

INFORMATION REQUEST # 1
TO: Enbridge Northern Gateway Pipelines
Northern Gateway Pipeline proposal
FROM: Josette Wier

1.1 Kitimat Summit Lake (KSL) Pipeline Looping Project

- Reference:**
- (i) Enbridge Northern Gateway Project Sec. 52 Application [complete], May 2010- CD distributed by Kevin Brown, Enbridge representative, at the Enbridge presentation to the Smithers District Chamber of Commerce, July 7, 2010
 - (ii) Vol 6A-Sec.52 Enbridge Northern Gateway Application-Environmental and Socio Economic Assessment, May 2010 Appendix 3A: Project Inclusion List within the REAA in Alberta and British Columbia, page 3A-9

Preamble: References (i) and (ii) mention oil and gas-related plant and facilities in the project inclusion list

- Request:**
- a) a definition of oil and gas-related plant and facilities; in particular specify if a pipeline is considered a facility
 - b) clarification regarding the inclusion or not of the KSL gas pipeline in the Project inclusion list

- Response:**
- a) "Oil and gas-related plant and facilities" is not a defined term; however, a pipeline is considered a facility. For the purposes of the Project Inclusion List, "oil and gas-related plant and facilities" included pipelines that have notified a regulatory body of their intent, that are under regulatory review, approved for construction, under construction or operational and until such time that the Terms of Reference for the JRP Agreement were finalized.
 - b) The Kitimat-Summit Lake Natural Gas Pipeline Looping ("KSL") Project, also known as the Pacific Trails Pipeline ("PTP"), was included in the Project Inclusion list. See Application (Volume 6A, Appendix 3A).

1.2 KSL Footprint areas

- Reference:**
- (i) Enbridge Northern Gateway Project Sec. 52 Application [complete], May 2010- CD distributed by Kevin Brown, Enbridge representative, at the Enbridge presentation to the Smithers District Chamber of Commerce, July 7, 2010
 - (ii) Vol 6A-Sec.52 Enbridge Northern Gateway Application-Environmental and Socio Economic Assessment, May 2010 Appendix 3A: Project Inclusion List within the REAA in Alberta and British Columbia, page 3A-9
- Preamble:** References (i) and (ii) show tables which includes footprint areas of oil and gas-related plant and facilities in hectares (ha) including the KSL project
- Request:**
- a) an explanation to why the Table 3A-1- Inclusion List within the REAA in Alberta and BC, from the official Enbridge CD includes 7 footprint areas totalling 1062 ha for the KSL project while the hard copy of the same table in the Enbridge Application binder only shows 4 footprint areas totalling 107 ha.
- Response:**
- a) Table 3A-1 is the same in both the CD version of Application (Volume 6A) and the hard copy version of Application (Volume 6A). In both versions, the Kitimat-Summit Lake Natural Gas Pipeline Looping ("KSL") Project has 7 footprint areas totaling 1061.72 ha and the Kitimat LNG Terminal project has 4 footprint areas totaling 106.99 ha.

1.3 KSL and Northern Gateway Routes

- Reference:**
- (i) Vol 6A- Sec. 52- Enbridge Northern Gateway Application- Environmental and Socio-Economic Assessment, May 2010- Section 7 Terrain-p.7-48
 - (ii) Vol 6A-Sec. 52- Enbridge Northern Gateway Application- Environmental and Socio-Economic Assessment, May 2010- Section 7 Terrain- p.7-34
 - (iii) Vol 6C- Sec. 52- Enbridge Northern Gateway Application- Environmental and Socio-Economic Assessment, May 2010- Human Environment p.5-80
- Preamble:**
- (i) mentions that "the two planned pipeline projects could use similar routing in some areas"
 - (ii) mentions that "adjacent RoWs [for the Pembina and KSL pipelines] should be coordinated and operated as one combined RoW, not separately" and bases cumulative effects assessment on the "assumption of satisfactory joint planning"
 - (iii) uses the assumption that the KSL project construction activities will overlap with project construction activities
- Request:**
- a) an overlay of the approved KSL route from KP 0 westward to Kitimat KP1176.87 on the 1:25 000 scale maps of proposed Northern Gateway route shown on Northern Gateway Response to Request for Additional Information from the Joint Review Panel Session Results and Decision dated January 19, 2011, March 2011, Appendix A p.A2-A128
 - b) a summary of the discussions between Northern Gateway, and previous and present proponents of the KSL natural gas pipeline proposal and the Pembina pipeline proposal regarding potential conflicts, synergies and rationalization of facilities, right of way and work space requirements should both projects proceed.
- Response:**
- a) Please refer to Northern Gateway's response to JRP IR 4.19.
 - b) The currently filed pipeline center-lines for Pacific Trails Pipeline, also known as KSL, and Northern Gateway are not final. Certainly for Northern Gateway, the pipeline routing process is an iterative process that is guided by input from environmental assessment, constructability assessment, Aboriginal input, stakeholder input, regulatory oversight and other factors. The route refinement process continues through the public engagement period and through the regulatory review process. Final route determination does not occur until after the Project receives a Certificate of Public Convenience and Necessity from the Federal regulatory process. The final determination of the pipeline center-line is only determined through the

detailed routing process that follows the issuance of this certificate. This process starts when the proponent files the detailed route in the Plan, Profile and Book of Reference. This is the process by which affected stakeholders can have any outstanding routing concerns addressed.

Pacific Trails Pipeline have not issued an updated or final pipeline center-line. For Pacific Trails Pipeline the regulatory process is different than Northern Gateway since that project is not regulated by the same authorities. Until Pacific Trails Pipeline issues an updated center-line it is not possible to further rationalize RoW and temporary workspace for these projects. At this time rationalization or conflicts can only be considered on a conceptual basis. Northern Gateway is prepared to enter into detailed discussion around routing synergies and rationalization once Pacific Trails Pipeline has publically issued a revised center-line. Northern Gateway will continue to reach out to Pacific Trails Pipeline to ensure these discussions occur as early as possible.

1.4 Surface Water Quality

- Reference:**
- (i) Vol 6A-Sec. 52- Enbridge Northern Gateway Application- Environmental and Socio-Economic Assessment, May 2010- Section 10-Surface Water Resources-p.10-75
 - (ii) Vol 6A-Sec. 52- Enbridge Northern Gateway Application- Environmental and Socio-Economic Assessment, May 2010- Section Terrain- p. 7-40 and 41
- Preamble:**
- (i) mentions an increase of Total Suspended Solids (TSS) "within natural fluctuations...depending on the overall watershed drainage area and overall PDA" and goes on to conclude "thus the contribution of the Project to cumulative environmental effects on water quality is not significant"
 - (ii) mentions "construction activities in areas prone to ARD [Acid Rock Drainage] will likely result in cumulative environmental effects on ARD and associated effects on surface water quality unless all projects implement suitable mitigation measures"
- Request:**
- a) an assessment of cumulative effects in the case of not satisfactory joint planning, meaning separate and uncoordinated construction activities, on surface water quality
 - b) how the areas prone to ARD will be identified and which suitable mitigation measures will be offered.
 - c) an explanation for the apparent contradictions in the statements quoted in (i) and (ii) with (i) stating no effects on water quality and (ii) the opposite.
- Response:**
- a) Cumulative environmental effects are changes to the biophysical or human environment that are caused by an action of the Project, in combination with other past, present and future projects and activities. Cumulative environmental effects of other projects and activities that overlap with those of the Project are identified. An assessment of potential interactions is completed to determine if an assessment of cumulative effects is required for that specific environmental effect. Cumulative environmental effects are then evaluated by taking the residual environmental effects of the Project in combination with similar environmental effects from other past, present, and future projects and activities. Taking mitigation into account, residual cumulative effects are assessed and characterized using similar terms and definitions as Project effects.

The Application (Volume 6A, section 7.4.6.3 p. 7-41) states "Without mitigation, the exposure of acid-generating rock might result in considerable environmental problems. However, with the

implementation of BMP (“Best Management Practices”) (Price and Errington 1998), the residual effects of effects on ARD are considered not significant (see Table 7-7).” Northern Gateway will successfully manage the environmental effects of the Project.

In reference (ii) above, other projects considered in the cumulative effects assessment were the Pacific Trail KSL Pipeline Looping Project, the Pembina Pipeline Project and the Kitimat LNG Inc terminal. All three projects are subject to Provincial and/or Federal environmental requirements, as is Northern Gateway. Northern Gateway obtained publically available information on these other projects. Generally this has been obtained from regulatory filing documents on the public record. If they proceed, each project will be required to meet regulatory requirements. On the basis of this information, Northern Gateway concluded that cumulative effects to surface water quality were not significant.

Northern Gateway recognizes that projects which may overlap should work co-operatively to implement the mitigation measures to ensure the effects on terrain will not have negative implications on the operation of any of the other pipelines in the future. At this time rationalization of conflicts can only be considered on a conceptual basis. Northern Gateway is prepared to enter into detailed discussion around routing synergies and rationalization of suitable mitigation measures. This is the intent of the reference provided in (ii) above. The Application (Volume 6A, section 7.4.6.2) states “ARD management methodology is outlined in the Acid Rock Drainage and Metal Leaching Field Investigation Report and the Identification and Mitigation of Acid Rock Drainage and Metal Leaching during Construction Report (Volume 3, Appendix E), and will be further developed during detailed design. The finalization of plans for dealing with acid-generating rock is expected during detailed design.” Also see Northern Gateway’s responses to J. Weir IR 1.3 and JRP IR 4.19.

- b) Preliminary plans for identification of areas prone to ARD and preliminary sampling are discussed in the Application (Volume 3, Appendix E-1).

Preliminary methods for identifying occurrences of ARD during construction and preliminary mitigation measures are discussed in the Application (Volume 3, Appendix E-1-2).

Further investigations and work are anticipated during detailed engineering.

- c) Suitable mitigation measures will be in place (see Northern Gateway’s

response to J. Wier IR 1.4b) above) during construction activities in areas prone to ARD. Thus, with the mitigation measures in place there is no contradiction in the environmental assessment conclusions quoted in (i) and (ii). Both assessments concluded there are no significant adverse effects on water quality by the Project.

INFORMATION REQUEST # 2
TO: Enbridge Northern Gateway Pipelines
Northern Gateway Pipeline proposal
FROM: Josette Wier

2.1

Reference: Vol. 7B: Risk Assessment and Management of Spills- Section 2 p.2-1

Preamble: The reference includes the following statement:

"Pipeline design will comply with all applicable codes and standards. Material specifications will be developed for the pipe and components".

According to the Natural Resources Defense Council Tar Sands Pipeline Safety Backgrounder, Dec 2010, "There are many indications that DilBit is significantly more corrosive to pipeline systems than conventional crude. Bitumen blends are highly acidic¹, sulfuric, viscous² and abrasive³ relative to conventional crudes⁴.

Request: a) How do the applicable codes, standards and material specifications take into consideration the more corrosive properties (acidity, viscosity and abrasion) of tar sands oil (DilBit)?

Response: a) The properties of diluted bitumen are required to meet the same specifications as other crude oil products moved on the Enbridge system. The diluted bitumen will have been treated to ensure it meets pipeline tariff specifications prior to transport in the Northern Gateway Pipeline and, as described in Northern Gateway's response to Haisla Nation IR 1.43c).

2.2

Reference: Vol. 7B: Risk Assessment and Management of Spills- Section 2 p.2-2

Preamble: In the reference above, one reads:

"The following key design features and mitigation measures will be implemented... using pipeline design that facilitates directing hydrocarbons away from sensitive areas through grading, ditching and constructing retention berms, where practical"

Request:

- a) How are sensitive areas defined?
- b) Please locate sensitive areas on the maps
- c) What is proposed when grading, ditching and building of retention berms away from sensitive areas are "not practical"?

Response: a) In the Joint Review Panel Results and Decision dated January 19, 2011, the JRP stated the following guideline for consequence areas:

“Consequence areas can be onshore and/or offshore including, but not limited to: wildlife reserves, occupied areas, Indian Reserves, urban areas or towns, water bodies, federal or provincial campgrounds and parks and town water intake locations”

In its response to the JRP’s request for additional information, Northern Gateway elaborated on this guideline and described consequence areas according to the following broad categories:

Officially Designated Protected Areas

Federal and provincial protected areas that are shown as consequence areas include:

- federal national parks
- provincial parks (in British Columbia, Class A, B, and C parks)
- provincial conservancies
- provincial ecological reserves
- provincial wildlife reserves

Campgrounds within federal and provincial parks and protected areas are also included as consequence areas.

Settlements

Human settlements that are shown as consequence areas include hamlets, villages, towns and cities, but not rural areas with sparse and isolated settlements or isolated residential parcels.

Indian Reserves

Areas that are designated by the federal government as Indian Reserves under the *Indian Act* are shown as consequence areas.

Water Use

Licenses related to human consumption and other uses (e.g., industrial, agricultural) are shown as consequence areas.

In Alberta, water licence data were obtained from Alberta Environment (Alberta Environment 2010). This includes both ground water and surface water intake locations for all purposes with sufficient attribute information on licenses to allow Northern Gateway to segregate licenses by purpose, such as human consumption.

In British Columbia, water licence data were obtained from GeoBC's data discovery provincial government service (GeoBC 2011). The data included:

- British Columbia points of diversion such as licensed surface water intake sites for all purposes but excludes groundwater intakes
- water intake extraction points for human consumption such as for human drinking water systems under the authorization of a Health Authority in BC. The information includes both surface and groundwater sources but does not include storage or treatment facilities.

Watercourses

Watercourses are shown as consequence areas if they contain fish species that are either at risk or harvested. Watercourses that do not contain at risk or harvested fish species are shown on the map but not designated as consequence areas.

Information on fish distribution was based on field programs carried out for Northern Gateway from 2005 to 2009 (Whelen et al. 2010), as well as other available data. The presence of species at risk was a criterion for defining a fisheries consequence area, because these species are of management concern and would be vulnerable to contact with oil.

Wildlife

Wildlife habitat is shown as a consequence area if it meets the following conditions:

- It contains species likely to interact strongly with oil. An interaction is considered strong when the species is both likely to contact oil (should a spill occur) and to have elevated mortality rates. Amphibians are considered the group most sensitive to spills,

followed by some aquatic birds that actively forage in wetlands (described below).

- It is likely to have species at risk. This analysis focuses on species federally listed by SARA or COSEWIC as Endangered, Threatened, or Special Concern (COSEWIC 2008); by British Columbia as Blue or Red listed (BC CDC 2008); or by Alberta as At Risk.

The most sensitive stream dwelling species at risk is likely to be the coastal tailed frog (which is federally listed as Special Concern and Blue-listed in British Columbia). Both field data and habitat suitability modeling were used to identify streams with habitat for coastal tailed frog.

Wetlands

Fens and marshes are shown as consequence areas for two reasons. First, herbaceous and bryophyte cover could be affected by contact with oil and their recovery rate may be slow. Second, these open water wetlands may be important as wildlife habitat, fish habitat or potential rare plant habitat, and they have unique hydrological regimes.

Wildlife species at risk that use open water include horned grebe, trumpeter swan, white-winged scoter, American bittern, great blue heron, sandhill crane, yellow rail, rusty blackbird, coastal tailed frog, and western toad. Several species at risk use wetlands but forage above water and are less likely to be exposed to oil (Nelson's sparrow, Le Conte's sparrow and rusty blackbird). Three ecosystems (bogs, swamps and floodplains) are not considered as consequence areas because they are dominated by tree and/or shrub species whose root structure would be less affected by an oil spill than lowland types (Walker et. al. 1978).

Information on wetlands was developed as part of terrestrial ecosystem mapping ("TEM") for the Project. In Alberta, the wetlands are typically mapped according to ecosite phase (Beckingham and Archibald 1996; Beckingham et al. 1996; Wheatley and Bentz 2002). In British Columbia, wetlands are mapped according to the guide Wetlands of British Columbia (Mackenzie and Moran 2004), as well as the Ministry of Forest's BEC field guides (Banner et al. 1993a, 1993b; DeLong 2003, 2004; DeLong et al. 1990, 1993, 1994). Fens and marshes were mapped in the Project effects assessment area ("PEAA") from 2008 to 2009 and following standards for TEM in British Columbia (RIC 1998).

- b) In Northern Gateway's response to the JRP's Request for Additional Information (March 2011), these consequence areas were mapped at a 1:25,000 scale along with the geographical extent of full-bore ruptures within each kilometre post along the entire length of the crude oil pipeline.

- c) Details of specific mitigation measures along the entire length of the pipeline will be developed during detailed engineering.

2.3

Reference: Vol. 7B: Risk Assessment and Management of Spills- Section 2 p.2-3

- 1 Gareth Crandall, Non-Conventional Oil Market Outlook, Presentation to IEA, 2002, pg. 4, <http://www.iea.org/work/2002/calgary/Crandall.pdf>
- 2 Crude Oil Quality Association, Canadian Crude Quick Reference Guide, Nov. 2009, <http://www.coqainc.org/102209CanadianCrudeReferenceGuide.pdf>.
- 3 2008 National Petrochemical and Refiners Association Q&A and Technology Forum Answer Book, 2008, Question 50, http://www.npra.org/forms/uploadFiles/17C4900000055.filename.2008_QA_Answer_Book.pdf
- 4 Environmental Science & Technology Centre (ESTC), Canadian Government, http://www.etccte.ec.gc.ca/databases/OilProperties/pdf/WEB_West_Texas_Intermediate.pdf.

Preamble: In reference above, one reads:

"Strategic locations along the pipelines will have valves, including at pump stations, major watercourse crossings and other locations based on a review of environmental, Aboriginal traditional knowledge (ATK), geotechnical and volume factors and operations and maintenance requirements. Valve locations will be determined during detailed design."

Request:

- a) How are the locations of the valves decided?
- b) Will there be opportunities for the public to have input on those locations?
- c) What will happen if there is disagreement on the proposed locations of the valves?
- d) Is there a maximum volume of hydrocarbons potentially to be spilled between valves?

Response:

- a) Please refer to Northern Gateway's response to JRP IR 3.3.
- b) The location of the pipeline valve sites will be finalized during detailed engineering and will primarily be based on CSA Z662 requirements and the additional requirements identified in the pipeline risk assessment work. An opportunity for public input on the valve site locations would be available through the Community Advisory Boards ("CAB"). The CAB process allows for respectful and meaningful exchange of ideas and concerns regarding the Project. This process has been in place throughout the regulatory process and has resulted in excellent participation by the public, Aboriginal groups and other stakeholders, and has influenced the Project's design.
- c) Northern Gateway is responsible for the design, operation and integrity of the pipelines and consequently Northern Gateway will select the final locations of the valve sites.

- d) Please refer to Northern Gateway's response to JRP Request for Additional Information (March 2011), Section A, for details on the potential maximum spill volumes along the entire oil pipeline route.

For reasons detailed in Northern Gateway's response to J. Wier IR 2.27, spills of these magnitudes are highly unlikely for a pipeline built, constructed and operated to modern standards such as Northern Gateway.

2.4

Reference: Vol. 7B: Risk Assessment and Management of Spills- Section 2 p.2-3

Preamble: CCO procedures are mentioned but not defined and not part of the abbreviations list in Section 12 of Vol. 7B

Request: a) Please define CCO and CCO procedures

Response: a) “CCO” stands for Control Centre Operations. “CCO Procedures” refers to Control Centre Operations procedures, and these include, among other things, the standard steps that would be undertaken in the control centre in the event of any reported or observed emergency or possible emergency situation, or abnormal operating condition.

2.5

Reference: Vol. 7B: Risk Assessment and Management of Spills- Section 3 p.3-3

Preamble: This is in reference to Table 3-3 "Spill Statistics for Enbridge's Liquids Pipeline System (2005-2009)" which only mentions Enbridge spills in Canada while the majority of Enbridge pipelines are located in the USA. The table is misleading as it shows an average ranging between 53 to 324 barrels/yr which pale in comparison of the Enbridge 20,000 barrels spilled in Michigan in 2010 and the 700 to 1500 barrels spilled in the North West Territories (WLR KP380) in 2011.

Request:

- a) What is the length of Enbridge pipelines respectively in the USA and Canada?
- b) Please provide a similar table for Enbridge pipeline spills in the USA including the 2010 major oil spill in the Kalamazoo system?
- c) How are spills volumes and recovery estimated?
- d) What is the margin of error on spills volume and recovery estimates?
- e) Which spills were of tar sands oil (diluted bitumen or DilBit) for Canada and the USA?

Response:

- a) The length of Enbridge crude oil and liquids pipelines in the USA and Canada can be found in **Attachment J. Wier IR 2.5a).**
- b) Please see **Attachment J. Wier IR 2.5b).**
- c) Release volumes are estimated at various stages of the emergency response and recovery/clean-up effort. Initial estimates are made in the first hours of the emergency response effort with the best information available at the time based on field reconnaissance and cursory operating history from the Enbridge Edmonton Control Centre. Static factors such as pipe size, topography and isolation valve location are taken into account, as well as dynamic factors such as the pipeline flow rate and release duration. As response and recovery efforts continue, release estimates may be refined through use of more detailed operating history and custody transfer measurement information, as well as physical observations from the site.

Recovery volumes are estimated during the clean-up effort and typically are based on visual observations in the field. Recovery volume estimates may also be refined through actual measurement of oil volumes present after recovered water has settled from the recovered water/oil mixture, and from estimates of hydrocarbon concentrations in soil, water and debris that is removed from the site.
- d) There is no calculable margin of error related to released or recovered

volumes of oil. The estimated volumes are based on the best available information and are refined as more specific and detailed information becomes available.

- e) Not relevant. Enbridge ships a variety of crude oil products on its pipelines, including diluted bitumen and synthetic oil. Typical industry terminology for this material would be “crude” oil.

2.6

Reference: Vol. 7B: Risk Assessment and Management of Spills- Section 4 p.4-1 and 4-2

Preamble: Table 4-1 Physical Properties of Hydrocarbons in the Marine Environment shows such properties at 15 degrees celsius which will largely not apply to our northern rivers most of the year. Much has been learnt from such physical properties of DilBit from the 2010 spill the Kalamazoo system in Michigan.

- Request:**
- a) Is the assessment of diluted bitumen physical properties in the marine environment still considered applicable to the fresh water environment after what has been learnt from the Kalamazoo tar sands oil spill?
 - b) How is the viscosity of diluted bitumen affected by lower temperatures than 15C in fresh water?

Response:

- a) Yes, the assessment of the physical properties of diluted bitumen in the marine environment is considered applicable to the freshwater environment. The assessment was based on standard methods and applies to both marine and freshwater conditions. Please refer to SL Ross (2010a), which details properties for fresh and weathered diluted bitumen at temperatures of 1°C and 15°C. The weathered diluted bitumen would have a density approaching 1.0 g/cc, which indicates that once the diluted bitumen weathers, it may be susceptible to sinking in fresh water.

Reference:

SL Ross. 2010a. Properties and Fate of Hydrocarbons associated with Hypothetical Spills at the Marine Terminal and in the Confined Channel Assessment Area Technical Data Report. Prepared for Northern Gateway Pipelines Inc. Calgary, AB.

- b) Please refer to Section 3 of the above referenced Technical Data Report, for viscosity data for fresh and weathered diluted bitumen at temperatures of 1°C and 15°C. In general viscosity increases at lower temperatures.

2.7

Reference: Vol. 7B: Risk Assessment and Management of Spills- Section 4 p.4-1 to 4-2

Preamble: Paragraph 4.3 Weathering and Fate of Hydrocarbons, does not make a particular case for tar sands oil or DilBit. Much is being learnt about tar sands oil (DilBit) behaviour in the Kalamazoo system spill which makes this paragraph largely outdated. US-EPA (Environmental Protection Agency) has made numerous statements about the unexpected and difficult challenges posed by tar sands oil spill like the following: "We are not tarsands oil experts. But we can tell you this particular oil has resulted in our needing to be creative in learning how to identify the submerged oil component," Dollhopf says. [Ralph Dollhopf is the EPA's incident commander and federal on-scene co-ordinator in Marshall, Michigan] "It has resulted in a longer and more expensive cleanup".

Financial Post, July 23, 2011

In the same paragraph, one reads "Freezing of freshwater would affect how hydrocarbons are partitioned and would have implications for clean up strategies and persistence hydrocarbons". Freezing conditions are a most common occurrence in the rivers to be crossed and require to be addressed appropriately.

Request:

- a) Please re-submit the section on the properties and weathering of DilBit in light of what has been learnt from the Kalamazoo system tar sands oil spill
- b) Please describe the partitioning of tarsands oil (DilBit) in freezing conditions

Response:

- a) The results of the SL Ross technical data reports are consistent with the Kalamazoo incident (see Northern Gateway's response to J. Weir IR 2.6a). The energy inputs that will generate oil dispersion or water-in-oil emulsion formation will be different in a river environment than described in the Application (Volume 7B, Section 4.3.1), where rapids, riffles and water-falls will replace breaking wave action.
- b) The action of a freeze-thaw cycle on crude oil mixtures, including diluted bitumen, does not affect the chemical make-up or structure of the bulk material. Freezing may reduce evaporation rates and can break water-in-oil emulsions. Frozen ground will limit the movement of diluted bitumen into the soil, and frozen water surfaces can contain or encapsulate oil.

2.8

Reference: Vol. 7B: Risk Assessment and Management of Spills- Section 4 p.4-6

Preamble: Under "Sedimentation" one reads "Weathered hydrocarbons that interact with inorganic and organic particulates in water can be adsorbed on to the particles. Fine particulates can also adhere to the dispersed droplets. The hydrocarbon and particulate complexes accumulate in the benthic environment when the density of the complex exceeds the density of water. This process is usually most prevalent when hydrocarbons encounter particle-rich waterbodies."

- Request:**
- a) Has the proponent identified the "particle-rich waterbodies" and if so, could the proponent list them?
 - b) Has the proponent identified particular times in the year when sedimentation is significant?
 - c) What has the proponent learnt about the adsorption capabilities of tar sands oil (DilBit) from their Kalamazoo system oil spill last year?

- Response:**
- a) The Project has not identified the "particle-rich waterbodies". Please refer to Northern Gateway's responses to Federal Government IR 95, 97 and 105 for a general discussion of oil mineral aggregates.
 - b) Sedimentation in a watercourse is likely to be most significant following the spring freshet (spring to early summer) when runoff resulting from snowmelt or rainfall and snowmelt runoff increases the watercourse's sediment load. Please see the Hydrology Technical Data Report (AMEC Earth and Environmental 2010) for further information relevant to the six hydrological zones crossed by the pipelines right-of-way.

Reference:

AMEC Earth and Environmental 2010. Hydrology Technical Data Report. Prepared for Northern Gateway Pipelines Inc. Calgary, AB.

- c) The Kalamazoo spill resulted in submerged oil and oil deposition in bottom sediments that were subsequently delineated and treated. Oil-fines interaction is a natural process in oil weathering and would be expected for diluted bitumen blends, as with other crude oils.

2.9

Reference: Vol. 7B: Risk Assessment and Management of Spills- Section 5 p.5-3

Preamble: In Table 5-1 Key Response Actions the initial response mentions "Spill verification through SCADA or other means".

Request:

- a) Please describe "other means"
- b) How many spills like the Willow River spill in the North West Territories (WLR KP380)) have been missed by the SCADA system?
- c) Why are those spills, like the Willow River missed by SCADA?
- d) What is the smallest volume of spill SCADA is able to detect?

Response: a) Enbridge uses multiple approaches for leak detection on its oil pipelines. These approaches are designed to provide comprehensive and overlapping leak detection capabilities.

There are four primary methods of monitoring for possible leaks used on Enbridge pipelines. All these techniques have a different focus with a different application of technology, resources and timing. These methods include:

1. Visual surveillance and reports. These are from Enbridge line patrols (aerial and ground) and by third-party reports of oil or oil odors. Aerial line patrols are conducted on a regular basis and managed by Field Operations. Both aerial and ground patrols can also be completed whenever there are concerns about pipeline integrity. Third-party reports are handled through the emergency telephone line, managed by the Enbridge Edmonton Control Centre.
2. Scheduled line balance calculations. These are sometimes called "over/short reports" in the industry. They are calculations of oil inventory done at fixed intervals (example: 2 hour, 24 hour intervals, etc). The purpose for leak detection is to identify unexpected losses of inventory that may indicate possible leaks. Enbridge currently utilizes a line balance feature within our Commodity Movement Tracking ("CMT") system. Line balance calculations are monitored by the Enbridge Edmonton Control Centre.
3. Controller monitoring. This is the continuous monitoring of pipeline conditions (e.g., pipeline pressure) by the Pipeline Controller. The focus of this is to identify unexpected operational changes (e.g.,

pressure drops) that may indicate a leak. This activity occurs within the Enbridge Edmonton Control Centre.

4. Computational Pipeline Monitoring (“CPM”). This is computer-based monitoring using continuous measurements of pipeline conditions. This is an industry standard for dedicated leak detection. CPM is the primary Enbridge real-time system for detecting leaks on all of its liquids pipelines. This application is developed and maintained by the Leak Detection group to support the Enbridge Edmonton Control Centre.

These approaches are used together to examine and identify potential leak conditions.

- b) Northern Gateway is not aware of any other releases like the Norman Wells KP 380 incident. At this point, the full details of the cause of the incident are not known, however Enbridge is undertaking a thorough investigation. During excavation of the pipeline, Enbridge discovered a tiny crack in the pipeline, sometimes called a “pinhole leak.” This type of leak allows the oil to slowly stream out of the pipe, but the pressure inside the pipe is maintained. The oil in the Norman Wells System (Line 21) located in the North West Territories is chilled to prevent melting of the permafrost. The surface area and subsurface area where the leak occurred was frozen at the time of the oil release. The oil from the leak surfaced when the ground began to thaw. Permafrost is only encountered on Line 21 within the Enbridge System.
- c) Enbridge’s pipeline control system (“SCADA”) utilizes a real-time hydraulic transient model for all of its leak detection systems, including the Norman Wells pipeline (Line 21). The model is also known as the Material Balance System (“MBS”). The MBS is designed to meet the requirements of the Onshore Pipeline Regulations, 1999, CSA Z662/Annex E, U.S. DOT's CFR 49 Part 195 and API 1130.

The Norman Wells (Line 21) MBS uses three detection windows of 5 minutes, 20 minutes and 2 hours to monitor for large, medium and small leaks respectively. The MBS sends audible alarms to the pipeline operator whenever there is a material (injection vs. delivery) imbalance that indicates a potential leak. The Line 21 MBS is designed to detect leaks during normal pipeline operations and when the pipeline is not operating (shut in). The performance of the Line 21 MBS may be negatively impacted by the occurrence of slack-line flow (column separation) conditions.

Although Enbridge continues to investigate the factors surrounding this incident, Enbridge currently believes that during the period leading up

to the discovery of the May 2011 release at KP 380.4, the Line 21 MBS model was fully functional and there were no imbalance alarms received because the release leak rate was below the minimum thresholds of the MBS system.

The type of feature that was present at KP 380.4 on the Norman Wells system would normally be detected by high resolution ultrasonic in-line inspection (“ILI”) in advance of a failure. Coincidentally, high resolution ultrasonic ILI was scheduled to begin on Line 21 in 2011 before Enbridge knew of the feature and will continue on a regular basis. High resolution ultrasonic ILI will be utilized on a regular basis on the Northern Gateway pipelines.

- d) The sensitivity of the MBS leak detection system depends upon the design of the pipeline and its instrumentation. The minimum detectable leak size for the Northern Gateway pipelines will be determined during detailed engineering. Enbridge is actively investigating and testing a number of alternative leak detection technologies that are complimentary to the current leak detection system and aimed at detecting smaller leaks. If performance is acceptable, Enbridge would plan to implement one or more of these technologies on the Northern Gateway pipelines.

2.10

Reference: Vol. 7B: Risk Assessment and Management of Spills- Section 5 p.5-6

Preamble: In the reference above, one reads: "Northern Gateway will maintain response equipment along the pipeline route, packaged so it can be mobilized by ground transportation, helicopter or both. Locating equipment near the pipeline RoW will enable efficient mobilization of response equipment for immediate Tier 1 response. Pump stations are potential locations for response equipment. ... For a summary of the proposed locations for emergency response equipment, see Table 5-3.

Table 5-3 Proposed Locations for Emergency Response Equipment Caches
General Location Province Infrastructure.

....

- Prince George British Columbia Major pipeline maintenance depot
- Fort St. James British Columbia Oil and condensate pumping station
- Burns Lake British Columbia Oil and condensate pumping station
- Houston British Columbia Condensate pumping station
- Clearwater British Columbia Condensate pumping station
- Kitimat British Columbia Marine terminal, condensate initiating station and a minor pipeline maintenance depot

Request: a) Why is Clearwater marked as an emergency response location when it is not on and not even near the pipeline proposed route?

b) Why such a long distance of 327 kms by road for emergency equipment location between Kitimat and Houston?

Response: a) The reference to Clearwater is for the pump station of that name. It does not refer to the Clearwater municipality. Please refer to the Application (Volume 3, Appendix C, Figure C-1).

b) Northern Gateway will be reviewing all the proposed locations for emergency response caches during detailed engineering. As noted in the Application, pump stations, including the Clearwater Pump Station, represent potential locations for response equipment. Emergency response equipment will also be positioned at locations other than pump stations.

2.11

Reference: Vol. 7B: Risk Assessment and Management of Spills- Section 7 p.7-1

Preamble: In the reference above, one reads: " Following is a summary of two relevant historical hydrocarbon spills", which are the 2000 Pine River spill of light crude oil and the 1997 diesel spill in New York. None of those examples use tar sands oil (DilBit) which has been shown in the Kalamazoo to behave differently from what was known previously from oil spills (see quote from the Financial Post in preamble of 2.6).

- Request:**
- a) Given that none of those spills used tar sands oil (diluted bitumen), explain why they are used as "relevant examples".
 - b) Given that (and unfortunately so for the people of Michigan) the Kalamazoo river spill is the most relevant example of tar sands oil spill, please describe the risk assessment process and management of the spill there, giving particular emphasis on the unforeseen difficulties encountered with dealing with tar sands oil in fresh water.
 - c) If not possible, could the proponent use another tar sands oil spill as a more relevant example?

- Response:**
- a) The spill management systems are not dependent on oil type. The oil type spilled will contribute to the biological effects of a spill, and the required response. The two spills described in the Application (Volume 7B, Section 7) were intended as examples for how oil behaves in a freshwater ecosystem. In the remainder of Section 7, the assessment considers the environmental effects of spills of the range of products that will be shipped through the pipeline.
 - b) Please refer to Northern Gateway's response to J. Wier IR 2.11a).
 - c) Please refer to Northern Gateway's response to J. Wier IR 2.11a).

2.12

Reference: Vol. 7B: Risk Assessment and Management of Spills- Section 7 p.7-5 and 6

Preamble: Under the referenced paragraph 7.3.3 Mitigation Measures, one reads:
"Mitigation measures would be implemented to limit the extent of the affected area. Mitigation measures are based on the degree of physical disturbance and chemical characterization compared with undisturbed soils and the remediation criteria. Remediation through in-situ or ex-situ treatment and amendment applications, or offsite disposal followed by soil replacement from borrow areas, would be considered. Short-term mitigation measures would include containment, control and recovery of the hydrocarbon on the soil surface, to limit the area affected. Ex-situ treatment may not always be a viable option because of the remoteness of the location, or the potential for secondary damage that may be created through soil removal.

Remediation of wetland soils could include removal and ex-situ treatment of mineral soils, in-situ bioremediation and isolated burning. In a wetland, natural attenuation would be allowed because peat is unlikely to be naturally replaced if it is removed. For river systems, it is important to identify where hydrocarbons might contact the riverbanks, to focus cleanup efforts and limit unnecessary shoreline disturbance. Affected soils would be sampled for contaminants and physical and chemical properties, to determine appropriate site-specific mitigation (treatments would differ depending on soil texture types and mineral versus organic soil). Cleanup would be monitored and adapted to changing conditions, because soils can become buried and newly deposited sediment can come into contact with hydrocarbon-contaminated soil. The success of containment can be moderate, particularly in wet soils, because hydrocarbons can disperse in both surface and groundwater. Although most of the hydrocarbons can be recovered, residual traces may affect soil quality".

"Would" is used 6 times in this paragraph, conveying a very low level of commitment compared with the strong affirmations in the regional socio-economic effects assessment like: "It is estimated that project construction will create 1,870 person-years of indirect and induced employment in British Columbia and Alberta"

Vol. 6C: Environment and Socio-economic Assessment-Human environment Section 4.4 p.4.4-111 "Modelling of the effects of operations on the national and provincial economies indicates that annual expenditures of \$111.9 million in the pipeline transportation sector in British Columbia will generate about 295 indirect and induced jobs every year"

Vol. 6C: Environment and Socio-economic Assessment-Human environment Section 4.4 p.4.4-114 etc...

- Request:**
- a) Why are mitigation measures for oil spill so tentative and conditional while the socio-economic benefits, equally uncertain and conditions dependent, are so positively presented?
 - b) If mitigation measures "would" be implemented, what are the the conditions required for implementation?
 - c) If short-term mitigation measures would include containment, control and recovery of the hydrocarbon on the soil surface, what are the conditions for not including such measures?
 - d) If affected soils would be sampled for contaminants and physical and chemical properties, to determine appropriate site-specific mitigation (treatments would differ depending on soil texture types and mineral versus organic soil) and cleanup would be monitored and adapted to changing conditions, please describe the reasons for not sampling or not monitoring.

- Response:**
- a) The assessment of socio-economic benefits and effects in the Application (Volume 6C) relates to the predicted socio-economic effects of the routine activities for the Project during construction, operations and decommissioning. Additional detailed information is provided in AMEC (2010). The assessment uses engineering cost estimates and accepted practices to predict socio-economic effects. Assumptions in various analyses are discussed in the Application (Volume 6C). Because the routine activities of the Project are relatively well defined, it is possible to make reasonably reliable predictions of economic benefits such as the amount of employment, and the requirements for goods and services.

In contrast, the prediction of the trajectory and environmental consequences of a spill and, in turn, the type and extent of response, is dependent on a large number of factors such as:

- the type of oil spilled
- where a spill occurred
- the volume of oil spilled
- the response and restoration actions taken
- the weather and oceanographic conditions
- the time of year
- proximity to sensitive areas

Given the large number of factors that can determine the specific response required for a specific spill event, it is not possible to provide specific details on the response procedure and mitigation that would be required for every type of spill that could potentially occur over the life

of the Project.

Northern Gateway has committed to prepare a Pipeline Oil Spill Response Plan and a Marine Oil Spill Response Plan, including supporting plans such as control point mapping and consequence area mapping for the pipeline, and geographic response plans and an environmental sensitivity atlas for marine areas. Through these plans, details will be provided on emergency response, shoreline cleanup and shoreline rehabilitation. These plans will be prepared following Project approval and will be completed and submitted for review by government agencies at least six months before commencement of operations.

Reference:

AMEC. 2010. Technical Data Report. Socio-economic Conditions – Human Environment. Prepared for the Enbridge Northern Gateway Project by J. Thompson, C. McArthur, R. Leitch, R. Karki, A. McArthur, D. Yee, and G. Demke, AMEC Earth and Environment, Calgary, Alberta.

- b) Please refer to the Northern Gateway's response to J. Wier IR 2.12a).
- c) Please refer to the Northern Gateway's response to J. Wier IR 2.12a).
- d) Please refer to the Northern Gateway's response to J. Wier IR 2.12a).

2.13

- Reference:**
- i) Vol. 7B: Risk Assessment and Management of Spills- Section 7 p.7- 6
 - ii) Northern Gateway Response to request for Additional Information from the Joint Review Panel Session Results and Decision, dated January 19, 2011- March 2011

Preamble: In reference (i), Paragraph 7.3.4 Follow-up and Monitoring describes monitoring on agricultural lands, wetland and riparian areas, but it does not mention the extent of the monitored area. Further, in reference (ii) Appendix A, the cross-hatched areas showing the extent of full bore spills stop at the edge of the page, without giving any indication of how far would the spill affect areas beyond the page limits.

- Request:**
- a) What is the extent of the monitored area for presence of oil products, ie distance from the spill location?
 - b) How is that distance determined?
 - c) If "In wetland and riparian areas, the following would be monitored to confirm hydrocarbons have been removed to target concentrations" what are the target concentrations?
 - d) "If portions of the wetland are bioremediated, soils may be monitored to verify that microbes are breaking down contaminants effectively" what are the reasons for bioremediated soils NOT to be monitored?
 - e) What are the options if bioremediation does not work?

Response:

- a) In the event of a spill, Northern Gateway will implement a comprehensive environmental monitoring program that is commensurate to the site specific conditions. The program would employ industry best practices for environmental monitoring, and be developed in consultation with relevant regulators, First Nations, and stakeholders as appropriate. The objectives of the program would be to characterize the extent of contamination arising from the incident, to monitor containment effectiveness and clean-up progress, and to guide the development of further response and remediation plans.

The spatial extent of monitoring will be dependent on many factors including the volume of the spill, the nature of the spill, and the receiving environment of the spill.

- b) The extent of the spatial area to be monitored would be determined using existing models and verified by field sampling.
- c) Results from the monitoring program would be reviewed relevant to applicable Federal and Provincial environmental quality guidelines. The monitoring program would be implemented immediately following an incident. The targets concentrations and duration of the program

would be site and circumstance specific, and developed in consultation with the appropriate regulatory and stakeholder groups.

- d) If bioremediated soils are showing positive results of microbe activity such as a re-establishment of a self-sustaining vegetation cover, monitoring would not be necessary. Monitoring would only be conducted if no re-establishment was occurring or to confirm that Federal and Provincial quality guidelines and target concentrations were being achieved.
- e) There are multiple methods available for bioremediation (see also Northern Gateway's response to JRP IR 6.2b)). Excavation and removal would be an option available should bioremediation options be unsuccessful.

2.14

Reference: Vol. 7B: Risk Assessment and Management of Spills- Section 7 p.7-6

Preamble: In paragraph 7.4 Hydrogeology, one reads: "Groundwater quality related to hydrocarbon content is typically measured in terms of BTEX, PAH and other volatile or light extractable hydrocarbon concentrations and compared with applicable guideline levels".

This statement does not differentiate tar sands oil (diluted bitumen) from the general "hydrocarbon" family.

- Request:**
- a) How does the composition of tar sands oil (diluted bitumen) differ from synthetic oil and condensate composition, in particular for acidity, sulfur, heavy metals and extractable hydrocarbons?
 - b) How do the particular physical characteristics of tar sands oil (diluted bitumen) like viscosity and density affect the effectiveness of present oil spill cleaning techniques in rivers and wetlands?

- Response:**
- a) The Application is based on a range of representative oils that may be transported as part of the Project. The oils that were selected as representative include:
 - Syncrude Synthetic Light Oil
 - CRW condensate (CRW)
 - MacKay River Heavy bitumen diluted with synthetic light oil (MKH)

The chemical composition of the above oils is included in Appendix E of the Marine Ecological Risk Assessment for Kitimat Terminal Operations (Stephenson et. al, 2010).

Physical property tests relevant to oil spill response are included in two Technical Data Reports authored by SL Ross (SL Ross 2010a, 2010b).

Please refer to Northern Gateway's response to Haisla Nation IR 1.24.

References:

SL Ross. 2010a. Properties and Fate of Hydrocarbons from Hypothetical Spills in the Open Water Area Technical Data Report. Prepared for Enbridge Northern Gateway Pipelines Limited Partnership. Calgary, AB.

SL Ross. 2010b. Properties and Fate of Hydrocarbons from

Hypothetical Spills in the Confined Channel Assessment Area and at the Marine Terminal Technical Data Report. Prepared for Northern Gateway Pipelines Inc. Calgary, AB.

Stephenson, M., A. St-Amand, P. Mazzocco and J.-M. Devink. 2009. Marine Ecological Risk Assessment for Kitimat Terminal Operations Technical Data Report. Prepared for Northern Gateway Pipelines Inc. Calgary, AB.

- b) The selection of shoreline cleanup or treatment tactics is dependant, in part, on the physical characteristics of the oil. This topic, and a discussion on the fate and behaviour of these oil types for different habitats, is discussed in detail for a range of generic oil types in the “Field Guide for Oil Spill Response on Marine Shorelines” published by Environment Canada (Owens and Sergy 2010). The guide includes a specific section on tactics for marine wetlands (Section 4.13). On-water strategies and tactics that would be applicable for rivers are discussed in this Field Manual. It is Northern Gateway's current understanding that Environment Canada is considering the completion of a “Field Guide for Oil Spill Response in Freshwater Environments” that would provide additional guidance on freshwater rivers, riverbanks and wetlands.

There would be little difference in the operational response to the Project oils as compared to more conventional oil examples which have a similar behaviour and fate.

The physical properties of Project-related hydrocarbons are described in the following two technical data reports.

References:

SL Ross. 2010a. Properties and Fate of Hydrocarbons from Hypothetical Spills in the Confined Channel Assessment Area and at the Marine Terminal Technical Data Report. Prepared for Northern Gateway Pipelines Inc. Calgary, AB.

SL Ross. 2010b. Properties and Fate of Hydrocarbons from Hypothetical Spills in the Open Water Area Technical Data Report. Prepared for Enbridge Northern Gateway Pipelines Limited Partnership. Calgary, AB.

Owens, E.H. & Sergy, G.A. 2010. A Field Guide to Oil Spill Response on Marine Shorelines. Emergencies Science and Technology Section, Science and Technology Branch, Environment Canada, Ottawa, Ontario.

2.15

2.15 Reference: Vol. 7B: Risk Assessment and Management of Spills- Section 7 p.7-7 and 8

Preamble: "Although baseline chemical data are not available for groundwater resources along most of the pipeline route, hydrocarbon concentrations in groundwater are expected to be below detectable levels in areas where there is no current or past human activity"
Further, one reads "Depending on groundwater conditions, contaminated groundwater may then move to a discharge point and affect surface water quality farther away"

Request:

- a) Is the proponent willing to collect baseline monitoring data on groundwater hydrocarbon concentrations?
- b) If not, why not?
- c) Is the proponent willing to collect baseline monitoring data on groundwater movements to determine how far downstream contamination from a spill can spread?
- d) If not, why not?

Response:

- a) Northern Gateway conducted a baseline program including hydrogeology field survey, groundwater sampling, field measurements (physical water quality parameters), laboratory analyses for major ions and nutrients (Appendix F table F1- Hydrogeology Technical Data Report, 2010). The ESA was prepared following CEA 2007 and NEB Filing Manual 2008 guidelines. Sec. 52 Vol. 6A section 3.2.5 pp. 3-6 and 3-17.
- b) Not applicable.
- c) Yes. Northern Gateway will design and implement a groundwater monitoring program including the collection of baseline monitoring data as required by federal and provincial regulations. Prior to construction, background groundwater data will be collected. During operations, groundwater monitoring will be implemented. Duration and frequency of groundwater sampling and list of analytes (e.g., petroleum hydrocarbons (PHCs), polycyclic hydrocarbons (PAH), and naphthenic acids (NAs)), will be finalized before operations begin and will meet regulatory requirements.

Northern Gateway has identified groundwater features within 500 m of proposed RoW and measured groundwater levels during baseline hydrogeology field studies (Appendix E p E-21, Hydrogeology Data

report 2010). If a spill were to occur and leak into the groundwater, contamination of surface streams through recharge from groundwater aquifers is most likely to be limited to aquifers that are narrow, primarily composed of sand and gravel, and under the influence of surface water. These are generally shallow aquifers, which have local flow patterns following surficial topography (i.e., moving from higher to lower elevations). Discharge to surface water would occur during the wintertime. Where an environmentally sensitive recharge area is located within the pipeline corridor or an aquifer within the corridor is linked to such a recharge area Northern Gateway will collect baseline information on the aquifer. This information would be used by Northern Gateway, in the event of a spill, to develop and calibrate a predictive model for flow patterns, groundwater movement and direction of flow or contaminants; water and contaminant travel time; horizontal and vertical hydraulic conductivity and boundary condition conductance in environmentally sensitive recharge zones.

d) Not applicable.

2.16

Reference: Vol. 7B: Risk Assessment and Management of Spills- Section 7 p.7-8

Preamble: Paragraph 7.4.3 Mitigation Measures states: "The most appropriate mitigation measures would be implemented by following industry standards to bring groundwater to baseline conditions".

Request:

- a) Please describe such industry standards and give examples that brought back baseline conditions to contaminated groundwater with tar sands oil (DilBit)?
- b) Please clarify in those examples if baseline conditions were known before contamination?
- c) If no hydrocarbons were present before contamination, did industry standards mitigation measures succeed in eliminating all contaminants in the groundwater or did the mitigation measures simply achieved applicable guidelines?

Response:

- a) Please see Northern Gateway's response to JRP IR 6.2a). Typical approaches would be to first characterize the degree and extent of contamination in the groundwater. In the oil sands areas it is not uncommon for groundwater to contain detectable concentrations of hydrocarbon which are naturally occurring. As a part of the characterization study, background concentrations would be established to provide a potential baseline for remediation targets. The background is normally established up-gradient of the source area in areas representative of the site condition but have been unaffected by the site activities. The groundwater quality within the affected area would be compared to the local background chemistry to determine the degree of impact. The water quality would also be compared to applicable regulatory standards. Target remediation levels would be established based on background concentrations or regulatory guideline, whichever is greater. Options for mitigation and/or management would be evaluated and an optimal solution would be selected based site specific ground conditions and on the requirements and objectives of the remediation/risk management program. Potential options could include pump and treat, in-situ remediation methods or monitored natural attenuation.
- b) General baseline conditions were established over a relatively broad area during the baseline data collection phase of the Project. These conditions would be considered in assessing the preliminary degree of impact and ultimately on a need to further investigate the site to determine site specific background levels. The latter exercise is important since the site-specific evaluations take into consideration natural variability which may occur across the site.

- c) Typical approaches are to meet applicable health or ecological standards which reduce the risk to human or ecological receptors. Where no detectable hydrocarbon concentrations are present within the background, remediation targets would default to applicable risk based criteria, translating to compliance with Tier 1 guidelines or if appropriate, establishment of a Tier 2 guideline which takes into consideration site specific conditions.

2.17

Reference: Vol. 7B: Risk Assessment and Management of Spills- Section 7 p.7-15

Preamble: Paragraph 7.7.2 Potential Effects on Wildlife states that "If SARA-listed species or species of management concern are affected by a spill along the pipeline route, Northern Gateway would consult with provincial and federal agencies and, as appropriate, Aboriginal groups, to identify possible options and management strategies".

Request: a) Is this statement indicating that "possible options and management strategies" will always be available?
b) Is "no option" a "possible option"?

Response: a) That is correct. Options and management strategies will always be available. Determining which options and management strategies will be applied in the event of a spill will be done in consultation with resource management agencies and participating Aboriginal groups.
b) Doing nothing is a possible option if, in consultation with resource management agencies and participating Aboriginal groups doing nothing is acceptable and when doing something may cause more damage than leaving the site to recover naturally.

2.18

Reference: Vol. 7B: Risk Assessment and Management of Spills- Section 7 p.7-21

Preamble: In paragraph 7.7.4 Follow up and Monitoring, one reads: "A follow-up program may be done to assess effectiveness of mitigation measures and cleanup techniques"

Request: a) What are the circumstances or conditions for which a follow up program will not be done?

Response: a) A follow-up program would not be done if, based on consultation with resource management agencies, participating Aboriginal groups and affected stakeholders, one is not considered necessary and/or if impacts to the environment are unlikely to occur. For example, a small spill on a gravel or concrete pad within a Northern Gateway facility where virtually all material has been deemed to have been recovered may not require a follow-up program.

2.19

Reference: Vol. 7B: Risk Assessment and Management of Spills- Section 7 p.7-21

Preamble: In paragraph 7.8 Freshwater Fish and Fish Habitat, one reads:

- i) "Fish eggs and larvae are more sensitive and less mobile (USFWS 2006, Internet site), so are most vulnerable." Further, from what is being seen in the tar sands oil spill in the Kalamazoo system, one year after the spill, there are about 200 acres of submerged oil in 6" of sediments in certain locations at the bottom of the river and "workers use high-pressure water "stingers" to stir goblets of oil from the sediment on the river bottom. Crews on other vessels follow, scooping the oil into garbage bags at natural deposition points along the polluted zone".(Financial Post, July 23, 2011).
- ii) "Salmonid species that have variable maturity times (allowing cohorts to overlap) may have the best chance to recover".
- iii) "Anadromous species such as pink, chum and ocean-type chinook salmon"

- Request:**
- a) From (i) what is known of the particular effects of tar sand oil (diluted bitumen) which accumulates in sediments on salmonid eggs and larvae survival?
 - b) From (i), what will be the effects of the stirring of the sediments on the survival of fish and larvae and on benthic invertebrates?
 - c) From (ii) does this statement mean that the species with no variable maturity times will be wiped out?
 - d) From (iii) what is an ocean-type chinook?
 - e) From (iii) is there non ocean type chinook?
 - f) Why are Coho not mentioned?

- Response:**
- a) Toxicity of residual oil could be an issue in soft sediment deposits at the sides of slow moving low gradient rivers, which could have effects on the invertebrates and predators in those habitats, but probably not on salmonid eggs as salmon do not favour those habitats for spawning.
 - b) In the short term, the effects of high-pressure washing the substrate is sediment suspension and associated effects and the potential mobilization of crude oil and associated compounds. These effects have to be weighed against the effects of leaving the sediments in-place and allowing natural processes of degradation to break down deposited oil.
 - c) Not having a variable maturity means that sometimes a larger

proportion of the population is in the stream and at risk than a variable maturity species. For example chinook juveniles emerging in one spring may return over several years, while all of the pink salmon returns from one spring will return together.

- d) An ocean type chinook migrates to the sea relatively soon after emergence.
- e) 'Non ocean' type chinook are termed 'stream type' and spend one or more winters in a freshwater environment before migrating to the ocean.
- f) No particular reason. Coho in freshwater have an added resiliency because, while in freshwater, they are typically distributed widely in the watershed and thus less susceptible to releases in any particular location.

2.20

Reference: Vol. 7B: Risk Assessment and Management of Spills- Section 7 p.7-24

Preamble: The application states "Residual hydrocarbon contaminants in sediment would likely cause mortality of benthic invertebrates (Lytle and Peckarsky 2001; US EPA 1999, Internet site), which would lower the food supply for insectivorous fish (e.g., salmonids)

- Request:**
- a) Will tar sands oil (diluted bitumen) which deposit in sediments cause more mortality in benthic invertebrates?
 - b) Will tar sands oil (diluted bitumen) which deposit in sediments have more detrimental effects on salmon populations because of their destruction of benthic invertebrates?

- Response:**
- a) As explained in the Application (Volume 7B, Section 7) spilled hydrocarbon contaminants entering a stream or river would have the potential to be deposited in sediments. This potential would be greater for diluted bitumen than for lighter hydrocarbon products, due to its density. However, contamination of sediment is usually present, and somewhat persistent, following spills of crude oil or refined oil products that enter aquatic ecosystems. Such contamination of sediments can cause mortality of benthic invertebrates and alteration of benthic invertebrate community composition and productivity, which can have knock-on effects on the productivity of fish populations. Sediment contamination can also affect the survival and health of developing fish eggs and embryos in spawning habitats. These topics are all discussed in the above noted section of the Application (Volume 7B).
 - b) Please refer to the Northern Gateway's response to J. Wier IR 2.20a).

2.21

Reference: Vol. 7B: Risk Assessment and Management of Spills- Section 7 p.7-24

Preamble: In the above reference one reads "In fast-flowing channels, winter and spring flows are expected to flush accumulated fine sediments and hydrocarbons from erosional areas in the first year. However, habitat in back eddies, side channels, and other areas with reduced flow would likely remain affected. Longer term effects on periphyton and benthic invertebrates would depend on the degree of flushing that occurs. Hydrocarbons in surface sediments can degrade relatively quickly, but if they sink into the sediment, contamination at depth may remain indefinitely (Reddy et al. 2002; Wang et al. 1998). As a result, time for full recovery of stream habitat can vary".

Request:

- a) Will tar sands oil (diluted bitumen) deposits be flushed the same way as synthetic oil?
- b) If hydrocarbons remain in definitively in the sediments, does that mean that some fish populations will be completely wiped out and full recovery of stream habitat impossible to achieve?
- c) Please give examples of "full recovery of stream habitat" timelines as none of the 3 examples given (Pine River, St Lawrence River marsh and small trout stream in New York) show such full recovery.

Response:

- a) Flushing of diluted bitumen depends in part on streamflow velocity, turbulence of flow, and the properties of the material (density, adhesion, etc.) being flushed. The properties of diluted bitumen are presented in the Technical Data Report "Properties and Fate of Hydrocarbons from Hypothetical Spills in the Confined Channel Assessment Area, Section 3 (Tables 3-1 to 3-4) and summarized in the Application (Volume 7B, Section 4.1). Diluted bitumen is denser, more viscous and has greater adhesion than synthetic crude oil. Therefore, greater velocities may be required to flush diluted bitumen than synthetic oil. While deposits may settle in back eddies or other low velocity zones, they may be remobilized during higher flow events.
- b) No, with appropriate clean-up and remediation, fish populations will recover. See Northern Gateway's responses to Haisla Nation IR 1.38 to IR 1.42.
- c) A comprehensive summary of the recovery of the Pine River fish population is currently being prepared and will be submitted to the JRP.

2.22

Reference: Vol. 7B: Risk Assessment and Management of Spills- Section 7 p.7-26

Preamble: In paragraph 7.8.4 Follow-up and Monitoring, one reads:

"If a spill into a watercourse occurs, the effectiveness of mitigation and cleanup measures may be assessed at affected and unaffected sites by monitoring:

- water
- sediment
- density and species richness of periphyton, invertebrate, macrophyte and fish populations

Monitoring would continue until water and sediment meet provincial guidelines for the protection of aquatic life."

Request: a) What are the circumstances where the effectiveness of mitigation and clean up measures will NOT be monitored?
b) What will be proposed if the monitoring program finds that such measures are ineffective?

Response: a) Please see Northern Gateway's response to Haisla Nation IR 1.42e) (under Habitat).
b) Please see Northern Gateway's response to Haisla Nation IR 1.42e) (under Habitat).

2.23

Reference: General Oil Spill Response Plan, March 2011 p.1-8

Preamble: In paragraph 1.3 Enbridge Environment, Health and Safety Policy, one reads in Figure 1-3 a commitment to "consult openly with our customers, neighbours, employees and partners". I contend that this commitment has not been lived up to with the Northern Gateway proposal with their supposedly "public" consultation where the real public was absent, except for their CAB (Community Advisory Board) where they control the agenda and the microphone. They mostly catered to Municipalities, Chambers of Commerce, service clubs etc... and consistently refused public fora, except for the one which only reluctantly, they agreed to attend in Terrace.

Request:

- a) Please define "neighbour" in the referenced policy
- b) Please define "openly"
- c) Please clarify if "openly" also means, first, responding, and second, signing with a name other than Enbridge to electronic correspondence from individuals

Response: The reference in this Information Request is to Northern Gateway's commitment to adopt Enbridge's corporate Environment, Health and Safety Policy.

- a) In this policy, "neighbour" refers to companies and/or individuals who work and/or live in proximity to Enbridge construction and operation activities.
- b) In this policy, "openly" means that information will be exchanged between Enbridge, customers, neighbours, employees and partners. The method of exchange will be determined based on the situation but may include meetings, websites, toll free phone lines, FAQ, email exchanges, and/or newsletters.
- c) The means of corresponding openly will be determined based on the situation. Large projects such as Northern Gateway have a website and central email account set up with personnel dedicated to managing the large amount of correspondence. These responses are put together by a multi-disciplinary team, not just one person. As such, we sign on behalf of Enbridge Northern Gateway Pipelines as a team, and use this signature to act as a response on behalf of the company. Our practice has been to sign update notification letters to the public or responses to queries over the Northern Gateway info line in this manner. Members of our multi-disciplinary team will be available during the hearings to answer any additional questions you may have.

2.24

Reference: General Oil Spill Response Plan, March 2011 p.1-9 and 10

Preamble: In paragraph 1.5.1 one reads: "The operational plans will be completed six months before commissioning of the Project, and will include details for supporting emergency response along the pipeline right-of-way (RoW), at the Kitimat Terminal, and along the shipping routes in Canadian waters". It is not clear how this plan will come about and what public involvement there will be.

Request:

- a) Please describe who will be the stakeholders, if any, involved in the formulation of the ORSP plans
- b) Will the OSRP be offered for public comments and discussions?

Response:

- a) Stakeholders that Northern Gateway anticipates would be consulted and their input considered during the development of the operational oil spill response plans include, but may not be limited to, local emergency service personnel, Project response organization personnel, response contractors, water utilities, local industry groups, environmental and emergency management authorities and regulatory bodies.

Communication with various levels of government, aboriginal groups, and local area committees would be considered in the identification of environmental and socio-economic sensitivities. Northern Gateway plans to augment the operational oil spill response plans by detailing site-specific oil spill response tactics for priority sensitive sites.

- b) No. Please refer to Northern Gateway's response to J. Wier IR 2.24a).

2.25

Reference: General Oil Spill Response Plan, March 2011 p.1-14

Preamble: In Table 1.5 titled "Incident Classification Communication, Actions and Resources", public communication is shown as "Courtesy, at Northern Gateway's discretion" for the 3 levels of emergency.

Request: a) Please list the reasons for which any accident would not be communicated to the external public

Response: a) To clarify, courtesy public notifications are only appropriate at the Alert Level as outlined in the reference table.

Enbridge reports all releases that meet the applicable regulatory reporting criteria. As such, Enbridge makes notification of pipeline releases meeting the detailed external regulatory reporting criteria, to the appropriate agencies with jurisdiction.

Canadian reporting criteria have been provided in **Attachment J. Wier IR 2.25**.

2.26

Reference: General Oil Spill Response Plan, March 2011 p.3-11

Preamble: In paragraph 3.5 "As Low as Reasonably Practicable" one reads: "The as low as reasonably practicable (ALARP) principle assumes that applicable regulatory requirements will be satisfied in a way that will balance the acquisition of additional oil spill response resources in proportion to the anticipated loss of ecological resources. The ALARP principle is most relevant for determining equipment requirements and cleanup endpoints." This explanation is most difficult to understand.

Request: a) Does this mean that the oil spill response will aim at being as small as possible to simply satisfy regulatory requirements and not go beyond?

Response: a) No, please refer to Northern Gateway's response to Coastal FN IR 1.22f).

2.27

Reference: General Oil Spill Response Plan, March 2011 p.4-2

Preamble: In the reference above, one reads "The current pipeline design limits potential spill volumes to less than 2,000 m³ at key watercourse crossings. The forecast maximum spill from the pipeline is approximately 7,800 m³ located near KP 165". This represents less than 2 minutes of spill at water crossings and about 6 minutes at KP165 for the 525,000 barrels/d pipeline of tar sands oil, which seem unrealistic.

Request: Please describe how the 2000 m³ (317 barrels) and 7,800 m³ (1238 barrels) maximum spill volumes are obtained
Please explain how a spill can be controlled in less than 2 minutes
Please explain the range of volumes of spills that can take place, given that a pin hole crack in the Enbridge pipeline in the North West Territories (WLR KP380) in May 2011, spilled undetected volumes poorly estimated at between 700 to 1500 barrels from an initial estimate of 4 barrels! (WLR KP380 Enbridge pipeline only carries 39,400 barrels/d which is more than 10 times less than the proposed pipeline).
If a spill on land occurs larger than 2000 m³ and 7,800 m³, what will be Northern Gateway liability for having miscalculated the risk?

Response: a) The potential spill volumes were calculated using a proprietary volume out computer model to provide an estimate of potential maximum volume product released at any location along the pipelines. Please refer to Northern Gateway's response to Haisla Nation IR 1.21c) for further information.

Please note that there was a mathematical error in the Preamble calculations. At the annual average throughput rate of 525,000 barrels/day and based on a conversion factor of 1 barrel = 0.159 m³, a volume of 2000 m³ would flow through the oil pipeline in approximately 34.5 minutes. For 7,800 m³ this would represent a flow duration of approximately 134.6 minutes. It is important to note that the potential maximum volume released at any location is based on both the dynamic (pressurized) volume, prior to full valve closure, and the static (gravity) drain down taking into account natural topography and pipeline profile characteristics. The referenced 2,000 m³ and 7,800 m³ volumes are a combination of the initial volume released during the five minute response and valve closure time and the volume released from the drawdown within the pipeline section after valve closure. Note that the maximum release volumes listed above are comprised of almost entirely the volume of product remaining in the pipeline after full closure of the valves and the release by gravity drain down.

- b) Please refer to Northern Gateway's response to J. Wier IR 2.27a) above.
- c) The leak referred to above occurred in May 2011, near the town of Wrigley, NWT, on the Norman Wells pipeline. This NPS 12 oil pipeline was installed in 1985 and has a capacity of 8,000 m³/day (50,000 bbl/day). Although the initial leak was thought to be 0.6 m³ (4 bbl) it was subsequently estimated at approximately 240 m³ (1500 bbl) once remediation activities were underway. The cause was a pinhole leak, a rare occurrence. Enbridge will be conducting a full inspection of the pipeline this fall, using sophisticated in-line inspection equipment, and the cause of the pinhole will be determined once the section of pipe is removed and analyzed.

Northern Gateway is designing the pipelines to limit the potential maximum volume release along the pipelines in accordance with criteria developed as part of the pipeline risk assessment. This potential release volume currently varies from less than 2000 m³ at selected watercourses to a maximum of 7800 m³ at one particular low consequence location. Please refer to the Response to JRP Request for Additional Information (March 2011) Section A, for details on the potential maximum spill volumes along the entire oil pipeline route.

Knowledge about pipeline risk has increased exponentially over the last two decades. Higher levels of pipeline safety resulting from performance based industry standards and regulations, optimal design, high quality pipe and coating manufacture, construction quality assurance through inspection and testing, and safety first operations and contingency provisions have resulted in a reduced accident and incident rate for modern transmission pipelines. Best practices and improved technology are applied to every aspect of the pipeline lifecycle.

Current modern pipeline design, construction, testing and inspection (during construction and operation), and safety first operation have significantly increased pipeline reliability and reduced spill occurrences. In fact, from a review of the pipeline ruptures under NEB jurisdiction, there have been no ruptures to pipelines constructed within the past 25 years.

In the case of corrosion, it is generally known that new, state-of-the-art, internally inspected pipelines are significantly less likely to fail due to the effects of corrosion than older pipelines represented in the database and the example referred to above. Specifically, the following factors help mitigate the corrosion potential:

1. Internal Corrosion
 - High quality steels

- Advanced internal inspection tools used regularly to detect the onset of internal or external corrosion
- Corrosion inhibitors
- Cathodic protection
- Construction inspection and quality control (QC)

2. External Corrosion, in addition to the above:

- High quality external coating
- Regular external surveillance and inspection

External third party impacts are minimized by RoW access restrictions, regular patrols to detect the potential for any unauthorized activity, conspicuous posting of pipeline location, the one-call system (“call before you dig”) and general public information and education, particularly where activity levels in the vicinity of the pipeline are relatively high. Natural external impacts such as those from avalanches, slides, or floods are mitigated through avoidance by routing, special design provisions if avoidance is not feasible, and continual monitoring and surveillance to detect and eliminate any developing threats.

Operational failures such as overpressure, excessive vibration, or operator error are largely eliminated by provisions including:

- Pipeline integrity program
- Operator training and certification
- Real time pipeline condition monitoring and ability to remotely respond by shut-in, isolation, or change in operating parameters
- Conservative safety first operating philosophy and practice

Finally, in the instance a failure occurs, swift response both in pipeline shutdown and isolation and mobilization and utilization of appropriate spill contingency personnel and equipment, will significantly reduce any consequences.

- d) Northern Gateway will be responsible for the response and clean-up of all spills that occur on its pipelines and facilities.

2.28

Reference: General Oil Spill Response Plan, March 2011 p.4-6

Preamble: From the reference above, one reads under 4.6.1.1 High Consequence Area Maps:

"Northern Gateway will maintain maps identifying high consequence areas along, or close to, the pipelines that could be potentially affected by a spill, including:

- human settlements
- Indian Reserves
- commercially navigable waterways
- officially designated protected areas
- environmentally sensitive areas (as defined, see Section 4.6)
- important traditional harvesting sites (where information is available)
- important cultural and archaeological sites (where information is available)
- licensed water use"

Request: Will those High Consequences Area been made public ?
Will public have an input in their designation?
What will happen if what local residents consider "High Consequence Area" is rejected by Enbridge?

Response: a) Northern Gateway has developed a data set as shown in Response to JRP Request for Additional Information (March 2011). This data set, referred to as Consequence Areas ("CA"), is based on definitions provided in Section A.3 of the response. The CA definitions include:

- Officially designated protected areas which include federal and provincial parks, conservancies, ecological and wildlife reserves,
- Settlements which included hamlets, villages, towns and cities,
- Indian reserves,
- Licensed water withdrawal locations related to human consumption or other uses such as for industry and agriculture,
- Watercourses with endangered or harvested fish species,
- Wetlands, fens and marshes.

Please refer to the maps contained in Northern Gateway's response to JRP Request for Additional Information (March 2011), Appendix A and Appendix B, which identify the consequence areas for the Project.

The definitions of Northern Gateway's CAs and the HCA definitions that Enbridge Operations are developing are very similar such that for all practical purposes the intent of the definitions are the same and the

terms can be used interchangeably. The data sets used for the Northern Gateway CA maps will provide the basis for the HCA maps produced six months prior to the commencement of operations.

- b) The location of the consequence areas will be finalized during detailed engineering. An opportunity for public input on the identification of consequence areas would be available through the Community Advisory Boards (“CAB”). The CAB process allows for respectful and meaningful exchange of ideas and concerns regarding the Project. This process has been in place throughout the regulatory process and has resulted in excellent participation by the public, Aboriginal groups and other stakeholders, and has influenced the Project’s design.

Northern Gateway is responsible for the design, operation and integrity of the pipelines and consequently Northern Gateway will select the final locations of the consequence areas.

2.29

Reference: General Oil Spill Response Plan, March 2011 p.4-7

Preamble: From the reference above, the tactical response is said to depend, among other factors, on the type of hydrocarbon spilled but no discussion is offered as how the strategies will differ with each type.

Request: a) Please describe the differences in strategies in relation to the type of hydrocarbon discharged

Response: a) Please refer to Northern Gateway's response to Federal Government IR 89 (III).

2.30

Reference: General Oil Spill Response Plan, March 2011 p.4-7

Preamble: Control points are defined as "pre-planned oil spill response sites" with some criteria to select them

- Request:**
- a) Please detail how "limited environmental effect" is a criteria for establishing a control point
 - b) Are there distance limits between control points?
 - c) When there will be no "good road access or alternative access (e.g., aerial)" does that mean there will no control points for those areas?
 - d) Does "aerial access" mean the ability to land and/or deposit equipment?
 - e) Please give a ballpark estimate of the number of control points for the whole pipeline route proposal

Response:

- a) The reference to "limited environment effect" in Section 4.7.1 of the General Oil Spill Response Plan ("GOSRP") refers to the intended objective of minimizing adverse effects on the environment, which may be associated with locating a control point at a particular site. For example, a pre-disturbed site with good access is preferable.

- b) Distance between control points or the number of control points on a watercourse is not pre-set. Each river is examined on a case-by-case basis. Following detailed design and planning, control points would be defined in the operational Pipeline Oil Spill Response Plan ("POS RP"), which would be finalized at least six months prior to commencement of operations and filed with the JRP.

Please refer to the River Control Points for Oil Spill Response Technical Data Report for examples.

- c) Please refer to Northern Gateway's response to J. Wier IR 2.30b). Control points will be aligned with the access plans during detailed design. Control points may also be used as staging areas for accessing more remote areas along a watercourse.
- d) Aerial access may mean either ability to land or ability to deposit equipment in the proximity of areas where response personnel cannot otherwise access.
- e) Please refer to Northern Gateway's response to J. Wier IR 2.30b).

2.31

Reference: General Oil Spill Response Plan, March 2011 p.5.1

Preamble: Paragraph 5.1 asserts that to "commence a response safely depends...on the type of hydrocarbon released" but does not offer any discussion on the differences in response with each type of hydrocarbon spilled.

Request: a) Please describe the specifics of the safety and health guidelines to respond to a tar sands oil (diluted bitumen) spill.

Response: a) As stated in the General Oil Spill Response Plan ("GOSRP"), Section 5.3, site specific health and safety plans would be made available in the event of a spill. Please see the attached Material Safety Data Sheet for bitumen which includes safety and health considerations for diluted bitumen (**Attachment J. Wier IR 2.31**).