating report of oil on surface soil.

- At 14:13 MST, the presence of hydrocarbons on surface accompanied by strong odour was reported to the Control Centre by landowner.
- At 14:22 MST, the Control Centre initiated emergency shutdown procedure.

Sumas, Tank 121: oil found in secondary containment area of storage tank on January 24, 2012

- At 02:39 MST, the tank level deviation triggered an alarm in the Control Centre.
- At this time Tank 121 was inactive and isolated at the tank valve.
- At 05:50 MST, the Control Centre initiated the procedure for responding to abnormal operating condition, and contacted field technician to investigate.
- At 06:50 MST, the field technician assessed and confirmed that a release had occurred.
- No shutdown was necessary because the tank was already inactive and isolated.

KP 923 Kingsvale North Release: Small (pinhole) leak found on June 12, 2013, by maintenance worker during anomaly investigation.

- At 10:03 MST, the presence of hydrocarbons on surface was reported to Control Centre.
- At 10:10 MST, the Control Centre initiated emergency shutdown procedure.

KP 966 Release: Small (pinhole) leak found on June 26, 2013, during an anomaly investigation dig.

- At 12:09 MST, the presence of hydrocarbons in soil during an integrity dig was reported to Control Centre.
- At 12:34 MST, after further excavation field personnel called Control Centre again to report the hydrocarbons were a probable leak. Control Centre initiated emergency shutdown procedure.

Summary of New Commitments:

- Trans Mountain commits to to introducing a leak detection procedure directing the Control Centre Operator (CCO) to perform a controlled shutdown of the pipeline when a leak cannot be ruled out in a given time period after initial indication. Trans Mountain will have the revised procedure in effect during the operation of the Project.

- Trans Mountain commits to including the review of shutdown procedures, including the rationale for selecting a 10 minute threshold or other time thresholds, in the consultation program undertaken with the Province of BC as part of developing the updated EMP.

2.21 Emergency Response Plans

Reference:

i. A4D3F2, Trans Mountain EMP documents, Attachment 2.3 – Pipeline Emergency Response Plan, Distribution, PDF p. 11 of 191.

ii. A4D3F2, Trans Mountain EMP documents, Attachment 2.3 – Pipeline Emergency Response Plan, Scope of the Plan, PDF p. 14 of 191.

Preamble:

In reference (i), Trans Mountain lists the "non-Trans Mountain entities" to which Trans Mountain has issued copies of its Pipeline ERP.

In reference (ii), Trans Mountain explains:

> The plan will not cover the tactical response techniques for a fire, however it will cover the response actions for the effects of radiant heat and air monitoring for plumes (smoke or otherwise), on the public, that result from a fire event. Detailed response actions including tactical information for fires can be found in the site specific "Fire Pre-Plan".

Request:

a) Please explain how Trans Mountain determines what "non-Trans Mountain entities" should receive copies of the ERPs.

b) Please provide a copy of the Fire Pre-Plan referred to in reference (iii).

Response:

a) It is Kinder Morgan Canada Inc.'s (KMC's) intent to continue to share unredacted versions of the EMP documents with agencies tasked with ensuring public safety. KMC's emergency management program (EMP) is shared, tested and regularly exercised with federal, provincial and local agencies. The EMP meets regulatory requirements and KMC works with emergency planners and emergency responders to maintain relationships and to ensure their awareness of KMC's system, as well as mutual awareness of joint exercises and programs.

KMC is willing to provide copies of the EMP documents to local, provincial and federal authorities who satisfy the following conditions:

- The authority has/is willing to participate in consultations with KMC;
- The authority could be called upon to respond to an event associated with the Trans Mountain Pipeline system within their jurisdiction;
- The authority has requested a copy and/or requires a copy by legislation, and
- The authority has signed a confidentiality agreement and/or has a method by which the document can be filed confidentially.

Although the full details of the EMP documents are not appropriate to include as part of public filing, KMC is willing to meet with the Province of British Columbia to discuss KMC's existing and updated EMP documents.

Please refer to the response to Province of BC IR No. 2.21b.

b) With regard to all requests regarding the EMP, Kinder Morgan Canada Inc. (KMC) acknowledges the interest of The Province of British Columbia to seek more information about the existing emergency management program (EMP) documents, and reference materials related to the Trans Mountain Pipeline System, which is why KMC filed a redacted copy of the existing Emergency Response Plans publicly. In Ruling No. 50 (Filing ID A4G5I9) the National Energy Board (NEB) determined that it was "satisfied that sufficient information has been filed from the existing EMP documents to meet the Board's requirements at this stage in the process."

It is KMC's intent to continue to share unredacted versions of the EMP documents with agencies tasked with ensuring public safety. KMC's EMP is shared, tested and regularly exercised with federal, provincial and local agencies. The EMP meets regulatory requirements and KMC works with emergency planners and emergency responders to maintain relationships and to ensure their awareness of KMC's system, as well as mutual awareness of joint exercises and programs.

The Application, Volume 7, Section 4.8 outlines the process to enhance Kinder Morgan Canada's (KMC) existing emergency management programs (EMP) as they relate to the Trans Mountain Pipeline system to address the needs of the Project (Filing ID A3S4V5). The final programs will be developed in a manner consistent with the NEB draft conditions related to emergency response (Filing ID A3V8Z8).

KMC also acknowledges the Province of British Columbia's interests and concerns about consultation opportunities for the updated EMP for the Project.

Since the updated EMP depends upon the final detailed design of the Project, a process which will not be carried out unless the Project receives approval and until KMC has an opportunity to review the conditions of such approval, the updated EMP cannot be provided during the NEB's regulatory review of the Project. However, to ensure affected parties have the opportunity to express concerns and provide input which will inform the updated EMP, KMC will conduct a consultation program as part of developing the updated EMP as described in the NEB draft conditions related to emergency management (Filing ID A3V8Z8).

Following receipt of a Certificate of Public Convenience and Necessity for the Project, KMC will file with the NEB a consultation plan related to KMC's EMP review that will include consultation scope, objectives; preliminary lists of regulatory authorities, communities, Aboriginal groups with whom KMC will engage, and a preliminary list of consultation locations and timing, as well as any other information that the NEB requires. The consultation plan will describe the methods that will be used to track commitments made during consultation and to incorporate them into KMC's EMP, including its

Emergency Response Plans. As part of this program KMC will periodically file reports with the NEB on progress of its EMP review including summaries of interested parties consulted and how their comments were considered.

KMC will file with the NEB the revised Emergency Response Plan for the pipeline as part of the approval conditions for the Project. The plan will demonstrate KMC's ability to prepare for, respond to, recover from, and mitigate the potential effects of emergencies of any type related to the Trans Mountain Pipeline system. Filing of the Emergency Response Plan will include, for the NEB's consideration, a final report on the consultation process as well as confirmation that an independent third party has reviewed and assessed the Emergency Response Plan and that KMC has considered and incorporated the comments generated by the independent review and assessment into the plan.

Ultimately, updates to the EMP incorporating feedback from consultation activities must result in an EMP that continues to meet the requirements of the *National Energy Board Onshore Pipelines Regulations* (2013) (OPR). As it does for the existing system, the OPR provides lifecycle regulation for all aspects of the Project operation including requirements for emergency response programs. KMC must maintain and update the EMP throughout the lifecycle of the expanded Trans Mountain Pipeline System. As well, throughout the life of the expanded system, NEB staff will continue to conduct emergency response exercise evaluations and emergency procedures manual reviews to verify that companies are prepared to anticipate, prevent, manage, and mitigate emergency situations.

KMC acknowledges the Province of British Columbia's interests and concerns about consultation opportunities for the updated Emergency Management Program (EMP) for the Trans Mountain Expansion Project and will invite the Province of British Columbia to participate in the process described above.

Summary of New Commitments:

- KMC acknowledges the Province of British Columbia's interests and concerns about consultation opportunities for the updated Emergency Management Program (EMP) for the Trans Mountain Expansion Project (the Project) and will invite the Province of British Columbia to participate in the process described above.

2.22 Unified Command

Reference:

A4D3F2, Trans Mountain EMP documents, Attachment 2.3 – Pipeline Emergency Response Plan, Section 8.8, Unified Command, PDF p. 90 of 191.

Preamble:

The Pipeline ERP describes the use of Unified Command as follows:

> In the unified command, decisions with regard to the response will be made by consensus and documented through a single Incident Action Plan (IAP) for each operational period. In the event that the Unified Command is unable to reach consensus, the FOSC/FIC [Federal On Scene Coordinator/Incident Commander] has ultimate decision making authority.

Request:

a) Please explain the basis for the statement above that FOSC/FIC has ultimate decision-making authority in the event that the Unified Command is not able to reach consensus.

b) Please explain how this stated assignment of authority would apply to any aspect of an incident that is under the specific jurisdiction of the Province (e.g. waste management, provincial wildlife species, provincial Crown lands).

Response:

a) The Trans Mountain Pipeline system is regulated by the National Energy Board (NEB), which is the lead federal regulatory agency (FOSC/FIC) for all incidents that occur on NEB-regulated pipelines. The NEB has federal, provincial and territorial partnerships in place to deal with overlapping and adjoining jurisdictions, common regulatory objectives and the need for effective communication. Trans Mountain expects the NEB will always attempt to work cooperatively with other agencies and respect overlapping or concurrent jurisdictions.

In British Columbia, Trans Mountain understands that the Ministry of Environment will have a presence at all spills impacting or threatening provincial lands and will be the lead provincial agency with either an Incident Commander working in a Unified Command and/or a lead individual working in an senior team advising Unified Command.

In the event that Unified Command cannot agree on a course of action, the Incident Commander of the agency with the primary jurisdiction and expertise over the specific issue is deferred to for the final decision. In the unlikely event that the NEB would deem that reasonable, adequate, and appropriate response actions are not being conducted in which case the NEB may, at their discretion, take control of the incident from Trans Mountain. In the case of Trans Mountain this means the NEB, as the lead federal agency with primary jurisdiction, would make the final decision on the overall approval of

the Incident Action Plan. Trans Mountain is unaware of a situation where the Unified Commanders could not reach agreement on the specifics of an Incident Action.

With regard to all requests regarding the EMP, please refer to the response to Province of BC IR No. 2.21b.

b) The referenced paragraph describes a situation where Unified Command cannot agree upon a course of action. Trans Mountain is unaware of a situation where the Unified Commanders could not reach agreement on the specifics of an Incident Action Plan and the federal representative in Unified Command made a decision against an aspect of an incident that was under the specific jurisdiction of a province.

2.23 Land-based spill response equipment

Reference:

i. A4D3F2, Trans Mountain EMP documents, Attachment 2.3 – Pipeline Emergency Response Plan, Section 9.6.1, Spill Response Equipment Maintenance, PDF p. 109 of 191.

ii. A4A2Z5, Trans Mountain Follow-Up Response to BC IR No. 1.25, PDF p. 14 of 30.

Preamble:

The Pipeline ERP (reference (i)) states as follows:

> KM response equipment is tested and inspected as noted below.
>
> - Containment boom – During boom deployment exercises, boom will be inspected for signs of structural deficiencies. If a tear in fabric or rotting is observed, boom will be repaired or replaced. In addition, end connectors will be inspected for evidence of corrosion. If corrosion is detected, equipment will be repaired or replaced.
> - Miscellaneous equipment – Other response equipment identified in this Plan will be inventoried and tested on an annual basis to ensure that the stated quantities are in inventory and in proper working order. The equipment inspection and deployment exercises are recorded and maintained at the facility and retained for a period of
> - five years. [emphasis added]

In reference (ii), Trans Mountain sets out the response tactics that would be utilized in responding to a spill into the North Thompson River near Darfield, British Columbia. Trans Mountain states that it would "dispatch 2 vacuum trucks from Kamloops to the area".

Trans Mountain goes on to state: "A vacuum truck is mobilized from Kamloops to the work area to store and transport recovered oil to an appropriate disposal facility", and that "additional vacuum trucks will be dispatched if oil recovery rates or volumes warrant this action".

Similar details are provided with respect to the other spill scenarios. In the Fraser River near Hope, British Columbia scenario, for instance, Trans Mountain refers to a vacuum truck being dispatched from Chilliwack, a "second vacuum truck" being dispatched if required, and recovered oil being "transported from the response work area to an appropriate disposal facility by locally sourced vacuum trucks".

Request:

a) Please provide a sample of the equipment inspection records referred to in reference (i).

b) Are these records required by, provided to and reviewed by the NEB?

c) Would the vacuum trucks referred to in reference (ii) be available for immediate dispatch at any time of day? Would the "additional vacuum trucks" and "locally sourced vacuum trucks" be similarly available?

Response:

a) Although the information requested is not within the scope of this proceeding and not relevant to the National Energy Board's (NEB) List of Issues, Trans Mountain Pipeline ULC (Trans Mountain) offers the following response to your question:

Please refer to the response to Province of BC IR No. 2.21b.

Kinder Morgan Canada Inc. (KMC) has attached (Province of BC IR No. 2.23a Attachment 1) a sample of the inspection form for the Oil Spill Containment and Recovery Units. KMC also has forms for post incident/use, and monthly, spring, and annual inspection checklists. The response boats are inspected annually, and receive regular maintenance by certified technicians.

b) Maintenance and Training records are part of Kinder Morgan Canada Inc.'s (KMC) Integrated Safety and Loss Management System (ISLMS). Specifically, the KMC Training Department and KMC Emergency Response and Security Department has accountability for maintaining training records related to the Emergency Management Program. The National Energy Board (NEB) may request the records during an audit of the ISLMS or programs within the ISLMS, in which case KMC would supply those records to the NEB.

c) With regard the EMP, please refer to the response to Province of BC IR No. 2.21b.

The details of the response scenarios described in Trans Mountain Follow-Up Response to Province of BC IR No. 1.25 (Filing ID A4A2Z5) would be subject to adjustment depending upon the availability of vacuum trucks in proximity to a particular response location at the time of the spill. The sourcing locations in the referenced response were stated to provide the reader with a sense of what type of response resources might be utilized and from where they would be sourced. In many cases, the closest available resources are the most desirable.

The availability of vacuum trucks, locally sourced or otherwise, varies according to activity levels in their respective businesses and locations. For this reason, Kinder Morgan Canada (KMC) maintains business relationships with multiple vacuum truck service providers to ensure the greatest probability of sourcing this equipment and trained operators for rapid response when and where needed.

KMC's experience in both BC and Alberta has been that when required, vacuum trucks for emergency spill response are typically available irrespective of the time of day or night. Their arrival time onsite would not typically delay oil recovery operations at a river spill as there are portable temporary oil storage tanks available with the other spill response equipment deployed in an Oil Spill Containment and Recovery (OSCAR) unit.

As an example of the services available to KMC a letter from McRaes, a contractor with whom KMC maintains a Master Service Agreement, is attached (Province of BC IR No. 2.23c Attachment 1).

2.24 Personnel and contractors for land-based spill response

Reference:

i. A4A2Z5, Trans Mountain Follow-Up Response to BC IR No. 1.25, PDF p. 12 of 30.

ii. A4D3F2, Trans Mountain EMP documents, Attachment 2.3 – Pipeline Emergency Response Plan, Section 9.6.2, Contractors, Contractor Equipment and Labor, PDF p. 110 of 191.

iii. A4A2Z5, Trans Mountain Follow-Up Response to BC IR No. 1.25, PDF p. 16 of 30.

Preamble:

In reference (i), Trans Mountain states, for instance, that in responding to a spill into the North Thompson River near Darfield, British Columbia, it would:

- Mobilize 6 available responders and required supplies from North Thompson and Kamloops districts to the spill site to initiate measures the prevent oil from making its way across the Yellowhead Highway and minimize amount of oil reaching the North Thompson River.
- Mobilize available responders via vehicle from North Thompson and Kamloops districts, estimated 15 personnel, to a pre-designated meeting point in Barriere.
- Mobilize additional required personnel from Sumas, Burnaby and Alberta Districts by vehicle (15-20 personnel available) to pre-designated meeting points in Barriere.

The Pipeline ERP (reference (ii)) provides that "Kinder Morgan has ensured by [*sic*] the availability of private personnel and equipment necessary to respond, to the maximum extent practicable".

Reference (iii) provides that Trans Mountain would "contact O'Briens Group (currently contracted as Incident Management Team service provider) and notify them to begin preparing to provide replacement Incident Management".

Request:

a) How many Trans Mountain employees are located in British Columbia? Please detail their job titles, locations, and level of spill response training. If necessary, employee names may be redacted and replaced by a non-personal identifier (e.g. "Employee #1", "Employee #2", etc.).

b) How does Trans Mountain ensure the availability of private personnel and equipment, as stated in reference (ii) above?

c) What exactly is meant by the qualification that contractor and equipment availability is ensured "to the maximum extent practicable"?

d) Would the personnel referred to in reference (ii) be directly employed by Trans Mountain, or contracted labor? If the latter, would they be on retainer for guaranteed response on a 24/7 basis?

e) Please provide a list of all contractors (personnel and equipment suppliers) that are currently on retainer for guaranteed response (i.e. contractors that have a contractual obligation to immediately respond upon request)?

f) Please identify the contracted response time for each contractor identified in response to request e) above.

g) In specific reference to reference (iii), where is O'Briens Group located?

h) Approximately how long would it take for O'Briens Group to travel to Darfield, British Columbia in order to provide replacement Incident Management?

i) How many of the response contractors (providers of equipment and/or personnel) with which Trans Mountain has entered or plans to enter into retainer agreements are located outside British Columbia? How many are located outside Canada?

Response:

a) Kinder Morgan Canada is the operator of the Trans Mountain Pipeline. There are approximately 92 Kinder Morgan Canada employees based in British Columbia. Numbers, functions and spill response training follow:

Operations & Maintenance Field Personnel[1]	**(62 people in classification)**
Training Course/module:	
ICS training to level appropriate for expected response duties	62
Incident Safe Approach	62
Hazardous Waste Operations and Emergency Response (HAZWOPER)	1
Administrative[2]	**(6 people in classification)**
Training Course/module:	
ICS training to level appropriate for expected response duties	6
Accounting/Lands/External Communications[3]	**(6 people in classification)**
Training Course/module:	
ICS Training to level appropriate for expected response duties	6
Hazardous Waste Operations and Emergency Response (HAZWOPER)	2
Management/Engineering/Technical/EHS[4]	**(18 people in classification)**
Training Course/module:	
ICS Training to level appropriate for expected response duties	18
Hazardous Waste Operations and Emergency Response (HAZWOPER)	16

Notes:

1. Includes titles PLP Technician, Pipeline Integrity Tech, Pipeline Maintenance Tech, Operator Tech, Mechanical Tech, Electrical Tech, Instrument Tech, PLM Tech, Heavy Duty Mechanic, PLM Tech (Temp), PLP Tech (Temp)
2. Includes title Admin Assistant
3. Includes titles Lands Administrator, Ops Budget Analyst, Communications Advisor, Damage Prevention Coordinator, Permit Tech
4. Includes titles Director, Manager, Supervisor, Regional Engineer, Integrity Engineer, EHS Coordinator

With regard to the EMP, please refer to the response to Province of BC IR No. 2.21b.

b) Kinder Morgan Canada Inc. (KMC), operator of the Trans Mountain Pipeline, maintains up to date master agreements or other commercial business relationships with multiple spill response organizations, equipment suppliers and contractors within British Columbia, Canada and the United States through its EHS and Procurement Departments to ensure that required services, personnel and equipment are available when needed. In addition KMC is, and will continue to be, able to access further response resources as required through the network of contacts maintained by its primary spill response contractors. An example of this approach would be working through Western Canadian Spill Services (WCSS), Western Canada Marine Response Corporation (WCMRC), or through parties to the CEPA mutual aid agreement to access these networks of response personnel and equipment providers.

Through the diversification of its spill response service and equipment providers described above, KMC is confident that private personnel and equipment (in the context of the Request) will be available as and when needed.

With regard to the EMP, please refer to the response to Province of BC IR No. 2.21b.

c) Kinder Morgan Canada Inc. (KMC) takes its responsibility to respond to pipeline incidents very seriously. During the response to an emergency incident on its system, KMC will use its own trained personnel and if required, response contractors and equipment and/or assistance from one or more of its mutual aid partners.

KMC belongs to a number of response organizations and participates in mutual aid exercises to supplement the company's self-reliant response capability. KMC has contracts and master services agreements with a number of response contractors to supply equipment and/or personnel during an emergency, some of whom are identified in Section 4.5.2 of Volume 7 (Filing ID A3S4V5), many others are identified in the KMC Emergency Response Plans. Mutual aid agreements are in place if needed.

The qualification that contractor and equipment availability is ensured "to the maximum extent practicable" means that KMC's expectation is that contractor services and equipment are available unless very unusual circumstances arise such as, but not limited to:

- severe weather on some or all of the mobilization route creates unsafe conditions to mobilize utilizing vehicles, vessels or aircraft, the mode of transportation depending on the requirements of the emergency,
- a combination of road closures and poor visibility make it unsafe to transit to the incident with a combination of vehicles and aircraft,
- a major emergency incident occurs elsewhere in a particular contractor's area of operations that impairs their ability to respond.

KMC maintains commercial relationships with a number of service providers of pipeline incident response services to provide diversity and to maximize the likelihood of all required resources being available to respond when and where needed. KMC's Emergency Response Plans contain listings of the various contractors and service providers operating in the geographic districts transited by the pipeline. KMC has not disclosed the names of contractors or service providers for privacy reasons.

With regard to the EMP, please refer to the response to Province of BC IR No. 2.21b.

d) Although the information requested is not within the scope of this proceeding and not relevant to the National Energy Board's (NEB) List of Issues (Filing ID A3V6I2), Trans Mountain Pipeline ULC (Trans Mountain) offers the following response to your question:

It is anticipated that the personnel referred to in reference (ii) would be trained employees of private contracting businesses with which KMC has or will have a commercial relationship.

The details of contractual terms to be put in place with emergency response service or equipment providers prior to operation of the expanded pipeline system are not available at this time as the development of the enhanced Emergency Management Program (EMP) has not yet been completed. The enhanced EMP will be one of the key inputs to guide Kinder Morgan Canada Inc.'s (KMC) future response resource needs.

With regard to the EMP, please refer to the response to Province of BC IR No. 2.21b.

e) Kinder Morgan Canada (KMC) maintains Master Service Agreements (MSA) with many contractors including those that provide Emergency Response services. Many of the companies for which MSAs have been negotiated offer immediate Emergency Response services, 24 hours per day. Retainer agreements to guarantee contractor availability for emergency response have in many cases proven unnecessary. That said, KMC does have retainer arrangements with a number of service providers. The names cannot be included in this response as contract information is commercially sensitive and is proprietary.

Emergency response requests have received priority status from contractors and the contractor resources have typically initiated an expedited response with rare exceptions. KMC anticipates and expects that this will continue.

A sampling of the contractors that provide emergency response services, with which KMC has MSAs in place include Quantum Murray, Golder Associates, McRae's Environmental and Fire Master Oilfield Services.

The contractual agreements with West Coast Marine Response (WCMRC) and Western Canada Spill Services (WCSS) are slightly different from other emergency response services and equipment providers:

Kinder Morgan Canada has an emergency response agreement in place with West Coast Marine Response Corporation (WCMRC) specifically for marine spills originating at Westridge Marine Terminal in Burnaby, BC. The agreement guarantees the response of WCMRC for marine spills at Westridge for durations of up to 24 hours, with specific stipulated response times. If the requirement for WCMRC response extends beyond 24 hours the agreement includes provision for extension.

KMC is a member company with Western Canada Spill Services, a spill response cooperative which maintains spill response equipment accessible to all its member companies in a number of locations across Alberta and in northeast BC.

Please also refer to Province of BC IR No. 2.24c.

f) Please refer to the response to Province of BC IR No. 2.21b.

KMC's contract with Western Canada Marine Response Corporation (WCMRC) contains contracted response times.

KMC is a shareholder in WCMRC and maintains with it a current response services agreement. WCMRC are federally certified through Transport Canada (TC), under the Canada Shipping Act to provide response services in the event of an oil spill into the marine environment on the West Coast of British Columbia.

Within the Application, Volume 8A, Section 5.5.1.1 (Filing ID A3S4Y6), federally mandated response times are outlined in Table 5.5.2: WCMRC Response Time Planning Standards. Trans Mountain Pipeline ULC (Trans Mountain), in consultation with WCMRC, has proposed reduced response times, as noted in Volume 8A, Table 5.5.3, Proposed Improvements to WCMRCs Emergency Response Capacity, of the Application (Filing ID A3S4Y6). A copy of the table is attached (Province of BC IR No. 2.24f Attachment 1) showing the proposed improvements to WCMRC's emergency response capacity. For convenience and comparison, Volume 8A, Table 5.5.2 (Filing ID A3S4Y6) with existing WCMRC Response Time Planning Standards is shown below:

TABLE 5.5.2

WCMRC RESPONSE TIME PLANNING STANDARDS

	150 tonnes (Tier 1)	1,000 tonnes (Tier 2)	2,5000 tonnes (Tier 3)	10,000 tonnes (Tier 4)
Inside Designated Port boundary	Deployed on-scene in Designated Port boundary 6 hours	Deployed on-scene in Designated Port boundary 12 hours	N/A	N/A
Inside Primary Area of Response/ Enhanced Response Area	N/A	N/A	Delivered on-scene in Primary Area of Response / Enhanced Response Area boundary 18 hours	Delivered on-scene in Primary Area of Response / Enhanced Response Area boundary 72 hours
Outside Primary Area of Response/ Enhanced Response Area	N/A	N/A	Delivered on-scene outside Primary Area of Response / Enhanced Response Area 18 hours + travel time	Delivered on-scene outside Primary Area of Response / Enhanced Response Area 72 hours + travel time

Note: On water recovery operations for spills in sheltered and unsheltered waters are to be completed within 10 operational days from initial deployment of equipment.

Source: WCMRC 2012

With regard to the EMP, please refer to the response to Province of BC IR No. 2.21b.

g) Witt O'Brien's (O'Brien's) has offices in 10 U.S. locations as well as in the U.K. and Brazil. The offices on the west coast of North America are located in Bellingham, WA,

Anchorage, AK and Brea, CA. To date, Kinder Morgan Canada Inc. has interacted to the greatest degree with personnel based at the Bellingham, WA office.

h) Based on their current configuration it would take O'Brien's personnel approximately 12 to 48 hours after notification to mobilize to Darfield, British Columbia. This assumes no severe travel delays due to extremely poor visibility, which can occur in winter and which may temporarily impact both road and air travel times.

In the event of a release Kinder Morgan Canada Inc. (KMC) has the resources to fully implement the initial field response including trained personnel to fill incident command system (ICS) positions. When O'Briens Group personnel arrive to support the response, they provide oversight, and in some cases relieve KMC personnel in ICS positions, and are not core to initial response.

i) The details of the contractual terms to be put in place with emergency response service or equipment providers prior to operation of the expanded pipeline system are not available at this time as the development of the enhanced Emergency Management Program (EMP) has not yet been completed. The EMP will be one of the key inputs to inform KMC as to what its future response resource needs will be.

With regard to the EMP, please refer to the response to Province of BC IR No. 2.21b.

2.25 Training and exercises

Reference:

A4D3F2, Trans Mountain EMP documents, Attachment 2.3 – Pipeline Emergency Response Plan, Section 17.1, Training, PDF p. 191 of 191.

Preamble:

The Pipeline ERP gives a brief overview of the training Trans Mountain provides to employees and states that "[t]raining records are the joint responsibility of the Operations Training Coordinator, and Emergency Response and Security Advisor".

Request:

a) Please provide a copy of the most recent training records referred to above. If, owing to security concerns, the names of employees cannot be disclosed, they may be redacted and replaced by a non-personal identifier (e.g. "Employee #1", "Employee #2", etc.).

b) Please provide the training and exercise participation record for each Trans Mountain employee, using a non-personal identifier if required.

c) If either training or exercise participation is not tracked for individual employees, please explain why, and explain how Trans Mountain ensures that responders are suitably trained and exercised in the absence of such tracking.

Response:

a) Please see response to City of Surrey IR No. 1.4g (Filing ID A3X6A5) which states the following:

The following is the number of Kinder Morgan Canada Inc. (KMC) individuals with current, valid training as of May 1, 2014. It is important to understand that not every employee or members of the incident management team require the same training, and training is based on the expected response duties. The list also does not include those who have expired certification and are currently refreshing their courses.

- Incident Command System Training – 165
- Incident Safe Approach – 95
- Supervisor Fire Fighting Training – 5
- Fire Suppression (Foam and Water) – 88
- Tank Fire Suppression – 23
- Hazardous Waste Operations and Emergency Response (HAZWOPER) – 42

With regard to the EMP, please see response to Province of BC IR No. 2.21b.

b) Members of the Incident Management Team are required to attend at least one exercise every 3 years to remain on the team. Typically the Incident Management Team

members participate at least every second year, with several members of the team participating 1 to 3 times per year.

Please also refer to Province of BC IR No. 2.25a.

c) Please refer to the response to Province of BC IR No. 2.23b.

2.26 Incident Command Posts and staging areas

Reference:

A4D3F2, Trans Mountain EMP documents, Attachment 2.3 – Pipeline Emergency Response Plan, Section 11.3.1, Incident Command Post, and Section 11.3.3, Staging Areas, PDF p. 171-172 of 191.

Preamble:

The Pipeline ERP provides a brief description of the purpose of an Incident Command Post (ICP) and of the selection of staging areas.

Request:

a) Has Trans Mountain pre-designated potential ICP locations in British Columbia and assessed their suitability for large multi-agency response operations (i.e., space available, phone lines, internet/Wi-Fi capabilities, amenities, access, etc.) along the pipeline, Trans Mountain facilities, and tanker routes?

b) If yes, are pre-designated ICP facilities immediately available for use upon demand? If not, what is the minimum lead time required to gain access to such a facility?

c) If Trans Mountain has not pre-designated and assessed potential ICPs in British Columbia, please explain why and indicate whether Trans Mountain will commit to doing so prior to the commencement of Project operations.

d) Please provide the information requested in a)-c) above with respect to staging areas.

Response:

a) Kinder Morgan Canada Inc. (KMC) has pre-designated potential Incident Command Post (ICP) and Staging Area locations along the current pipeline corridor and in communities where its facilities are located. Access to these facilities, and the lead time required varies depending on the location and type of facility being used. Specifically KMC has identified resources in the following communities:

- British Columbia: Burnaby, Richmond, City of Vancouver, Abbotsford, Chilliwack, Hope Merritt, Kamloops, Clearwater, Blue River, Valemount;
- Alberta: Jasper, Hinton, Edson, Gainford, Edmonton, Sherwood Park.

KMC has agreements and protocols in place where appropriate with the service providers. All facilities meet the requirements for internet and telephone connectivity, food, lodging, meeting space, parking, and security for a multi-agency response.

With regard to the EMP, please refer to the response to Province of BC IR No. 2.21b.

b) Please refer to the response to Province of BC IR No. 2.26a.

c) Please refer to the response to Province of BC IR No. 2.26a.

d) Please refer to the response to Province of BC IR No. 2.26a.

Please refer to the response to Province of BC IR No. 2.21b.

2.27 Communications

Reference:

A4D3F2, Trans Mountain EMP documents, Attachment 2.3 – Pipeline Emergency Response Plan, Section 11.4, Communications, PDF p. 172 of 191.

Preamble:

The Pipeline ERP provides a brief description of the modes of communication during an emergency situation.

Request:

a) Please provide a copy of the detailed communications plans Trans Mountain has developed to ensure that the capabilities and capacity outlined in the ERP are planned for and available.

b) If such a plan does not exist, please explain why and whether Trans Mountain will commit to the development of such a plan prior to the commencement of Project operations.

c) Has Trans Mountain prepared communications materials in advance of an incident for immediate use in the event of an emergency? If not, will Trans Mountain do so?

Response:

a) Additional documentation referred to in the Emergency Response Plans such as communication plans, security plans, initial health and safety plans, health and safety plans, refuelling plans, lodging and food plans, medical plans etc. are documents that are produced at the time of an incident as part of the overall Incident Action Plan. The content and format of these specific action plans is largely driven by the Incident Command System (ICS) process.

Specific communication strategies will depend upon the nature of the incident and would be approved under the Incident Command System. Kinder Morgan Canada Inc. (KMC) is committed to timely communications with those that are directly impacted by any emergency event. The methods used for informing the public include door to door delivery of information, social media, traditional media, website updates and a phone hotline. KMC maintains a standby website that can to be activated and populated as needed, the hotline is also ready to go live at the time of an incident. The public is notified about the hotline number via the website, social media and traditional media, along with any information package that may be prepared for distribution to those impacted by an emergency, and/or at open house style events.

With regard to the EMP, please refer to the response to Province of BC IR No. 2.21b.

b) Please refer to the response to Province of BC IR No. 2.27a.

c) Please refer to the response to Province of BC IR No. 2.27a.

Please refer to the response to Province of BC IR No. 2.21b.

2.28 Security during spill response

Reference:

A4D3F2, Trans Mountain EMP documents, Attachment 2.3 – Pipeline Emergency Response Plan, Section 11.5, Security, PDF p. 172 of 191

Preamble:

The Pipeline ERP highlights the need for security measures to be in place during the response to an emergency, and refers to a security plan form.

Request:

a) Has Trans Mountain developed a detailed security plan? If yes, has it been filed or will it be filed with the NEB?

b) If Trans Mountain has not developed such a plan, please explain why and indicate whether Trans Mountain will commit to preparing such a plan prior to the start of Project operations.

c) Does Trans Mountain have security contractors on retainer to ensure that security can be established and maintained as soon as possible in the event of an incident?

d) If not, please explain why and indicate whether Trans Mountain will commit to doing so prior to the start of Project operations.

Response:

a) Additional documentation referred to in the Emergency Response Plans such as communication plans, security plans, initial health and safety plans, health and safety plans, refuelling plans, lodging and food plans, medical plans etc. are documents that are produced at the time of an incident as part of the overall Incident Action Plan. The content and format of these specific action plans is largely driven by the Incident Command System (ICS) process.

With regard to the EMP, please refer to the response to Province of BC IR No. 2.21b.

b) Please refer to the response to Province of BC IR No. 2.28a.

c) Kinder Morgan Canada Inc. (KMC) has contractual relationships with contractors able to promptly supply additional equipment and personnel during any type of emergency including fire events.

With regard to the EMP, please refer to the response to Province of BC IR No. 2.21b.

d) Please refer to the response to Province of BC IR No. 2.28c.

2.29 Emergency Response Line

Reference:

i. A3Y2E6, Trans Mountain Response to City of Burnaby IR No. 1.07.21 b), PDF p. 185 of 754.

ii. A3Y2E6, Trans Mountain Response to City of Burnaby IR No. 1.07.23 e), PDF p. 188 of 754.

iii. A4D3F3, Trans Mountain EMP documents, Attachment 2.4 – Terminals & Tank Farms Emergency Response Plan, Section 7.3.2, Public Notification, PDF p. 64 of 177.

Preamble:

In reference (i), Trans Mountain states that it will not expand the Emergency Response Line system so as to include emergency services personnel.

Reference (ii) states that "Kinder Morgan Canada does not currently have an early warning system to communicate risk to the public".

Reference (iii) describes the public notification system currently in place at the Sumas Terminal:

> Sumas Terminal subscribes to a mass Callout System, to assist in providing timely information to residents near the Trans Mountain Sumas terminal in the event of a pipeline emergency or maintenance that has potential for major disruptions. The Trans Mountain Callout System is intended to improve and augment the notification program and to provide more timely notifications to neighbours. …

Request:

a) Why will Trans Mountain not consider expanding the system so as to include first responders?

b) At what point in an emergency situation will first responders be notified?

c) Will Trans Mountain commit to the implementation of an early warning system to communicate risk to the public?

d) Why is the mass Callout System described in reference (iii) not used at all Trans Mountain tank farm and terminal facilities? Would Trans Mountain commit to implementing this system at all Trans Mountain facilities?

Response:

a) As outlined in response to. City Burnaby IR No. 1.07.21b (Filing ID A3Y2E6), the Emergency Response Line (ERL) process is for Kinder Morgan Canada Inc. (KMC) to identify the extent and location of an emergency and assess initial response actions/resources required, and confirm necessary external notifications have been completed.

b) Local first responders are contacted immediately, upon discovery of an emergency condition, and oftentimes when an emergency is suspected.

c) At this time, Trans Mountain is unable to commit to implementation of an early warning system as described.

Please refer to the response to Province of BC IR No. 2.21b.

d) As a point of clarification, Trans Mountain's response to City of Burnaby IR No. 1.07.23e (Filing ID A3Y2E6) stated that Kinder Morgan Canada does not currently have an early warning system to communicate risk to the public. This response was meant to refer specifically to Trans Mountain facilities in Burnaby.

The Sumas Callout System is a trial installation. Kinder Morgan Canada Inc. (KMC) is still evaluating the effectiveness of its notification system at its Sumas terminal as part of a trial implementation, a decision regarding the implementation of a callout system at other facilities has not yet been made. Please refer to the response to Province of BC IR No. 2.29c.

KMC is committed to working collaboratively with response agencies, local municipalities and first responders in the areas of emergency response and public notifications.

Please refer to the response to Province of BC IR No. 2.21b.

2.30 Evacuations

Reference:

i. A3Y2E6, Trans Mountain Response to City of Burnaby IR No. 1.03.08 c), PDF p. 69 of 754.

ii. A4D3F2, Trans Mountain EMP documents, Attachment 2.3 – Pipeline Emergency Response Plan, Section 9.8, Public Evacuation Plan, PDF p. 110 of 191.

iii. A4D3F2, Trans Mountain EMP documents, Attachment 2.3 – Pipeline Emergency Response Plan, Section 8.2, Use of Emergency Response Criteria in Public Health Protection Strategy, PDF p. 161 of 191.

Preamble:

In reference (i), Trans Mountain states:

> During consultation with various fire departments, including the City of Burnaby, it has been expressed by those agencies that KMC does not have the authority to order evacuation, and/or conduct the evacuation of residents, schools, daycares, hospitals, businesses, parks, recreation facilities, and other public/private places, nor does it have the authority to close roads, redirect traffic, public transit and other transportation related infrastructure. KMC agrees with the interpretation of the federal, provincial and municipal legislation dealing with emergency programs. [emphasis added]

However, the Pipeline ERP (as well as the other filed ERPs) provides as follows in reference (ii):

> If the public is immediately threatened in the initial stages of the incident and evacuation is required before local response agencies arrive at the scene of the emergency, the Incident Commander must ensure public protection and may request available company personnel to initiate an evacuation and/or site perimeter security, which may include roadblocks. Evacuation duties will be turned over to local response agencies as soon as possible. [emphasis added]

Finally, the ERP (in reference (iii), for instance) refers to “shelter in place” as an alternative to evacuation, depending on the circumstances.

Request:

a) Even if, as stated in reference (i), Trans Mountain does not have the authority to order and/or conduct evacuations, the EMP documents state that company personnel may initiate an evacuation if it is required before local response agencies arrive at the scene (reference (ii)). Has Trans Mountain carried out any assessments and planning in order to determine potential evacuation zones based on the nature of the product shipped through the pipeline or stored at Trans Mountain’s facilities? Please provide an answer with respect to both Line 1 and Line 2.

b) If not, does Trans Mountain plan to carry out such assessments and planning?

c) To what extent has Trans Mountain engaged in evacuation planning, drills and exercise with local response agencies? Please provide documentation to verify the planning carried out to date.

d) Does Trans Mountain not have the authority to initiate voluntary tactical evacuations where an incident poses a threat to the public?

e) If so, what plans are in place for the initiation of tactical evacuations?

f) If no plans are currently in place, will Trans Mountain develop them?

g) What steps has Trans Mountain taken to educate members of the public who live or work near the pipeline or facilities about the safe execution of a "shelter in place" decision?

h) If Trans Mountain has not conducted any public education, drills and exercises for a "shelter in place" scenario, will Trans Mountain commit to doing so on a regular basis?

Response:

a) KMC confirms that it has carried out assessments of potential evacuation zones in relation to its storage terminal facilities. The existing emergency response plans for these facilities include aerial photo maps outlining the initial evacuation zones for fire events including potential roadblock location. These maps provide a means to expedite decisions by the unified command or incident commander in the early stages of an incident.

Please refer to the response to Province of BC IR No. 2.21b. The enhanced EMP will be developed, including similar analysis of potential evacuation zones, to reflect the needs of the expanded pipeline system if Line 2 is approved.

b) Please refer to the response to Province of BC IR No. 2.30a.

c) Kinder Morgan Canada's (KMC) efforts to date with local emergency responders have been focused on ongoing efforts to enhance first responder familiarity with its facilities, the properties of the petroleum products transported and stored on the pipeline system, safety procedures for response to various operating upset and emergency conditions that may occur, required personal protective equipment and air and petroleum vapour monitoring protocols among others. There have not been field exercises with local emergency responders solely for the purpose of practicing evacuations; however some of the joint exercises undertaken with local authorities and responders have included evacuations as an element of the scenario.

A comprehensive listing of all emergency management exercises completed by KMC from 2009 to March, 2014 can be found in NEB IR No.1.69A (Filing ID A3W9H8). Those that have included evacuation activities as part of the scenario from 2009 to March 2014 are listed below:

Kamloops, March, 2009 - participants included Kamloops Fire and Rescue, BC Ministry of Environment, Upper Nicola Band, First Nations Emergency Services, BC Provincial Emergency Program.

Richmond, January 2010 - participants included City of Richmond Fire Department, Vancouver International Airport, BC Oil & Gas Commission, Transport Canada, BC Provincial Emergency Program, Richmond RCMP, Quantum Murray.

Edmonton, October 2012 - participants included National Energy Board, RCMP, First Response.

Although KMC is not responsible for the emergency planning of other organizations, it welcomes the opportunity to work collaboratively with organizations and responders in developing a protocol/plan to ensure a safe and timely response to incidents at its facilities and along the pipeline, including evacuations should that be required to ensure the safety of nearby residents. KMC will continue to offer to review emergency response plans (ERP), educate their personnel on our operations, and provide advice on proper response techniques. KMC prefers to jointly manage incidents with the local, provincial and federal authorities in the jurisdiction of the emergency using Unified Command within the Incident Command System (ICS).

Please refer to the response to Province of BC IR No. 2.21b.

d) Kinder Morgan Canada Inc. (KMC) does not have the authority to order evacuation, and/or conduct the evacuation of public/private places, nor does it have the authority to close roads, redirect traffic, public transit and other transportation related infrastructure. This has been confirmed to KMC through discussion with various municipal emergency response organizations. KMC agrees with the federal, provincial and municipal legislation dealing with emergency programs.

KMC will endeavor to warn the public of unsafe conditions, advise of the need to evacuate, and attempt control the entry of the public into spill response sites for reasons of safety whenever necessary, however, it cannot enforce these access restrictions. To augment its own efforts KMC prefers to work collaboratively with local first responders through an Incident Command System (ICS) structure to coordinate the above activities as well as others in the unlikely event that the need arises.

Please refer to the response to Province of BC IR No. 2.21b.

e) Please see response to Province of BC IR No. 2.30a. Please refer to the response to Province of BC IR No. 2.21b.

Although the information requested is not within the scope of this proceeding and not relevant to the National Energy Board's (NEB) List of Issues (Filing ID A3V6I2), Trans Mountain Pipeline ULC (Trans Mountain) offers the following response to your question:

Additional documentation referred to in the Emergency Response Plans such as communication plans, security plans, initial health and safety plans, health and safety

plans, refuelling plans, lodging and food plans, medical plans etc. are documents that are produced at the time of an incident as part of the overall Incident Action Plan. The content and format of these specific action plans is largely driven by the Incident Command System (ICS) process. Detailed plans are developed to address specific incident conditions and depend upon many details that cannot be known in advance.

Kinder Morgan Canada Inc. (KMC) will endeavor to warn the public of unsafe conditions, advise of the need to evacuate, and attempt control the entry of the public into spill response sites for reasons of safety whenever necessary.

The emphasized statement reference (ii) reflects KMC Response Philosophy and is important to clarify. The KMC Response Philosophy is summarized in the KMC ICS Guide (Filing ID A63573), one of the documents of the existing KMC Emergency Management Program. Although KMC does not have the regulatory authority to enforce evacuations this does not and will not impede KMC's efforts to request such actions and take response actions that are in the interest of public safety.

The KMC Response Philosophy from the ICS Guide is shown below. It is used to provide general guidance to first responders, including KCM personnel. Note that the first step 1.2.1 Control the Incident Site pertains to initiating evacuation as does step 1.2.4 Establish Initial Objectives.

1.2 Kinder Morgan Response Philosophy

On all emergency incidents, Kinder Morgan will follow the following basic response approach:

1.2.1 Control the Incident Site

- The incident scene must first be controlled to ensure a safe and effective response to any incident:
- Don't rush in; hazards must first be fully assessed
- Establish and announce command at the ICP, either at the incident scene location or, if necessary at a remote location
- Establish and maintain an isolation perimeter, with hot, warm and cold zones
- Establish staging area(s)

1.2.2 Size up the Situation

- A site assessment will identify the scope and nature of the incident, as well as any potential hazards to responders:
- Recognize and identify any hazardous materials involved
- Source of any releases
- Potential exposures

1.2.3 Evaluate the Hazards and Risks

- An assessment must be conducted to evaluate the level of risk to responders and the public:
- Assess health, physical and chemical hazards
- Gather technical data (MSDSs, etc.)

- Conduct vapour monitoring

1.2.4 Establish Initial Objectives

- After the potential hazards have been identified, the Incident Commander(s) can establish the initial objectives for the response. Typical initial objectives include:
  - Control the incident Scene
  - Ensure the safety of responders and the public
  - Establish Incident Command Post

1.2.5 Select and Don PPE

- All incident responders must be protected with the PPE appropriate to the hazards present:
  - Approved Fire-Resistant Coveralls
  - Hard Hats (where overhead hazards are present)
  - Gloves
  - Splash Goggles
  - Rubber Steel-Toed Boots
  - Also:
  - PPE must be worn properly in order to fully protect responders.
  - Damaged or heavily-oiled PPE should be replaced as soon as possible

KMC prefers to work collaboratively with local first responders through an Incident Command System (ICS) structure to coordinate the above activities as well as others in the unlikely event that the need arises.

In the event of a spill or other emergency condition occurring, the current Trans Mountain Emergency Response Plan (ERP) is activated and municipal, provincial and federal authorities responsible for the protection of public health and safety will be notified. Evacuation of affected areas, conducted by local emergency responders, will occur if the health and safety of the public is threatened. The Trans Mountain ERP sets out the steps to contact local emergency services, this initiates the process that may lead to tactical evacuations.

At the time of a spill or other emergency condition Kinder Morgan Canada (KMC) and the local authority will make decisions about public safety and evacuation based on air monitoring of several parameters. KMC is willing and able to work with local authorities to determine the best course of action to protect the public and the environment. KMC will continue with its work to build awareness of its operations and potential emergency conditions with local emergency responders and local governments, sharing its emergency response plans, and ensuring a clear understanding of respective roles.

f) Kinder Morgan Canada Inc. (KMC) does not plan to develop tactical evacuation plans for municipalities or institutions since KMC does not have the authority to implement such plans unilaterally. Please refer to the responses to Province of BC IR No. 2.30d and e.

KMC has always been committed to working with organizations, both public and private, to ensure there is a mutual understanding how the pipeline and/or operations at facilities

could impact those organizations for incorporation in their own emergency response plans, when those organizations request assistance. However, KMC is not responsible for the emergency planning of other organizations. KMC agrees with the federal, provincial and municipal legislation dealing with emergency programs.

KMC is committed to engaging with external stakeholders where our pipelines operate. We offer to review emergency response plans, educate on our operations, and provide advice on proper response techniques.

KMC's Public Awareness Program is designed to promote awareness of KMC's pipelines in the geographic area, increase knowledge or the regulations and KMC's requirements for working near our pipelines, educate first responders on KMC's emergency preparedness and response activities and protocols, prevent third party damage to KMC's pipelines, and to enhance public safety. KMC does this through annual mailing programs, presentations, meetings, and participating in industry tradeshows and community events. Our program is continually evolving as we endeavor to meet the changing needs of our stakeholders and regulatory requirements.

As part of its Public Awareness Program KMC has an ongoing program to provide Community Awareness Emergency Response (CAER) sessions to first responders along the pipeline system. These sessions provide information with regard to the type and properties of petroleum transported through the pipeline and how to respond safely. These sessions along with regular exercises provide Trans Mountain the opportunity to maintain working relationships with first responders and to ensure mutual awareness of response programs. As well, KMC conducts regular emergency response exercises and equipment deployments that include participation from local emergency responders.

KMC does not plan to develop tactical evacuation plans for municipalities or institutions since KMC does not have the authority to implement such plans. KMC believes that emergency response plans, including those relating to evacuations, shelter in place, and other tactics, are the responsibility of emergency planners for each municipality or institution, and the respective first response organizations in each jurisdiction.

In the event of a fire or spill involving petroleum liquids from one of its facilities, KMC would immediately activate its air monitoring program in the surrounding community and provide timely advice to emergency agency personnel regarding measured contaminant concentration levels. The emergency agencies would then provide instruction to area residents with regard to evacuation or shelter in place.

Building on relationships developed in-part through the CAER program and joint exercises KMC expects to work co-operatively with the municipal responders in the unlikely event of an emergency occurring and anticipates working collaboratively with these responders through an Incident Command System (ICS) structure to coordinate these and other activities in the unlikely event the need arises.

Please refer to the response to Province of BC IR No. 2.21b.

g) Section 4.7, Volume 7 of the Application (Filing ID A3S4V5) details Community Awareness and Emergency Preparedness programs including the Continuing Education Program and Consultation Program.

Kinder Morgan Canada Inc. (KMC), the operator of the Trans Mountain Pipeline system (TMPL), is regulated by the *National Energy Board Onshore Pipeline Regulations* (OPR). Section 4 of the OPR requires that KMC operate TMPL in accordance applicable CSA standards and in compliance with plans developed and implemented by KMC. As well, Section 35 of the OPR requires that KMC develop and deliver a public awareness program:

> *"A company shall develop a continuing education program for the police, fire departments, medical facilities, other appropriate organizations and agencies and the public residing adjacent to the pipeline to inform them of the location of the pipeline, potential emergency situations involving the pipeline and the safety procedures to be followed in the case of an emergency."*

KMC's Public Awareness Program is designed to provide information identifying the presence of pipelines in the community as well as to provide safety and damage prevention messaging to those who live or work near the pipeline, and to those who may be called upon to respond in the event of a pipeline emergency.

KMC's public awareness program objective is to raise the awareness of stakeholder audiences regarding the presence of pipelines in their communities and steps to prevent and respond to pipeline accidents. KMC is committed to conducting pipeline operations with a primary focus on protecting the safety of any people living or working near our pipelines.

KMC believes that effective public awareness programs are vital to continued safe pipeline operations and a more informed public along pipeline routes should supplement an operator's pipeline safety measures and should contribute to reducing the likelihood and potential impact of pipeline emergencies and releases.

KMC's public awareness program provides information on the following topics:

- Awareness of pipelines in the community and their role in transporting energy
- How to recognize and respond to a pipeline emergency
- Awareness of hazards and measures taken to prevent pipeline accidents/incidents
- Emergency preparedness and measures taken to mitigate consequences of incidents
- Prevention and impacts of third party damages on pipeline systems (One-call requirements)
- Impacts of right-of-way encroachment
- Hazards associated with unintended releases
- Pipeline location information
- How to get additional information

The program identifies four general types of audiences to receive communication of relevant information regarding pipeline public awareness. The four stakeholder audiences are:

- Affected Public
- Emergency Officials
- Local Public Officials
- Excavators

The Affected Public Stakeholder Audience is comprised of groups such as Residents, Occupants, Tenants, Landowners, Farmers, Homeowner Groups, and Neighborhood Organizations and Businesses (includes all of the various Places of Congregation and Gathering, including Schools). KMC subscribes to various databases available in provincial jurisdictions to identify details of properties affected by the pipeline, and uses this data to populate tract specific files that can be used in the GIS platform. The compiled addresses are then used as the affected public stakeholders to which KMC public awareness message is delivered.

The Emergency Officials, Public Officials, and Excavators are identified through identification of their respective constituencies or work areas relative to the pipeline. The lists of stakeholder's addresses are obtained from third-party compilers, One-Call Centres, and internal databases.

Message content delivered through the program reflects the needs and interests of each of the four general types of audiences. For each group content generally includes:

The Affected Public

- Purpose and reliability of pipelines
- How to contact KMC with questions or concerns regarding public safety, information on Integrity Management Programs to protect High Consequence Areas located in their area, emergency preparedness, public awareness, or land use practices that require a crossing permit.
- Awareness that they live or work near pipelines
- Hazards associated with unintended releases
- An overview of what KMC does to prevent pipeline accidents
- How to recognize and respond to a pipeline emergency
- What protective/response actions to take in the unlikely event of a pipeline release
- How to notify KMC in case of pipeline emergencies
- How to assist in preventing pipeline emergencies by following safe excavation/digging practices and reporting unauthorized digging or suspicious activity
- How to identify pipeline operators in their area
- How community or governmental decisions regarding land use may affect pipelines and the community along the pipeline ROW (supplemental)
- How individuals can create undesirable encroachments upon a pipeline ROW (supplemental)

Emergency Response Officials

- Purpose and reliability of pipelines
- How to get the location and detailed information of KMC's pipeline(s) that cross their area of jurisdiction
- Emergency contact numbers for KMC
- Information about potential hazards with KMC's transported products
- Information about KMC's emergency response plans for pipelines in their jurisdiction
- How to obtain pipeline location information
- How to notify KMC regarding pipeline emergency
- How to safely respond to a pipeline emergency
- An overview of what KMC does to prevent pipeline accidents
- How to contact KMC with questions or concerns regarding public safety, information on Integrity Management Programs to protect High Consequence Areas under their jurisdiction, emergency preparedness, public awareness, or land use practices

Local Public Officials

- Purpose and reliability of pipelines
- Information about KMC pipelines that cross their area of jurisdiction
- How community or governmental decisions regarding land use may affect KMC's pipelines and the community safety
- Hazards associated with unintended pipeline releases
- An overview of what KMC does to prevent pipeline accidents
- How to obtain pipeline location information
- How to inform our company of questions or concerns regarding public safety, Integrity Management issues, emergency preparedness, public awareness, or land use practices
- One-Call requirements

Excavators

- Purpose and reliability of pipelines
- Awareness that digging/excavating along KMC's ROW may affect public safety, pipeline safety, and/or pipeline operations
- Hazards associated with unintended pipeline releases
- Information regarding damage prevention requirements for the particular jurisdiction, including One-Call notification requirements
- How to obtain pipeline location information (supplemental)
- Information about safe excavation practices in association with underground utilities
- How to notify KMC about a pipeline emergency or regarding damage to our pipeline(s)
- Emergency and non-emergency contact numbers for KMC
- How to recognize a pipeline leak

Methods for delivering this content includes the following:

Brochures – The use of Public Awareness Brochures is the predominant delivery method used by KMC to communicate to stakeholder audiences. The brochures are delivered to stakeholder audiences via postal services as part of a direct mail out campaign. The brochures can also be delivered to the affected public by door-to-door contact along the pipeline right-of-way (ROW). Additionally, the brochures may be delivered to emergency officials, public officials, and excavators during group meetings.

Letters - Letters occasionally accompany the Public Awareness Brochures mailed to emergency officials. The letters contain additional information regarding KMC's activities in responding to a pipeline release, approximate pipeline location, and contact information.

Pipeline Maps - Emergency responders and public officials seeking pipeline maps are directed to secure mapping information from our mapping department. The type of mapping given to stakeholders is given in sufficient detail, provided it does not compromise the physical security of our pipeline systems and it must protect confidential and proprietary business information.

Response Cards / Bounce Back Cards - The cards may be used as a tool to evaluate the effectiveness of our program. KMC may utilize response cards to provide direct-mail recipients a means to provide comments or request additional information, to augment other evaluation methods, and/or as a part of a collaborative effort.

Personal Contact / Training - KMC may utilize group meetings (e.g., CAER Program) to communicate to selected stakeholder audiences such as emergency officials and excavators. Facility-specific emergency response training and drills, open houses, and other community events are conducted by KMC's local field personnel on an as-needed basis.

Videos (VHS, DVDs, Electronic Media Files, and CD's) - KMC may utilize videos in its public awareness program as a graphical representation to adjunct local presentations where appropriate.

E-mail - KMC may utilize e-mail as a means for sending public awareness information to stakeholders where stakeholders prefer this type of communication.

Public Service Announcements - Electronic media such as radio or TV may be used by KMC as a collaborative public service effort to deliver safety information.

Newspaper and Magazines - KMC may utilize newspaper and magazines as a means to deliver public awareness information to reinforce key safety information to broader audience.

Paid Advertising - KMC may utilize paid radio ads in communicating our public awareness message to stakeholders. From time to time, KMC will participate in paid advertising for special events to reinforce key safety information to a broader market.

Pipeline Markers - KMC utilizes pipeline markers on all of its pipeline right-of-ways. These markers are used to communicate the approximate location of the pipeline(s), provide public awareness that a buried pipeline or facility exists nearby, provide contact information in the event of a pipeline emergency, facilitate aerial or ground surveillance of the pipeline ROW, and provide warning to excavators about the presence of a pipeline(s).

One Call Center Outreach - KMC will utilize the efforts of One-Call Centers' outreach to stakeholders. KMC supports and participates in many initiatives developed by the One-Call Centers. Particularly, One-Call Centers conduct meetings and mailings directed towards excavators, public officials, and emergency response personnel. These meetings explain the state's damage prevention process, how pipeline operators work to ensure their facilities are protected, and how operators work to make pipelines safe for all who work and live around them. The meetings also inform stakeholders on how to respond should a pipeline accident occur. These meetings provide face-to-face contact between KMC personnel and stakeholders.

Kinder Morgan's Web Site - KMC will utilize its internet web site to communicate with affected stakeholders. Stakeholders can access additional information regarding pipeline public awareness from KMC's web site at www.kindermorgan.com/business/canada. Web access is available 24/7, and has the ability to provide additional, focused information.

Promotional Items (Specialty Advertising Materials) – At the discretion of field operations management, promotional items containing imprinted message content may be provided to stakeholder audiences at public awareness events or during personal contacts with stakeholders. Such items may communicate the company's 24-hour emergency contact number, the "Dig Safely" message, or other public education messages.

Please refer to Province of BC IR No. 2.30g - Attachments 1 through 9 for more details about the program. Attachments 1 through 7 provide some examples of brochures distributed as part of the program. Attachment 8 provides the table of contents for the program and Attachment 9 provides a matrix of message content and frequency for each of the four audiences.

KMC is committed to engaging with external stakeholders where our pipelines operate. KMC offers to review emergency response plans, educate on KMC's operations, and provide advice on proper response techniques. KMC conducts regular emergency response exercises and equipment deployments that include participation from local emergency responders.

During an emergency, KMC does not have the legislative authority to impose a shelter-in-place directive. However, KMC will work closely with groups such as community first responders, and other response agencies to ensure a safe and efficient response, which if required, will involve “shelter-in-place”.

KMC has always been committed to working with organizations, both public and private, to ensure there is a mutual understanding of how the pipeline could impact those organizations for incorporation in their own emergency response plans, when those organizations request assistance. KMC offers to review emergency response plans, educate on our operations, and provide advice on proper response techniques. KMC conducts regular emergency response exercises and equipment deployments that include participation from local emergency responders. However, KMC is not responsible for the emergency planning of other organizations.

Emergency planning in this context includes planning for the application of tactics such as evacuation and shelter-in-place when and where required, the education and awareness of residents about the municipality’s emergency plans, and if needed, the implementation of the plans.

Please refer to the response to Province of BC IR No. 2.21b. As part of the EMP review KMC will review information regarding shelter-in-place to ensure suitable messaging is incorporated into responses plans and public awareness materials.

Please refer to the response to Province of BC IR No. 2.21b.

Attachments:

- Province of BC IR No. 2.30g - Attachment 1: CAER Program Presentation
- Province of BC IR No. 2.30g - Attachment 2: KMC Mail Out to Elected Officials
- Province of BC IR No. 2.30g - Attachment 3: KMC Affected Public Mail Out Brochure
- Province of BC IR No. 2.30g - Attachment 4: Pipeline in Your Community: Homeowner Awareness (hand delivered)
- Province of BC IR No. 2.30g - Attachment 5: Annual Mail Out: 2014 Jet Fuel (pls. note, the 2015 topic is TMPL)
- Province of BC IR No. 2.30g - Attachment 6: Emergency Response Brochure (mail out)
- Province of BC IR No. 2.30g - Attachment 7: Damage Prevention Presentation
- Province of BC IR No. 2.30g - Attachment 8: Public Awareness Program Talbe of Contents
- Province of BC IR No. 2.30g - Attachment 9: Public Awareness Program – Appendix A

h) Please refer to Province of BC IR No. 2.30c and g.

Summary of New Commitments:

- The enhanced EMP will be developed, including similar analysis of potential evacuation zones, to reflect the needs of the expanded pipeline system if Line 2 is approved.

- As part of the EMP review KMC will review information regarding shelter-in-place to ensure suitable messaging is incorporated into responses plans and public awareness materials.

2.31 Material Safety Data Sheets

Reference:

i. A3Y8X8, Trans Mountain Responses to NS NOPE IR No. 1.12 a), PDF p. 36 of 84.

ii. A4D3F2, Trans Mountain EMP documents, Attachment 2.3 – Pipeline Emergency Response Plan, Section 1.1, Safety Guidelines, PDF p. 19 of 191.

iii. A4D3F2, Trans Mountain EMP documents, Attachment 2.3 – Pipeline Emergency Response Plan, Section 14.0, Material Safety Data Sheets, PDF p. 184 of 191.

iv. A3Z8C3, Trans Mountain Follow-up Response to BC IR No. 1.16 b) – Attachment 1, Pipeline Investigation Report P05H0044, PDF p. 4 and 16 of 23.

Preamble:

Reference (i) states:

> In the event of an emergency incident originating from a Trans Mountain facility or pipeline, communication of Material Safety Data Sheet (MSDS) information to affected area hospitals would take place if needed through the Kinder Morgan Canada (KMC) Incident Command System Liaison Officer and would occur as rapidly as possible following verification of the incident. The MSDS contains information needed by medical staff to begin treatment. [emphasis added]

The safety guidelines set out in reference (ii) highlight the importance of reviewing MSDSs so as to limit the risk posed by vapours and fire or explosion.

Reference (iii) states that MSDSs for products shipped through the pipeline and/or stored at the terminal sites are available online, and provides two hyperlinks.

In reference (iv), the TSB notes that the employee who first discovered the released crude oil near Ward Road was not equipped with the appropriate PPE:

> The Terasen employee was wearing basic personal protective equipment (PPE): safety glasses, boots, and Nomex coveralls. However, he was not equipped with the additional PPE appropriate for the hazards associated with this occurrence, such as a respirator or self-contained breathing apparatus, and a benzene detector or any other type of volatile organic detector. [emphasis added]

The TSB further notes that City of Abbotsford FRS personnel had not been informed of the hazards posed by the released product:

> The National Energy Board's Onshore Pipeline Regulations require that the company inform local emergency measures, fire department, and first responder personnel along the pipeline route of the location of the pipeline and the nature of the products being shipped. Terasen had not informed FRS personnel of the hazards or of the need for special types of equipment when responding to pipeline emergencies. [emphasis added]

Request:

a) Please describe the process to be relied on by Trans Mountain and first responders in order to immediately access the appropriate MSDS for the specific product involved in a spill incident, so as to avoid putting responders at risk as occurred during the Ward Road release.

b) Does Trans Mountain provide online real-time access to MSDSs for all products shipped by the pipeline to ensure the safety of responders and the public in any given incident? If Trans Mountain does not currently provide such access, will it commit to doing so? If not, why not?

c) Has Trans Mountain conducted any community outreach activities so as to make the public, local governments, emergency response organizations, and hospitals aware of the online availability of MSDSs? If not, will Trans Mountain commit to doing so? If not, why not?

Response:

a) All Trans Mountain field personnel who are expected to respond to an incident on the Trans Mountain Pipeline system are trained in Incident Safe Approach. KMC is able to quickly identify the product in a storage tank and/or specific pipeline location and provides material safety data sheets (MSDS) including the product name to incoming first responders almost immediately. As part of its ongoing public awareness program KMC provides training to first responders that includes considerations for safest approach to a release.

Kinder Morgan Canada Inc. (KMC) has an ongoing program to provide Community Awareness Emergency Response (CAER) sessions to first responders along the pipeline system. These sessions provide information with regard to the type and properties of petroleum transported through the pipeline and how to respond safely. In the unlikely event of a release, KMC provides material safety data sheets (MSDS) and the product name to incoming first responders and communities as soon as possible.

b) Trans Mountain does not routinely provide public access to this information. Kinder Morgan Canada (KMC) maintains an online database of material safety data sheets (MSDS') for all products shipped by the pipeline. In the unlikely event of a release, KMC provides MSDS and the product name to incoming first responders and communities as soon as possible. Trans Mountain ships many products in batches and several factors influence the rate at which these products travel through the pipeline. This requires field staff to verify product information at specific locations with the Control Centre; this verification usually takes less than one minute.

c) Kinder Morgan Canada Inc. (KMC) has an ongoing program to provide Community Awareness Emergency Response (CAER) sessions to first responders along the pipeline system. These sessions provide information with regard to the type and properties of petroleum transported thorough the pipeline and how to respond safely. In

the unlikely event of a release, KMC provides material safety data sheets (MSDS) and the product name to incoming first responders and communities as soon as possible.

Please also refer to the response to Province of BC IR No. 2.31b.

2.32 Response tactics for land-based spills

Reference:

A4A2Z5, Trans Mountain Follow-Up Response to BC IR No. 1.25, PDF p. 19 of 30.

Preamble:

In reference (i), Trans Mountain identifies some response tactics that would be implemented in responding to a spill into the Fraser River near Hope, British Columbia. Trans Mountain states as follows:

> Overall tactical approach will be 1) to attempt to confine all spilled material to a side channel of the Fraser River, where conditions are much more favourable for recovery of the oil than in the river main stem and 2) to utilize river boom set to deflect oil in multiple locations, in conjunction with directing oil to skimmer/boom combinations to capture, thicken and recover floating oil.

Request:

a) Has Trans Mountain identified and mapped all side channels of the Fraser River and the North Thompson River that could be relied upon in utilizing this response tactic?

b) Has Trans Mountain considered access to these side channels and included access details in its EMP documents?

c) Has Trans Mountain identified available boat launches on these side channels and spill response equipment in their vicinity?

d) If the answer to requests a), b) and/or c) above is yes, please provide some documentation to substantiate the responses.

e) If the answer to any of the above is no, does Trans Mountain commit to doing so and to include this information in its revised EMP documents?

Response:

a) Kinder Morgan Canada Inc. (KMC) has GIS mapping for all side channels of the Fraser and North Thompson Rivers however not every side channel is suitable or accessible for deploying response personnel and equipment. The KMC GIS mapping data can be rapidly accessed whenever needed. KMC cannot say with certainty that all side channels that could potentially be used in a given emergency situation have been identified, however many locations, including side channels that are wee-suited and accessible for use in emergency response situation have been defied and documented.

For areas that may potentially be affected by an oil spill from Trans Mountain along the Fraser and North Thompson Rivers Trans Mountain will:

- identify and map side channels that could be used in containment and recovery of oil,

- consider access to these side channels and include access details in its EMP documents,
- and; identify available boat launches on these side channels and the spill response equipment in their vicinity.

In addition to KMC's GIS mapping the existing Emergency Response Plans (Filing ID A63573), specifically the Control Point and Field Guide document predetermined locations for accessing, and intercepting oil from water bodies. A redacted example of this information is provided as Province of BC IR No. 2.32a Attachment 1 – Control Point data example, and Province of BC IR No. 2.32a Attachment 2 – Field Guide data example. Information has been redacted from the attachment in accordance with the principles described in the aforementioned filing.

Please note, the control point documentation currently identifies the following information:

- Location photo (with applicable field orientation information)
- CAD drawing of the control point showing access, work areas etc.
- A map showing driving access
- Driving / access directions
- CP name, latitude, longitude, elevation, ownership
- Workspace size / location
- Workspace description / pertinent comments
- Water body information such as: name, width, depth or bank height, bed type, distance to confluence
- Logistical information such as: nearest KMC response equipment, boat access, helicopter access, nearest upstream CP, nearest downstream CP.
- Strategy comments

Please also refer to:

- Province of BC IR No. 2.21b.
- Province of BC IR No. 2.35a regarding a review of control points that will be used in future for both Line 1 and Line 2 as discussed in the response.
- Province of BC IR No. 2.49b regarding Trans Mountain Geographic Response Plans.

b) Please refer to the response to Province of BC IR No. 2.32a.

c) Please refer to the response to Province of BC IR No. 2.32a.

A number of available and accessible boat launches and their approximate distance from spill response equipment are currently documented in the Kinder Morgan Canada Inc. (KMC) control points manual. This will be augmented per the commitment above.

d) Please refer to the response to Province of BC IR No. 2.32a

e) Please refer to the response to Province of BC IR No. 2.32a.

Summary of New Commitments:

For areas that may potentially be affected by an oil spill from Trans Mountain along the Fraser and North Thompson Rivers Trans Mountain will:

- identify and map side channels that could be used in containment and recovery of oil,
- consider access to these side channels and include access details in its EMP documents, and
- identify available boat launches on these side channels and the spill response equipment in their vicinity.

2.33 OMA formation in river waters

Reference:

A3S4V6, Application Volume 7, Risk Assessment and Management of Pipeline and Facility Spills, Section 5.3.2, Release to Water, PDF p. 14 of 137.

Preamble:

In the Application, Trans Mountain states as follows:

> Understanding the behaviour of dilbit spilled to water is available from lab to mesoscale testing in tanks and from observations made following actual spills (Westridge and Marshall spills). The most significant observations are that the behaviour of dilbits tested or spilled are consistent with Group 3 and 4 crude oils: they float on water until oil densities change, through weathering and/or sediment uptake. As with most crude oils, dilbit may gradually overwash, become suspended in the water column, or sink depending on the degree of weathering and formation of OMAs [Oil Mineral Aggregates]. The Marshall spill, into Talmadge Creek and Kalamazoo River, resulted in oil transport down river with most oil remaining on the water surface. A portion of oil, mixed with river bank and/or suspended sediment, and [sic] did submerge and in places sank

Request:

a) What range of sediment concentrations and river velocities were encountered in Talmadge Creek and the Kalamazoo River during the first three weeks of the Marshall spill?

b) Please compare the data requested in a) above with the maximum sediment concentrations and river velocities for the following British Columbia Rivers:

- Fraser River,
- North Thompson River,
- Coquihalla River, and
- Coldwater River.

c) Please provide an analysis of the average number of days per year when river conditions within 10% of the concentrations and velocities identified for the purposes of a) above could be present in the rivers listed in b) above.

Response:

a) Data on sediment concentrations and river velocities during the first three weeks of the Marshall spill are not available from the vicinity of the spill. Discharge volumes for the USGS monitoring station on the Kalamazoo River near Battle Creek are provided in Province of British Columbia IR No. 2.33a Attachment 1, showing in excess of 3,000 cubic feet/second (85 cu.m./s) at the time of the spill. The USGS records for 2013 (Province of British Columbia IR No. 2.33a Attachment 2) show that turbidity measurements were not in place until April 2011.

It is worth noting that river velocities vary within a watercourse, dependent on river geomorphology, cross-section, and water discharge (or flow) rates. In places, river velocities can be near static to very fast flow in constricted locations. As pointed out in numerous reports of the Line 6B spill that the portion of oil that entered the creek and river traveled downstream within a range of hydrodynamic settings: main channels, channel margins, secondary channels, oxbows, pools, and over dams (Dollhopf *et al.,* 2014).

It is also important to note that during the Marshall spill, the spilled oil travelled on land and through wetlands where it could pick up a significant amount of sediment before reaching the watercourse. The significance of the sinking process observed during the Marshall spill was not only due to high suspended sediments in the river, but also likely due to sediments that got attached to the oil before reaching the watercourse.

With regard to the EMP, please refer to the response to Province of BC IR No. 2.21b.

Reference:

Ralph H. Dollhopf, Faith A. Fitzpatrick, Jeffrey W. Kimble, Daniel M. Capone, Thomas P. Graan, Ronald B. Zelt, and Rex Johnson, 2014. Response to Heavy, Non-Floating Oil Spilled in a Great Lakes River Environment: A Multiple-Lines-Of-Evidence Approach for Submerged Oil Assessment and Recovery. International Oil Spill Conference Proceedings, p. 434-448.

b) Given that the requested data is not available, a specific response to the information request cannot be provided. A general comparison between discharge and turbidity of the Kalamazoo River and the Nicola River (of which the Coldwater River is the largest tributary) were provided in response to inform a discussion with the Upper Nicola first nation (refer to Province of BC IR No. 2.33b Attachment 1). For the latter, an average turbidity of 8.6 NTU was measured between 1971 and 1978, with a maximum of 54 NTU being recorded.

Maximum turbidity reported for the North Thompson (North Kamloops Station 0600164) between 1965-1982 was 26 NTU (BC Ministry of Environment 1992). The same report indicates suspended sediments of 30mg/L or 3.9 NTU for turbidity. The extremes for turbidity on the Kalamazoo River reached 1270 FNU in June and July 2013 (measures rated “fair”) (Province of BC IR No. 2.33a Attachment 2).

As indicated in the response to NEB IR 1.62a (Filing ID A3W9H8), suspended sediment concentrations for the Fraser River scenario modeled ranged from a minimum of 25.5 mg/L in summer to a maximum of 79.6 mg/L in spring.

Please note that the spill scenarios in Section 7 of the Application were evaluated with reference to four case studies described in the Technical Report TR 7-1, Volume 7, Qualitative Ecological Risk Assessment of Pipeline Spills ERA Pipeline Qualitative Ecological Risk Assessment of Pipeline Spills (Stantec 2013, Filing ID A3S4W9), as well as the Yellowstone River oil spill; the DM 932 oil spill; the Wabamun Lake Bunker “C” oil

spill; and the modeling conducted by Enbridge Northern Gateway Project for the Athabasca River near Whitecourt, Alberta.

With regard to the EMP, Please see response to Province of BC IR No. 2.21b.

Reference:

British Columbia Ministry of Environment, Lands, and Parks. 1992. Technical Appendix, Thompson River Water Quality Assessment and Objectives. Victoria, BC.

c) Given that the requested data is not available, a specific response to the information request cannot be provided.

2.34 Spills into ice-covered rivers

Reference:

i. A3X5V6, Trans Mountain Response to Adams Lake Indian Band IR No. 1.2.7, PDF p. 15 of 123.

ii. A3S4V6, Application Volume 7, Risk Assessment and Management of Pipeline and Facility Spills, Section 7.1.3.1 – Winter Conditions, PDF p. 57 of 137.

iii. A4D3F2, Trans Mountain EMP documents, Attachment 2.3 – Pipeline Emergency Response Plan, Section 4.6, Spills in Cold Weather, PDF p. 52- 53 of 191.

iv. CGUS HS Committee on River Ice Processes and the Environment http://cripe.civil.ualberta.ca/Downloads/16th_Workshop/Andrishak-Hicks-2011.pdf

Preamble:

When asked in reference (i) how spilled diluted bitumen would be recovered from an ice-covered river, Trans Mountain states:

> Ice, as a solid, is impermeable and would keep oil on the surface. Cold conditions also mean that oil is more viscous and will not flow or spread like it would under warmer conditions. Containment on the ice surface through use of berms, trenches, or other barriers would be used to limit oil movement. Clean-up activities, subject to Unified Command approval, could entail manual and mechanical collection of oil from the ice surface, provided safe operating conditions and controls are in place.

In reference (ii), Trans Mountain discusses the assumed fate of diluted bitumen spilled into the North Thompson River in winter and finds as follows:

> Although the North Thompson River can be ice covered for several months of the year, it responds quickly to snow melt or rain events, and the ice cover may not be reliable. Open water patches in the ice allow some of the oil to become entrained in the river, and it moves downstream beneath the ice but still floats as its density is initially around 940 kg/m^3.

The Pipeline ERP (reference (iii)) provides a brief discussion of the recovery of oil under ice. It states as follows:

> The containment and recovery of oil under ice involves numerous safety and operational issues. The combination of pre-planning and safe practices will increase the likelihood of success.
>
> Ice safety will be assessed immediately prior to flooding and if weather conditions change during the flooding where personnel are required to be deployed on ice.

The ERP goes on to mention ice augering and ice trenching/slotting as possible recovery techniques.

Reference (iv) states that if a spill under partial ice cover cannot be contained and removed within a relatively short time, ice growth and breakup may cause entrained oil to disperse over a larger area.

Request:

a) As is acknowledged in reference ii), winter conditions in the North Thompson River area are unlikely to be such that a solid, impermeable ice cover would form. Partial ice cover represents typical winter river conditions in British Columbia. What measures, in addition to ice augering and ice trenching/slotting, would Trans Mountain employ to access, track, contain and recover oil spilled into a partially frozen river, with open water patches (resulting either from weather conditions or from the release of warm oil onto the surface of the river) which could allow some of the oil to become entrained in the river under the ice?

b) How does Trans Mountain propose to respond to the additional challenge posed by the dispersion of oil described in reference (iv)?

c) In light of the "safety and operational issues" identified in reference (iii), what "pre-planning and safe practices" will Trans Mountain employ to ensure the safety of spill responders working on or near ice covered watercourses?

Response:

a) Kinder Morgan Canada Inc. (KMC) acknowledges and agrees that partial and full ice cover conditions, of varying thickness and strength can present very challenging access and oil recovery conditions for emergency responders in the unlikely event of a pipeline spill into a river, stream or lake. Environmental conditions that may exist at any time of year need to be considered and incorporated into KMCs emergency response plans (ERP), selection of response equipment, available tactics and training of personnel.

To help address these emergency response challenges, KMC is commencing a project to develop Geographic Response Plans (GRPs) which will become part of an enhanced Emergency Management Program (EMP) in support of the expanded pipeline system. Among other factors, the project will consider partial and full ice cover challenges in terms of access and a variety of response tactics, in addition to those listed, that may be employed under various ice conditions.

Please see the response to Province of BC IR No. 2.35a for more information about the scope of the GRP project and the development of emergency programs for the Project. With regard to the EMP, please refer to the response to Province of BC IR No. 2.21b.

b) Please refer to the responses to Province of BC IR No. 2.35a and 2.34a.

c) Pre-planning and safe practices are centered around Kinder Morgan Canada Inc.'s (KMC) training program. A rigorous training and response exercise program is in place for all operations and head office staff that ranges from detailed equipment deployment drills to full Incident Command System (ICS) management and organization training and

deployment. Trans Mountain field personnel receive regular training and refresher training on spill response tactics, techniques and equipment and participate in regular spill response exercises and practice equipment deployments. These activities include all aspects of responding to a release on or near ice covered water. All training includes safety requirements for specific techniques and equipment utilized. This includes identifying any specialized personal protective equipment (PPE) or training requirements based on a site specific hazard assessment. No response will commence until all associated hazards have been addressed. Safety is the number one priority.

With regard to the EMP, please refer to the response to Province of BC IR No. 2.21b.

2.35 Gap analysis – river conditions

Reference:

A3W9H8, Trans Mountain Response to NEB IR No. 1.72, PDF p. 407-409 of 421

Preamble:

In the reference above, Trans Mountain is asked to describe (a) how the emergency management exercises conducted by Trans Mountain in the past 5 years consider emergency response in challenging terrain, difficult to access areas, and in challenging environmental conditions such as heavy snowfall or snow pack, ice cover, and heavy rainfall, and (b) the options and mitigation for responding effectively to a spill in areas with heavy snowfall or snow pack, under ice cover, or heavy rainfall conditions and in difficult-to-access areas.

In its response, Trans Mountain explains how difficult terrain, weather and environmental conditions are taken into consideration in emergency response exercises, and discusses various techniques and equipment for responding to spills in heavy snow fall, snow pack, ice, or heavy rainfall conditions.

Request:

a) Please conduct and provide a spill response gap analysis for a spill incident into the following rivers:

- Fraser River,
- North Thompson River,
- Coquihalla River, and
- Coldwater River.

The analysis should indicate:

- the average number of days annually when in-river oil recovery operations would not be possible, and
- the average number of days annually when in-river oil recovery effectiveness would be limited or constrained due to factors including, but not limited to, ice cover (full or partial), freshet or high stream flow conditions, the presence in the river of large woody and other debris, weather and environmental conditions (sub-zero temperatures, freezing rain, thunderstorms, high winds, high temperatures, etc.), or any other condition that would impact responder safety or the effectiveness of spill response equipment and tactics.

b) Please clearly outline the process, criteria, parameters, assumptions and other factors used to complete the analysis requested in a) above and support all conclusions.

Response:

a) The information requested is not required at this stage of development. The information will, however, be developed as part of the EMP review and can be provided to the

Province as part of that process. Please see response to Province of BC IR No. 2.21b. Trans Mountain believes that sufficient information has been provided to address the National Energy Board's (NEB) List of Issues (Filing ID A3V6I2).

Kinder Morgan Canada Inc. (KMC) acknowledges and agrees that all of the river systems mentioned in the question undergo marked seasonal variations in rates of flow, ice cover, accessibility and other factors that impact and challenge emergency response operations in the unlikely event of a pipeline spill. Environmental conditions that may reasonably exist for any time of year need to be considered and incorporated in KMCs emergency response plans, selection of response equipment and training of personnel.

To help enhance how KMC provides emergency response throughout the year, considering the various environmental conditions that may be encountered as described above, KMC is commencing a project to develop Geographic Response Plans (GRPs) which will become a part of the enhanced Emergency Management Program (EMP) to support the expanded pipeline system.

The project will include:

- A review of both Lines 1 and 2 with production of a response capability analysis that will address the requirements in the Province's request above.
- Development of a complete set of GRPs covering both Lines 1 and 2. The analysis referenced above will serve as a key foundational element for the new GRPs that will be developed. The GRPs will provide responders with guidance and detailed information on access, deployment and product recovery as well as strategies and tactics relevant to environmental conditions throughout the year.
- Include guidance for KMC responders for other environmental factors such as full or partial ice cover of rivers, streams and lakes, forest fire and smoke, avalanche and flooding conditions. The North Thompson Valley has the highest fire return history of any transited by the Trans Mountain pipeline system (TMPL system).
- A full review of control points including spacing, access suitability under various environmental conditions and others.
- Full consultation and incorporation of First Nations, local and regional governments as well as Canadian Pacific Railway and Canadian National Railway response capabilities and mutual aid, in addition to KMCs existing mutual aid partners.
- SCAT guidance, the extent and details of this guidance will be finalized prior to the project commencing.

Please refer to the response to Province of BC IR No. 2.21b.

b) Please refer to the response to Province of BC IR No. 2.35a. The information requested about the analysis will be developed as part of the upcoming Geographic Response Plans (GRP) project described in Province of BC IR No. 2.35a. The detailed process,

criteria, parameters, assumptions and other factors that will be used in the analysis to be done for the GRP project referenced above are not available at this time.

Summary of New Commitments:

- Kinder Morgan Canada Inc. (KMC) is commencing a project for completion prior to expanded pipeline system operation, to develop Geographic Response Plans (GRPs) which will become a part of the enhanced Emergency Management Program (EMP) to support the expanded pipeline system.

2.36 Air monitoring and oil sampling during spill response

Reference:

i. A3Y2D3, Trans Mountain Response to BROKE IR No. 1.7 e), PDF p. 28-29 of 36.

ii. A4A2Z5, Trans Mountain Follow-Up Response to BC IR No. 1.25, PDF p. 16 of 30.

iii. A3X5X3, Trans Mountain Response to Burnaby Teachers' Association IR No. 1.4, PDF p. 3 of 6.

iv. Letter dated March 27, 2012 from Kinder Morgan Canada to Abbottsford residents regarding the January 24, 2012 release at Sumas Terminal, p. 2 of 3 (attached).

Preamble:

In reference (i), Trans Mountain states as follows with respect to the potential public health effects of a spill:

> As part of the spill response measures, monitoring programs would be initiated to track both the capture of spilled oil as well as the presence of any spill related chemical residues in different environmental media, including the water, air, soils and/or sediment, and extending to possible foodstuffs if necessary to protect public health. The results of the monitoring program(s) are used, in part, to guide decision making opposite the need for control measures such as food advisories. These controls will remain in place until the results of the monitoring program(s) indicate that public health and safety is not at risk. The implementation of the monitoring programs and introduction of such control measures will serve to reduce the opportunities for exposure of the public to the chemicals, especially any exposures that could be received through secondary pathways on a longer-term basis. [emphasis added]

In reference (ii), Trans Mountain indicates that, in responding to a spill into the North Thompson River near Darfield, British Columbia, for instance, it would "dispatch[…] third party environmental specialists on an expedited basis to the site to formulate a site-specific air monitoring and water monitoring plan and began air monitoring, recording of results and sampling as appropriate." [emphasis added]

Reference (iii) also addresses public health effects:

> At the same time, emergency services would be contacted immediately and trained KMC technicians would be dispatched to the location to help local authorities secure the area and commence air monitoring to ensure air quality for those in the immediate vicinity.

In reference (iv), Trans Mountain described the air quality monitoring measures it planned to implement following the Sumas Terminal release and made the following commitment: "… we have engaged an independent rapid response service provider to conduct air monitoring and sampling if needed. This will be in place by summer 2012".

Reference (ii) also discusses oil sampling after a spill:

> Environmental assessments on air, soil, groundwater, wildlife and any other necessary site-specific environmental media will be conducted to assess the magnitude and extent of any impacts. Based on the results of the assessments, further monitoring, risk management or remediation may be implemented to ensure public safety and that applicable regulatory standards are met.

Request:

a) Will Trans Mountain commit to immediate and ongoing air monitoring for public health and safety as an integral part of response efforts in the event of a spill?

b) Will Trans Mountain's EMP include an air monitoring program designed to provide immediate and continuous information to the public with respect to chemical residue levels in the air? If yes, please describe in detail the air monitoring program being contemplated.

c) Would air monitoring be initiated in all instances of pipeline release, including slow or pinhole leaks?

d) How soon after a spill would Trans Mountain initiate air monitoring?

e) Who are the "third party environmental specialists" referred to in reference (ii)? Will these specialists be familiar with Trans Mountain's EMP documents? Will Trans Mountain provide training and exercise sessions for these specialists? If yes, how often?

f) Has Trans Mountain established the "rapid response" process for ambient air monitoring and sampling referred to in reference (iii)? If yes, please describe the role and capabilities of the service provider Trans Mountain has engaged and provide all relevant documentation.

g) How soon after a spill would Trans Mountain initiate oil sampling and "environmental assessments on air, soil, groundwater, wildlife and any other necessary site-specific environmental media"?

h) Who would conduct oil sampling and "environmental assessments on air, soil, groundwater, wildlife and any other necessary site-specific environmental media"? Will these contractors be familiar with Trans Mountain's EMP documents? Will Trans Mountain provide training and exercise sessions for these contractors? If yes, how often?

Response:

a) Kinder Morgan Canada Inc. (KMC) would like to note that the existing EMP documents (Filing ID A63573) include immediate and ongoing air monitoring for public health and safety as an integral part of response efforts in the unlikely event of a release. KMC is committed to continuing this practice based on the documents Filing ID A63573.

In the event that a release occurs from the Trans Mountain Pipeline that could cause petroleum vapours in surrounding community, KMC immediately mobilizes specialized contractors to surrounding communities to implement air monitoring for public health and safety. KMC has agreements in BC and Alberta to provide air monitoring services during releases and fires in accordance with the air monitoring plans included in the in the terminal and pipeline Emergency Response Plans. These contractors have provided emergency contact information and it is reasonable to assume initial air monitoring would occur in the Greater Vancouver within 3 hours after being contacted. Initiation of contractor air monitoring in other areas could take longer due to travel time.

In addition to the above, as soon as an incident is reported, trained local KMC technicians are dispatched to the location to help secure the area and commence air monitoring in the immediate vicinity. KMC would consult with the local authority to determine the best course of action to protect the public. It is reasonable to assume technicians will be on site within 2 hours at locations in British Columbia, and at some locations much sooner.

KMC also has real-time continuous ambient fence line monitors installed at Burnaby and Sumas terminals to measure hydrogen sulphide (H2S) volatile organic compounds (VOC), and sulphur dioxide (SO2) and weather parameters such as wind speed, wind direction, temperature and humidity. A similar system will be operational at Westridge Terminal by the end of 2015.

Please refer to the response to Province of BC IR No. 2.21b.

b) Please refer to the response to Province of BC IR No. 2.36a.

c) Although the information requested is not within the scope of this proceeding and not relevant to the National Energy Board's (NEB) List of Issues (Filing ID A3V6I2), Trans Mountain Pipeline ULC (Trans Mountain) offers the following response to your question:

Air monitoring for occupational health and safety would occur for all releases, regardless of size, for the protection of responders and repair personnel.

The size of the release and its proximity to public receptors would determine if Trans Mountain Pipeline ULC (Trans Mountain) would initiate a larger scale ambient air monitoring plan for the protection of public health. A detailed Public Health Air Monitoring Plan is included in the Trans Mountain Emergency Response Plans.

Please refer to the response to Province of BC IR No. 2.36a.

d) Please refer to the response to Province of BC IR No. 2.36a.

e) Please refer to the response to Province of BC IR No. 2.36a.

Kinder Morgan Canada Inc. (KMC) has contracts and master services agreements with a number of response contractors, including Golder Associates, O'Briens, Quantum Murray, and others, to supply equipment and/or personnel during an emergency, some of whom are identified in Section 4.5.2 of Volume 7 (Filing ID A3S4V5). These

contractors are knowledgeable with Trans Mountain's EMP documents and participate in KMC's training and response exercise program including detailed equipment drills to full ICS management and organization training and deployment. Frequency of training is based on regulatory requirements within jurisdictional areas of operation, but typically KMC holds several emergency response exercises and training sessions every year.

f) Trans Mountain Pipeline ULC (Trans Mountain) has established multiple service providers to ensure comprehensive geographical coverage and timely mobilization of resources in the event of an unplanned release. The role and capabilities of the service provider are described below. The scope of work may be increased if conditions warrant.

The service providers will review the site specific details of the release location and develop an air monitoring plan (AMP) which details the number of sampling locations, the sensitive receptors and the frequency that is appropriate to ensure no exposure threshold is reached for air contaminants identified to have negative human health risks.

- Collect spot measurement and where necessary (and possible) data log in select locations for the following parameters:
    - Total volatile organic compounds
    - Benzene
    - Hydrogen sulphide
    - Sulfur dioxide
    - Mercaptans
- Where necessary, conduct a VOC scan of target contaminants using a thermal desorption tube or summa canister (situation dependent)
- Where necessary, conduct a sampling for methyl mercaptan, ethyl mercaptan
- Prepare a daily report to the unified command which includes methodology, findings/results, conclusions and recommendations

The service providers selected will participate, where appropriate in Trans Mountain's Emergency Response Exercises and be trained in Incident Command Systems (ICS).

Refer to the response to Province of BC IR No. 2.36a.

g) As soon as an incident is reported, Kinder Morgan Canada Inc. (KMC) begins staffing and mobilization of the Incident Management Team (IMT) and trained KMC technicians would be dispatched to the location to help secure the area and commence air monitoring to ensure air quality for those in the immediate vicinity. KMC would consult with the local authority to determine the best course of action to protect the public.

The maximum response time for additional sampling and assessment is not defined. Response personnel, including those responsible for all environmental assessments, are stationed strategically along the pipeline in order to be able to respond promptly to issues that arise anywhere along the pipeline route.

Please refer to Province of BC IR No. 2.36a.

h) Please refer to Province of BC IR No. 2.36e.

Summary of New Commitments:

- The existing EMP documents provided in Filing ID A63573 include immediate and ongoing air monitoring for public health and safety as an integral part of response efforts in the unlikely event of a release. KMC is committed to continuing this practice based on the documents Filing ID A63573.

2.37 Wildlife care

Reference:

A4D3F2, Trans Mountain EMP documents, Attachment 2.3 – Pipeline Emergency Response Plan, Section 13, Wildlife Care, PDF p. 181-183 of 191.

Preamble:

The Pipeline ERP (as well as the other filed ERPs) provides an overview of the operational aspects of post-spill wildlife care, and emphasizes the fact that these "require careful planning".

The ERP states that "[v]olunteer manpower is often required to ensure adequate operations of the time and energy intensive requirements of successful oiled wildlife response [sic]", and goes on to highlight the "many unique concerns regarding personnel health and safety" that oiled wildlife response presents.

The ERP also makes it clear that "[t]here are very specific and well-documented facility requirement [sic] for the successful care of oiled wildlife. These requirements must be incorporated into the development of the Wildlife Care Centre to ensure a successful response effort".

Request:

a) Please provide Trans Mountain's detailed wildlife care plan, describing the nature and availability of wildlife response personnel, equipment, mobile and fixed facility locations, and other resources and the procedural information that will guide Trans Mountain's response to wildlife affected by a spill.

b) If Trans Mountain does not currently have a detailed wildlife care plan, please explain why and indicate whether Trans Mountain will commit to developing such a plan prior to the start of Project operations.

c) Are contracted wildlife care personnel, equipment, facilities and other resources under retainer for immediate mobilization?

d) If not, please explain why and indicate whether Trans Mountain will commit to ensuring that contracted wildlife care services, equipment, facilities and other resources are under retainer for immediate mobilization.

e) Please explain why Trans Mountain appears to rely on volunteers to assist in the response to oiled wildlife, in light of the significant health and safety concerns outlined in the ERP?

f) Has Trans Mountain developed a plan for volunteer management, so as to ensure that the presence at the scene of an incident of large numbers of volunteering members of the public does not interfere with emergency response operations?

Response:

a) Detailed plans are developed to address specific incident conditions and depend upon many incident specific requirements that cannot be known in advance. The questions cannot be answered in the form requested.

Additional documentation referred to in the Emergency Response Plans such as communication plans, security plans, initial health and safety plans, health and safety plans, refuelling plans, lodging and food plans, medical plans etc. are documents that are produced at the time of an incident as part of the overall Incident Action Plan. The content and format of these specific action plans is largely driven by the Incident Command System (ICS) process.

Recovery and treatment of impacted wildlife is a very specialized discipline requiring specific training and equipment. Kinder Morgan Canada Inc. (KMC) has a wildlife recovery contractor with federal migratory permits and provincial rehabilitation permits on contract for immediate response to an incident across the Trans Mountain Pipeline system (TMPL system). The contractor will respond with the appropriate scale of equipment and trained personal as the situation requires and work closely with Federal and Provincial Government Agencies (BC Ministry of Environment, Alberta Environment, Environment Canada/Canadian Wildlife Services and Fisheries and Oceans Canada).

In the unlikely event of a spill, or release from the pipeline, where there existed a concern for impacts to wildlife, a incident specific Wildlife Recovery Plan would be developed in anticipation of said impacts to local habitat or fauna. During the response phase of the release, the development, approval and utilisation of this plan would be directed through by Unified Command as identified by the Incident Command System (ICS).

In 2012, the Province developed a draft wildlife management document: “Guide to Wildlife Management During Oil Spills in British Columbia.” The document was never formally adopted but would be considered as guidance in developing detailed plans.

Please refer to the response to Province of BC IR No. 2.21b.

b) Please refer to the response to a) above.

c) Please refer to the response to a) above.

d) Please refer to the response to a) above.

e) As discussed in the response to Del Ponte IR No. 1.4d.2 (Filing ID A3Y2J0), Kinder Morgan Canada Inc. (KMC) does not rely on volunteers for emergency response. Recovery and treatment of impacted wildlife is a very specialized discipline requiring specific training and equipment. KMC has a wildlife recovery contractor with federal migratory permits and provincial rehabilitation permits on contract for immediate response to an incident across the Trans Mountain Pipeline system (TMPL system). The contractor will respond with the appropriate scale of equipment and trained personnel as

the situation requires. KMC can not predict where the trained personnel come from or whether they are volunteers or not. Many wildlife response organizations use volunteers to perform this work, however they report to the response organization which has been hired by KMC.

As described in Section 4.5 and Section 4.6 of Volume 7 (Filing ID A3S4V5), KMC maintains a network of response resources which includes internal and external equipment and properly trained personnel. A rigorous training and response exercise program is in place for all operations and head office staff that ranges from detailed equipment deployment drills to full Incident Command System (ICS) management and organization training and deployment. Please refer to the response to City of Vancouver IR No. 1.08.01e (Filing ID A3Y2G6) for a discussion surrounding ICS, municipality inclusion and roles / responsibilities.

KMC belongs to a number of response organizations and participates in mutual aid exercises to supplement the company's self-reliant response capability. KMC has contracts and master service agreements with a number of response contractors to supply equipment and/or personnel during an emergency, some of whom are identified in Section 4.5.2 of Volume 7 (Filing ID A3S4V5).

If a spill occurred as a result of Trans Mountain's pipeline or facility operations, KMC would be in charge of Incident Command for the response. KMC's response network is identified in Section 4.5 of Volume 7 (Filing ID A3S4V5). Please refer to Table 4.3.1, Section 4.3.1 of Volume 7 (Filing ID A3S4V5) for the three-tiered response structure which explains who would be invited to the response based on the definitions provided.

For marine response, as stated in the response to City Burnaby IR No. 1.25.01g (Filing ID A3Y2E6), Western Canada Marine Response Corporation (WCMRC) does not use volunteers.

Also refer to response to f) below regarding the management of volunteers. Please refer to the response to Province of BC IR No. 2.21b.

f) Additional documentation referred to in the Emergency Response Plans such as communication plans, security plans, initial health and safety plans, health and safety plans, refuelling plans, lodging and food plans, medical plans etc. are documents that are produced at the time of an incident as part of the overall Incident Action Plan. The content and format of these specific action plans is largely driven by the Incident Command System (ICS) process.

Under ICS the response would be guided, in-part, by a safety plan developed to address the specific conditions of the incident. The plan would establish requirements for safe work practices, which in-turn establish requirements for personal protective equipment (PPE) and safety training. Similarly, a security plan would be developed to address the unique conditions of the response. Both the safety and security plans would be approved by the unified or incident command.

As part of the response a perimeter would be established to control against theft or tampering and to ensure responders who are admitted into the incident site are authorized and have the appropriate level of training and personal protective equipment. Volunteers who show up on scene unrequested by unified or incident command would not be admitted on site. In the event that emergent volunteers were identified or anticipated to engage in unsafe “free-lancing” activities outside the managed response efforts the information officer, working with the safety officer, would be tasked by unified or incident command to develop and deliver messaging, education, and other proactive measures to address the situation.

While volunteers would not be used, situations could arise where emergent volunteers present a potential pool from which to hire and train response workers. In the event that external resources (general labour or particular skills) were required to meet objectives established by unified or incident command, emergent volunteers would be directed to the procurement function of ICS which is responsible for sourcing any additional labour, supplies or equipment required for the response. ICS procurement would establish a process to inventory applicants, hire and train them as needed.

Please refer to the response to Province of BC IR No. 2.21b.

Summary of New Commitments:

- Trans Mountain will review its wildlife care requirements for the Project as part of its EMP consultation with the Province of BC.

2.38 Oil spill waste management

Reference:

i. A4D3F2, Trans Mountain EMP documents, Attachment 2.3 – Pipeline Emergency Response Plan, Section 9.5.2, Waste Management Plan, PDF p. 109 of 191.

ii. A4D3F2, Trans Mountain EMP documents, Attachment 2.3 – Pipeline Emergency Response Plan, Section 9.4.2, Initial Handling and Storage, PDF p. 108 of 191.

Preamble:

Reference (i) describes waste management planning as follows:

> Before any waste materials are transported off the site for disposal, a Waste Management Plan should be prepared in consultation with provincial agencies. Responsibility for working with the provincial authorities to develop a proper Waste Management Plan lies with the Environmental Unit Leader.

In reference (ii), the Pipeline ERP highlights the importance of waste management planning:

> Initial oil handling and storage needs may be overlooked in the emergency phase of a response, which could result in delays and interruptions of cleanup operations. Initially, waste management concerns should address:
>
> - Equipment capacity
> - Periodic recovery of contained oil
> - Adequate supply of temporary storage capacity and materials.

Request:

a) Does reference (i) represent the entirety of Trans Mountain's planning for oil spill waste management?

b) If so, how does Trans Mountain reconcile the apparent lack of planning to date with the statement in reference (ii) that emphasizes the importance of waste management planning in order to avoid delays and interruptions in cleanup operations?

c) Will Trans Mountain commit to developing a detailed Waste Management Plan to be included in its Emergency Management Program documents before commencing operations?

Response:

a) No.

Kinder Morgan Canada Inc. (KMC) has a current Waste Management Plan; however it does not form part of references (i) or (ii). The KMC Waste Management Plan and KMC Environment Plan are typically applied by, or supervised by, the EHS professionals that form part of ICS during an incident response. As a result, the Waste Management and

Environment Plans and other environment reference documents reside with the KMC Environment Department. The Plans are not replicated in their entirety in individual Emergency Response Plans or other similar documents that form the Emergency Management Program. All environment references are readily available to any KMC employee that needs to access them during an incident.

During an incident, the specific elements of the KMC Waste Management Plan that will be applied to the situational needs of the response are documented in an incident-specific waste plan. Details such as type of waste, anticipated volume and location will be included in the incident-specific plans. Unified Command will review and approve the incident-specific plans to address the detailed waste management requirements of the incident.

KMC will apply these Plans through the ICS using experienced environmental professionals.

Waste Management Plans are developed by the Environment Unit in the Planning Section, under the framework of Unified Command (UC), to address a specific situation. Waste streams are segregated in the field according to the storage and disposal needs identified in the Waste Management Plan. Oily liquids and solids as well as non-oiled materials would comprise the wastes collected during a spill. All oily waste is manifested and moved under an approved Transportation Plan also developed within the UC.

During an oil spill, best management practices play a major role in minimizing and managing wastes. To that end, the practices are to:

- Segregate waste streams on land and water.
- Using pre-determined control points provide access so that response equipment can be deployed and solid and liquid wastes taken away on existing roadways. Work areas are located on level ground outside of flood zones.
- Prevent secondary contamination by demarcating and securing contaminants, including the use of liners, impermeable berms, rain covers for storage tanks, and proper drainage, where collected materials are stored on an interim basis.
- Use a variety suitable vehicles to transport wastes. Vehicles may include landing craft, small mini-barges, and dracones on water, lined dump trucks and tank trucks on land, and helicopter-slung collapsible tanks. All vehicles are only allowed to leave a site once it is determined that their load will not generate a secondary pollution issue.

Within ICS, the BC Ministry of Environment provides guidance for oil spill waste management under the Environmental Management Act. The legislation is detailed on the Ministry's website including registration forms to manage waste streams by type and quantities. BC regulations also recognize the federal Transportation of Dangerous Goods Act by identifying hazardous wastes as those substances "no longer being used for their original purpose, and those meeting the criteria for Class 2, 3, 4, 5, 6, 8 or 9 of the federal dangerous goods regulations, including those that are recycled, treated,

abandoned, stored or disposed of, intended for recycling, treatment or disposal or in storage or transit before recycling, treatment or disposal".

Waste oil, including oil recovered during a spill cleanup operation, is specified in the Regulation "where the oils are in the waste in a total concentration greater than 3% by weight and the oils through use, storage or handling have become unsuitable for their original purpose due to the presence of impurities or loss of original properties."

Part 2 of the Regulation specifies minimum siting standards for all hazardous waste facilities while Part 3 lists the operational requirements of such facilities, including security and training. The waste oil generated from a spill (in quantities of 210 litres or more) must be properly manifested for its transportation to a hazardous waste facility and will not be accepted for disposal in quantities of more than 100 litres or 100 kilograms unless the weight or volume of the shipment has been measured. Records must be kept by the waste facility for 2 years.

For hazardous wastes generated from an accidental spill, exemption from the Regulation (Part 9 Section 52) can be sought from "a director" at the Ministry of Environment provided that the person will manage the hazardous waste in a manner that will not pose a threat to human health or the environment, and the exemption is in the public interest.

Please refer to the response to Province of BC IR No. 2.21b.

b) Please refer to the responses to Province of BC IR No. 2.38a and 2.38c.

c) No. Detailed waste Management plans are developed to address specific incident conditions and depend upon many details that cannot be known in advance. Please refer to the response to Province of BC IR No. 2.38a.

The Kinder Morgan Canada Inc. Waste Management Plan and Environment Plan will be reviewed and enhanced prior to the in-service date of the expanded pipeline system to ensure the Plans adequately address the needs of the expanded pipeline and addresses all future regulatory requirements. Please refer to the response to Province of BC IR No. 2.21b.

Summary of New Commitments:

- The Kinder Morgan Canada Inc. Waste Management Plan and Environment Plan will be reviewed and enhanced prior to the in-service date of the expanded pipeline system to ensure the Plans adequately address the needs of the expanded pipeline and addresses all future regulatory requirements.

2.39 Environment, Health and Safety Policy

Reference:

A4D3F2, Trans Mountain EMP documents, Attachment 2.3 – Pipeline Emergency Response Plan, Section 15.0, Environment, Health and Safety Policy, PDF p. 185 of 191.

Preamble:

In the reference above, Trans Mountain makes the following assertion: “Trans Mountain has systems in place that prepare for emergencies and procedures that coordinate our response plans with emergency response organizations in the communities where we operate”.

Request:

Please describe the “systems” referred to above.

Response:

This is a general reference to the EMP. The Application, Volume 7, Section 4.2 (Filing ID A3S4V5) outlines the Management System that ensures Trans Mountain is prepared for emergencies and has the procedures in place that coordinate our response plans with emergency response organizations in the communities where we operate.

2.40 Facility fire and explosion

Reference:

A4D3F1, Trans Mountain EMP documents, Attachment 2.3 – Westridge Marine Terminal Emergency Response Plan, Section 6.3, Fire and Explosion Checklist, PDF p. 61 of 170.

Preamble:

The Fire and Explosion Checklist sets out the actions to be taken in the event of a fire or explosion at the Westridge Marine Terminal (the other filed ERPs contain similar information). One of these actions is to "[a]pply foam and water if available and as directed by Fire Department Personnel". This appears to indicate significant reliance on municipal first responders in the response of an emergency at Trans Mountain facilities.

Request:

a) Please describe in detail the extent to which Trans Mountain relies, or will rely, on municipal first responders to respond to an emergency originating at its facilities.

b) How does Trans Mountain plan to rely on local fire departments in the response to an emergency at its facilities in the event of a widespread public emergency that might render municipal first responders unavailable to attend at its facilities?

Response:

a) The question cannot be answered in the form requested because response actions are situationally specific and detailed extents cannot be known in advance.

Local first responders are contacted immediately, upon discovery and confirmation of an emergency condition, and oftentimes when an emergency is suspected as outlined in response to Province of BC IR No. 2.29b. Trained Kinder Morgan Canada Inc. (KMC) technicians at the location work with the local first responders to help secure the area and commence air monitoring to ensure air quality for those in the immediate vicinity. KMC would consult with, provide product information, air monitoring results, and other information about the incident to the local authority to determine the best course of action to protect the public.

KMC does not have the authority to order evacuation, or conduct the evacuation of residents, schools, daycares, hospitals, businesses, parks, recreation facilities, and other public/private places, nor does it have the authority to close roads, redirect traffic, public transit and other transportation related infrastructure. KMC agrees with the interpretation of the federal, provincial and municipal legislation dealing with emergency programs.

KMC takes full responsibility for any emergency that results from the Trans Mountain Pipeline system and its facilities and plans to jointly manage such an incident with the local, provincial and federal authorities in the jurisdiction of the emergency using Unified Command. The current planning method calls for the replacement of municipal services

with private firms as early in a response as possible, with the approval of Unified Command.

Kinder Morgan Canada Inc. (KMC) has an ongoing program to provide Community Awareness Emergency Response (CAER) sessions to first responders along the pipeline system. These sessions provide information with regard to the type and properties of petroleum transported through the pipeline and how to respond safely. These sessions along with regular exercises provide Trans Mountain the opportunity to maintain working relationships with first responders and to ensure mutual awareness of response programs.

Please refer to the response to Province of BC IR No. 2.21b.

b) Please refer to the response to Province of BC IR No. 2.40a.

The emphasised text in the preamble is meant to indicate the general intention of working in cooperation with local fire department personel.

Kinder Morgan Canada Inc. (KMC) is committed to ensuring a prompt and immediate response to any fire event that involves Trans Mountain Pipeline or Facilities to protect the public, employees, environment, and property. KMC fire plans for specific facilities are developed based in-part to reflect the capabilities of local municipal first responders. In the low likelihood event of a hydrocarbon fire KMC will respond using on-site trained personnel, and third party responders, to augment local municipal resources where required. Trans Mountain will continue to work with the local agencies with respect to fire protection to ensure all local resources and services are used efficiently to ensure prompt and safe fire response.

Trans Mountain expects that first responders will prioritize the allocation of resources to maximize public safety, and coordination of these decisions would be achieved through joint participation in Unified command under ICS. In the event that there are competing requirements for emergency response capacity Trans Mountain will cooperate with local agencies in the overall response and will seek to augment local resources with those available from outside the effected area.

In the low likelihood that an event consumed or made unavailable local resources capability, KMC would respond to the emergency with all regionally available resources while procuring additional resources, such as KMC personnel and specialized service and equipment providers, from outside of the effected region.

As part of a company with a significant resources throughout North America, KMC is well positioned to, and has the ability to acquire and deploy resources from outside a region effected by a force majeure event.

KMC uses the Incident Command System (ICS) for incident planning which is adaptable to different emergency scenarios and allows for quick identification of required resources, and a method of procurement. It is KMC's preference to enter into a Unified Command with the municipal, provincial and federal agencies to ensure a safe and

thorough response to any emergency. The ICS, and as noted above, KMCs proven ability, and commitment, to draw on response resources throughout North America, provides KMC the ability to coordinate with and assist communities with the overall response to the event, and not just those impacts associated with the Trans Mountain Pipeline system.

A widespread public emergency, that has caused a local state of emergency which has also impacted a Trans Mountain Facility would likely be managed from a municipal or provincial (where no local emergency management structure exists) Emergency Operations Centre. It is the expectation of Trans Mountain that Liaison personnel would be embedded within the larger response structure.

Please refer to the response to Province of BC IR No. 2.21b.

2.41 Response to previous incidents

Reference:

i. A3W9H8, Trans Mountain Response to NEB IR No. 1.70 a)

ii. A3Z8C3, Trans Mountain Follow-Up Response to Province of BC IR No. 1.16(b), Attachment 1 – Pipeline Investigation Report P05H0044.

iii. A3W9H8, Trans Mountain Response to NEB IR No. 1.70 b), PDF p. 404 of 421.

Preamble:

In reference (i), Trans Mountain provides a summary description of hydrocarbon releases experienced in its facilities in the past 10 years.

The description of each incident includes the "time of equipment arrival on site", which is defined as the "time of arrival of the first piece of equipment on site, this is often the same time as the time of initial assessment. KMC employees bring basic spill response equipment with them when responding to incidents".

At PDF p. 399 of 421, reference (i) states as follows with respect to the Ward Road release:

> **Ward Road Release**
>
> Date: July 15, 2005.
>
> Time: 7:30 am – Odour Complaint.
>
> Level of Incident: Level 3.
>
> Volume: 1320 bbl.
>
> Product: Crude Oil.
>
> Location: Kilometre Post 3.1 – Sumas Transfer Line at Ward Road (Abbotsford, BC).
>
> Site Access: Access to the spill site was Ward Road, and adjacent private property.
>
> Cause of Release: Equipment failure.
>
> Time of Initial Assessment: 7:30am Sumas Operations notified, discovered oil at Ward Road at 9:30am and completed assessment of area of impact at approximately 1:40pm.Response activities began at 9:30am while assessment continued to determine extent of impacts.
>
> Notification to Transportation Safety Board/NEB: 1:00pm (3 hours, 30 minutes from confirmation of incident).
>
> Time of equipment arrival on site: 10:40am – Vacuum Trucks Arrive. [emphasis added]

At PDF p. 398 of 421, reference (i) defines the date provided in the description of each incident as "the date on which the incident occurred".

Reference (ii) is Pipeline Investigation Report No. P05H004, issued by the Transportation Safety Board of Canada in relation to the Ward Road release. The Report describes the sequence of events at PDF p. 4 of 23:

> At 1130 mountain daylight time1 on July 8, the CCC received an odour complaint from a local resident. The CCO used Terasen's Odour Complaint Form to record the details, then notified the company's Burnaby operator, who investigated the odour complaint around 1400. The operator could detect crude oil odours, but could not determine the source.
>
> At 2138 and 2355, the CCO received further odour complaints from local residents in the same vicinity. After completing an Odour Complaint Form, the CCO contacted Burnaby to dispatch a Terasen operations employee to investigate. On 08 July 2005, around midnight, the operations employee proceeded to Ward Road. While crude oil odours were apparent near Ward Road, he did not discover crude oil.
>
> During the week leading up to the discovery of the location of the rupture, Terasen received five odour complaints from the area immediately south of the Sumas Tank Farm. Each complaint was investigated by a Burnaby operations employee without determining the cause of the odours.
>
> …
>
> At 1110, the City of Abbotsford (COA) Police and Fire Rescue Service (FRS) personnel arrived on site. At 1120, Terasen's Environmental Coordinator arrived on site. To enable the FRS to mitigate incidents involving any hazardous products, Terasen's first responders needed to identify the hazardous properties of the spilled product. However, the Terasen representative did not immediately identify the spilled product as containing hazardous by-properties. The FRS personnel, believing that there were no imminent hazards, began searching the ROW [right-of-way] to determine the source of the leak. Once identified, they marked the source of the leak. Then, they erected inverted weirs and began to contain the crude oil spill and inhibit further migration of product downstream of Ward Road. At 1140, vacuum trucks were dispatched to Ward Road. They arrived on site at 1440. [emphasis added]

The Transportation Safety Board concludes as follows, at PDF p. 15-16 of 23:

> Terasen's response and identification of the location of the leak was delayed by a number of factors that were within the company's capacity to manage and remediate. Vegetation along the ROW was dense. Vegetation clearing had been changed from twice to once a year and was not scheduled until October. Deploying a single Terasen operations employee at midnight did not lend itself to easy and early detection of product loss at the occurrence site because of both overgrown vegetation and darkness.

> Terasen employees responding to the odour complaints would have found walking the ROW difficult, with wet, soft footing, and dense, tall vegetation hampering visibility. The employee that discovered the release was not equipped with the PPE [Personal Protective Equipment] and gas detection equipment required by company procedures, although they were available.
>
> The employees were not well equipped to perform a thorough investigation of the ROW to find the source of the odour.
>
> Unlike PLM [Terasen's Pipeline Maintenance Division] employees, the Burnaby operations employees had limited knowledge of PPE and of the location of the pipelines in the ROW. Because no Odour Complaint Follow-Up Form was available from previous visits to the same location, responding operations employees were handicapped with respect to specific knowledge of the ROW and the location of the pipeline. This lack of follow-up did not permit employees on subsequent complaint investigations in the same area to explore other avenues. Because of the extensive history of previous odour complaints related to the Sumas Tank Farm, Burnaby operations employees may have underestimated the issue and were therefore reluctant to call for local PLM technical assistance. This incomplete response to the odour complaints led to delays in identifying the occurrence and to an increased impact of the leak on the surrounding environment.
>
> …
>
> Within four hours of arriving on site, the majority of the initial response, including locating the source of the leak, determining the extent of migration of the crude oil, and initiating containment (constructing three weirs) was completed by the FRS.
>
> …
>
> The initial response of FRS personnel was very effective, but because they had not been adequately informed by Terasen of the potential hazards of the products released from the pipeline, they lacked proper detection equipment to protect against potential occupational safety and health issues.
>
> [emphasis added]

With respect to the time of arrival of response equipment on site, reference (ii) states: "At 1140, vacuum trucks were dispatched to Ward Road. They arrived on site at 1440." [emphasis added]

When asked by the NEB to describe the learnings from those incidents, Trans Mountain states as follows in reference (iii):

> The investigations completed for the seven incidents outlined in the response to question NEB IR No. 1.70a did not include recommendations specific to the KMC Emergency Response Program. Also, post incident emergency response evaluations completed after some of these incidents included learnings generally related to operational activities that could have prevented the release, and not the response activities that took place. After all events it was noted that KMC had an appropriate

response to each event and was able to procure the staff and resources required to respond to the incident. [emphasis added]

Request:

a) For each incident described in reference (i), please describe:

- the equipment that arrived on site at the time specified; and
- the source of that equipment.

b) For each incident described in reference (i), please provide, as requested in NEB IR No. 1.70 a.5), "the time it took Trans Mountain to mobilize equipment to the site, set up an incident command post, and commence emergency phase activities (i.e., set up mitigation/equipment to prevent hydrocarbon migration, and allow containment and repair)".

c) For each incident described in reference (i) involving a spill into a river, please indicate the time it took to establish the first three downstream control points.

d) Please explain why the Ward Road release is described in reference (i) as having occurred on July 15, 2005, when, according to reference (ii), the first odour complaint was received on July 8, 2005.

e) Please explain why it took Trans Mountain (then Terasen Pipelines (Trans Mountain) Inc.) an entire week from the first odour complaint and a total of five odour complaints to discover the leak and commence response activities.

f) Please explain why, once the leak was discovered, the majority of the initial response, including locating the source of the leak, determining the extent of migration of the oil, and initiating containment, was performed by Abbotsford Fire Rescue Service (FRS), and not Trans Mountain personnel. Please describe Trans Mountain's understanding of the role of municipal first responders during a spill event.

g) Please explain why Trans Mountain employees failed to inform FRS of the potential hazards of the released product. What steps has Trans Mountain taken since the Ward Road release to adequately inform local emergency responders along the pipeline route of the location of the pipeline and the nature of the products being shipped?

h) What steps, if any, has Trans Mountain taken to address the factors identified in reference (ii) as the cause for the delay in identifying and responding to the leak?

i) Please explain why reference (i) states that the time of arrival on site of vacuum trucks was 10:40, when reference (ii) indicates that vacuum trucks arrived at 14:40.

j) In light of the delay in identifying and responding to the Ward Road release, please explain the statement in reference (iii) that "KMC had an appropriate response to each event".

k) Who made the determination that "KMC had an appropriate response to each event"? What factors were evaluated in reaching that conclusion? Please provide documentation to support that conclusion.

l) Why, as stated in reference (iii), did post-incident response evaluations not include response activities? Why did the investigation of the Ward Road release not result in any improvements to leak detection procedures, including procedures for the investigation of odour complaints, and monitoring of landowner activities?

Response:

a) In the response to NEB IR No. 1.70a (Filing ID A3W9H8) the above requested information was provided. Trans Mountain Pipeline ULC (Trans Mountain) notes the following for your convenience from the response to NEB IR No. I.70a (Filing ID A3W9H8):

- The definition used for the Time of equipment arrival was: *"time of arrival of the first piece of equipment on site, this is often the same time as the time of initial assessment. KMC employees bring basic spill response equipment with them when responding to incidents."*
- Ward Road Release – Please note the times stated in reference (i) are not in MST. Stated as MST, the odour complaint was received at 0830 and oil was discoved at 1030. The OSCAR Trailer from Burnaby Terminal arrived at 1430 and the vacuum trucks arrived at 1440.
- Westridge Delivery Line Release - Time of equipment arrival on site: 11:49 am (18 minutes from incident time).
- Tank 82 Release - Time of equipment arrival on site: 8:30 pm (at time of incident confirmation).
- KP 150 Release - Time of Initial Assessment: 3:30 pm (1 hour, 12 minutes from incident time).
- Tank 121 Release - Time of equipment arrival on site: 7:00 am (at time of incident confirmation).
- Kingsvale North Release - Time of equipment arrival on site: 11:35 am (30 minutes after confirmation of incident).
- KP 966 Release - Time of equipment arrival on site: 12:09 pm (at time of incident report).

The specific source and type of equipment that was first on scene is not within the scope of this proceeding and not relevant to the National Energy Board's List of Issues (Filing ID A3V6I2).

b) Please see the response to NEB IR. No. 1.70a (Filing ID A3W9H8). Emergency Phase activities are considered to be underway as soon as an emergency is confirmed, or as defined in the response to NEB IR. No 1.70a (Filing ID A3W9H8), the time of initial assessment. In a case where the time of incident is not the same as the time of initial assessment, it is due to the first report of a potential incident time being recorded as the official time of the incident, regardless of when the emergency phase began. All third

party reports of incidents must be confirmed by a Kinder Morgan Canada Inc. (KMC) employee or contractor before an emergency is declared. For each of the incidents described in NEB IR No. 1.70a (Filing ID A3W9H8) the Time of Initial Assessment, time of equipment arrival on site, and the time the incident command post was activated has been repeated below for convenience:

Ward Road Release

Odour complaint received at 0830 MST. Sumas Operations notified, discovered oil at Ward Road at 1030 MST. Response activities began at 1120 MST.

Time of equipment arrival on site: 1430 MST Burnaby Oscar Unit arrives; 1440 MST Vacuum Trucks Arrive.

Incident Command Post activation: began setting up at Sumas Station at 1330 MST.

Westridge Delivery Line Release

Time of Initial Assessment: 11:49am (18 minutes from incident time).

Time of equipment arrival on site: 11:49am (18 minutes from incident time).

Time of Incident Command Post activation: 12:08pm (19 minutes from Initial Assessment and confirmation of incident).

Tank 82 Release

Time of Initial Assessment: 8:30 pm (at time of incident confirmation).

Time of equipment arrival on site: 8:30 pm (at time of incident confirmation).

Time of Incident Command Post activation: 10:30 pm (2 hours from Initial Assessment).

KP 150 Release

Time of Initial Assessment: 3:30 pm (1 hour, 12 minutes from incident time).

Time of equipment arrival on site: 3:30 pm (at time of confirmation of incident).

Time of Incident Command Post activation: 3:45 pm (15 minutes from Initial Assessment; 1 hour, 27 minutes from incident time).

Tank 121 Release

Time of Initial Assessment: 7:00 am.

Time of equipment arrival on site: 7:00 am (at time of incident confirmation).

Time of Incident Command Post activation: 7:15 am (15 minutes from Initial Assessment and confirmation of incident).

Kingsvale North Release

Time of Initial Assessment: 11:05 am (at time of incident report).

Time of equipment arrival on site: 11:35 am (30 minutes after confirmation of incident).

Time of Incident Command Post activation: 11:45 am (40 minutes after the confirmation of incident).

KP 966 Release

Time of Initial Assessment: 12:09 pm (at time of incident report).

Time of equipment arrival on site: 12:09 pm (at time of incident report).

Time of Incident Command Post activation: 1:00pm (51 minutes from time of confirmation of incident).

Please also refer to the response to Province of BC IR No. 2.41a.

c) None of the incidents described in the response to NEB IR No. 1.70a (Filing ID A3W9H8) involved a spill into a river. However, the Ward Road Release involved a release into a creek. Records indicate oil was discovered at 1030 MST and an inverted weir was installed at 1530 MST to contain the oil for recovery. Unfortunately records do not indicate the time it took to establish the first three downstream control points, but the weir installation indicates control points were established prior to 1530 MST.

d) The Ward Road release is described in reference (i) as having occured on July 15, 2005 as that is when the release was verified by one of the pipeline operators. In most cases discovery and release dates are the same. When releases occur from cracks or other small features, the flowrate from the pipe is reduced and verification may occur after the initiation of the release. The actual date and time of the start of the Ward Road release is unknown. Trans Mountain acknowledges the odour complaint information presented in reference (ii) which, in hind-sight, suggests the release most likely commenced on or before July 8, 2005.

Please refer to the response to Province of BC IR No. 2.21b.

e) Trans Mountain acknowledges the odour complaint information presented in reference (ii) indicates the release most likely commenced on or before July 8, 2005. Reference (ii) also includes information describing several factors, within the company's capacity to manage and remediate, which contributed to the delay in identification of the location of the leak. In addition to these factors, when releases occur from cracks or other small features, the flowrate from the pipe is small making it difficult to verify a release has occurred. As the volume of the release increases it becomes easier to identify.

Kinder Morgan Canada Inc. (KMC) acknowledges the response to the 2005 Ward Road odour complaints was not sufficient to identify the release in a timely manner and has improved the Company Odour Complaint Investigation and Response Program to

prevent delays in identifying releases. The improved program includes a training module for KMC employees who respond to odour complaints.

Please refer to the response to Province of BC IR No. 2.21b.

f) Abbotsford Fire Rescue Service (FRS) arrived on site prior to Kinder Morgan Canada Inc. (KMC) response crews and Western Canada Marine Response Corporation personnel and took the initiative to implement initiate initial response measures. KMC equipment and response personnel arrived on site soon after, set up incident command, and implemented a comprehensive emergency response to the pipeline release. Following the emergency response phase KMC completed successful remediation and reclamation of the release location.

Municipal first responder's role is to take all actions necessary to protect the public. KMC does not have the authority to order or conduct evacuations of public or private places. KMC personnel also do not have the authority to close roads, redirect traffic, redirect, stop or redirect public transit, or other transportation related infrastructure. KMC works collaboratively with the local first responders through an ICS structure to coordinate these and other activities in the unlikely event the need arises.

The FRS response to the Ward Road release was done so on their own initiative and helped prevent further migration of the crude oil. KMC greatly appreciates municipal first responders with sufficient manpower and knowledge to safely implement early response measures. It should also be noted that historically KMC has responded to provide assistance at the request of government agencies to incidents involving semi-trailer spills and other third party petroleum releases unrelated to KMC's operations. In these cases KMC takes a similar initiative by providing trained response personnel and equipment to help ensure public safety and minimize impacts to the environment.

Please refer to the response to Province of BC IR No. 2.21b.

g) It is unfortunate, that although there were strong petroleum odours in the area of the release, Abbotsford Fire Rescue Service (FRS) personnel believed there were no imminent hazards, as stated in the Transportation Safety Board of Canada Pipeline Investigation Report No. P05H004. Kinder Morgan Canada Inc. (KMC) trains operations personnel to assess hazards prior to undertaking nonroutine tasks. No record exists of all discussions which took place in the early stages of the response. However, if hazards were not identified and discussed prior to commencing initial response activity, responding KMC personnel, and likely FRS personnel, were not following their respective procedures or safety policies.

KMC has an ongoing program to provide Community Awareness Emergency Response (CAER) sessions to first responders along the pipeline system. These sessions provide information with regard to the type and properties of petroleum transported through the pipeline and how to respond safely. In the unlikely event of a release KMC provides material safety data sheets (MSDS) and the product name to incoming first responders and communities as soon as possible. KMC has provided CAER sessions to the

Abbotsford Fire Rescue Service (FRS) many times over the years. These sessions included a detailed discussion with regard to the hazards associated with a crude oil release. KMC strives to meet with each Fire Department along the pipeline every three years.

Please refer to the response to Province of BC IR No. 2.21b.

h) In order to determine the root cause of the Ward Road Release and identify measures to prevent similar incidents from occurring as well as improvements to the response to pipeline releases, Kinder Morgan Canada Inc. (KMC) completed a comprehensive incident investigation. The incident investigation report includes several recommendations with regard to how the Company responds to odour complaints. To address these recommendations KMC has revised the Company Odour Complaint Investigation and Response Procedure to prevent delays in identifying releases and to make sure employees implement safety precautions. KMC has also developed an Odour Complaint Investigation and Response training module. This training is required for all KMC field technicians.

When an odour complaint is received at the KMC Control Centre, it is assigned to the local on-call technician. If the area where the odours are present includes the Trans Mountain Pipeline right-of-way, the technician can request assistance from pipeline maintenance personnel to assist with the investigation. In addition to the above, the section of right-of-way on Sumas Mountain now has the vegetation mowed twice per year.

Please refer to the response to Province of BC IR No. 2.21b.

i) The response to NEB IR No. 1.70a incorrectly states the vacuum truck arrival time. Vacuum trucks arrived at 14:40.

j) In the response to Province of BC IR No. 2.41 Kinder Morgan Canada Inc. (KMC) acknowledges the response to the 2005 Ward Road odour complaints was not sufficient to identify the release in a timely manner. Actions taken to improve the response to odour complaints are also included in the response.

With regard to emergency response to the Ward Road release the actions taken by KMC were appropriate and resulted in successful clean up and remediation of the impacted area. Upon discovery on July 15, 2005 the necessary personnel and equipment were dispatched, incident command was established and appropriate emergency response measures implemented. Emergency response efforts continued in full cooperation with government agencies until all free oil was recovered. At the end of the emergency response phase, Incident Command disbanded and KMC continued with site remediation and reclamation for several years. Remediation of the site is now complete and KMC is in the process of removing the groundwater monitoring wells in order to receive formal closure from the National Energy Board. With regard to the Trans Mountain emergency response the TSB stated in its investigation report that:

> *Terasen's response was handled efficiently and effectively by the initial PLM [Terasen pipeline maintenance] response group and later by the larger team controlled by the Incident Command System. The released oil was cleaned up quickly and contaminated soils were removed to a controlled area for disposal.*

Please refer to the response to Province of BC IR No. 2.21b.

k) Emergency response evaluations are completed following larger incidents that require significant emergency response efforts and implementation of the incident command system. These sessions are not documented to encourage individuals to participate freely and share their opinions and information. Positive remarks with regard to Kinder Morgan Canada Inc. (KMC)'s response following various releases have been made by regulators, response contractors as well as Company employees. KMC puts considerable resources into its emergency response program and holds several exercises every year. Although evaluations following both exercises and responses to incidents identify areas for improvement, consensus is usually reached by these individuals that the response was appropriate and effective.

The main factors which would lead individuals to reach this conclusion include KMC's ability to procure personnel and resources required to respond; implementation of the incident command system and unified command; and the results achieved by the emergency response. Unfortunately, as stated above, documentation is not available to provide with this response. Information supporting the KMC emergency response to the Ward Road release was appropriate is included in the response to Province of BC IR No. 2.41j.

Please refer to the response to Province of BC IR No. 2.21b.

l) The above request does not accurately state what is included in reference (iii). Reference (iii) states "Also, post incident emergency response evaluations completed after some of these incidents included learnings generally related to operational activities that could have prevented the release, and not the response activities that took place". Typically, learnings are only included where potential improvements are identified by the various organizations represented at the evaluation. The absence of such observations suggests the Kinder Morgan Canada Inc. (KMC) response activities were appropriate and effective.

The second half of the request also wrongly states that the investigation of the Ward Road release did not result in any improvements to leak detection procedures. The detailed KMC Ward Road incident investigation report includes six recommendations with regard to odour complaints and three recommendations with regard to integrity management and maintenance which have resulted in improvements, including modifications to the Company Odour Complaint Investigation and Response Procedure Program (refer to Province of BC IR No. 2.41h) and the Crossing Approval Procedure. The investigation also resulted in an initiative to identify locations with vulnerable soils such as swamps and peat bogs, and extend the Natural Hazards Management Program

and geotechnical database to include these areas. KMC also provided employees with technical information warning of the dangers of changes due to soil loading around peat bogs and swamps.

In addition to the above, since the Ward Road release KMC has made considerable changes to its Pipeline Protection Program. Please see Volume 4C, Section 6.0 and 6.1 of the Facilities Application (Filing ID A3S1L1). KMC now has a department of pipeline protection and public awareness specialists who are responsible for protecting the pipeline (both the existing system and, if approved, the expanded pipeline system) through public awareness and monitoring of ground disturbance activity within close proximity to the pipeline or right of way.

KMC recognizes third party damage as a significant threat to our pipeline assets and the Pipeline Protection Department develops and administers policies, procedures, and training required as part of the KMC Damage Prevention Program. The Damage Prevention program is responsible for:

- surveillance of the right-of-way with ground and aerial patrols to monitor activities that could negatively impact the pipeline;
- response to each ground disturbance/excavation request through the Provincial Call Before You Dig Centre;
- physically locating the pipeline to issue ground disturbance safety or proximity permits; and
- observing/inspecting ground disturbance activity to ensure the safety of the pipeline.

Please see Volume 7, Section 4.7 (Filing ID A3S4V5) for information on Community Awareness and Emergency Preparedness initiatives. Through our Public Awareness Program, KMC is responsible for communicating damage prevention and pipeline safety messages to four distinct stakeholder groups:

- Affected Public;
- Contractor/Excavator;
- Emergency Responders; and
- Elected Officials and Government Employees.

KMC's Public Awareness Program is designed to create awareness about pipelines, provide important safety information to people living and working near KMC pipelines, increase knowledge of the regulations for working around pipelines, educate first responders and the public on KMC's emergency preparedness and response activities, prevent damage to KMC pipelines, and enhance public safety. KMC does this through a variety of tactics such as our website and social media, annual mailing programs, landowner packages, presentations, trade shows and community events.

Please refer to the response to Province of BC IR No. 2.21b.

2.42 Continuous improvement

Reference:

i. A4D3F2, Trans Mountain EMP documents, Attachment 2.3 – Pipeline Emergency Response Plan, Revisions after Release or Exercise, PDF p. 8 of 191.

ii. A3Z8C8, Trans Mountain Follow-up Response to BC IR No. 1.16 d), PDF p. 2 of 2.

Preamble:

The Pipeline ERP (reference (i)), as well as the other filed ERPs, states a commitment to continuous improvement:

> In the event that Kinder Morgan Canada experiences a release (worst case of otherwise), or conducts an exercise or training session, the effectiveness of the plan will be evaluated and updated as necessary.

In reference (ii), Trans Mountain explains:

> Following the emergency response phase of the Westridge Release, the National Energy Board (NEB) organized sessions for all those who took part in the emergency response and the post-remediation monitoring and cleanup to discuss what worked and what did not, as well as enhancements to future emergency responses. … (KMC) participated in these sessions but does not have any record or minutes related to the meetings. Meetings such as these are often informal and minutes not taken in order to promote frank discussion among participants. KMC does not have records describing enhancements to the Company emergency response program resulting from information gathered these sessions.

Request:

a) Please describe Trans Mountain's continuous improvement program with respect to spill response techniques and equipment.

b) Please describe the process, alluded to in reference (i), that Trans Mountain follows for revising its ERPs in response to incidents, exercises and training.

c) What specific improvements has Trans Mountain's continuous improvement program yielded?

d) Please reconcile the commitment to continuous improvement with the statement in reference (ii) that Trans Mountain does not keep any records of the outcome of discussions at post-spill debrief sessions organized by the NEB. How can "lessons learned" from spill events result in any ability to revise ERPs if they are not captured in writing?

Response:

a) The programs, processes and procedures related to Kinder Morgan Canada Inc.'s (KMC) spill response techniques and equipment form a portion of the KMC Emergency Management Program (EMP). The EMP in turn, through the KMC Environment, Health & Safety Management System (EHSMS), is an element of the KMC Integrated Safety and Loss Management System (ISLMS).

The EMP is regularly reviewed and adjusted as needed to address a combination of regulatory compliance, operational need, industry best practice, and lessons learned from exercises and incidents.

The ISLMS is an overarching framework based on the principal of continuous improvement, providing a structured approach to continuously improving programs within KMC, with the overall objective of assuring the safety and security of people and protection of the environment. It is a requirement of SOR/ 99-294 National Energy Board (NEB), *Onshore Pipeline Regulations* (OPR).

The ISLMS requires program managers in all areas of operations, including emergency response, safety, environment, security, integrity management, system control, monitoring, and leak detection and others to set specific goals each year, commensurate with the ISLMS philosophy of continuous improvement.

As stated above, the ISLMS requires all program managers, including the program manager responsible for emergency response, to set annual objectives and to set specific, supporting goals for continuous improvement. The performance against these objectives and supporting goals is monitored through formal processes each year. The performance monitoring occurs through well-established, documented mechanisms that include the KMC employee performance management system and its periodic formal and informal employee performance appraisals. Additional performance monitoring at the company-wide level occurs through the mandatory, formal ISLMS review meetings held which involve program managers, senior managers and company executive sponsors. The ISLMS requires that the mandatory annual reviews of program elements are documented and signed off by the Company Accountable Officer.

The resolution of problems that are identified concerning the performance of spill response techniques and equipment may become part of one of more of the EMP program manager's annual objectives, which are then monitored and reported upon by the mechanisms described in the preceding paragraph. Any physical or technological issues that are identified through periodic inspection or testing of equipment and systems are documented, addressed and the lessons learned are applied to locations across the system.

Annual improvement goals for emergency response are in part developed from learnings gained through table-top and field deployment spill exercises and through experience gained through the response to live spills. Action items are identified through internal post-exercise or post-incident reviews. The response actions review is conducted by

survey and a workshop is held to review the response. External agencies that participated in the Incident Command System (ICS) structure are invited to participate in the survey and workshop, however participation is voluntary. Any actionable items that come from the survey and/or workshop are tracked on a KMC internal action tracker until the item is complete.

The ISLMS is audited by the NEB based on the frequency that they deem necessary.

The operation of the Trans Mountain Expansion Project (TMEP) will be integrated into the existing ISLMS, meeting the regulatory requirements of the NEB, OPR.

b) The current EMP documents are internally reviewed annually to ensure response actions and contacts are appropriate and critical information that may be needed during a response is up to date, and every 5 years to ensure the entire program meets or exceeds regulatory requirements. When these reviews result in changes, which the normally do, updated plans are issued to manual holders. The following are examples of the information that is reviewed in detail during the annual review;

- Responder Health and safety for personal protective equipment (PPE) requirements and the occupational exposure thresholds for the different products;
- Notification procedures including incident management team contact telephone numbers,
- Review of contractors/service providers contact details and contract terms ensuring the contract is still valid;
- Hazard listing to ensure all hazards have a response procedure
- Response procedures for completeness, and accuracy including a review of new response techniques to be considered for inclusion.

This routine review process does not preclude changes to address learnings from exercises, advice from external agencies, changes in regulation, and other off-cycle events. When events like these occur the changes are incorporated and updates to the plan are issued.

Please refer to the response to Province of BC IR No. 2.21b.

c) A list of learnings from exercises including how the learnings were incorporated into the current EMP are outlined in the response to NEB IR No. 1.69b (Filing ID A3W9H8), and learnings related to incidents are outlined in the response to NEB IR No. 1.70b (Filing ID A3W9H8) for past incidents. Both have been copied below for your convenience.

Text from NEB IR No. 1.69b (Filing ID A3W9H8)

Request:

b) Please discuss the learnings from the exercises and provide evidence of how these learnings were incorporated into Trans Mountain's emergency management program, and communicated to Trans Mountain office and field personnel.

Response:

b) Kinder Morgan Canada Inc. (KMC) held 28 exercises between March of 2009 and March of 2014.

The following pages list the exercises from Information Request No.1.69a and include emergency management program related learnings, how they were incorporated to the emergency management program, and how they were communicated. Some of the earlier exercises have missing data and the learnings are unavailable, though information gained would have been used in continuous improvement of the program. During the Emergency Management Program Management System review in 2012 a deficiency was identified with regard to the procedure for retention of records related to emergency response exercises. KMC is committed to continual improvement, and as such has corrected the procedure for the capture of learnings within the management program. Exercises with incomplete documentation have been identified in the following list of exercises.

Exercise Date	Location	Learnings
March 5, 2009	Kamloops	Learnings specific to logistics and support services to improve effectiveness of exercise and not to the Emergency Management Program.
March 25, 2009	Edmonton	Learnings specific to logistics and support services to improve effectiveness of exercise and not to the Emergency Management Program.
April 16, 2009	Jasper	Learnings specific to logistics and support services to improve effectiveness of exercise and not to the Emergency Management Program.
September 10, 2009	Fraser River	Learnings specific to logistics and support services to improve effectiveness of exercise and not to the Emergency Management Program.
October 14, 2009	Edmonton	Incomplete documentation.
November 17, 2009	Westridge	Incomplete documentation.
January 27, 2010	Richmond	Learnings specific to logistics and support services to improve effectiveness of exercise and not to the Emergency Management Program.
September 21, 2010	Westridge	Learnings specific to logistics and support services to improve effectiveness of exercise and not to the Emergency Management Program.
June 23, 2010	Edmonton	Learnings specific to logistics and support services to improve effectiveness of exercise and not to the Emergency Management Program.
September 15, 2010	Valemount	The radio communications were difficult due to building limitations; a radio relay was established to fix the issue of communicating with the field operations. Other learnings were related to the need to have local knowledge in the Logistics section, and more people were required for the size of the exercise and local conditions.
February 23, 2011	Edmonton	Incomplete documentation.
February 10, 2011	Westridge	Learnings specific to logistics and support services to improve effectiveness of exercise and not to the Emergency Management Program.
April 21, 2011	Jasper	The emergency response plans require updates to the contact sections; this update was completed by June of 2011 and distributed to all plan holders.
November 23, 2011	Abbotsford	Incomplete documentation.
April 10, 2012	Hope	Incomplete documentation.
June 27, 2012	Clearwater	Incomplete documentation.
September 6, 2012	Jasper	It was recognized at the exercise that the response trailers may be stocked and have inconsistent set up, which may complicate response efforts if personnel were to respond from an adjacent district, therefore the outcome was to conduct a system wide readiness and feasibility study of equipment types, locations and suitability in 2014. This is on-going and involves the participation of various levels of the company.
October 26, 2012	Edmonton	To liaise with companies in pipeline alley and exercise response plans together. This is scheduled for September of 2014. To continue with efforts to exercise with Strathcona County Emergency Services, this was completed in May of 2013, and efforts are on-going to ensure Trans Mountain participates with local response agencies across the pipeline.

Exercise Date	Location	Learnings
November 28, 2012	Richmond	Ordering and resource request process needs clarification. A study was undertaken to determine what had worked in the past for the ordering process and forms that work with the Kinder Morgan Canada procurement process. A form was developed and distributed to all field offices in September of 2013. ICS Manual required updates and amalgamation into a guide that is specific to Kinder Morgan Canada operations. A project was undertaken to update the ICS guide and make it a handbook for all employees. The guide was finalized and distributed in July of 2013, after field testing and review. All members of the incident management team received a copy of the guidebook and is used as part of ICS training. The training priorities were reviewed and updated to ensure groups of responders were receiving the material that was most appropriate to them. The exercise program was revamped for 2013 and communicated to all employees.
February 13, 2013	Blue River	Learnings specific to logistics and support services to improve effectiveness of exercise and not to the Emergency Management Program.
June 25, 2013	Kamloops	Learnings specific to logistics and support services to improve effectiveness of exercise and not to the Emergency Management Program.
May 23, 2013	Westridge	The exercise confirmed the adequacy of existing emergency response program.
May 30, 2013	Edmonton	Response to the Edmonton Terminal site is confusing for Emergency Services due to multiple buildings and entrances with the same address. Signage was added to the main gate and procedures for calling emergency services were updated and communicated to all terminal and office employees working at Edmonton Terminal for calling 911. Changes were made to the alarm system automatic call out to reflect the new entrance labelling system. This was completed in November 2013.
September 12, 2013	Edmonton	Learnings specific to logistics and support services to improve effectiveness of exercise and not to the Emergency Management Program.
November 7, 2013	Westridge	The exercise confirmed the adequacy of existing emergency response program.
December 11, 2013	Edmonton	The exercise confirmed the adequacy of existing emergency response program. Learnings were related to the logistics of an exercise to make things more visible for observers and evaluators. Examples include ability to print larger maps, a tracking mechanism for injection of recovered oil, communication of exercise inputs and responses to observers, and ICS vests for all in the command post to easily identify operational groups.
April 10, 2014	Chilliwack	To further develop response plan information for wildlife recovery, and local knowledge of culturally and environmentally significant areas surrounding the pipeline. To further develop control point information to contain more response tactics. These learnings are being researched for ongoing operational updates to the ERP as well as planned enhancements for the proposed expansion.

Text from NEB IR No. 1.70b (Filing ID A3W9H8)

Request:

b) Please discuss the learnings from the incidents and provide evidence of how these learnings were and will be incorporated into future development of Trans Mountain's emergency management program, and communicated to Trans Mountain office and field personnel.

Response:

b) Kinder Morgan Canada Inc. (KMC) investigates all petroleum release incidents on the Trans Mountain Pipeline system. The investigation reports include recommendations to prevent future incidents or improve the Company's incident response. The investigations completed for the seven incidents outlined in the response to question NEB IR No. 1.70a did not include recommendations specific to the KMC Emergency Response Program. Also, post incident emergency response evaluations completed after some of these incidents included learnings generally related to operational activities that could have prevented the release, and not the response activities that took place. After all events it was noted that KMC had an appropriate response to each event and was able to procure the staff and resources required to respond to the incident.

A learning that resulted from the Sumas Tank Farm release in 2012 was the need to develop a community air monitoring program to address public health concerns related to emissions from a petroleum release and to identify when evacuation of local residents would be necessary. The Kinder Morgan Air Monitoring Plan for Unplanned Petroleum Release Acute Public Health Risk Related to the Inhalation Pathway was completed in February 2013 and implemented in an exercise the same year. This plan is being incorporated into all emergency response plans in 2014.

The method used to communicate learnings to company or contractor personnel depend on the target audience and include modifications to the training program, safety flashes or other bulletins, or discussion at tailgate or other safety meetings. Examples of changes to company procedures as the result of learnings from the incidents mentioned in NEB IR No. 1.70a include:

- Issuing Company ID cards issued to all employees and contractors, and procedures for identifying who requires an ID card,
- Modifications to the odour complaint process for investigation and reporting of odours,
- Modification to leak detection systems,
- Enhancement of crossing permits, line marking, line locating and crossing inspection work processes and documentation,
- Enhancing the public awareness management program to cover all aspects of pipeline protection, including the periodic evaluation of the effectiveness of pipeline surveillance practices,

- Updated training for tank inspectors to include procedures for ensuring contractor preparedness for emergencies and assessing hazards on active tanks,
- Studying site drainage paths and ensuring any points of intersection with groundwater drainage systems are isolated,
- Assessing the capacity and permeability of tank bays,
- Updating the winterization procedure for external floating roof drain systems to address system freezing hazard at locations where hazard may only be present on a short term and/or infrequent basis, and
- Development and implementation of a Tank Level Deviation Alarm Standard.

d) The information request is not relevant to one or more of the issues identified in the National Energy Board's List of Issues for the Trans Mountain Expansion Project. However we offer the following examples of changes and modifications to our operations resulting from incidents that demonstrate commitment to continuous improvement.

Following the Westridge spill in Burnaby in 2007 caused by third party damage to the pipeline we made a significant organizational change which created a department solely dedicated to protection of our pipeline assets from third party damage. New positions were created to manage all aspects of damage prevention. Patrol frequencies on the high risk urban areas were also increased.

Following the Sumas release in 2012 improvements were made to our air monitoring capabilities at the Sumas tank farm. A system to provide automatic notification to residents in case of an incident at the tank farm was implemented, and protocols for responding to odour complaints were modified.

KMC's Quality Assurance Program continuously monitors the adequacy and effectiveness of the Integrated Safety and Loss Management System (ISLMS) at achieving its stated goals. It has processes for identifying deficiencies and opportunities for improvement, for developing action plans and for tracking identified actions through to completion. Management will participate in the Quality Assurance Program by reviewing KMC performance in meeting safety and loss management goals and committing to action plans.

The KMC- Annual Quality Assurance Report is completed by April 30th of each year, and includes:

- results of audits integrated with other data in hazard identification and analysis and risk assessment;
- a summary of all identified deficiencies and how they were addressed;
- a summary of any identified opportunities for improvement and the plans to capitalize on these opportunities;
- an evaluation of KMC's performance in achieving safety and loss management goals, objectives and targets (as outlined by performance measures and targets in the Safety and Loss Management Dashboard);
- a summary of the annual human resources evaluations; and,

- documentation demonstrating the adequacy and effectiveness of the ISLMS.

A letter is filed with the NEB by April 30th of each year stating that the Annual Quality Assurance Report has been completed and signed by the Accountable Officer.

2.43 Emergency Management Program revisions and Regional Environmental Emergencies Team

Reference:

i. A4D3F4, Trans Mountain EMP documents, Attachment 3 – Review and Revision of the Emergency Management Program for Trans Mountain Expansion Project, PDF p. 1 of 2.

ii. A4D3F2, Trans Mountain EMP documents, Attachment 2.3 – Pipeline Emergency Response Plan, Section 16.3, Provincial – British Columbia, PDF p. 190 of 191.

iii. A4D3F1, Trans Mountain EMP documents, Attachment 2.2 – Westridge Marine Terminal Emergency Response Plan, Section 6.2, Federal, PDF p. 168 of 170.

iv. A4D3F2, Trans Mountain EMP documents, Attachment 2.3 – Pipeline Emergency Response Plan, Section 10.0, Planning Section, PDF p. 111 of 191.

v. A4D3F0, Trans Mountain EMP documents, Attachment 2.1 – Incident Command System Guide, Section 4.2, Regional Environmental Emergency Team (REET), PDF p. 22 of 122.

vi. A4E1T5, Follow-Up Information from Environment Canada, Attachment 2, PDF p. 2-3 of 4.

Preamble:

In reference (i), Trans Mountains states as follows: “The EMP is a set of dynamic documents that is reviewed regularly and updated to accommodate lessons learned and industry best practices.”

The Ministry of Environment is referred to in the ERPs as “BC Ministry of Environment, Lands and Parks (MOE)” (see, for instance, reference (ii)).

The ERPs further state that Environment Canada will notify PEP (Provincial Emergency Program) in the event of an incident (see, for instance, reference (iii)). PEP is no longer in existence and has been replaced by Emergency Management BC.

Finally, the ERPs make reference to working closely with “REET” (Regional Environmental Emergency Team) when discussing the duties of Trans Mountain’s Environmental Unit (see, for instance, reference (iv)).

The Incident Command System Guide (reference (v)) includes a lengthy discussion of REET:

> The Regional Environmental Emergencies Team (REET) provides consolidated and coordinated environmental advice, information and assistance in the event of an environmental emergency. REET is most common in Canada, however it may be adapted for use in the USA if the responding agencies are interested in forming this type of team.

REET members represent several federal, provincial and municipal government departments, aboriginal communities, private sector agencies, and local individuals. In British Columbia, REET is co-chaired by Environment Canada and the Province of British Columbia.

In an emergency situation REET operates as a multi-disciplinary and multiagency team that provides comprehensive and coordinated environmental advice, information and assistance to the Responsible Party Incident Commander, Coast Guard On-Scene Commander (marine spills) or other government Lead Agency (land spills). On behalf of the Responsible Party Incident Commander, Coast Guard On Scene Commander or Lead Agency, REET can address and prioritize the environmental, cultural, economic, property and human issues. REET effectively eliminates agency overlap and utilizes all resources to identify and action the resources at risk. Technical specialists representing REET agencies may form part of the Environmental Unit, reporting to the Resources at Risk Specialist. A member of the REET may also act as the Leader of the Resources at risk Unit. REET, when established, is responsible to:

- Establish the REET team from agencies with jurisdiction or interest in the spill, as well as local resources such as Native Bands, local cultural/historical specialists, and other appropriate private sector groups.
- As a team identify the environmentally sensitive resources in the area impacted — Resources at risk (ICS 232)
- Assist with determining pollutant behaviour, fate and effects
- Identify and prioritize environmental areas to be protected, rehabilitation priorities, economically impacted areas, historical and culturally sensitive areas, and socioeconomic resources impacted.
- Support the Environmental Unit Leader in both the Tactics and Planning meetings regarding resources at risk and REET recommendations/priorities.
- Maintain a log of all activities (ICS 214) and forward to Documentation Unit at the end of the shift.

In reference (vi), Environment Canada makes it clear that REET has ceased to exist: “The REET model existed until mid-2012 when it was was [sic] replaced with the Environmental Emergencies Science Table (Science Table)”. Environment Canada goes on to describe the functions performed by the Science Table, which differ significantly from the functions previously carried out by REET:

> During the response to an environmental emergency requiring multi-agency cooperation, personnel from Environment Canada's NEEC [National Environmental Emergencies Centre] can convene and chair (or co-chair with BC Ministry of Environment) a Science Table at the request of the Lead Agency coordinating the emergency response. The Science Table is not a spill response organization in the literal or traditional sense; namely, it does not involve in hands-on spill clean-up operations, nor does it own or maintain clean-up equipment. Rather, the Science Table brings together relevant experts in the field of environmental protection in the event of a significant environmental emergency response.

…

The role of the Science Table is to develop consensus on environmental protection and cleanup priorities by bringing the right expertise, adapting the scale of response to a particular environmental emergency, and providing a forum for rapidly moving information to minimize damage to human life or health, or the environment while maximizing the use of limited response resources. These discussions can occur on-site, or by telephone or videoconference.

The Science Table supplies the Lead Agency, Responsible Party, and response organizations with consolidated scientific and technical advice on environmental concerns, priorities and strategies, thus enabling and optimizing the environmental response.

…

The Science Table does not include the provision of response training to stakeholders. Response personnel from Environment Canada's Environmental Emergencies Program do, however, liaise with and exercise with Science Table stakeholders in a continued effort to build on the knowledge gained and relationships established from past REET exercises and response activities.

Request:

a) How often does Trans Mountain revise and update its EMP documents?

b) Please reconcile Trans Mountain's commitment to regular revisions of its EMP documents with the fact that the ERPs refer to organizations that are no longer in existence or have undergone name and contact information changes.

c) Please describe how the functions that were previously carried out by REET are now performed in the event of an emergency.

Response:

a) Kinder Morgan Canada Inc. (KMC) acknowledges the interest of the Province of British Columbia to seek more information about the existing emergency management program (EMP) documents, and reference materials related to the Trans Mountain Pipeline System, which is why KMC filed a redacted copy of the existing Emergency Response Plans publicly. In Ruling No. 50 (Filing ID A4G5I9) the National Energy Board (NEB) determined that it was "satisfied that sufficient information has been filed from the existing EMP documents to meet the Board's requirements at this stage in the process."

Although the information requested is not within the scope of this proceeding and not relevant to the NEB's List of Issues, KMC offers the following response to your question.

The current EMP documents are internally reviewed annually to ensure response actions and contacts are appropriate and critical information that may be needed during a response is up to date. The EMP documents are reviewed every 5 years to ensure the

entire program meets or exceeds regulatory requirements. When these reviews result in changes, which they normally do, updated plans are issued to manual holders. Following are examples of the information that is reviewed in detail during the annual review:

- Responder Health and Safety for personal protective equipment (PPE) requirements and the occupational exposure thresholds for the different products;
- Notification procedures including incident management team contact telephone numbers;
- Review of contractors' and service providers' contact details and review of contract terms to ensure the contract is still valid;
- Hazard listing to ensure all hazards have a response procedure; and
- Response procedures for completeness and accuracy including a review of new response techniques to be considered for inclusion.

This routine review process does not preclude changes to address learnings from exercises, advice from external agencies, changes in regulation, and other off-cycle events. When events like these occur, the changes are incorporated and updates to the plan are issued.

b) The changes to REET occurred in the spring of 2014, after the annual update was underway. Information describing the new Science Table program was not available, nor well understood when the current Emergency Management Program documents were published. Below is a description of the Science Table program taken from Environment Canada's website accessed February 1, 2014:

> *During the response to an environmental emergency requiring multi-agency cooperation, the Environmental Emergencies Science Table (the "Science Table") can be convened to provide advice to the lead agency. The Science Table brings together relevant experts in the field of environmental protection such as response agencies, all levels of government, Aboriginal representatives, local communities, industries, environmental non-government organizations, and academic institutions.*
>
> *The Science Table of experts is able to develop consensus on protection and clean-up priorities, bring the right expertise, adapt the scale of response to a particular environmental emergency, and provide a forum for rapidly moving information to minimize damage to human life or health, or the environment while maximizing the use of limited response resources. These discussions can occur on-site, or by telephone or videoconference.*

This closely matches the description of what was formerly known as REET. KMC took additional time to incorporate these changes to ensure all parts of the EMP reflect the changes. The current Emergency Management Programs will be updated to reflect the new program name and description in the spring of 2015.

As an example of typical latency in responding to changes such as the new Science Table, despite diligent programs, Trans Mountain respectfully notes that the Province of British Columbia's *Inland Oil Spill Response Plan* and *Marine Oil Spill Response Plan* both of which are dated July 2013 and signed by the Minister of Environment on October 30, 2014 contain similar references to REET and have not been updated to reflect the new Science Table program. Copies of these plans retrieved from the internet on February 1, 2015 have been attached for convenience. Please see Province of BC IR No. 2.43b Attachment 1 (Inland Oil Spill Response Plan) and Province of BC IR No. 2.43b Attachment 2 (Marine Oil Spill Response Plan).

Please refer to the response to Province of BC IR No. 2.21b.

c) Please refer to the response to Province of BC IR No. 2.43b.

2.44 Fate and behaviour of diluted bitumen in aquatic environments

Reference:

i. A3Y2Z1, Trans Mountain Response to BC IR No. 1.73 l), PDF p. 170 of 187.

ii. A3Y3C0, Trans Mountain Response to Raincoast Conservation Foundation IR No. 1.34 a), PDF p. 79 of 81.

iii. A3X6L7, Trans Mountain Response to Katzie First Nation IR No. 1.11 b), PDF p. 20 of 24.

iv. A3X5X6, Trans Mountain Response to Burrard Inlet Marine Enhancement Society IR No. 1.4 c), PDF p. 7 of 11.

v. A3W9H8, Trans Mountain Response to NEB IR No. 1.60 b), PDF p. 348 of 481

vi. "Nestucca" Oil Spill, Department of Fisheries and Oceans – Report on Spill Response: http://www.dfo-mpo.gc.ca/Library/173303.pdf, PDF p.16 of 24

vii. National Research Council, Committee on Marine Transportation of Heavy Oils, Marine Board, Commission on Engineering and Technical Systems. Spills of Nonfloating Oils: Risk and Response (1999): http://www.nap.edu/openbook.php?record_id=9640&page=25, p. 25 of 87.

Preamble:

In reference (i), Trans Mountain Trans Mountain discusses the factors necessary for diluted bitumen to sink and concludes as follows:

> Two factors are necessary for diluted bitumen to interact with suspended sediments and sink: a high level of energy, characterized by the energy dissipation rate, and a significant concentration of suspended sediment. These two parameters cannot be dissociated; hence the suspended sediment concentration has to be quantified at the same time as energy dissipation rate. The modelling studies found that at no time in the shipping route was there both sufficient energy and sufficient sediment concentration to form oil-mineral aggregate, using equations for the rate of formation found in the published literature, as described in the Volume 8C TR8C-12 S9-Modeling the fate and behaviour of marine spills for the Trans Mountain Expansion Project. [emphasis added]

In reference (ii), Trans Mountain states as follows with respect to the potential for diluted bitumen to sink within Canadian waters along the proposed tanker route:

> … [S]cientific literature demonstrates that high energy provided by breaking waters and high sediment concentrations are required to form Oil-Mineral Aggregate (OMAs). Those conditions are not observed along the tanker route; hence the unlikely event of forming OMAs in the marine waters along the route. Suspended matter can also be found in shallow water near shorelines consisting of fine-grained sediment concentrations due to the wave energy, could form OMAs, although such conditions are not likely. An

> additional related mechanism for oil-mineral interaction is a situation where oil may be deposited on a beach, form OMAs with the sand on the beach, and then be pulled off the beach by tide and wave action, ultimately sinking because of its increased density. The model used for the simulations, SPILLCALC, allowed for submergence, such as by sinking through the Fraser River Plume and then floating on the interface between the plume and deeper waters. However, in none of the simulations did this form of submergence occur.
>
> The potential sinking of weathered oil has been monitored during the Gainford experiments, described in the Application, Volume 8C, S7 – A Study of Fate and Behaviour of Diluted Bitumen Oil on Marine Waters. No oil was observed gaining neutral or negative buoyancy within 8 days. No oil was observed sinking in the brackish water during the entire experiment. [emphasis added]

Reference (iii) states:

> The products shipped on the Trans Mountain system are, by tariff, restricted from having a specific gravity greater [sic] 0.94 and will not sink in their unweathered state. Tests conducted for Trans Mountain, by Environment Canada (2013), and by SLRoss (2010, 2011) for the Northern Gateway application, show that weathered representative samples of diluted bitumen (CLB and AWB) are expected to remain floating on saltwater. While the Environment Canada Report does not provide a time element for the densities of samples tested, the Gainford report (TR 8C-12-S7 – A Study of Fate and Behavior of Diluted Bitumen Oils on Marine Waters) showed that fresh and weathered representative samples of diluted bitumen (CLB and AWB) would float on freshwater for eight days or more depending on local factors such as turbulence and mixing energy. The same tests showed that conventional skimming equipment is capable of removing both fresh and weathered oil. [emphasis added]

However, in reference (iv), Trans Mountain reiterates the facts accepted by the Joint Review Panel following the hearing of the Northern Gateway application, including the following finding: "Dilbit may sink when it interacts with sediment or other suspended particulate matter, or after prolonged weathering". [emphasis added]

Further, in reference (v), Trans Mountain provides the following evidence on the fate and behaviour of spilled diluted bitumen, relying on both the Government of Canada report and the Gainford report:

> At colder temperatures, all oil densities increase at a rate greater than that of water. The Government of Canada report specifies that "Temperature decreased oil density by approximately 2% from 0°C to 15°C" (p.31). In the Government of Canada (2013) report, the most evaporated dilbits (>25% mass loss through heating to 80°C) exceeded 1,000 kg/m^3, or freshwater, and would be expected to submerge or sink in freshwater.
>
> The Gainford report test results showed that natural weathering of Cold Lake Blend (CLB) and Access Western Blend (AWB), without any agitation and water uptake (static), resulted in one density record of 1,000 kg/m^3 (AWB at 15°C) after 10 days on

> water. After weathering under mild to moderate agitation conditions for 8 days, AWB dilbit emulsion densities reported from the Gainford report tests exceeded 1,000 kg/m^3 (at 15°C). Weathered CLB, inclusive of incorporated water, exceeded 1,000 kg/m^3 in two cases: moderate agitation interior tank after 8 days (Table 4-4) and mild agitation exterior tank S4 after 9 days (Table 4-7). These weathered oils would have slightly greater densities at colder temperatures than the 15°C reference temperatures used at Gainford (see Figure 1.60A-1 below); however, colder temperatures also can be expected to slow evaporation so the time required to reach an equivalent weathered state would be longer. [emphasis added]

In reference (vi), the US National Research Council found as follows with respect to the 1988 Nestucca barge oil spill off the coast of Washington State:

> The *Nestucca* spill in December 1988 released 5,500 barrels of heavy marine fuel oil with an API gravity of 12.1 three kilometers off Grays Harbor, Washington. The spilled oil quickly formed tar balls that moved below the water surface (i.e., were overwashed by waves) and could not be tracked visually. Two weeks later, oil unexpectedly came ashore along the coast of Vancouver Island, Canada, 175 kilometers north of the release site, contaminating 150 kilometers of shoreline (NOAA, 1992). [emphasis added]

The presence of submerged oil following the Nestucca spill is corroborated by the following statement by the Department of Fisheries and Oceans (reference (vii)):

> Aerial surveillance was used extensively to track oil movement although observations were frequently frustrated by bad weather and poor observation conditions. In addition, aerial surveillance under such conditions failed to detect extensive patches of floating oil, suggesting that the oil was dispersed, partially submerged or difficult to see in open choppy ocean conditions. [emphasis added]

In the Province's opinion, Trans Mountain's position on the susceptibility of diluted bitumen to sink (in both freshwater and marine waters) requires clarification.

Request:

a) Do the statements in references (i) and (ii) above hold true for the sediment-laden freshwater lens generated by the Fraser River outflow that is found on the water surface in the Strait of Georgia?

b) Please reconcile the statements in references (i) and (ii) with the submergence of oil in the Nestucca incident described in reference (vi).

c) Trans Mountain appears to accept that, if specific conditions are met, diluted bitumen can sink. However, a number of the references above seem to indicate that such conditions are unlikely to be met during the lifetime of the Project. Does Trans Mountain take the overall position that at no time during the lifetime of the Project will submerged or sunken oil be encountered? The response should address both freshwater and marine environments.

Response:

a) Yes. The surface sediment concentrations used during this modelling study are shown in Table 2.44a-1. More details are available in the NEB IR 1.62a (Filing ID A3W9H8). The sediment used in the hydrodynamic and spill modelling is fine silt with grain size less than 8 microns. This grain size range was chosen based on model calibration using satellite imagery of the Fraser River plume and also represents the sizes of sediment that are more likely to enter into Oil Mineral Aggregates (OMA) formation. Coarser grain sizes sink from the surface layer once the Fraser River reaches the Strait of Georgia, and are not available for interaction with oil on the surface. The model input sediment concentrations were extracted from the HYDAT database.

TABLE 2.44A-1

SURFACE SEDIMENT CONCENTRATION (mg/L)

	Winter			Spring			Summer			Fall		
	min	median	max	min	median	max	min	median	max	min	Median	max
Westridge	0.1	0.3	2.6	0.8	1.6	11.9	0.5	1.0	4.4	0.3	0.7	5.1
Fraser River	26.5	31.0	54.2	48.6	50.1	79.6	25.5	28.7	41.3	30.2	34.3	44.3
Strait of Georgia	0.1	1.4	20.8	0.6	7.2	51.5	0.7	5.7	25.6	0.5	2.9	24.1
Arachne Reef	0.1	0.1	1.5	0.3	1.1	11.5	1.0	1.6	7.7	0.5	0.7	2.8
Race Rocks	0.0	0.0	0.1	0.0	0.3	2.2	0.4	0.7	2.0	0.1	0.2	0.6
Buoy J	0.0	0.0	0.0	0.0	0.1	0.6	0.1	0.3	0.8	0.0	0.0	0.3

Note: All values are summarized from an area around the spill location corresponding to the median oil coverage after 24 hours. Minimum and Median values are computed as the median (during each season, in time) of modelled surface sediment concentration minimums or medians from the spatial extent. Maximum values are the highest in both space and time.

A maximum of 79.6 mg/L was observed for surface sediment concentration, and was found in the Fraser River. This number is representative of fine sediment concentrations during the freshet in the Fraser River. Total sediment concentration in the river would be higher, but OMA is a process that operates most efficiently with fine sediment. It should be noted that while the Fraser River Plume looks very muddy, it doesn't take particularly high concentrations of fine sediment to give the appearance of high sediment concentration. To put these numbers in perspective, the concentration that the Federal Government used in their Technical Report is 10,000 mg/L, two orders of magnitude greater than the maximum surface sediment at each site. Also, Dr. Khelifa conducted multiple studies on the Oil Mineral Aggregates formation. The following paper "*Characteristics of Oil Dropplets Stabilized by Mineral Particles: The Effect of Salinity, Khelifa et al, 2003*" describes that about 24% of viscous oil could interact with sediments, considering a sediment concentration of 200 mg/L. This concentration is one order of magnitude greater than observed in the Strait of Georgia. The level of energy used in this study was high, i.e. a reciprocating shaker at a minimum speed capable of continuously disrupting the layer of surface oil.

Finally, an energetic environment is necessary to create and stabilize Oil Mineral Aggregates (OMA), assuming sufficient suspended sediment concentration would be

available, which is not the case as described above. The energy dissipation rate from waves at New Dungeness was computed over a period of record of 10 years. The average and maximum energy dissipation rate was then displayed on Figure 2.44a-1 below, alongside with energy dissipation rate values from various literature. The graph showing OMA stabilization is described in Khelifa's paper referenced below:

- Chickadel C., S. Talke, A.R. Horner-Devine and A.T. Jessup, 2011, Infrared-Based Measurements of Velocity, Turbulent Kinetic Energy, and Dissipation at the Water Surface in a Tidal River
- Liu H., C. Wu and J. Ren, 2011, Estimation of turbulent kinetic energy dissipation rate in the bottom boundary layer of the Pearl River Estuary
- Khelifa A., P.S. Hill and K. Lee, 2005, A comprehensive numerical approach to predict oil-mineral aggregate (OMA) formation following oil spills in aquatic environments

As one can observe in Figure 2.44a-1, the level of energy observed in the area of study, represented here by New Dungeness, is well below the level required to stabilize OMA in Khelifa's experiment. As a result, based on the concentration of suspended sediments and the energy dissipation rate in the area of study, the statements in references (i) and (ii) hold true for the sediment-laden freshwater lens generated by the Fraser River outflow that is found on the water surface in the Strait of Georgia.

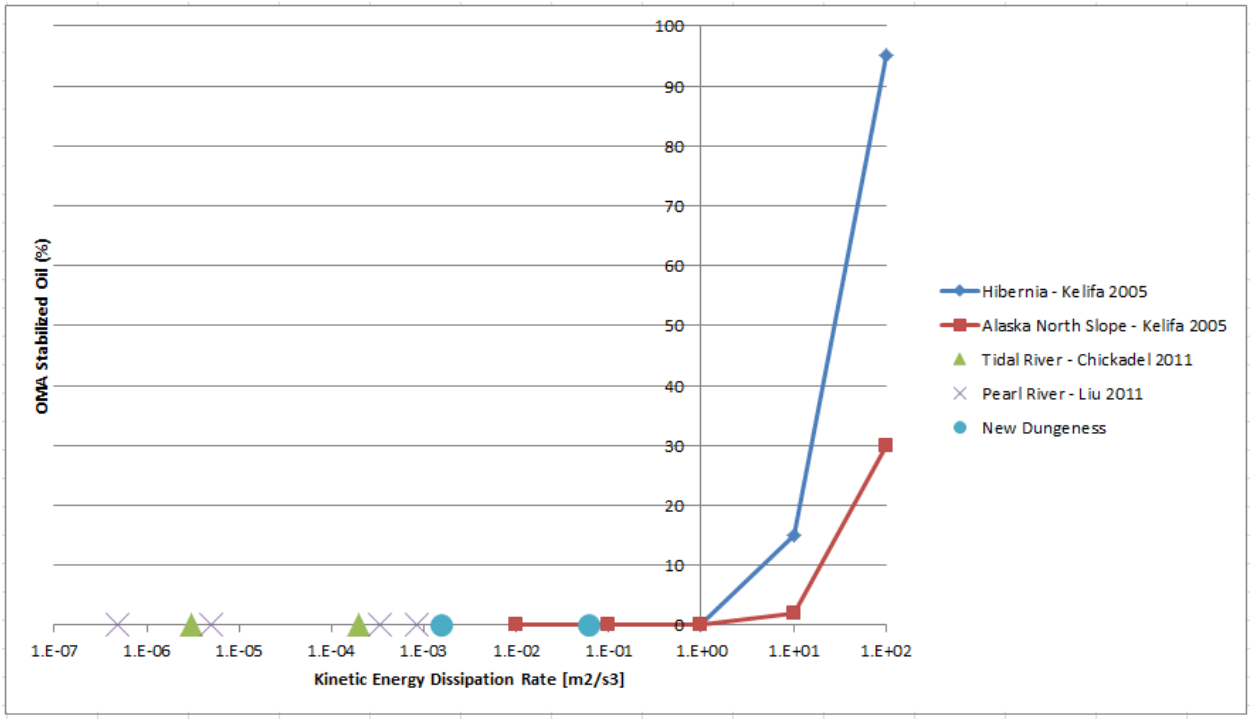


Figure 2.44a-1 Percentage Of Stabilized Oma Based On Energy Dissipation Rate

References:

Chickadel C., S. Talke, A.R. Horner-Devine and A.T. Jessup, 2011, Infrared-Based Measurements of Velocity, Turbulent Kinetic Energy, and Dissipation at the Water Surface in a Tidal River

Khelifa A., P.S. Hill and K. Lee, 2005, A comprehensive numerical approach to predict oil-mineral aggregate (OMA) formation following oil spills in aquatic environments

Khelifa A., P.S. Hill, P.S. Stoffyn-Egli and K. Lee, 2003, Characteristics of Oil Dropplets Stabilized by Mineral Particles: The Effect of Salinity

Liu H., C. Wu and J. Ren, 2011, Estimation of turbulent kinetic energy dissipation rate in the bottom boundary layer of the Pearl River Estuary.

b) It should be noted that, unlike the product shipped by double hulled project tankers, i.e. diluted bitumen, which has an API gravity of 20.6 (about 930 kg/m^3), oil spilled by the Nestucca, a single hulled towed barge, was heavier with an API of 12.1 (about 985 kg/m^3). Thus, the oil spill event is not comparable with hypothetical low likelihood oil spills from Project tankers. Although the information requested relates to a product other than those proposed for the Project, Trans Mountain offers the following response.

First, the term “submergence” should be clarified. In the Nestucca incident, the submergence of the oil was most likely due to the very energetic environment, *i.e.* wave energy, which entrained the oil, in the form of small droplets, into the water column. The entrainment process takes place during high energy wave events, and after the waves subside, the oil re-surfaces, and forms a slick on the surface. Hence the temporary disappearance from the water surface. This phenomenon is called vertical dispersion. References (i) and (ii) talk about submergence due to the agglomeration of oil with minerals (OMAs) and the increase of the oil’s density. The submergence mechanism described in References (i) and (ii) and for the Nestucca incident are two different mechanisms.

The mechanism that occurred during the Nestucca spill was likely vertical dispersion. The US National Research Council concluded that “the spilled oil quickly formed tar balls that moved below the water surface (*i.e.,* were overwashed by waves) and could not be tracked visually”. The Department of Fisheries and Oceans concluded that a range of processes could be at play: “In addition, aerial surveillance under such conditions failed to detect extensive patches of floating oil, suggesting that the oil was dispersed, partially submerged or difficult to see in open choppy ocean conditions.” Both explanations rely on some suppositions. Since the oil very quickly became submerged, the tar ball explanation seems less correct, because formation of tar balls would require time for the evaporation of the volative fraction to occur. The entrainment process can act as soon as the oil is on the water, and we believe it is a more likely explanation for the disappearance of the oil and its re-appearance two weeks later.

Figure 2.44b-1 shows the wave conditions (height: Hs; period Tp) at Gray’s Harbor, WA, for the month of December. These data were provided by the Coastal Data Information

Program Website (refer to Province of BC IR No. 2.44b - Attachment 1). The Nestucca incident occurred on December 23, 1988, which had wave weights greater than 4 m with long wave period, typical of open ocean wave condition. The incident was caused to some extent by the high wave conditions, and these waves served to temporarily disperse the oil as it moved northward with the surface currents in the region.

Wave conditions along the shipping route proposed by Trans Mountain were described in detail in NEB IR No. 1.65a (Filing ID A3W9H8). Table 2.44B-1, below, summarizes wave conditions.

TABLE 2.44B-1

WAVE HEIGHTS RECORDED AT VARIOUS LOCATIONS

Station	Significant Wave Height – Frequency of Occurrence		
	<1.5 m	**1.5 – 2.5 m**	**>2.5 m**
Halibut Bank	99.5%	0.5%	0.03%
New Dungeness	98.1%	1.8%	0.08%
Neah Bay	40.1%	37.9%	22.0%
	Primarily Swell with Influence by Prevailing Local Winds		

Most of the shipping route will not be subject to wave conditions as severe as the ones encountered during the Nestucca incident. Neah Bay, located at the western entrance of Juan de Fuca Strait, is the site offering the most similarities with Gray's Harbor. About 22% of the time, waves are expected to be greater than 2.5 m.

Focusing on the outer part of Juan de Fuca Strait, the modelling conducted at Buoy J shows similar oil behavior to the Nestucca incident. This site is the furthest offshore of the selected hypothetical release sites, and encounters wave conditions from the open Pacific, similar to Gray's Harbor. Figure 2.44b-2 shows a time series of wave height at Buoy J. during the period of study, *i.e.* October 2011 to September 2012. As one can observe, this site shows wave heights well above 2.5 m during a significant part of the year. In many of the scenarios modelled for the stochastic analysis, some of the oil was entrained in the water column due to energetic wave conditions and disappeared from the water surface. Since the oil was buoyant, it resurfaced several hours or days after as soon as the level of energy died down. As an example, the mass balance for stochastic modelling conducted at Buoy J during winter shows an average of 200 m^3 of oil submerged. Episodic events show that over 5,000 m^3 of oil, or 30% of the total amount released during a critical worst case scenario, were temporary entrained in the water column and submerged. For instance, a spill released on March 31 2012 encountered waves with significant wave height exceeding 6 m on April 2, and at this time 5,600 m^3 of oil were dispersed into the water column.

Finally, it should be reminded that the shipped product, diluted bitumen, has an API gravity of 20.6 (about 930 kg/m^3) and is not as heavy as the heavy marine fuel oil spilled during the *Nestucca* incident, which had an API of 12.1 (about 985 kg/m^3).

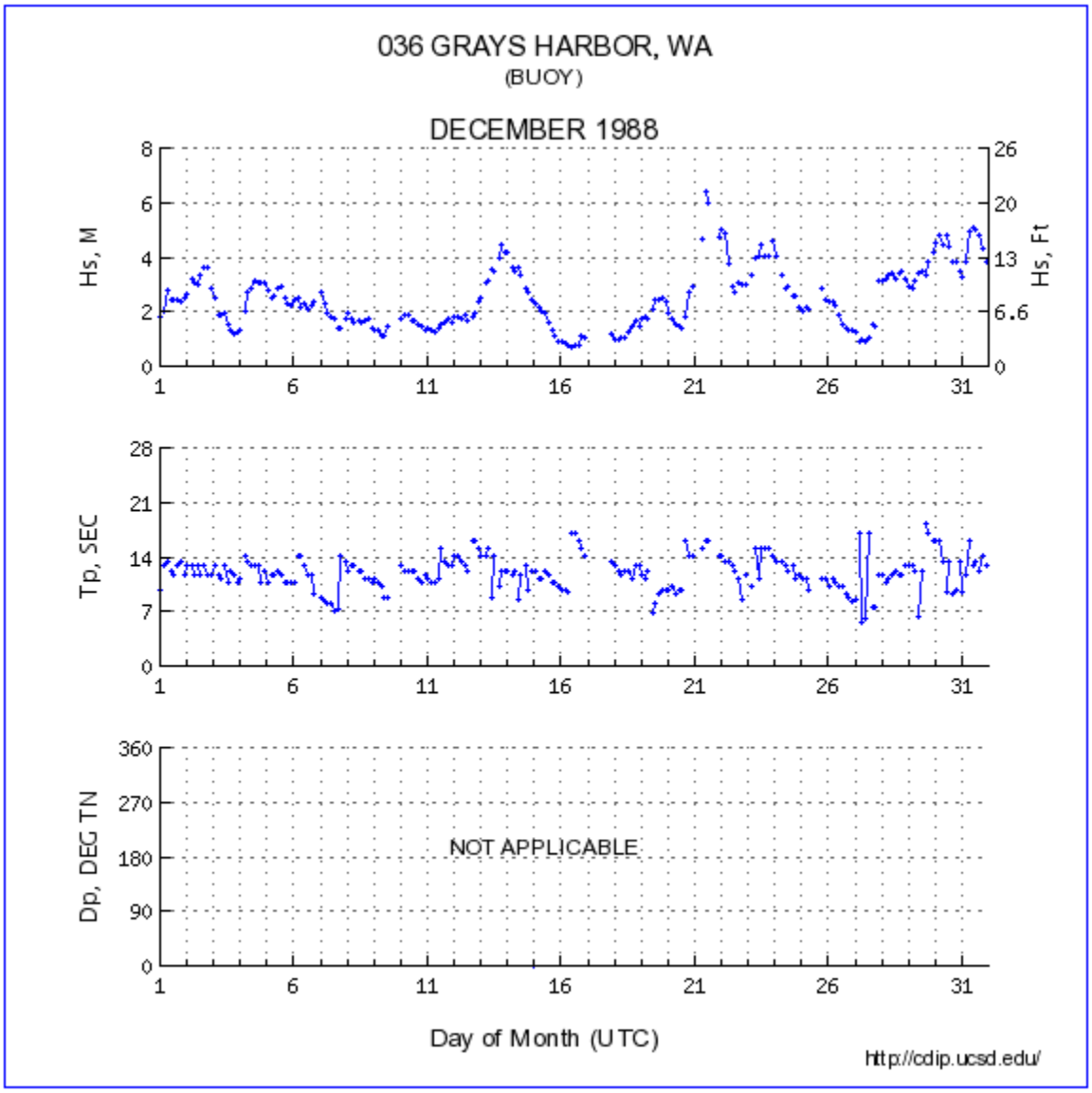


Figure 2.44b-1 Wave Conditions at Gray's Harbor, WA, during December 1988

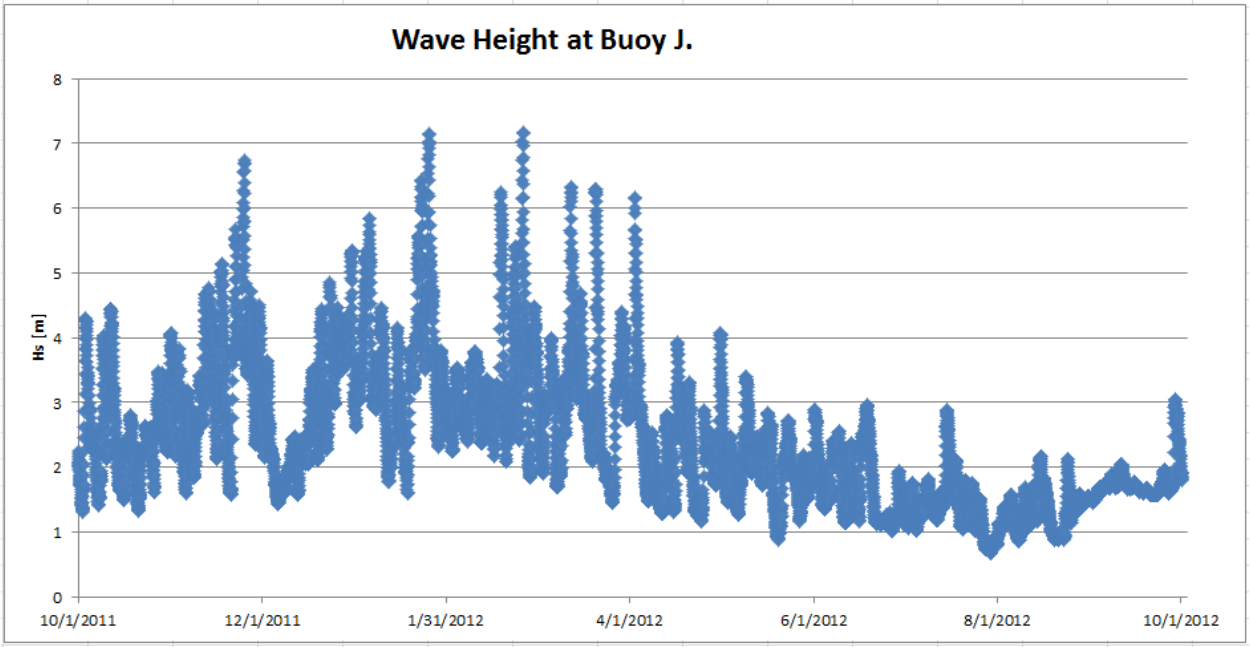


Figure 2.44b-2 Time Series of Wave Height at Buoy J. – October 2011 – September 2012

Reference:

Coastal Data Information Program. No date. Grays Harbor, WA Conditions+Forecast. Website: http://cdip.ucsd.edu/?nav=historic&sub=data&stn=036&stream=p1. Accessed January 2015.

c) TMPL does not take the overall position that a spill could not happen nor that if a diluted bitumen spill were to occur that there is no possibility of submerged or sunken oil. The Project approach is to be risk informed and use best practices in engineering and operations to ensure spills do not happen. Should a spill happen, the Project also sets forth best practices in emergency response. It is clear in the application, and recognized in the request, that TMPL recognizes that specific conditions may lead to some portion of spilled dilbit to submerge or sink in marine and/or freshwater, as is the case for many Group 3 to 4 oils given a combination of weathering and sediment interaction effects, however such occurrences, should they occur would be low likelihood events.

For further discussion, please refer to:

- City of Vancouver IR 1.08.05h (Filing ID A3Y2G6)
- Katzie FN IR No. 1.11b (Filing ID A3Y2G6)

2.45 Temperature effects on weathering of diluted bitumen

Reference:

i. A3W9H8, Trans Mountain Response to NEB IR No. 1.60 a), PDF p. 347 of 421.

ii. A3Y2G6, Trans Mountain Response to City of Vancouver IR No. 1.08.05 f), PDF p. 113 of 213.

Preamble:

In reference (i), Trans Mountain explains why the tests conducted at the Gainford site were carried out at average water temperatures of 15 degrees Celsius and not at colder water temperatures, and states as follows:

> The ambient temperature conditions at Gainford during the tests were not typical of Burrard Inlet in February, but do fall within the documented temperature range for the inlet.
>
> 15°C is a standard reference temperature used in both labs and the industry at large to report information on oil physical properties. This also allows assessments to be calculated for other temperatures.

In reference (ii), Trans Mountain discusses the impact on test results of the use of winter oils under summer conditions:

> Winter formulations have a higher fraction of volatiles relative to summer blends; however, the rate of loss of volatiles from summer blend is lower than from winter blend because of the smaller mole fraction. Relative to the ambient conditions that prevailed at Gainford, diluted bitumen crude oil may be expected to have a slightly slower rate of evaporation and slightly greater viscosity once exposed to weathering under colder winter ambient conditions. There is no impact to the study results as it is clearly stated what the conditions were during the tests.

Request:

a) Please explain how the results of the tests conducted at Gainford can be applied to the ambient and water temperature conditions of Burrard Inlet and other modelled marine spill locations in February.

b) Please explain how 15 degrees Celsius “allows assessments to be calculated for other temperatures”.

c) Reference (ii) states that diluted bitumen may be expected to have a slower rate of evaporation and greater viscosity once exposed to weathering under colder ambient temperatures. Although the Gainford study clearly states the test conditions, it only studies the fate and behaviour of diluted bitumen in conditions which may not be representative of the range of conditions found on an annual basis along the shipping route. Please explain how Trans Mountain intends to address this gap in the evidence.

Response:

a) As stated in City of Port Moody IR 1.3.23b (Filing ID A3X5Z8), the results from the multiple tests done to date with dilbits [Volume 8C, TERMPOL Reports, TR 8C-12 S7 – A Study of Fate and Behavior of Diluted Bitumen Oils on Marine Waters (Filing ID A3S5G2) Government of Canada (2013), and SL Ross (2011)], and from analogy with the behavior of medium to heavy oil products, provide information that can be reasonably extrapolated to understand how temperatures within the range of Burrard Inlet may affect the weathering of diluted bitumens and implications for spill response.

Studies of the weathering character of oils at reference temperatures are used to build models for oil fate and behavior, such as those used extensively worldwide in NOAA's ADIOS2 program. The results of the Gainford tests, as well as Government of Canada and SLRoss tests, provide a very comprehensive base for this type of analysis for water temperatures at different times of year.

References:

Government of Canada. 2013. Properties, Composition, and Marine Spill Behaviour, Fate and Transport of Two Diluted Bitumen Products from the Canadian Oil Sands. Ottawa, Ont. 87 pp. (Province of BC IR No. 2.45a Attachment 1)

SL Ross, 2010a. Properties and Fate of Hydrocarbons Associated with Hypothetical Spill at the Marine Terminal and in the Confined Channel Assessment Area. Technical Data Report prepared for Enbridge Northern Gateway. 132 pp. (Province of BC IR No. 2.45a Attachment 2)

SL Ross. 2011b. Meso-scale Weathering of Cold Lake Bitumen/Condensate Blend. Report prepared for Enbridge Northern Gateway. (Province of BC IR No. 2.45a Attachment 3)

SL Ross, 2010c. Properties and Fate of Hydrocarbons Associated with Hypothetical Spill in Open Waters. Technical Data Report prepared for Enbridge Northern Gateway. (Province of BC IR No. 2.45a Attachment 4)

b) Please refer to the responses to:

- Province of BC IR 2.24a
- NEB IR 1.61a (Filing ID A3W9H8)

15°C is a standard reference temperature used in both labs and the industry at large to report information on oil physical properties. This also allows assessments to be calculated for other temperatures.

Refer also to the response to Province of BC IR 2.45c.

c) Characterizing the fate and behavior of different crude oils and oil products does not necessarily entail conducting unlimited tests to simulate the full range of variable environmental factors, including all temperatures that may be found along shipping route. Instead, the prediction of oil behavior is based on a specified set of tests that allow

results to be extrapolated to different environmental variables, such as is used in the NOAA ADIOS2 modeling as well as other oil weathering and fate models. This is the approach used for the Application and reflects the testing and results discussed in the Government of Canada (2013) studies.

Nevertheless, recommended areas for additional testing are the subject of a number of initiatives, as discussed in NEB IR 1.63a (Filing ID A3W9H8).

Reference:

Government of Canada. 2013. Properties, Composition, and Marine Spill Behaviour, Fate and Transport of Two Diluted Bitumen Products from the Canadian Oil Sands. Ottawa, Ont. 87 pp. (Province of BC IR No. 2.45a Attachment1).

2.46 Response to submerged or sunken oil

Reference:

i. A3Y2Z1, Trans Mountain Response to BC IR No. 1.9 d), PDF p. 26 of 187.

ii. A3X5X6, Trans Mountain Response to Burrard Inlet Marine Enhancement Society IR No. 1.4 a), PDF p. 4 of 11.

iii. A3Y2Z1, Trans Mountain Response to BC IR No. 1.74 i) (ii), PDF p. 179 of 187.

iv. A4E2V0, Follow-Up Information from Western Canada Marine Response Corporation, Attachment 3 – Trans Mountain Request for Information from WCMRC – Table 1, Response to BC IR No. 1.73 q), PDF p. 14 of 18.

v. A3Z2A6, Trans Mountain Response to BC Motion to Compel Full and Adequate Answers to BC IR No. 1, Organization Chart entry 1.20 b), PDF p. 20 of 76.

vi. A4E9K7, Follow-Up Information from Western Canada Marine Response Corporation, Attachment 1, Table 1, Response to BC IR No. 1.73 p), PDF p. 15 of 21.

Preamble:

In reference (i), Trans Mountain suggests that there are no spill response tactics specific to the recovery of diluted bitumen:

> Based on the results of the Gainford Study and an examination of relevant literature, Trans Mountain concluded that diluted bitumen behaves similarly to conventional blended crude oil when spilled (…). As Trans Mountain has been shipping diluted bitumen on the Trans Mountain Pipeline system (TMPL) since the late 1980's and since diluted bitumen behaves similarly to blended crude oil when spilled, Trans Mountain believes that the tactics in the existing emergency management program are effective to address potential spills for the different types of product transported on the existing and the expanded TMPL. [emphasis added]

Similarly, reference (ii) states that "response to diluted bitumen is treated no differently that responding to other heavy conventional oil spills". Trans Mountain goes on to discuss the mechanical skimming options available and other general response practices for surface oil removal.

However, in reference (iii), Trans Mountain acknowledges the limitations of conventional spill response methods for the recovery of submerged oil:

> Conventional surface booming may become less effective should oils become neutral to negatively buoyant after weathering for a number of days. Trawl net booms specifically designed to recover submerged heavy oils are not currently stocked by WCMRC as their performance has proved to be only partially successful. [emphasis added]

In reference (iv), Western Canada Marine Response Corporation (WCMRC) asserts that "technologies and techniques listed previously [in response to BC IR No. 1.73 o)] have been tested and proven during the various responses listed in the table below". The table that follows lists five incidents and the oil detection and recovery techniques used in each instance.

Reference (v) states:

> Actions required to recover sunken oil would be developed by the responsible party and regulatory authorities working as part of Unified Command and would be guided by a net environmental benefit analysis. [emphasis added]

Finally, in reference (vi), WCMRC states as follows:

> With sunken oil, positive identification is the first step in developing a response plan for it. After that, a Net Environmental Benefit Analysis (NEBA) will help identify the best method to manage the product without causing additional environmental impact in the process. Since the focus during all oil spills is to first control the source and then remove the free-floating oil from the water, recovery of sunken oil typically becomes a post emergency remedial action.
>
> The following table briefly discusses practical techniques that may be used to recover sunken oil. Aside from the operational countermeasures, it should be noted that, when justified by a Net Environmental Benefit Analysis, natural attenuation is considered a valid remedial action. Natural attenuation may rely on both the accretion of sediments to cap sunken oils and naturally occurring microbial action to degrade the product. Some studies (Lee et al., 1997) suggest that the formation of fine oil-mineral aggregates (OMA) can enhance bacterial consumption of oil, speeding its removal from the ecosystem.

The table provided goes on to list a number of sunken oil recovery techniques, the water depth up to which each is effective, and the limitations of each technique.

Request:

a) Please explain why methods for the recovery of submerged oil such as trawl net booms, which are described in reference (iii) as being "only partially successful", are not stocked by WCMRC, when it appears that no method can possibly be described as fully successful.

b) For each incident listed in reference (iv), please describe the effectiveness of the detection and recovery techniques that were relied upon, providing the percentage of submerged or sunken oil that was recovered in each instance.

c) Please describe Trans Mountain's understanding of the role of Unified Command in spill response. Does Trans Mountain not take the view that, while Unified Command is responsible for making tactical decisions during the course of spill response, Trans Mountain, in instances where it is the responsible party, should bring the array of available, previously identified spill response tactics to the table?

d) Is it Trans Mountain's position that, relying on the information provided in reference (vi), there is no available response technique for oil that has sunk below 30 metres, and that such oil will be left to attenuate naturally?

e) Please provide any SCAT reference materials (e.g. guidebook, training materials) that address the location, tracking and/or recovery of submerged or sunken oil.

Response:

a) Trans Mountain is aware that WCMRC is committed to evaluating improvements to the recovery of submerged oil in an effort to positively identify effective emergent technologies. To date, the consensus regarding trawl net and mesh skirted booms is that they do not appreciably contain the oil although the technique merits further testing. To supplement the performance of traditional booms, there is benefit under certain conditions in introducing sorbents, specifically viscous oil snare, into the catenary of a containment boom to retard the escape of oil through entrainment – both Trans Mountain and WCMRC are aware of the historical precedent validating the effectiveness of this measure. In the meantime, proven response techniques and equipment must focus on the prompt removal of floating oil by:

- Controlling the source of the spill
- Preventing released oil from entering a waterbody
- Containing, intercepting and promptly removing oil from the water surface
- Removing stranded oil that could be remobilized from the shoreline

The base premise of this position has been supported in the Joint Review Panel hearings relating to Northern Gateway. The Panel, in assessing the issue, accepted the following facts on the behavior and fate of spilled dilbit (bitumen blended with condensate or synthetic crude oil):

1) The maximum initial density of the dilbit would be 940 kilograms per cubic metre, in conformance with the proposed pipeline tariff specification. When initially spilled, the density would be less than that of fresh water or salt water, making dilbit a floating oil.

2) Experts agreed that dilbit is not a simple two-phase mixture of bitumen and condensate, but is instead a new, cohesive, blended product. When spilled into water, lighter hydrocarbon fractions of the entire blend would begin to evaporate. As lighter fractions evaporate, the viscosity of the weathered dilbit would increase, and evaporation of remaining lighter fractions would be progressively inhibited.

3) Past examples of spills do not indicate that products similar to dilbit are likely to sink within the timeframe for response options, or in the absence of sediment or other suspended particulate matter interactions.

4) Dilbit may sink when it interacts with sediment or other suspended particulate matter, or after prolonged weathering.

5) Bench-top and wave tank testing indicated that dilbit is not likely to sink due to weathering alone within a short to medium timeframe. The evidence indicated that multiple factors, such as the interaction between density, viscosity, potential emulsion formation, and environmental conditions must all be examined together in considering the fate of spilled oil, including the possibility of sinking. Much of the evidence that the Panel heard did not consider these factors collectively.

6) The weight of evidence indicates that, when spilled in water, dilbit with a maximum density of 940 kilograms per cubic metre would behave similarly to an intermediate fuel oil or lighter heavy fuel oil with a density less than 1,000 kilograms per cubic metre. Various experts, including those involved in spill response, said that these products provide reasonable analogs for dilbit behaviour as it relates to oil spill response.

7) Transport Canada said that a response organization would be likely to treat a dilbit spill as a blended crude oil product spill.

Reference:

National Energy Board, Canadian Environmental Assessment Agency. 2013. Considerations Report of the Joint Review Panel for the Enbridge Northern Gateway Project, Volume 2. Calgary, AB. 354 pp.+ attachments.

b) The Table listed in reference (iv) has been reproduced below for the intervenor's convenience.

The intervenor's question cannot be answered in the manner asked. Contributing literature from multiple sources that discussed the submerged or sunken oil recovery techniques cited in column-1 did not publish "the percentage of submerged or sunken oil that was recovered in each instance."

TABLE 2.46B-1

SUNKEN OIL RECOVERY TECHNIQUES

TECHNIQUE	WATER DEPTH	LIMITATIONS	CONSIDERATIONS
Manual recovery from shoreline	< 1-meter	- Water clarity - Wave energy	- Worker safety - Containment of remobilized oil
Long-reach excavator from shoreline	Limited in reach and digging depth by excavator boom, typically between 10 – 20 meters	- Water clarity - Wave energy - Shoreline load bearing soils - Shoreline sensitivity	- Worker safety - Containment of remobilized oil - Destruction of bottom habitat
Manual agitation from boats	< 2-meters	- Wave energy - Wind energy - Current	- Worker safety - Containment of remobilized oil
Mechanical agitation from boats	Typically executed with small excavators; limited in reach and digging depth by excavator boom, usually < 4-meters	- Wave energy - Wind energy - Current	- Worker safety - Containment of remobilized oil - Destruction of bottom habitat
Diver-directed pumping	To avoid the complexity of decompression and/or mixed gas diving, divers must remain on compressed air and not go below 10-meters	- Water clarity - Wave energy - Current	- Worker safety - Containment of remobilized oil
Dredging	30-meters	- Wave energy - Wind energy - Current	- Containment of remobilized oil - Destruction of bottom habitat - Remobilization of prior (baseline) contaminants
Natural attenuation	Limited only by the process of naturally occurring microbial action	- Wave energy - Wind energy - Current - Microbial presence	- Net Environmental Benefit Analysis

c) Trans Mountain adheres to and practices the same Incident Command System (ICS) as described in the BC Ministry of Environment's Marine Oil Spill Response Plan published on their website (http://www2.gov.bc.ca/gov/DownloadAsset?assetId=957BE9291ED74F4FB5E007B26D69ADD0&filename=marine_oil_response_plan.pdf) and detailed in Section 4 of that document, which notes "*The Marine Oil Spill Incident Management Team is comprised of the five ICS sections: Command, Operations, Planning, Logistics, and Finance/Administration*."

There is nothing to the contrary in Trans Mountain's submittals indicating that Trans Mountain has entertained any other interpretation of ICS. Accordingly oil spills will be managed by a Unified Command (UC) acting within the framework of the Incident Command System (ICS). Each spill is different. As tactics are developed through the ICS planning cycle, the spill management team (*i.e.,* Unified Command / RP and RO) may develop an array of different equipment to address the situation.

d) An oil spill from a project tanker is a low likelihood occurrence. As noted in earlier replies (*e.g.,* City of Vancouver 1.08.05h [Filing ID A3Y2G6], Katzie FN IR 1.11b [Filing ID A60816]), no oil was observed to sink for the conditions used during the Gainford tests in for brackish water (Technical Report 8C-12 S7, Volume 8C, Fate and Behaviour of Diluted Bitumen Oils on Marine Waters [Filing IDs A3S5G2, A3S5G4, and A3S5G5). As pointed out in the same report, and echoed in the Government of Canada (2013) report, factors can contribute to oil submergence and/or sinking, as with other heavy oils. As such, oil spill response plans and Response Organizations include strategies, tactics, and equipment to respond promptly, minimize the potential for oil submergence or sinking and to address submerged or sunken oil.

In the eventuality that a portion of spilled oil should become submerged or sink, a variety of techniques are available and have been used for tracking and recovery of submerged and sunken oil (refer to Province of BC IR No. 2.46d Attachment 1). Response options for water depths greater than 30 m are noted within the guides where there is no depth restriction or for strategies and tactics with variable working depths.

Reference:

Government of Canada. 2013. Properties, Composition, and Marine Spill Behaviour, Fate and Transport of Two Diluted Bitumen Products from the Canadian Oil Sands. Ottawa, Ont. 87 pp.

e) Owens Coastal Consultants (2013) *Oil Spills, Shoreline Response and SCAT* offers an informative section on submerged and sunken oil. Section 4.6, 'Submerged or Sunken Oil' begins on beginning on PDF page 106 of 324 (Province of BC IR No. 2.46e Attachment 1).

Reference:

Owens Coastal Consultants. 2013. Oil Spills, Shoreline Response and SCAT: Shoreline Response and Shoreline Oiling Assessments (SCAT) Surveys for Oil Spills in the Gulf of Mexico. Section 4.6, pages 4-30 to 4-38.Fil

2.47 Personnel and contractors for marine spill response

Reference:

i. A4E2V0, WCMRC Follow-Up Response to BC IR No. 1.74 j), PDF p. 18 of 18.

ii. A4E2V3, WCMRC Follow-Up Response to BC IR No. 1.72 a), Attachment 6 – WCMRC At-A-Glance North Coast, PDF p. 1 of 3.

iii. A4E2V4, WCMRC Follow-Up Response to BC IR No. 1.72 a), Attachment 6 – WCMRC At-A-Glance South Coast, PDF p. 1 of 7.

iv. A4E2V5, WCMRC Follow-Up Response to BC IR No. 1.72 a), Attachment 6 – WCMRC At-A-Glance Vancouver Island, PDF p. 1 of 4.

v. A4E2W2, WCMRC Follow-Up Response to BC IR No. 1.72 b), Attachment 15 – FOSET Charter Contract.

Preamble:

In reference (i), WCMRC confirms that "there is dedicated capacity for oil spill response, including shoreline cleanup".

The "At-A-Glance documents" filed by WCMRC (reference (ii)) appear to indicate that all trained responders (WCMRC personnel, contracted support personnel, FOSET members and First Nations responders) are on call 24 hours a day, 7 days a week.

Reference (iii) is a sample FOSET Charter Contract, which includes, in Schedule F, a sample WCMRC Dispatch Order.

Request:

a) Please confirm that all trained responders are indeed on call 24 hours a day, 7 days a week.

b) Please provide copies (with redactions for the protection of personal information, if appropriate) of the retainer contracts in place, showing that contracted personnel are obligated to make themselves available 24 hours a day, 7 days a week.

c) Please explain how FOSET members and First Nations responders can be available for response 24 hours a day, 7 days a week.

Response:

a) The response to this question pertains to WCMRC. WCMRC is always accessible by telephone and in a ready state. Currently, WCMRC maintains a 24-hour per day, 7-day per week standby system such that a WCMRC operational person is on duty supported by other WCMRC personnel and resources. WCMRC maintains contact information for its personnel, advisors, government agency personnel, local contacts for area plans, FOSET members/vessels, contractors, suppliers, custodians and clients (member/non-

members) and mutual aid personnel. WCMRC will first call out staff personnel followed by a cascade of other individuals and organizations as required for an appropriate response. While WCMRC is indeed on call 24 Hours a day, 7 days a week, not all responders, including FOSET members, contractor resources and First Nations responders can understandably maintain that schedule. As such, WCMRC works proactively to increase the personnel on their contract roster to provide sufficient redundancy to meet the contingency of unavailable supplemental responders. The tiered deployment of staff responders followed by a cascaded call-out of redundant contract resources is not an unusual protocol amongst response organizations worldwide.

In the future, WCMRC plans to meet the enhanced response requirements for the Project by establishing additional bases for Vancouver Island and the South Coast. The equipment plan calls for five new bases in addition to a potential enhancement of the existing Vancouver Harbour (Burnaby) base. Two to three of these six bases will be staffed 24 hours a day.

Section 5.5.2, Table 5.5.3 of Volume 8A of the Application (Filing ID A3S4Y6) describes the enhanced marine spill response planning standards proposed for TMEP.

b) In Ruling No. 50 (Filing ID A4G5I9) the NEB determined that it was "satisfied that sufficient information has been filed from the existing EMP documents to meet the Board's requirements at this stage in the process." Although the information requested is not within the scope of this proceeding and not relevant to the National Energy Board's (NEB) List of Issues (Filing ID A3V6I2), Trans Mountain Pipeline ULC (Trans Mountain) offers the following response to your question:

Please refer to the response to Province of BC IR No. 2.47a.

c) Please refer to the response to Province of BC IR No. 2.47a.

2.48 Shoreline cleanup

Reference:

i. A3W9H8, Trans Mountain Response to NEB IR No. 1.74 b), PDF p. 414 of 421.

ii. A4D3F2, Trans Mountain EMP documents, Attachment 2.3 – Pipeline Emergency Response Plan, Section 4.7, Response Tactics for Shorelines, PDF p. 54 of 191.

Preamble:

Reference (i) states as follows with respect to pre-spill Shoreline Cleanup and Assessment Technique (SCAT):

> Trans Mountain has evaluated and completed pre-spill SCAT applicable to a potential spill at the Westridge Marine Terminal and will be evaluating the conduct of basic pre-spill SCAT surveys and actitivities [sic] as part of the emergency management review. The evaluation will support development of selected site-specific tactic plans for watercourse crossing and/or high consequence area and expedite the application of a full SCAT program should a spill actually occur.
>
> …
>
> **Pipeline**: Unlike the Westridge Marine Terminal, the location of any potential spill along the right of way is unknown. Should a spill occur a full SCAT program would be launched downstream of the spill site. Basic pre-spill SCAT will be conducted with a view to support development of proposed watercourse mitigation planning. The update and enhancement of the existing Emergency Response Plans will include targeted basic pre-spill SCAT surveys and related SCAT/shoreline cleanup guidance and training materials. Fundamental principles of SCAT and best practice shoreline cleanup response requires (a) a division of the shoreline into geographic units or segments; (b) standard terms and definitions for documentation; and (c) systematic assessment of the shorelines. At the basic level, the latter includes a physical characterization of the shoreline substrates, which is synonymous with "river bank substrate surveys".
>
> The exact locations and level of detail of basic pre-spill SCAT surveys will be determined in coordination with other response preparedness activities, primarily, the development of site specific shoreline response tactic plans and identification of appropriate techniques and options to address oiled river bank and lake shorelines (as addressed in NEB IR No. 1.74a and 1.74c). Pre-spill SCAT will focus on locations designated as high consequence or high priority areas, which are generally captured within the High Consequence Area (HCA) mapping. The pre-spill SCAT will be at a level of detail needed to support the development of these shoreline response tactics and techniques and would at a minimum always include shoreline segmentation and (river bank) substrate characterization. [emphasis added]

Reference (ii) provides a summary of response tactics for various shoreline types.

Request:

a) Will Trans Mountain commit to conducting pre-spill SCAT surveys and activities for all water bodies potentially impacted by a spill at any location along the pipeline and tanker routes?

b) If yes, please provide a schedule for completion of the work detailed above.

c) If yes, how will this work address fluctuations in river levels and flood conditions throughout the year?

Response:

a) Trans Mountain has evaluated and completed pre-spill SCAT surveys applicable to a potential spill at the Westridge Marine Terminal (WMT) and will be evaluating the conduct of basic pre-spill SCAT surveys and activities as part of the pipeline right-of-way's emergency management review. The evaluation will support development of selected site-specific tactic plans for watercourse crossing and/or high consequence area and expedite the application of a full SCAT program should a spill actually occur.

Facility: A detailed pre-spill SCAT dataset was sponsored by Trans Mountain and successfully compiled for Central Burrard Inlet, British Columbia and used to populate a Pre-Spill SCAT database system. This project was completed March 2014. The dataset supports the Trans Mountain Pipeline Expansion Project, the emergency response plans for existing operations at the Westridge Marine Terminal and WCMRC's emergency response plans for other operations in the Central Burrard Inlet. Pre-spill SCAT datasets can be developed to different levels of detail. For the Central Burrard Inlet project, a relatively high level of detail was completed using current standards, terminology and procedures and included SCAT related standards of Environment Canada.

Pipeline: While Westridge Marine Terminal can be identified as a possible (albeit low likelihood) marine spill site location, the location of any potentially low likelihood spills along the pipeline right of way cannot be as easily determined, especially as the pipeline is underground along the entire route. Therefore, should a spill occur a full SCAT program would be launched downstream of the spill site. The exact locations and level of detail of basic pre-spill SCAT surveys will be determined in coordination with other response preparedness activities, primarily, the development of site-specific shoreline response tactic plans and identification of appropriate techniques and options to address oiled river bank and lake shorelines (as addressed in NEB IR No. 1.74a and 1.74c [Filing ID A3W9H8]). Pre-spill SCAT will typically focus on locations designated as high consequence or high priority areas, which are generally captured within the High Consequence Area (HCA) mapping. The pre-spill SCAT will be at a level of detail needed to support the development of these shoreline response tactics and techniques and would at a minimum always include shoreline segmentation and (river bank) substrate characterization.

Fundamental principles of SCAT and best practice shoreline cleanup response requires (a) a division of the shoreline into geographic units or segments; (b) standard terms and

definitions for documentation; and (c) systematic assessment of the shorelines. At the basic level, the latter includes a physical characterization of the shoreline substrates, which is synonymous with "river bank substrate surveys".

The targeted basic pre-spill SCAT surveys and related SCAT/shoreline cleanup guidance and training materials shall be used to update and enhance the existing Emergency Response Plans.

Tanker Route: The pre-spill SCAT dataset for Central Burrard Inlet is an ideal model for planning future mapping and upgrading coastal information as needed for spill response along the tanker route. The route between Westridge Terminal and the sea buoy is a common shipping route navigated by many vessels, including those serving U.S. ports. As such, it is not a role for Trans Mountain to lead a pre-SCAT survey effort along this route although TM would certainly support such an effort undertaken by Federal or Provincial authorities.

In 2013, WCMRC began developing a mapping application to apply to its existing Geographic Response Strategies (GRS) program. GRS is a plan used for the initial nearshore response in an emergency situation. The program utilizes local knowledge to assist in shoreline sensitivity classification to possible oiling. Each feature is then field-tested and a two-page reference document is developed and reviewed with government agencies. The goal of a GRS is to protect sensitive natural and cultural features while reducing decision-making time during an actual spill. GRSs are designed to provide all the necessary information required to carry out an efficient and rapid response.

Consultation on EMP: The Application, Volume 7, Section 4.8 outlines the process to enhance Kinder Morgan Canada's (KMC) existing emergency management programs (EMP) as they relate to the Trans Mountain Pipeline system to address the needs of the Project (Filing ID A3S4V5). The final programs will be developed in a manner consistent with the National Energy Board's (NEB or Board) draft conditions related to emergency response (Filing ID A3V8Z8).

Since the updated EMP depends upon the final detailed design of the Project, a process which will not be carried out unless the Project receives approval and until KMC has an opportunity to review the conditions of such approval, the updated EMP cannot be provided during the NEB's regulatory review of the Project. However, to ensure affected parties have the opportunity to express concerns and provide input which will inform the updated EMP, KMC will conduct a consultation program as part of developing the updated EMP as described in the NEB draft conditions related to emergency management.

Following receipt of a Certificate of Public Convenience and Necessity for the Project, KMC will file with the NEB a consultation plan related to KMC's EMP review that will include consultation scope, objectives; preliminary lists of regulatory authorities, communities, Aboriginal groups with whom KMC will engage, and a preliminary list of consultation locations and timing, as well as any other information that the NEB requires. The consultation plan will describe the methods that will be used to track commitments

made during consultation and to incorporate them into KMC's EMP, including its Emergency Response Plans. As part of this program KMC will periodically file reports with the NEB on progress of its EMP review including summaries of interested parties consulted and how their comments were considered.

KMC will file with the NEB the revised Emergency Response Plan for the pipeline as part of the approval conditions for the Project. The plan will demonstrate KMC's ability to prepare for, respond to, recover from, and mitigate the potential effects of emergencies of any type related to the Trans Mountain Pipeline system. Filing of the Emergency Response Plan will include, for the NEB's consideration, a final report on the consultation process as well as confirmation that an independent third party has reviewed and assessed the Emergency Response Plan and that KMC has considered and incorporated the comments generated by the independent review and assessment into the plan.

Ultimately, updates to the EMP incorporating feedback from consultation activities must result in an EMP that continues to meet the requirements of the *National Energy Board Onshore Pipelines Regulations* (2013) (OPR). As it does for the existing system, the OPR provides lifecycle regulation for all aspects of the Project operation including requirements for emergency response programs. KMC must maintain and update the EMP throughout the lifecycle of the expanded Trans Mountain Pipeline System. As well, throughout the life of the expanded system, NEB staff will continue to conduct emergency response exercise evaluations and emergency procedures manual reviews to verify that companies are prepared to anticipate, prevent, manage, and mitigate emergency situations.

b) Please refer to the response to Province of BC IR No. 2.48a.

c) Changes can be expected in the water levels of freshwater lakes, ponds and wetlands, and more dramatically in rivers and streams due to seasonal snowpack runoff and local precipitation events. These changes are important insofar as they affect where oil may strand, natural removal processes and rates, environmental effects, cleanup techniques and operational activities such as staging and access. Freshwater shoreline preparedness planning, including relevant elements of pre-spill SCAT, as decided, will consider typical seasonal water level fluctuations. Typically, pre-spill SCAT surveys to characterize the nature of the shoreline, riverbank and backshore are conducted at periods of low water, i.e. when the substrate is most exposed and visible. However, survey/mapping could extend laterally outward to encompass that (now dry) zone which could be inundated during periods of average high water conditions. Information about the zone of average water fluctuation - the potential oiling zone - can be beneficial to real time SCAT, shoreline cleanup decision-making and response operations at different water levels.

2.49 WCMRC mapping project

Reference:

A3Y2Z1, Response to BC IR No. 1.65 a), PDF p. 149 of 187.

Preamble:

In the reference above, Trans Mountain explains as follows:

The Western Canada Marine Response Corporation (WCMRC) advises that a program is currently underway to develop Geographic Response Plans (GRPs) and Geographic Response Strategies (GRSs) for the BC Coast. The program began in 2013 with the initial focus on higher traffic areas such as Vancouver Harbour, southern Georgia Strait, Haro/Juan de Fuca Straits, associated Douglas Channel passages, and Prince Rupert. The goal is to complete assessment of these areas by the end of 2017. Pre-spill Shoreline Clean-up Assessment Technique (SCAT) requirements will also be addressed concurrent to the GRP planning process for high-risk areas.

Request:

a) How will input from first responders, local governments, First Nations, the Province of British Columbia, and other key stakeholders be incorporated into the development, maintenance, and approval process for GRPs, GRSs and SCAT materials?

b) How will Trans Mountain work with first responders, local governments, First Nations, the Province of British Columbia, and other key stakeholders to exercise GRPs and GRSs?

Response:

a) From the preamble Trans Mountain understands that this information request pertains to WCMRC's current program to develop Geographic Response Plans (GRPs) and Geographic Response Strategies (GRSs) for the BC Coast. In response to the November 2013 recommendations issued by Canada's Tanker Safety Expert Panel, the Federal Government established "*new area spill-response planning partnerships*" for Southern British Columbia. These planning partnerships (please see Province of BC IR No. 2.49a Attachment 1)

"…will take into account geography, environmental sensitivities and oil tanker traffic volumes. Environment Canada and Fisheries and Oceans Canada will work with partners to gather data to be used in emergencies to minimize environmental damage to sensitive areas. Canada will also create a new program to build capacity for Aboriginal communities to participate more in marine safety and response activities."

The development of WCRMC's Geographic Response Plans (GRP) have actually pre-dated the recommendations of the Tanker Safety Expert Panel by utilizing periodic consultations with federal, provincial and local municipal government as well as First

Nations. During WCMRC exercises GRPs are tested and reviewed with stakeholders for input and enhancements.

WCMRC is currently implementing a new technology based mapping system that is capable of overlaying information from current databases containing pre-SCAT data and points of local knowledge supplied by First Nations and local governments and communities.

In June 2014, all the work completed within the WCMRC Geographic Response Strategies Development Program for Central Burrard Inlet was reviewed with the emergency planners from the surrounding municipalities. These local representatives provided feedback and suggestions for additional program features that are of high importance within their community. Later, in August 2014, WCMRC field-tested the Geographic Response Strategies identified in a similar manner for the waters of Haro Strait. Booming strategies for Sidney Island, Mayne Island, Morsby Island, Saltspring Island and Pender Island were tested. The fieldwork involved multiple spill response vessels deploying boom in the water along the shoreline to test pre-developed strategies. The field team included local biologists who assisted in developing and documenting protection strategies for identified sensitivities. In total, thirty-eight GRS strategies were developed.

The preceding discussion demonstrates WCMRC's mechanism for engaging stakeholders in the GRP/GRS process.

b) From the preamble Trans Mountain understands that this information request pertains to WCMRC's current program to develop Geographic Response Plans (GRPs) and Geographic Response Strategies (GRSs) for the BC Coast. WCMRC conducts certification exercises on Geographic Area of Response basis where GRP/GRS are utilized as part of the scenario evolution. Key stakeholders are invited to participate within an ICS section. In addition to WCMRC personnel and contractors, exercise participants have included representatives from the Canadian Coast Guard, Environment Canada, British Columbia Ministry of Environment, Transport Canada, and First Nations. Local RCMP officers, ambulance services, fire services, local emergency planners, port representatives and other non-governmental organizations such as Islands Trust and university students have also been invited to attend WCMRC exercises. These exercises follow a rotation of:

- 150 Tonne on-water deployment (annual),
- 1000 Tonne Tabletop (annual),
- 2500 Tonne on-water deployment (every 2 years),
- 10,000 Tonne Tabletop (every 3 years)

In addition to the GRP/GRS process indicated in the response to Province of BC IR No. 2.49a, the certification exercise program is another mechanism for engaging stakeholders in GRPs/GRSs.

With regard to Trans Mountain's Geographic Response Plans please refer to the responses to City of Abbotsford IR No. 2.3.15 a), b), and c) which are provided below for convenience.

The Application, Volume 7, Section 4.8 outlines the process to enhance Kinder Morgan Canada's (KMC) existing emergency management programs (EMP) as they relate to the Trans Mountain Pipeline system to address the needs of the Project (Filing ID A3S4V5). The final programs will be developed in a manner consistent with the National Energy Board's (NEB or Board) draft conditions related to emergency response (Filing ID A3V8Z8).

Trans Mountain Pipeline ULC
Trans Mountain Expansion Project
NEB Hearing Order OH-001-2014
Responses to Information Request from
City of Abbotsford

2.3 Emergency Management and Response

2.3.15 Geographic Response Plan

Reference:

i. B279-7 - Attachment 3 Emergency Management Program for TMEP - A4D3F4, PDF p. 2.

ii. Meeting between representatives of the City of Abbotsford and Kinder Morgan Inc. on December 11, 2014.

Preamble:

Reference (i) refers to a Geographic Response Plan: "KMC anticipates that the control point information will be incorporated, along with existing and new information, in its Geographic Information System (GIS) to formalize a GIS-based Geographic Response Plan (GRP) for the expanded pipeline system." In Reference (ii), Trans Mountain representatives have referred to a Geographic Response Plan without providing specific information about the plan or obtaining input from the City.

Request:

a) What is the Geographic Response Plan (GRP)?

Response:

a) The Geographic Response Plan (GRP), like other contingency plans, is an oil spill emergency response plan (ERP) that presents strategies for controlling releases of hydrocarbons, in this case, from the Trans

Mountain pipeline (TMPL). The unique feature of a GRP is that not only are access sites pre-determined according to their coordinates (e.g., latitude and longitude) where mitigation measures have the highest potential for success but also that the sites are linked to environmental and a wide range of other very useful information including meteorological, biological, demographic, and other specific data.

The GRP is a means to provide the most comprehensive, practical, and up-to-date data to responders so that informed decisions can be made at the time of a spill. Where available linkages to real-time data bases (e.g., weather, flow rates in waterways) and to recent and historical documents (reports on local fish, bird, and mammal populations) are provided. Because quick, relevant, and accurate communication is key, contacts and capabilities are also noted for local communities and emergency responders.

The GRP is a living entity that evolves along with the information sources that are connected to its geo-referenced sites (usually referred to as control points). The resource data sources are dynamic as new information becomes available. The GRP are normally enabled and managed through integration within a Geographic Information System (GIS) platform.

Request:

b) How is the GRP deployed and how does it relate to emergency response?

Response:

b) The GRP are normally enabled and managed through integration within a Geographic Information System (GIS) platform. Information from the system is made available either through hard copies or in real time through direct access to the Trans Mountain's GIS system. In addition to GRP information Trans Mountain's GIS system contains information about the pipeline system, detailed mapping of its surroundings, environmental sensitivities, and "points of interest" data. The GIS system access is available remotely and normally forms part of an Incident Command Post.

As described in response to City of Abbotsford IR No 2.3.15a, the GRP contains geographically specific information helpful to expedite response actions including information about facility locations and access, pre-determined for locations for staging areas and command posts, and descriptions of control points and access.

Request:

c) When and how was the GRP initially developed? Who did Trans Mountain consult in developing the GRP?

Response:

c) Although the information requested is not within the scope of this proceeding and not relevant to the NEB's List of Issues, Trans Mountain Pipeline ULC (Trans Mountain) offers the following response to your question

The primary components of Trans Mountains current GRP are the Field Guide (detailed mapping of the pipeline and facility location information) and the Control Points Manual (detailed descriptions of pre-determined locations to intercept oil reaching waterways). These documents have evolved over as part of the pipeline's emergency program since it since came into service. Like other elements of Trans Mountain's programs their development has been informed in-part based on going consultation with emergency responders, and through lessons learned in exercises and real response.

The Application, Volume 7, Section 4.8 outlines the process to enhance Kinder Morgan Canada's (KMC) existing emergency management programs (EMP) as they relate to the Trans Mountain Pipeline system to address the needs of the Project (Filing ID A3S4V5). The final programs will be developed in a manner consistent with the National Energy Board's (NEB or Board) draft conditions related to emergency response (Filing ID A3S4V5).

As part of the program to revise the EMP KMC will more formally designate additional geographic information already maintained within its GIS system as part of the EMP data and integrate external sources of information (river gauges, weather, for example) emergency response in an effort to broaden the scope of the current GRP.

2.50 Marine spill response – drills

Reference:

A3Y2Z1, Trans Mountain Response to BC IR No. 1.72 g), PDF p. 164 of 187.

Preamble:

When asked whether WCMRC is required to demonstrate its response capability through the use of regulator-supervised unannounced drills, Trans Mountain states:

> On the average, WCMRC responds to 20 spills a year involving different products, quantities and responsible parties. All these incidents are unannounced and subject to regulator supervision. [emphasis added]

Request:

a) With respect to the spills WCMRC has responded to in the past five years, please describe

   (i) the average spill volume;
   (ii) the average distance between spill locations and the closest WCMRC base; and
   (iii) the average duration of the response.

b) How does WCMRC's response to those spills demonstrate its ability to respond to a large spill event?

c) Please describe the type and extent of regulator supervision of WCMRC's response to those spill events,

d) Please provide any post-spill reports produced by the regulator referred to above that reference WCMRC's performance or capabilities.

e) Please outline the regulator's mechanisms for collecting information and providing feedback to WCMRC so as to ensure continuous improvements to its response capability.

f) Please provide a copy of the most recent training records for WCMRC staff, identifying the number of staff trained in the Incident Command System and various aspects of spill response, and the number of staff at each competency level. If the names of employees cannot be disclosed, they may be redacted and replaced by a non-personal identifier (e.g. "Employee #1", "Employee #2", etc.).

Response:

a) The majority of navigable water spills that WCMRC responded to during the last five years were spills of less than 100 litres. These deployments were all associated with spills of hydrocarbon products and mixtures such as: diesel; diesel/lube oil; diesel/hydraulic; gear oil; hydraulic oil; and waste oil. More specific averages cannot be

computed because WCMRC's records are based on ranges rather than discrete volumes.

The average distance between these oil spill locations and the closest WCMRC response base was approximately 65 km (the median distance was 12 km).

Each incident is logged from the initial call out on an ICS 201 form – and if the duration exceeds 24/48 hours, is logged as part of a daily Incident Action Plan. This information is held separately by incident file and not consolidated into a searchable database.

b) On the average, WCMRC responds to 20 spills a year involving different products, quantities and responsible parties. Response to actual spills, however small, forms the basis for larger incident preparation. Additionally, WCMRC has participated in two notable mutual aid requests:

1) the 2005 train derailment spill of heavy fuel oil into Alberta's Lake Wabamun; and

2) the 2010 Deepwater Horizon crude oil spill in the Gulf of Mexico.

Because spills are infrequent short-lived events, a robust exercise program is necessary to insure a Response Organization's ability to respond to large spill incidents. In compliance with Transport Canada regulations, WCMRC engages in certification exercises. WCMRC follows a triennial cycle of exercising up to the current regulatory threshold of a 10,000 tonne spill scenario. Future exercise scenarios will be developed to maintain compliance with any changing Transport Canada regulations. As noted in Volume 8C, TERMPOL Reports, TR 8C-12 S12 – Review of Trans Mountain Expansion Project Future Oil Spill Response Approach Plan Recommendations on Bases and Equipment (Filing ID A3S5I9), WCMRC has proposed increasing their response capacity to 20,000 tonnes in the shipping channel to support the Trans Mountain Expansion Project. This increase in response equipment capacity and corresponding response personnel has been proposed to address the requirements of the credible worst-case spill identified in the quantitative risk assessment and will, in the future, be exercised accordingly.

In addition to the aforementioned WCRMC also participated and played an important role in response to the 2007 Inlet Drive spill where third party damage to Trans Mountains Westridge delivery line resulted in diluted bitumen entering Burrard Inlet via the storm drain system.

c) As noted in the prior response to Province of BC IR No. 1.1.72g (Filing ID A3Y2Z1):

"On the average, WCMRC responds to 15 - 20 spills a year involving different products, quantities and responsible parties. All these incidents are unannounced and subject to regulator supervision" by Transport Canada through the Unified Command whose regulatory members could include the Canadian Coast Guard, Environment Canada, British Columbia Ministry of Environment, First Nations and Transport Canada.

Further, as also noted in the prior response to Province of BC IR No. 1.1.72f (Filing ID A3Y2Z1):

"Western Canada Marine Response Corporation (WCMRC) must demonstrate to Transport Canada that it is prepared to respond to a spill under various circumstances. For Response Organizations, including WCMRC, this certification cycle is every three years under the Canada Shipping Act, 2001. In order to meet Transport Canada requirements, WCMRC holds a number of both equipment deployment and tabletop exercises as well as oil spill response-training courses within each certification period.

Annually WCMRC provides Transport Canada with information related to:

- An executive summary of the Oil Spill Response Plan
- A description of the relationship to other spill response plans/management systems
- Complete details of the response organization
- Geographic Area of Response
- Emergency call-out procedure
- Notifications/Activation through the on call system
- Personnel available to respond
- Equipment available to respond
- Health, Safety and Loss Control Program
- Site Specific Health and Safety Plan
- Response countermeasures
- Wildlife protection and rehabilitation

As part of the certification process, a schedule of exercises is undertaken including:

- 1,000 tonne tabletop, annually
- 150 tonne equipment deployment, annually
- 2,500 tonne equipment deployment, every two years
- 10,000 tonne tabletop, every three years

These exercises are conducted under the Incident Command System (ICS) and are executed in coordination with existing WCMRC members with the BC Ministry of Environment participating in the ICS. Transport Canada attends and assesses all exercises to verify WCMRCs capability and capacity.

d) Transport Canada recertified WCMRC. Please refer to the response to Province of BC IR No. 1.1.63g (Filing ID A3Y2Z1) for 2013 certification sign-off document issued by Transport Canada.

e) To verify the adequacy of WCMRC's commitment to the standards of a certified Response Organization, Transport Canada, as the regulator, systematically monitors WCMRC. Annually WCMRC provides Transport Canada with information related to:

- An executive summary of the Oil Spill Response Plan
- A description of the relationship to other spill response plans/management systems

- Complete details of the response organization
- Geographic Area of Response
- Emergency call-out procedure
- Notifications/Activation through the on call system
- Personnel available to respond
- Equipment available to respond
- Health, Safety and Loss Control Program
- Site Specific Health and Safety Plan
- Response countermeasures
- Wildlife protection and rehabilitation

Transport Canada attends and observes during drills and exercise.

A copy of WCMRC's last 10,000 tonne certification exercise debrief package (*Tier 4 Tri-Annual Tabletop Exercise Debrief Package*) has been attached as an illustration of criteria validated by TC (see attachment Province of BC IR No. 2.50e Attachment 1).

Refer to Province of BC 1.1.63g (Filing ID A3Y2Z1). Should further information be required, please contact Transport Canada (TC).

f) Although the information requested is not within the scope of this proceeding and not relevant to the National Energy Board's List of Issues (Filing ID A3V6I2), Trans Mountain offers the following response to the Province's question. A copy of WCMRC's 10 year Summary of Training Activities has been attached for consideration (see attachment Province of BC IR No. IR No. 2.50f Attachment 1). Please also refer to the prior request in Province of BC 1.1.72a (Filing ID A3Y2Z1) for background information.

2.51 Response capacity of the Canadian Coast Guard

Reference:

i. A3S4Y6, Application Volume 8A, Marine Transportation, Section 5.1.1.4, Equipment, PDF p. 30 of 34.

ii. A4A8U4, Follow-Up Information from Canadian Coast Guard, PDF p. 4 of 6.

Preamble:

In reference (i), Trans Mountain points out that, in addition to WCMRC's response capacity, "the Canadian Coast Guard operates three large equipment depots in Victoria, Richmond, and Prince Rupert, and maintains equipment caches in an additional ten locations along the West Coast".

In the first round of intervenor Information Requests, Trans Mountain was asked by the City of Vancouver and the Province of British Columbia to further describe the response capacity of the Canadian Coast Guard (CCG). As Trans Mountain was unable to provide that information itself, it sought to obtain it from the CCG and filed the follow-up information set out in reference (ii). While reference (ii) fails to list the spill response equipment the CCG owns, it states as follows:

> As stated in the previous question, Coast Guard capacity should not be counted as equipment available for project-related incidents as part of the proponent's preparedness planning. In the event of an incident, Coast Guard personnel will monitor the response of the ship owner and ensure an appropriate response. If actions of the ship owner are not satisfactory, the Coast Guard could take over the response using its authorities under the Canada Shipping Act, 2001. In this case, the Coast Guard may choose to contract spill response services or use its own equipment as appropriate.
>
> Canada's primary response capacity for oil spills in Canadian waters rests with industry, via Transport Canada-certified Response Organizations. It is the Response Organization's responsibility to build and maintain response capacity; in the event of a spill, Response Organizations are required to have on hand enough capacity and capability to handle a ship-source spill of up to 10, 000 tonnes within prescribed timeframes, with the option to bring in additional capacity from other response areas or internationally in the event of a large spill. [emphasis added]

Request:

In light of the statement in reference (ii) that "Coast Guard capacity should not be counted as equipment available for project-related incidents", does Trans Mountain continue to rely on the spill response capacity of the CCG in Project-related spill response planning?

Response:

Trans Mountain and WCMRC have never included Canadian Coast Guard equipment as a component of current or future enhanced response planning capacity. The fact that Trans Mountain acknowledges that "the Canadian Coast Guard operates three large equipment

depots in Victoria, Richmond, and Prince Rupert, and maintains equipment caches in an additional ten locations along the West Coast" (Volume 8A, Marine Transportation, Section 5.1.1.4, Equipment, PDF p. 30 of 34, Filing ID A3S4Y6), is not meant to suggest their reliance on CCG assets.

2.52 Proposed marine oil spill response improvements

Reference:

A3W9H8, Trans Mountain Response to NEB IR No. 1.64 a), PDF p. 365-366 of 421.

Preamble:

In the reference above, Trans Mountain is asked to answer the following request:

> Please confirm whether Trans Mountain is committed to having the oil spill response improvements outlined in the Western Canada Marine Response Corporation report in place prior to commencing Project operations.
>
> a.1) If confirmed, please discuss how Trans Mountain would ensure that the proposed improvements are in place prior to commencing Project operations, and how would it ensure the continued availability of the proposed resources for the life of the Project.

Trans Mountain provides the following response:

> Trans Mountain is a member and founding shareholder of Western Canada Marine Response Corporation (WCMRC) and in this capacity is working to secure a commitment from WCMRC, in the form of a resolution from its Board of Directors or similar instrument, to implement the enhanced planning standards described in Table 5.5.3 of Reference i). Doing so requires that an appropriate funding mechanism be in place to protect other WCMRC members from costs associated with investments by WCMRC in enhanced marine spill response procedures, equipment, and resources while ensuring that all members benefit from the reduction in Bulk Oil Cargo Fees expected to result from the commencement of the Project-related volumes.
>
> Resolution of these issues and a commitment from WCMRC to implement the enhanced planning standards is expected by Q3 2014.

Request:

a) Please provide an update on the resolution of the issues identified above and WCMRC's commitment to implement the enhanced planning standards.

b) Regardless of the response to request a) above, please confirm whether Trans Mountain is committed to having the oil spill improvements outlined in the WCMRC report in place prior to commencing Project operations.

Response:

a) A resolution has been tabled and passed by the WCMRC Board of Directors, which will commit Western Canada Marine Response Corporation (WCMRC) to implement the enhanced planning standards described in Volume 8A Table 5.5.3 (Filing ID A3S4Y6) in a manner as generally described in their report provided as Volume 8C TR 8C-12 S12

(Filing ID A3S5I9) and in a manner to support the in-service schedule for Tran Mountain Expansion Project. The resolution is subject to a funding mechanism which is currently undergoing an administrative review and is now expected to be in place in Q2 2015.

b) Trans Mountain is committed to support Western Canada Marine Response Corporation's (WCRMC's) implementation of the enhanced planning standards described in Volume 8A Table 5.5.3 (Filing ID A3S4Y6) and in a manner as generally described in their report provided as Volume 8C TR 8C-12 S12 (Filing ID A3S5I9) so that they are in place prior to commencing Project operations. Trans Mountain is also committed to support the Government of Canada's efforts to establish and enforce marine safety regulations that ensure a world class tanker system, particularly those with similar effect as the WCRMC enhancements.

Trans Mountain believes planning standards for marine spill response should be based on the following principles:

- **Augment capacity within the existing regime.** Where the need exists for additional response capacity, it should be met through an expansion of WCMRC's resources.
- **Response capacity should reflect the risks.** Response capacity should be established based on consideration of probability and consequence with particular consideration to predicted spill volumes, material fate and behavior, and geographic setting including sensitive areas.
- **Investments should benefit affected communities.** Where new investment in response capacity is required, Kinder Morgan Canada will seek to maximize the benefit to First Nations and other communities along the transit route. Benefits may consist of capacity building, capital investment, training and provision of ongoing services.

Refer to the response to a above.

Summary of New Commitments:

- Support Western Canada Marine Response Corporation's implementation of the enhanced planning standards described in Volume 8A Table 5.5.3 (Filing ID A3S4Y6) and support the Government of Canada's efforts to establish and enforce marine safety regulations with similar effect.

2.53 Operational thresholds and new spill response equipment

Reference:

i. A3Y2Z1, Trans Mountain Response to BC IR No. 1.64 a), PDF p. 148 of 187.

ii. A3W9H8, Trans Mountain Response to NEB IR No. 1.65 c), PDF p. 370-371 of 421.

iii. Washington Administrative Code Chapter 173-182, Oil Spill Contingency Plan Rule: http://apps.leg.wa.gov/WAC/default.aspx?cite=173-182&full=true.

Preamble:

In the first reference, Trans Mountain describes the response capacity of WCMRC as follows:

> Western Canada Marine Response Corporation's (WCMRC's) calculated response capacity based upon the current Transport Canada planning standards is 27,000 tonnes of equipment capacity on the BC Coast, approximately one third of which is suitable for the open water (i.e., unsheltered water) environment.

In reference (ii), Trans Mountain discusses the effectiveness of conventional spill response equipment in challenging environmental conditions such as wind, waves, and tides. Trans Mountain states:

> There have been continual improvements in the design of spill response equipment that have made them [sic], as well as the entire response system, more effective in different weather conditions …
>
> Operational thresholds may be increased through the deployment of more recently developed dual purpose containment and recovery devices, such as Current Busters™ that offer more effective countermeasures under stronger wind, wave and current conditions.

Reference (iii) is Washington State's Oil Spill Contingency Plan Rule, which regulates oil spill preparedness and contingency planning for onshore and offshore oil transportation facilities (including pipelines) and covered vessels. Section 173-182-621provides as follows

(1) [The Washington State Department of] Ecology will review the planning standards at five-year intervals to ensure the maintenance of best achievable protection to respond to a worst case spill and provide for continuous operation of oil spill response activities to the maximum extent practicable and without jeopardizing crew safety.

(2) Ecology will adopt a five-year review cycle to ensure that the planning standards are updated to include proven new response technologies and response processes. In addition plan holders and other interested parties will be provided an opportunity to present information and proposals regarding spill prevention credits to support an alternative worst case discharge volume for the contingency plan. The review cycle is designed to evaluate BAP [Best Achievable Protection] by assessing contributing elements including:

(a) Best achievable technology;
(b) Staffing levels;
(c) Training procedures; and
(d) Operational methods.

(3) The review cycle will be used to evaluate a variety of spill operations, tools, and technologies including, but not limited to, the following:
(a) Advancing systems for the removal of oil from the surface of the water;
(b) Improving the performance of existing skimmer/boom and storage systems technology;
(c) Improving the performance of in situ burn and dispersants technology;
(d) Broadening the environmental conditions under which oil spill cleanup can take place;
(e) Ensuring that the technology is deployable and effective in a real world spill environment; and
(f) Considering tools or technology that are designed, produced, and manufactured in an energy-efficient process and products are reuseable, recyclable, and reduce waste.

[emphasis added]

Request:

a) Please explain how Trans Mountain determined that approximately one third of the response equipment capacity held by WCMRC is suitable for the open water environment.

b) Will Trans Mountain commit to the full-scale acquisition prior to commencing Project operations, and continuous availability throughout the life of the Project, of Current Busters™ and/or any other best available technology for spill response (both land-based and marine), with demonstrated effectiveness in difficult weather conditions? For the purpose of this request, “best available technology” should be understood as state of the art technology that is both commercially available and proven to be effective, as demonstrated by its adoption by other industry members.

The response should address the acquisition of equipment to reach a capacity sufficient for a worst case spill and should include the logistical support required to deploy such equipment (e.g. vessels and crew). The response should also provide any evidence stemming from previous worldwide spill events that demonstrates that the use of the identified technology resulted in improved oil recovery rates.

c) Does Trans Mountain meet the planning standards described in reference (iii) for its Puget Sound line? If yes, will Trans Mountain commit to ensuring that the same land-based and marine spill response technology is made available for the response to Project-related emergencies?

d) Please describe Trans Mountain’s process for reviewing, assessing and implementing best available technology (as defined in a) above) to ensure continuous improvement

and the creation of a world leading spill preparedness and response program for the pipeline and the associated tanker route.

Response:

a) WCMRC uses Transport Canada (TC) guidelines, published in their document *Response Organization Standards*, to establish minimum equipment levels suitable for designated operating environments. For planning purposes, TC determined that 40% of any spill could potentially occur within "unsheltered" waters in WCMRC's Enhanced Response Area (ERA).

As such, WCMRC maintains response equipment to meet that TC planning standard.

Reference:

Transport Canada. 1995. Response Organization Standards. Ottawa, Ont. 13 pp.

b) Western Canada Marine Response Corporation (WCMRC) is the Transport Canada (TC) certified marine response organization (RO) for the navigable waters of British Columbia. As such, WCMRC is responsible for the acquisition of suitable marine response equipment to support both Trans Mountain and other members of WCMRC. A detailed discussion of WCMRC's proposed equipment enhancements to support the Project (including reference to Current Busters™) has been submitted to the NEB in Volume 8C, TERMPOL Reports, TR 8C-12 S12 – Review of Trans Mountain Expansion Project Future Oil Spill Response Approach Plan Recommendations on Bases and Equipment (Filing ID A3S5I9). The proposed response system enhancements have been based on a risk assessment developed through research by Det Norske Veritas (DNV). DNV's assessment provides the rationale for a Credible Worst Case discharge as the criteria to use for oil spill planning. This rationale is based upon the type of tankers (modern double-hull Aframax class ships) used by the project, the stringent acceptance criteria of such tankers, the high standard of risk reducing measures already in place and those proposed in the future by TMEP including the use of additional escort tugs, oversight by authorities as well as the historical records of the region and the terminal. Trans Mountain is committed to supporting WCMRC to achieve the enhancements detailed in Table 5.5.3, Volume 8A of the Application (Filing ID A3S4Y6) prior to the Project becoming operational.

To verify the adequacy of WCMRC's commitment to the standards of a certified Response Organization, TC systematically monitors WCMRC. Annually WCMRC provides Transport Canada with information related to:

- An executive summary of the Oil Spill Response Plan
- A description of the relationship to other spill response plans/management systems
- Complete details of the response organization
- Geographic Area of Response
- Emergency call-out procedure
- Notifications/Activation through the on call system

- Personnel available to respond
- Equipment available to respond
- Health, Safety and Loss Control Program
- Site Specific Health and Safety Plan
- Response countermeasures
- Wildlife protection and rehabilitation

With respect to land-based response, Trans Mountain's Emergency Management Program (EMP) undergoes regular review to reflect lessons learned through actual responses and practice exercises and to ensure it is kept up to date with respect to technology and available equipment. Application Volume 7, Section 4.8 outlines the process to enhance Trans Mountain's existing emergency management programs, including training, as they relate to the Trans Mountain Pipeline system to address the needs of TMEP. The final programs will be developed in a manner consistent with the National Energy Board's (NEB's) draft conditions (Filing ID A3V8Z8): 42, 49, 50, 51, 52, 53, 54, 56 and 60. As part of the ongoing land-based program enhancement, KMC will undertake a resource gap analysis to determine what additional resources are needed, and where the additional resources are required.

c) Yes, Kinder Morgan Canada (KMC) Puget Sound operation meets all applicable Washington Administrative Code requirements in chapter 173-182 (the "WAC").

The planning standards in Washington State vary based on transportation mode, and geographic location. Those for transmission pipelines and tanks provide clear expectations for determining response resource needs and means for continual improvement.

For KMC's Canadian operations the cycle of continual improvement for the Trans Mountain EMP incorporates appropriate leading practices, including proven new response technologies and response processes, from all jurisdictions in which KMC operates, including Washington State. As a result, despite the WAC's lack of applicability to Canadian operations, the planning standards used for KMC's existing Trans Mountain EMP are compliant with those of the WAC. The WAC is one of the regulations that has informed the Trans Mountain EMP throughout its evolution, and will continue to do so.

Please refer to the response to Province of BC IR No. 2.42 and Volume 7, Section 4.2 (Filing ID A3S4V5) for more information about Trans Mountain's Integrated Safety and Loss Management System (ISLMS) for continuous improvement.

Trans Mountain notes that the commitment to apply best achievable technology is one made by the regulator with regard to the review and maintenance of their planning standard regulations. Trans Mountain is supportive of this effort to ensure regulation that results in a requirement for proven new response technologies and response processes because it reflects KMC's commitment to the same end.

Ultimately, updates to the Trans Mountain EMP must result in a program that meets the requirements of the National Energy Board *Onshore Pipelines Regulations* (2013)

(OPR). The OPR provides lifecycle regulation of Trans Mountain's ISLMS and EMP. Trans Mountain believes that the OPR requirements, as implemented by Trans Mountain, result in the same end as the WAC.

While Trans Mountain cannot commit to be bound by regulation established for Washington State, through its ISLMS Trans Mountain will ensure its EMP is maintained to ensure that the planning standards are updated to include proven new response technologies and response processes applicable to its pipeline system.

d) Western Canada Marine Response Corporation (WCMRC), the Transport Canada (TC) certified marine response organization (RO) for the navigable waters of British Columbia, will be the lead marine responder at the Westridge Marine Terminal (WMT) and along the tanker route. As a condition of operating in Canadian waters, legislation requires that all tank vessels and all Oil Handling Facilities (including Trans Mountain's WMT) have a contractual arrangement with a certified oil spill RO that will maintain a prescribed level of preparedness to respond to a spill on the polluter's behalf. OHF, in addition to maintaining a RO contract, must also possess resident equipment and boom to be deployed as first response in the event of a spill. WCMRC must routinely demonstrate to its oversight regulator, Transport Canada that it is prepared to respond to a spill under various circumstances. This certification cycle, itemized in the response to Province of BC IR No. 2.50c, is every three years.

WCMRC is also a member of both the Association of Petroleum Industry Cooperative Managers (APICOM) and the Global Response Network (GRN) - coalitions of diverse oil-spill response organizations operating in different areas of the world. Collectively, their mission is to advance knowledge and expertise of oil spill response and to share that information with other group members to enable them to provide better response to their members and customers. Because of the wide range of situations represented, these organizations can be viewed as dynamic forums to propagate best achievable technology. This organizational framework provides an excellent consultative network for WCMRC and its members.

With respect to land-based response, as noted earlier in the response to Province of BC IR No. 2.53b, KMC's Emergency Management Program (EMP) is regularly reviewed to confirm that industry's lessons from responses and practice exercises are suitably integrated to the overall plan, including technology and available equipment.

As part of the ongoing program enhancement, and review, KMC will undertake periodic assessments of available technology to ensure that KMC response regime is up to date regarding technology, required training and equipment. Please refer to the response to Province of BC IR No. 2.21b.

Summary of New Commitments:

- Through its continuous improvement program Trans Mountain will ensure its EMP is maintained to ensure that the planning standards are updated to include proven new response technologies and response processes applicable to its operation.

2.54 Aboriginal participation in emergency preparedness and response activities

Reference:

A3Y2Z1, Trans Mountain Response to BC IR No. 1.22 d), PDF p. 65 of 187.

Preamble:

In the reference above, Trans Mountain is asked whether it intends to make funding available upfront (i.e., in advance of participation) to ensure Aboriginal communities are able to meaningfully participate in spill prevention, preparedness, response, and recovery activities. Trans Mountain responds as follows:

> Trans Mountain understands the importance of meaningful participation by Aboriginal groups in spill prevention, preparedness, response and recovery activities. With respect to land-based emergency preparedness and response, the cost of equipment and training is part of the risk assessment and gap analysis referred to in Province BC IR No. 1.1.22a.
>
> With respect to marine-based emergency preparedness and response, Trans Mountain is prepared to make an investment, and is discussing same directly with First Nations. Trans Mountain is interested in better understanding how the authorities and governments responsible for marine spill prevention and emergency preparedness related activities will participate. [emphasis added]

Request:

Please explain whether Trans Mountain will make funding (in addition to the costs associated with the provision of training and equipment) available to Aboriginal communities in advance of their participation in Project-related emergency preparedness and response activities, so as to make such participation possible

Response:

Trans Mountain has committed some funds and will make more funding available to those Aboriginal groups who are close to the line and wish to participate in Trans Mountain's Project-related emergency preparedness and response program.

Additionally, Mutual Benefit Agreements (MBAs) are implemented through confidential negotiations where Trans Mountain offers capacity building programs to Aboriginal groups interested in developing capacity in regard to Emergency Response Management.