NEB Application Update

Volumes 3, 6A and 6C

ENBRIDGE NORTHERN GATEWAY PROJECT

Update to Sec. 52 Application for the Enbridge Northern Gateway Project

December 2012

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Section 2.4 Pipeline Route Revisions

Section 2.4.21 Pipeline Route Rev. V Revisions (New Section)

The Application referred to Pipeline Route Rev. R and the Update to the Application (Volume 3), which was filed in December 2010, referred to Pipeline Route Rev T. Update to the Application (Volume 3), which was filed in January 2012, referred to Pipeline Route Rev. U. The following additional revisions have been made to the pipeline route and pump station locations. These revisions are incorporated in Pipeline Route Rev. V and result from further stakeholder consultation, Aboriginal engagement, engineering revisions and environmental considerations.

Where these route revisions extended beyond the 1-km wide corridor of Pipeline Route Rev. U shown in the Appendix C.2 Route Atlas Imagery Maps, the project effects assessment area (PEAA) has been adjusted and environmental and socio-economic assessment work conducted. These areas are described in more detail in the Update to Volume 6A and 6C.

2.4.21.1 Private Lands (KP 20 to KP 23)

The pipeline route has been relocated to increase the distance from a private residence (see Appendix D, Figure D-19).

2.4.21.2 Alexander First Nation (KP 59 to KP 71)

The pipeline route has been relocated onto the Alexander 134 Indian Reserve as agreed to with the Alexander First Nation and as described in Northern Gateway's Reply Evidence (Exhibit B83-40), Attachment 17, Section 6.2.2 (see Appendix D, Figure D-20).

2.4.21.3 Alexander First Nation (KP 241 to KP 262)

The pipeline route has been relocated onto the Alexander 134A Indian Reserve as agreed to with the Alexander First Nation and as described in Northern Gateway's Reply Evidence (Exhibit B83-40), Attachment 17, Section 6.2.2 (see Appendix D, Figure D-21).

2.4.21.4 McLeod Lake Indian Band (KP 718 to KP 720)

The pipeline route and Bear Lake pump station (KP 718.8) have again been relocated off of the Sas Mighe 32 Indian Reserve as agreed to with the MacLeod Lake Indian Band and as described in Northern Gateway's Reply Evidence (Exhibit B83-40), Attachment 17, Section 6.6.1 (see Appendix D, Figure D-22).

2.4.21.5 Morice River Area (KP 997 to KP 1049)

The pipeline route has been relocated further away from the Morice River as requested by Fisheries and Oceans Canada, Environment Canada, and local stakeholders and as described in Northern Gateway's Response to JRP IR 11.10(c) (Exhibit B135-1). This route revision will reduce potential environmental

effects, provide an improved Morice River crossing location, and improve constructability (see Appendix D, Figure D-23).

2.4.21.6 Pump Station Location Revisions

The following additional pump station location revisions have been made:

- The Whitecourt pump station (KP 204.5) has been relocated onto the Alexis Whitecourt 232 Indian Reserve as agreed to with the Alexis Nakota Sioux Nation and as described in Northern Gateway's Reply Evidence, Attachment 17, Section 6.3.2 (Exhibit B83-40).
- The Smoky River pump station (KP 418.0) has been relocated to improve the hydraulic design for the oil and condensate pipelines.
- The Bear Lake pump station (KP 718.8) and pipeline route have been relocated off of the Sas Mighe 32 Indian Reserve as agreed to with the MacLeod Lake Indian Band and as described in Northern Gateway's Reply Evidence, Attachment 17, Section 6.6.1 (Exhibit B83-40).
- The Houston pump station (KP 1006.2) has been relocated to align with the Morice River Area pipeline route revision described in Section 2.4.20.5 above.

Section 2.6 Potential Pipeline Route Revisions under Consideration

Based on recently received information, the following potential pipeline route revision will be considered:

- There is a possibility of relocating the pipeline route (KP 929 to KP 943) further north of the Burns Lake area to avoid proposed Indian Reserve lands that would overlap the pipeline route between KP 931 and KP 932 (see Appendix D, Figure D-24). This revision will be evaluated when further information on the proposed Indian Reserve lands is available and when further consultation with the relevant Aboriginal groups has taken place.

Section 4.2.3 Hydraulic Design Results

In Section 4.2.3, Table 4-3 is updated with the table below, based on Pipeline Route Rev. V.

Table 4-3 (Revised) Oil System Pump Station Discharge Pressures

Pump Station	Approximate Kilometre Post (Route Rev. V)	Typical Discharge Pressure at Design Rate	
		psig	kPa
Bruderheim	0	2130	14685
Whitecourt	204.5	2130	14685
Smoky River	418.0	2112	14562
Tumbler Ridge	600.3	1294	8922
Bear Lake	718.8	1612	11114
Fort St. James	827.8	1670	11514
Burns Lake	928.8	1672	11528
Note: Conversion Factor from psig to kPa is 6.8948			

Section 4.3.3 Hydraulic Design Results

In Section 4.3.3, Table 4-6 is updated with the table below, based on Pipeline Route Rev. V.

Table 4-6 (Revised) Condensate System Pump Station Discharge Pressures

Pump Station	**Approximate Kilometre Post** (Route Rev. V)	**Typical Discharge Pressure at Design Rate**	
		psig	**kPa**
Kitimat	1177.6	667	4599
Clearwater	1130.0	1809	12473
Houston	1006.2	1195	8239
Burns Lake	928.8	1246	8591
Fort St. James	827.8	1416	9763
Bear Lake	718.8	1394	9611
Tumbler Ridge	600.3	1025	7067
Smoky River	418.0	1419	9784
Whitecourt	204.5	1142	7874
Note: Conversion Factor from psig to kPa is 6.8948			

Section 5.1 Line Pipe

In Section 5.1, Table 5-1 is updated with the table below, based on Pipeline Route Rev. V.

Table 5-1 (Revised) Oil Pipeline Design Parameters

Item	Line Pipe
Outside diameter (mm)	914
Max. design pressure range (kPa)	15082-16892
CSA notch toughness category	I
Design factor	0.72
Min. design temperature (°C)	-5
Max. design temperature (°C)	50
Material grade (MPa)	483
Min. Wall thickness range (mm)	19.8-22.2
Estimated length (km)	1,177.6

Table 5-2 is updated with the table below, based on Pipeline Route Rev. V.

Table 5-2 (Revised) Condensate Pipeline Design Parameters

Item	Line Pipe
Outside diameter (mm)	508
Max. design pressure range (kPa)	9765-13031
CSA notch toughness category	I
Design factor	0.72
Min. design temperature (°C)	-5
Max. design temperature (°C)	50
Material grade (MPa)	483
Min. Wall thickness range (mm)	7.1-9.5
Estimated length (km)	1,177.6

Section 5.5 Valves, Flanges and Fittings

In Section 5.5, the referenced Table F-1 is updated with the respective table in Appendix F, based on Pipeline Route Rev. V.

Section 6.3.2 Stage 2: Detailed Site Review

In Section 6.3.2, the referenced Table G-1 is updated with the respective table in Appendix G, based on Pipeline Route Rev. V.

Section 8.3 Pumps and Motors

In Section 8.3, Table 8-1 is updated with the table below, based on Pipeline Route Rev. V.

Table 8-1 (Revised) Summary of Pumps and Motor Size

	Approximate Kilometre Post (Route Rev. V)	**Purpose**	**Oil Pumps and Motor Size**	**Condensate Pumps and Motor Size**
Bruderheim	0	Oil	6 @ 4,290 kW (5,750 HP)	N/A
Whitecourt	204.5	Oil and Condensate	6 @ 4,290 kW (5,750 HP)	2 @ 4,290 kW (5,750 HP)
Smoky River	418.0	Oil and Condensate	5 @ 4,290 kW (5,750 HP)	2 @ 4,290 kW (5,750 HP)
Tumbler Ridge	600.3	Oil and Condensate	3 @ 4,290 kW (5,750 HP)	2 @ 4,290 kW (5,750 HP)
Bear Lake	718.8	Oil and Condensate	3 @ 4,290 kW (5,750 HP)	2 @ 4,290 kW (5,750 HP)
Fort St. James	827.8	Oil and Condensate	3 @ 4,290 kW (5,750 HP)	2 @ 4,290 kW (5,750 HP)
Burns Lake	928.8	Oil and Condensate	3 @ 4,290 kW (5,750 HP)	2 @ 4,290 kW (5,750 HP)
Houston	1006.2	Condensate	N/A	2 @ 4,290 kW (5,750 HP)
Clearwater	1130.0	Condensate	N/A	2 @ 4,290 kW (5,750 HP)
Kitimat	1177.6	Condensate	N/A	2 @ 4,290 kW (5,750 HP)

NOTES:
HP – horsepower
N/A — not applicable

Section 9 Kitimat Terminal

The tank terminal description is updated to 16 oil tanks. The number of condensate tanks remains at 3. This update will provide the required tank capacity, product segregation and operational flexibility for the Project.

The referenced Figures I-1 and I-2 are updated with the respective figures in Appendix I.

Section 9.1.3 Oil Tanks

The oil tanks description is updated to 16 oil tanks. The terminal site will also have some limited additional civil site development to allow for potential future site utilization.

In Section 9.1.3, Table 9-1 is updated with the table below.

Table 9-1 (Revised) Oil Tank Specifications

Item	Metric Units	Imperial Units
Tank Diameter	74.07 m	243 ft.
Tank Height	24.4 m	80.03 ft
Roof Type	Open-top external floating pontoon	
Minimum Freeboard	1.05 m	3.44 ft.
Nominal Capacity per tank	98,410 m^3	619,000 bbl
Working Capacity per tank	87,440 m^3	550,000 bbl
Total Working Capacity for 16 tanks	1,399,000 m^3	8,800,000 bbl
Design Injection Flow Rate per tank	150,100 m^3/ day	944,000 bpd
Average Takeaway Flow Rate per tank	15,900 m^3/ hour	100,000 bph

Section 9.2.4 Condensate Tanks

In Section 9.2.4, Table 9-5 is updated with the table below.

Table 9-5 (Revised) Condensate Tank Specifications

Item	Metric Units	Imperial Units
Tank Diameter	74.07 m	243 ft.
Tank Height	24.4 m	80.03 ft
Roof Type	Open-top external floating pontoon	
Minimum Freeboard	1.05 m	3.44 ft.
Nominal Capacity per tank	98,410 m^3	619,000 bbl
Working Capacity per tank	87,440 m^3	550,000 bbl
Total Working Capacity for 3 tanks	262,320 m^3	1,650,000 bbl
Design Injection Flow Rate per tank	11,130 m^3/ hour	70,000 bph
Average Takeaway Flow Rate per tank	30,680 m^3/ day	193,000 bpd

Section 9.5.3 Tank Impoundment System

The remote impoundment reservoir location is updated to be located at the southeast end of the tank lot (see Appendix I, Figure I-1). As per the current BC Fire Code, the reservoir size is updated for the following:

- 100% of the volume of the largest tank in the tank farm, plus
- 10% of the aggregate volume of the 18 remaining tanks, plus
- an allowance for potential future tanks, plus
- 100% of the runoff from the catchment area for a 1 in 100 year, 24 hour storm event, plus
- the amount of fire water generated from potential firefighting activities at the tank farm.

Update to Volume 6A and Volume 6C

The following provides updated information to the environmental and socio-economic assessment (ESA) for project activities related to the pipelines. This information is provided as a result of pipeline route and associated project effects assessment area (PEAA) revisions described as Route Rev. V and detailed in the Update to Volume 3 (December 2012).

The Pipeline Route Atlas Maps (see Appendix C.1 Revised) and Route Atlas Imagery Maps (see Appendix C.2 Revised) have been updated to reflect Pipeline Route Rev. V and are contained within the Update to Volume 3 (December 2012). Where route revisions extended beyond the 1-km wide corridor of Pipeline Route Rev U, the project effects assessment area (PEAA) and associated 1 km wide Project Corridor has been adjusted and environmental and socio-economic assessment work conducted. These areas are described in the Update to Volume 6A and 6C (December 2012).

Volume 6A and 6C: Section 3 Scope of Assessment and Environmental Assessment Methods

ESA information was collected and compiled specific to each pipeline route revision rather than as an update to specific environmental and socio-economic discipline sections in the previously filed Volume 6A and 6C. In locations where pipeline route revisions extended outside of the 1 km wide pipeline corridor, additional ESA work was completed based on existing information without additional field work. For atmospheric environment, soils, vegetation, wildlife and fisheries this review consisted of an examination of previous field studies as well as terrain and habitat mapping.

Pipeline route revisions that resulted in changes to watercourse crossing locations in fish bearing waters are assessed for Route Rev. V using the Risk Management Framework (RMF) as described in Volume 6A of the Application.

For non traditional land use and heritage resources a desktop review was conducted that consisted of an examination of previous field assessments, topographic maps and orthophotos combined with a file search of site records maintained by the Alberta Historic Resources Management Branch and the BC Archaeology Branch. A desktop overview of land interests (i.e. tenures or dispositions) that reflect various land and resource activities for the pipeline route revisions was conducted using the Land Status Automated System (LSAS) for Alberta and the British Columbia Integrated Land and Resource Registry (ILLR) for British Columbia. In addition, the potential overlap of parks, protected and designated recreational areas and resource management zones (RMZs) for land and resource management zones (LRMPs) in British Columbia was examined.

In locations where the pipeline route revision did not extend outside of the 1 km pipeline corridor, no additional assessment work was completed except to confirm that similar terrain was crossed. This assessment work was based on a review of orthophotos.

Table 6A-1 (Revised) provides a listing of the proposed pipeline route and PEAA revisions, their location, a description of the revision, comments and an environmental and socio-economic assessment. Appendix C.2 (Revised) contains figures depicting each of the pipeline route and PEAA revisions. Table 6A-2 (Revised) provides a listing of the pipeline revisions as they relate to the effects on freshwater fish and fish habitat.

A summary description of the potential effects of pipeline route and PEAA revisions on identified environmental and socio-economic disciplines are described in the following sections.

Volume 6A: Section 4 Atmospheric Environment

An overview of atmospheric environment (e.g. emission sources) for the Kitimat Terminal is provided in Table 6A-1 (Revised). As indicated in Volume 6A of the Application, the Kitimat Terminal air quality PEAA includes emission sources from the Project, existing emission sources in the District Municipality of Kitimat and Kitamaat Village, and potential future regional emission sources.

Overall, the effects of Route Rev. V on the atmospheric environment are expected to be similar to the effects of Route Rev. U. The Application modeling for emissions from the hydrocarbon tanks at the tank lot assumed 14 tanks plus a possibility in the future of adding an additional 2 tanks. The modeling therefore, overpredicted the expected emissions for the initial design of the tank lot. Original conclusions indicated emissions resulting from operation of the Kitimat Terminal are predicted to be below relevant air quality objectives. No potential effects are expected at the Kitimat Terminal site that have not been previously addressed in the ESA. Consequently, the proposed increase to 16 oil tanks will not alter the conclusions of significance presented in the ESA.

Volume 6A: Section 6 Soils

An overview of soils (e.g., soil series, land capability, etc.) for the areas of pipeline route and PEAA revision is provided in Table 6A-1 (Revised). As indicated in Volume 7A of the Application, site-specific soil stripping and salvage plans will be undertaken and detailed mitigation measures for the handling and storage of topsoil will be defined in the construction environmental protection and management plan.

Overall, the effects of Route Rev. V on soils are expected to be similar to the effects of Route Rev. U. No potential effects are expected along Route Rev. V that have not been previously addressed in the ESA. Consequently, the proposed route will not alter the conclusions of significance as presented in the ESA.

Volume 6A: Section 8 Vegetation

An overview of vegetation (e.g., rare plants, plant communities, wetlands, etc.) for the areas of pipeline route and PEAA revision is provided in Table 6A-1 (Revised). Field assessments and updated mapping of vegetation will be conducted for three segments of Route Rev. V where the pipeline route revision is located outside the 1 km wide corridor. The Alexander FN relocation 134A is a preferred route because it is located next to an existing right of way, as compared to the previous route which would likely have a greater effect on vegetation communities and rare plants. As discussed in Volume 7A, site-specific rare plant surveys will be undertaken in areas of high potential prior to construction.

Overall, the effects of Route Rev. V on vegetation are expected to be similar to the effects of Route Rev. U. No potential effects are expected along Route Rev. V that have not been previously addressed in the ESA. Consequently, the route revisions will not alter the conclusions of significance as presented in the ESA.

Volume 6A: Section 9 Wildlife

An overview of wildlife and wildlife habitat considerations for the areas affected by the pipeline route revisions is provided in Table 6A-1 (Revised). The Alexander First Nation relocation 134A will likely have less effect on wildlife because it parallels existing rights-of-way and infrastructure, including Highway 43, and affects less grizzly bear core habitat area. The Morice River Area alternate will generally have less effect on wildlife riparian habitat since it is located away from the Morice River and floodplain. This revision is also farther from the proposed Wildlife Habitat Area for the Telkwa caribou herd and no longer intersects any primary and secondary goat ungulate winter range polygons. However, this revision no longer parallels the Morice West Forestry Service Road (FSR) and Crystal Creek FSR and offers fewer opportunities to use existing rights-of-way. This may increase linkages between cutblock road networks and increase human access locally but does not preclude Northen Gateway from applying other methods to minimize linear feature density in this region. This revision will also require additional measures to control access during construction and operations. For the remaining segments, Route Rev. V and Route Rev. U are expected to have similar effects on wildlife.

During centerline survey, important wildlife features (e.g., nests, dens, mineral licks) will be identified and where possible, avoided during detailed routing.

Overall, the effects of Route Rev. V on wildlife are expected to be similar to the effects of Route Rev. U. No potential effects are expected along Route Rev V that have not been previously addressed in the ESA. Consequently, the route revisions will not alter the conclusions of significance as presented in the ESA.

Volume 6A: Section 11 Freshwater Fish and Fish Habitat

An overview of fish habitat for the areas of pipeline route and PEAA revision is provided in Table 6A-1 (Revised). The assessment of risk on fisheries and fish habitat at each watercourse crossing is summarized in Table 6A-2 (Revised). The Route Rev. V revision avoids the crossing of 29 tributaries to the Morice River. Twenty of the proposed watercourse crossing locations along Route Rev. U are relocated from the current location to Route Rev. V (6 downstream and 14 upstream). The proposed crossing locations are outside of the zone of influence mapped for past route revisions and as a result, further fish habitat mapping and fish habitat utilization survey work will be conducted to evaluate these new locations and determine the preferred crossing locations within the applied for 1 km corridor.

No potential effects are identified along Route Rev. V that have not been previously addressed in the ESA. Consequently, the route revisions are not expected to alter the conclusions of significance as presented in the ESA. As stated in Volume 6A Section 11, where adverse effects cannot be avoided or mitigated, a compensation plan will be developed in cooperation with DFO and in accordance with DFO's policies and mandate, to offset the corresponding loss of habitat productive capacity.

Volume 6C: Section 5 Non Traditional Land Use

An overview of non-traditional land use for the areas of pipeline route and PEAA revision is provided in Table 6A-1 (Revised).

In both Alberta and British Columbia, there are slight variations in the number of land interests (dispositions or tenures) and resource management zones between the route revisions. There are no changes in the number of parks intersected by the route, protected areas or recreation areas and therefore there are no outstanding land interests (tenures and/or parks, protected areas) that would preclude construction along the proposed route revisions.

An update to 16 oil tanks at the Kitimat Terminal is not expected to alter overall visibility of the marine terminal and therefore impact visual or aesthetic resources. The size and location of the PEAA remain the same as reflected in Route Rev. U. Mitigation for changes to visual and aesthetic resources will be implemented and are detailed in Volume 6C, Section 5.9.3.3 of the Application.

Overall, the effects of Route Rev. V on non traditional land use are expected to be similar to the effects of Route Rev. U. No potential effects are expected along Route Rev. V that have not been previously addressed in the ESA. Consequently, the route revisions will not alter the conclusions of significance as presented in the ESA.

Volume 6C: Section 6 Heritage Resources

The heritage resource reviews of each revision outside of the 1 km wide pipeline corridor are summarized in Table 6A-1 (Revised). Route Rev. V is not likely to result in any change to the effects assessment for archaeological and historic sites based on the desktop review, since no currently known, highly significant sites are noted to occur. The Route Rev. V revisions avoid several previously recorded sites, potentially resulting in a lower level of impact than Route Rev. U. However, additional fieldwork will be conducted to confirm this determination.

As discussed in Volume 7A, in locations where pipeline route revisions fall within target areas previously defined as having moderate to high potential for containing unknown heritage resources, field studies will be conducted prior to construction. Field studies will consist of a Historical Resource Impact Assessment in Alberta and an Archaeological Resource Impact Assessment in British Columbia to confirm whether any unknown sites of heritage value are present. If sites are found on the pipeline route revision, mitigative requirements will be issued by the provincial regulatory agency. Since the provincial regulatory agency is responsible for managing the cumulative effects to archaeological resources, as long as provincial requirements are adhered to, no negative effects are anticipated.

Summary

In summary, no potential effects are identified along the proposed pipeline route revisions that have not been previously addressed in the ESA. Consequently, the proposed pipeline route revisions will not alter the conclusions of significance as originally presented in the ESA. The PEAA revisions will not result in any change to the effects assessment, and no additional field work will be conducted to assess the PEAA revision areas.

Supplemental environmental field studies will be conducted for some of the pipeline Route Rev. V revisions. It is possible that rare plants, wildlife species of concern, or archaeological features may be discovered during the completion of these field surveys or prior to construction. It is anticipated that many of these discoveries will be similar to those recorded during previous surveys. Appropriate mitigative measures will either be the same or similar to those recommended in supporting study reports. Construction mitigation measures described in the Application and environmental contingency plans filed in the construction environmental protection and management plan (EPMP) will apply.

Literature Cited

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GeoBC. 2011. British Columbia Integrated Land and Resource Registry. Integrated Land and Resource Registry (Theme) Accessed 2011. https://apps.gov.bc.ca/pub/geometadata/metadataDetail.do?from=search&edit=true&showall=showall&recordSet=ISO19115&recordUID=38238

Appendix A (Revised) Project Overview Map

The following figure replaces the Update to Application Volume 3, January 2012, Appendix A, Figure A-1.

Appendix C.1 (Revised) Pipeline Route Atlas

The following figures replace the Update to Application Volume 3, January 2012, Appendix C, Figures C-1 to C-14.

Table C-1 (Revised) Route Atlas Tabular Index

Figure No.	Figure ID	Title
C-1	11-025-000 Rev 3	Pipeline Route Atlas Index
C-2	11-025-001 Rev 3	Pipeline Route Atlas – Kilometre Posts 0 to 50
C-3	11-025-002 Rev 3	Pipeline Route Atlas – Kilometre Posts 40 to 135
C-4	11-025-003 Rev 3	Pipeline Route Atlas – Kilometre Posts 130 to 235
C-5	11-025-004 Rev 3	Pipeline Route Atlas – Kilometre Posts 230 to 330
C-6	11-025-005 Rev 3	Pipeline Route Atlas – Kilometre Posts 320 to 430
C-7	11-025-006 Rev 3	Pipeline Route Atlas – Kilometre Posts 425 to 530
C-8	11-025-007 Rev 3	Pipeline Route Atlas – Kilometre Posts 525 to 630
C-9	11-025-008 Rev 3	Pipeline Route Atlas – Kilometre Posts 620 to 730
C-10	11-025-009 Rev 3	Pipeline Route Atlas – Kilometre Posts 725 to 825
C-11	11-025-010 Rev 3	Pipeline Route Atlas – Kilometre Posts 815 to 915
C-12	11-025-011 Rev 3	Pipeline Route Atlas – Kilometre Posts 910 to 1015
C-13	11-025-012 Rev 3	Pipeline Route Atlas – Kilometre Posts 1010 to 1115
C-14	11-025-013 Rev 3	Pipeline Route Atlas – Kilometre Posts 1095 to 1177.62

Appendix C.2 (Revised) Route Atlas Imagery Maps

Table C-2 (Revised) Index of Map Numbers and Kilometre Posts

Figure No.	Figure ID	Approximate	
		KP Start	KP End
0	11-027-000 Rev 1 Index Map		
1	11-027-001 Rev 2	0	22
2	11-027-002 Rev 2	21	40
3	11-027-003 Rev 2	39	58
4	11-027-004 Rev 3	57	77
5	11-027-005 Rev 3	75	95
6	11-027-006 Rev 2	93	113
7	11-027-007 Rev 2	111	132
8	11-027-008 Rev 2	130	150
9	11-027-009 Rev 2	149	168
10	11-027-010 Rev 2	167	188
11	11-027-011 Rev 2	185	207
12	11-027-012 Rev 2	206	225
13	11-027-013 Rev 2	224	244
14	11-027-014 Rev 2	243	263
15	11-027-015 Rev 2	261	281
16	11-027-016 Rev 2	280	299
17	11-027-017 Rev 2	298	317
18	11-027-018 Rev 2	316	337
19	11-027-019 Rev 2	335	355
20	11-027-020 Rev 2	354	375
21	11-027-021 Rev 2	373	393
22	11-027-022 Rev 2	391	411
23	11-027-023 Rev 2	410	432
24	11-027-024 Rev 3	431	452
25	11-027-025 Rev 3	450	469
26	11-027-026 Rev 2	468	489
27	11-027-027 Rev 2	487	509
28	11-027-028 Rev 2	508	527
29	11-027-029 Rev 2	526	546
30	11-027-030 Rev 2	544	564
31	11-027-031 Rev 2	563	583
32	11-027-032 Rev 2	581	604

Table C-2 (Revised) Index of Map Numbers and Kilometre Posts (cont'd)

Figure No.	Figure ID	Approximate	
		KP Start	KP End
33	11-027-033 Rev 2	601	625
34	11-027-034 Rev 2	623	645
35	11-027-035 Rev 2	643	665
36	11-027-036 Rev 3	664	685
37	11-027-037 Rev 2	684	705
38	11-027-038 Rev 2	704	723
39	11-027-039 Rev 2	722	741
40	11-027-040 Rev 2	740	760
41	11-027-041 Rev 2	758	778
42	11-027-042 Rev 3	777	796
43	11-027-043 Rev 3	795	814
44	11-027-044 Rev 2	813	836
45	11-027-045 Rev 2	835	854
46	11-027-046 Rev 2	853	873
47	11-027-047 Rev 2	872	891
48	11-027-048 Rev 2	890	909
49	11-027-049 Rev 2	908	928
50	11-027-050 Rev 2	926	946
51	11-027-051 Rev 2	945	965
52	11-027-052 Rev 2	964	984
53	11-027-053 Rev 2	983	1004
54	11-027-054 Rev 2	1002	1022
55	11-027-055 Rev 3	1021	1041
56	11-027-056 Rev 2	1040	1060
57	11-027-057 Rev 3	1059	1081
58	11-027-058 Rev 2	1079	1099
59	11-027-059 Rev 3	1098	1120
60	11-027-060 Rev 3	1118	1146
61	11-027-061 Rev 3	1146	1167
62	11-027-062 Rev 2	1165	1177.62

Appendix D (Revised) Pipeline Route Revisions

The following are new figures, Figure D-19 to Figure D-24

Table D-1 (New) Pipeline Route Alternatives

Figure No.	Figure ID	Title
D-19	11-026-019 Rev 0	Pipeline Route Revisions – Kilometre Posts 0 to 65
D-20	11-026-020 Rev 0	Pipeline Route Revisions – Kilometre Posts 15 to 115
D-21	11-026-021 Rev 0	Pipeline Route Revisions – Kilometre Posts 200 to 305
D-22	11-026-022 Rev 0	Pipeline Route Revisions – Kilometre Posts 665 to 770
D-23	11-026-023 Rev 0	Pipeline Route Revisions – Kilometre Posts 970 to 1075
D-24	11-060-001 Rev 0	Potential Future Route Revision – Kilometre Posts 928.6 to 943.3

Appendix F (Revised) Pipeline Valve Site Selection

The following table is a revision to the Application, Volume 3, Appendix F, Table F-1 and Application (Volume 3 Update, January 2012)

Table F-1 (Revised) Preliminary Pipeline Valve Locations

KP (based on Route Rev V)	Valve Location Description	Oil	Condensate
0.0	Bruderheim Pump Station / North Saskatchewan River (East Side)	X	X
3.2	North Saskatchewan River (West Side)	X	X
7.6	Tributary to North Saskatchewan River (West Side)	X	X
23.1	Tributary to Sturgeon River (West Side)	X	X
70.0	Alexander FN	X	X
98.5	Majeau Pump Station (Potential Future)	X	X
128.7	Pembina River (East Side)	X	X
131.9	Pembina River (West Side)	X	X
137.0	Paddle River (East Side)	X	X
138.8	Paddle River (West Side)	X	X
167.6	Little Paddle River (West Side)	X	X
179.9	Mink Creek (East Side)	X	X
184.0	Athabasca River (East Side)	X	X
188.3	Athabasca River (West Side)	X	X
198.7	Sakwatamau River (East Side)	X	X
204.5	Whitecourt Pump Station / Sakwatamau River (West Side)	X	X
218.8	Chickadee Creek (West Side)	X	X
231.1	Two Creek (East Side)	X	X
245.8	Two Creek (West Side)	X	X
261.7	Iosegun River (West Side)	X	X
289.4	Little Smoky River (East Side)	X	X
291.7	Little Smoky River (West Side)	X	X
304.8	Fox Creek Pump Station (Potential Future)	X	X
319.1	Waskahigan (West Side)	X	X
337.1	Deep Valley Creek (East Side)	X	X
340.5	Deep Valley Creek (West Side)	X	X
358.2	Simonette River (East Side)	X	X
359.9	Simonette River (West Side)	X	X
370.7	Latornell River (East Side)	X	X
377.4	Latornell River (West Side)	X	X
382.7	Tributary to Latornell River (East Side)	X	X

Table F-1 (Revised) Preliminary Pipeline Valve Locations (cont'd)

KP (based on Route Rev V)	Valve Location Description	Oil	Condensate
394.3	Tributary to Smoky River #1 (East Side)	X	X
396.0	Tributary to Smoky River #1 (West Side)	X	X
405.7	Tributary to Smoky River #2 (West Side)	X	X
418.0	Smoky River Pump Station / Smoky River (East Side)	X	X
421.8	Smoky River (West Side)	X	X
424.8	Braaten	X	X
430.2	Big Mountain Creek (West Side)	X	X
447.8	Bald Mountain Creek (West Side)	X	X
464.1	Tributary to Stony Creek (West Side)	X	X
473.5	Pinto Creek (East Side)	X	X
475.1	Pinto Creek (West Side)	X	X
494.1	Wapiti River (East Side)	X	X
497.4	Wapiti River (West Side)	X	X
506.8	Elmworth Pump Station (Potential Future)	X	X
514.8	Calahoo Creek (West Side)	X	X
523.4	Hiding Creek (West Side)	X	X
534.8	South Redwillow River (West Side)	X	X
548.7	Tributary to Redwillow River (East Side)	X	X
563.4	Kinuseo Creek #1 (East Side)	X	X
567.7	Kinuseo Creek #1 (West Side)	X	X
591.8	Kinuseo Creek #2 (West Side)	X	X
598.5	Tributary to Murray River (East Side)	X	X
600.3	Tumbler Ridge Pump Station / Murray River (East Side)	X	X
601.1	Murray River (West Side)	X	X
604.2	Hook Creek (East Side)	X	X
605.6	Hook Creek (West Side)	X	X
613.7	Tributary to Imperial Creek (East Side)	X	X
639.7	Missinka River (East Side)	X	X
648.6	Missinka River (West Side)	X	X
666.7	Tributary to Missinka River (West Side)	X	X
673.2	Parsnip River (East Side)	X	X
675.5	Parsnip River Pump Station (Potential Future) / Parsnip River (West Side)	X	X

Table F-1 (Revised) Preliminary Pipeline Valve Locations (cont'd)

KP (based on Route Rev V)	Valve Location Description	Oil	Condensate
705.0	Chuchinka River (East Side)	x	X
706.3	Chuchinka River (West Side)	X	X
718.8	Bear Lake Pump Station	X	X
720.2	Crooked River (East Side)	X	X
722.4	Crooked River (West Side)	X	X
727.2	Tributary to Fisher Lake (West Side)	X	X
738.7	Slender Lake (West Side)	X	X
749.5	Muskeg River (East Side)	X	X
765.4	Salmon River (East Side)	X	X
766.8	Salmon River (West Side)	X	X
785.1	Tributary to Great Beaver Lake (West Side)	X	X
810.8	Tributary to Necoslie River (East Side)	X	X
818.3	Necoslie River (East Side)	X	X
824.3	Stuart River (East Side)	X	X
827.8	Fort St. James Pump Station / Stuart River (West Side)	X	X
842.5	Marie Lake	X	X
858.1	Sutherland River (East Side)	X	X
867.1	Duncan Creek (East Side)	X	X
867.8	Duncan Creek (West Side)	X	X
875.9	Tributary to Shovel Creek (East Side)	X	X
890.7	Pump Station (Potential Future)	X	X
906.7	Taltapin Lake	X	X
921.3	Stearns Creek (East Side)	X	X
928.7	Burns Lake Pump Station	X	X
931.9	Endako River (East Side)	X	X
933.9	Endako River (West Side)	X	X
935.5	Decker Lake	X	X
950.0	Maxan Creek (East Side)	X	X
952.4	Maxan Creek (West Side)	X	X
955.9	Tributary to Maxan Creek (West Side)	X	X
960.2	Foxy Creek #1 (East Side)	X	X
964.8	Foxy Creek #1 (West Side) / Foxy Creek #2 (East Side)	X	X

Table F-1 (Revised) Preliminary Pipeline Valve Locations (cont'd)

KP (based on Route Rev V)	Valve Location Description	Oil	Condensate
968.0	Foxy Creek #2 (West Side)	X	X
977.9	Klo Creek (East Side)	X	X
989.3	Buck Creek (East Side)	X	X
991.8	Buck Creek (West Side)	X	X
1006.2	Houston Pump Station	X	X
1007.0	Owen Creek (West Side)	X	X
1014.7	Fenton (West Side)	X	X
1023.5	Lamprey (East Side)	X	X
1026.2	Lamprey (West Side)	X	X
1032.0	Cedric Creek (East Side)	X	X
1033.7	Cedric Creek (West Side)	X	X
1039.2	Nado Creek	X	X
1042.1	Morice River (East Side)	X	X
1044.2	Morice River (West Side)	X	X
1049.7	Crystal Creek (West Side)	X	X
1059.3	Gosnell Creek (East Side)	X	X
1064.3	Gosnell Creek (West Side)/Gosnell Pump Station (Potential Future)	X	X
1076.3	Clore River (East Side)	X	X
1078.0	Clore Tunnel (East Portal) / Clore River (West Side)	X	X
1084.5	Clore Tunnel (West Portal)	X	X
1085.3	Hoult Tunnel (East Portal)	X	X
1091.9	Hoult Tunnel (West Portal)	X	X
1098.6	Tributary to Hoult Creek (East Side)	X	X
1103.7	Hunter Creek (East Side)	X	X
1116.2	Hunter Creek (West Side)	X	X
1123.8	Tributary to Kitimat River #1 (West Side)	X	X
1128.2	Chist Creek (East Side)	X	X
1130.0	Clearwater Pump Station / Chist Creek (West Side)	X	X
1137.8	Cecil Creek (South Side)	X	X
1148.6	Wedeene River (North Side)	X	X
1151.5	Wedeene River (South Side)	X	X
1153.8	Little Wedeene River (North Side)	X	X

Table F-1 (Revised) Preliminary Pipeline Valve Locations (cont'd)

KP (based on Route Rev V)	Valve Location Description	Oil	Condensate
1154.8	Little Wedeene River (South Side)	X	X
1159.4	Tributary to Kitimat River #2 (North Side)	X	X
1163.9	Gravel Pit	X	X
1170.8	Moore Creek (South Side)	X	X
1177.6	Kitimat Terminal	X	X

Note: The valve locations that are indicated with North, South, East or West are watercourses that are crossed by the pipeline. All other names were selected based on nearby features or locations.

Appendix G.1 (Revised) Pipeline Watercourse Crossing Information

The following is a revised table for the Application, Volume 3, Appendix G.1. and Application (Volume 3 Update, January 2012).

Table G-1 (Revised) Watercourse Crossing Methods for Review Sites

KP (Route Rev. V)	Watercourse Name	Proposed Crossing Method (Construction Timing)[a]	Alternative Crossing Method (Construction Timing)[a]
2.8	North Saskatchewan River	Open Cut (Summer)	Open Cut (Winter)
130.9	Pembina River	HDD	Isolated (Winter)
137.5	Paddle River	Isolated (December to April)	Isolated (Summer)
163.1	Little Paddle River	Isolated (December to April)	Isolated (Summer)
186.8	Athabasca River	HDD	Open Cut (Winter)
199.8	Sakwatamau River	Isolated (Winter)	Open Cut (July 16 to August 31)
218.6	Chickadee Creek	Isolated (Winter)	Isolated (Summer)
241.2	Two Creek	Isolated (Winter)	Isolated (Summer)
258.5	Iosegun River	Isolated (Winter)	Isolated (Summer)
271.4	Tributary to Iosegun Lake	Open Cut if frozen (November to February)	Isolated (November to February)
271.6	Tributary to Iosegun Lake	Open Cut if frozen (November to February)	Isolated (November to February)
271.6	Tributary to Iosegun Lake	Open Cut if frozen (November to February)	Isolated (November to February)
271.2	Tributary to Iosegun Lake	Open Cut if frozen (November to February)	Isolated (November to February)
271.9	Tributary to Iosegun Lake	Open Cut if frozen (November to February)	Isolated (November to February)
273.8	Tributary to Iosegun Lake	Open Cut if frozen (November to February)	Isolated (November to February)

Table G-1 (Revised) Watercourse Crossing Methods for Review Sites (cont'd)

KP (Route Rev. V)	Watercourse Name	Proposed Crossing Method (Construction Timing)[a]	Alternative Crossing Method (Construction Timing)[a]
290.4	Little Smoky River	Isolated with reroute (Winter)	Trenchless
317.6	Waskahigan River	Isolated (Winter)	Isolated (Summer)
338.2	Deep Valley Creek	Isolated (Winter)	Isolated (Summer)
340.1	Tributary to Deep Valley Creek	Isolated with reroute (Winter)	Isolated with reroute (Summer) or HDD
359.4	Simonette River	Bore	Open Cut (July 16 to July 31)
371.3	Latornell River	Isolated with reroute (Winter)	Trenchless
395.1	Patterson Creek	Isolated (Winter)	Isolated (Summer)
403.7	Tributary to Smoky River	Isolated (Winter)	Isolated (Summer)
421.0	Smoky River	HDD	Open Cut (Winter)
429.0	Big Mountain Creek	Isolated with reroute (Winter)	Isolated with reroute (Summer), HDD or Other Trenchless
446.7	Bald Mountain Creek	Isolated (Winter)	Isolated (Summer)
474.3	Pinto Creek	Bore with reroute	Trenchless
495.0	Wapiti River	HDD	Open Cut (November to February)
520.1	Hiding Creek	Isolated (December to April)	Isolated (Summer)
534.1	South Redwillow River	Isolated (Winter)	Isolated (Summer)
563.7	Kinuseo Creek	Isolated (July to August)	Open Cut (July 15 to August 15)
568.2	Kinuseo Creek	Isolated (July to August)	Open Cut (July 15 to August 15)
583.0	Five Cabin Creek	Isolated (Summer)	Open Cut (July 15 to August 15)

Table G-1 (Revised) Watercourse Crossing Methods for Review Sites (cont'd)

KP (Route Rev. V)	Watercourse Name	Proposed Crossing Method (Construction Timing)[a]	Alternative Crossing Method (Construction Timing)[a]
590.4	Kinuseo Creek	Bore	Open Cut (July 15 to August 15)
599.3	Tributary to Murray River	Isolated (July to August)	Open Cut (July August)
600.8	Murray River	Aerial	Other Trenchless
604.7	Hook Creek	HDD	Isolated (July to August)
621.9	Tributary to Imperial Creek	Open Cut (Anytime)	N/A
643.4	Missinka River	Bore	Open Cut (July 15 to August 15)
648.1	Missinka River	Open Cut (July 15 to August 15)	N/A
673.8	Parsnip River	HDD	Open Cut (July 15 to August 15)
705.7	Chuchinka Creek	Isolated (August)	Open Cut (July 15 to August 15)
713.3	Angusmac Creek	Isolated (August)	Open Cut (July 15 to August 15)
721.0	Crooked River	Bore	Open Cut (July 15 to August 15)
750.9	Muskeg River	Bore	Isolated (Winter)
765.8	Salmon River	Bore	Isolated (Winter)
783.1	Tributary to Great Beaver Lake	Isolated (Winter)	Isolated (Summer)
819.4	Necoslie River	Bore	Isolated (Winter)
824.9	Stuart River	HDD	Other Trenchless
859.5	Sutherland River	Bore	Isolated (January to March)
867.4	Tributary to Duncan Creek	Isolated (December to April)	Isolated (Summer)
932.5	Endako River	Trenchless	Other Trenchless

Table G-1 (Revised) Watercourse Crossing Methods for Review Sites (cont'd)

KP (Route Rev. V)	Watercourse Name	Proposed Crossing Method (Construction Timing)[a]	Alternative Crossing Method (Construction Timing)[a]
951.5	Maxan Creek	Isolated (Summer)	Open Cut (Summer)
963.7	Foxy Creek	Isolated (August to March)	Open Cut (August to March)
967.8	Foxy Creek	Isolated (August to March)	Open Cut (August to March)
978.7	Klo Creek	Isolated (September to January)	Open Cut (September to January)
990.1	Buck Creek	Bore	Isolated (Summer)
996.5	Parrott Creek	Isolated (August to March)	Open Cut (August to March)
1006.7	Owen Creek	Bore	Isolated (August to September)
1012.8	Fenton Creek	Isolated (August)	Open Cut (August)
1024.8	Lamprey Creek	Bore	Isolated (August to September)
1032.7	Cedric Creek	Isolated (Summer)	Open Cut (Summer)
1043.1	Morice River	HDD	Other Trenchless
1049.3	Crystal Creek	Bore	Isolated (August to September)
1063.9	Gosnell Creek	Bore	Isolated (Winter)
1076.5	Tributary to Burnie River	Bore	Isolated (August to March)
1077.6	Clore River	Trenchless	Isolated with reroute (Winter), or Aerial with reroute
1084.9	Tributary to Clore River	Aerial	N/A
1092.1	Hoult Creek	Aerial	N/A
1104.1	Hunter Creek	HDD	Isolated (Winter)
1114.7	Tributary to Kitimat River	Open Cut (Anytime)	N/A

Table G-1 (Revised) Watercourse Crossing Methods for Review Sites (cont'd)

KP (Route Rev. V)	Watercourse Name	Proposed Crossing Method (Construction Timing)[a]	Alternative Crossing Method (Construction Timing)[a]
1128.4	Chist Creek	HDD	Other Trenchless
1136.7	Cecil Creek	Bore	Isolated (Summer)
1145.4	Deception Creek	Isolated (Summer)	Open Cut (Summer)
1150.1	Wedeene River	HDD	Other Trenchless
1154.1	Little Wedeene River	Bore	Isolated (January to April)
1160.0	Tributary to Kitimat River	Isolated (July to August)	Open Cut (July to August)
1162.2	Duck Creek	Isolated (July to August)	Open Cut (July to August)
1166.4	Tributary to Kitimat River	Isolated (July to August)	Open Cut (July to August)
1169.2	Anderson Creek	Isolated (Winter)	Open Cut (August)
1170.5	Moore Creek	Aerial	N/A

NOTES:
[a] All watercourse crossing methods and construction timings are preliminary and will be finalized during detailed engineering

Appendix H (Revised) Pump Station Drawings

The following figures are revised:

H-1 Oil and Condensate Pipeline Flow Diagram

H-2 Plot Plan for the Bruderheim Oil Initiating Pump Station Plot Plan

H-3 Whitecourt Dual Pump Station Plot Plan

H-4 Smoky River Dual Pump Station Plot Plan

H-6 Bear Lake Dual Pump Station Plot Plan

H-9 Houston Pump Dual Pump Station Plot Plan

H-11 Bruderheim Station Oil Initiating Pumps Process Flow Diagram

H-13 Whitecourt Station Oil Pumps Process Flow Diagram

Appendix I (Revised) Kitimat Terminal Drawings

The following figures are revised:

I-1 Kitimat Terminal Preliminary Layout Plot Plan

I-2 Kitimat Terminal Preliminary Layout with Contours Plot Plan

I-19 Kitimat Terminal Civil Sections Layout – Civil Sections Plot Plan

I-20 Kitimat Terminal Rough Grading Profile – Sections WE-1 & WE-2

I-21 Kitimat Terminal Rough Grading Profile – Sections WE-3 & WE-4

I-22 Kitimat Terminal Rough Grading Profile – Sections SN-1 & SN-2

I-23 Kitimat Terminal Rough Grading Profile – Sections SN-3 & SN-4

I-24 Kitimat Terminal Rough Grading Profile – Sections SN-5

Table 6A-1 (Revised) Environmental and Socio-Economic Summary of Route Rev. V Revisions for the Northern Gateway Project

Revision Location / Figure Reference	Total Length	Rationale	Discipline	Comments	Assessment
Private Lands (KP 20 to 23) Figure 1 and Figure 2	3 km	Pipeline route relocated to increase distance from private residence	Soils	Centerline is located within original PEAA.	No further assessment of the route is required.
			Vegetation	Centerline is located within original PEAA.	No further assessment of the route is required.
			Wildlife	Centerline is within original PEAA. This section of the route is in the White Zone. New route crosses one less riparian corridor than Route Rev U.	No further assessment of the route is required.
			Fisheries	Two watercourses are intersected. Both streams have been previously surveyed at other locations.	Field survey of new crossing locations required.
			Land and Resource Use	No major changes in land dispositions (tenures) and resource management zones; No parks and protected areas within PEAA	Land interests (tenures), and parks and protected areas, documented and assessed as part of the NEB filing (Volume 6C)
			Heritage Resources	Centerline is located within original PEAA.	No further assessment of the route is required.
Alexander First Nation 134 (KP 58.7 to 71) Figure 4	12.3 km	Pipeline route relocated onto the Alexander 134 Indian Reserve	Soils	Centerline is located outside the original PEAA.	Field assessment and mapping of soils will be undertaken.
			Vegetation	Centerline is located outside the original PEAA.	Field assessment and mapping of plant communities and rare plants

					will be undertaken.
			Wildlife	Centerline is outside original PEAA. This section of the route is in the White Zone. New route has less paralleling of existing RoW so intersects more intact native vegetation patches than Route Rev U. New route is further away from Deadman Lake than Route Rev U.	No further assessment of the route is required.
			Fisheries	Five watercourses are intersected. Three streams have been previously surveyed at other locations.	Field survey of new crossings required.
			Land and Resource Use	No major changes in land dispositions (tenures) and resource management zones; No parks and protected areas within PEAA	Land interests (tenures), and parks and protected areas, documented and assessed as part of the NEB filing (Volume 6C)
			Heritage Resources	No changes to assessment based on this route revision.	No further assessment of the route is required.
Alexander First Nation 134A (KP 240 to KP 262) Figure 13 and Figure 14	22 km	Pipeline route relocated onto the Alexander 134A Indian Reserve	Soils	Centerline is located outside the original PEAA.	Field assessment and mapping of soils will be undertaken.
			Vegetation	Centerline is located outside the original PEAA.	Field assessment and mapping of plant communities and rare plants will be undertaken.
			Wildlife	Centerline is partly outside original PEAA. New route has much more	No further assessment of the route is required.

				paralleling of existing RoWs and infrastructure, including Highway 43, compared to Route Rev U. New route is further to the periphery of grizzly bear core habitat area than Route Rev U.	
			Fisheries	Nine watercourses are intersected. Five streams have been previously surveyed at other locations.	Field survey of new crossings required.
			Land and Resource Use	No major changes in land dispositions (tenures) and resource management zones; No parks and protected areas within PEAA	Land interests (tenures), and parks and protected areas, documented and assessed as part of the NEB filing (Volume 6C)
			Heritage Resources	No changes to assessment based on this route revision.	No further assessment of the route is required.
Private Lands (KP 590) Figure 32	Not applicable	PEAA revision	Soils	No concerns related to soils noted.	No further assessment is required.
			Vegetation	Expansion extends beyond original PEAA.	Field assessment and mapping of plant communities and rare plants will be undertaken.
			Wildlife	No concerns related to wildlife noted.	No further assessment is required.
			Fisheries	No concerns related to fisheries noted.	No further assessment is required.
			Land and Resource Use	No major changes in land dispositions (tenures) and resource management zones; No parks and protected areas within PDA	Land interests (tenures), and parks and protected areas, documented and assessed as part of the NEB filing (Volume 6C);
			Heritage Resources	Corridor in this area modelled as having high archaeological potential. One previously	No further assessment is required.

				recorded site located along north bank of Kinuseo Creek approximately 450 m northwest of KP 590.3	
McLeod Lake Indian Band (KP 718 to 719.5) Figure 38	1.5 km	Pipeline route and Bear Lake pump station have again been relocated off of the Sas Mighe 32 Indian Reserve	Soils	Centerline is located within original PEAA.	No further assessment of the route is required.
			Vegetation	Centerline is located within original PEAA.	No further assessment of the route is required.
			Wildlife	Centerline is within original PEAA. Only a minor change in centerline relative to Route Rev U.	No further assessment of the route is required.
			Fisheries	One watercourse intersected.	Site surveyed in previous route version. No further work required.
			Land and Resource Use	No major changes in land dispositions (tenures) and resource management zones; No parks and protected areas within PEAA	Land interests (tenures), and parks and protected areas, documented and assessed as part of the NEB filing (Volume 6C)
			Heritage Resources	Centerline is located within original PEAA.	No further assessment of the route is required.
Morice River Area (KP 997 to 1049) Figure 53 to Figure 56	52 km	Pipeline route relocated further away from the Morice River	Soils	Centerline is located outside the original PEAA.	Field assessment and mapping of soils will be undertaken.
			Vegetation	Centerline is located outside the original PEAA.	Field assessment and mapping of plant communities and rare plants will be undertaken.
			Wildlife	Centerline is outside original PEAA. New route is further from the Morice River and the confluence with Gosnell Creek.	New route is further from the southern boundary of the proposed Wildlife Habitat Area for the Telkwa caribou herd. Both routes run through an

				New route is off the Morice River floodplain. Both routes run through areas with considerable logging development. Route Rev U partly parallels the Morice West FSR and Crystal Creek FSR. New route parallels very little existing linear disturbance and creates linkages between cutblock road networks that might increase human access to a larger area than would Route Rev U.	area of low caribou use (based on telemetry locations for the Telkwa herd). New route is likely to have less effect on high value wildlife habitat in riparian zones than Route Rev U because it is located farther away from the Morice River and off the floodplain. Riparian zones are often important as wildlife movement corridors. New route may have less of an effect on wildlife movement relative to Route Rev U because it is farther from the Morice River and parallels less existing right-of-way (i.e., the wider opening created by paralleling existing right-of-ways may have a barrier effect for some species). New route no longer intersects any primary and secondary goat ungulate winter range polygons. This portion of the route is in an area where there are concerns regarding linear feature density and its effects on wildlife. New route would appear to offer fewer opportunities to achieve this

					compared to Route Rev U; however, this does not preclude the use of other methods to minimize linear feature density in this region.
			Fisheries	Twenty-nine watercourses are intersected. Twelve streams have been previously surveyed at downstream locations.	Field survey of new crossings required.
			Land and Resource Use	No major changes in land dispositions (tenures) and resource management zones; No parks and protected areas within PEAA	Land interests (tenures), and parks and protected areas, documented and assessed as part of the NEB filing (Volume 6C)
			Heritage Resources	Three recorded archaeological sites in potential conflict with previous Route U alignment (GbSr-8, GbSu-3, and GbSu-4) are avoided by the proposed alternate route.	No previously-recorded archaeological sites in conflict with proposed alternate route. Sparsely scattered areas of model-predicted moderate and high archaeological potential throughout; mostly centered on the Morice River crossing. One reported cultural trail intersects the east end of the alternate route.
Kitimat Terminal Figure 62	Not applicable	Updated to 16 oil tanks to provide required tank capacity, product segregation and operational flexibility.	Atmospheric Environment	Tanks are located within the original PEAA. The Application modeling for emissions from the hydrocarbon tanks at the tank lot assumed 14 tanks plus a possibility in the future of adding an additional 2 tanks. The modeling therefore, overpredicted the expected	No further assessment is required.

				emissions for the initial design of the tank lot. No potential effects are expected at the Kitimat Terminal site that have not been previously addressed in the ESA.	
			Land and Resource Use	Tanks are located within the original PEAA and size and location of PEAA remain the same.	No further assessment is required.

Table 6A-2 (Revised) Summary of Fisheries Risk at Revised Watercourse Crossing Locations

Kilometre Post (KP) Route U	Watercourse Name	Site Number Route V	RMF Rating	Sensitivity Rating	Scale of Negative Effects	Reason for RMF Change	Mitigation Notes
20.21	Tributary to Sturgeon River	9032	Low	4.3	1.5	Previous site was low risk. Site moved 250 m downstream.	Sampling must be completed
21.45	Tributary to Sturgeon River	9033	Low	4	0.5	Previous site was low risk. Site moved 500 m upstream.	Sampling must be completed
59.13	Tributary to Riviere Qui Barre	9034				Previous site was NCD. No RMF rating. Site moved 270 m downstream. Site conditions require confirmation	Sampling must be completed
62.67	Riviere Qui Barre	9035				Previous site was NVC. No RMF rating. Site moved 1 km downstream. Site conditions require confirmation.	Sampling must be completed
66.64	Tributary to Riviere Qui Barre	9037	Low	4.6	0.5	Previous site was low risk. Site moved 2 km downstream. Site conditions require confirmation.	Sampling must be completed
67.47	Tributary to Riviere Qui Barre	NA				Removed from route.	
240.32	Tributary to Two Creek	NA				Removed from route.	
240.75	Tributary to Two Creek	NA				Removed from route.	
241.30	Tributary to Two Creek	NA				Removed from route.	
241.87	Two Creek	145	High	14.4	8	Site moved to previously surveyed crossing location. Sensitivity score driven by species sensitivity, habitat dependency and species rarity. New site will retain values in species sensitivity	No additional sampling required

						and species rarity. Habitat dependency is site specific and may change.	
242.23	Tributary to Two Creek	NA				Removed from route.	
243.89	Tributary to Two Creek	146				Site completed using SOP. Site moved to previously surveyed crossing location.	No additional sampling required
243.94	Tributary to Two Creek	NA				Removed from route.	
244.14	Tributary to Two Creek	NA				Removed from route.	
248.92	Tributary to Heavysound Creek	NA				Removed from route.	
249.70	Tributary to Heavysound Creek	NA				Removed from route.	
254.68	Tributary to Heavysound Creek	NA				Removed from route.	
256.92	Tributary to Iosegun River	NA				Removed from route.	
258.50	Tributary to Iosegun River	NA				Removed from route.	
259.67	Iosegun River	3027				Site completed using SOP. Site moved to previously surveyed crossing location.	No additional sampling required
998.10	Tributary to Owen Creek	NA				Removed from route.	
999.09	Tributary to Owen Creek	NA				Removed from route.	
999.79	Tributary to Morice River	NA				Removed from route.	
1000.85	Tributary to Morice River	NA				Removed from route.	
1002.71	Tributary to Owen Creek	NA				Removed from route.	
1003.27	Tributary to Morice River	NA				Removed from route.	

1004.53	Tributary to Morice River	NA				Removed from route.	
1005.32	Owen Creek	9004				Site moved 3.7 km upstream. Trenchless crossing - completed using SOP.	Sampling must be completed
1005.97	Tributary to Owen Creek	NA				Removed from route.	
1006.66	Tributary to Morice River	NA				Removed from route.	
1007.81	Tributary to Fenton Creek	NA				Removed from route.	
1008.15	Tributary to Fenton Creek	NA				Removed from route.	
1010.33	Tributary to Fenton Creek	9007	Medium Low Risk	13.7	3.5	Site moved upstream above 3.5 m falls. Falls barrier to upstream fish passage. Watercourse crossing is non-fish-bearing	Sampling must be completed to confirm site conditions
1010.52	Fenton Creek	9011	Medium Low Risk	13.8	3.5	Site moved 1.1 km upstream. Previous site was medium-low risk. Sensitivity score driven by species sensitivity, habitat dependency and species rarity. New site will retain values in species sensitivity and species rarity. Habitat dependency is site specific and may change.	Sampling must be completed
1012.81	Tributary to Morice River	9012	Low Risk	4	6	Site moved upstream above 10 m falls. Falls barrier to upstream fish passage. Watercourse crossing is non-fish-bearing	Sampling must be completed to confirm site conditions
1013.88	Tributary to Morice River	9031	Low Risk	4	5	Site moved upstream above 10 m falls. Falls barrier to upstream fish passage. Watercourse crossing is non-fish-bearing	Sampling must be completed to confirm site conditions

1016.21	24.5 Mile Creek	9017	Medium Low Risk	13.6	3.5	Site moved upstream above 40 m falls. Falls barrier to upstream fish passage. Watercourse crossing is non-fish-bearing	Sampling must be completed to confirm site conditions
1016.47	Tributary to 24.5 Mile Creek	9018	Medium High Risk	13.6	5	Site moved upstream above 10 m falls. Falls barrier to upstream fish passage. Watercourse crossing is non-fish-bearing	Sampling must be completed to confirm site conditions
1018.08	Tributary to Morice River	NA				Removed from route	
1020.12	Tributary to Lamprey Creek	9019	Medium Low Risk	13.9	3.5	Site moved 4 km upstream. Previous site was medium-low risk. Sensitivity score driven by species sensitivity, habitat dependency and species rarity. New site will retain values in species sensitivity and species rarity. Habitat dependency is site specific and may change.	Sampling must be completed
1020.72	Tributary to Lamprey Creek	NA				Removed from route	
1021.22	Lamprey Creek	9020				Site moved 3.7 km upstream. Trenchless crossing - completed using SOP.	Sampling must be completed
1021.86	Tributary to Morice River	NA				Removed from route	
1023.36	Tributary to Morice River	NA				Removed from route	
1023.89	Tributary to Morice River	NA				Removed from route	
1024.74	Tributary to Morice River	NA				Removed from route	
1025.20	Tributary to Morice River	NA				Removed from route	

1025.50	Tributary to Morice River	NA				Removed from route	
1026.16	Tributary to Morice River	NA				Removed from route	
1026.27	Tributary to Morice River	NA				Removed from route	
1026.35	Tributary to Morice River	NA				Removed from route	
1027.16	Tributary to Morice River	NA				Removed from route	
1028.50	Cedric Creek	9024	Medium Risk	11.6	5	Site moved 3.6 km upstream. Previous site was medium risk. Sensitivity score driven by species sensitivity, habitat dependency and species rarity. New site will retain values in species sensitivity and species rarity. Habitat dependency is site specific and may change.	Sampling must be completed
1030.40	Tributary to Morice River	NA				Removed from route	
1031.23	Tributary to Morice River	NA				Removed from route	
1033.44	Tributary to Morice River	NA				Removed from route	
1033.79	Tributary to Morice River	9025	Low Risk	11.6	3.5	Site moved 3 km upstream. Previous site was low risk. Sensitivity score driven by species sensitivity, habitat dependency and species rarity. New site will retain values in species sensitivity and species rarity. Habitat dependency is site specific and may change.	Sampling must be completed
1037.38	Tributary to Morice River	NA				Removed from route	

1037.46	Tributary to Morice River	NA				Removed from route	
1037.67	Tributary to Morice River	NA				Removed from route	
1038.30	Tributary to Morice River	NA				Removed from route	
1038.58	Tributary to Morice River	NA				Removed from route	
1038.74	Tributary to Morice River	NA				Removed from route	
1039.49	Tributary to Morice River	NA				Removed from route	
1039.96	Tributary to Morice River	NA				Removed from route	
1040.49	Tributary to Morice River	NA				Removed from route	
1041.07	Morice River	9027				Site moved 2 km upstream. Trenchless crossing - completed using SOP.	Sampling must be completed
1041.15	Tributary to Morice River	NA				Removed from route	
1043.01	Tributary to Gosnell Creek	NA				Removed from route	
1044.84	Tributary to Gosnell Creek	NA				Removed from route	
1046.75	Tributary to Gosnell Creek	NA				Removed from route	