
City of Burnaby Comments on Trans Mountain’s Response to the National Energy Board’s Information Requests Nos. 1, 2, and 3 on the Burnaby Terminal Variance

The City of Burnaby (“Burnaby”) provides the following comments on Trans Mountain’s responses to information requests no. 1, 2, and 3 of the National Energy Board (the “NEB” or the “Board”) concerning the Burnaby Terminal variance.

City of Burnaby’s Position

Burnaby maintains our position as outlined in the submissions to the Board dated June 30, 2017 that Trans Mountain has failed to provide sufficient information with respect to risks to critical interests and values in the area surrounding the Burnaby Terminal, and emergency response in order for the Board to consider the variance of the Burnaby Terminal design. As outlined below with respect to specific information requests of concern to Burnaby, Trans Mountain has either failed to provide the information requested – merely defending the deficiencies in its risk assessment methodology highlighted by Burnaby and the Board – or deferred the collection of the information requested until after construction of the Burnaby Terminal is complete.

Further, in the information request responses, Trans Mountain states that it would be engaging with Burnaby with respect to the variance application and emergency response. Burnaby can report that such engagement has not occurred and that many matters that are critical to protecting interests in Burnaby remain outstanding.

It is Trans Mountain’s obligation to put forward a credible risk assessment and to provide evidence that it has or will mitigate all risks from the expansion to Burnaby and its residents to As Low As Reasonably Practicable (ALARP), without assuming any reliance on Burnaby services. Trans Mountain has failed to provide such evidence, and merely asserts that risks have been reduced to ALARP without evidence or justification. No future consultation or emergency response plan will provide for the opportunity to address risk through tank farm design. These matters of critical importance to public safety in Burnaby must be addressed prior to consideration of the Burnaby Terminal variance and prior to commencing construction.

IR No. 1.3 – Fire Water Reservoir and Firefighting

The proposed fire water reservoir is under sized and does not meet the supply requirements of the expanded facility according to the Burnaby Fire Department.

The scenario identified as the largest water requirement is invalid. Previous versions of the KMC TMTF Emergency Response Plan utilize and reference the scenario expectation of a full surface containment bay fire. The current version of the KMC TMTF Emergency Response Plan replaced full surface containment bay fire with a small spill event. Therefore, the short fall in the proposed fire/foam system infrastructure was not addressed by Trans Mountain by adjusting the

volume or flow capability of the firefighting systems, but by reassessing the “credible worst case scenario” to a scenario that requires less firefighting capacity and capability.

According to the Burnaby Fire Department, the firefighting requirements for a full surface containment bay fire is as follows:

- 22,014 usgpm for 20 minutes of firefighting foam solution applied to the entire containment bay area. This volume requirement exceeds the discharge limitations of the equipment proposed by Trans Mountain.
- Alternately, a fire attack is possible, where only a quarter of the containment bay area is applied in a single application, made four times over. This application strategy requires increased flow requirements to both cool the tank shell in areas where foam application is delayed, and foam application in areas where a foam blanket has previously been applied in order maintain the foam blanket’s integrity. The flow and total volume of this strategy, based on the requirements of NFPA 11, is a minimum of 5,878 usgpm for 80 minutes - requiring 7,121 m³ of fire water.

Therefore, the fire water reservoir is undersized by 1,121 m³.

Further, Trans Mountain’s statement with respect to impairment remains unclear. The response infers impairment, and a loss of firefighting ability due to system change-over. However, Trans Mountain does not state how it will address this impairment.

IR No. 1.6 – Consultation with Potentially Affected Stakeholders

The Board expressly recognized in the NEB report the requirement of Trans Mountain to continue to engage with impacted municipalities in order to address outstanding concerns. Burnaby and its residents will bear the burden of the risks of the expansion of the Burnaby Terminal. Yet, Trans Mountain has failed to engage with Burnaby with respect to the risk assessment for the tank farm and the need to vary the tank farm design in order to reduce risk.

In fact, Trans Mountain recently cancelled the Emergency Management Engagement Workshops with Burnaby residents scheduled for the end of April 2018, due to Trans Mountain’s shutdown of non-essential operations. Clearly, Trans Mountain does not consider emergency management in Burnaby an essential part of its operations in the City to warrant continued spending.

Trans Mountain lists in the response to the IR No. 1.6 of the Board the planned future opportunities to engage with Burnaby on the variance to the tank farm and emergency response. Burnaby can report that these discussions with Trans Mountain did not eventuate, and that Burnaby’s concerns with respect to the tank farm remain outstanding. Trans Mountain has made no effort to update its filings for Conditions 22 and 24 in order to address or incorporate the concerns of Burnaby. Burnaby’s outstanding concerns remain as set out in our submission of June 30, 2017 and include the following:

- **Missing Critical Site-specific Information** – Trans Mountain has not completed an inventory of the values that will potentially be impacted by an emergency event at the Burnaby Terminal. The assumptions made in Trans Mountain’s risk assessment and variance application are not grounded in an understanding of the values in the area surrounding the tank farm and the resources available for emergency response. Without this site-specific information, Trans Mountain’s risk assessment that underlies the variance application is inaccurate and incomplete.
- **Risks of Boilover and Vapour Cloud Explosion not accounted for** – Trans Mountain underrepresents the risk of boilover and vapour cloud explosion. Trans Mountain makes assumptions in the risk assessment that may not be possible given the location of the Terminal – for example Trans Mountain assumes complete evacuation of the impacted area would be possible before a boilover event. Trans Mountain further underrepresents the potential for event domino effects where fire suppression is not possible due to the location of the tank farm, the lack of safe firefighting positions and the need to evacuate all personnel.
- **Narrow Risk Assessment** – The scope of Trans Mountain’s risk assessment remains unacceptably narrow in terms of the risks that it quantifies. Trans Mountain has not provided further information with respect to the risk of external events such as arson, vandalism, or forest fire impacting the tank farm. Given the urban location of the tank farm, and the controversy surrounding the Project, these are credible risks that need to be accounted for in the risk assessment.
- **Improper Risk Assessment Methodology** – Trans Mountain still fails to account for risk of impacts other than loss of life, including damage to values of local concern within Burnaby and non-fatal harm to residents. In failing to consider these risks, Trans Mountain has not developed mitigation measures to reduce or address these risks contrary to the requirements of Condition 22.
- **Failure to Consider Available Mitigation Measures** – Trans Mountain has failed to justify as to why it should not be required to employ all available risk reduction measures, given the location of the tank farm directly adjacent to neighbourhoods. Trans Mountain does not provide any evidence to the Board as to why certain risk reduction measures are not reasonably practicable, or as to why Trans Mountain is not able to adjust tank capacity in order to allow for certain measures to be implemented such as increased capacity for secondary containment.

IR No. 2.3 – Emergency Management (indirect impacts of boil over and secondary fire events)

In response to IR 2.3 of the Board, Trans Mountain defers dealing with the non-direct impacts raised in Burnaby’s submissions to surrounding lands, people and evacuation routes until the emergency management plans due only six months prior to commencing operations. However, these issues are relevant to the risk assessment and to the tank farm design. Mitigation of these

risks should be dealt with now, not at the last step when there is no opportunity to change the layout of the tank farm to reduce risk.

IR No. 2.5 – Ignition Probability

In response to IR 2.5 of the Board, Trans Mountain agrees with Burnaby’s submissions that it used the ignition probability curve based on the wrong fuel type (diesel and fuel oil) and “that it intends to store heavy, light, and synthetic crude oil, not diesel or fuel oil, and that the various types of crude oil will be stored at conditions above their flash points.”. This is a significant admission from Trans Mountain of the flaws within its risk assessment methodology.

However, Trans Mountain then goes on to state that the very conservative application of the other factors in the risk assessment equations makes the selection of the wrong ignition probability curve appropriate. Trans Mountain’s failure to address the errors in its assessment of ignition probability is unacceptable. Trans Mountain has underrepresented the ignition risk by choosing the wrong fuel type in circumstances where Trans Mountain proposes to store crude oil above flash point – Trans Mountain must be made to provide accurate information on ignition probability and risk.

In the event that Trans Mountain’s statement that intends to store crude oil above flash point is incorrect, Trans Mountain still has not justified its use of the wrong ignition probability curve and the consequent underrepresentation of the risks to individuals surrounding the Burnaby Terminal.

IR No. 3.1 – Event Trees

Despite the concerns of Burnaby, Trans Mountain again takes the position in its response to the Board that “base and escalation events that do not result in fatal injury do not contribute to individual risk”, and does not account for risks that do not result in fatalities but may result in damage to property/people. A risk assessment based on such a flawed methodology cannot be relied upon.

Trans Mountain further only considers a very narrow set of initiating events (tank rupture, full surface fire, secondary containment fire and earthquake) – ignoring the potential for human error, vandalism, arson, forest fire and other credible initiating events. Trans Mountain neglects to consider a number of domino and escalating effects, such as toxic exposure, effectively underrepresenting the risk of emergency events at the Burnaby Terminal and the need to account for these risks in tank farm design prior to construction.

The assumption underlying much of Trans Mountain’s risk assessment is that there will be emergency response personnel immediately available to respond to fires, spills or other emergency events, which negates the need to consider escalating effects such as toxic exposure or fire spread. The immediate availability of emergency response personnel with the necessary training to respond to hydrocarbon events is not borne out on the evidence put forward by Trans Mountain. As previously stated, a proper response should not rely on the assumption that Burnaby services will be available. Trans Mountain’s safety plans must stand on their own.

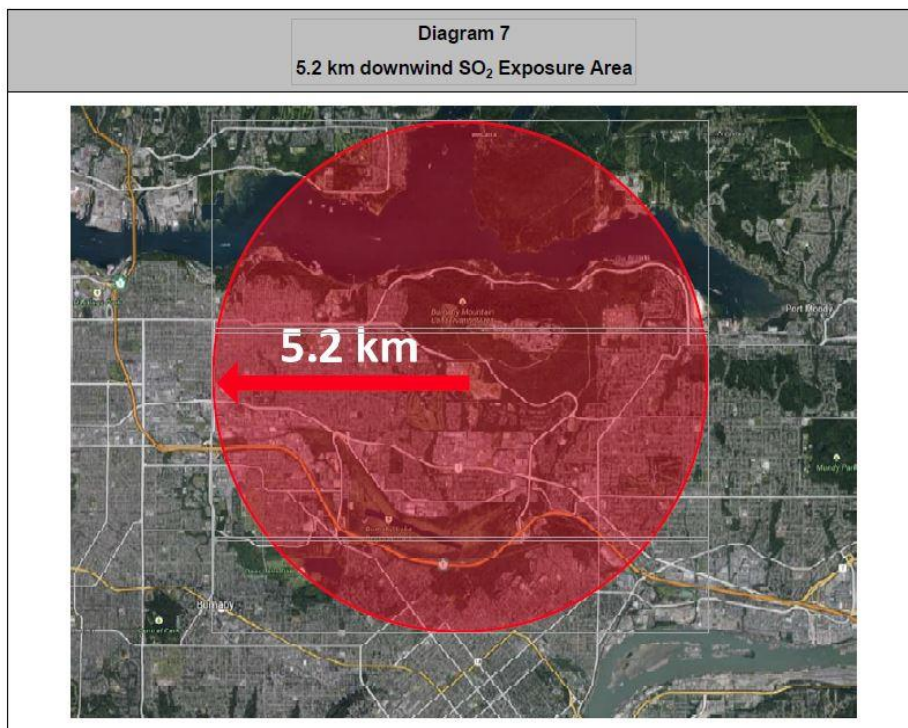
Further, it is clear that Burnaby will not be able to provide technical hydrocarbon firefighting within the fenceline and the elapse time for Trans Mountain to provide this specialized support is 6–8 hours (on site personnel are not trained to operate with specialized firefighting equipment outside the safe working area). As such, Trans Mountain’s risk assessment needs to be redone in order to account for domino or escalating effects of exposure to a long term spill or fire event – ignoring the potential for long term events is not a credible approach to risk assessment.

Figure 3.1A – Tank Rupture

Trans Mountain states in this response that the “Toxic (CO, SO₂) exposure effects are neglected here due to short event duration.”

Given the proximity of the Burnaby Terminal to residential neighbourhoods, the toxic exposure effects cannot be neglected in any credible risk assessment of a tank rupture and associated fire event with respect to the Burnaby Terminal. Trans Mountain’s failure to consider this credible risk to Burnaby residents is a serious deficiency in the risk assessment that is of critical concern to Burnaby. Burnaby provided evidence to the Board during the NEB hearing of the risks of toxic exposure in the “Trans Mountain Tank Farm Tactical Risk Analysis” as follows (see pp. 5, 68-73):

Highly toxic Hydrogen Sulfide will very quickly, upon facility release, expose residential areas to conditions that are immediately dangerous to life. Smoke outfalls from fire event may contain Sulphur Dioxide (SO₂), in which KMC analysis shows a potential health concern could be felt up to 5.2 km. downwind.



Trans Mountain acknowledged in its own risk assessment before the Board that “there is a possibility some of the oil will contain small amounts of Sulphur which will be converted to Sulphur Dioxide (SO₂) in a fire, the analysis shows a potential health concern could be felt up to 5.2 km downwind” (see p. 3).

We are advised by the Burnaby Fire Department that a containment bay fire could require application of foam solution from 20 minutes to 80 minutes, and a full surface tank fire with a displaced or damaged roof structure could require application of foam solution from 55 minutes to 65 minutes based on the flow requirement identified in NPFA 11. During this application time, the smoke and products of combustion will be present and will create a toxic SO₂ and CO exposure of significance that cannot be neglected. Further, during a boilover event, there is the potential for a fire to escalate and ignite surrounding tanks, making firefighting unsafe and quick suppression of the fire impossible (a multiple tank fire includes the potential of having to allow one or several storage tanks to burnout over 2-4 days).

Figure 3.1B – Full Surface Fire – external or internal floating roof tank

Trans Mountain’s event tree for a full surface fire is based on the incorrect assumption that only direct flame contact will create a fire escalation to a neighboring tank. We are advised by the Burnaby Fire Department that the mere heating of the tank surface without direct flame contact can ignite a neighboring tank. Further, for a tank fire event initiated by a structural roof displacement or where a structural roof displacement occurs during the fire event, much greater heat impact will be discharged. These risks are not accounted for in Trans Mountain’s assessment.

Furthermore, due to tank farm design configuration, many of the locations required for mobile firefighting devices, and thus where firefighting personnel will be forced to operate, will create thermal radiation exposure exceeding safe working conditions regardless of PPE worn. In addition, due to tank farm design configuration, many of the locations required for mobile firefighting will create a SO₂ and CO toxic exposure requiring all personnel to operate and function exclusively from self-contained breathing apparatuses. The elapse time for the facility to provide this level of personnel and equipment is 6–8 hours. This situation would create an unmitigated discharge time of heat and toxic SO₂ and CO into the neighboring community for 6 – 8 hours. The domino effects of such exposure are not accounted for by Trans Mountain.

The portion of the assessment identifying boilover consequence assumes the withdrawal of all firefighting personnel prior to boilover to a safe distance in order to achieve the stated risk to life utilized in this model. However, the consequence of firefighter withdrawal to protect their lives and achieve the stated risk to life utilized, is the abandonment of fire control measures to confine or restrict the fire’s growth within the facility. This potentially could create fire extension to a second or third tank, the release of heat and toxic products over a much longer time frame, and fire extension to adjacent high risk areas outside the fence line. These domino effects of a boilover scenario are not accounted for in Trans Mountain’s assessment.

Figure 3.1D – Earthquake

Again, the omission of the toxic effects of SO₂ and CO as a result of extended fire operations is inappropriate and significantly impacts the accuracy of the analysis provided. During an earthquake, contributing factors to even escalation of structural tank breakdown or failure, the loss of firefighting water systems and the consequential inability to confine, restrict and suppress toxic products and heat outfall are not considered.

IR No. 3.3 – Hazard Distances

The figures provided as an attachment to IR No. 3.3 appear to be hand drawn and do not provide an accurate basis to identify the contour impacts and distances.

Figure 11-1

This figure identifies an outfall heat impact to the forested area immediately adjacent to the potential tank fire location of up to 15 kWm⁻². According to the Burnaby Fire Department, this heat impact in an uphill direction would be unquenchable with fire streams based on:

- insufficient firefighting discharge device ability;
- insufficient safe deployment position within fire stream reach; and
- high risk to firefighting personnel to operate mobile equipment in the uphill downwind direction.

Figure 11-2

According to the Burnaby Fire Department, the SO₂ lethality of a tank full surface fire has the following potential impacts:

- impact at 50% fatality into the medium density residential area;
- impact at 1% fatality at 250m into the medium density residential area;
- a 30 minute exposure to potential fatality due to outfall toxic exposures occurs prior to the reasonable ability for firefighting personnel to extinguish the initiating fire event; and
- impacts that require all fire operations to be conducted within the protection of self-contained breathing apparatus. The stated elapse time for the facility to provide this level of personnel and equipment has been provided as 6 – 8 hours. This situation would create an un-mitigated discharge time of toxic SO₂ into the neighboring community for 6 – 8 hours.

Figure 11-3

According to the Burnaby Fire Department, the CO lethality of a tank full surface fire has impacts that require all fire operations to be conducted within the protection of self-contained breathing apparatuses. The elapse time for the facility to provide this level of personnel and

equipment has been provided as 6 – 8 hours. This situation would create an unmitigated discharge time of toxic CO into the neighboring community for 6 – 8 hours.

Figure 11-4

According to the Burnaby Fire Department, the thermal radiation impacts of a containment bay fire include:

- fire spread likely 200m into high risk forested areas adjacent to the facility, specifically in the unpreventable uphill, upwind direction;
- firefighting personnel will be required to operate with full firefighting bunker gear and behind fire stream protection within 100m of the fire event. This distance is the very edge of the stream reach of the mobile fire device identified within the application, and assumes (a) safe location and (b) access is available for meaningful fire attack to prevent fire growth and spread throughout the facility. The stated elapse time for the facility to provide this level of personnel and equipment has been provided as 6 – 8 hours. This situation would create an unmitigated discharge time of thermal radiation into the neighboring community and fire growth potential for 6 – 8 hours;
- traversing the roadway access north of the facility to and from SFU would require full firefighting bunker gear ensemble and fire stream protection; and
- areas within the facility where firefighting personnel would need to strategically and tactically position would create the high risk of personal injury by exposure to thermal radiation of up to 20 kWm^{-2} – double the heat impact of a tolerable and maximum 3 minute exposure.

Figure 11-5

According to the Burnaby Fire Department, the SO₂ lethality of a containment bay fire includes the following impacts:

- impact at 100% fatality into community areas and the SFU access roads adjacent to the facility;
- impact at 50% fatality at 300m into the medium density residential area;
- impact at 50% fatality at 10m into the SFU building campus area; and
- impact at 1% fatality at 600m into the medium density residential area.

Figure 11-7

According to the Burnaby Fire Department, the thermal radiation lethality of a boilover event includes the following response:

- requires full firefighting bunker gear ensemble and fire stream protection 350m into the medium density residential area; and
- a no entry zone 150m into the medium density residential area.

IR No. 3.5 – ALARP

Trans Mountain has underrepresented the risk of the Burnaby Terminal by only considering risks that would result in immediate human fatality. This is an inappropriate risk assessment methodology. As a result, Trans Mountain has not addressed some risks or mitigated those risks to ALARP.

In response to IR 3.5, Trans Mountain notes that it “has included the ALARP principle in the approach by including all reasonably practicable design changes intended to reduce risk”. However, Trans Mountain then goes on to acknowledge some of the changes that were not reasonably practicable due to the physical constraints of the property and other factors, including:

- 1) The ability to move Westridge Marine Terminal destined design volumes through Burnaby Terminal while maintaining appropriate segregation levels was materially compromised. Throughput and segregation capabilities are both reduced when the number of tanks and their capacities are reduced.
- 2) Adding mitigation measures, such as greater secondary containment capacities relative to tank capacities, could not be practically achieved due to physical constraints, such as available area (complicated by terrain considerations). In considering the physical layout, there is a fundamental trade-off between adding secondary containment capacity to reduce the risks associated with spills and reducing secondary containment surface areas to reduce the risks associated with fires. Increasing the height of secondary containment berms, to increase capacity without increasing surface area, is also problematic due to space constraints (berms become wider as they become higher) and seismic stability.
- 3) Adding mitigation measures could not be practically achieved due to limitations in the application of systems, such as additional fire-suppression, which is constrained by water supply, storage, and pumping system capacity, foam distribution system complexity, and foam application technology.

Trans Mountain does not provide evidence as to why the above measures are reasonably impracticable, but merely makes the bald assertion that such mitigation measures are not available without any evidence.

Trans Mountain does not put forward any evidence of alternate tank configurations that were considered in order to further reduce risk and allow for the safe deployment of firefighting personnel. Further, Trans Mountain does not justify why reducing the storage capacity at the Burnaby Terminal was not considered as a means to reduce risk and to allow for, for example, further secondary containment capacity. The terrain and physical constraints of the Burnaby Terminal are not matters that should be used to justify the failure to implement mitigation measures in circumstances where Trans Mountain did not put forward alternative locations for the terminal – if mitigation measures are not possible within the confines of the site then Trans Mountain should be made to consider reducing tank capacity to accommodate those measures.

The sole reliance on fixed firefighting systems as opposed to the use of trained firefighting personnel and mobile equipment to augment fixed systems is unreasonable and impracticable. According to the Burnaby Fire Department, equipment system options exist and facility areas are present on site to support the addition of further:

- access roadways to allow for the safe deployment of firefighting personnel and equipment;
- fire suppression equipment (fixed or mobile);
- water supply reservoirs;
- higher capacity pumps;
- higher capacity proportioners;
- higher capacity fire water main distribution;
- higher capacity discharge systems; and
- higher capacity application devices to further manage the risks.