Enbridge Northern Gateway Pipelines Inc.
Enbridge Northern Gateway Project

Information Request No. 2

2.1. Overview and General Information

Reference:

i) Volume 1, Overview and General Information, Section 1.3 Project Benefits, (Page 1-3 and continued in 1.4 and 1.5)

Preamble:

In the application, the following are listed as benefits of the project:

- Increased prices for Canadian oil would result in annual producer revenues increasing by $2.39 billion in the first full year of operations to over $4.47 billion by 2025.
- Over a 30-year operating period, Canadian gross domestic product (GDP) would increase by $270 billion.
- Federal and Provincial governments could collect an additional $81 billion in revenue.
- Government Revenue from pipeline operations will exceed $85 million per year
- Canadian Oil industry would benefit by $28 billion over the Project's first 10 years of operations.
- Taxes paid during construction are estimated to exceed $913 million.

Request:

a) Please provide a listing of the key elements for each sector (industry, federal government, and provincial governments) which will result in the benefits listed above.
b) With regard to the figures listed above, please provide the detailed worksheets for each figure by listing how this dollar amount was reached. For example what is the break down elements of the $81 billion in revenue, and what is the distribution between the federal and provincial governments?
c) Some of the elements did not specify if the figures would be annual or over the whole duration of the project life, for example taxes paid during construction are estimated to exceed $913 million. Please provide clarification around the timing of monetary benefits.

2.2 Impacts to Existing and Future Infrastructure

Reference:

i) Volume 3A – Engineering, Construction and Operations

Preamble:

The proposed pipeline corridor will cross several provincial highways, secondary roads, forest service roads and other utilities. The province values its road infrastructure as this is a key provincial asset. As it is difficult to predict where future developments may occur it is critical that the depth of the pipe does not create an economic barrier to future developments along the corridor. The province wishes to better understand the implications of designing new crossing of the pipeline corridor and has an interest in ensuring that any planned crossings will meet existing and future infrastructure needs.

Where no crossing is presently planned, it is understood that the pipelines will generally be buried at a minimum depth of 90 cm. It is further understood that road crossing will require a minimum depth of 120 cm. As a consequence, any future road construction over the right of way will require one of the following: that the two pipelines be dropped to an appropriate depth, a ramp of earth or bridge be constructed over the two pipelines to achieve depth of coverage or a concrete pad be laid over the pipes to meet the protective requirements.

Request:

a) For future road crossing please provide more information on the [process envisioned] including notification procedures, standards, and clarification of who will bear the specific costs associated with the crossings.
b) How does the proponent plan to address the need to register existing and future roads within the pipeline right-a-way as defined under the *Transportation Act* and registration of these roads under the *Land Title Act*?
c) The Utility Policy Manual requires pipelines to cross all Highway infrastructure (including numbered routes, side roads and unconstructed right of way) at 90% degrees. A review of the submitted topographic mapping shows the proposed pipelines to be crossing highway right of way at angles that do not meet the 90% degree requirement, i.e., areas surrounding Fort St James and Burns Lake. Would the Proponent be prepared to alter its plan in order to conform with this policy?
   BC Ministry of Transportation and Highways Utility Policy Manual
   http://www.th.gov.bc.ca/permits/Utility%20Permit%20Manual.pdf
d) Please identify when the proponent can share any information related to possible impacts to highway's and other road infrastructure, such as culverts and ditches, as a result of Pipeline crossing?

e) Permanent pole lines for pump stations and temporary pole lines for camps and staging areas will be required for the proposed project. Where will these lines be located in relation to any provincial road infrastructure?

2.3 Public Consultation

Reference:

i) Volume 4, Public Consultation & Volume 7 A – Construction Environmental Protection & Management Plan

Preamble:

Volume 4 identifies the stakeholders, First Nations and interested parties that may be affected by the proposed project. This includes a description of the engagement process with 525 British Columbia Land Owners and 76 Occupants. The province values public engagement and has an interest in ensuring that an accurate listing of the existing rights or authorizations along the route is known. This generally includes provincial authorizations in the following subject matters: Lands, Forests, Range, Agriculture, Trappers, Guides, Road Users, Mines, Clean Energy, Commercial Recreation, etc. Provincial authorizations are very dynamic and given the time lag between the issuance of a certificate, final route changes and the start of construction there will be a need for a final Provincial review and status check.

Request:

a) Given the number of impacted Land Owners and Occupants the province would like more information on how disputes between the proponent and the parties involved could be resolved. Please provide a description of the conflict resolution process available to land holders and holders of provincial authorizations and any dispute mechanisms that are available. This should also address the unintended circumstances such as Land Owner or Occupant trespass during construction or operations.
b) With regard to any specific commitments made to Land Owners or Occupants (holders of provincial authorizations), please explain how such commitments will be tracked, implemented, and reported.
c) The Province requests a detailed plan from the Proponent concerning engagement and consultations with relevant provincial ministries with respect to the construction and operation of the pipeline.

2.4 Public Consultation – Post Application

Reference:

i) Volume 4: Public Consultation, Section 5: Post-Application Consultation Activities

Preamble:

It is cited in the Application that the Proponent will continue consultation activities through all phases until the project is completed.

Request:

a) Please provide a summary of information related to consultation activities with forest industry user groups. This should include the forest licence holders that will be affected by the project.

2.5 Volume 6C - Regional Social and Economic Effects

Reference:

i) Update to Sec. 52, Volume 6C, Environmental and Socio-economic Assessment, Section 4.4, Table 4.4-11 Annual Project Operating Expenditures (Page 4.4-52)

Preamble:

Table 4.4-11 provides Typical Yearly Expenditures for Operations and Maintenance, and Taxes at the Alberta, British Columbia and Federal levels. Annual expenditures for power in BC are estimated at $25.4 million; with expenditures for property taxes in BC being estimated at $28.5 million. There is a note in the Table for each value briefly explaining how these have been estimated.

Request:

a) With regard to expenditures for power in BC and Alberta, please provide their individual total power requirements, the expected rate classification, and the rates or prices anticipated to be in effect.
b) With regard to expenditures for property taxes in BC, please provide the detailed worksheets or estimating technique used to calculate the taxes. This should include, for example, property values, anticipated tax rates, and a description of the land area expected to be subject to taxes (whether it is width of right of way or other corridor width, etc.).

2.6 Employment

Reference:

New Material Volume 6C: Environmental and Socio-economic Assessment (ESA) – Human Environment Section 4.4: Regional Social and Economic Effects, (Page 4.4-129 – Executive Summary)

Preamble:

The net economic benefit to the province for increased employment generated by the proposed project's construction or continuing operations, whether measured by local area, region, province, or total project, depend upon the employment being incremental – that is, it is not just drawing resources from other projects. This will happen when new jobs are filled by unemployed resources. The three regions of the proposed project vary dramatically – both in the availability of skills that are required by the proposed project, and in the levels of current and projected employees.

The current (September 2011) regional labour market statistics are:

- North Coast and Nechako development region: employment is 44,800; unemployment rate is 8.6% (highest among all regions); and
- Northeast development region: employment is 35,800; unemployment rate is 4.3% (lowest among all regions).

(Source: Labour Force Survey http://www.bcjobtrendtracker.ca

Northeast BC

Construction in Northeast BC will consist of two pipeline spreads. One contractor will construct the BC portion of Spread 5 starting in winter 2015–2016, and a second contractor will construct Spread 6 during the following summer (2016). A peak workforce of about 225 people will be required in Q1, 2016 for Spread 5, and a second peak of 820 people will be required in Q3, 2016 for Spread 6 and the associated pump station. Regional residents will account for 27% of the total on-site construction workforce in this region. This means that, during the peak quarter of construction, there may be 600 workers from other parts of BC and Alberta in the region.

Central BC

Construction of the five pipeline spreads in Central BC will collectively require a large construction workforce, most of whom will be employed during four consecutive construction seasons. Four of the five spreads will be built sequentially by one contractor using a crew that will be housed in construction camps. The number of workers directly employed on-site for these spreads will vary from quarter to quarter but will peak at more than 1,050 people in Q3, 2015.

Regional residents are expected to account for 28% of the total workforce in Central BC. This means that an average of 630 workers from other parts of BC and Alberta will be employed in the region over a two-year period, although greater numbers of workers

from outside the region will be employed in Q1, 2015 (750 workers), Q3 and Q4, 2014 (940 to 960 workers), Q1, 2016 (610 workers) and Q3, 2016 (600 workers).

Coastal BC
Coastal BC will experience a noticeable short-term population increase during construction. Construction in the region will occur over four years and will provide about 12 quarters of continuous employment for at least 300 people, with another 100 people being continuously employed for nine of those 12 quarters. Regional residents are expected to account for 30% of labour requirements in this region. Therefore, an average of 230 workers from outside the region will have to be brought in for 10 of the 12 quarters, starting in Q4, 2013, with an extra 535 workers from outside the region required in Q2 and Q3, 2016 for construction of Spread 12."

Request:

a) With regard to employment of regional residents in the various stages of pipeline construction in the three regions in BC:
   i) Please provide descriptions of the types of skilled and unskilled trades that will make up the 70% + of employees from outside the region; and
   ii) Please provide a detailed assessment of the potential [proponents intentions?] to provide training to local residents, including training measures the Proponent intends to introduce to improve workforce participation by First Nations in the central and coastal regions where they represent the majority of the population and the unemployed.

2.7 Pipeline Corridors

Reference:

i) Volume 3 A – Engineering, Construction and Operations, section 2.3

Preamble:

Volume 3A provides a description of the route and the various alternatives explored. The western route from the northeast BC border to near Houston proposes to establish a new utility corridor where the Proponent will be the primary utility using the corridor. The Proponent will share a corridor with Pacific Trails Natural Gas Pipeline from Buck Flats to Kitimat. Pacific Trails Natural Gas proposes to construct their pipeline from Kitimat to Summit Lake starting in 2012 and will could be in production by the time the Proponent would be ready to start construction. This should present a number of opportunities and challenges.

Request:

a) With regard to the pipeline route in BC, provide a rationale as to why the use of existing utility corridors was not considered as a selection criteria in the report.

b) Given the shared portion of the corridor with Pacific Trails Pipeline please provide further information on efforts to collaborate on routing, construction and ongoing access management.

2.8. Engineering Construction and Operations

Reference:

Volume 3, Engineering, Construction and Operations, Section 1.4 Regulations, Codes and Standards, (Page 1-2)

Preamble:

As the Project falls under the Jurisdiction of the NEB, it will be designed, constructed and operated to comply with the latest NEB regulations, including the Onshore Pipeline Regulations, 1999 (OPR-99), which incorporate, by reference, the Canadian Standards Association (CSA Z662-07, Oil and Gas Pipelines Systems. These standards in turn reference other standards and publications, which will be followed as appropriate in the design. The pipelines and facilities will be designed and built in accordance with Enbridge's Engineering Standards and Construction Specifications.

Request:

a) With regard to CSA Z662-07 mentioned above, the province notes that the Federal government in Information Request 1, noted that the new edition of CSA Z662-11 is in effect. For such, the province would also requests that the CSA Z662-11 replace CSA Z662-07.
b) With regard to "the pipelines and facilities will be designed and built in accordance with Enbridge's Engineering Standards and Construction Specifications", mentioned above the following sentence is requested to follow after:
the pipelines and facilities will be designed and built in accordance with Enbridge's Engineering Standards and Construction Specifications *which comply to the latest versions of NEB regulations, including the Onshore Pipeline Regulations, 1999 (OPR-99), which incorporate, by reference, the Canadian Standards Association (CSA Z662-11), Oil and Gas Pipelines Systems including all amendments for such references.*

2.9 Engineering, Construction and Operations – Geotechnical Conditions

Reference:

i) Volume 3, Engineering, Construction and Operations, section 3, Table 3-2, Page 3-3

Preamble:

Volume 3, Section 3, provides an overview of geotechnical conditions. Table 3-2 provides general comments on primary geotechnical conditions and mitigation strategies.

Given the geology and geomorphology of the route in BC is complex and there is potential for destructive landslides."

Request:

a) Please confirm the current seismic standards used for design of the pipeline.
b) Please indicted, based on hazard mapping completed to date, how the proponent intends to avoid natural hazards, or minimize their effect on the proposed pipeline.
c) Please provide all hazard mapping performed to date.

2.10 Acid Rock Drainage and Metal Leaching Field Investigation

Reference:

i) Volume 3, Report E-1-1 – Acid Rock Drainage and Metal Leaching Field Investigation

Preamble:

Section 14.2.2 of this document recommends that a percent sulphide (%S) cut-off should not be used as the only means of assessing acid rock drainage (ARD) potential unless the minimum neutralizing potential (NP) value is known. Even low levels of sulphide can lead to ARD if the NP is insufficient to neutralize the resulting acid. This section is significant when considering the Red Rose formation where both the NP and S% values of the unit have been screened [by the proponent?] as not acid generating due to the low sulphide values.

The screening criteria to determine ARD came from the 1997 Price publication, referenced below. Price has recently published a new document in December 2009.

Sampling only rock outcrops which show visible sulphides (section 4.2) may be inaccurate. There are examples of units that have generated acid where the sulphides were not visible with a hand lens. Kinetic testing will provide the requisite data to ascertain the potential for neutral drainage metal leaching (ML) and potentially acid generating (PAG) units.

Request:

a) Are the changes or updates in the 2009 Price document being incorporated into the conclusions in the referenced investigation? Explain how the screening criteria for ARD prediction may change the conclusions of which rock units are potentially acid generating.
b) How comfortable is AMEC with the accessibility to rock units specifically within the coast mountains? Please describe any additional work that is planned in this area to determine ARD classification given the lack of access to some rock units.
c) Have any kinetic tests been commenced on materials identified as PAG? If so, please provide the results of these tests. If not, why not?
d) Has a hydrogeology evaluation been completed for the areas identified as having PAG issues? If so, please provide the evaluation.
e) Will pH level of surface water samples be done to confirm background levels?

Cited References:

Price W (2009) Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials. MEND Report 1.20.1.

Preamble:

The statement in section 2.1, 'neutral pH metal leaching is generally only a concern if discharge is into a sensitive resource and/or with little dilution' is true but may be optimistic. If there are sensitive receptors in an area identified in a possible metal leaching (ML) area, then kinetic testing should be completed to verify the ML issue.

Limestone Lined Ditches: In section 2.2.1 the description of the BC Ministry of Transportation (MoT) history at Pennask Creek is true; however, it should be clarified that the limestone lined ditches have not been a successful long-term mitigation option. It was concluded that the mitigation measure employed at the site was inappropriate for the site conditions and required frequent monitoring and maintenance.

The management guidelines for acid rock drainage (ARD) came from the 1998 Price publication. However Price has recently published a new document in December 2009.

Encapsulation/Covers: The BC MoT experience with encapsulated PAG rock (at VIHP) is that it is a mitigation option that can have significant long-term monitoring and maintenance requirements. The use of shotcrete as a cover on exposed PAG rock would also require frequent maintenance.

Blending: Table 9-1 suggests blending of limestone sand/gravel with excavated PAG rock and emplacing mixture as trench backfill is a mitigation option. This

would require monitoring and possible maintenance. If the NP of the limestone is utilized before the AP is depleted then the problem is concentrated within the trench.

The BC MoT experience at its longest ARD site (at Pennask Creek) is that blending limestone with the acid generating rock to neutralize low pH drainage is a short-term option which requires high monitoring and maintenance.

In section 4.1 it is stated that uncertainties and complications exist when extrapolating surface grab samples. This would suggest the further need for further testing.

Request:

a) Please comment on the reliability of sulphide content through visual assessment given the referenced paper by Prince, 2004.
b) Please clarify the terminology PAG with respect to classification as potentially ARD releasing?
c) Please confirm if Figure 6.1 is correct? Should it not be total sulphide <0.1% instead of total sulphur <0.1%?
d) What is the basis for the recommended blending ratio is 4:1 NP to AP (acid potential)?
e) Please provide examples of long-term success stories using blending mitigation, specifically for linear corridor applications.
f) Please provide an analysis of the long-term monitoring and maintenance requirements for each mitigation option identified in the referenced report.
g) Will additional corrosion protection be added to the pipe in areas where PAG rock is used as trench backfill? If so, please describe the proposed protection. If not, why not?
h) Please confirm whether AMEC plans to do further testing given the uncertainties and complications noted in the preamble when extrapolating from surface grab samples.

Cited References:

Price W (2009) Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials. MEND Report 1.20.1.

Price, W.A. & D. Yeager. 2004. Case Studies of ML/ARD Assessment and Mitigation: Johnny Mountain Gold Mine. MEND Report 9.1a. 67p

Reference:

i) Volume 3, Report E-3 Preliminary Geotechnical Report Proposed Kitimat Terminal

Preamble:

Landslide hazards such as rock fall and debris flows have been identified to occur in the area of the proposed Kitimat Terminal. Displacement waves from subaerial and subaqueous landslides may also occur. A recent example is provided by Brideau et al (2011) where a rock slide that entered Chehalis Lake (Lower Mainland) generated a 38m high tsunami. There is no discussion of the affects of a seismic event either on landslide generation, the engineering properties of the materials or the hazards at the terminal site which lies within an identified active seismic zone. The provided climatic data for the Kitimat area shows snow is common during the winter (section 2). Additionally, the area is described as having significant steep slopes.

Request:

a) Please provide what seismic design code or design criteria will be applied to the terminal site? What is the expected affect of a design seismic event on the foundation stability, as well as, the expected effect on natural hazards, and potential for derivative displacement waves.
b) Please confirm whether snow avalanches are a concern at the site or along the access road due to the steep slopes surrounding the area.

2.11 Geotechnical Report on Tunnels

Reference:

i) Volume 3, Report -2 Preliminary Geotechnical Reports on Proposed Coast Mountain Tunnels Route (Rev R KP 1072 to KP 1087)

Preamble:

Natural hazard conditions at the site are known to consist of steep slopes with avalanche and rock fall hazards. Large boulders on the slope and scarring on trees have been observed at portal locations indicating existing rock fall and slide hazard issues. Tunnelling is an appropriate mitigative measure; however, careful assessment of slope hazards, such as rock fall, rock slides, debris slides, debris flows, and snow avalanches must be made at portal sites.

Request:

a) Please describe how the natural hazards at the portals will be addressed.
b) Will the pipeline be buried, or above ground at the portals?

2.12 Geotechnical Report

Reference:

i) Volume 3, Report E-1 Overall Geotechnical Report on the Pipeline Rev. R
ii) NGP Responses to JRP IR No. 4, 4.3 Geohazards: Permafrost, pages 5-6
iii) NGP Responses to JRP IR No. 4, 4.6 Terrain Stability, pages 12-13

Preamble:

Landslides are complicated and generally the site parameters are not well defined or understood. Successful mitigation requires a thorough identification of the hazard and its parameters.

The historic record shows landslides within the Interior Plateau and Coast Mountains regions where runout distances have frequently been greater than the 1km corridor (section 4.2.3). Other papers (Geertsema et al. 2009 and 2011; Geertsema and Cruden 2008) suggest 1km is too narrow. [In our opinion more work should be done to characterize landslide hazard and risk, including magnitude frequency relationships, depth of scour, and travel distance, incorporating climate change scenarios.]

In section 3.2.1.3, it is stated 'a few streams in the Rocky Mountains and Coast Range may be subject to debris flows'.

In NGP Responses to JRP No. 4, page 5 the proponent responds as follows: "No significant alpine permafrost has been identified during investigations to date including on-ground work on portions of the route through the highest parts of the route through the Rocky Mountains and the Coast Mountains as well as extensive aerial reconnaissance along the route." Recent work, such as this global

X-Sense.kmz

permafrost layer ( ) based on Gruber et al. (2011a) indicates much potential alpine permafrost along the pipeline route. Many of the large, long runout, rockslides in northern BC initiated within these permafrost zones. As climate continues to warm we can expect mountain permafrost to degrade. In a keynote address at an international landslide conference, Gruber (2011b) states "while some of the effects caused by transient cryosphere systems will conform to previous knowledge and expectations, we also have to expect types of events and landslides that have not or only rarely been observed and described before". Over the expected lifetime of the pipeline, careful consideration and monitoring of alpine permafrost and its derivative movements should be made.

Permafrost does not have to be ice-rich to create stability problems. Unsaturated material can also be ice bonded, and moss cover is not required as an insulating layer. Figure 4 in Gruber (2011b) shows an example of permafrost under 3m of unvegetated rubble in northeastern BC. Not only does this example reinforce the

fact that vegetative cover is not required, it also illustrates that boreholes and/or geophysical methods may be required to confirm or reject the presence of permafrost. (Hand digging a soil pit to a depth of 3 m in angular rubble is unreasonable.) Establishing whether or not alpine permafrost is present at depth is crucial for long term hazard and risk analysis.

Much can be learned from the European permafrost/landslide researchers in this respect (Gruber et al 2007; Noetzli and Gruber 2009; Huggel et al. 2010; Ravanel et al. 2010). Slope movements that are influenced by permafrost in mountain areas include rock slides, topples and falls, as well as, flows and slides in soil and rubble. Movements in rubble as demonstrated by Wirz et al (2011), can load topples and lead to cliff collapse. Dilation of rock fractures is also common and led to a massive rock fall from the Matterhorn in Switzerland. Remote sensing, GPS, and other in-the-ground monitoring systems are useful to determine movement vectors on these slopes.

In NGP Responses to JRP IR No. 4, page 13 the proponent responds as follows: "**The sensitive layers found to date have generally been located at depths well below potential trench depths**. As noted above, areas where stability issues are found will be avoided or suitable mitigation methods will be used."

If deep sensitive layers are found – their presence well below trench depths does not diminish slope stability concerns. Indeed, deeper sensitive layers might result in larger landslides than those generated in shallower layers. Deep sensitive clays can liquefy, and if the slope geometry allows it, result in large low gradient flowslides. This happened at Khyex River between Terrace and Prince Rupert in 2003 (Schwab et al. 2004). In this case a natural gas pipeline was ruptured.

Even seemingly minor construction fill placements have triggered landslides tens of hectares in area, and millions of cubic meters in volume. The most famous of these was perhaps the Rissa landslide in Norway, captured on videotape (Gregersen 1981), but there are also two local examples. Placement of a berm along HWY 37 between Terrace and Kitimat triggered two large flowslides in 1962. These two landslides had travel angles of 1.5° and each involved more than 10 million m^3 of glaciomarine sediment (Geertsema and Cruden 2008).

A review of methods for predicting flowslide dimensions is provided by Geertsema and Schwab (1997) and by Carson and Geertsema (2002: pages 689-692). Both papers discuss approaches by Bjerrum et al. (1969), Levebvre (1996), Lebuis and Rissman (1983), Mitchell (1978), Mitchell and Markell (1984), and Viberg (1984).

Loading triggers and bank erosion triggers (especially in a climate change scenario context) need to be considered.

The pipeline will be subject to different corrosion rates in different geologic settings. Additionally lateral pressures resulting from seismic shaking or ground movement can be expected, therefore the pipe design must consider stiffness and corrosion over the design life.

LiDAR (light detection and ranging) data appears to be sparse for the corridor. Geertsema and Clague (2011) have stressed the importance of obtaining LiDAR data to recognize and characterize landslide hazard along pipeline corridors. Many subtle details, diagnostic of instability, as well as landslides themselves, can be missed during field and aerial photo analysis. Brardinoni et al. (2003) show that up to 85% of landslides escape detection with airphoto analysis.

Request:

a) Please provide hazard maps prepared to date for the corridor.
b) Please provide comment on how you will utilize the information available from technical papers on the frequency of debris flows in the coast mountains.
c) Please confirm the level of risk which has been deemed acceptable to the project.
d) Please provide an estimate of landslide return intervals (magnitude/frequency data), potential depth of scour, and potential runout distance using future climate scenarios.
e) Please provide an analysis of the effectiveness of mitigation measures, such as groundwater control, debris flow and rock fall containment structures, to reduce the consequence of the hazard to the degree expected.

f) Please describe how the presence or absence of permafrost at depth will be confirmed in areas of permafrost potential according to the provided kmz layer

(X-Sense.kmz).

g) Please propose and describe a system for monitoring movements and subsurface temperatures of high elevation rock and rubble slopes. Please comment on how the temperature driven slope destabilization processes in areas with permafrost may affect the alignment [of the pipeline?]. Have the secondary effects of climate change been considered?
h) Please use the methods of Mitchell (1978), (or similar accepted methods) to predict potential flowslide dimensions where sensitive clays exist below the pipeline corridor using dynamic and static loading triggers as well as bank erosion, bearing in mind that travel distances may be as much as 3 km (as at one of the Lakelse landslides).
i) Please confirm the design life of the pipeline for engineering purposes. Please describe how pipeline corrosion will be tracked. Please confirm whether calculations involving time take into consideration the expected level of corrosion.
j) How will the presence of the pipeline impact resources (e.g. timber harvesting, mining, etc) on the slopes adjoining the pipeline? Will the values and vulnerability of the pipeline restrict resources values on the slopes above the corridor (for fear of landslides generated from those activities?).
k) How are you dealing with hazard levels the pipeline will negatively affect on adjacent and/or dependent properties?

l) Please provide details on the proposed extent of future LiDAR, coverage you intend to collect, bearing in mind the recommendations of Geertsema and Clague (2011). Include details on how future LiDAR data could be made available to the Province of BC.

References:

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2.13 Vehicle and Equipment Crossings Associated with Access

Reference:

i) Volume 3 – Engineering, Construction and Operations, Section 6.4

Preamble:

The Proponent has not identified the types of stream crossing structures to be used to access the construction component of the project. The types of temporary structures that will be used, and their method of deployment, are also not identified. As many of these temporary structures will be in place for multiple

seasons or years, the Province wishes to understand their potential for failure, and their potential impact on fish migration and water quality.

Request:

Please provide:

a) the types of stream crossing structures to be used to access the construction component of the project;
b) which access structures intended to be permanent and which will be temporary; and
c) the specific types of temporary structures that will be used and their method of deployment.

2.14 Locations of Control Valves

Reference:

i) Volume 3 Appendix F Table F-1

Preamble:

The Proponent has identified preliminary locations of control valves for both the crude oil and condensate pipelines. The Proponent has identified several 'crossing of concern'. These were identified by using the criterion that there was risk of important resource values. The Province wishes to have a better understanding of the decision not to include valves on both the right and left banks of the identified crossings of concern.

Request:

a) Please provide the basis for the decision for including valves only on one bank of the crossings that the Proponent has identified to be of concern.
b) Please provide any studies or reports related to this decision.

2.15 Watercourse Crossing Methods of Review

Reference:

i) Volume 3 Appendix G Table G-1

Preamble:

The Proponent has identified preliminary crossing methods for several tributaries. At KP 1109.4 the Proponent has indicated an open cut method. The Proponent does not indicate a timing window of least risk for the construction of the pipeline at

this crossing. This tributary is directly linked to the Kitimat River which is an important salmonid river. The decision tree in figure G-6 does not include a link in decision making where the non-fish bearing tributary is directly linked to a fish bearing stream.

Throughout the construction section from KP 1086 to KP 1121 the pipelines parallel the Kitimat River and cross numerous direct tributaries.

Request:

Please provide:

a) information as to how the decision to use an open cut method at KP 1109.4 was made using the figure G-6, including any reports prepared by or for the Proponent;
b) information with respect to the plans, if any, the Proponent has to mitigate downstream effects on water quality and fish habitat directly linked to the crossing location at KP 1109.4 should an open cut be used outside of a window of least risk, and
c) information on mitigation of construction effects on the water quality and fish habitat of the Kitimat River and the Proponent's rationale for selecting the type of crossing for each of the tributaries crossed between KP1086 and KP 1121.

2.16 Discharge Pressures for the Crude Oil Pipeline

Reference:

i) Volume 3 Application Update December 2010, Table 4-3

Preamble:

The Proponent identifies a range of typical discharge pressures for the crude oil pipeline as 8,893-14,893 kPa and a maximum pipeline design pressure range of 8,707-16,755 kPa. Therefore, there is a possibility of a discharge pressure to exceed the design pressure.

Request:

Please provide:

a) information respecting the plans for reducing the potential for pipeline failure in the event that the discharge pressure exceeds the design pressure

2.17 Discharge Pressures for the Condensate Pipeline

Reference:

i) Volume 3 Application Update December, Table 4-6

Preamble:

The Proponent identifies a range of typical discharge pressures for the condensate pipeline as 4,072-11,604 kPa and a maximum pipeline design pressure range of 9,650-12,040 kPa. Therefore, there is a possibility of a discharge pressure to exceed the design pressure.

Request:

a) Please provide information respecting the plans for reducing the potential for pipeline failure in the event that the discharge pressure exceeds the design pressure [same addition as above?].

2.18 Pipeline Operations

Reference:

i) Volume 7B Risk Assessment and Management of Spills, 2.3 Pipeline Operations

Preamble:

The Proponent has identified the implementation of a Remote Leak Detection System. The Province understands that this system, as proposed, would detect a release of +/- 5% of the volume. At 500,000 BPD, 5% equates to 25,000 BPD.

Request:

a) Is the Province's understanding correct?
b) Is the Proponent prepared to increase the sensitivity of the system such that it would detect a smaller percentage of the volume?
c) If yes, what does the Proponent propose as that percentage?
d) If not, why not?

2.19 General Oil Spill Response Plan (GOSRP), JRP receipt A1Y3Y8

Reference:

i) GOSRP, March 2011, 1.1.3
ii) GOSRP, March 2011, 4.7.1

iii) GOSRP, March 2011, 7.2.1
iv) GOSRP, March 2011, glossary page X
v) GOSRP, March 2011, page 1-9
vi) GOSRP, March 2011, page 1-10

Preamble:

In section 1.1.3, the Proponent does not refer to the recovery and rehabilitation of injured fish/wildlife. The Proponent also does not identify provincial permits and authorizations required for the handling and transport of injured fish and wildlife. Other authorizations are noted.

In section 4.7.1, the Proponent states that within the Watercourse Tactics Plan, control points will be identified for each key watercourse in the pipeline OSRP's. The Proponent does not set out criteria for determining the control points in each key watercourse or the specific criteria for identifying what a key watercourse is.

In section 7.2.1, the Proponent identifies strategies for containment and recovery of hydrocarbon release as it applies to surface movement and "slicks". The Proponent does not identify methods for recovery and containment of hydrocarbons that would not be present on the surface, but could be present in the sub-surface. The proposed product that the Proponent will transport is heavy crude which can also be neutrally buoyant. When combined with suspended sediments (Volume 7B Risk Assessment and Management of Spills – Section 4 Sedimentation) the product can travel sub surface and sink.

Request:

Please provide:

a) information on the plans the Proponent has for the recovery and rehabilitation of injured fish/wildlife and the necessary permits and authorizations needed for handling and transport of injured fish and wildlife;
b) the steps and criteria the Proponent will use to identify control point sites and the preparation of an appropriate preparedness plan including field verification and testing of those control points;
c) information on the criteria used by the Proponent to identify and define key watercourses; and
d) additional information on mitigating the effects and proposed containment, recovery and clean-up of the product that is present in the sub-surface if the product is no longer buoyant.
e) Regarding reference (iv) please respond to the following:
   (i) will the Spill Management Team (SMT) be employed fulltime?
   (ii) what training will its members receive?
   (iii) what will be the SPTs availability for spill response? [e.g. based on the standard corporate/agency model of using and training their existing management/technical staff to be available for exercises and incidents].

f) Regarding the reference in the Glossary to “Tiered Response”, please explain what this will entail. Specifically, what equipment will be involved, and what [performance ratings, availability, agreement terms etc that can be fully assessed, transparent and tested in Canadian waters.]
g) Regarding reference (v), with regards to a large oil spill, please provide information as to how the Proponent would establish an oil spill workforce for on-water response, shoreline cleanup, oiled wildlife rescue/rehab and oily waste management, including requesting, registering, screening, hiring, assigning, training, equipping, supervising, evaluating, and demobilizing that workforce.
h) Please provide the following plans:
   i) Salvage Response Plan;
   ii) Places of Refuge Plan;
   iii) Wildlife Response Plan; and
   iv) Shoreline Workforce Cleanup Plan.

2.20 Insurance

Reference:

i) Enbridge Northern Gateway Project, General Oil Spill Response Plan Section 3: Response Organization, B21-2 - General Oil Spill Response Plan - Enbridge Northern Gateway (March 2011) - A1Y3Y8, 03/31/2011, 3.3 Incident Command System p. 39/118
ii) Northern Gateway Pipelines Inc., TERMPOL STUDY NO. 3.15: General Risk Analysis and Intended Methods of Reducing Risk, Section 7: Incident Prevention and Response P 40/388

Preamble:

Insurance related to payment for the cost of clean-up of oil spills is covered in some detail in terms of responsibility and the value of insurance in the TERMPOL STUDY NO. 35 for marine spills. The discussion for insurance coverage for land-based spills, found in the discussion of oil spill response plans mentions insurance, but no details are provided of scope, liability and total value of insurance funds available.

Request:

a) With regard to insurance coverage for oil spills:
   - on the pipeline right of way;
   - that affect properties outside of the pipeline right of way; and
   - for third party claimants, say for loss of access or business losses.

   Please provide details on the proposed insurance value or bonding and claim procedures.

2.21 Tunnel Construction – Waste Disposal

i) Volume 7A, Construction Environmental Protection and Management Plan, A.3.13.6 Waste Disposal page A-88 and A.3.13.1 Waste Disposal page A-86

Preamble:

(A-3.13.6) Constructing the two tunnels is estimated to generate about 400,000 m^3 of waste rock (including a 30% bulking factor). **(A.3.13.1)** Each Tunnel will have a finished width of approximately 5.5 m, and will result in an estimated 400,000 m^3 of waste rock being generated.

Request:

a) Is it 400,000 m^3 for both tunnels **(A-3.13.6)** or 400,000 m^3 for each tunnel as per **(A.3.13.1)?**
b) More information about the final expected materials gradation and state
c) What are the proponent's plans for disposal of this material?
d) Please provide the proponent's plan for waste rock disposal, specifying the final locations and the disposal methodology for the materials.

2.22 Permitting and Agency Consultation

Reference:

i) Volume 7A – Construction Environmental Protection & Management Plan

Preamble:

Volume 7A provides a description of proposed management plans and potential regulatory requirements of affected agencies. The Province would like clarification regarding the potential highway crossing methods and review timelines.

Volume 7A indicates that plans, such as but not limited to: the Access Management Plan, Traffic Control Plan, Erosion and Sediment Control Plan, Blasting Management Plan and Weed Management Plan, and numerous other plans will be submitted to the Province for review sixty days prior to commencement of construction.

Request:

a) What methods of construction is the Proponent proposing to use where the pipelines cross through major and minor highways? What are the Proponent's proposed design criteria for a typical crossing?
b) What will be the impact on the proposed construction schedule if the sixty days referenced does not provide adequate time to consider the issuance of necessary provincial authorizations?

2.23 Hypothetical Spills Along the Pipelines

Reference:

i) Volume 7B: Risk Assessment and Management of Spills, Section 9

Preamble:

The Proponent has provided four examples of spill scenarios. All of the spill scenarios identified were modeled during the same "optimal period". The scenarios do not include components that should be considered as part of planning and mitigation. Examples of this are: large organic debris moving through the system at freshets; the likelihood of a highly turbid watercourse transporting and mixing with the product making it neutrally or negatively buoyant; and the effect of local climate and weather events. This list is not intended to be exhaustive of all potential components that could be included in a spill scenario.

Similarly, the four examples do not include a large, higher energy system, such as the Morice River that is habitat to both resident fishes and anadromous species. The range of flows on that river ($20m^3$- $250m^3$ at the WSC site of the Morice example) is different from that considered in the scenarios. It is not clear in the project description that the proponent has considered in detail (to the level of modeling) the effects of a large spill on a system such as the Morice and explained proposed measures that would be required to adequately mitigate such an event.

Request:

Please provide:

a) a revision of each of the four spill scenarios in order to represent the conditions present outside of an "optimal period" by including, at a minimum, the components set out in the preamble; and
b) expansion of the "hypothetical spills modelling" to include a wider array of the types of systems the project may affect;
c) more detailed consideration of mitigative and restorative efforts that could be expected by the proponent in terms of impacts to anadromous fish and their habitat; and
d) a spill scenario that represents a range of releases under an array of snow and ice levels that could be expected across the terrain that the project may affect.
d) a spill scenario [full release of both pipes] in which the spill occurs in a large, high energy river, having a flow rate of between $20m^3$ and- $250m^3$ including measures proposed to mitigate the effects of the spill.

2.24 Flow of the Crude Product

Reference:

i) Volume 7B: Risk Assessment and Management of Spills

Preamble:

The Proponent asserts that the crude oil product does not “flow” at low temperatures and that a release would be confined to the origin of the release. However, the temperature of the product as it is transported is much higher than the ambient temperature of the air due to pressure, friction and insulation values of the ground and ground cover.

Request:

Please provide:

a) a hydrocarbon release scenario and information associated with a hydrocarbon release under low temperatures using the higher than ambient temperatures of the product to model impact, distribution, and clean-up that would not be confined to the origin of the release; and
b) a hydrocarbon release scenario and information associated with a hydrocarbon release and clean-up where the release is carried by a stream covered with ice.

2.25 Contingency Plans and Environmental Management Plans

Reference:

i) Volume 7A: Construction Environmental Protection and Management Plan, Appendix A
ii) Section 52 Application Volume 7A – Construction Environmental Protection and Management Plan
iii) Appendix A: Contingency Plan and Environmental Management Plan Pages A-20 “Response Action
iv) Appendix A: Contingency Plan and Environmental Management Plan A-2.1.6 Response to Spills in Wetlands Pages A24

Preamble:

Reference i and ii - the Proponent has outlined mitigative measures associated with Key Identified Winter Range for mountain goats [in areas that have been mapped]. Due to resource constraints, not all of the mountain goat winter range has been spatially available or mapped.

The proposed project will be crossing or in close proximity to both Caribou and Mountain Goat critical seasonal periods including calving and kidding areas and important natal habitat.

Reference iii and iv - Application Volume 7A – The Construction Environmental Protection and Management Plan provided by the Proponent, dated May 2010, outlines the Proponent's approach to environmental protection and management measures that will be implemented during the construction of the pipeline, Kitimat Terminal and associated facilities.

Request:

Please provide:

a) additional information on the Proponent's intention to [map?] currently unmapped winter range in proximity to the local effects zone of the proposed pipeline corridor;
b) information on the Proponents intention to adhere to mitigative measures for both the mapped and unmapped winter range areas; and
c) additional information on mitigating disturbance effects on ungulates during critical seasonal periods outside of winter range occupation.
d) Regarding reference (iii), the "Response" states - "the contractor in consultation with Northern Gateway will direct the response effort". With respect to spills of hazardous materials, please confirm that the Proponent will be responsible for the actions of all contractors/subcontractors/ consultants employed by the Proponent during the construction phase of the project.
e) Regarding Reference (iv), it is stated that "Northern Gateway will consult with local government agencies as necessary to determine whether natural recovery is acceptable in the jurisdiction". Please provide clarification on what is meant by local government agencies.

2.26 Pipeline Local Climate Change

Reference:

i) Northern Gateway Pipelines Application

Preamble:

Pipelines can effectively increase the temperature of the ground directly adjacent to the pipeline.

Request:

Please provide:

a) information that outlines the effect of increased temperature on wetlands, local ground cover, vegetation change, and seasonal availability of vegetation; and
b) plans for mitigation measures associated with wildlife attraction due to changes in local conditions associated with the pipeline.

2.27 Incremental Commitments

Reference:

i) Northern Gateway Pipelines Application

Preamble:

It is cited in several locations in the Application that the Proponent will be increasing the requirements for shipping companies to use higher than standard shipping practices when navigating the waters in proximity to Douglas Channel and inland waters (tethered tugs, on board pilots, speed restrictions, whale watchers, etc.).

Request:

Please provide:

a) information on how the Proponent will monitor and enforce the adherence to this incremental standard,
b) information on the action the Proponent will take in the event of non-compliance to the incremental standards; and
c) Identify which shipping standards referred to in the Application are the current legal standards and which are incremental to them.

2.28 Environmental and Socio-Economic Assessment – Pipelines and Tank Terminal

Reference:

Volume 6A: Environmental and Socio-Economic Assessment – Pipelines and Tank Terminal, Section 8: Vegetation

i) Pages 8-24 – Pages 8-26: Mapping in British Columbia
ii) Page 824: Old Growth Forests

Preamble:

Regarding Reference (i): Terrestrial ecosystem mapping is indicated as the method used in BC. This mapping includes Biogeoclimatic site series estimation as a foundation for identifying ecological elements such as rare plants, rare ecosystems, wildlife habitat ratings, wetlands and other features. It is essential that ecological mapping is conducted with a resolution consistent with the accurate description of the ecological element in question. It is stated that a Level 5, 1:20:000-1:50,000, BC RISC survey intensity was used. In order for BC provincial ecologists to assess whether the probability of a rare ecosystem or any other map based ecological elements occurring in a particular map polygon is high, details concerning survey intensity are required.

Regarding Reference (ii): It is stated that Old Growth Forest areas were determined using VRI stand origin data. Different phases of BC's VRI can have varying levels of accuracy and require ground verification. Also, in BC the Non-spatial Old Growth Biodiversity Order and Government Action Regulation (GAR), under the *Forests and Range Practices Act*, are in force. In addition, government is working toward the establishment of Spatial Old Growth Management Areas (OGMA). The non-spatial and spatial landscape objectives in these documents are essential elements in maintaining the current existence of old natural forest and the recruitment potential of future natural forest.

Request:

Regarding Ref. (i):

Please provide:

a) All field data, methods and procedures associated with this mapping in BC.

Regarding Ref. (ii):

a) Has a determination been made as to whether the PDA or PEAA will impact any spatially defined OGMA or non-spatial OG recruitment area?
b) What phases of VRI/FC were used?
c) What was the level of confidence associated with stand origin data?
d) Was field validation carried out to estimate VRI data accuracy?
e) Explain how stand origin data was used to estimate Old Growth forest/structure.
f) Please provide total area (ha) of wetland ecosystems within the PEAA and REAA.

2.29 Right of Way

Reference:

i) Volume 6 A: Environmental and Social Assessment, Section 2.22: Right of Way and Section 2.23 Clearing

Preamble:

a) It is cited in the Application that the Proponent will be using existing road access to the Pipeline Right of Way during construction.
b) It is cited in the Application that the Proponent will be salvaging merchantable timber.

Request:

a) Please provide information related to the effects on Forest Road users groups during road construction and use for pipeline access.
b) Please provide:
    i) For each management unit (Timber Supply Area, Tree Farm Licence, Community Forest Agreement, & Woodlot Licence) information related to the effects on short and long-term Allowable Annual Cuts from removal of timber from land that is growing trees (Timber Harvesting Land Base) during pipeline construction and life of project.
    ii) Information related to the effects of construction on Forest Industry operations during and after pipeline construction. Specifically road delays or closures and any new measures the industry would need to use for safe operations when operating in or around the right of way.
c) The right of way is proposing to cross numerous forest cut blocks where licence holders have statutory obligations (*Forest & Range Practices Act)* to reforest the opening. Please provide information related to effects of destruction of forest plantations for the statutory obligations by pipeline construction activities along with any mitigative measures;
d) Information related to effects on Range tenures and users from pipeline construction, and;
e) Information related to the Timber Salvage Plan showing how proponent will maximise usage of timber rather than waste.

2.30 Risk Assessment and Management of Spills – Pipelines

Reference:

i) Section 52 Application Volume 7B – Risk Assessment and Management of Spills – Pipelines

ii) Section 1 Background - Page 1-1
iii) Section 3 Probability of Hydrocarbon Spills: Table 3-2 pages 3-2 and Table 3-3 pages 3-3
iv) Section 4 Properties and Weathering of Liquid Hydrocarbons: Table 4-1Physical Properties of Hydrocarbons in the Marine Environment page 4-1, Table 4-2 Chemical Properties of Liquid Hydrocarbons page 4-2 & 4-3
v) Section 5 Emergency Response Approaches and Capabilities pages 5-1
vi) Section 9.

Preamble:

Application Volume 7B – Risk Assessment and Management of Spills – Pipelines provided by the Proponent, dated May 2010, outlines the Proponent's approach to limiting the risks of accidents and malfunctions, including hydrocarbon spills from the pipeline.

The following request, regarding additional preparedness, prevention and response mitigation measures, is necessary for the BC Ministry of Environment, Environmental Emergency Program, to review the proposal.

Syncrude, according to the SLR study, has an adherence (stickiness) approximately 4 to 5 times that of Alaska Northslope Crude. Surface washing agents (Corexit) was used for the Kinder-Morgan Pipeline spill in Burnaby due to the difficulty of removing product from cobbles and rip-rap. For diluted bitumen, the condensate may drive the bitumen deep into the sediment, evaporate, and leave a very heavy residue.

Tables 9-3 and 9-4 state that Local Police and Fire Departments provide EMS [and?] security. Local Police and Fire Departments do not provide these services outside their jurisdictional boundaries in British Columbia.

The product planned to be transported is not conventional oil. The spill plans and equipment proposed are based on shipment of conventional oil.

Request:

a) Section 1 – Please specify what the Proponent considers a low, moderate, high probability spill.
b) Section 3 - Please provide the following:
    i) data for number of spills and methodology used to calculate spill return period (Reference Table 3-3);
    ii) spill release statistics for Enbridge Liquids Pipeline system for the period 1998-2010 (Reference Table 3-3);
    iii) information for pipeline spills occurring at stream crossing vs non stream crossings for the period 1998-2010 (Reference Table 3-3);
    iv) spill release information for pipelines carrying conventional oil vs non conventional oil (diluted bitumen) for the period 1990–2005; and

v) information whether non conventional oil (diluted bitumen) pipelines are more susceptible to corrosion/spill releases than conventional oil pipelines.

c) Section 4 - Please provide:
   i) the anticipated bitumen (undiluted) products proposed to be transported, including the area from which the products to be derived;
   ii) a description of the physical properties, including API, specific gravity, boiling point, solubility, viscosity, flash point, fire point, and ignition temperature of the following products (if they will be transported by the pipeline?):
      a) Bitumen product (**undiluted**), including;
         - Cold Lake Bitumen
         - Mackay River Heavy Bitumen
         - Athabasca bitumen
   iii) the bitumen (undiluted %) to condensate (%) ratio for proposed transported products;
   iv) the bitumen (undiluted %) to Syncrude synthetic oil (%) ratio for proposed transported products; and
   v) the chemical properties, including H_2S, content metals (mercury, lead, vanadium, nickel, arsenic) for the following (if they will be transported by the pipeline?):
      a) Bitumen product (**undiluted**), i.e.:
         - Cold Lake Bitumen
         - Mackay River Heavy Bitumen
         - Athabasca Bitumen
      b) Diluted bitumen, including.
         - Cold Lake Bitumen
         - Mackay River Heavy Bitumen
         - Atahbasca Bitumen
      c) Condensate
      d) Syncrude Synthetic Light Oil
d) Section 5:
   i) the spill response treatments suggested in this section address hydrocarbons that have specific gravities less than 1. Please provide Spill Response Objectives and Strategies for hydrocarbons that have specific gravities greater than 1, assuming that they are released into:
      - Freshwater (inland)
      - Marine water
   ii) Table 5-3 states the proposed location of equipment caches. What volume of spill would these equipment caches be equipped to deal with?
   iii) please provide a description of actual instances of spilled unconventional oil (for example diluted bitumen and syncrude synthetic oil) in freshwater environments and what the outcomes were regarding cleanup and remediation including what issues were encountered, fate and behaviour of diluted bitumen and the lessons learned;
   iv) one of the potential impediments to any hydrocarbon spill response and recovery operations is waste management and waste minimization. Please

provide more detail on how the Proponent plans to address these components; and

v) section 5.6 and 5.7– as part of the Proponent's Emergency Response Preparedness, please explain how the Proponent will pre identify protection of sensitive areas and what processes will be used to achieve this.

e) Section 7:

i) please describe the mitigation measures for a release into a watercourse including the use of flushing techniques for diluted bitumen.

f) Section 9:

i) 9.4.4 on page 9-20 states that 1200 to 1440 m^3 (60 – 72%) of diluted bitumen could remain in the system. How much of this product would end up as submerged product, i.e., end up on the freshwater river/lake bed or marine seabed?

ii) Re: 9.4.1 - description of Hydrocarbon Mass Balance for the Marine Terminal. pardon? is the hydrocarbon mass balance of theoretical amount of weathered diluted bitumen that would end up as submerged product on marine sea bed after:

- 72 hours
- 96 hours
- 1 week
- 1 month?

iii) Please provide a revised response plan in light of the final paragraph in the preamble above.

iv) How will the Proponent respond to a spill in freshwater/marine waters where the weathered product has a specific gravity greater than 1? What recovery techniques will the Proponent use to recover spilled product and mitigate impacts?

2.31 Risk Assessment and Management of Spills - Pipelines

Reference:

i) Volume 7B, Risk Assessment and Management of Spills - Pipelines, Section 9. Examples of hypothetical spills along the pipelines, 9.1, and (9.2 to 9.5) which covers example 1 to 4 Pages 9-1 to 9.28

Preamble:

9.1 Development of Hypothetical Examples – the following hypothetical examples and locations are provided in Volume 9.2-9.5

The hypothetical examples listed did not calculate the response time.

Request:

a) Please re-run the four hypothetical examples 9.2-9.5 to include the response time.
b) Please provide a further hypothetical example for a fire control initiated scenario which is extended to agricultural land or to mountainous forests including the following assumptions:
   i) Consequence Category (I) with its four considerations as per table 1 and shall address the probability category of at least B as per table 2 below. Table 1 and 2 are just illustrative tables:
   ii) Characteristics with a consequence category (i) (using Table 1) and probability category B (using Table 2).
   iii) Conceptual Emergency response plan is needed with response time calculated.
   iv) Additional Mitigation plan with complete procedures is needed to show how to reduce the consequences down from category (i) to minimum category (iii) and minimum probability to D, listing actions taken to do so.
   v) Potential effects on Key resources at risk including financial impact.

   Further, all hypothetical examples 9.2 to 9.5 together with the additional example to address:
   i) Health and Safety
   ii) Public Disruption
   iii) Environmental Impact
   iv) Financial Impact

Table 1. Risks Consequences Categories vs. Considerations (Ref.1)

Consequence Category	**Health and Safety**	**Public Disruption**	**Environmental Impact**	**Financial Impact**
I	**Fatalities or Serious Health Effects**	**Significant to a Large Community**	**Major/Extended Duration/Full Scale Response**	**>$Million 10 Cad**
II	Serious Injury or Moderate Health Effects	Significant Disruption to small community	Serious/Significant Resource Commitment	$Million 1-10 Cad
III	Medical Treatment or Minor Health Effects	Minor Disruption	Moderate/Limited Response of Short Duration	$Million 0.1-1 Cad
IV	Minor Impact	Minimal to no Disruption	Minor/Little or No Response Needed	<$Million 0.1 Cad

Table 2. Probabilities Categories (Ref.1)

Probability Category	Definitions*	Consequences		Probability				
A	Possibility of repeated incidents			**A**	**B**	**C**	**D**	**E**
B	Possibility of isolated incidents		**I**					
C	Possibility of occurring sometime		**II**					
D	Not Likely to occur		**III**					
E	Practically very rare to happen		**IV**					

References

1. Mahdi H. Arafat, El-Shabassy Y. Abdelghany, and El-Kadi, A. F., (2001) **"Modeling, Reliability Assessment, Rehabilitation And Optimization For Aged Industrial Plant, The Art Of Repair Under The Umbrella Of Risk Management"**, Proceedings The 29th International Conference On Computers And Industrial Engineering (ICC&IE), Montreal, Quebec, Canada 1st-3rd Nov 2001.
2. EL-Shabassy Y. Abdelghany, (2002) **"Decision Support System for Risks Management of International Construction Joint Ventures – The Art Of Tendering Overseas"**, Proceedings The 30th International Conference On Computers And Industrial Engineering (ICC&IE), Tinos Island, Greece 29thJune –2ndJuly 2002.
3. EL-Shabassy Y. Abdelghany, Eid M. S., (2003) **"Optimum Reliability Assessment For Rehabilitation Of Installations Without Disrupting Operations"**, Proceedings The 31st International Conference On Computers And Industrial Engineering (ICC&IE), San Francisco, USA 2nd-4th Feb 2003.
4. El-Shabassy Y. Abdelghany; Ezeldin S. A; (2010) **"Classification of Risks for International Construction Joint Ventures Projects"** 2010 ASCE and University of Alberta Construction Research Congress "Innovation for Reshaping Construction Practice", May 8th-11th, 2010 Banff, Alberta, Canada.

2.32 Risk Assessment and Management of Spills – Kitimat Terminal

Reference:

i) Volume 7C, Risk Assessment and Management of Spills – Kitimat Terminal, Section 5. Figure 5.3 Typical Emergency response Activities for the marine environment Page 5-10 and Section 9 Examples for Response Planning,

Example 1 and Example 2 (pages 9-5 to 9-9) and pages (9-10 to 9-14) respectively

Preamble:

The following is requested to obtain more information on the response time for each phase of the Emergency Response Plan.

Request:

a) Please provide an action plan that includes the estimated actions response time calculation for each action (considering the cumulative response time calculation) from the time that the spill occurs and is made known to Enbridge (which is the top box on the figure 5.3) to the final steps of clean up. The information is requested for only Example 1 and Example 2 using the same Examples Circumstances listed in 9.5.1 pages 9-5 and in 9.6.1 page 9-6 respectively for Examples 1 and 2 by Enbridge.
b) Please provide an estimated action response time calculation along the whole process including the cumulative total action response both Examples 1 and 2 listed. (e.g. Example 1 Medium Size Diluted Bitumen Spill and Example 2 Medium – Size Condensate Spill (pages 9-5 to 9-9) and pages (9-10 to 9-14) respectively).

   Please address the following aspects in both examples:
   1. Risk Consequence Category (II) with its four considerations as per table 1 and address the probability category of at least B as per table 2 below.
   2. Typical Emergency response plan based on Figure 5.3 is needed with response time calculated on Examples 1 and 2.
   3. Additional Mitigation plan complete procedures and preventative measures is needed to show how to reduce the consequences down from category (II) to minimum category (III) and minimum probability to D, listing actions taken to do so.
   4. Potential effects on Key resources at risk including financial impact.
   5. Both examples shall address the impact on:
      1. Health and Safety
      2. Public Disruption
      3. Environmental Impact
      4. Financial Impact

Table 1. Risks Consequences Categories vs. Considerations (Ref.1)

Consequence Category	Health and Safety	Public Disruption	Environmental Impact	Financial Impact
I	Fatalities or Serious Health Effects	Significant to a Large Community	Major/Extended Duration/Full Scale Response	>$Million 10 Cad
II	**Serious Injury or Moderate Health Effects**	**Significant Disruption to small community**	**Serious/Significant Resource Commitment**	**$Million 1-10 Cad**
III	Medical Treatment or Minor Health Effects	Minor Disruption	Moderate/Limited Response of Short Duration	$Million 0.1-1 Cad
IV	Minor Impact	Minimal to no Disruption	Minor/Little or No Response Needed	<$Million 0.1 Cad

Table 2. Probabilities Categories (Ref.1)

Probability Category	Definitions*	Consequences		Probability				
A	Possibility of repeated incidents			**A**	**B**	**C**	**D**	**E**
B	Possibility of isolated incidents		**I**					
C	Possibility of occurring sometime		**II**					
D	Not Likely to occur		**III**					
E	Practically very rare to happen		**IV**					

References:

1. Mahdi H. Arafat, El-Shabassy Y. Abdelghany, and El-Kadi, A. F., (2001) **"Modeling, Reliability Assessment, Rehabilitation And Optimization For Aged Industrial Plant, The Art Of Repair Under The Umbrella Of Risk Management"**, Proceedings The 29th International Conference On Computers And Industrial Engineering (ICC&IE), Montreal, Quebec, Canada 1st-3rd Nov 2001.


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2. EL-Shabassy Y. Abdelghany, (2002) **"Decision Support System for Risks Management of International Construction Joint Ventures – The Art Of Tendering Overseas"**, Proceedings The 30th International Conference On Computers And Industrial Engineering (ICC&IE), Tinos Island, Greece 29th June –2nd July 2002.
3. EL-Shabassy Y. Abdelghany, Eid M. S., (2003) **"Optimum Reliability Assessment For Rehabilitation Of Installations Without Disrupting Operations"**, Proceedings The 31st International Conference On Computers And Industrial Engineering (ICC&IE), San Francisco, USA 2nd-4th Feb 2003.
4. El-Shabassy Y. Abdelghany; Ezeldin S. A; (2010) **"Classification of Risks for International Construction Joint Ventures Projects"** 2010 ASCE and University of Alberta Construction Research Congress "Innovation for Reshaping Construction Practice", May 8th-11th, 2010 Banff, Alberta, Canada.

2.33 Marine Transportation - General

Reference:

i) Volume 8A Environmental and Socio-Economic Assessment – Marine Transportation, Section 1 and 4

Request:

a) Page 1-1 – bullet indicates that state of the art tug escorts will be used. Will this apply to in-bound condensate tankers as well? If no, please explain why not.
b) Are current condensate tankers coming in to Kitimat under the purview of Enbridge? If yes, are they currently being escorted by tug? If no, please explain why not?
c) Page 1-2 - bullet indicates that operational environmental limits will be identified for tanker and cargo handling at the berth. Will there be operational environment limits set for transit through internal waters to minimize the risk of incidents? Please provide what the operational limits are going to be.
d) Page 1-3 - will the Province of BC and, more specifically, the BC Ministry of Environment's Environmental Emergency Program be invited to participate in the TERMPOL review?
e) Page 4-3 - the section on vessel ownership indicates the tanker owner is responsible for safety of the tanker. Please explain the responsibility of the Proponent for any costs resulting from an incident involving a tanker including response, restoration and salvage costs for both the tanker its cargo.
f) Page 4-7 and 4-8 - information on emergency and escort towing indicates requirements for tankers. It is unclear from the information provided whether or not each tanker will carry a tow-line or only be equipped to receive a tow line. Please advise on the availability of towlines and information on whether or not helicopter deployable tow packages similar to those used in Alaska will be readily available.

g) Page 4-15 - tanker route options. Has a comparison of tanker traffic navigational (and environmental) risks been made with current tanker traffic to and from Vancouver? Can Enbridge provide a comparative analysis of the navigational and environmental risks between the proposed Kitimat routes and the existing Vancouver route (to the western entrance of Juan de Fuca Strait)?
h) Page 4-70 and 4-71 - oil spill response plans. Why will the oil spill response plan not be considered through the current application? What is the basis for the assertion that a 250 m^3 response capacity is a suitable planning standard for a stand-alone capability? How does this compares to the Alaska pipeline terminals stand-alone capacity?

2.34 Marine Transportation - Spills

Reference:

i) Volume 8C Risk Assessment and Management of Spills – Marine Transportation, Section 2, 5, and 8

Request:

a) Page 2-4, section 2.3 - the applicable acts and regulations are listed but there is no mention of relevant provincial legislation (i.e., *Environmental Management Act*, *Wildlife Act*, *Spill Reporting Regulation*, *Spill Cost Recovery Regulation*). Please advise as to why relevant provincial legislation has been omitted from this section. b) Page 5-1 – the Proponent indicates in section 5 that it will provide "extended responsibility" to cover the northern and southern approaches. Please provide a more fulsome description of what this actually means and the full extent of this commitment. Why is the Proponent only willing to provide this commitment to the north and south approaches and not the entire coastline of British Columbia?
c) Page 5-1 – the Proponent commits to a 6 to 12 hour response time in the CCAA in this section. Please provide how this compares to Alaska's response time commitment in Valdez and Prince William Sound. Please explain why this is a suitable response time frame given the potential impacts from an incident and the wind and tidal effects that would spread any released hydrocarbons.
d) Page 5-3- the Proponent indicates that they will provide NEB and Transport Canada with project specific emergency response plans for their review. Will the Proponent be providing these to the BC Ministry of Environment as the lead provincial agency for spills to review?
e) Page 5-7 – the Proponent outlines the role of the BC Ministry of Environment in this section. A provincial Incident Commander would be appointed in the event of a significant spill (or potential spill) to enter into Unified Command. Does Enbridge foresee any issues with the establishment of a Unified Command with the province?
f) Page 5-9- the Proponent outlines spill response objectives and indicates the use of volunteers. What occupational health and safety issues arise with respect to the use of volunteers?

g) Page 8-3 – The Proponent indicates a number of potential impacts to terrestrial wildlife in table 8-1. Why does the table omit the potential impact to terrestrial wildlife from scavenging of oiled wildlife?

2.35 Marine Transportation – General Questions

Reference:

i) Volume 8C, Risk Assessment and Management of Spills – Marine Transportation

Preamble:

Information is requested in order for the Ministry of Environment to review on behalf of the Province of BC.

In order to ensure appropriate response to marine and terrestrial spills the province of BC is planning to begin industry and stakeholder consultations on the establishment of:

- an industry funding model (which would establish fees for those companies transporting, using and storing significant amounts of hazardous materials) to support the province's spill response program by providing funding for additional program staff, establish a provincial spill response fund, and provide funding for prevention and preparedness activities; and
- a Terrestrial Spill Cooperative (which would require those companies transporting, using and storing significant amounts of hazardous materials) to belong to a provincially regulated spill response cooperative (akin to Western Canada Marine Response Corporation).

Request:

Please provide information on the following:

a) What are Proponent's plans for a rapidly deployable chemical dispersant capability?
b) What are the Proponent's plans for a rapidly deployable in-situ burning capability?
c) How does the Proponent's 32,000 ton planning scenario compare to the Alyeska pipeline's marine and terrestrial planning standards?
d) What would the Proponent's issues and concerns be with the implementation of these mechanisms that would help protect the economy, environment and social fabric from spills in the province?

2.36.Risk Assessment and Management of Spills – Marine Transportation Reference:

i) Volume 8C, Risk Assessment and Management of Spills – Marine Transportation, Section 2. Operational measures to prevent tanker-based hydrocarbon spills Page 2-

Preamble:

During the operational life of the project, incidents could occur because of accidents or malfunctions (e.g. ship grounding, ship collision), human error, vandalism, third party damage or natural events such as severe weather. The potential for, and effects of, spills would be reduced through measures such as implementing modern tanker specifications, tanker operational plans and emergency response plans. Detailed versions of the tanker specifications and operational plans will be prepared before the commissioning and operations of the marine terminal, and for tankers calling on the Kitimat terminal.

Request:

a) In the light of preamble Listed above, the following is requested:
   i) An implemented Action plan for a **hypothetical risk management example of ship grounding or ship collision** very close to the kitimat terminal which results in a major Oil spill, the example shall address the following aspects:
      1) The estimated actions response time calculation for each action (considering cumulative response time calculation) from time Spill Occurs and known to Enbridge to the following two phases
         a. Controlling the spill and re-opening the approaches again
         b. Reduction of the spill to its minimum limit

         Note: The estimated action response time calculation is needed along the whole process including the cumulative total action response for the example chosen ship grounding or ship collision. The hypothetical example shall address Consequence Category (II) with its four considerations as per table 1 and shall address the probability category of at least B as per table 2 below.
      2) Characteristics with a consequence category (II) (using Table 1) and probability category B (using Table 2).
      3) Conceptual Emergency response plan is needed with response time calculated.
      4) Additional Mitigation plan including complete procedures and preventative measures is needed to show how to reduce the consequences down from category (II) to minimum category (III) and minimum probability to D, listing actions taken to do so.
      5) Potential effects on Key resources at risk including financial impact.

Further, the hypothetical examples need to address:

1) Health and Safety
2) Public Disruption
3) Environmental Impact
4) Financial Impact due to closing the approaches for some time

Table 1. Risks Consequences Categories vs. Considerations (Ref.1)

Consequence Category	**Health and Safety**	**Public Disruption**	**Environmental Impact**	**Financial Impact**
I	Fatalities or Serious Health Effects	Significant to a Large Community	Major/Extended Duration/Full Scale Response	>$Million 10 Cad
II	**Serious Injury or Moderate Health Effects**	**Significant Disruption to small community**	**Serious/Significant Resource Commitment**	**$Million 1-10 Cad**
III	Medical Treatment or Minor Health Effects	Minor Disruption	Moderate/Limited Response of Short Duration	$Million 0.1-1 Cad
IV	Minor Impact	Minimal to no Disruption	Minor/Little or No Response Needed	<$Million 0.1 Cad

Table 2. Probabilities Categories (Ref.1)

Probability Category	**Definitions***	**Consequences**		**Probability**				
A	Possibility of repeated incidents			**A**	**B**	**C**	**D**	**E**
B	Possibility of isolated incidents		**I**					
C	Possibility of occurring sometime		**II**					
D	Not Likely to occur		**III**					
E	Practically very rare to happen		**IV**					

References:

1) Mahdi H. Arafat, El-Shabassy Y. Abdelghany, and El-Kadi, A. F., (2001) **"Modeling, Reliability Assessment, Rehabilitation And Optimization For Aged Industrial Plant, The Art Of Repair Under The Umbrella Of Risk Management"**, Proceedings The 29th International Conference On Computers And Industrial Engineering (ICC&IE), Montreal, Quebec, Canada 1st-3rd Nov 2001.
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3) EL-Shabassy Y. Abdelghany, Eid M. S., (2003) **"Optimum Reliability Assessment For Rehabilitation Of Installations Without Disrupting Operations"**, Proceedings The 31st International Conference On Computers And Industrial Engineering (ICC&IE), San Francisco, USA 2nd-4th Feb 2003.
4) El-Shabassy Y. Abdelghany; Ezeldin S. A; (2010) **"Classification of Risks for International Construction Joint Ventures Projects"** 2010 ASCE and University of Alberta Construction Research Congress "Innovation for Reshaping Construction Practice", May 8th-11th, 2010 Banff, Alberta, Canada.