



***Report of Environmental Assessment
and Reasons for Decision***

**EA0708-007: Dezé Energy Corporation Ltd.
Taltson Hydroelectric Expansion Project**

August 06, 2010

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List of abbreviations

DFO	Department of Fisheries and Oceans
LKDFN	łutsël K'e Dene First Nation
GNWT	Government of the Northwest Territories
INAC	Indian and Northern Affairs Canada
SARA	Species at Risk Act

Notes on language and references

Because Aboriginal names cited in this report have been transliterated from their original languages, spellings vary. Where evidence is quoted, this report reflects the spelling of the document cited. Further details on the Review Board's use of equivalent English terms are in Section 3.6.4.

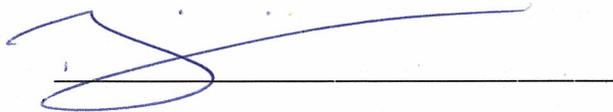
This report references documents on the Public Registry with the initials "PR" followed by the registry number of the document and specific page numbers where appropriate. Appendix B provides a listing of the documents on the Public Registry by number.

Review Board environmental assessment decision

To make its decision in this environmental assessment, the Mackenzie Valley Environmental Impact Review Board (Review Board) has relied upon all the information on the Public Record.¹ Having considered the evidence, the Review Board has made its decision in accordance with section 128 of the *Mackenzie Valley Resource Management Act*.

It is the Review Board's opinion that the proposed Taltson Hydroelectric Expansion Project is likely to cause significant adverse impacts to caribou, to the ecosystem of Trudel Creek, and to the culture of the Łutsël K'e Dene First Nation. The Review Board has prescribed measures to mitigate these impacts. These measures prevent new hunting access to caribou, increase water flow bypass at Twin Gorges, prevent the transmission line from crossing the Lockhart River, and require Dezé Energy Corporation Ltd. to create an advisory routing committee.

The Review Board recommends, under subparagraph 128(1)(b)(ii) of the *Mackenzie Valley Resource Management Act*, that the project be approved subject to the measures described in this report, which are necessary to prevent significant adverse impacts.



Richard Edjericon
Chairperson,
Mackenzie Valley Environmental Impact Review Board

August 6, 2010

Date

¹ The Public Record refers to the portion of the Public Registry that the Review Board relies on when reaching its decision. It contains all the evidence from the parties submitted during the environmental assessment.

Executive summary

The Mackenzie Valley Environmental Impact Review Board (Review Board) conducted an environmental assessment of a hydroelectric expansion project in the Akaitcho Region of the Northwest Territories, proposed by Dezé Energy Corporation Ltd. The proposed project involves:

- building a new control structure and raising the existing spillway at Nonacho Lake;
- building a hydroelectric plant 210 kilometres downstream at Twin Gorges to add between 36 to 56 megawatts of power-generating capacity, and constructing other control structures in the vicinity;
- re-clearing of the 70-kilometre existing winter road from Fort Smith to Twin Gorges, and building a new 215-kilometre winter road to Nonacho Lake;
- construction of a 690-kilometre transmission line from Twin Gorges, around the East Arm of Great Slave Lake, crossing the Lockhart River past the treeline, and northeast across tundra to the diamond mines; and,
- camps, barge landings and other supporting infrastructure along the route.

The Review Board has heard from First Nations, Métis organizations, community members, Elders, government organizations, cabin owners, ecotourism and fish camp operators, and members of the public. Parties raised various issues including:

- changes to Nonacho Lake;
- ecological changes to the Trudel Creek river system and potential impacts to fish and hydrology near the proposed power plant;
- potential impacts to caribou; and,
- issues regarding the detailed routing near the Lockhart River and proposed East Arm National Park.

The proposed winter road from Fort Smith may enhance public hunting access to areas within the historical winter range of the Bathurst, Ahiak and Beverly caribou herds by a combination of trucks and snowmobiles. The herds are currently in an unusually vulnerable condition. The Review Board is of the view that this is likely to cause significant adverse impacts to caribou, and has prescribed measures to physically prevent increased hunting access.

The Review Board heard concerns from Department of Fisheries and Oceans (DFO) and Nonacho Lake Fishing Camp that, although the project does not require new flooding, it would cause fluctuations in water levels in Nonacho Lake and changes at one of its outflows (the Tronka Chua gap). Based on an examination of the evidence, the Review Board is satisfied that the project is not likely to cause significant adverse impacts to fish from changes in Nonacho Lake, provided that DFO considers the results of the studies proposed by Dezé when carrying out its regulatory duties.¹ The project will cause ramping events which in turn will cause changes in the Trudel Creek river system. Ramping events

¹ See Section 3.4.2.2 for details.

involve relatively sudden hydrological changes in flow rates and water levels that vary considerably in magnitude and season from baseline levels and natural conditions. The Review Board is of the view that the ramping predicted by Dezé is likely to cause significant adverse impacts to wetlands, furbearers, fish and waterfowl in the Trudel Creek river system. These events are likely to result primarily from partial outages, as well as from routine annual turbine maintenance. The Board has prescribed a measure that requires Dezé to increase bypass capacity at Twin Gorges, and to create adaptive management plans that include monitoring of waterfowl, furbearers and wetland re-establishment in the Trudel Creek river system.¹

The Review Board accepts the evidence from Dezé that predicts that this project is likely to substantially reduce the greenhouse gas emissions from the diamond mines, which are the biggest industrial developments in the NWT. This can be seen as a significant beneficial impact of the project.²

The area of the Lockhart River, including the Old Lady of the Falls, is the most sacred site of the people of Łutsël K'e. They see any industrial development there as a desecration of a spiritual area of intrinsic value. The Review Board considered the evidence from the people of Łutsël K'e regarding cultural impacts. It agrees that the potential for industrial development in this area is not compatible with the Aboriginal values held by the people of Łutsël K'e for this area, and concludes that the project as proposed is likely to cause a significant adverse cultural impact on the people of Łutsël K'e. To prevent this, the Review Board prescribes a measure preventing the transmission line from crossing the Lockhart River without the consent of LKDFN.³

With respect to visual impacts on wilderness values in the proposed East Arm National Park, and the potential impacts on property owners in the area, the Review Board notes Dezé's willingness to mitigate visual impacts by changing tower design and configuration, and its proposal to run cable underwater for short lengths if necessary. The Review Board has prescribed a measure requiring the creation of an advisory routing committee to identify areas of local sensitivity and to advise Dezé on mitigative options such as pole design and route configuration.⁴ In the Review Board's opinion, this measure will also help Dezé avoid other cultural sites, preventing significant adverse cultural impacts beyond the Lockhart River area.

In terms of socio-economic impacts, the impacts on the Nonacho Lake Fishing Camp are largely addressed by the developer's commitments and by the Review Board's other measures. The Review Board accepts Dezé's evidence that the project is likely to cause significant beneficial large-scale socio-economic effects for Aboriginal communities in the South Slave, Akaitcho First Nations and NWT Métis Nation, and for the NWT as a whole.⁵

From a sustainability perspective, the proposed project harnesses and expands existing infrastructure of past projects, and is likely to extend the operating lifespan of the diamond mines, identified by Dezé as the primary customers for this electrical power. This project introduces a renewable resource development in a region with an economy based largely on non-renewable resource extraction, and

¹ See Section 3.3.2.8 for details.

² See Section 3.5 for details.

³ See Section 3.6.4.1 for details.

⁴ See Section 3.6.4.2 for details.

⁵ See Section 3.6.5 for details.

greatly decreases the production of greenhouse gasses from the NWT's biggest industrial developments, thereby reducing the total emissions from the NWT as a whole. The Review Board concludes, based on the evidence submitted, that this is a sustainable project.¹ It is likely to lead to improved social and economic benefits while reducing greenhouse gas emissions in the NWT, an accomplishment seldom achieved by major development projects elsewhere.²

Based on its considerations of the impacts and considering the commitments made by the developer, the Review Board concludes that the Taltson Hydroelectric Expansion Project as proposed is likely to be a cause of significant adverse environmental impacts unless the mitigation measures prescribed by the Review Board are implemented (under subsection 128(1)(b) of the *Act*). The Review Board recommends project approval subject to the measures described in this report.³ In the Review Board's opinion, these measures will prevent the significant adverse impacts identified, without sacrificing the environmental, social and economic benefits of this project.

¹ The Review Board did not assess the overall long-term financial viability of this project.

² See Section 3.7 for details.

³ These are listed in Appendix A.

Non-technical summary

Note: In the interest of avoiding technical terms, this non-technical summary may be imprecise with certain technical details of this report. Readers seeking authoritative references are advised to read the detailed text in the body of the report.

The Mackenzie Valley Environmental Impact Review Board (the Review Board) did an environmental assessment of a hydroelectric expansion project in the Akaitcho Region of the Northwest Territories. This project was proposed by Dezé Energy Corporation (Dezé). It involves:

- improving the existing dam at Nonacho Lake and building a new structure with gates to control the flow of water out of Nonacho Lake;
- building a hydroelectric power plant 210 kilometres downstream of Nonacho Lake, at Twin Gorges near the existing hydro plant. Dezé proposes to add between 36 to 56 megawatts of power-generating capacity, and constructing other structures nearby to control the flow of water;
- re-clearing the 70-kilometre existing winter road from Fort Smith to Twin Gorges, and building a new 215-kilometre winter road to Nonacho Lake;
- construction of a 690-kilometre transmission line from Twin Gorges, around the East Arm of Great Slave Lake, crossing the Lockhart River past the treeline, and northeast across tundra to the diamond mines; and,
- camps, barge landings and other works that will support construction along the route.

The Review Board has heard from First Nations, Métis organizations, community members, Elders, government organizations, cabin owners, ecotourism and fish camp operators, and members of the public. They raised many issues including:

- changes to Nonacho Lake;
- changes to fish, wildlife and their habitat on the Trudel Creek river system and possible impacts to fish and flows of water near the proposed power plant;
- possible impacts to caribou; and,
- issues about the details of the transmission line route near the Lockhart River and proposed East Arm National Park.

The proposed winter road from Fort Smith may increase access by hunters, using both trucks and snowmobiles, to areas that have been used by the Bathurst, Ahiak and Beverly caribou herds. At this time, the caribou herds are in an unusually weak condition. The Review Board is of the view that this is likely to cause significant adverse impacts to caribou, and has made measures to prevent increased hunting access.

The Review Board heard concerns from Department of Fisheries and Oceans and Nonacho Lake Fishing Camp that, although the project does not require new flooding, it would cause water levels to rise and fall in Nonacho Lake, and would stop water from flowing through the Tronka Chua gap as does now. Based on the evidence, the Review Board is satisfied that the project is not likely to cause significant

adverse impacts to fish from changes in Nonacho Lake, if the Department of Fisheries and Oceans considers the results of the fish and fish habitat studies proposed by Dezé when carrying out its duties.¹

The project will cause ramping events, which will cause changes in the Trudel Creek river system. A ramping event means a sudden change in the flow and water level. These events come from mechanical failures, as well as from planned maintenance of the turbines every year. Ramping events cause big changes from the natural flow and water levels. The Review Board is of the view that these ramping events predicted by Dezé are likely to harm wetlands, furbearers, fish and waterfowl in the Trudel Creek river system over the life of the project.

The Board has made a measure to reduce impacts of ramping events. It requires Dezé to increase bypass capacity at Twin Gorges, so that when turbines are not working, more water can spill around the turbines instead of flowing into the Trudel Creek river system. The Board has also made a measure that requires Dezé to create a plan for monitoring waterfowl, furbearers and wetland re-establishment in the Trudel Creek river system in such a way that Deze can learn from any changes that are seen, to improve project operation.²

The Review Board accepts Dezé's predictions that this project is likely to make an important reduction the greenhouse gas emissions from the diamond mines, which are the biggest industrial projects in the NWT. This is an important environmental benefit of this project.³

The area of the Lockhart River, including the Old Lady of the Falls, is the most sacred site of the people of Łutsël K'e. In their view, a transmission line there would desecrate a spiritual area that has its own special value. The Review Board considered the views the people of Łutsël K'e regarding cultural impacts. It agrees that a transmission line across the Lockhart River is not compatible with the Aboriginal values held by the people of Łutsël K'e for this area. The Review Board concludes that the project as proposed is likely to cause a significant adverse cultural impact on the people of Łutsël K'e. To prevent this, the Review Board made a measure preventing the transmission line from crossing the Lockhart River without the consent of LKDFN.⁴

The Review Board considered visual impacts and the wilderness values in the proposed East Arm National Park, and the possible impacts on property owners in the area. The Review Board notes that Dezé is willing to reduce or avoid visual impacts by changing tower design and layout, and has offered to run cable underwater for short lengths if necessary. The Review Board has made a measure requiring Dezé to create a routing committee to advise it on how to identify areas of local sensitivity and on other options to avoid or reduce impacts.⁵ In the Review Board's opinion, this will also help Dezé avoid other cultural sites, and will prevent significant adverse cultural impacts beyond the Lockhart River area.

In terms of social and economic effects, the impacts on the Nonacho Lake Fishing Camp are largely dealt with by Dezé's commitments and by the Review Board's other measures. The Review Board accepts

¹ See Section 3.4.2.2 for details.

² See Section 3.3.2.8 for details.

³ See Section 3.5 for details.

⁴ See Section 3.6.4.1 for details.

⁵ See Section 3.6.4.2 for details.

Dezé's evidence that the project is likely to cause important social and economic benefits for Aboriginal communities in the South Slave, Akaitcho First Nations and NWT Métis Nation, and for the NWT as a whole.¹

From a sustainability perspective, the proposed project builds on existing works from past projects, and is likely to extend the lifespan of the diamond mines. Dézé has said that the diamond mines are the primary customers for this electrical power. This project introduces a renewable resource development in a region with an economy based largely on non-renewable resources. It also greatly decreases the greenhouse gases from the NWT's biggest industrial projects, and reduces the emissions from the NWT as a whole. The Review Board concludes that this is a sustainable project.² It is likely to lead to improved social and economic benefits while reducing greenhouse gas emissions in the NWT. This is a rare accomplishment for a major development project.³

The Review Board concludes that the proposed Taltson Hydroelectric Expansion project is likely to be a cause of significant adverse environmental impacts unless the Review Board's measures are carried out. The Review Board recommends that this project be approved only with the measures described in this report.⁴ In the Review Board's opinion, these measures will prevent the significant adverse impacts identified, without sacrificing the environmental, social and economic benefits of this project.

¹ See Section 3.6.5 for details.

² The Review Board did not assess the overall long-term financial viability of this project.

³ See Section 3.7 for details.

⁴ These are listed in Appendix A.

1 Introductory information

This is the Mackenzie Valley Environmental Impact Review Board (Review Board)'s *Report of Environmental Assessment and Reasons for Decision* for Dezé Energy Corporation Ltd. (Dezé)'s proposed Taltson Hydroelectric Expansion Project. The purpose of this report is to:

- a) satisfy the reporting requirements of the *Mackenzie Valley Resources Management Act* (the *Act*) sections 121 and 128;
- b) convey the Review Board's decision and rationale on whether the proposed development is likely to be the of cause significant adverse impacts on the environment or be a cause for public concern;
- c) summarize the relevant evidence on which the decision is based; and
- d) document relevant parts of the environmental assessment.

1.1 Assessment report overview

This Report of Environmental Assessment is written in five parts, as follows:

- Section 1 provides background information on the regulatory history and referral of this development to the Review Board. This section also sets out the requirements of the *Act* and provides a brief description of the development proposal.
- Section 2 describes the Review Board's environmental assessment process for this project. It provides information about the parties to this assessment and the steps of the process the Review Board took to identify any significant adverse impacts or public concern as required by section 128 of the *Act*. Section 2 also describes the scope of the assessment and the changes to the proposed development's design that occurred during the assessment.
- Sections 3 outlines selected environmental components that the Review Board examined during the impact assessment. This section includes a summary of the evidence, the Review Board's analysis and conclusions, and any mitigations and suggestions by the Review Board.
- Section 4 considers the extent of, the reasons for, and the significance and likelihood of any public concern resulting from the proposed development.
- Section 5 describes the environmental assessment decision. It includes a summary of all conclusions as well as the report's overall conclusion. This section also summarizes measures and suggestions to avoid or reduce impacts.

1.2 Regulatory history

Dezé Energy Corporation submitted a complete application to the Mackenzie Valley Land and Water Board for a Type A Land Use Permit (MV200710033) and a Type A Water License (MV2007L4-0029) on June 5th, 2007. The Mackenzie Valley Land and Water Board notified the Review Board and other interested parties that it had commenced its preliminary screening of the development on June 20th, 2007. On October 5th, 2007, the Mackenzie Valley Land and Water Board referred the project to environmental assessment on the basis that it might have significant adverse impacts on the

environment and might be a cause of public concern. On October 17th, 2007, the Review Board notified the developer that it had initiated an environmental assessment.

During the preliminary screening the Yellowknives Dene First Nation and the Akaitcho Treaty 8 Tribal Corporation voiced concern over the project's cultural and physical impacts. North Slave Métis Alliance expressed concern for heritage resources and contamination of the area. The region along the transmission line route was also identified as an area of interest for the creation of a National Park.

Dezé proposes the Taltson expansion to capitalize on the full power-generating capacity of the Taltson watershed at the Twin Gorges hydroelectric facility. The primary purpose of the expansion is to supply the existing diamond mines (Ekati, Diavik and Snap Lake), and possibly the proposed Gahcho Kue diamond mine, with renewable electricity through construction of an electrical transmission line. The proposed project includes a new hydroelectric power generating plant with accompanying changes to accommodate a greater power production. Dezé's proposal also includes modifications to the existing dam structure at the upstream reservoir of Nonacho Lake, but does not require new flooding. The transmission line would stretch through the Taltson watershed, cross the Lockhart River that feeds the East Arm of Great Slave Lake, and extend over the tundra to reach the diamond mines.¹ On completion of the regulatory phase of the project, Dezé expects the project construction phase to take two to three years.

1.3 Requirements of the *Mackenzie Valley Resource Management Act*

The Review Board administers Part 5 of the *Mackenzie Valley Resource Management Act* (the *Act*) and therefore has decision-making responsibilities in relation to the proposed development. The Review Board is responsible for conducting an environmental assessment that considers the proposed development's biophysical, socio-economic and cultural impacts on the environment, in accordance with section 114 and section 115 of the *Act*. The Review Board conducted this environmental assessment based on its *Rules of Procedure* and *Environmental Impact Assessment Guidelines*.

Under subsection 117(1) of the *Act*, the Review Board must decide on the scope of the development. The Review Board must also consider the factors set out in subsection 117(2), which are further described in Section 2 of this report. Although the parties have submitted evidence regarding a variety of impacts, the Review Board is required to conduct a particular test: to determine whether the proposed development is likely to cause a **significant** adverse impact on the environment or to be a cause of significant public concern.² The Review Board must then prepare a *Report of Environmental Assessment*.³

Once the federal and responsible Ministers accept the Review Board's *Report of Environmental Assessment*, the developer, government and regulatory authorities must ensure that any approved measure is carried out.⁴ If the Review Board determines the development is not likely to have any

¹ Further project details are presented in Section 1.5.

² Subsection 128(1)

³ Subsection 128(2)

⁴ Section 62 and subsection 130(5)

significant adverse impact on the environment or be a cause of significant public concern,¹ the *Act* identifies the following:

- no regulatory authority can issue a license, permit or other authorization before the expiration of ten days after receiving the report of the Review Board;² and
- the federal Minister and Responsible Ministers may order an environmental impact review of the proposal, notwithstanding the Review Board's determination.³

1.4 Environmental setting

This section provides a summary of the biophysical setting of the project, based on Dezé's Developer's Assessment Report (DAR). The proposed project area, from the flow control structure at Nonacho Lake to the transmission line, stretches across multiple ecosystems in the Akaitcho region of the Northwest Territories. The southern portion of the project sits in the diverse Taiga Shield Ecozone, an area where dominant vegetation and terrain classification changes moderately from the south part of the region to the northern part. Moving from south to north, these classifications can range from fluvial plains with stunted black and white spruce woodlands and discontinuous permafrost, to high relief bedrock mixed with closed, young jack pine and black spruce stands and peatlands, to esker complexes with bedrock and even more extensive peatlands. In the more northerly Southern Arctic Ecozone where the transmission lines would terminate, Takijuj Lake Upland Ecoregion vegetation includes shrub tundra such as dwarf birch, willow, northern Labrador tea, moss and sedge tussocks. The landscape includes many esker complexes and lakes typical of Canadian Shield terrain and hosts continuous permafrost (PR#74⁴).

Barren ground caribou habitat covers much of the above terrain. In addition to caribou, the project area overlaps the habitats of moose, muskoxen, wolves, wolverines, grizzly and black bears, Arctic and red fox, marten and lynx. Various bird species within the project area include numerous songbirds, loons, ducks, geese, eagles, hawks, falcons and owls (PR#74).

The Taltson River watershed drains an area of approximately 60,000 square kilometres and represents the power-generating portion of the project that drains into and sits entirely south of Great Slave Lake. On average, the Taltson drainage basin receives 350 millimetres of precipitation per year, with rainfall (between June and October) making up two thirds of this total and snowfall the remainder. The watershed experiences the greatest monthly temperatures during July with an average maximum of 22.9 °C and the lowest during January at -28.9 °C (PR#74).

To produce power, the proposed project engages several water bodies that interconnect with the Taltson River at various points along its route, including Trudel Creek and Nonacho Lake. The entire Taltson watershed hosts aquatic species including northern pike, lake whitefish, lake trout and pickerel.

¹ Paragraph 128(1)(a)

² Subsection 129(a)

³ Paragraph 130(1)(a)

⁴ This report references documents on the Public Registry with the initials PR followed by the registry number of the document and specific page numbers where appropriate. Appendix B provides a listing of the documents on the Public Registry by number.

The system also is home to beaver, river otter and muskrat. Dene, Inuit and Métis use various parts of the proposed project area for hunting, fishing, other harvesting, and for spiritual purposes (PR#74).

1.5 Description of development

Project purpose

Built in 1964-65, the original hydroelectric facility at the Twin Gorges site produced 18 megawatts of electricity for the Pine Point lead-zinc mine. When the Pine Point mine shut down in 1986 the power-generating facility continued to service various communities south of Great Slave Lake including Hay River and Fort Smith.

Dezé's project proposes to expand this service to the three operating diamond mines at Ekati, Diavik and Snap Lake, and could include the proposed Gahcho Kue diamond mine. The project involves building new facilities without new upstream flooding. It is intended to fully capitalize on the flow-potential of the river system, a portion of which currently produces power at the Twin Gorges site. At present, power output is only one-quarter of the total potential. With the expansion, the combined hydroelectric generation at Twin Gorges could generate a total of between 54 and 74 megawatts of power. From the Twin Gorges site a new transmission line would deliver power across the tundra to new electrical substations at each mine, each of which would receive and redistribute power. This line would branch at the proposed Gahcho Kue mine site, with one branch feeding Snap Lake diamond mine and the other continuing north to service Diavik and Ekati (see Figure 1, page 15).

In its present form, the hydroelectric facility makes use of the flow and height differences between various water bodies in the Taltson River watershed including (and in descending order of height) Nonacho Lake, the Twin Gorges Forebay and Elsie Falls. The Twin Gorges Forebay feeds the hydroelectric facility at the Twin Gorges power plant, and water from the power plant discharges upstream of Elsie Falls.

Nonacho Lake control structure

Nonacho Lake is located 210 kilometres upstream of the Twin Gorges site. A dam restricts flow from Nonacho Lake by diverting a reduced flow to an artificial spillway beside the dam (the Nonacho Spillway) and occasionally to adjacent Tronka Chua Lake by a natural depression called the Tronka Chua Gap. The Nonacho dam raised the height of Nonacho Lake by two metres when it was originally built, and any flow through the Tronka Chua Gap rejoins the flow from Nonacho Lake upstream of the Twin Gorges site.

At present the Nonacho dam has three sluice gates that regulate flow through the dam depending on flow requirements at the Twin Gorges power plant site. Since the Nonacho dam is over forty years old and is leaking, Dézé proposes to repair it to reduce the uncontrolled flow through it. According to Dézé, a newly excavated canal with four sluice gates beside the repaired Nonacho dam would more effectively regulate the volume of water that flows downstream to the Twin Gorges site. Dézé refers to this proposed feature as the Nonacho Lake control structure. A proposed small-scale generating station within the control structure would provide enough electricity to run it, with a diesel generator providing backup power as needed. To route the flow of Nonacho Lake more effectively through the control

Figure 1 Map of the Taltson project in the Akaitcho region



Source: Developer's Assessment Report – Dezé Energy Taltson Hydroelectric Expansion Project (PR#74)

structure, Dezé also proposes to raise the level of the crest of the constructed Nonacho Spillway by roughly fifty centimetres.

Transmission line route

The proposed project requires a transmission line approximately 700 kilometres long to run from the Twin Gorges facility to the diamond mines in the Slave Geological Province (see Figure 1, page 15). Line towers will be placed approximately 350 metres apart for most of the route, typically on stone outcrops. The towers will be either pole-type or steel lattice type, 22 to 25 metres tall, with three conductors in line between them (PR#74 pp6.4.15-21).

South Valley Spillway, minimum flow release structure and the South Gorges Spillway

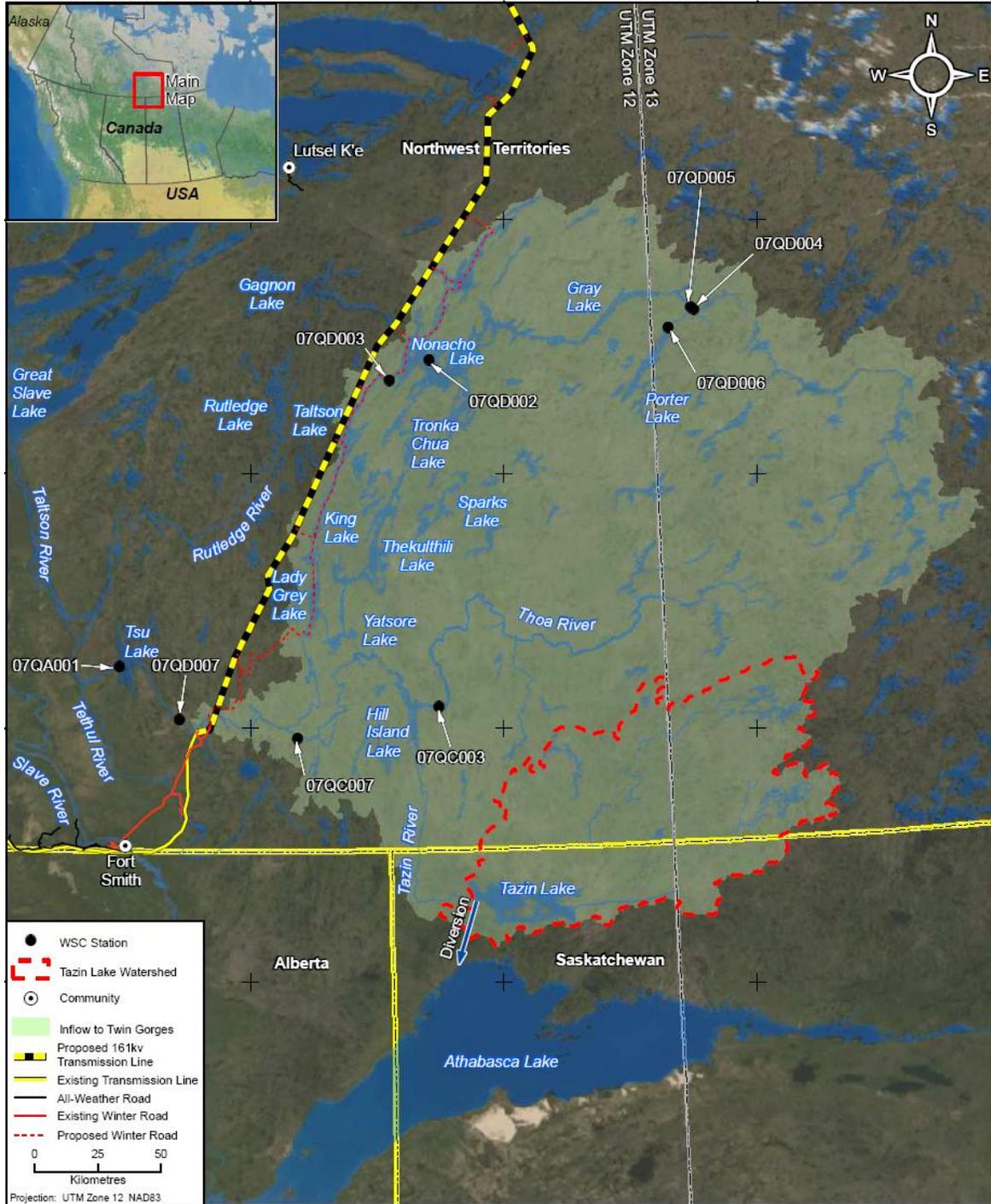
Water from Nonacho Lake flows 210 kilometres downstream to the Twin Gorges Forebay. The Twin Gorges plant is located at the downstream end of the forebay. Approximately nine kilometres upstream of the power plant is the South Valley Spillway, located off the forebay. When water is prevented from flowing through or past the generating stations, the forebay rises, and when levels exceed a certain height, the water flows over the South Valley Spillway into the Trudel Creek river system (see Figure 3, page 18). Water from the South Valley Spillway feeds Trudel Creek and loops around for 33 kilometres and joins the discharged water from the hydroelectric facility just downstream of Elsie Falls.

Dezé Energy's current water license limits the minimum flow below Elsie Falls to 28 cubic metres per second. In order to meet this minimum flow requirement in the event of an unplanned shutdown of one or both power plants, Dezé's expansion includes the establishment of two structures that can increase flow past the plants. A proposed minimum flow release structure at the South Valley Spillway would allow Dezé to increase flow past this outlet as needed. Dezé also proposes to create a new spillway just south of the existing power plant by excavating portions of the South Gorges Bypass Spillway, near the Twin Gorges plant.

New hydroelectric facility

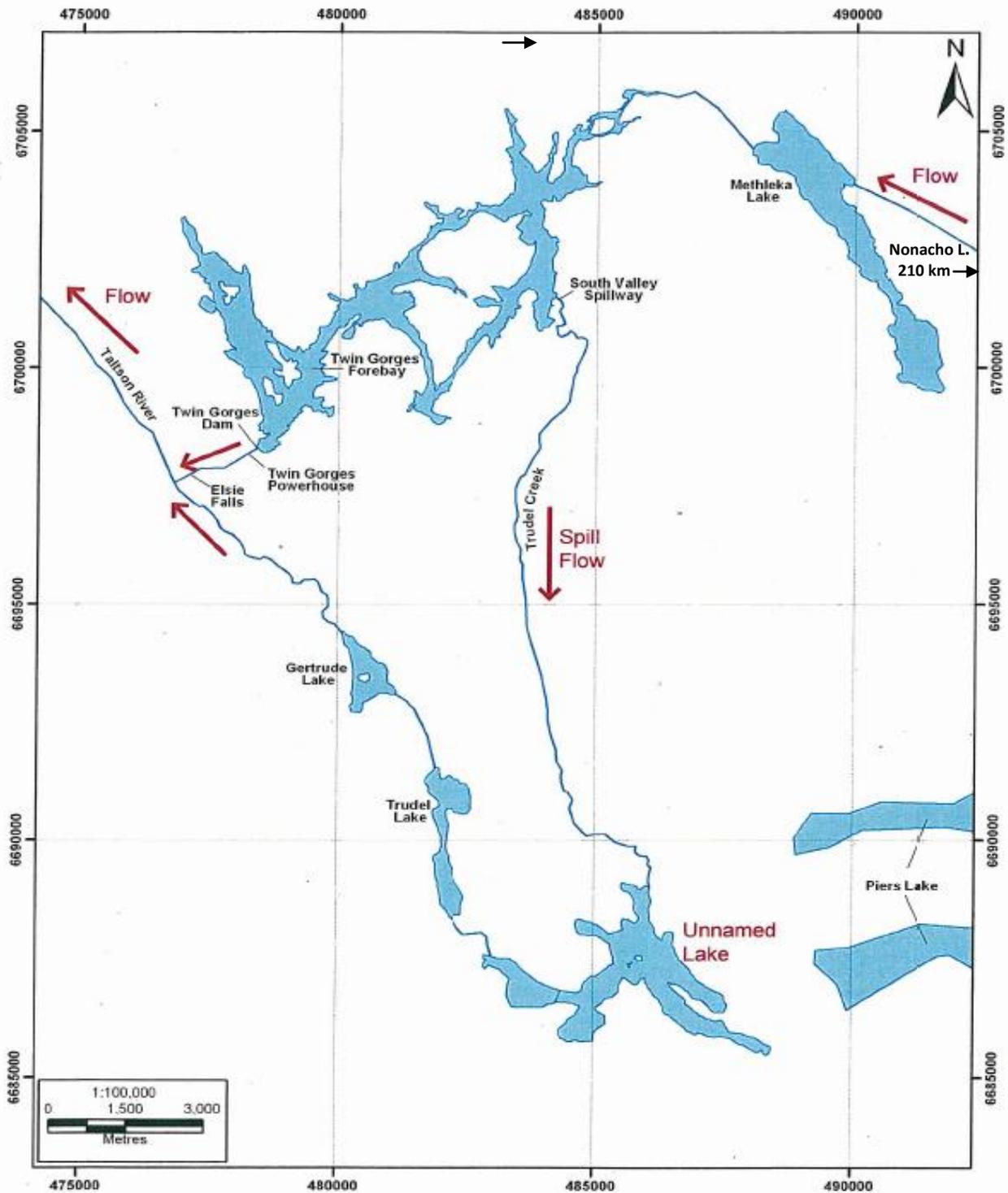
The new facility that would increase the power-generating capacity of the Twin Gorges system consists of a newly excavated 1.2-kilometre canal leading to two penstocks that each lead water to a turbine. This new generator station would sit just north of the existing facility and have a small artificial canal emptying into the Taltson River just below Elsie Falls. It may generate between 36 and 56 megawatts of power, depending on flow and final project configuration. The project is proposed with a forty year lifespan, although Dezé estimates that it is physically possible for the infrastructure to last up to one hundred years.

Figure 2: Taltson River watershed



Source: Developer's Assessment Report – Dezé Energy Taltson Hydroelectric Expansion Project (PR#74)

Figure 3: Hydrological map of Twin Gorges area & Trudel Creek river system



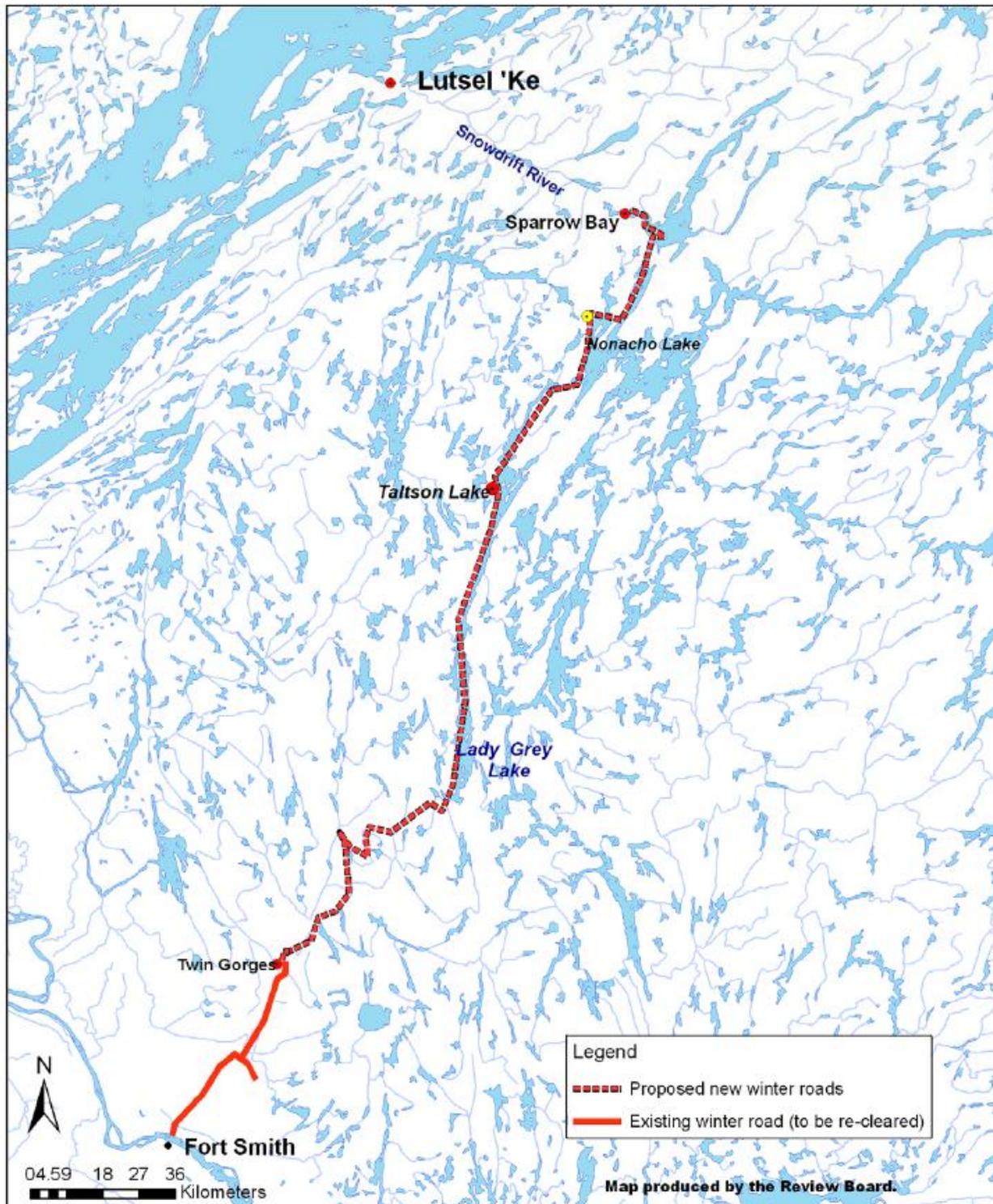
Adapted from: Developer's Assessment Report – Dezé Energy Taltson Hydroelectric Expansion Project (PR#74)

Construction

Dezé's current plan for construction begins in winter where a winter road from Fort Smith to Twin Gorges would allow delivery of large- and small-scale materials to various staging areas. Dézé would reach Nonacho Lake by the use of this winter road and reach other staging areas using spurs from the winter road (see Figure 4, page 20). During the following summer Dézé would barge materials to the East Arm of Great Slave Lake and begin construction of the various structures for the expansion including the transmission line. Mobile transmission-line construction camps would house up to forty people, while the Nonacho and Twin Gorges camps would be larger. The transmission line includes a fifteen to thirty metre wide right-of-way for towers that would stand up to 25 metres tall. Spacing between towers would be up to 350 metres, depending on topography. Towers would have anchor wires securing them to the ground.

In the second winter of the project, Dézé would continue with delivery of materials to key staging areas via the winter road. During the second summer construction would continue. The third winter would see removal of the construction materials and staging areas (PR#74 pp6.5.48-50)

Figure 4: Map of existing and new proposed winter road



2 Environmental assessment process

2.1 Parties to the environmental assessment

Fourteen parties participated in this environmental assessment. According to the Review Board’s *Rules of Procedure*, the developer is considered a directly affected party. The remaining thirteen registered parties were:

- NWT Treaty #8 Tribal Corporation
- Łutsël K’e Dene First Nation (LKDFN)
- Deninu Kue First Nation
- North Slave Métis Alliance
- Fort Resolution Métis Council
- Department of Fisheries & Oceans (DFO)
- Government of the Northwest Territories (GNWT)
- Indian and Northern Affairs Canada (INAC)
- Environment Canada
- Transport Canada
- Parks Canada
- Natural Resources Canada (NRCan)
- The Carter Family

During the environmental assessment process, representatives of government departments had the opportunity to identify their interests and to notify the Review Board of their intent to participate in the proceeding as an interested party. Parties to the environmental assessment had the opportunity to attend and actively participate in the process. Though some parties did not actively participate through information requests or hearings, information exchanges between the developer and parties can be found on the public registry. Table 1 below illustrates the involvement of the parties throughout this environmental assessment process, including information request responses and the public hearing.

Table 1 Participation of the parties

Party	Information requests, technical sessions (Yellowknife, Łutsël K’e)	Hearing
NWT Treaty #8 Tribal Corporation		✓
Lutselk’e First Nation	✓	✓
Deninu Kue First Nation	✓	✓
North Slave Métis Alliance	✓	✓

Fort Resolution Métis Council	Attended the Łutsël K'e session	✓
Department of Fisheries & Oceans (DFO)	✓	✓
Government of the Northwest Territories (GNWT)	✓	✓
Indian and Northern Affairs Canada (INAC)	✓	✓
Environment Canada	✓	✓
Transport Canada	✓	✓
Parks Canada	✓	✓
Natural Resources Canada	✓	Written hearing submission
The Carter Family		✓

✓ = actively participated in this phase of the environmental assessment

The *Terms of Reference* for the Developer's Assessment Report outlined the parties' roles and responsibilities. The developer was responsible for producing the information necessary for the Review Board and the parties, including the developer, to use to evaluate the potential impacts that the proposed project might have on the environment.

2.2 Environmental assessment phases

After the referral of October 5, 2007 and the initial start up functions such as creating a distribution list, the Review Board conducted this environmental assessment in three phases: a scoping phase, an analytical phase, and a decision phase. See Figure 5 (page 23) for tasks associated with each phase of the environmental assessment.

Figure 5: Dezé Energy Expansion Project environmental assessment process



Development of workplan and Terms of Reference

The Review Board issued a draft workplan in February 2008. This document established milestones and identified the Review Board's timelines and expectations for the completion of the environmental assessment. Parties and participants in the environmental assessment submitted comments about the workplan through mid-March 2008. After considering these comments, the Review Board issued the final workplan at the end of March 2008. The Board revised the workplan in September 2009 to reflect changes to the Developer's Assessment Report submission date and other considerations in the environmental assessment process.

The Review Board issued the draft Terms of Reference to the distribution list for comment, also in February 2008. The Review Board considered all comments and issued the final Terms of Reference in March 2008. The Terms of Reference defined the scope of development, the scope of assessment and provided direction to Dezé Energy and the parties about their roles, responsibilities and other deliverables in the environmental assessment process.

Developer's Assessment Report

Dezé Energy prepared its Developer's Assessment Report according to the Terms of Reference. After receiving the Developer's Assessment Report (PR# 74) the Review Board deemed the report to be in conformity on March 28, 2009. Review Board staff hosted a technical gap analysis session during the last week of May to review various aspects of the report.

Information requests

Given the volume, quality and complexity of information requests that followed the release of the Developer's Assessment Report, in addition to numerous requests for deadline extensions from various parties, the Review Board decided that another technical session would be the most appropriate forum to address outstanding issues, rather than the normal approval process, which would have been arduous and protracted. Review Board staff hosted an information technical session in Łutsël K'e on September 28, 2009, where Dézé and other parties discussed the development and the issues surrounding it. Further, the Review Board directed staff to host a three-day technical session in Yellowknife so that parties to the environmental assessment could discuss concerns in person and address any further information gaps stemming from the Developer's Assessment Report. The session was held on October 1st, 2nd and 5th. The Review Board requested that the developer supply written answers to questions it could not adequately answer during the session, setting a deadline for October 30th 2009 for the responses to be sent to the Review Board. This modified process represented the final opportunity for parties to request clarifying information about the Developer's Assessment Report in preparation for their written final submissions.

Pre-hearing conference

Review Board staff hosted a pre-hearing conference on December 15, 2009 to discuss procedures and to set the agenda for the hearing.

Public hearing

On January 14th and 15th, 2010, the Review Board held a public hearing in Dettah, Northwest Territories. Radio, posters, newspapers and webpage announcements notified the public prior to the hearing. The main purpose of the hearing was to allow the public an opportunity to hear and participate in a discussion of the unresolved issues related to the proposed development during the environmental assessment. The hearing was an opportunity for the community members to bring up important concerns directly to the Review Board.

The developer and several other parties gave presentations to the Review Board. All parties had the opportunity to question both the developer and the other parties involved. The parties highlighted direct and indirect impacts of the proposed development and presented final impact predictions and mitigation suggestions to the Review Board.

Partial closure of Public Record

After the public hearing in Dettah on January 14th and 15th, 2010, there were undertakings from the developer and DFO. The GNWT also responded to an information request regarding the caribou issue.

The Review Board gave notice of final submission by January 29th, 2010 from all parties. Because of the feedback from parties on the alternate routing of the Taltson transmission line, proposed by Dezé during the hearing and subsequent submissions, the Review Board decided to have a partial closure of the Public Record and to allow comments pertaining only to the route adjustment to the transmission line. The deadline for these submissions was February 18th. On February 18th 2010, the Review Board received two Requests for Ruling submissions, from Parks Canada and from Natural Resources Canada regarding the re-routing of the transmission line.¹

Additional assessment of alternate route

On March 12th, 2010 the Review Board met and discussed the new alternate route proposed in the Kache/ Fort Reliance area (referred to as “the Reliance adjustment” in this report). Due to the evidence and the comments from parties, the Board decided to extend the assessment of the Reliance adjustment route only. Dezé was asked to clarify its proposal by March 26th, 2010. Parties of the assessment were given until April 12th, 2010 to submit information requests for this proposed route by April 26th, 2010. The Review Board issued the final submission date for May 10th, 2010 and the developer was given until May 12th, 2010 for its final submission.

Environmental assessment decision

After the closing of the Public Record on May 12th, 2010, the Review Board deliberated on all evidence. The Review Board considered all submissions in its decision. The Review Board has prepared this *Report of Environmental Assessment & Reasons for Decision* for submission to the Minister of Indian Affairs and Northern Development as required by subsection 128(2) of the *Act*.

2.3 Decisions on significance

Section 128 of the *Mackenzie Valley Resource Management Act* requires the Review Board to decide, based on all the evidence on the Public Record, whether or not in its opinion the proposed development will likely have a significant adverse impact on the environment or be a cause for significant public concern.

The Review Board asked the registered parties to assist by providing their own views of the predicted impacts and their significance. The Review Board considered the following characteristics of all environmental impacts identified:

- magnitude
- geographic extent
- timing
- duration
- frequency
- nature of the impact
- reversibility of the impact
- probability of occurrence
- predictive confidence level

¹ See section 3.6.2 for details regarding the chronology of this portion of the environmental assessment.

Section 3 of this report describes the Review Board’s analysis and the reasons for its decisions on the significance of adverse impacts that are likely to result from the proposed development.

In addition, the *Mackenzie Valley Resource Management Act* paragraph 128 (1)(c) requires the Review Board to identify whether the proposed development is likely to be cause of significant public concern. Section 4 of this report provides the details of the Review Board’s analysis of public concern.

2.4 Scope of development

The scope of development describes the elements of the proposed project that the Review Board considers in the environmental assessment. The scope of the development takes into account both principal and accessory development activities. It also outlines any future activities under the land use permit, water license or other regulatory instruments.

Based on the developer’s evidence, the Review Board identified the principal development scope to include those components listed in Table 2.

Table 2: Scope of development

Phase	Components/Activities
Construction	Construction of Twin Gorges expansion facility, including canal and buildings
	Construction of Nonacho Lake control structure
	Construction of transmission line and substations
	Construction of laydown yards and temporary camps, as well as camp activities
Operations	Generation and transmission of electricity
	Maintenance of all facilities
Water management	Discharge of water through the Twin Gorges generation facilities
	Operation of Nonacho Lake control structure
	Intermittent flow changes through South Valley Spillway and Trudel Creek river system
	Wastewater management during construction and operations
Transport	Re-establishment of temporary winter road from Fort Smith to Taltson Twin Gorges
	Establishment of temporary winter road from Taltson Twin Gorges to Nonacho Lake and spur roads
	Use of the current Tibbitt-Contwoyto winter road and Snap Lake/ Gahcho Kue spur during construction
	Barging of transmission materials on Great Slave Lake to laydown areas
	Use of helicopter and/or fixed wing aircraft for construction and maintenance
Closure and reclamation	Closure and reclamation of project components

2.5 Scope of environmental assessment

The scope of the environmental assessment identifies which issues and items the Review Board will examine during the process. The Review Board recognized that the Mackenzie Valley Land and Water Board referred this environmental assessment, and therefore the Review Board developed the scope of

assessment with public concern in mind as well as factors listed under subsection 117(2) of the *Mackenzie Valley Resource Management Act*.

After considering the relevant information available on the Public Record, the Review Board made decisions on the scope of the assessment. When assessing social and cultural impacts the geographical scope of this assessment included Northwest Territories communities that have traditionally used the area. The Review Board had to consider the entire proposed project area to assess the development-specific and public concern issues. The geographic scope of the assessment included the communities of Łutsël K'e , Fort Resolution, Fort Reliance and Fort Smith, the areas they use and vicinity of the proposed project in general. The Review Board established the temporal scope to include all phases of the proposed expansion project, from mobilization to closure, until such time that no potential significant adverse impacts would be attributable to the proposed development.

Valued components

The Review Board identified the following potentially affected valued components for the *Terms of Reference* after examining the Public Record:

Key lines of inquiry

- barren ground caribou
- water fluctuations in Taltson watershed (excluding Trudel Creek)
- ecological changes in Trudel Creek

Subjects of note (biological)

- canal construction
- turbine issues
- species at risk
- access
- climate change
- fur bearers

Subjects of note (socioeconomic)

- employment
- regional economic development
- tourism impacts
- legacy issues
- harvesting and land use
- heritage resources

The *Terms of Reference* also required an analysis of the project's contribution to sustainable development.

Traditional knowledge

The Review Board recognizes the important role that Aboriginal cultures, values and knowledge play in its decision-making. In accordance with the requirements of subsection 115(1) of the *Mackenzie Valley Resource Management Act*, the Review Board considered all traditional knowledge that parties shared during the environmental assessment.

3 Assessment of impacts

This section of the report considers specific issues related to impacts that arose during the environmental assessment. All information is based on material from the Public Record. For each issue, the Review Board describes:

- the developer's submissions and predictions (based on its *Developer's Assessment Report*, hearing statements and other evidence from Dezé on the Public Record);
- other relevant items on the Public Record (such as submissions from parties to the EA);
- the analysis and conclusions of the Review Board pertaining to each issue; and,
- any measures or suggestions by the Review Board.

The Review Board has considered all issues that were raised in this environmental assessment, pursuant to the requirements of s.117 of the *MVRMA*. The deliberations of the Review Board considered evidence from the hearings as well as the written evidence on the Public Record.¹ This report does not discuss issues which the Review Board has decided are fully resolved by the material on the Public Record. The only issues discussed in detail in this *Report of Environmental Assessment* are those that the Review Board decided warranted further consideration for the purposes of its decision under section 128 of the *Act*. The Board notes that within the framework of the *Act*, the significance determinations described in this report are not intended to limit regulators from drawing their own conclusions when carrying out their regulatory duties.

The outstanding issues addressed in sections 3.1 to 3.6 of this report involve those concerning caribou, aquatics, cultural issues, socio-economic issues, and sustainability. The Review Board considered the evidence in the project-specific context and in the cumulative context where appropriate.

The commitments made by the developer during the environmental assessment were considered by the Review Board in reaching its conclusions. These include the commitments described in the following sections, in addition to any other commitments made during hearings and in written submissions. The Review Board's conclusions assume that the developer will implement all of its commitments.

Note: The Review Board has observed that much of the evidence from parties, and from specialized government departments in particular, was based on their informed opinions, but that those parties did not submit substantive evidence explaining the reasons underlying their conclusions. Although the views of specialized government departments were duly considered, in this case the Review Board was required to rely more heavily on its own analysis of the developer's evidence than is usually necessary. The Review Board hopes to see improved detailed documentation supporting the technical predictions of government in future environmental assessments.

¹ See Appendix B for a full listing of documents on the Public Registry.

3.1 Impacts on caribou from increased access

This section examines the evidence on the potential impacts to caribou resulting from increased access and related mortality. This section summarizes Dezé's proposed winter roads, and reviews evidence that deals with whether caribou are likely to be in the vicinity of the proposed winter roads. The section then examines evidence about the vulnerability of herds in question, and what the predicted impacts mean to the herds considering the current caribou populations and trends. Following this, the section looks at the potential for increased hunting by truck and snowmobile on the proposed roads and the mitigations that have been proposed.

Following the summary of the evidence, the Review Board's findings are described. Other impacts to caribou that are not related to access are examined in Section 3.2 of this report.

3.1.1 Parties' submissions

3.1.1.1 Proposed road development

Dezé proposes to maintain a winter road to transport bulk materials and machinery during the construction phase of the project (see map in Figure 4, page 20). This access road would originate in Fort Smith, continue past the existing Twin Gorges hydroelectric facility, and terminate at the Nonacho Lake Control Structure site. Spur roads and other access trails would branch from the main winter roads and staging areas to deliver materials to key sites along the transmission line right-of-way (PR#74 pp6.5.1-2).

Built from 1964 to 1966 for access to the Twin Gorges site during construction of the existing hydroelectric facility, the 60 kilometre road from Fort Smith has not been used for 17 years and is somewhat overgrown. A portion of the route was cleared by the NWT Power Corporation, a parent company of Dezé Energy Corporation, under a previous land use permit (MV2008F0027), which expires in 2013.¹ The application states that "(t)he winter road would likely facilitate snowmobile access, and increase harvest levels during its five years of operation"(p4). The application identified that "the winter road will be blocked at each end and slash placed across the lower portages to discourage use" as a mitigation (p5).

For the proposed project, Dezé assumes it would have to re-clear a right-of-way for the Fort Smith to Twin Gorges road to be functional as a heavy-duty haul road (PR#74 p6.5.4). The first 75 kilometres of winter road past Twin Gorges would consist of groomed ice road on interconnected lakes and low lying areas with some vegetative clearing (PR#74 p6.5.6). The remaining 140 kilometres to the Nonacho Lake site consist of an ice road and associated portages (PR#74 p6.5.10).

For the transmission line, Dezé proposes to clear vegetation to ground level for the portions of the project below the tree line. Twin Gorges is 356 kilometres from the tree line (PR#74 p6.5.40). Dezé proposes a right-of-way corridor width of 30 metres, minimizing that width to 15 metres where possible

¹ See www.mvlwb.com for further details.

(PR# 74 p6.5.40). Within that corridor there would be a five to eight metre wide trail beneath the transmission line for use during construction (PR#120 p126).

After starting construction, Dezé plans to use the entire winter road between January and April for a period of three to four years, but will continue to maintain the Fort Smith-Twin Gorges road past the construction phase if needed. Dezé proposes to decommission the portion of the winter road between Twin Gorges and Nonacho Lake after construction (PR#74 p6.5.16). Access to the road is limited to winter when the Slave River is frozen, typically mid-November to mid-April (PR#125 p87).

3.1.1.2 Winter road area and caribou range

In the DAR, Dezé concludes that the winter access road would not contribute to a significant adverse impact on caribou from increased hunting access. Dezé reached this conclusion assuming that caribou would not be in the vicinity of the winter road. It stated “(s)ome Project components do not lie within the Bathurst, Ahiak or Beverly herd ranges...therefore, these components were not considered in the pathway analysis. These Project components include the Twin Gorges facilities, the South Valley Spillway, and the Fort Smith to Twin Gorges winter road” (PR#74 p12.2.1).

At numerous other places in the DAR, Dezé emphasized that the road would not cause adverse impacts on caribou because the caribou do not populate the area.¹ For example, Dezé stated that “collared caribou movements indicate that Bathurst caribou do not frequent this area” (PR#74 p12.2.9). In its letter of January 13th, 2010, the Government of the Northwest Territories (GNWT) accepts Dezé’s conclusion that the road would not have a significant adverse impact, stating “...hunters would have to travel by snowmobile for a distance of 150 kilometres to 200 kilometres from Fort Smith to reach the most southerly portion of the current Bathurst caribou winter range...” (PR#207 p10).

During the technical session on October 5th, 2009, Dezé was asked by Dr. Anne Gunn, former GNWT caribou biologist and the Review Board’s technical expert, about basing assumptions of caribou distribution only on collar information from the Bathurst herd. Specifically, Dr. Gunn asked why Dezé’s conclusions about caribou range focus on the Bathurst herd, why the Beverly herd was excluded when historic information indicates range overlap with the access road, and why the Ahiak herd was also excluded. Dr. Gunn also questioned why collars were assumed to represent the range of the whole Bathurst herd, considering that collars were only on caribou cows (PR#120 p49; PR#177 p2), and that caribou bulls have a different range and tend to be distributed further south (PR#120 pp48-50).

Dezé responded that it focused on the Bathurst herd because it is more thoroughly studied. There have been regular population estimates of the Bathurst herd, studies of how it interacts with diamond mines, and Traditional Knowledge about the herd has been collected. For the Ahiak and Beverly herds, there is little information in terms of demography, collar-based tracking, and population estimates. Dezé stated that this would limit its quantitative analysis and increase uncertainty had its predictions been based on those herds. Dezé noted that since the different herds are the same species, the different herds are likely to react to disturbances in the same way (PR#120 pp54-56).

¹ See PR#74, pp12.3.3.7, 12.5.8, 12.7.2, 15.5.14, 15.5.17, 15.5.18, and 15.11.18.

Dezé also stated that the Bathurst herd “is exposed to the greatest level of cumulative effects, so if we’re going to see an effect - either incremental or cumulative - it’s going to happen to the Bathurst herd and, obviously, it’s the herd which is harvested the most by the people of the Northwest Territories” (PR#120, p56). Dézé noted that had it focused equally on the Ahiak and Beverley herds as it did the Bathurst herd, the levels of uncertainty in its conclusions would necessarily be higher (PR#120 pp54-56).

In the same technical session, Dr. Gunn pointed out that different communities harvest the Bathurst herd than do the Beverly and Ahiak herds. With respect to Dézé’s point about the Bathurst herd being the herd most likely to show effects, Dr. Gunn stated that the “catastrophic decline” of the Beverly herd “probably means that it’s already under considerable stress, so it may be less resilient to the effects of a project than a herd that’s exposed to more development (such as the Bathurst herd)”, and that the Ahiak herd may also be less resilient.

Based on discussions at the technical sessions, Dézé examined two studies of caribou winter range in the area (PR# 126). These studies support the notion that caribou habitat can extend south and into the portion of the winter road between Fort Smith and Twin Gorges. Dézé presented the findings of Zalatan *et al* (2006) which trace historic barren-ground caribou movements from 1900 onward using trampling scars on black spruce roots. Dézé also reported on a 1998 study by Thomas *et al* that analyzes aerial surveys for barren-ground caribou in the Taltson river basin area in the mid 1980s, as well as a 1995 study by Thomas *et al* using pellet counts (PR# 126 p84).

From these studies, Dézé acknowledged that “it can be concluded that the winter range of central Canadian barren-ground caribou was once larger than suggested by the satellite collar data collected from 1996 to 2007” (the period from which Dézé based its conclusions about the extent of caribou range). Dézé also concluded that although the areas south of Nonacho Lake may not be preferred by caribou for another 120 years, “caribou may return to these areas in the next 10 to 30 years” (PR# 126 p84).

Dezé said at the January 14th, 2010 public hearing that caribou may be present in the area, noting that since the time when it proposed mitigation measures, “there has been information brought to our attention which does indicate that presently there might be more Beverly and Ahiak activity out there than we had anticipated, and that historically the range went much further... (W)e predominantly based the effects assessment on the findings from the Bathurst caribou and we used that as a surrogate essentially for barren-ground caribou as a whole” (PR# 209 pp90-91).

3.1.1.3 Caribou vulnerability

Much of the evidence on the record indicates that caribou population levels for Bathurst, Beverly and Ahiak herds are unusually low and that the current trend points to continued population declines. The GNWT submitted a technical report titled *Decline and Recovery of the Bathurst Caribou Herd: Workshops October 1 & 2, 5 & 6, 2009* (PR#221) that summarizes many aspects of the current situation for the Bathurst caribou herd and other herds. This report indicates that the Bathurst caribou herd population, whose habitat ranges into the vicinity of the winter access road, has dropped from over 100,000 to below 32,000 due to various causes (p2). Other herds such as the Ahiak have shown similar declines although the Beverly herd – the overwintering range of which overlaps that of the Bathurst – has shown the most serious decline (p11).

The same report recognizes that hunting is a direct – though controllable - cause of mortality for any herd. For herds with dangerously low population levels, hunting can potentially cause significant adverse impacts. This workshop report confirms that the Bathurst herd is vulnerable to direct mortality from hunting:

The Bathurst herd has been hunted by more communities in the NWT than any other. With winter roads have come increased access and greater hunter numbers. No caribou herd could survive a harvest of 15-22% per year (mostly cows) for any amount of time. (PR# 221 p23)

This report predicts that with no change in harvesting rate the herd could disappear within five years (PR#221 p27). The GNWT has publically recommended a harvest of the Bathurst herd that is greatly reduced from historical levels. On January 1st, 2010, the GNWT imposed a no-hunting zone for the Bathurst herd throughout the North Slave region.

A July 2009 report from the Beverly Qaminarjuak Caribou Management Board describes results from calving ground surveys of the Beverly herd. There is no overall population estimate for this herd, but population trends are visible from calving ground surveys. In 1994 the number of observed adult caribou on survey transects was 5,737. This number has fallen steadily, and in 2008 only 148 adult caribou were observed. In the 2009 survey, only 78 were observed – a further 47% decrease that represents a “dramatic continuing drop in the number of cows and calves”. Overall survey results indicate a continued “major decline” (PR#216)¹. GNWT observations of trends for the Ahiak herd indicate a comparable decline (PR#218 p1).

3.1.1.4 Access and hunting

While Dezé stated throughout the DAR that the winter road would be outside the overwintering range for caribou, Dezé acknowledges that the road may serve to increase hunting and hunting pressure above its present level (PR#74 pp12.3.2, p15.5.17, p15.11.7). Dezé also recognizes that:

1. increased hunting can be associated with increased road access (PR# 74, p12.2.9);
2. some snowmobile enthusiasts use the road in its present overgrown state;
3. unauthorized road use is likely during and after construction (PR#74 p6.5.16, 15.5.19).

The GNWT acknowledges in a letter to the Review Board that “(t)he proposed winter road would be accessible to trucks for 2-3 years, potentially increasing hunter traffic during this time” (PR#207 p9).

Additionally, Dezé stated in the DAR that “(o)f the various linear corridors, roads probably have the greatest effect on wildlife....In particular, hunting from roads can be the primary source of disturbance for wildlife”. This was documented in north eastern Alberta and on winter roads in the NWT, and that “(t)hese winter roads would facilitate access to an area that is currently difficult to access by snowmobile, and impossible by car or truck” (PR# 74, 15.5.1). Dezé considered the change in hunting

¹ Due to a reporting error in the July 2009 report, these results are corrected per the BQCMB March 2010 report. (http://www.arctic-caribou.com/press_releases/March_10.html)

access from other winter roads in the NWT as an indicator of the possibility that roads from the proposed project will be used for hunting, saying:

The number of hunting vehicles on the Tibbitt to Contwoyto winter road to hunt ranged from 573 vehicles in 2004 to 284 vehicles in 2006 (Ziemann, 2007), indicating that new Project winter roads may be used to access areas for hunting caribou....It is anticipated that some unauthorized use of the winter roads may occur, leading to some hunting in previously inaccessible areas....Trucks using the Tibbitt to Contwoyto winter road are often used to haul snow machines, the combination of which greatly improves hunting success. (PR# 74, 12.3.37)

Parties expressed concern regarding the potential for the proposed roads to increase hunting access to caribou. At the October 2009 Information Request session Łutsël K'e resident and long-time caribou harvester Archie Catholique spoke of the impact of roads and access on caribou, his experiences around Yellowknife, and his predictions about the impacts of the proposed project. He expressed particular concern about the potential for people to use trucks to move snowmobiles for the purpose of hunting further down the road. Mr. Catholique described his observations of very high levels of hunting on other winter roads near communities, and stated that he predicts the same scenario for the proposed winter road from Fort Smith. He said: "... I guarantee that if there's a caribou out there, they're going to see hundreds of trucks over there. And that's going to have an impact... on the caribou" (PR# 120, pp 107- 108).

In the LKDFN submission of December 11th, 2009, then Chief Stephen Nitah of the LKDFN described further concerns regarding access and caribou. He predicted that the combination of transmission line and increased access via winter roads will affect the ranges of the Bathurst, Beverly and Ahiak herds. Chief Nitah noted that the transmission line is on the primary migration route for both the Bathurst and Ahiak herds, and states that these are harvested by LKDFN hunters. LKDFN identifies the overwintering range as "especially vulnerable" due to increased hunting pressure as a result of the proposed winter roads. Chief Nitah expressed doubt that access to winter roads can be effectively prevented or controlled, saying that this is a matter of "grave concern" to LKDFN. LKDFN states: "With the Bathurst and Ahiak herds in severe decline, we cannot afford to increase the stresses on these herds... This is of grave concern to us" (PR#169).

Likewise, current LKDFN Chief Antoine Michel¹, in LKDFN's final submission of March 10th, 2010, identified potential impacts on caribou from increased access as a problem. Regarding the winter road from Fort Smith to Nonacho Lake, Chief Michel stated, "They say they are going to control access to the winter road and block it from use after the construction period is over, however, it is well known that a road, once constructed, will remain in use particularly for snowmobiles for years to come". The same submission, LKDFN voiced "strong disagreement" over Dezé's prediction that the long distances involved would make increased snowmobile access unlikely, and cited the frequency of hunters in the territory surrounding Łutsël K'e that come from greater distances than that of Nonacho Lake from Fort Smith.

¹ On April 21st, 2010, Antoine Michel replaced Stephen Nitah as Chief of Łutsël K'e. Antoine Michel participated in earlier parts of the Environmental Assessment as an Elder prior to becoming Chief. This report makes explicit who was speaking as Chief.

At the public hearing in January, 2010, the Yellowknives Dene First Nation (YKDFN) expressed concern about road construction and increased hunting pressure on caribou herds during a vulnerable period. Based on observations of hunting and winter roads in the Chief Drygeese Territory, the YKDFN stated that access control had been a concern for years and concluded that “this cannot be successfully mitigated” (PR#231).

3.1.1.5 Proposed mitigation

To avoid any possible adverse impact from the winter access road, in sections of the Developer’s Assessment Report (PR# 74) and also in Dezé’s *Commitments 2009* document (PR# 126 p 87) Dezé offered to avoid increasing overall access by restricting road access. Much of the mitigation that Dezé put forth in the DAR centered on the combination of a gate at the Slave River, a gate at the Twin Gorges site, physical blocking of route at the end of each hauling season, and monitoring with adaptive management (e.g. PR#74 p6.5.16; 12.2.2; 12.3.37; 15.5.9; 15.5.20).

Considering the combinations of road access restrictions and the lack of overlap between the project roads and winter caribou range, Dezé said, “Given the travel distance, planned access control mitigation, and the variability in barren-ground caribou winter distribution, it is predicted that the magnitude of the effect of increased access on caribou abundance may only approach or slightly exceed the limits of existing conditions” (PR# 74 15.3.37). Based on this rationale, Dezé predicted no significant adverse impact from increased access at several places in the DAR (e.g. PR# 12.2.9-10; 12.5.8; 15.5.14; 15.11.18). Dezé recognized that there is little empirical data to demonstrate the effectiveness of mitigations related to impacts from increased access (PR#126 p87).

However, Dezé assumed that the gate it proposed at the Slave River would not prevent the existing snowmobile access between Fort Smith and Twin Gorges, although it would prevent truck access. In its technical report of December 11, 2009, INAC - the authority over Crown land in Canada – agreed that re-opening the winter road would result in increased access by vehicles, but stated that the public has a general right of access because the road traverses Crown land (PR#163 p19). In its hearing presentation, INAC stated that without a lease, Dezé cannot limit access to Crown land by placing a gate at the Slave River.

Following notification of this, Dezé committed to preventing access beyond the Twin Gorges site by installing a gate on the winter road on the portion that leads through Dezé’s private property at Twin Gorges, with fencing to prevent detours. Dezé also committed to working with the GNWT department of Environment and Natural Resources (GNWT) to monitor public use of the road (PR#240 pp4, 8). For the open access portion of the road – the first 60 kilometres from Fort Smith - they would collaborate to monitor “unauthorized” use of the proposed winter roads and to record evidence of activities in a manner similar to that done by ENR on the Tibbitt to Contwoyto winter road. Dezé committed to introduce new mitigations “should the proposed mitigation practices or structures prove insufficient” (PR#126 p89).

In a letter to the Review Board from the department of Environment and Natural Resources (ENR), the department echoed this cooperative commitment:

A check-station could be set up near the south end of the proposed winter road to monitor vehicle traffic and hunter kills. If there is evidence of heavy hunter traffic, ENR

has legislative tools that can be used to manage harvest such as establish a no-hunting zone around the winter road or portions of it... In addition, GNWT has committed to working with the developer to further develop their Environmental Monitoring Program as well as the Human Wildlife Conflict Management Plan... (PR# 207 p9)

In response to a question at the January, 2010 public hearing, the GNWT recognized that, with this type of arrangement, hunting could occur before a mitigation to prevent access could be put in place, and that neither the GNWT nor Dezé had any thresholds for mitigation or stopping a possible significant adverse impact in progress (PR#209 p144-6).

3.1.1.6 Review Board's analysis and conclusions

In considering the evidence regarding increased hunting access, the Board notes that caribou numbers are very low for the Bathurst herd (PR#218), that the surveys of the Beverly herd suggest that it is in "catastrophic decline" (PR#120 p58), and also that the Ahiak herd population is extremely low (PR#218). This is a period of vulnerability for caribou to mortality from hunting. In the Board's view, due to the current condition of the herds, any increase in caribou hunting pressure at this time is undesirable and potentially significant. An increase in hunting pressure now would be much more significant than an equivalent increase at a time when caribou populations are high and when numbers are increasing.

In the DAR, Dezé predicted there would be no impact on caribou due to increased hunting access, based on certain assumptions. Two of these are 1) that the range of caribou does not include the winter road, and 2) that a gate at the Slave River would prevent or greatly limit increased hunting access on the winter road should overlap occur.

Dezé based the winter caribou range assumptions on satellite collar information. However, Dezé has since recognized that collars were only on the cows of the Bathurst herd, and have only been used since 1996. Based on two independent historic studies of barren-ground caribou movements, Dezé accepts that the historical range "went much further" than indicated by the data used (PR#209, p90), and that caribou may return to the vicinity of the winter roads in ten years to thirty years (PR#126, p84). This leads the Review Board to conclude that caribou may range in the area of the winter roads, where there would be uncontrolled access.

Dezé predicted that, even with a gate at the Slave River, some unauthorized use of winter roads was likely during construction and beyond (PR#74 p6.5.16, 15.5.19), and that there could be an increase in hunter traffic on the winter road (PR# 74, p12.2.9). It recognized that:

- winter roads have greater effects on wildlife than other linear corridors (PR#74 p15.5.1);
- winter roads for this project would facilitate snowmobile access (PR#74 p15.5.1);
- hunting on other winter roads in the NWT suggests that hunting may occur on roads for this project (PR#74 p12.3.37).

These points were recognized by Dezé when it still planned to have a gate at the Slave River. INAC has indicated that without a lease Dezé cannot put a gate there. Without a gate at the Slave River, the public is able to carry snowmobiles on trucks as far as Twin Gorges, beyond which lies 215 km of winter roads. Dezé has described how other winter roads created new hunting access elsewhere in the NWT, and recognized that "the combination (of trucks and snowmobiles) greatly improves hunting" (PR# 74 p12.3.37). Former Chief Archie Catholique raised the same concern on behalf of LKDFN, stating that a

new accessible road would make it easier for people to “jump in their truck, throw on their skidoos and go down that road” (PR#120 p107). It is the Board’s view that this is likely if the project were to proceed without any gate at the Slave River.

Not having a gate at the Slave River would increase the potential for caribou hunting on the 60 kilometre winter road from the Slave River to Twin Gorges, partly by expanding the range for snowmobiles using Twin Gorges as a launching point. With respect to increasing access beyond the Twin Gorges gate, the evidence raises questions about the effectiveness of unmanned gates to exclude determined hunters (PR#214). If more hunters can get snowmobiles to the Twin Gorges site by driving them there in trucks, it is reasonable to expect more snowmobiles will get around the unmanned gate at Twin Gorges as well. This is likely to increase access to the 215 kilometres of new roads from Twin Gorges to Nonacho Lake.

Dezé has indicated that it will block the road on Crown land from Fort Smith to Twin Gorges at the end of each hauling season. If Dézé is able to do this, it would likely be an effective way to avoid increased access outside of the operating season of the road. However, INAC has indicated that Dézé does not have the right to do this without a lease or title (PR#182 p13; PR#210 p246).

With respect to INAC’s position that Dézé cannot prevent the public from accessing Crown lands, the Review Board notes that physically preventing access to a road that is open for construction would not reduce existing access, but would avoid increasing access. Similarly, restricting new access does not limit the right of Aboriginal peoples to harvest, because it does not reduce the current ability to do so. However, it does prevent the proposed project from increasing it.

Dezé proposed to permanently block access to the winter access road (PR# 74 pp15.5.17; 6.5.16, 6.8.4; 12.2.9; PR#126 p87). This appears to conflict with Dézé’s reserving the right to continue using the Fort Smith-Twin Gorges road as needed after construction (PR#74, 6.5.16) is completed. This reduces the certainty of road closure and reclamation after the three-year construction phase, and raises the possibility of ongoing impacts associated with increased access throughout the 40-year life of the project.

The Review Board has considered Dézé’s commitment to monitor “unauthorized” use of the proposed winter roads and to record evidence of activities, possibly in cooperation with the GNWT in a manner similar to that done by ENR on the Tibbitt to Contwoyto winter road. However, increased hunting along winter roads such as the Tibbitt to Contwoyto winter road has been identified by both Dézé and the GNWT as a cause of increased access and caribou mortality in spite of present monitoring. This suggests that the same approach cannot be relied on to ensure a different result for the project’s winter roads.

The Review Board accepts the idea of monitoring as a component of adaptive management for the purposes of impact mitigation. In the Board’s view, however, monitoring for the purpose of adaptive management is more reliable as mitigation if it describes 1) under what specific conditions a developer will act to mitigate any problems it identifies, and 2) what feasible and reliable actions, if any, are available to the developer to address those problems.

Dezé has not specified any thresholds or monitoring results that will cause it to take specific actions regarding caribou impacts related to access. The GNWT has indicated that it could set up a check station and, if there is evidence of “heavy hunter traffic”, manage hunting using legislative and other

management tools. In the Board's view, in light of the current vulnerability of caribou populations, it is not acceptable to mitigate increased mortality resulting from increased access only after there is evidence of heavy hunter traffic. The Board also notes that the GNWT has no specific thresholds to trigger any management actions that could mitigate impacts (PR#209 p145).

The Board has considered the possibility of a no-hunting zone as raised by the GNWT. Even if a ban or no-hunting zone was created around the road, the Board is not convinced it would be effective. The studies that Dezé submitted on the effectiveness of different methods to control access characterize legislative measures as "slightly better than 'moderately' effective" (PR#214 p7). In light of the present vulnerability of the caribou herds in question, the Review Board is not convinced that a hunting ban is sufficient to ensure that increased hunting does not lead to significant impact on the caribou herds in the area of the proposed winter road.

Considering the evidence in light of the lack of thresholds for action and the lack of reliable mitigation available, in the Board's view the proposed monitoring cannot be relied upon to prevent increased hunting access on the winter road.

In summary, the evidence showing long-term variations in caribou range indicates that the new access proposed by the project does overlap with the winter range of caribou. Dezé has indicated that it may continue to maintain the road from Fort Smith to Twin Gorges beyond the construction period and that caribou may return to the area during the life of the project. Without the gate at the Slave River that Dezé initially proposed, the concern LKDFN and others voiced is valid because people are likely to use trucks to transport snowmobiles as far as Twin Gorges. As Dezé indicated, the combination of trucks and snowmobiles "greatly improves hunting success". In the Board's view, this likelihood of increased caribou mortality, at this particularly vulnerable period of low numbers and declining population for the Bathurst, Ahiak and Beverly caribou herds would be a significant adverse impact.

In terms of effectively mitigating access, the Review Board accepts the analysis cited by Dezé (PR#214) which indicates that physically preventing access is the most reliable mitigation. Without a gate, there is uncontrolled access to the 60 kilometres of road from Fort Smith to Twin Gorges (PR#182 p13). Rather than monitoring and possibly applying legislative tools, the initial plan proposed by Dezé - installing a gate at the Slave River - was more likely to be effective, simpler and less expensive. The Board notes that the evidence indicates that staffed gates are most effective, but that unstaffed gates are effective where they use natural features to prevent determined hunters from going around them. The Board notes that a gate would prevent the project from increasing access, without reducing the access that already exists.

Measure 1

To prevent significant adverse impacts on caribou from increased hunting access, Dezé will put a gate at the Slave River end of the proposed winter road. This gate should be located to optimize the use of natural features to prevent circumvention if possible. It is preferable for this gate to be staffed. If Dezé is unable to obtain a lease for this purpose, then INAC, the GNWT and Dezé will collaborate to find another means to allow a gate at this location.

The Board notes, that if necessary, other means mentioned in the above measure could include the allowance of a condition in the land use permit, if INAC's restriction (regarding limiting access to Crown land) is based on policy rather than a legal requirement.

The Board notes that section 3.2.2.2 of the *Compendium of Physical Access Control Measures for Roads and Other Rights-of-Way* (PR#214, p11) identifies other suggested design specifications of effective gates¹. It is suggested that Dezé consider these when designing the gates referred to above.

The Review Board recognizes the importance of Dezé's commitment to block the road from Fort Smith to Twin Gorges at the end of each hauling season if allowable. In spring, after the haul road closes, the combination of long daylight hours and relatively mild weather make this an ideal time to hunt. In the Board's view, mitigating access during this period is an important part of mitigating the overall impacts of increased access. The evidence submitted by INAC indicates that Dezé does not have the right to do this on Crown land without a lease or title (PR#182 p13; PR#210, p246). If Dezé is not allowed to physically block road access on Crown land, the following measure is intended to achieve the same result.

Measure 2

To prevent significant adverse impacts on caribou from increased hunting access, if Dezé is not permitted to block the road on Crown land at the end of each hauling season as proposed, Dezé will block the ice road on the Slave River using snow berms at the end of each hauling season.

In its January 13th, 2010, letter to the Review Board, the GNWT states that it maintains check stations on all winter roads in the North Slave region (PR#207 p9). Although this is not a reliable mitigation on its own, it is still likely to help Dezé and the GNWT to identify changes in access resulting from the road and the effectiveness of mitigation measures. The suggestion below reflects this, and specifies the harvest of caribou cows because of its implications on calf production and population trends (PR#218 p16).

Suggestion 1

The GNWT should maintain a staffed check station on the proposed winter road at the Slave River to monitor harvest and road activity for purposes other than project construction. If possible, the GNWT should engage members of local Hunting and Trapping organizations for this. If results of this check station indicate any harvest of caribou cows, the GNWT and Dezé should identify and implement additional physical measures to prevent increased hunting access.

3.2 Other impacts to caribou

Besides the above impacts on caribou related to increased access, Dezé presented its predictions of various other types of potential caribou impacts in Section 12 of the DAR. These include impacts related to:

- increased predation along right-of-ways;

¹ The *Compendium of Physical Access Control Measures for Roads and Other Rights-of-Way* (PR#214), compares various access control methods such as staffed gates with physical barriers such as berms and slash rollback. The study notes that "access control measures are most effective when properly placed to eliminate the possibility of people detouring around the access control point and when people respect the intent of the access control". The study, as referenced by Dezé, also found that unmanned gates are not as effective unless access around the gate is restricted by physical means, such as fallen trees or fence "wings" extending into brush (PR#126 p88; PR#214).

- habitat loss and loss of habitat effectiveness; and,
- disturbances to caribou behaviour and movements due to the transmission line.

This section summarizes Dezé's general approach to its predictions on these and other subjects, examines the relevant evidence pertaining to each, and provides the Review Board's analysis and conclusions.

3.2.1 Parties' submissions

3.2.1.1 Dezé's approach to predicting impacts on caribou

Dezé's caribou predictions focused on data collected from monitoring the Bathurst herd. Based on satellite collar data, Dezé concluded that this herd would encounter the project more frequently over much of its migratory range than other herds in the Northwest Territories (PR# 74, 12.1.7). Dezé also concluded that the larger amount of data available for the Bathurst herd, compared to minimal data available for the Ahiak and Beverly herds, would translate to a higher degree of certainty for any predictions relating to impacts on caribou (PR# 74, 12.1.8).

Dezé pointed out that the Beverly and Ahiak herds may also encounter the project, but that the investigations, analyses and studies of potential impacts to caribou followed a conservative approach and therefore overestimated the impacts. Because of this additional level of caution, Dezé considers it duly rigorous to apply the conclusions to these other herds even though the studies focus primarily on the Bathurst herd (PR# 74, 12.1.9). Dezé provides examples of its cautious approach in its modeling of caribou population trends and responses to the project, saying that it:

- considered direct effects to the landscape from past development and land use permits as not having been reversed;
- considered a transmission line width of 15 to 30 metres for direct effects including in the tundra setting where Dezé expects no clearing to take place;
- used an expanded footprint for exploration projects, such as a one kilometre radius;
- treated mineral exploration projects as continuous projects throughout the year in the absence of data on the timing and frequency of activity under a land use permit;
- conducted fragmentation analysis using a 200-metre right of way (also due to computational constraints)

Dezé classified potential impacts to caribou using to the following groups (PR#74, 12.2.6):

- invalid – pathway does not exist, is removed by mitigation, or mitigation results in no detectable (measurable) change and residual effect relative to baseline or guideline values;
- minor – mitigation results in a minor change from the pathway, but has a negligible residual effect (e.g. loss of a small amount of habitat, but has little effect on the population);
- valid – a pathway that likely contributes to residual effects to caribou.

Invalid pathways included impacts related to a change in ice cover as a result of Dezé's control of water flow from Nonacho Lake over the winter. Dezé concluded that control of the water flow would minimize the range of water level change during seasonal transition and lead to an acceptable ice cover (PR#74, 12.2.8). Invalid pathways also included effects from caribou interaction with hazardous

materials. Dezé cited the lack of adverse impacts from such interactions from development in the Northwest Territories thus far as justification for this classification of invalid for this pathway.

For minor pathways, Dezé included increased road access causing increased hunting¹, recreational snowmobile use of the project's road causing sensory disturbance, and vehicle-caribou collision. Dezé presented snowmobile disturbance to be temporary and periodic, and not different from baseline effects (PR#74, 12.2.10). For impacts from vehicular collision, Dezé reported that between 1996 and 2007, the Tibbitt to Contwoyto winter road reported one caribou fatality. Dezé intends to use speed limits as a primary means of preventing collision with caribou, as well as implementation of its Human Wildlife Conflict Management Plan. The question of restricting road use to prevent vehicular collision (PR#74, 12.2.11) with caribou is still open and therefore this suggested mitigation does not fully eliminate the potential for vehicular collision with caribou.

Dezé identified the following as valid pathways for potential adverse impacts on caribou:

- use of the transmission line right-of-way by wolves for easier stalking of caribou;
- habitat loss and fragmentation from the project footprint;
- change in caribou population numbers and distribution from habitat loss;
- change in habitat quality, caribou movement and behaviour from sensory disturbance.

Relevant evidence on each of these is summarized below.

3.2.1.2 Increased predation

Dezé indicated in the DAR that increased predation of caribou by wolves along the transmission line right-of-way may occur (PR# 74, 12.3.36). The department of Environment and Natural Resources (GNWT) has suggested that Dezé place slash across the right-of-way to decrease the use of these corridors to decrease the potential for mortality from this pathway (PR# 74, 12.3.36). Dezé accepts this suggestion, stating: "Permanent slash would be placed across the ROW in an effort to discourage predator use" (PR# 74 p12.3.36).

3.2.1.3 Habitat modeling

When modeling and assessing impacts to habitat from the project, Dezé compared (including direct and indirect loss) three different development scenarios. The first is the pristine scenario, which assumes no past development across the entire caribou range. The second is the existing scenario, which recognizes development up to 2007 (when the environmental assessment started). The third is the application scenario, which includes past development plus the project. In its model Dezé considered all previous and existing authorized developments in the Bathurst caribou range.

In terms of habitat loss, Dezé predicts, based on its modeling and comparison of the above three scenarios, that "(t)he cumulative decrease in the quantity of habitats within seasonal ranges from pristine conditions to application of the Project is estimated to be less than 1.2% for any given

¹ Impacts to caribou related to increased access are described in the previous section [Section 3.1] and are not examined further here.

habitat...well below the 40% threshold value identified for habitat loss associated with declines in bird and mammal species..." (PR# 74, 12.5.4). Dezé found that changes to habitat patches – a measure of how a project can fragment quality habitat – varied between 1% and 16% across seasonal ranges (PR# 74, 12.5.6).

To predict the effects from habitat loss and sensory disturbance, Dezé used mathematical models like population viability analysis (PVA) and habitat suitability indices (HSI). Population viability analysis for caribou indicates what factors may have the greatest influence on a herd including deep snow that may hinder travel and cover food and also predict the effects of habitat loss (PR# 74, 12.5.7). This analysis produces a "likelihood of population persistence" by controlling all other variables while changing the value of the factor under question. The results of modeling "indicated that there was little detectable change in population size and risk of population decline between the different development scenarios for the 60-year simulation period" (PR# 74, 12.5.7).

In its cumulative effects assessment Dezé examined the combined effect of the proposed project in combination with other human activities within the Bathurst herd range to determine potential impacts on caribou abundance. This included a consideration of direct and indirect habitat loss using the PVA model described above. The model also considered rates of survival, reproduction and harvest. The results indicated that changes to habitat were negligible when compared to harvest, survival and reproduction rates. Project-specific decreases in each seasonal range were less than 0.2% of the total range available. When this is combined with all other human activities in the range, the result is a decrease of less than 2% of available habitat (PR#74 p19.18-19). Dezé provides a detailed breakdown of this by habitat type and season (PR#74 p12.12.8-10).

Besides habitat loss, habitat fragmentation and sensory disturbance, Dezé considered other cumulative factors in its assessment of effects on caribou distribution. The predicted cumulative total of high and good quality habitat removed from the Bathurst range by the project, in combination with all other human activities, is 5% for spring range, 7.2% for the post-calving range, 9% for the rut range and 0.9% for the winter range (PR#74 p12.3.23; p19.19). Of this, the proposed project's contribution is less than a 0.5% decrease in habitat quality (PR#74 p12.3.23).

Dezé's modeling and prediction of cumulative effects included the identification of reasonably foreseeable future projects. It considered potential contributions of impacts from an additional small-scale diamond mine in the Lac de Gras region, the Tyhee Yellowknife Gold Project, the Bathurst Inlet Port and Road and the East Arm National Park in combination with the effects of the proposed project (PR#74 12.7.3).

The department of Environment and Natural Resources reviewed the analysis and noted that "(t)he translation to likely effects at the population level (population viability analysis) is questionable – the confidence limits on the projected population trend make it difficult to say anything about likely population-level effects... [the] analyses are valid, although the translation to population-level effects is somewhat questionable" (PR# 207, p11).

For sensory disturbance, Dezé considered the direct physical footprint and the indirect footprint (noise, dust, and other sensory disturbances) in determining the zone of influence (ZOI) around the project that

could modify the behaviour and occurrence of caribou (PR# 74, 12.3.1). This includes changes in behaviour which can increase energy use by caribou. These in turn can alter survival and reproductive rates, affecting the overall population (PR# 74, 12.3.2).¹

Dezé used an HSI model to assess how the project may have an impact on good, low and poor quality habitat in the caribou's seasonal ranges. This model combined information on caribou habitat and the project's location to mathematically predict how caribou will behave when the project alters certain habitat. Overall, this model predicted a less than 10% decrease in quality habitat for any season from the project when combined with all other development thus far (PR# 74, 12.5.6).

Dezé noted that there is appropriate information for such a study in the tundra summer range for the Bathurst caribou, but that there is not enough information to apply it to Bathurst caribou in the forested overwintering range south of the treeline. Instead, Dézé used available information from woodland caribou, compared results with recent satellite-tracked caribou movement and found that the model produced suitable predictions. The department of Environment and Natural Resources accepted the model and its results (PR# 207, p5).

3.2.1.4 Uncertainties about transmission lines and caribou movements and behaviour

While Dézé has made the case that encountering the transmission line may not lead to a significant adverse impact on caribou resulting from effects of the transmission line as a source of disturbance to caribou movements, the company acknowledged the following (PR# 74 p12.7.2):

...(I)t can be assumed that that the majority of the Bathurst herd cows and calves would pass under the transmission line at least once per year, and likely more frequently. The effect that this may have on caribou behaviour and movement, particularly on a tundra environment where such features are visible for long distances, is largely uncertain. The rate of habituation to such features is also not well understood.

In the DAR, Dézé noted a 2008 study by Nellemann *et al.* in northern Europe that showed that the abandonment of central parts of the study area by reindeer (*Rangifer tarandus*, the same species as barren-ground caribou) coincided with the establishment of a power line (PR#74 p9.5.64). Dézé notes that in Scandinavia, domestic reindeer resist crossing under power lines, for reasons thought to be a combination of sensory disturbance and changed snow conditions. This is believed to be partly due to the hum of the electrical lines (PR#74 p12.3.12). Dézé notes that many transmission lines are usually designed to allow the electric field noise of the lines (known as the "corona") to reach a maximum of 55 decibels at 15 metres from the source, while the proposed project is predicted to be less than 30 to 35 decibels, depending on the weather conditions. Dézé therefore predicts that it is unlikely that the corona from this project will be audible from the ground (PR#74 p12.3.38). In its cumulative consideration of sensory disturbance, Dézé recognizes that overall disturbance may be cumulatively significant during project operations (PR#74 p19.19).

¹ Impacts from on caribou behaviour and movement due to sensory disturbance are further discussed in Section 3.2.1.4.

In its *Draft Environmental Monitoring Program*, Dezé states that “there exists a high degree of uncertainty as to how caribou will respond to the presence of the transmission line in a tundra environment”. Dezé identifies design-based mitigations for this, stating that “(m)itigation included in the Project design to reduce effects to caribou include the relocation of the proposed transmission line route away from the important migratory areas at the east end of Lac de Gras and MacKay Lake” (PR#136 p41).

The behavioural response to towers and lines as a barrier to wildlife movement is a concern of LKDFN. This was expressed by Elder Henry Basil in a technical session on October 2nd, 2009. Elder Basil said, “(W)hat I see here is like an electric fence going all across my land, so I’m really concerned in that area” (PR#118 p117). On October 5th, 2009, during the same technical session, Robert Mulders of the GNWT also raised the issue of the behavioural response of caribou to the transmission line, and possible effects on caribou movements and migrations (PR# 120 p19).

During discussion at the May 2009 technical sessions in Yellowknife, Dezé committed to analyze collar data for caribou movement near the Snare transmission line in order to establish a reference point for how caribou behaved while in the vicinity of a transmission line. Dezé reported on its findings at the October 2009 Information Request sessions, as follows: “...unfortunately for our analysis, the Snare line is pretty much on the outer edge of the Bathurst caribou range but, nonetheless, we do have maps ... which illustrate crossings of the Snare Hydro transmission line by collared caribou on several occasions over three or four years” (PR# 120 p20).

During an aerial caribou survey, Dezé observed caribou, caribou trails as well as feeding craters underneath the transmission line. Using this information, Dezé stated that “caribou in the boreal scenario did not...seem to be too troubled by the transmission line.” However, Dezé acknowledged that “where we have uncertainty is on the tundra scenario where the same caribou would be interacting with a transmission line and...to be fair, probably a more sensitive time of year as they’re coming off the calving grounds” (PR# 120 p20). In terms of sensory disturbance, Dezé has recognized that caribou sometimes avoid transmission lines but it is unclear whether they do so in response to visual or audible stimuli (PR#120 p36).

3.2.1.5 Monitoring changes in caribou behaviour

Dezé has proposed to monitor the behaviour of caribou in the vicinity of the transmission line during the construction phase and the operational phase. The following summarizes Dezé’s plan for monitoring for and adapting to caribou in the vicinity of the transmission line during construction:

- in its commitment document of January 29th, 2010, Dezé committed that “construction activities near caribou hunting camps will occur in winter, outside of the caribou hunting season” (DAR-21);
- in the same document, Dezé committed that construction activities will be “scheduled to avoid caribou migrations, and monitoring will be conducted to predict and avoid disturbance to caribou groups” (DAR-22);
- during construction, collared caribou information would indicate if any caribou approach the line, and environmental monitors will document the presence of caribou;

- Dezé states that “should substantial numbers of caribou be present near construction activities, construction managers would be notified and requested to find strategies to avoid the caribou” (PR#136 p24);
- during the January 14th, 2010, hearing in Dettah, Dezé committed to following mobile caribou protection measures (PR#177)¹.

Dezé has stated that during the operations phase, monitoring would “quantify how caribou interact with a transmission line on the barren ground” (PR#120 p24).

As a result of the questions regarding caribou raised by the GNWT at the October 2009 technical sessions, Dezé met with GNWT biologists on Nov. 23rd, 2009 to discuss caribou issues and other matters related to the Taltson project. In its own report of this meeting, the GNWT said, “There is uncertainty about how caribou will react to the transmission line. Is it acceptable that Dezé propose to monitor caribou behaviour around the transmission line during operation?” (PR#142).

In a December 16th, 2009 letter to the GNWT, the Review Board requested more information on this meeting, asking the GNWT to help it understand how certain caribou issues were resolved to the GNWT’s satisfaction. The GNWT commented on the above approach to monitoring the effect of the transmission line on caribou in their January 13, 2010 letter to the Review Board, (PR# 207 p3):

GPS collars have been deployed by the GNWT on Bathurst caribou since 2008, and provide more frequent and accurate data than the older satellite collar technology. It is anticipated that this technology will provide sufficient accuracy and frequency of data to determine if there are movement changes in the vicinity of the transmission line.

In the same letter, the GNWT stated satisfaction with such a strategy and supported the contribution to scientific literature that this approach represented. The GNWT indicated that transmission lines in Norway suggest a barrier effect for reindeer when various infrastructure and other lines are present (PR# 207 p4). The GNWT stated that the tundra environment and lack of surrounding infrastructure represent a new environmental configuration for caribou and is worthy of careful study. In this light, the GNWT has committed to cooperate with Dezé to develop the Environmental Monitoring Program and Human Wildlife Conflict Management Plan that will guide Dezé’s strategy for minimizing further adverse impacts to caribou.

In its *Draft Environmental Monitoring Program* (PR#136), Dezé makes it clear that its proposed monitoring of the behavioural effects of transmission lines on caribou is being done because there is little information on the subject and because caribou are important to Northern communities. However, Dezé makes it clear that the monitoring is “not anticipated to identify new mitigation and will not provide useable information to the adaptive management process” (p41). This is reinforced elsewhere in the same document, where Dezé says the following regarding its proposed monitoring of caribou monitoring during the operational phase (PR#136 p42):

This monitoring is proposed as research, to add to our understanding of how caribou react to transmission lines, and to provide communities an opportunity for meaningful

¹ Mobile caribou protection measures involve managing activities depending on the number of caribou in the area and caribou populations and trends (PR#209 p28).

input. This research would be conducted when the transmission line is operational, and the research can only reveal if caribou are affected by transmission lines, not why. As such, this research would not lead to mitigative or management actions that could reduce the effect ...

3.2.2 Review Board analysis and conclusions

With respect to increased predation by wolves using the transmission line right-of-way for more effective hunting, the Board notes that Dezé accepts the GNWT's suggestion that Dezé place slash along right-of-ways to decrease predator use. Dezé's statement that "permanent slash would be placed across the ROW in an effort to discourage predator use" (PR# 74 p12.3.36) is a commitment to an important mitigation that is, in the view of the Board, adequate to deal with the impact in question.

The Board accepts Dezé's points about the connection between disturbance of caribou and the loss of effective habitat, when habitat use changes due to differences in caribou behaviour. No parties suggested any specific problems with Dezé's analysis of effects on caribou habitat from a combination of population viability analysis and habitat suitability indices. The Board is satisfied with these predictions.

With respect to cumulative effects assessment, the Review Board notes that Dezé did a particularly thorough job of identifying all other past and present activities across the Bathurst herd range, duly considering the combined effects of the proposed project in combination with those activities. It is unfortunate that this information is not available for the Ahiak and Beverly herds. Dezé's identification of reasonably foreseeable future projects follows a cautious and inclusive approach. With the implementation of the measures related to access (identified in Section 3.1.1.6 above), the Review Board is satisfied that this development is not likely to contribute to significant adverse cumulative impacts on caribou.

Dezé's proposed monitoring and adaptive management with respect to caribou during construction of the transmission line is reasonable in the Board's view. The thresholds in the *Draft Environmental Monitoring Program* are specific and appropriate. Dezé's commitment to follow mobile caribou protection measures is a suitable approach to ensuring that project activities are not unduly hampered, while providing sufficient protection for any caribou herds that may be in the vicinity during construction. In combination with Dezé's use of timing to avoid the caribou migration, the Board is satisfied that project construction activities will not cause significant adverse behavioural impacts to caribou.

With respect to the potential for the transmission line to disturb or affect caribou movements during the operational phase of the development, the Review Board accepts Dezé's point that there is little research on the subject in the setting of the project. The examples of caribou behaviour around the Snare transmission line are in a forested setting. This may not be predictive of caribou responses in the tundra setting, where there usually nothing overhead. Dezé was not able to produce any examples of research that pertain to the disturbance-related responses of caribou movements resulting from transmission lines in the tundra setting (PR#12.7.2). However, based on the evidence from parties including the GNWT, and considering the expert opinion of the Review Board's advisor Dr. Anne Gunn, the Board considers it possible but not likely that the transmission line will disturb caribou movements.

The Board notes that the GNWT and Dezé have discussed jointly monitoring caribou behaviour around transmission lines, but that this monitoring is, in Dezé's words, "not anticipated to identify new mitigation and will not provide useable information to the adaptive management process" and "would not lead to mitigative or management actions that could reduce the effect..." (PR#136). In the Board's view, the proposed monitoring for effects of behavioural disturbance affecting the movements of barren-ground caribou movements from the proposed project is worthwhile even if it is not used to mitigate the effects of this project. This would improve the (very limited) current understanding of the subject, which may be useful in future decision-making.

In terms of sensory disturbance, Dezé has recognized that caribou sometimes avoid transmission lines but it is unclear whether they do so in response to the way transmission lines look, the way they sound, or some other stimulus. Different tower designs present different kinds of sensory stimuli, which might reduce the possibility of problems to caribou movement caused by transmission lines. This is best addressed at the project design stage by Dezé. Relevant research may exist in other countries such as Greenland and Norway, which have transmission lines within the ranges of barren-ground caribou herds.

Suggestion 2

Dezé should examine the literature regarding transmission lines in the vicinity of barren ground caribou to determine if certain tower design features are preferable. If so, Dezé should incorporate these features in its project design to the extent feasible.

The Review Board notes that Dezé proposes to monitor caribou in the vicinity of the transmission line, and that the GNWT and diamond mines currently monitor the same herds. If Dezé's monitoring is conducted in a manner that allows for results that can be integrated with those of other caribou monitoring programs, the results would be more valuable.

Suggestion 3

The Board encourages Dezé to conduct its monitoring in a manner that complements other efforts to study the Bathurst, Ahiak and Beverly herds where feasible, provided that this does not compromise Dezé's own monitoring objectives.

3.3 Impacts on Trudel Creek from ramping events

Water fluctuations in the Taltson River watershed are identified as a key line of inquiry in the *Terms of Reference* for the environmental assessment of the Taltson Hydroelectric Expansion Project. The *Terms of Reference* required Dezé to address potential impacts to Trudel Creek, including (PR#56 p24):

- an assessment of the expected environmental shift in Trudel Creek, including: water level fluctuation range, timing, duration and frequency, habitat shift and erosion potential;
- an assessment of the impacts to aquatic communities and habitat in Trudel Creek, including a prediction of the quantity and quality of aquatic habitat to be lost due to decreased flows;
- the impacts of sudden extreme flow events in Trudel Creek in regard to aquatic life (including benthos), furbearers, erosion potential for channel banks and substrate, vegetation;
- a description of any impacts associated with the mitigation activities and potential effects of the mitigation activity;
- a discussion of the reversibility of impacts associated with water level changes and the ability of affected ecosystems to recover; and
- an assessment of the potential impact to harvesters who may hunt, fish, trap or travel in and around Trudel Creek.

Submissions from parties at the public hearing, during technical sessions and in technical reports, highlighted changes in water levels and flows to various lake and river sections of the Taltson watershed as a key concern. Throughout the EA, parties discussed impacts resulting from changes to water quantity. This section focuses on the impacts to the Trudel Creek river system from ramping events. Section 3.3.1 describes parties' submissions. These describe what ramping events are, and what the predictions are about the impacts of ramping events on hydrology, wetlands, fish and aquatic habitat, furbearers, and water birds¹ (including species at risk). Section 3.3.2 describes the Review Board's analyses and conclusions for each valued component and for the Trudel Creek river system overall.

3.3.1 Parties' submissions

This section summarizes the evidence on the record submitted by Dezé and other parties. Because the potential impacts from ramping events relate to the entire Trudel Creek river system, the submissions from parties deal with potential effects on many different but interconnected valued components. These include the effects of ramping on:

- the flow of water and ice,
- fish and fish habitat,
- aquatic and riparian vegetation,

¹The term "water birds" is used here to refer to any swimming or wading birds, and is not limited to the family *Anatidae* implied by the technical interpretation of the term "waterfowl". Where parties are quoted referring to "waterfowl", the term has not been changed.

- wetlands,
- waterfowl, including species at risk,
- furbearers, and
- traditional harvesters.

This section describes what occurs during ramping events, and then presents the evidence on each of the above subjects in separate sections below.

3.3.1.1 Ramping events

Ramping events refer to the rapid increase or decrease in water flow that occurs when turbines are shut off and restarted. At present much of the outflow from the forebay (the body of water upstream of the Twin Gorges facility) passes down the Trudel Creek river system instead of flowing through the area where the turbines are proposed (as illustrated in the hydrological map on Figure 3, page 18). With the proposed development, this would change so that most of this water would pass through the turbines, except when they are offline. Trudel Creek would then experience a range of flow rates and water levels during ramping events (PR#74, 17.10-17.24).

When power generation plants go offline there will be a rapid increase in water level, or “ramping event”, when water will stop flowing through the turbines and back up behind them in the forebay. This excess water must be rerouted. Dezé proposes to pour it over the South Valley Spillway and into the Trudel Creek river system, thereby causing a sudden increase in flows and rise in downstream water levels. Once the turbines are restarted, water will pass through Twin Gorges again and the flow in the Trudel Creek river system will drop to pre-outage conditions. The flows and water levels in Trudel Creek begin to increase rapidly within hours of a power facility shutdown, and decrease rapidly within hours of the turbines being restarted (PR#74, 17.10-17.24).

Ramping events can result from scheduled outages, such as generators being taken offline for several weeks per year during annual maintenance (PR#74, p6.6.123), and from unscheduled outages due to events that happen at times that are difficult to predict (such as a major equipment failures, lightning strikes or forest fires) (PR#74, 17.10-17.24). Based on outages over the past 20 years (PR#126, p45), outages are four times more likely to occur in summer than they are in winter.

Scheduled shutdowns at the Twin Gorges power facility will occur annually for each turbine for routine maintenance. Each turbine would be inoperative for approximately one week. Maintenance of the turbines would take place sequentially under either of the two expansion scenarios and would last approximately 3 consecutive weeks. The preferred timing for the annual scheduled outages is just prior to freshet in April or May (PR#74, p13.3.4; 14.3.3).

Unscheduled or accidental power outages and shutdowns of the turbines are a reality for any hydro power facility and are described in the *Accidents and Malfunctions* section of the DAR (PR#74 17.4). Statistics regarding the frequency of unscheduled power outages at the existing Taltson power plant as well as the Snare Lake system are described in Dezé’s submission of November 2, 2009 (PR#126).

Dezé describes different kinds of outages which vary in frequency and effect. Short duration outages will last up to 60 minutes and occur about seven to ten times per year. These do not cause substantial increases in the flows in Trudel Creek. “Significant outages” cause the forebay level to increase and

cause flows to rise “substantially” in Trudel Creek.¹ These are predicted to occur one to two times per year. “Very significant outages” cause the forebay level to increase and require the full pre-outage flows, less the bypass spill (see below), to be routed into Trudel Creek.² These are predicted on average every four to five years (PR#126, pp40-41).

“Significant outages”, as described above, are less extreme in magnitude than “very significant outages” but occur more often. Both result in ramping.

Power outages and ramping events could cause a variety of adverse effects on the Trudel Creek ecosystem to both the aquatic and riparian environment (described in detail in Sections 3.3.1.2 to 3.3.1.6 of this report). In order to minimize these, the developer considered five spillway alternatives, three of which are described Deze as being “low cost” (PR#126 pp49-52). Of these, the developer proposed constructing a bypass spillway called the **South Gorge Spillway**. This would have a staged gate control (allowing for graduated closure) at the Twin Gorges facility for use during both scheduled and unscheduled power outages (PR#136, p38; PR #240, DAR-7 p2). Dezé states that the South Gorge Spillway is proposed to maintain flow in the Taltson River below Elsie Falls, downstream of the generators, based on the 28 m³/s minimum flow that the NWT Power Corporation is required to maintain under the existing water license (PR#74, p6.4.49). However, even though it is not proposed to be built to primarily mitigate ramping, this bypass would still reduce flows into Trudel Creek, but only by “a modest amount” (PR#126, p50). The South Gorge Spillway would be opened in the event of an outage that could not be corrected quickly. This would cause some water to bypass the generators, releasing up to 30 m³/sec of water flow from the forebay into the tailrace of the Twin Gorges facility, which would flow into the Taltson River below Twin Gorges.

Doing this would reduce water levels in the forebay and reduce the increase in flow to Trudel Creek (PR #74, 14.3.3). Any excess flow above 30 m³/sec would back up in the forebay and pour into Trudel Creek via a different spillway, called the **South Valley Spillway**. The developer states that the proposed South Gorge Spillway is a mitigation measure that will minimize adverse effects from ramping events to Trudel Creek (PR #74, 17.4.3).

The developer has committed to an annual maintenance schedule that would take one turbine off-line at a time to minimize the impacts of scheduled ramping events (PR #240, p1). After any outage involving multiple turbines, the developer has proposed further mitigation by staggering the start-up of the turbines to reduce the suddenness of the drop in the level of Trudel Creek as turbines restart (PR#74 p 17.23).

When turbines are running at full capacity, if a single turbine is shut down for scheduled maintenance, discharge from the South Valley Spillway into Trudel Creek would peak approximately 6 hours after initial turbine shutdown and remain elevated over the three-week annual maintenance period. Flow in Trudel Creek would change by up to 44 m³/sec for the 36 MW expansion and up to 53 m³/sec for the 56 MW scenario. Changes in water level in Trudel Creek would be up to 0.68 m for the 36 MW expansion and up to 0.79 m for the 56 MW expansion (PR#74 p14.3.20).

¹ Dezé categorizes these as “Type Four” outages.

² Dezé categorizes these as “Type Five” outages.

The greatest degree of change would occur in the worst-case scenario of a full outage occurring when water at Trudel Creek is flowing at a low level. Dezé predicts that the flow will increase from 4 m³/s to 214 m³/s, and water level in the creek would increase by up to 2.7m over eight hours time (PR#74 p17.23). This would result from a typical full outage and restart with one generator reloaded every four to six hours (PR#74 p6.6.9-14). The highest flows are most likely in August and September. If an outage were to occur during a period of high flows, a predicted flood with a return period of ten years, the peak flow in Trudel Creek would increase from 161m³/s to a high of 371 m³/s and peak water level in the creek would increase by 1.6 meters (PR#74, DAR pp17.24-25). These figures indicate predicted flow *after* the mitigations proposed by the developer.

Although the worst case scenario described above would result in the greatest degree of change, this describes a ramping event that is likely to occur much less often than the ramping events predicted from partial outages. Much of the evidence presented in the remainder of Section 3.3.1 of this report deals with worst case scenario predictions because these were a focus of parties' submissions. The Review Board's analysis (in Section 3.3.2) focuses on the evidence pertaining to partial outages because these are expected to be more frequent.

3.3.1.2 Hydrology: sedimentation, ice jamming and overflow

The developer described the natural annual flow regime of in the DAR. Although it is focussed on the Taltson River (as opposed to Trudel Creek), it describes the hydrology of the same watershed. In the baseline condition, spring freshet following snowmelt typically is when peak annual flows occur. Flows typically ebb gradually over the following months. Fall rains may result in later peaks, but these are generally of lower magnitude and are less frequent (PR#74 pp9.3.10-11). Natural flooding may raise water levels as high as ramping events would.

Dezé has documented natural variation flow levels from year to year from 1978-1990. Ramping effects would be most pronounced in contrast to years with low flow, because of the greater proportional change of the additional water. According to Dezé's model, 9 of the 12 years in the period examined would have been low flow scenarios under the 56MW expansion, and approximately half would have been low flow years under the 36 MW expansion (PR#74 p14.3.6).

The developer recognized that ramping events in winter would result in water released over the ice in Trudel Creek. However, since Trudel Creek is a low velocity system, ice scour is not expected to be a problem (PR#118, p87). The DAR indicates that the presence of riparian vegetation helps stabilize shorelines and reduces the potential for erosion (PR#74, p14.6). When asked at the Technical Session which locations along Trudel Creek are currently protected from ice scour by riparian vegetation, Dezé replied that this is the case for all of Trudel Creek. Dezé indicated that ice mats may adhere to vegetation and soft material, and then when water levels rise these would be lifted by floating ice, but that this would be similar to baseline conditions (PR#118, p87-89).

In its Technical Report submission of Dec. 11, 2009, INAC expressed concern over the potential for power outages and ramping events to result in fluctuations in water level and flow in Trudel Creek (PR#163 p9). INAC specifically notes that ramping events along Trudel Creek can increase the likelihood of ice jamming and overflow in the winter and bank erosion and sedimentation in the watercourse during the summer months. To mitigate these effects, INAC provides a general recommendation that the developer "moderate and control water releases through Trudel Creek to the extent possible during

power outages, shutdowns and restarts to reduce impacts from a relative quick increase in flow and water level” (PR#163 p10; PR#210 p240). In the *Table of Commitments* submitted by Dezé on March 5th, 2010 (PR#294 p17) the developer states that this recommendation is addressed in part through proposed mitigation measures in the DAR.

During scheduled outages ice cover may partially break up and then jam within the Trudel Creek channel or in the Taltson River downstream of Elsie Falls. The effects of localized flooding on fish and wildlife upstream of an ice jam are considered by the developer to be low (PR#136 p 27). At several points during the technical session in Yellowknife and Łutsël K’e , Aboriginal groups expressed concern regarding potential safety risks and impacts from changing water levels on land users, based on past experiences with hydroelectric developments at Twin Gorges (PR#117 pp94, 96, 172).¹

The developer has recognized that local land users are concerned about the effect of changes in ice conditions downstream of Twin Gorges where people may use the ice as a travel corridor. As described in both the October 2009 *Draft Environmental Monitoring Program* and Dezé’s submission of November 2nd, 2009, the developer has committed to “work with people that travel on the Taltson River ice between Tsu Lake and Twin Gorges to develop a communication system to advise users of the potential changes to the ice structure as a result of a shutdown/start-up event” (PR#126, p27; PR#136). No detailed mechanism for doing so was identified.²

3.3.1.3 Fish

The risk of eggs or juvenile fish being flushed away by ramping events arose as one of several possible impacts from ramping events. In the DAR (PR#74 p14.8.58) the developer provided its impact predictions regarding the potential for **scheduled** ramping (such as shutdown for maintenance purposes) to affect fish. All of the following predictions are based on a predicted flow increase of 50 m³/s (PR#74, pp14.8.58-61):

- The developer predicts that displacement of incubating eggs during increased flows is not likely;
- Regarding juvenile and adult displacement during plant start-ups (as generators come back on line after maintenance and water levels in Trudel Creek drop), if the reduction of the water levels is gradual then some fish species are not likely to be displaced, but it is possible for other fish species;
- Depending on timing, some but not all fish eggs may be dewatered;
- The potential for sediment transport and deposition downstream is low at a predicted flow increase of 50 m³/s.

For extremely large unscheduled ramping events, the developer considers the same issues as above but assumes a higher flow rate (PR#74, pp17.43-49). It concludes that displacement of eggs and erosion leading to smothering of eggs will be minor, based largely on the likelihood of such an event occurring in

¹ These comments were made regarding legacy issues and Nonacho Lake, which are dealt with further in Section 3.6.5. They are raised here to recognize that communities have expressed a sensitivity regarding furbearer loss due to hydrological changes from hydro projects in the area, and are not directed to the Trudel Creek river system in particular.

² The Review Board notes that although this relates primarily to the Taltson River downstream of the development, it is also applicable to the Trudel Creek river system.

when walleye (*Stizostedion vitreum*) and pike (*Esox lucius*) are spawning and their eggs incubating (May and June).

The developer recognizes that dropping water levels after ramping, from scheduled or unscheduled outages, may dewater incubating eggs if fish spawn during the period of increased water levels following a ramping event. If this occurs in May or June, the magnitude of the effect is high. However, these are not frequent events, they would not happen every year, and some eggs will survive, so the effect would be reversible and would not harm fish populations (PR#74 p17.44). Dezé clarified in the technical session that this prediction was based on the forecasted frequency of ramping events, which were estimated based on experiences with the Snare hydro system. Due to the narrow spawning windows of some species, this is considered a low probability event (PR#118, pp49-52). Arthur Beck also expressed the view that Trudel Creek was just a little creek; a spillway, not even a river and the Talston River is the system of importance in the context of fish spawning.(PR#210,pp173-174)

In the technical sessions, Dezé specified that it considered proposed mitigation related to ramping appropriate to mitigate effects on populations because of the low likelihood of unscheduled outages occurring during a critical timing window (PR#118, p54). The developer notes that in large, full outage ramping events, which are rare, water levels would drop by over two meters in roughly 20 hours, and this may strand fish. Most fish would not be stranded, and fish populations would recover, so Dezé considered this a reversible impact with a low residual effect (PR#74, pp17.43-49).

Dezé and DFO met on October 6th, 2009, following the Technical Sessions, and discussed the potential for fish stranding associated with ramping events in Trudel Creek (PR#124 p1). During the meeting, the developer committed to several mitigation measures intended to reduce adverse effects of fish stranding. These include:

1. conducting a trial opening and closing of the spillway gate to observe potential fish stranding sites in Trudel Creek and Taltson River to determine the level of stranding that may occur (PR#159, p16);
2. identifying sites of high potential for fish stranding in Trudel Creek; monitoring selected sites during an initial outage event; and,
3. consulting with DFO on the results of the monitoring program and applying adaptive management techniques to identify any operational changes that could be applied (PR #124, p2).

The developer predicted that fish habitat would be affected due to the lower waterline. The developer expects wetlands to stabilize in three to ten years, providing stable cover and food conditions to fish. For these reasons, the developer states that there will be no significant reductions to fish habitat structure and cover conditions (PR#74, p17.49).

In its Technical Report (PR#159), DFO describes the adverse effects of ramping events on Trudel Creek in terms of the potential to displace fish from preferred habitats, erosion, siltation and harm to fish eggs and benthic invertebrates, an important source of food for fish (pp14-16).

A rapid decrease in water levels during ramping after turbine start-up could strand fish in isolated pools and on banks. After discussions with DFO, the developer committed to conducting a trial opening and

closing of the spillway gate to observe potential fish stranding sites in Trudel Creek and Taltson River to determine the level of stranding that may occur (PR#159, p16).

Parties criticized Dezé for relying on a complex hydrological model which depends on theoretical assumptions that may be questionable. In its Technical Report, DFO concludes that “(t)he proponent’s assessment of impacts to fish and fish habitat rely extensively on the accuracy and precision of their models and assumptions” (PR#159 p16). In INAC’s Technical Report, INAC asserts that this model specifically fails to adequately consider the influence of precipitation on the freshet, which is a problem because “the influence of snow accumulation and snow melt can have a drastic influence on the reservoir capacity, freshet timing and freshet magnitude, particularly over a series of years” (PR#163, p9).

DFO expressed concerns regarding the effects of large ramping events on the re-establishment of wetlands and on the various life stages of fish in Trudel Creek that depend on them. It recommends reducing the frequency of ramping events as much as is technically feasible (see Section 3.3.1.4 below for details).

3.3.1.4 Wetlands and vegetation

In the Developer’s Assessment Report, the developer describes the functions of wetlands as “critical to the maintenance of biodiversity and ‘healthy ecosystems’.... (W)etlands provide habitat for fish and wildlife and also regulate hydrology, water quality and climate of a given area” (PR#74, p14.6.1). Impacts on wetlands have bearing on fish, as they are important nurseries for young fish and for invertebrate species that are important as food for fish. They are important habitat for waterfowl and other birds, including species at risk, and for muskrat and beaver, which are traditionally harvested. Accordingly, impacts on wetlands may affect these other valued components.

The developer states that the reduction of water from baseline levels and the rising of water levels that is predicted to follow, along with sporadic changes in flow, in both summer and winter months, will affect the ecology of the Trudel Creek river system, including the banks and vegetation where furbearers and waterfowl live. The extent and function of the wetlands are valued components of this environmental assessment. Dezé states that “loss of wetland area is one of the largest threats to wetlands in the Northwest Territories”. Wetland function includes hydrological function, habitat function and ecological function (PR # 74, pp14.6.9-10). In identifying impact pathways, the developer notes that “changing water levels would affect the current flood regime, which is the primary force for maintaining riparian wetland communities... Water levels substantially above or below current ecosystem community boundaries would result in species composition shift following natural succession” (PR # 74, pp14.6.12).

Dezé stated in the DAR that it does not know how long it will take for new wetlands to re-establish. It states (PR#74 p14.6.16):

Although a total change of wetland community is predicted, the time-scale for succession is largely unknown... The extent and rate of colonization by emergent species is unknown, because of information relating to the slope, sediment composition and seed bank is lacking... Existing riparian wetlands would be left high and dry but vegetation communities may persist for more than a decade. New wetland communities

would begin colonization of non-vegetated areas within three years but would not be diverse functioning communities for up to 10 years.

In the technical session, Dezé clarified (PR#118, pp91-92) that it expects aquatic plants to re-establish resulting in a robust littoral zone habitat in one to three years. A review of related literature predicts that emergent vegetation and wetlands could occur between five and ten years.

The Developer's Assessment Report notes the uncertainties in its prediction of wetlands colonizing areas that are now part of the river bed of Trudel Creek. These uncertainties are particularly identified in light of the potential magnitude of flooding events including ramping. The DAR states (PR#73, p14.6.17):

Previously submerged areas, which would be exposed un-vegetated areas post-expansion, would be susceptible to flooding. This may reduce the ability of colonizing species to quickly establish in the riparian areas or Trudel Creek. These large fluctuations in flows would ultimately transport sediment, seeds and nutrients into and out of the system. Sediment transport may provide substrate suitable for colonization as the waters recede. However, these sediments may be transported downstream to areas not suitable for wetland development. They may also be depositing in existing wetlands, further impacting communities downstream.

Dezé predicts changes in the species present in the wetlands that re-establish, but does not know how long this will take. Dezé states "although a change in wetland community is predicted, the time scale for succession is unknown" (PR#74, p14.10.5).

The DAR (PR#74) identified several other unknowns with respect to wetland extent:

- The developer states that "a confounding factor contributing to the effect of the Project on wetland vegetation and its ability to colonize any areas which, under baseline, were in the submergent zone, is the large potential fluctuations in flows in Trudel Creek" (p14.6.17).
- The developer further identifies problems leading to uncertainties regarding wetland mapping in Trudel Creek, based on reliance on different types of aerial photographs that result in "a data set of wetland extent that is not comparable between data sources" (p14.6.23).
- Regional data for the area including Trudel Creek is of a scale that is "too small to effectively identify wetland communities, and often includes forest and open water in wetland areas, resulting in an over-estimate of wetland area" (p14.6.23).
- The regional maps are 30 to 50 years old, and in the last 20 years the extent of wetlands has changed (p14.6.23).

During the technical session, Dezé stated that its opinion regarding establishment of new littoral zones and wetlands succession are based on the historic high flow levels (PR#118 p51). When questioned about high peak flows preventing the establishment of new wetlands, the developer stated (PR#118, pp91-93):

The erosional forces of those flows, in our view, given our understanding of the system, won't impede the succession of the transition of those (wetlands). Now we recognize that that's our opinion (and) how we understand the system. But we recognize that there's assumptions that we're making and there's information we need to gather first

to better understand what's there... We're going to be monitoring succession and see how things actually transition as we're predicting. And then if they do not, that's where adaptive strategies will come into play.

INAC does not accept the flow and erosion predictions which underlie Dezé's predictions for wetland re-establishment. In its *Draft Environmental Monitoring Program*, Dezé states that "young plants are quite susceptible to wash out. This is especially true if flows are strong enough to cause erosion along the river banks" (PR#136 p12). As indicated above, INAC states in its Technical Report of December 11th, 2009 that the hydrological model on which Dezé's predictions are based fails to take into account the influences of precipitation within the basin or headwater areas. It states that "the influence of snow accumulation and snow melt can have a drastic influence on the reservoir capacity, freshet timing and freshet magnitude, particularly over a series of years" (PR#163 p9).

Other evidence submitted by INAC that conflicts with the assumptions underlying Dezé's predictions about wetlands deal with ramping frequency, ice scour and erosion. In its Technical Report, INAC expressed concern regarding the relative frequency of outages. Although Dezé predicted this based on the Snare hydro system, INAC notes that experiences at the Taltson hydro system indicate a higher frequency of ramping events. INAC concludes that there is an increased likelihood of ice jamming in winter and erosion in the summer as a result. It recommends that Dezé "moderate and control water releases through Trudel Creek to the extent possible during power outages, shutdowns and restarts to reduce impacts from a relatively quick increase in flow and water level" (PR#163 p10). During the hearing on January 15th, 2010, INAC identified the increased potential for ice jams, for flooding and scouring in Trudel Creek as a particular concern (PR#210 p239).

Lower flows and a reduced water level in Trudel Creek will become the new hydrological regime following project construction and during operations of the expanded power facility. DFO notes in its submission of December 11th, 2009 that it may take more years than Dezé predicted before vegetation can colonize stream banks at the lower water level (PR#159). The re-vegetation of littoral and riparian zones along newly exposed stream banks could be impeded by ramping events. DFO points out that the developer's habitat predictions are based on aquatic vegetation on the riverbed¹ re-stabilizing within one to three years, and that "large ramping events in Trudel Creek could impede re-vegetation of littoral and riparian zones which could make it very difficult for the system to stabilize after flows are reduced" (PR#159 p16).

In DFO's view, this will affect the likelihood of the developer's predictions. DFO points out that the developer stated, in its draft monitoring plan (PR#136), that "the young plants are quite susceptible to wash out". From this, DFO concludes that "(t)he successful re-establishment of riparian and aquatic vegetation in a timely manner is critically important as it provides habitat for a variety of life stages of fish species that reside in Trudel Creek" (PR#159, p16). In its Technical Report, DFO recommends that the developer "reduce the frequency of ramping events as much as is technically feasible in Trudel Creek to allow the creek to stabilize and riparian/aquatic vegetation communities to become re-established" (PR#159, p16).

¹ Dezé's prediction of re-vegetation within one to three years refers to littoral (riverbed or lakebed) vegetation. Dezé predicted that riparian area (along the shorelines or riverbanks) would take five to ten years for vegetation to re-establish fully (PR#74 s14.6).

Details on the riparian habitat monitoring proposed by Dezé in the Taltson River basin, including Trudel Creek, are included in the *Draft Environmental Monitoring Program* (PR#136). The key component of the monitoring will be the ongoing assessment of riparian zones and wetlands. The program centers on re-vegetation and monitoring plans developed by the British Columbia Ministry of Transportation. The program will consist of 5 to 10 monitoring sites in strategic locations on the Taltson River basin, including Trudel Creek (p 29). Dezé does not identify any specific project management actions to address any problems that are found, but says that “the need for... adaptive management will be assessed” (p31).

A full outage could occur at any time of year and could last from minutes to a month (PR#74, Section 17.5.4.1). Water levels going substantially above or below current ecosystem community boundaries would result in species composition shifts. The effects of a full outage according to the developer will be minimized through the same mitigation measures as cited above for fish (PR#74 p17.69-70), namely to construct the South Gorge Bypass and to restart turbines one at a time after ramping events to reduce the suddenness of the drop in Trudel Creek level (PR#74 p14.6.12).

The DAR predicted that for full outages in Trudel Creek, the impacts of scheduled ramping on wetlands will be adverse, of a high magnitude, highly likely, continuous and medium-term. However, it is reversible over the years “provided that water levels and water level fluctuations post-expansion allow new riparian wetland communities, similar to pre-expansion communities, to develop and flourish”. The overall impact is described by the developer as “moderate” (PR#74 p14.6.17).

In its January 29th, 2010 submission, DFO recommends that the Dezé “develop and implement an active riparian/aquatic replanting program, in consultation with DFO, in order to expedite the successful colonization of vegetation along and within the new stream channel”. DFO further states that this replanting program could be part of a fish habitat compensation plan under a *Fisheries Act* authorization to balance unavoidable fish habitat loss in Trudel Creek river system (PR#238, p7). In the *Table of Commitments* submitted by Dezé on March 5th, 2010 the developer states that it has not currently committed to an active riparian or aquatic replanting program but will monitor vegetation transition as described in its *Draft Environmental Monitoring Program* (PR#294 p14).

In order to allow the Trudel Creek system to stabilize and riparian and aquatic vegetation communities to re-established, DFO recommends that the developer reduce the frequency of ramping events as much as is technically feasible (PR#159 p16). The developer states in its March 5th, 2010 *Table of Commitments* (PR#24 p15) that it has not committed to this recommendation but that it will implement mitigation measures to reduce the effects of ramping as described in the Section 17.4.3 DAR.

3.3.1.5 Semi-aquatic furbearers

The DAR indicates that muskrat is the furbearer most harvested by the communities of Fort Smith and Fort Resolution, and that beaver harvest is also important in both communities (PR#74, p9.6.24). Aquatic mammals, including beaver and muskrat, are present in Trudel Creek river system. These mammals rely on riparian and aquatic habitat for their entire life history including foraging, shelter and reproduction (PR#74 p17.90).

The developer recognizes that altered water levels due to *partial* outages, especially in winter, or decreases in levels will likely result in muskrat and beaver deaths. There are several potential causes of this (PR#47 pp14.9.22-23)¹:

- Changes in water destroy beaver and muskrat lodges and their food caches. This will likely lead to animal deaths or leave them vulnerable to predators and the environment (PR#74 p14.9.23);
- Increased flows or water levels during the fall and winter can flood muskrat and beaver out of their lodges (PR#74 p14.9.25);
- Increased water levels limit muskrat populations, because water fills burrows and drowns young (PR#74 p14.9.25);
- Winter drought conditions or low water can cause food access to be limited and can cause predation to increase;
- A rapid drop of water in winter can freeze beaver and muskrat where there is insufficient water under the ice. The DAR identifies that muskrat populations can be drastically reduced by almost 50% from a 40 centimetre decrease in water level (PR#74 p14.9.23-26;p17.89);
- Other adverse effects to these species are poor condition of juveniles and spring abandonment of lodges (Smith and Peterson, 1991, as cited in PR#74).

Dezé and community participants in the environmental assessment described the sensitivities of communities to the subject of furbearer loss. The following examples were given.²

In its DAR, Dézé identifies concerns about impacts from releases of water in winter on the muskrat population in the past, from the perspective of harvesters. The DAR cites the 1981 testimony of Frank Laviolette at a NWT Water Board hearing in which he stated his concerns about the impacts of hydroelectric developments at Twin Gorges on furbearers. Based on extensive time on the land, he said (PR#74, p9.6.18):

What was the (musk)rat population was coming back thick, very thick, thick as its been for the last probably 40 years, and during the winter there should have been a heck of a lot of muskrats on the Spring and Taltson Rivers. But because of that dam letting out water, water rushing through the winter time, it drowned all the muskrat, which means thousands of dollars lost. The trappers didn't get anything.

At the September 29th, 2010, technical session in Łutsël K'e, Elders J.B. Rabesca and George Giroud described similar experiences where hydroelectric developments at Twin Georges caused the deaths of many beaver and muskrat which were found floating in spring (PR#116 p117; pp130-131).

The DAR identifies similar concerns expressed by R. Boucher regarding previous development at Twin Gorges. " Our (musk)rat population has gone right down to just about nothing now, where in the olden

¹ Dézé cited some of these in reference to all the zones it examined. This included Trudel Creek but was not exclusive to it.

² These relate to events at the Taltson River from previous hydroelectric development. Accordingly, these are included as they relate to community concerns, not as technical predictions for Trudel Creek.

days – you can look at the game files – where people used to come in with a thousand rats per trapper... So it's really having a lot of effect on the people downstream" (PR#74, p9.6.18).

At the Technical Sessions on October 2nd, 2009, Dezé Chairman Don Balsillie indicated that flooding in winter is an ongoing problem that creates hardship for trappers, and that "there's some degree of loss there and concern with that" (PR#118, pp98-99).

Similar concerns regarding muskrat and beaver were voiced about the impacts of this proposed development. During the hearing on January 15th, 2010, harvester Arthur Beck of the Fort Resolution Métis Council told the Review Board that beaver and muskrat build homes before the ice forms in the fall with breathing holes in the ground. If water is released in winter, they are frozen into their homes and cannot escape when breathing holes are flooded, so they drown in their homes. He also noted that the Taltson River was the more important harvesting area (PR#210, page 171, 172, 176).

The developer acknowledges that proposed changes to water flows are expected to affect the abundance, location and activity of beaver and muskrat, stating that the project would "likely lead to direct loss of individuals via freeze-out, drowning, starvation, increased predation etc." However, Dezé predicts no significant adverse impacts to the preservation of furbearer harvesting opportunities within the Taltson River watershed because these adverse effects are considered to be reversible. This is because later generations of furbearers are predicted to replace the lost individuals. Dezé states that a key component of this conclusion is the assumption that there would be high quality future habitat which would lead to furbearer distribution and abundance similar to baseline conditions. Based on this, the developer predicts that full outages would cause no significant adverse effect to the preservation of furbearer harvesting opportunities within the Taltson River watershed (PR#74, pp17.96-97).

Dezé describes the predicted frequency of ramping events as another key component to the "not significant" rating of effects on furbearers, stating (PR#74, p17.98):

Both scheduled and unscheduled ramping events would have effects on furbearers and individuals are likely to be lost. These ramping events are predicted to be infrequent enough that effects on furbearers would be reversed prior to the next ramping event. The Taltson River watershed may become 'sink' habitat in that migrants may move into the area following a ramping event and thus maintain the population but the migrants may be lost during the next ramping event.

Dezé says that more stable water levels would benefit furbearer populations between ramping events (PR#74, p17.98).

In terms of habitat availability, the DAR states that the developer's models predict changes in vegetation and wetlands, which could lead to a change in the availability of resources for foraging or shelter (PR#210, pp14.9.23).

Dezé has proposed a four-year program, consisting of two years before operations and then two years after operations, to observe and report impacts on these animals in Trudel Creek. The developer plans to use this research as a way to confirm that large-scale changes to the Trudel Creek ecosystem do not occur (PR#136 p43). Dezé will produce an annual monitoring program report to be circulated to communities, regulatory agencies, Aboriginal groups and other stakeholders ((PR#136, page 44).

In its *Draft Environmental Monitoring Program*, Dezé states, regarding the beaver and muskrat monitoring (PR#136 p43):

(C)hanges to Project operation are not anticipated to result from these studies. Any changes to Project hydrology for environmental reasons would be driven by the more sensitive receptors of fish and other aquatic species. Thus, effects thresholds related to beaver and muskrat are not relevant. Rather, these studies are proposed to address uncertainty in the effects, and to confirm that large-scale changes to the Trudel Creek ecosystem do not occur.

In its report of the December 18th, 2009 meeting between Environment Canada and Dezé, Environment Canada identified downstream effects from outages on muskrat must be considered when considering the timing of scheduled outages (PR#196).

The mitigations pertaining to furbearers are the same ones intended to minimize the effects of ramping in general (see Section 3.3.1.1 above). Project design mitigation and mitigation practice call for planning project activities in order to have little or indirect effect to wetland ecosystems, specifically, the South Gorge Spillway bypass and the scheduled maintenance and restart of one generator at a time (PR#74 p.17.24).

3.3.1.6 Water birds (including species at risk) in Trudel Creek

The DAR identified 26 waterfowl and loon species occurring within the project footprint area (PR#74 p9.5.16). Dezé identified the potential for direct mortality of various waterfowl and their young due to the rapid increase in water levels. Dezé also identified the potential for reduced reproductive success for waterfowl due to water fluctuations (PR#74 p17.50). Flooding could wash away young in nests and low levels could strand nests, exposing them to increased predation. Destruction, alteration or modification of vegetation (shelter and food sources) cause changes to diet and loss of habitat that affects the birds (PR#74 p17.92).

In its DAR, Dezé states that “for ground nesting waterfowl, stable water levels are necessary for reproductive success (Cott *et al.*, 2008 in PR#74 p17.92). Regarding unscheduled ramping, Dezé states “Without mitigation, the change in water levels due to ramping would have adverse effects on all ground-nesting waterfowl” (PR#74 p17.52). This is reflected in Dezé’s *Draft Environmental Monitoring Plan*, which acknowledges that during operations of the project, changes to water levels are expected to affect nest density, location and success. In the same document, Dezé states that this “would most likely result from the anticipated changes to wetlands and associated vegetation and invertebrates” (PR#136, page 42).

The DAR recognized two ways that unscheduled ramping events can cause impacts on waterfowl. Dezé states that “direct mortality leading to reduced population abundance due to rapid increase in water levels” and “reduced reproductive success leading to reduced population abundance due to rapid increase in water levels” are valid effect pathways, but each is minor due to the proposed mitigations. These mitigations are those identified above (see Section 3.3.1.1), plus the possibility of artificial nesting platforms (PR#74, pp17.52-53). Because of the developer’s conclusion that mitigation would make these effects minor, no further detailed criteria were offered for evaluating the significance of these impacts.

The developer states in its November 2nd, 2009 submission that ramping would only result in direct mortality to nesting waterfowl and loss of nests when it occurs during the nesting and early brood rearing season, so these would not be frequent adverse effects on waterfowl (PR#126, p112). In its report of a December 18th, 2009 meeting with Dezé (PR # 196), Environment Canada voiced concern over timing of scheduled outages in relation to migratory water bird nests as they relate to ramping within Trudel Creek. There is a risk of nest disruption or destruction if outages occur during nesting season. In its Technical Report of December 11th, 2009, Environment Canada specified that the incubation period ranges from May 7 to July 21st, and that young birds can be present in the nest until August 10th, although for certain species the young may be present later (PR#161, pp12-13). Environment Canada “recommends that scheduled annual outages be done prior to May 7, unless baseline data on migratory birds in the area indicates that these outages could be done later without disturbing or destroying nests or eggs of migratory birds”¹. The developer has agreed to this recommendation in its *Table of Commitments* (PR#294 p5).

Recommendations by Environment Canada to reduce this risk include a nest protection plan as well as managing scheduled ramping to avoid the most sensitive timing windows for waterfowl.

The developer has agreed to a four-year program for monitoring nest density, location and success in Trudel Creek, comparing it with a reference area. This is intended to make it possible to compare changes in water level, flow rates and associated changes in vegetation. In its *Draft Environmental Monitoring Program*, Dezé states that results from proposed waterfowl monitoring are not expected to change project operation, and that this monitoring is meant only to address uncertainty and confirm that there have been no large-scale changes (PR#136, p42).

In its meeting on December 18th, 2009, Environment Canada recommended a nest protection plan be developed that demonstrates that Dezé has taken “all reasonable actions to reduce the risk of destroying downstream migratory bird nests” (PR#196). Dezé agreed to develop a nest protection plan (PR#196). The detailed commitment filed by Dezé states that it will develop a plan “that outlines strategies and mitigation intended to reduce effects to waterfowl nests within Trudel Creek during scheduled ramping events” (PR#240, DAR-82p4).

The developer also commits to developing a nest protection plan to outline mitigation of effects to migratory bird nests. This will outline reasonable actions to take in order to reduce the risk of destroying migratory bird nest sites in Trudel Creek (PR#196; PR#238 sDAR-82 p4).

The mitigations pertaining to water birds are the same ones intended to minimize the effects of ramping in general (see Section 3.3.1.1 above). In addition, the developer suggests that it may construct artificial platforms for waterfowl management to increase reproductive success in Trudel Creek. Dezé states that nest platforms have been successfully employed for species present in the area, including the common loon, mallard and Canada goose (PR#74 p17.92). The DAR notes that not all species would be candidates for using nest platforms, and that platform design features may differ among the species that do use them. Dezé states that it could build nesting platforms if surveys indicate that the population of breeding waterfowl and shorebirds warrants mitigation (PR#74 p17.52).

¹ The yellow rail and horned grebe are species at risk, and are addressed separately in Section 3.3.1.6.1 below.

3.3.1.6.1 Species at risk

The *Species at Risk Act (SARA)* creates responsibilities for the Review Board in addition to those of the *MVRMA*. If a project is likely to affect a listed wildlife species or its critical habitat, the Review Board must identify the adverse effects of the project on the species and its critical habitat and, if the project is carried out, must ensure that measures are taken to avoid or lessen those effects and to monitor them (SARA ss.79(2)). The *Terms of Reference* specify (PR#56 p26):

For the purpose of this environmental assessment, the term “species at risk” includes all species listed under any applicable schedule of the Species at Risk Act, as well as any species listed by the Committee on the Status of Endangered Wildlife in Canada. It also includes any species listed by the GNWT with designations “may be at risk”, “at risk” or “sensitive” in the General Status Rankings for Species in the NWT.

The yellow rail and the horned grebe are two species at risk considered by Environment Canada to occur in the Trudel Creek river system.

The horned grebe is a diving water bird with a pointed bill, resembling a small loon. It builds floating nests in shallow wetlands with emergent vegetation (such as reeds and cattails). Destruction of wetlands is a major threat to this species. The highest documented densities of horned grebes have been observed in the southern NWT. Even temporary loss of wetlands during droughts can also negatively impact horned grebe populations (COSEWIC –*Assessment and Status Report 2009*). The horned grebe was listed as a species at risk by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in April 2009. This was after the DAR was prepared. During the technical session on October 5th, 2009, Dezé stated that horned grebe were observed during waterfowl surveys (PR#120 p154). Dezé confirmed that some were observed along Trudel Creek (PR#126, p111).

In its Technical Report of December 11th, 2009, Environment Canada states that Horned Grebe in the Northwest Territories have been observed to have eggs in nests as early as May 20th, and young in nests until August 10th. Environment Canada recommends scheduled outages occur before May 7th, unless committed local baseline studies data suggest that these outages could be done later without destroying nests or eggs (PR#161, p13).

Dezé states that the project may affect horned grebe the same way that it may affect waterfowl in general. Their food supply during breeding season may also be affected by water fluctuations, and their reproductive success may be reduced by altered water levels within Trudel Creek, because their nests and young would be flooded by ramping events. Dezé states that “horned grebes, like loons, are particularly sensitive to this effect as their nests are generally built 5 to 10 centimetres above water level” (Stedman 2000, in PR#126, p112). Dezé conservatively predicted that major, unscheduled partial outages would occur only one year in five on average at any time of the year, but less frequently during the nesting and early brood season. Based on the low frequency of the impact, Dezé concludes that it is not significant (PR#126, pp112-113).

Environment Canada met with Dezé on December 18th, 2009, and discussed impacts to horned grebes. In its commitment document of January 29th, 2010 Dezé commits to develop mitigation measures to

avoid or lessen all potential adverse effects to horned grebes (PR#240, pEC-18). It also commits to monitor to determine the effectiveness of mitigations or identify where further mitigation is required, and to develop details of mitigation and monitoring for horned grebes prior to project construction (EC-18).

The yellow rail is a small bird that nests in wetlands in a range that includes the area of the project. Habitat loss is the greatest threat to this species, which is listed as a species of special concern under the Species at Risk Act.

The developer surveyed for yellow rail in the project area in 2008, following the Canadian Wildlife Service protocol for yellow rail surveys (PR#120, p161). No yellow rail were detected. Environment Canada identified problems related to the timing of the survey that make its conclusions questionable. Specifically, the survey was conducted while ice was present, which is too early for the survey method to be effective, (PR#210, p108). Environment Canada identifies further uncertainty because the survey was conducted in a year that was drier than normal, and in dry years yellow rails may not breed in areas where they typically nest (PR#120, pp161-162). It concludes that further study is therefore needed to conclude if the species inhabits the area, and recommends that yellow rail surveys be done prior to construction of the project in the areas likely to have the bird. If yellow rails are detected, the proponent should work with EC to determine the appropriate mitigation and monitoring measures (PR#161, p14; PR#210, p92; PR#240 p5).

Dezé has not agreed to adopt this recommendation, citing that no yellow rail were identified in its surveys, and that current mitigation assumes the presence of yellow rail (PR#238, SEC-20 p6). This refers to the mitigations intended to reduce ramping (PR#74 17.24) and the nest mitigation plan described above (PR#196; PR#238 sDAR-82 p4).

3.3.2 Review Board analysis and conclusions

This section describes:

- general observations about past and predicted changes to the flows of the Trudel Creek river system, hydrology, and vulnerable periods for fish and wildlife;
- the Board's analysis of the evidence about each of the individual valued components described above (hydrology, wetlands, fish and fish habitat, furbearers and water birds (including species at risk)); and,
- the Board's overall conclusions regarding potential impacts to the Trudel Creek river system as a whole.

3.3.2.1 Past and predicted changes to Trudel Creek flows

Although there may be various impacts on several different valued components such as wetlands, water birds, fish and vegetation, these are largely driven by larger systemic changes to the Trudel Creek ecosystem. These broader impacts come primarily from changes to the water flows (hydrology), and secondarily from resulting changes to habitat in the form of altered wetlands, littoral zones and other vegetation. Most of the predicted impacts on fish and wildlife stem from changes to flow and changes to habitat availability and quality, particularly to

wetlands. The main mitigations identified by the developer for all of the valued components in Trudel Creek all focus on flow. For this reason, an analysis of the predictions about changes to flows is important in evaluating the potential impacts on all other valued components in Trudel Creek.

The Board recognizes that the Trudel Creek river system is currently a large volume river system, 33 kilometres long, 70-230 metres wide, (PR#74, p14.1.2; fig.14.3.4) that includes three lakes, and that this is now considered the baseline condition for this environmental assessment. The flow on the system is now 117 m³/s for half the time (PR#74, p14.3.12). With the proposed development, flow would be greatly reduced. It would only flow at its current rate from 3% to 5% of the time. Average and minimum flows would be greatly reduced, and frequently, flows are expected to be at the minimum level, slightly above 4 m³/s.¹ This means that the Trudel Creek river system would have the flows of a small creek, well below its present flow rates.

In the Board's opinion, the history of the Trudel Creek river system is an important consideration when weighing the significance of this change. Although it would change from the current large river system to a small creek, that change actually returns the system to around the same average flows that existed before any hydroelectric development affected the system, before the Twin Gorges Dam was built to serve the Pine Point Mine in 1964, and before the closure of that mine further increased flows in Trudel Creek in 1986. The Board notes that in its pristine condition, Trudel Creek was a small creek with typical habitat and wildlife.

This does not mean that the reduction in average flows is environmentally insignificant. In the 24 years since 1986, it has become a productive river system. It is the home of established wetlands, furbearers, water birds, including at least one species at risk, and fish populations. As a river system, it is ecologically more productive in many respects than it was in its pristine state as a small creek. In the Board's view, the impacts on the wetlands, fish and wildlife in Trudel Creek cannot be assumed to be entirely irrelevant just because it was once a small creek.

3.3.2.2 Board analysis: ramping and hydrology

In its pristine state, Trudel Creek contained natural habitat, such as established fish habitat and established wetlands. These were based on natural flow levels and timing (i.e. natural hydrology). With the proposed development, Trudel Creek would have lower levels, with natural variation and flooding, but would also experience unnatural "spikes" in water levels from ramping events. For this reason, changes in flows in Trudel Creek matter even though the new average flow is closer to its pristine average levels.

It must not be assumed that Trudel Creek will function as it did in pristine conditions in the face of sudden flooding and then equally sudden dropping that will occur annually or even more often. The Board notes Dezé predicts that for a scheduled shutdown, which will occur annually for routine

¹ With some variability per Dezé's March 5, 2010, commitment to develop a variable hydrograph (PR#294)

maintenance of generators, flows and water levels would increase substantially over a short period of time¹ and remain high for a three week period.

Assuming this occurs during the low flow conditions that are expected to exist for most of the operations time period, this means flows would increase tenfold² during ramping caused by routine maintenance. In the less likely event of a worst-case scenario, the Board notes that Dezé predicts the flow could increase to 53 times its operational average flow rate over an eight hour period, and the water level in the creek would increase by up to 2.7 meters, or 9 feet, in depth (PR#74, DAR p17.56). This suggests caution in assuming that the habitat and wildlife of Trudel Creek will re-establish to its former condition on its own.

The focus of much of the evidence presented regarding the worst case scenario appears to have caused some confusion for parties to the EA. Worst case scenarios are, by definition, less likely to occur but of much higher consequence than other scenarios. This impact assessment technique overstates what one might expect and presumably discounts impacts of lesser more common events. In the Board's responsibility to identify any likely, significant adverse impacts, the focus on the worst case scenarios risks diverting attention from consideration of the effects of more frequent events with effects that have lower magnitude, such as partial outages. Dezé states that the full outage scenario discussed in the DAR would require simultaneous outage of both plants, for which Dezé believes the likelihood is much lower (PR#126, p41). The Board does not assume that just because the effects of partial outages are of lower magnitude than those of a worst-case scenario, or other full outage, that the effects are not significant.

The Board notes that natural flooding occurs in the Taltson watershed, including Trudel Creek (PR#74 pp9.3.10-11). Although peak natural flooding levels may be similar to those caused by ramping events, the Board notes important differences. Ramping events change the speed that the water rises, because these changes are relatively sudden, occurring over hours, instead of days or weeks (PR#74 p14.3.20). Further, the unscheduled outages causing ramping events do not follow the same seasonal pattern of natural flooding. They occur much more often in the summer but at less predictable times than the freshet.

Natural variation in water levels means that in some years, water in Trudel Creek will be higher than in others. The greatest relative change would happen if there was a full outage occurring when water at Trudel Creek is flowing at a low level. When Dezé modelled the proposed project onto the historical data, water levels were minimal most years despite natural variation (PR#74 p14.3.6). With the project, the effects of natural variation on Trudel Creek will be greatly minimized, and the effects of ramping events in most years will remain pronounced because they will be occurring in a creek with minimal flows. This will be true in the majority of wet years despite natural variation.

The Board recognizes that Dezé has identified three main mitigation measures to reduce the effects of ramping on Trudel Creek. These are: using the South Gorge Spillway to divert excess water flow, shutting down one generator at a time during maintenance, and staged restarts of generators after

¹ During routine maintenance, flows would increase to 44 to 53 m³/sec, and creek levels would increase from 0.68 to 0.79 metres over a period of hours.

² from approximately 4 m³/sec

outages¹. The South Gorge Spillway will allow 30 m³/s of water to flow around the generators when one or more are offline.

The Board notes that the size of this bypass was not designed primarily to mitigate the impacts of ramping events. The flow of 30 m³/s in the South Gorge Spillway is not enough to prevent ramping from occurring, even during scheduled ramping when one generator at a time is taken offline for annual maintenance. Dezé states that the South Gorge Spillway designed primarily to meet the conditions of the current water license for the Twin Gorges hydro plant, which was selected to maintain minimum flow in the Taltson River below Elsie Falls, downstream of the generators (PR#74, p6.4.49). This is not enough to prevent ramping during routine turbine maintenance for the proposed project. The Board notes that, in Dezé's words, this bypass would reduce flows into Trudel Creek, but only by "a modest amount" (PR#126, p50).

The other main mitigations for the effects of ramping are operational. During scheduled maintenance, Dezé will take one generator offline at a time to reduce ramping, and following unscheduled ramping events, it will restart the generators one at a time to reduce the flow in Trudel Creek less suddenly (PR#74, p6.6.123-127). Dezé recognizes that shutdown and start-up guidelines are typical for hydroelectric facilities across Canada (PR#240 sDAR-5, p1). This suggests to the Review Board that they are a widely accepted mitigation practice.

Collectively, the South Gorge Spillway and the outlined operational practices above are the mitigations Dezé proposes to reduce ramping. Each of the predictions for impacts that Dezé makes for the valued components in the Trudel Creek river system assumes that these will reduce the impacts.

The Board takes note of the magnitude of the changes that ramping will cause, even with these mitigations. A typical scheduled ramping event, such as during routine generator maintenance, would raise Trudel Creek flows tenfold over a time period of about six hours, and then drop flows by the same amount over a similar time period about one week later.² Other partial outages of individual turbines will cause similar effects. In the considerably less frequent event of a full outage and restart (i.e. an unscheduled ramping event) the flow in Trudel could increase up to fiftyfold, and water levels could increase about 9 feet (2.7m) over eight hours (PR#74, p6.6.123-127). This is not expected to occur more frequently than once every 20-80 years. In the Board's view based on these predictions alone, even after proposed mitigation, even scheduled ramping events are likely to cause significant changes to water flows and levels over relatively short periods of time. Unscheduled outages should be much less frequent but could cause changes that are of an even greater magnitude.

¹ See the Section 3.3.1.1 above for details.

² Maintenance of each turbine would result in ramping for about one week, and maintenance will be conducted one turbine at a time (PR#74 p14.1.18). The collective period for both proposed generators and the existing unit would result in a total of three weeks of ramping during annual maintenance.

3.3.2.3 Board analysis: ramping and vulnerable periods

In its impact predictions, Dezé argues that major unscheduled outages are infrequent, and unlikely to occur during the narrow timing windows when various valued components are particularly vulnerable. This is an important part in its determinations of significance. For example:

- Dezé's predictions on fish assume low frequency of ramping events when reaching the conclusion that residual effects would be "low" and not significant (PR#74, p17.48-49; PR#118, p54). The magnitude of the effect of a prolonged outage during peak pike and walleye spawning and egg incubation periods is high, but the likelihood is low (PR#74, p17.44);
- The predicted frequency of ramping events is a key component to the "not significant" rating of effects on furbearers (PR#74 p17.97-8);
- Direct mortality and reduced reproductive success for waterfowl is a valid pathway but the frequency would be low. Frequency of direct mortality to nesting waterfowl and loss of nests from outages and ramping events would only occur during nesting and early brood rearing season which would reduce the frequency of adverse effects to waterfowl (PR#126 p112);
- Frequency of flooding the nests or young of horned grebe, a species at risk, was considered not significant due to the predicted frequency of ramping during the nesting and brood season (PR#126 pp112-113).

Many of Dezé's impact predictions have considered serious ramping impacts only from a perspective of an occurrence as a one event every four or five years. However, Dezé identifies that "significant outages... lasting several hours and upwards where... flows have risen substantially in Trudel Creek" will occur at a rate of one to two per year, and that "very significant outages" will occur once every four or five years. Understanding the likelihood of occurrence requires considering not just the frequency in isolation (i.e. number of events per year) but in light of the total length of the period for which it will occur (i.e. event frequency x 40 years). Based on the 40-year predicted project life, Dezé's predictions mean that ramping from full and partial outages will cause substantial rises in Trudel Creek flows 48 to 90 times, even if the worst-case scenario event does not occur. Most of these ramping events will likely be caused by partial outages. Considering outages will take a duration of six to eight hours to reach peak flows in Trudel Creek, outages of one or two hours are likely not as important. Looking only at the longer outages with higher flows, such as those three hours in length or more, the Review Board concludes that there will be several during the life of the project.

Cumulatively, Trudel Creek will be affected by ramping from outages at the proposed project in combination with outages at the existing Twin Gorges facility. The frequency of ramping events that affect Trudel Creek is determined by the number of significant outages of the proposed project plus the number of significant outages at the Twin Gorges hydroelectric plant. Dezé predicts this may further double the project-specific estimates for partial outages (PR#126 p41). Considering the cumulative frequency of partial failures from both Twin Gorges and the proposed project as predicted by Dezé, it appears to the Board that partial ramping is likely to occur more often than the times predicted by Dezé for the expansion project in isolation.

The Board notes that many of Dezé's impact predictions in the DAR are based on the worst case scenario, and the predicted impacts are described as not significant in Dezé's view because of the low frequency of these. However, Dezé fails to adequately consider the effects of ramping from partial outages. By focussing primarily on the one-in-five-year full outage scenario, Dezé's predictions for

wetlands, furbearers, water birds and aquatic life do not adequately consider the most frequent ramping events and the cumulative results from partial outages.

The developer has indicated that for fish, furbearers, and waterfowl there are periods when those valued components would be particularly vulnerable to impacts from ramping, but the risk of ramping occurring during those periods is low enough to result in no significant impacts being predicted. The critical timing period for fish (spawning and egg incubation) is from May to June. Water birds, including the horned grebe, a species at risk, incubate eggs from May to August, with young in nests as late as August 10th. Fall and winter are vulnerable periods for muskrat and beaver because ramping can cause them to be flooded out of or frozen into dens, while in spring ramping can drown the young in dens.

On a species-by species or impact-by-impact basis, the vulnerable period may be narrow, but the Board does not agree that the low frequency will result in a minor impact on populations, especially considering increased number of partial outages and the possible overlap with scheduled outages. For most species, the early summer is a vulnerable time. Line outages occur four times as often in summer than in winter. In the Board's view, considering the length of the overall period in which valued components in Trudel Creek are most vulnerable, and the prediction of when many significant or very significant outages are most likely to occur each year during the life of the project, it is likely that ramping events will occur during the most vulnerable periods.

This project is expected to cause many ramping events, and likely more ramping events in combination with the existing Twin Gorges plant. The low frequency of ramping over a five year period does not mean a correspondingly low likelihood over the forty-year life of the project. Although there is no certainty that any single ramping event in isolation will cause significant impacts, it is the Review Board's opinion that at least some of these events are likely to occur during sensitive periods and cause significant impacts to fish and wildlife in Trudel Creek.

3.3.2.4 Board analysis: ramping and wetlands

The Review Board is particularly interested in the predicted effects of ramping on the establishment of wetlands, because wetlands are identified as important habitat for all wildlife, including fish, furbearers and waterfowl, in Trudel Creek. As stated by the developer, wetland functions are "critical to the maintenance of biodiversity and 'healthy ecosystems'" (PR#74, p14.6.1). This is underscored by evidence regarding fish and wildlife in Trudel Creek, for example:

- DFO states that the "successful re-establishment of riparian and aquatic vegetation in a timely manner is critically important as it provides habitat for a variety of life stages of fish species that reside in Trudel Creek" (PR#159 p16);
- Dezé predicts that ramping would kill individual muskrat and beaver by freeze-out, drowning, starvation, and increased predation, leading to reduced abundance. However, Dezé says this would not result in reduced harvest opportunities because populations would eventually return, assuming that there would be high quality future habitat (i.e. wetlands would re-establish well). Dezé states that this assumption is "a key component" of this conclusion; (PR#74 pp17.96-97).
- Regarding waterfowl, Dezé states "Changes to water levels with operations are expected to affect nest density, location and success. This would most likely result from the anticipated changes to wetlands and associated vegetation and invertebrates" (PR#136 p42);

Because impacts on wetlands have broad implications for all fish and wildlife in Trudel Creek, a detailed consideration of predicted impacts to wetlands is merited. Dezé asserts that wetlands will re-colonize the area that is now the creek bed but which will be the banks of the greatly reduced Trudel Creek. However, these wetlands “would not be diverse functioning communities for up to ten years”.

Dezé has predicted that there will be no significant impacts on wetlands because they will eventually re-establish, but Dezé identified several uncertainties regarding its wetland predictions. To briefly recap those described above¹, these include the possibility that flooding “may reduce the ability of colonizing species to quickly establish in riparian areas of Trudel Creek” because flows may wash sediment, seeds and nutrients out of the system to downstream areas not suitable for wetland development (which may also cause impacts in downstream wetlands) (PR#73, p14.6.17).

In its technical report, DFO challenged Dezé’s conclusions about the likelihood of riparian vegetation re-establishing in the period Dezé predicted because of this, saying “large ramping events could impede the re-vegetation of littoral and riparian zones which could make it very difficult for the system to stabilize after flows are reduced” (PR#159, p16). The Board notes that DFO did not produce additional substantiation to fully explain the detailed reasons underlying its conclusions. Dezé also predicts “a total change of wetland community” as a result of hydrological changes in Trudel Creek resulting from project construction and notes that the timing of wetland re-establishment is “largely unknown” because it is lacking the good information needed to make this determination. Dezé also acknowledges what are, in the Board’s view, deficiencies in its regional mapping of wetlands that are necessary to adequately evaluate the regional significance of impacts to wetlands in the Trudel Creek river system.

To compensate for the uncertainties, the Board notes that Dezé has proposed a monitoring program to study impacts to wetlands (PR#118, p51). During the technical session, Dezé stated that if wetlands were not re-establishing as predicted, “that’s where adaptive strategies will come into play” (PR#118, pp91-93). In the Board’s view, monitoring for the purpose of adaptive management is more reliable as mitigation if it describes 1) under what specific conditions it will act to mitigate any problems it identifies, and 2) what feasible and reliable actions, if any, are available to it to address those problems.

Dezé has not indicated either. The *Draft Environmental Monitoring Plan* states only that “the need for... other forms of adaptive management will be assessed as information is obtained” (PR#136, p31). In the Board’s view, as the project is currently proposed, if monitoring finds that sudden flooding from ramping events is preventing wetland from returning, there is little else Dezé can do to reduce sudden flooding from ramping. Dezé has declined to adopt DFOs’ recommended program of active replanting, saying that its experts have advised that “for various reasons, Trudel Creek should not be actively re-vegetated in the immediate years after operations” (PR#240, DFO-20p17).

In its DAR, Dezé concludes that ramping is not likely to result in erosion problems in Trudel Creek, as the potential for erosion to result from ramping events is reduced by the presence of riparian vegetation that helps stabilize shorelines (PR#74, p14.6). During technical sessions, Dezé specified that all of Trudel Creek is currently protected from ice scour by riparian vegetation, and that it expects sedges to transition downslope, considering the low gradient system and the controls that Dezé has to minimize erosion through its operations mitigations (PR#118 pp89-90). However, Dezé has stated elsewhere that

¹ See Section 3.3.1.4 above for details

“Young plants are quite susceptible to wash out. This is especially true if flows are strong enough to cause erosion along the river banks” (PR#136, p12). Dezé has also stated that the newly reduced flow in Trudel Creek means that “existing riparian wetlands would be left high and dry” (PR#74, p14.6.16).

The Board acknowledges that predicted natural flooding may also impede the re-establishment of the wetlands. Accepting that young plants are susceptible to wash out, and recognizing that ramping events will involve very high flows, the Review Board does not agree that wetlands along Trudel Creek will mitigate erosion during ramping events during the re-establishment period. *Established* wetlands may mitigate erosion, but ramping may flush out seeds and young plants from the exposed banks of the current creek bed. If wetlands are delayed from being established by high flows and erosion, it is not clear how they can be expected to mitigate the effects of those flows. In contrast, the currently established wetlands will be “high and dry” and may not reduce the effects of ice scour or erosion on the young plants colonizing the old creek bed. The Board accepts Dezé’s argument that wetlands will mitigate erosion from ramping events after re-establishment; however, the Board is of the opinion that that over the period of re-establishment of the wetlands, erosion will likely result in significant adverse impacts. Evidence from INAC, indicating that ice jamming and erosion will be even greater than Dezé predicts, suggests that this problem could be even more severe. The Board notes that INAC did not provide detailed substantiation to fully explain the detailed reasons underlying its conclusions.

Dezé indicated that ice mats may adhere to vegetation and soft material, and then when water levels rise these would be lifted by floating ice, but that this is a natural process that would be similar to baseline conditions (PR#118, p87-89). Considering the reduced mean flows in Trudel Creek, the range of predicted water fluctuations will be higher than the baseline. This suggests that there will be more incidents of water over ice, which will spread over larger areas of creek banks. This erosion caused by lifting ice would likely be more widespread than it is under baseline conditions. In the Board’s opinion, this increased lifting of vegetation and soft material may mobilize sediments and damage vegetation, increasing erosion.

As described above, Dezé has indicated that it is “especially true” that “young plants are susceptible to wash out” if there is river bank erosion. The Board accepts that ice jamming and erosion would further inhibit wetland re-establishment.

Based on this, the Board concludes that there is an unacceptable risk that large ramping events will impede re-vegetation, making it difficult for the system to stabilize after flows are reduced. The Board notes that DFO recommended that Dezé “reduce the frequency of ramping events as much as is technically feasible in Trudel Creek to allow the creek to stabilize and riparian/aquatic vegetation communities to become re-established” (PR#159, p16). INAC has made a similar recommendation, that Dezé “moderate and control water releases through Trudel Creek to the extent possible during power outages, shutdowns and restarts to reduce impacts from a relative quick increase in flow and water level” (PR#163 p10).

In the DAR, Dezé concluded that impact on wetlands will be “moderate”, and that this is because any impacts will be reversible. However, Dezé further states that the impact is reversible “provided that water levels and water level fluctuations post-expansion allow new riparian wetland communities, similar to pre-expansion communities, to develop and flourish” (PR#74:p14.6.17). In the Board’s view, the evidence does not indicate this is the case. The system is likely to be affected by many ramping events, meaning that water level and fluctuation will not follow a natural pattern.

To summarize, in evaluating potential impacts on wetlands, the Board has considered:

- the developer's prediction of many ramping events over the life of the project;
- the likely doubling of the frequency of partial outages from the proposed project in combination with the Twin Gorges plant;
- the degree of sudden increase in water levels during ramping from both partial and full outages;
- the natural hydrological variation;
- the numerous uncertainties in the impact predictions regarding wetlands;
- the vulnerability of seeds and young plants to being washed away;
- the five to ten-year minimum period for functioning wetlands to re-establish, and the risk of flows preventing re-establishment for a longer period;
- Dezé's assumption that wetlands will mitigate erosion, and the predicted rate of wetland re-establishment;
- the recommendations from parties regarding managing flows in Trudel Creek from ramping events; and,
- the lack of monitoring thresholds and reliable options to mitigate impacts identified by proposed monitoring.

Based largely on these reasons, the Review Board concludes that the project as proposed is likely to cause adverse impacts to wetlands in the Trudel Creek river system for at least a ten-year period, and that ramping events may inhibit their re-establishment for a longer time period. In the opinion of the Review Board, this is a significant impact on wetlands and on wetland-dependent species in the Trudel Creek river system.

3.3.2.5 Board analysis: fish

Dezé has indicated that impacts to fish eggs from dewatering and smothering from displaced sediment are likely to be minor. The Board notes that this is most probable if outages last long enough for spawning to occur during the period or raised water levels. The Board's review of historical outages in the Snare and Taltson hydro systems indicates that such outages are unusual. Considering this in light of the short fish spawning period, the Review Board does not consider this to be probable.

Regarding fish stranding issues, the Review Board is of the view that the commitments made by Dezé in its October 6th, 2009 meeting with DFO will help reduce the potential for fish stranding.

DFO has described the importance of wetlands to fish, both as an important habitat for juveniles and as habitat for the smaller fish and invertebrates that larger fish feed on. In part, the Board's conclusions regarding wetlands reflect issues raised by DFO.

To summarize, in evaluating potential impacts on wetlands, the Board has considered:

- the developer's prediction of many ramping events over the life of the project;
- the likely doubling of the frequency of partial outages from the proposed project in combination with the Twin Gorges plant;
- the degree of sudden increase in water levels during ramping from both partial and full outages;
- the natural hydrological variation;
- the numerous uncertainties in the impact predictions regarding wetlands;

- the importance of wetlands as habitat for juvenile fish;
- the importance of wetlands as habitat for the species fish feed on;
- the five to ten-year minimum period for functioning wetlands to re-establish, and the risk of flows preventing re-establishment for a longer period; and,
- the recommendations from DFO regarding managing flows in Trudel Creek from ramping events.

Based largely on these reasons, the Review Board concludes that the project as proposed is likely to cause significant adverse impacts to fish in the Trudel Creek river system for at least as long as it takes for functioning wetlands to re-establish. In the opinion of the Review Board, these impacts can be addressed by a combination of the measure described below in Section 3.3.2.8 and by DFO during its own regulatory processes.

3.3.2.6 Board analysis: ramping and furbearers

Regarding furbearers, Dezé has predicted that ramping would kill individual muskrat and beaver by freeze-out, drowning, starvation, increased predation, and reduce abundance, but this would not result in reduced harvest opportunities because populations would eventually return. As Dezé notes, this assumes high quality habitat. Dezé has predicted that wetlands may take ten years to fully re-establish, and, as described above, the ability of wetlands to re-establish on a former creek bed subjected to ramping events may be longer. As described above, furbearers are vulnerable to flooding, freezing, or drowning for much of the year, from fall through spring. Dezé expects populations to eventually return, assuming the availability of high-quality habitat, so it considers the impact reversible and not significant.

Considering Dezé's predictions in light of issues related to other parts of the same system, the Board notes that there is uncertainty about stated ramping frequency and how long it will take for wetland, and the furbearers that depend on them, to re-establish. If all of Dezé's predictions are correct, diverse and functioning wetlands will not be established for up to ten years. Parties have challenged the assumptions underlying this prediction as questionable, and suggest that it could take longer. As Dezé stated in the DAR, "(a)lthough a change in wetland community is predicted, the time scale for succession is unknown" (PR#74, p14.10.5). The effects of ramping will kill furbearers, and for the years until functioning wetlands are re-established, furbearer populations are unlikely to recover between ramping events, to the point of affecting abundance.

At a minimum, assuming the developer's predictions are correct, furbearer abundance in Trudel Creek is likely to be reduced for at least a decade. Dezé has characterized its uncertainty level as "high" with respect to the significance of several kinds of impacts to furbearers (PR#74, p17.57 58). Even if the population rebounds as Dezé predicted, the best scenario results in reduced harvesting opportunity for a decade. Although Dezé has indicated that muskrat and beaver trapping are important for Fort Resolution and Fort Smith (PR#74 p9.6.24), it has not specified how much trapping occurs in the Trudel Creek river system. During the hearing on January 15th, 2010, harvester Arthur Beck of the Fort Resolution Métis Council indicated that the Taltson River is more important from a trapping perspective (PR#210 p176).

The Board notes that the vulnerable period of muskrat and beaver to being killed by changing water levels covers much of the year, because of their dependence on lodges which in turn depend on certain water levels. The changes in water levels predicted by the developer will likely result in furbearers being starved or eaten in fall, drowning or freezing in winter, and having young drowning in dens in spring, as

well as many other indirect impacts. Furbearers are vulnerable to the effects of ramping for many months of the year. In the Board's view, it is likely that this will occur numerous times during the ramping events.

Dezé has stated that if ramping events are frequent enough so that the effects on furbearers overlap, then the entire watershed could become a 'sink habitat' with continual in-migration of furbearers that die during the next ramping event (PR#74, p17.98). Based on the Board's analysis of ramping frequency (above) and the uncertainties of Dézé's hydrological model, this appears to be a real risk with the project as proposed. Furbearer abundance is unlikely to rebound between ramping events in the years before wetlands are re-established. Depending on the timing of ramping events, the effects of ramping could overlap, so that furbearer deaths are too frequent for the population to regain abundance regardless of the availability of good wetland habitat. This may reduce furbearer abundance for the entire life of the project, even after wetlands are re-established.

If the effects of ramping events do overlap in this manner, and Trudel Creek does become a population sink for furbearer populations throughout the entire watershed, as Dézé said it might, then this would have a greater bearing on trappers than impacts in Trudel Creek alone would. As harvester Arthur Beck identified in the hearing, the Taltson River is an important trapping area. As Dézé indicated in the DAR, muskrat and beaver are extremely important species for harvesters in Fort Smith and Fort Resolution. This suggests that ramping impacts on Trudel Creek could have ramifications over a much larger area than the length of the creek itself.

The Board notes that Dézé has indicated that the preferred timing of scheduled outages will be "just prior to the onset of freshet, which generally occurs in April or May" (PR#74, p13.3.4; 14.3.3; PR#126 p112). This is within the vulnerable period for muskrat. Ramping during this time is more likely to result in muskrat drowning or freezing of adults and young in dens.

The developer has committed to monitoring of impacts from ramping on furbearers. The Review Board notes that this monitoring would include only two years of project operation (PR#136 p43). In the Board's view, two years of monitoring during operations may underestimate the actual impacts, by failing to capture the impacts of very significant outages. These are only predicted to occur once in five years, and are unlikely to occur in any given two-year period (PR#126 pp40-41).

Further, Dézé has clarified that the results of this monitoring will not change project operation (PR#136 p43). In the Board's view, this does not indicate any link between monitoring and adaptive management that might mitigate potential impacts.

To summarize, in evaluating potential impacts on furbearers, the Board has considered:

- the developer's prediction of many ramping events over the life of the project
- the likely doubling of the frequency of partial outages from the proposed project in combination with the Twin Gorges plant;
- the degree of sudden increases in water levels during ramping from partial outages;
- the vulnerability of furbearers to ramping throughout much of the year;
- the high degree of uncertainty regarding the re-establishment of wetlands, which Dézé's predictions of furbearers population recovery depend on;
- the likelihood that furbearer abundance will be reduced for at least a decade;

- the natural hydrological variation;
- the risk that Trudel Creek will become a regional furbearer population sink;
- the lack of reliable options to mitigate impacts identified by proposed monitoring; and,
- the likely loss of furbearer trapping opportunities in Trudel Creek for at least a decade.

Based largely on these reasons, the Review Board concludes that, the predicted partial outages alone are likely to cause adverse impacts to furbearers in the Trudel Creek river system for at least a ten-year period. Over the life of the project, these will be combined with occasional full outages. In the opinion of the Review Board, this is a significant impact of the project.

3.3.2.7 Board analysis: ramping and water birds

Based on the review of the evidence, the main potential direct impacts on water birds in Trudel Creek come from ramping, resulting in drowned young and flooded nests from early May to early August. These impacts could result from partial outages causing ramping that substantially raises flows in Trudel Creek during that period even if no full outages occur. Dezé has stated that “without mitigation, the change in water levels due to ramping would have adverse effects on all ground-nesting waterfowl” (PR#74, p17.52). The mitigations identified are those that are generally identified by Dezé to reduce ramping effects: the South Gorge Spillway and operational procedures described above. Dezé has also said that it may construct nest platforms to increase reproductive success in Trudel Creek if the water bird population falls (PR#74, p17.52,92).

In terms of waterfowl habitat, the Board has concluded (above) that there is an unacceptable risk that large ramping events will impede re-vegetation, making it difficult for the system to stabilize after flows are reduced. Even if the developer’s prediction is correct, wetlands will not be fully re-established for five to ten years. Dezé thoroughly documents that waterfowl distribution is driven “primarily by access to wetlands” (PR#74, p9.5.17). This indicates that the risk identified by the Board about wetland re-establishment carries with it a corresponding risk to waterfowl. The Board notes that habitat loss is identified by the Committee on the Status of Endangered Wildlife in Canada as a major threat to both of the water bird species at risk addressed above.

The Board notes that the bypass proposed by the South Gorge Spillway is not enough to prevent ramping from scheduled outages, and that the project expects many unscheduled outages that cause ramping events. Nesting and brooding occur from early May to early August during the period of the year when unscheduled outages are more common. Considering this, and the sudden changes in flow volume even after the proposed mitigations, the Board does not agree with the developer’s conclusion that effects on water birds will be minor. Ramping due to partial outages alone is likely to flood water bird nests and drown young over the 40 years of proposed project operation. This is as true for the horned grebe, which builds floating nests, as it is for other water birds.

With respect to the yellow rail, the developer’s argument is that its surveys have not detected them in the entire study area, and therefore they will not be affected. Although Dezé followed survey protocol prescribed by the Canadian Wildlife Service of Environment Canada, Environment Canada has indicated that the methods used by Dezé for these surveys are reliable when used at the right time, but that the survey is not effective while ice is present. Ice was present when Dezé conducted the survey, and the results therefore do not confirm that Trudel Creek is not yellow rail breeding habitat. Dezé has not submitted any evidence to refute this. In the opinion of the Review Board, this makes the survey results

questionable. Dezé has failed to prove that Trudel Creek is not yellow rail breeding habitat, while Environment Canada has not established that it is. If it is, then yellow rail nests are as likely to be flooded and young drowned as any other ground nesting water bird.

In terms of nesting platforms that Dezé indicated may be used to further mitigate impacts on water birds, the Board notes that although these have been used by mallard, common loon and Canada goose elsewhere, their use is species specific (PR#74, p17.92). The Board finds no evidence on the record that indicates nest platforms reliably mitigate impacts of ramping on any of the other 23 waterfowl and loon species occurring in the study area, nor that nest platforms will mitigate impacts on the horned grebe or yellow rail.

The developer has committed to monitoring of impacts from ramping on waterfowl nesting success. However, as was the case for furbearer monitoring (above), Dezé has clarified that the results of waterfowl monitoring will not change project operation (PR#136, p42). In the Board's view, Dezé does not indicate any link between the proposed waterfowl monitoring and adaptive management that might mitigate potential impacts.

With respect to Dezé's commitment to develop a nest protection plan, the Board notes that there are important differences between what Dezé apparently committed to in the meeting report submitted on January 12th, 2010, and the actual commitment that was later filed by the developer on January 29th, 2010. In its meeting on December 18th, 2009, Dezé appears to agree with Environment Canada's recommendation that a nest protection plan be developed that "demonstrates that Dezé has taken all reasonable actions to reduce the risk of destroying downstream migratory bird nests" (PR#196). Dezé and Environment Canada both signed this meeting report. In the Board's view, this confirms that each found it accurate. The detailed commitment later filed by Dezé states that it will develop a plan "that outlines strategies and mitigations intended to reduce effects to waterfowl nests within Trudel Creek during scheduled ramping events" (PR#240, DAR-82p4).

To summarize, in evaluating potential impacts on water birds, the Board has considered:

- distribution of water birds is primarily driven by access to wetlands which are not likely to be re-established in Trudel Creek for at least five to ten years;
- the developer's prediction of many ramping events due to partial outages over the life of the project;
- the likely doubling of the frequency of partial outages from the proposed project in combination with the Twin Gorges plant;
- the degree of sudden increase in water levels during ramping;
- the natural hydrological variation;
- the vulnerability of water bird nests to ramping;
- the lack of options to mitigate impacts identified by proposed monitoring, and,
- the uncertainties related to nest platforms as mitigation for impacts on most water bird species including species at risk.

Based largely on these reasons, the Review Board concludes that ramping events from partial outages are likely to cause significant adverse impacts to water birds including the horned grebe and possibly the yellow rail in the Trudel Creek river system in the form of flooding and washing away nests and young.

3.3.2.8 Overall conclusions on Trudel Creek ecosystem

The Board notes that for the aquatic parts of this assessment, ramping is the single activity that has the most numerous potential impacts associated with it. Although the effects of a worst-case scenario are particularly extreme, the Review Board considers them much less likely to occur. The actual impacts are likely to be caused by ramping from full and partial outages. The Board notes that the impacts of ramping from partial outages alone are sufficient to cause many of the impacts described. The Board does not accept Dezé's arguments that the low frequency of ramping means that impacts on wetland reestablishment not significant, or that the risks of ramping during periods of particular ecological vulnerability are acceptable. Potential impacts of ramping on Trudel Creek identified on the record include:

- ice jamming during breakup from water released over ice in winter;
- ice scour causing bank erosion and sedimentation;
- smothering of fish eggs by sedimentation;
- dewatering of fish eggs;
- flushing away of fish eggs and juveniles;
- stranding of adult fish;
- reducing the food supply of fish;
- preventing re-establishment of "critically important" nursery habitat for juvenile and young fish;
- impeding the re-establishment of wetlands and underwater plants;
- destroying beaver and muskrat lodges and their food caches, leading to animal deaths;
- increased predation on beaver and muskrat from destruction of lodges;
- flooding muskrat and beaver out of their lodges in fall and winter;
- drowning young beaver and muskrat in their dens in spring;
- freezing out of both beaver and muskrat from insufficient water under the ice, resulting in "drastically reduced" populations;
- washing away young waterfowl in nests;
- flooding or stranding waterfowl nests;
- exposing nests and young to increased predation;
- loss of waterfowl shelter from destruction or alteration of vegetation;
- loss of waterfowl food sources from destruction or alteration of vegetation;
- reducing the density of waterfowl nests;
- flooding nests and young of horned grebe, a species at risk

These result from the numerous ramping events predicted to arise due to scheduled and unscheduled outages. In combination with the existing Twin Gorges plant, the number of partial outages may be reasonably expected to further double. Although this frequency of ramping events means that no one of these impacts is certain in a given year, in the Review Board's view it is likely that this will be caused by ramping that substantially increases flows in Trudel Creek during ecologically vulnerable periods over the 40-year life of the development. Over the life of the project, these impacts on wetlands, fish, furbearers and water birds are likely, adverse and significant.

The Review Board has determined that significant adverse impacts to valued components of the ecosystem of Trudel Creek are likely to occur as a result of power outages and ramping events with the small 30 m³/sec bypass spillway proposed by the developer. Dezé has indicated that the amount of bypass was designed primarily to meet the requirements of the existing water license for flow in the

Taltson River, and not to prevent impacts from ramping events on Trudel Creek. The Review Board agrees with Dezé that the proposed South Gorge Spillway will reduce ramping flows into the Trudel Creek river system by only “a modest amount” (PR#126 p50). It is the view of the Review Board that the 30 m³/sec bypass spillway does not provide sufficient mitigation to prevent significant adverse impacts to the Trudel Creek ecosystem.

As the project is proposed, with only 30 m³/sec bypass capacity, it is not possible to take a single turbine offline without causing ramping. As a result, even deliberate scheduled outages result in ramping. These are predicted to be more common than the unscheduled outages that result in ramping. If the size of the bypass were increased enough to allow for one turbine to be taken offline without ramping, then ramping in Trudel Creek would change in the following ways:

- 1) Scheduled outages would not result in ramping, eliminating the most frequent type of ramping event and greatly reducing the frequency and overall number of ramping events;
- 2) During unscheduled outages, there would be more time to respond to problems before ramping occurs, and better opportunity to fix problems to avoid ramping; and,
- 3) Peak flows during ramping events would be reduced.

If the bypass was increased enough to allow for one turbine to be taken offline without ramping, these results would reduce the magnitude, frequency and likelihood of ramping and related impacts on the Trudel Creek river system. This one change in project design would partially or fully address a wide variety of likely impacts on several different valued components.

The Board notes that both INAC and DFO recommended reducing ramping flows into the Trudel Creek river system. INAC recommends that Dezé “moderate and control water releases through Trudel Creek to the extent possible during power outages, shutdowns and restarts to reduce impacts from a relative quick increase in flow and water level” (PR#163, p10). DFO recommends that the developer “reduce the frequency of ramping events as much as is technically feasible in Trudel Creek to allow the creek to stabilize and riparian/aquatic vegetation communities to become re-established” (PR#159, p16).

The Board does not have adequate information on the costs and feasibility of including additional capacity to allow for a turbine to be shut down without causing ramping, so it cannot specify a quantity.

In order to mitigate significant adverse impacts to the Trudel Creek ecosystem described above from rapid flow increases and decreases into Trudel Creek resulting from ramping events, the spillway or bypass capacity at Twin Gorges must be increased.

Measure 3

In order to reduce or prevent significant adverse impacts from ramping to the valued ecological components of the Trudel Creek river system, the developer will:

- i. **produce an adaptive management plan that includes monitoring the impacts of changes in water flows on waterfowl, furbearers and wetland re-establishment and regularly report these results and management actions taken to the regulatory authorities; and,**
- ii. **ensure that the proposed project has additional bypass capacity at the Twin Gorges Facility beyond what is proposed.**

The Review Board notes that DFO is able to specify in its regulatory process whether it requires the developer to include similar monitoring and reporting of impacts on fish in the Trudel Creek river system.

The Board recognizes that increased bypass capacity could cause minor changes in flow immediately downstream of the generators, as well as minor construction related impacts. In the Board's view any changes that would result from this are likely of a smaller scale and are not significant, particularly when compared to the potential impacts on the Trudel Creek river system that are mitigated by the increased bypass capacity.

3.4 Other aquatic issues

3.4.1 Impacts on Trudel Creek from reduced flow

3.4.1.1 Parties' submissions

In order to provide increased power production, much of the water that currently passes over the South Valley Spillway into Trudel Creek would be routed through the expanded Twin Gorges power facility. The predicted reduction in mean monthly flow for Trudel Creek is 77-87 percent in the 36 MW scenario and 85 -90 percent in the 56 MW scenario. Flow volume and velocities in the river sections of the Trudel Creek river system would be reduced and water depths would drop throughout the Trudel Creek sub-watershed.

During low flow months from February to May, the average minimum monthly flow would be 4 m³/sec, which would be a decrease of 90% from baseline flows (PR#74 p14.4.26). During dry years, and particularly during consecutive dry years, flows may not increase above the minimum for the entire year (PR#74, 14.7.27). In a consecutive dry year scenario, flow in Trudel Creek would therefore remain at 4.m³/sec throughout the entire year. Flow reductions of this magnitude would result in significant changes to fish, fish habitat availability and littoral vegetation in Trudel Creek (PR#74 p14.7.37).

Prior to construction of the Twin Gorges Facility in 1964 there was likely no connectivity, or very periodic connectivity between the Taltson River and Trudel Creek at the South Valley Spillway. Air photos from the time indicate that fish habitat was considerably less in the Trudel system than what currently exists. The Twin Gorges expansion project will result in average Trudel Creek flows being closer to the flow regime that occurred prior to the Twin Gorges development (PR#126, p29).

Water levels and flow rates were modelled using HEC-ResSim and HEC-RAS software to predict changes to Trudel Creek in both the 36 MW and 56 MW expansion scenarios. Water levels and flows were simulated over a 13-year period (PR#74, 14.4.19).

An effects assessment of the reduced flows was conducted using a weighted useable area model to quantify and analyze the potential loss of fish and fish habitat. The model considered the effects of reduced flow conditions on various life stages for northern pike, whitefish and walleye (PR#74 p14.8.17). During the Technical Sessions and in the follow-up *Commitments 2009* document, the developer

responded to questions regarding the model and provided rationale for the methods used for conducting the assessment of flow related impacts on Trudel Creek (PR#126 pp29).

To mitigate impacts to fish and fish habitat in the Trudel Creek system, the developer has proposed a minimum flow of 4 m³/sec from the forebay over the South Valley Spillway into Trudel Creek (PR#240, p2, DAR-6). Modelling predicted that an altered hydrograph with the minimum 4 m³/sec would not result in significant negative effects to fish, habitat or littoral vegetation (PR #74 p14.8.66).

In addition to the minimum flow limit for Trudel Creek, the developer has proposed other mitigation measures to minimize adverse effects to the Trudel Creek aquatic ecosystem. These are described in Section 3.3.1.1 above.

In its Technical Report submission, INAC has expressed concern over the developer's reliance on water flow modelling assumptions in that actual flow conditions and events may deviate from the modelled predictions as presented in the DAR (PR#163 p8). To address this concern, it stated (PR#163 p9):

INAC recommends that Dezé be required to continue calibration and verification of its Taltson River Basin Model during the regulatory phase but most importantly during the initial years of operations such that further operational adjustments can be implemented to reduce potential impacts. The calibration and verification should take into consideration, to the extent possible, precipitation information within the basin to help improve forecasting ability.

In its *Table of Commitments*, January 29, 2010, the developer states that it has committed to this recommendation in part (PR#240 INAC-1, p 16). Dezé's *Draft Environmental Monitoring Program* proposes that the Basin Model will be periodically revised to reflect new water survey gauge information prior to construction and will maintain the gauges throughout operations to adapt flow controls to reduce adverse effects of low flow conditions (PR#136 p25).

In its Technical Report submission, INAC notes concern that the proposed 4 m³/sec minimum flow for Trudel Creek may not be adequate to avoid adverse impacts during the winter months and that minimum flow should be established for other seasons (PR#163 p11). INAC recommends that the developer should provide additional evidence to support its proposed minimum flow for Trudel Creek and establish a minimum flow for other seasons (PR#163 p11). The developer states in its Jan 29, 2010 Table of Commitments that it has not committed to this recommendation but that "If INAC were to identify those pathways or effects predictions that are not adequately supported in the DAR, Dezé will continue to develop the monitoring program to address these issues, if warranted" (PR#240 INAC-6 p17).

DFO remains concerned with the proposed fixed minimum flow release of 4 m³/sec for Trudel Creek because variable flow is required to maintain a healthy and sustainable ecosystem (PR#159 p11). During January 15, 2010 public hearing, DFO noted that if the minimum flow rate of 4 m³/sec is put in place, a variable flow rate could be lost over time if flow rates in the future are lower (PR#210, p24). DFO also stated that "The minimum flow of 4 cubic meters per second could cause a flat hydrograph for an extended period in low flow years" (PR#210, p24). According to DFO, the developer did not conduct an effects assessment for Trudel Creek using a flat 4 m³/sec minimum flow throughout the year over consecutive dry years where the maximum amount of water would be used for power production

(PR#238, p6). In its January 29, 2010 response to a public hearing undertaking, it was further stated that DFO “remains concerned that should the Taltson River experience consecutive low flow years and the Proponent is only required to supply a minimum 4 m³/sec to Trudel Creek, significant adverse effects could be expected to fish and fish habitat of this aquatic ecosystem” (PR#238 p6).

The proposed minimum flow may also delay the spring freshet in Trudel Creek which could delay spring spawning for fish due to low water temperatures (PR #168 p12). A reduced frequency of spring freshet will likely mean limited spawning in river stretches of the Trudel Creek river system. A corresponding reduction in aquatic vegetation due to low flows will also have adverse effects on rearing habitat for juvenile fish and invertebrates (PR#159 p12).

In its Technical Report submitted December 11th, 2009, DFO contends that the weighted usable area analysis likely underestimates adverse impacts to fish habitat from low water levels in Trudel Creek during project operations. DFO suggests that the number and location of baseline cross-sections used in the WUA modeling are inadequate and as a result shallow fish habitat will be affected to a greater extent by changes in predicted flow velocity and wetted area (PR#159 p13).

For these combined reasons, in order to mitigate adverse effects on fish, fish habitat and the aquatic ecosystem in Trudel Creek, DFO is recommending a more protective flow regime for Trudel Creek than the minimum 4.0 m³/sec proposed by the developer. As stated by DFO at the January 15th, 2010 public hearing (PR#210, p24):

In order to address the need for variable flow to protect fish and fish habitat in Trudel Creek, DFO recommends, as an interim measure or starting point, that the Proponent adopt a flow regime that incorporates a minimum flow release of 4 cubic meters per second in conjunction with a variable 95 percent exceedence or 5th percentile baseline monthly flow hydrograph, where the greater of the two (2) flows would define the minimum monthly flow release.

According to DFO, this recommended flow regime for Trudel Creek could be refined with additional baseline information so that an economically viable power expansion project can be balanced with maintenance of an acceptable seasonal hydrograph that would sustain fish and fish habitat (PR#238 p6). DFO notes that they are willing to work with the developer to refine a variable flow seasonal hydrograph and explore the acceptability of an alternative flow regime (PR#238 p6).

DFO states in its January 29, 2010 post-hearing undertaking that an agreed to minimum flow regime could become a condition in a *Fisheries Act* authorization which will be required for Trudel Creek during the regulatory phase of the Taltson hydroelectric power expansion project (PR#238 p6).

During the public hearing on January 15th, 2010, DFO confirmed that Dezé had made a commitment regarding hydrograph variability in Trudel Creek that satisfied their concern (PR#210 pp46-47, 74). However, in its January 29th, 2010 Table of Commitments, Dezé states that it has not currently committed to the DFO recommendation of a variable flow regime in Trudel Creek (PR#240 p13 DFO-16). In correspondence dated March 5, 2010, Dezé clarified its position, stating that it “commits to the development of a variable hydrograph for Trudel Creek of a magnitude and frequency that minimizes impacts to the long-term integrity of Trudel Creek to the satisfaction of DFO” (PR#294). The developer

states in the same letter that it accepts DFO's position that the agreement on an acceptable flow regime for Trudel Creek can be finalized during the regulatory phase.

3.4.1.2 Review Board analysis and conclusions

In the opinion of the Review Board, the March 5th, 2010 clarification by Dezé provides confidence that regulatory processes will ensure that the pattern of low flows the Trudel Creek river system will not result in significant impacts.

3.4.2 Water fluctuations in Nonacho Lake

3.4.2.1 Parties' submissions

Construction of the Nonacho Lake Control Structure would require the one time drawdown of 0.85 metres based on the average lake elevation for Nonacho Lake. During normal operations, waterline elevation will experience a drawdown from 0.86 metres to 0.5 metres on average for the 36 MW generation scenario, which is a change from the current drawdown of 0.35 metres. The fluctuations in Nonacho Lake for the 56 MW generation scenario would be smaller than for the 36 MW scenario, because there is less need to store water during freshet and other periods of high natural flow if there is more water flowing through the turbines. Drawdown would commence in the fall and remain low through the winter as construction takes place and over the same period during operations. The impacts to fish and fish habitat from the drawdown during construction and operations were considered in the DAR with the conclusion that the impacts were minor (PR#74 p15.2.41).

The Department of Fisheries and Oceans (DFO) does not accept this conclusion, because Dezé did not consider potential impacts to spawning lake trout and incubating eggs in shallow waters (PR#159 pp5-6). The Carter family, owner of the Nonacho Lake Fishing Lodge voiced concern about this during their public hearing presentation and in their January 29th, 2010 submission (PR#209; PR#242).

During the Technical Sessions, the developer, in response to a question from DFO, stated "that lake trout are typically a deeper water spawning fish" and that from literature reviews "lake trout spawn in depths of 0.12 metres down to depths of 55 metres over rocks and cobbles. Due to the approximately three meters deep of flooding that took place when the Taltson dam was first put into operation, 40 years ago, the current shallow water substrate is silty, high in organics, and is vegetated and is not preferred habitat for spawning lake trout (PR#117 pp44-45).

DFO describes its predictions of the potential impacts on Nonacho Lake in its submission of December 11th 2009. It states that "the one time drawdown during construction and fluctuating water levels during operations has the potential to dewater lake trout eggs prior to emergence if they are within the drawdown zone". It predicts that during the one time drawdown during construction and fluctuating water levels during operations, lake trout eggs that are spawned in the fall in water depths within the drawdown zone would be dewatered prior to emergence. According to DFO, lake trout are known to spawn in shallow water depths in the NWT, a view which is supported by direct personal observations of Myles Carter, who is identified by DFO as an experienced guide at Nonacho Lake Fishing Camp. DFO agrees with the developer that limited information is available on the relative use of shallow reef habitats and deep water habitats for lake trout spawning in Nonacho Lake. DFO states that it is essential to determine what depths are used for spawning prior to construction in order to identify site specific mitigations or operational changes to minimize potential impacts on lake trout (PR#159 p5-6).

In response to an information request from DFO on the subject of the potential for drawdowns to expose lake trout spawning areas, Dezé informed DFO that in the 36 MW scenario the drawdown would have a .25m overlap with spawning depths, and the 56 MW scenario would have no overlap (PR#159 p6).

The Nonacho Lake Fishing Camp is owned and operated by the same Carter family cited above in DFO's technical submission. During the public hearing, Myles and June Carter expressed concerns regarding potential impacts on fish in Nonacho Lake and on indirect impacts to the Nonacho Lake Fishing Camp should fish populations be affected by the proposed development (PR#209).¹

In the *Draft Environmental Monitoring Program*, the developer committed to a lake trout monitoring program for Nonacho Lake. The two-phased monitoring program would include:

- a desk top study to identify potential lake trout spawning locations in Nonacho Lake; and
- a field program analysis and assessment of fish use and habitat values of identified spawning locations.

Phase 1 has already occurred in consultation with a guide at the Nonacho Lake Fishing Lodge and Phase 2 would occur pre-construction during the peak lake trout spawning window of September 1-15 (PR#136 pp34-35).

In its technical submission and in its hearing presentation, DFO recommends that the developer proceed with the two-phased monitoring program as identified in the October 2009 Draft Environmental Monitoring Plan. As part of the monitoring program DFO is willing to assist in developing the assessment plan, analyzing results and assisting the developer with drawdown scenarios that would mitigate impacts to lake trout spawning habitat. DFO also recommends that the developer involve the Nonacho Lake Fishing Lodge and potentially affected Aboriginal groups in this monitoring program to ensure long-term healthy lake trout populations in Nonacho Lake (PR#159 p6; PR#184 p16).

3.4.2.2 Review Board analysis and conclusions

Dezé and DFO are in agreement that the two-phased pre-construction monitoring program as identified by the developer in the Draft Environmental Monitoring Plan should be implemented. The monitoring program can be used to identify operational changes or mitigation measures that could minimize potential impacts to lake trout spawning. It is noted that during operations, annual winter drawdown during the 56 MW expansion scenario will be less than during the 36 MW expansion scenario and potential adverse impacts to spawning areas would correspondingly be reduced.

The Review Board notes the 36 MW scenario may result in the loss of fish due to exposure of some spawning beds during drawdowns and operational fluctuations. The Review Board understands that this is relevant to DFO from a regulatory perspective, and expects that DFO will require a No Net Loss plan that considers the above desktop and field studies when fulfilling its regulatory responsibilities related to fisheries authorizations. In the opinion of the Review Board, this, in combination with the adaptive

¹ Potential socio-economic impacts to Nonacho Lake Fishing Camp are discussed in section 3.6.5 of this document.

management made possible by the above studies, will mitigate any significant environmental impacts on fish from fluctuating water levels in Nonacho Lake.

The Review Board notes that the Nonacho Lake Fishing Lodge relies on a healthy self-sustaining fish population for their fishing business. The Review Board expects Dezé to inform the Carter family of the ongoing development of the fish monitoring program in Nonacho Lake.

3.4.3 Water quality

3.4.3.1 Introduction

Changes to water quality during construction and operation of the hydro expansion project within the Taltson River watershed and at stream crossings along the transmission line route were considered by the Review Board. Alterations to water quality were assessed by the developer as a subset of the key line of inquiry for water fluctuation in the Taltson River watershed. In written technical reports and presentations at the public hearing, parties identified potential contamination or alteration of water quality from the project as an issue of concern (PR#117; PR#118; PR#161; PR#163; PR#209; PR#210). The following were the main surface water quality issues considered:

- mercury may be released from sediments into lakes due to an increased range of seasonal water fluctuations during construction and operations;
- dissolved oxygen levels in lakes may be decreased, particularly in winter, due to reduced flows to Tronka Chua Lake and the Trudel Creek river system;¹
- explosives and blasting residue, including nitrates and ammonia, may be released into surface water during construction;
- sediment from earthworks construction activities, concrete wash water effluent, runoff from stockpiles of excavated rock, sewage and domestic waste water may be introduced to surface water.

The proposed hydro expansion project would result in increases in water level variation in Nonacho Lake which would disturb a larger surface area of sediments and may mobilize mercury into the water column. While the Taltson hydro expansion would not result in the flooding of new areas, existing mercury in disturbed sediments may be redistributed in the water column due to increased rates of fluctuation. An increase in the availability of mercury in water raises the potential for bioaccumulation of mercury in small aquatic organisms and biomagnifications over time to fish through the food chain. The potential for elevated mercury concentrations in fish tissue in Nonacho Lake was an issue raised by parties (PR#161 pp9-10; PR#163 p14).

¹ The issue of dissolved oxygen reductions in the Trudel Creek river system is examined in this section. Issues pertaining to hydrology and water quantity in the Trudel Creek river system are examined separately in Sections 3.3 and 3.4.1.

Under both proposed power generation scenarios the project will reduce water flow levels into Tronka Chua Lake. Flow reductions can affect water quality by reducing dissolved oxygen levels in winter months. The survival of fish depends on having enough dissolved oxygen in the water, which can be critical in winter months. There is currently no baseline data on dissolved oxygen levels during the winter for Tronka Chua Lake where flow reductions will occur (PR#163 p13-15).

There are four sites associated with the Taltson expansion project that would require use of explosives and blasting both in-stream and near-stream during construction. These locations include the North Gorge inlet and tailrace, and the Nonacho Lake control structure canal inlet and outlet. Blasting residue including nitrates and ammonia from the use of explosives can enter the aquatic environment from spillage during handling, leaching of explosives from blast holes prior to detonation and incomplete detonation of explosives. Blasting residue from the use of explosives in and near water has the potential to be toxic to aquatic life (PR#161 pp5-7).

The proposed project will require that work, including canal construction, spillway construction, dam modifications and spillway improvements be conducted in and near water. Contaminants and sediment may be introduced to surface water during blasting of rock, stockpiling of waste rock, the placement of rock and concrete in or near water and the use of machinery. Sewage and domestic wastewater discharges from construction camp facilities can contaminate surface water if not handled and treated appropriately. The developer has not finalized sewage and wastewater treatment and disposal designs for the camps (PR#161 pp7-9).

3.4.3.2 Parties' submissions

Predictions from modelling of mercury concentrations in lake trout in Nonacho Lake and Taltson Lake from the two hydro expansion scenarios have concluded that increases are marginal and that effects are considered negligible. According to the developer, mercury concentrations for lake trout from project related flooding would be well below Health Canada Guidelines (PR#126 pp20-22). The developer states in its Draft Environmental Monitoring Plan that mercury sampling has been conducted in the Taltson River as part of the Twin Gorges aquatics monitoring program (PR#136 p27-28).

Due to concerns expressed by several parties (e.g. PR#161; PR#163; PR#242), the developer has committed to sediment monitoring for mercury at locations in Nonacho Lake and Trudel Creek as part of its Draft Environmental Monitoring Plan (PR#136 p28) and Dezé's commitments of November 2nd, 2009 (PR#126 p23). Monitoring of Nonacho Lake sediments would provide an early indication of increased mercury in the food chain. In addition, the developer has stated that if changes in mercury in sediments are detected, adaptive management through biological monitoring would be proposed and discussed with stakeholders as needed (PR#126 p23).

Environment Canada and INAC suggest that monitoring of mercury in sediment only as proposed by the developer may not provide adequate information on the potential for mercury uptake in organisms. The parties recommend that a monitoring program that will indicate levels of uptake of mercury in aquatic organisms and adaptively manage operations should be part of the environmental monitoring program (PR#161 pp9-10; PR#163 pp13-14). The Carter family identified its concerns regarding the potential release of mercury in its submission of January 29th, 2010 (PR#242). INAC states that it is prepared to assist the developer in the development of this monitoring plan (PR#163 p14).

Modelling of dissolved oxygen levels in the Trudel Creek system and Tronka Chua Lake indicate that *Canadian Council of Ministers of the Environment Guidelines* (CCME) for dissolved oxygen are currently not being met under baseline conditions in winter. Dissolved oxygen levels would be further reduced under either expansion scenario for the project. The developer has committed to monitoring dissolved oxygen levels during the winter as described in the Draft Environmental Monitoring Plan (PR#136). Monitoring would take place pre-construction to gain a better understanding of baseline conditions and during operations to obtain adequate information to verify the model. Results of both the baseline and operations modelling of dissolved oxygen would enable the developer to identify if a preferred operational scenario is feasible for both water balance during power generation and mitigation of environmental effects to water quality (PR#126 p12-15).

In its Technical Report, INAC notes that under both project expansion scenarios, information from the developer indicates that dissolved oxygen levels in Gertrude Lake will fall below CCME thresholds for sensitive early life-stage for fish and below the threshold for other life stages in Unnamed Lake. INAC is concerned over the potential for dissolved oxygen levels to be further reduced in the Trudel Creek system and to fall even further below the Guidelines established by CCME for the protection of fish (PR#163 p14).

INAC recommends that the developer gather additional information on dissolved oxygen levels in winter for all areas of interest and that these data be used to further calibrate and validate the model used to calculate dissolved oxygen levels. INAC and Environment Canada recommend that baseline conditions for dissolved oxygen be further delineated to address data gaps and so that assumptions used in the model for effects assessment can be verified and impacts more accurately predicted. Environment Canada recommends that more than one year of data collection for dissolved oxygen is required in order to capture the extent of natural variability (PR#161 p9). The parties also recommend that dissolved oxygen should be monitored and reported as part of the Environmental Monitoring Programme. The results of this monitoring should be used to adaptively manage operations at the power generation facility to mitigate negative effects of reduced dissolved oxygen levels in water. INAC is willing to assist the development of the monitoring plan (PR#163 pp-15).

The developer has committed to the use of water-resistant, packaged explosives for blasting in or in close proximity to water in order to reduce the source of nitrate contamination during blasting activities (PR#126 pp68-69). In addition, the developer has proposed a 10 metre set back from water when using non-water resistant explosives so that any explosives residues can be contained and isolated from entering a water course during blasting (PR#126 p65).

The developer has committed to conducting all concrete works in dry conditions and that concrete will not be in contact with water bodies during construction activities (PR#126 p10). To minimize the effects of general construction activities on water the developer commits to designing and implementing an erosion and sediment control management plan (PR#74 s7pp19-21). With respect to concerns with the potential for acid rock drainage in waste rock, the developer has committed to developing a metal leaching and acid rock drainage management plan in consultation with other parties. Waste rock that is potentially acid generating or metal leaching would initially be located well away from any water body and further management would be determined depending on potential risks (PR#87).

INAC has indicated continued concern with the proposed use of non-water resistant explosives outside of the 10 metre setback from the edge of the water as committed to by the developer (PR#163). It is the position of INAC that the potential exists for blast residue from explosives to enter surface or ground

water from wet holes drilled outside the 10 metre setback. INAC recommends that the developer submit a blast management plan for regulatory review that details procedures for placing explosives in wet holes outside the 10 metre set back zone so that effects to surface water are avoided (PR#163 p13).

3.4.3.3 Review Board analysis and conclusions

The developer's commitments for mercury monitoring in sediments as described in the October 2009 *Draft Environmental Monitoring Plan* will provide an indication of any changes in mercury levels in sediments resulting from the expansion project. If changes in mercury levels in sediments are detected, the developer has committed to adaptive management through biologic monitoring which will include discussions with stakeholders (PR#126 p23). A significant influx of mercury from soil into the aquatic environment is not expected as the project will not result in new flooding or new inundation of terrestrial soils. Effects to water quality and aquatic life from the potential remobilization of mercury from sediments are not anticipated to be significant. The Review Board concludes that provided the developer implements the mitigation measures and commitments proposed, adverse effects to water quality from mercury contamination will not likely be significant.

Regarding the potential impacts from reduced dissolved oxygen in Trudel Creek and downstream of the Tronka Chua gap, the Board is of the view that a problem with dissolved oxygen is unlikely to result in significant impacts. If DFO decides that the residual impacts from reduced dissolved oxygen are relevant from a regulatory perspective, the Review Board expects that it will fulfill its regulatory responsibilities with due diligence. In the long term, the Review Board expects Tronka Chua Lake to return to a relatively stable state that reflects its former condition without flows from Nonacho Lake, as it was prior to the original Twin Gorges flooding.

Regarding the issues related to explosives, fish entrainment, acid rock drainage and metal leaching, the Review Board notes the commitments and monitoring proposed by Dezé. The Board expects these issues to come under due scrutiny during the regulatory processes, and expects that Dezé will meet existing guidelines on the respective issues. Based on these considerations, the Review Board is of the opinion that the proposed development is not likely to cause significant environmental impacts related to these issues.

3.5 Climate and air quality

3.5.1.1 Submissions from the Parties

In its description of climate and air quality, Dezé presents the beneficial and adverse impacts of the project. Potential sources of impacts include the following as (PR#74 p15.6.4-6):

- fuel combustion by generators, helicopters, mobile equipment and vehicles during construction and operation;
- construction camps;
- vegetation clearing for the transmission line, reducing the available CO₂ sink;
- backup generators at Twin Gorges and Nonacho Lake;
- CO₂ and methane released by anaerobic decomposition of submerged vegetation.

Dezé states that its mitigations to reduce impacts on climate and air quality may include (PR#74 p15.6.6):

- dust control;
- control of open burning and optimizing incinerator usage at camp sites;
- preventative maintenance of equipment on site;
- control or eliminate equipment idling time;
- minimizing the number of trips between construction areas and transfer sites.

To further reduce emissions of particulate matter, oxides of nitrogen, sulphur dioxide and carbon monoxide, Dezé has committed to following GNWT open burning policies, following Environment Canada guidelines, developing an incineration management plan and reporting annually (PR#126 p66).

Dezé states that the three-year construction phase is relatively short compared to the forty-year life of the project. It describes the emissions during construction as “small and short term” (PR#74 p15.6.8). Dezé says that “(a)ir emissions during the construction phase would have a relatively small or insignificant negative incremental effect on climate and air quality” (PR#74 p15.6.11).

During operations, the hydroelectric plant causes no direct air emissions. Vehicles and aircraft are the only source of emissions during the operational phase, resulting in “negligible” impacts on air quality.

The main beneficial impacts on climate and air quality are cumulative, as they involve the combined effects of the proposed development in combination with others. The project will displace up to 56 MW of existing and planned diesel generation at the diamond mines in the Slave Geological Province. This effectively would replace approximately 100,000,000 litres of diesel each year of operation (PR#74 p1.9), which equates to a reduction of 279,520 tonnes of greenhouse gases¹ every year for the 40 year

¹ The DAR describes greenhouse gases CO₂, methane and N₂O using the CO₂ equivalent (a standardized collective measure). In this report, the general term “greenhouse gases” is used to include “CO₂ equivalent”.

project lifespan (PR#74 p15.6.12). This does not include the additional benefits of eliminating emissions from trucking diesel to the diamond mines.

Dezé puts this in the context of the Northwest Territories. Major industrial developments (primarily diamond mines in the NWT) are required to report their greenhouse gas emissions. The 2006 reported emissions of greenhouse gases for the NWT were 318,477 tonnes. Depending on the megawatts generated by the proposed project, the hydroelectric power that could be provided to the mines would result in a greenhouse gas reduction of 74% to 88% of the reported total.

The total amount of greenhouse gases report for the NWT in 2006 was 1,160,000 tonnes, which includes the amount from major industrial developments as well as unreported sources such as private cars and fuel use by communities. The proposed project would result in a 20% to 24% reduction in this amount, and would offset an amount of greenhouse gases equivalent to 54% to 65% of Yellowknife's projected emissions for 2015 (PR#74 pp15.6.12-14).

The above predictions are made by Dézé subject to the uncertainties it identified as pertinent to the prediction, such as those arising from physical factors that affect emission and dispersion, as well as uncertainties related to greenhouse gas calculations for decaying vegetation.

Dézé concludes the following about this effect (PR#74 pp15.6. 14):

A scientific consensus has been established that the Canadian Arctic is particularly vulnerable to the consequences of climate change. While the project would have very minor or negligible direct adverse effects on the existing air quality of the region, from a cumulative perspective the Project offers a very significant benefit to the NWT and Canada in terms of reducing GHG emissions.

Dézé categorizes this as a highly likely beneficial effect of a high magnitude, not only at a regional level but also at national and global levels, and one that is continuous and of long-term duration. In Dézé's opinion, it is a significant and positive effect.

LKDFN agrees with Dézé about the vulnerability of the region to climate change but disagrees with the predicted reduction in greenhouse gas emissions as predicted by Dézé. In its hearing presentation LKDFN presented three main reasons for this (PR#202):

1. This project will extend the life of the existing diamond mines and promote development of new mines, with an associated carbon footprint.
2. Mines will continue to need diesel fuel to heat and run transportation fleets, mine trucks and backup diesel generators.
3. Mines are currently using waste heat from diesel generation as a heat source, and will require a replacement if diesel generation no longer occurs.

At the January 14th, 2010, hearing in Dettah, LKDFN requested a detailed carbon footprint analysis to demonstrate the validity of Dézé's predictions. Following the technical sessions, Dézé provided its estimates related to emissions from truck traffic to the diamond mines (estimated to be 3000 to 4000 tonnes of greenhouse gas emissions per year. Dézé also provided additional details related to its own assessment of the proposed project's emissions life cycle (PR#126 pp70-73).

At the January 2010 hearing, Environment Canada described how airborne pollutants can enter water bodies and wildlife (PR#185). It emphasized that good practices for solid waste incineration greatly reduce airborne pollutants such as dioxins and furans (p24). Environment Canada outlined desirable components for an incineration management plan, and recommended that Dezé's incineration management plan follow Environment Canada's *Technical Document for Batch Waste Incineration* (p27-29).

3.5.1.2 Review Board analysis and conclusions

The Review Board accepts Dezé's predictions about emissions caused by the project during construction and operation. In the Board's view, emissions from vehicles and equipment associated with this project are minor in comparison. The mitigations proposed by the developer are reasonable and will address these adequately.

The Review Board notes Dezé's commitment to develop an incineration management plan, and expects this to meet Environment Canada's *Technical Document on Batch Waste Incineration*. In the Review Board's opinion, this will adequately avoid pollutants resulting from solid waste incineration.

In the Review Board's view, the most significant effect of this development on climate and air quality is potentially beneficial - replacing the millions of litres of fossil fuel used at the NWT's biggest industrial developments with hydroelectric power. Dezé has demonstrated to the Board's satisfaction that this project will likely reduce the NWT's main industrial emissions of greenhouse gases considerably. Climate change poses a particular risk to northern Canada. In the Review Board's view, the proposed development provides an opportunity to replace most of the fossil fuel use at the diamond mines with clean, renewable energy.

As Dezé states in the DAR (PR#74 p15.6.2) "climate is a fundamental component of all ecological systems". Changes to climate threaten many of the ecological components that communities value most, such as caribou, fish, and water. The Review Board notes that these are essential to Aboriginal culture and the subsistence economy, and to the well-being and way of life of Aboriginal peoples of Canada. Subsection 115(c) of the *Mackenzie Valley Resource Management Act* specifically requires the Review Board to have regard for this. By reducing the majority of the NWT's greenhouse gas emissions from industry, this project helps to lessen the NWT's contribution to a problem that matters to Northern communities.

The Board has considered the views of LKDFN that the proposed project will not reduce emissions at the diamond mines. As Dezé recognized in the technical sessions, (PR#118 p210), the proposed development may not reduce the emissions from the fleet of trucks supplying the mines. In the Board's opinion, the detailed carbon footprint analysis requested by LKDFN is not needed to recognize that this is a minor consideration compared with the hundreds of thousands of tonnes of greenhouse gas emissions that would be eliminated annually by using the hydroelectric power produced by this project.¹

¹ Specifically, 20% to 24% reduction of the NWT total, which in 2006 was 1,160,000 tonnes (PR#74 pp15.6.12-14)

If the project does extend mine life and induce new development, by using hydroelectric power it will do so in a manner that is highly efficient with respect to greenhouse gas emissions.

In summary, the Review Board accepts Dezé's predictions that the adverse impacts of emissions from project construction and operation are minor at most, and that the beneficial effects of the project from providing a renewable substitute for fossil fuels used at the NWT's largest industrial projects are likely and significant.

3.6 Routing

Most of the issues related to the proposed transmission line are related to locations along the route. Dezé changed the proposed routing during the EA process as issues were raised specific to the routing. This section describes what route was originally proposed and how that changed as parties identified the major related issues. This section includes:

- a general description of the major routing alternatives initially considered by Dezé (Section 3.6.1);
- for the major route that Dezé chose, a description of the evolution of the detailed route and related issues as they unfolded during the EA process (Section 3.6.2);
- a detailed examination of cultural issues raised by LKDFN related to a specific portion of the route (Section 3.6.3); and,
- the Review Board's analysis of the above evidence and its conclusions related to routing issues (Section 3.6.4).

3.6.1 Consideration of major routing alternatives

The proposed project requires a transmission line approximately 700 kilometres long that runs from the Twin Gorges facility to the diamond mines in the Slave Geological Province. Towers will be placed approximately 350 metres apart for most of the route, typically on rock outcrops. The towers will be either pole-type or steel lattice type, 22 to 25 metres tall, with three conductors strung in line from them (PR#74 pp6.4.15-21).

Section Eight of the DAR describes Dezé's initial consideration of major routes, which included four alternatives (illustrated in Figure 6 on page 91) (PR#74 pp8.4.1-2). These were:

1. the West Arm Route, running around the west arm of Great Slave Lake through Fort Providence and Yellowknife, then on to Snap Lake and Ekati;
2. the Island Crossing Route, running north from Twin Gorges with aerial crossings between the Simpson Islands and a short submarine cable in the Hearne Channel near McKinley Point, then north to Snap Lake and Ekati;
3. the Submarine Route, running north from Twin Gorges to Great Slave Lake, underwater through Great Slave Lake to the north shore, then north to Snap Lake and Ekati; and,
4. the East Arm Route, from Twin Gorges to a crossing on the Lockhart River and then north to Gahcho Kue (with a further three options for routing to the diamond mines).

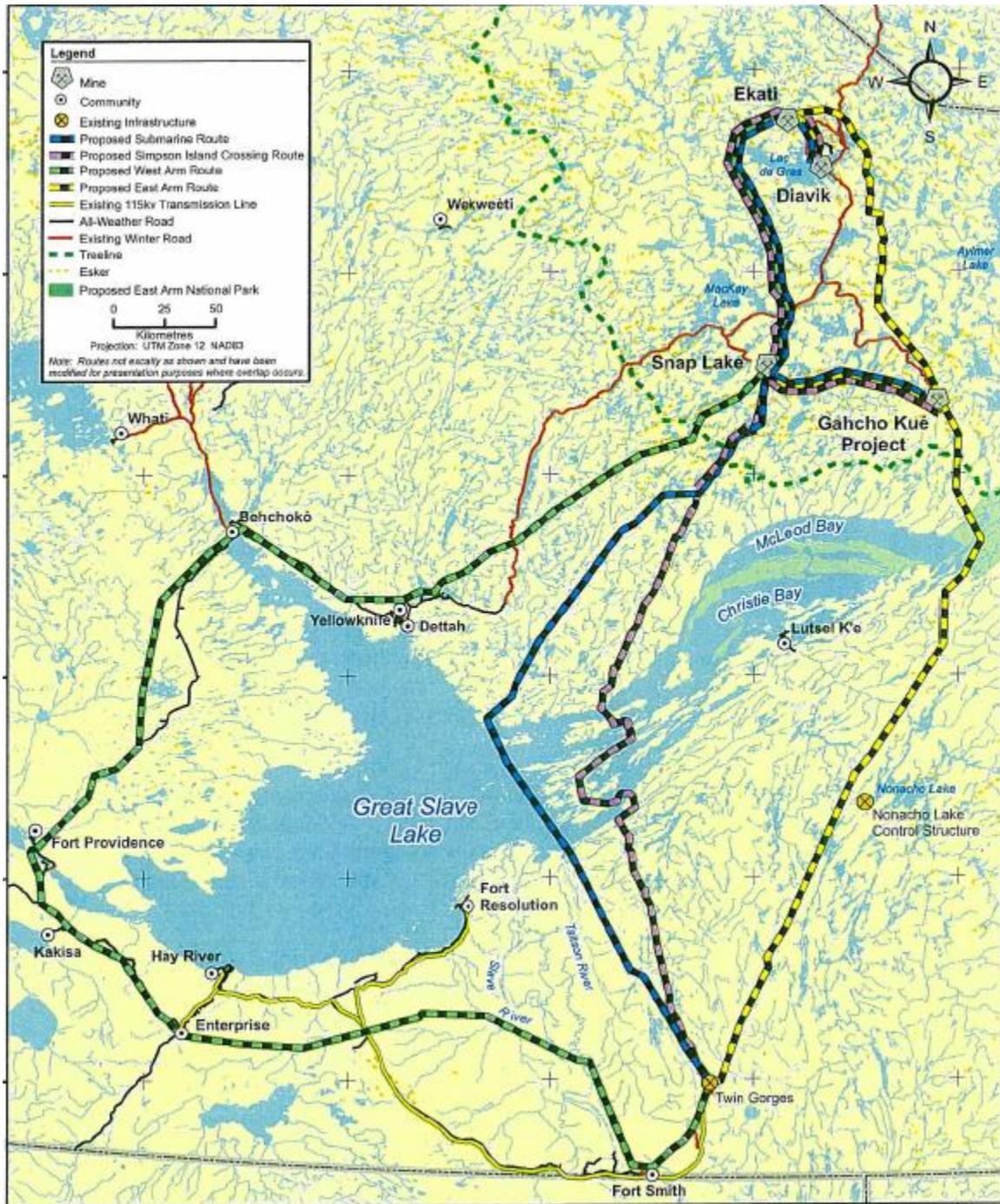
Dezé weighed each of the four routes, assigning scores for the following categories:

- environment
- socio-economic
- land access
- engineering and cost; and,
- construction and operating risk.

Several criteria were identified for each category, and Dezé quantified scores for each one (PR#74 pp8.4.28-40). Dezé summed these for each category, and gave each equal weight. The results were:

1. The West Arm Route was not chosen because, as the longest, it is “at the limit of technical feasibility”, and is the most expensive for construction, operation and maintenance;
2. The Island Crossing Route was not chosen because the large towers required for adequate height between islands would create a significant environmental impact in an “environmentally sensitive region”, the submarine sections would be some of the deepest underwater cable crossings in the world, and because of difficulties installing and maintaining cables in remote and extreme climate areas;
3. The Submarine Route was not chosen due to the risk of underwater cable failure and repair time in extreme weather and the related unreliability of electric power supply to the users, and for reasons similar those described above for the Island Crossing Route; and,
4. The East Arm Route was the one selected by Dezé, due to its favourable line access, land tenure and socio-economics, in combination with lower engineering costs and lower construction and operations risks.

Figure 6: Map of major route alternatives considered by Dezé



3.6.2 Routing alternatives within the East Arm Route

Within the East Arm route, various local routing alternatives (also referred to as “adjustments”) were considered by Dezé and the parties during the EA. The alternatives and the reasons for each are described here in the context of the EA process in which they arose.

Dezé proposed a crossing of the Lockhart River in the Report of EA (PR#74) and remained open to identifying the crossing location along the river that was most culturally acceptable. In its submission of Dec. 11th, 2009 (PR#169) and during the public hearing on January 14th, 2010, (PR#202; PR#209) LKDFN expressed strong concerns, stating that any crossing of the river between Artillery lake and Great Slave Lake was unacceptable for cultural reasons (PR#209).¹

Dezé decided to explore alternative routes for the portion of the transmission line in the eastern end of the East Arm. In its February 22nd, 2010 submission, Dezé stated “Until we had the opportunity to hear the concerns of LKDFN regarding areas of cultural and spiritual importance in the East Arm area, we were unable to address these issues” (PR#287 p28). In response to LKDFN’s concerns, Dezé examined a potential crossing at the south end of Artillery Lake. Following discussions with LKDFN, Dezé concluded that the Artillery Lake route is “also of significant cultural and spiritual importance and that this route is not a viable option”, and stated that, based on LKDFN’s concern, it would not proceed with further analysis of that route (PR#249).

Dezé also examined a potential crossing along Maufelly Point and Fairchild Point in Great Slave Lake near Reliance (“the Reliance adjustment”). Dezé initially considered an aerial crossing of the 800-metre gap between the two points. In its submission of February 11th, 2010 (PR#260) Dezé estimated that the aerial crossing of the gap would require towers at least 70 metres high on both points, and estimated the additional capital cost to be \$2 million. Dezé also considered an underwater cable between the Points. This would require cable termination structures less than 15 metres high near the tip of each Point and would require an estimated additional capital cost of \$5 million. In response to parties’ concerns regarding aesthetic impacts from towers along the Reliance adjustment, on February 22, 2010, Dezé expressed its commitment to adopt design measures to address aesthetic concerns. These included the use of low profile towers, and possibly underwater cables (PR#287 p7). A March 26th, 2010 letter from Dezé later confirmed that the Reliance adjustment would involve an underwater cable between the two points (PR#297). Technical details regarding this underwater crossing were provided by Dezé in its April 26th 2010 response to an information request proposed by INAC (PR#302, 306).

On February 18th, 2010, Parks Canada submitted a Request for Ruling regarding the Reliance adjustment, arguing that since it only arose after the public hearing in January, parties had inadequate time to analyze the proposal and predict impacts. Natural Resources Canada submitted a similar Request for Ruling on the same date. These requests were supported by the GNWT (PR#293), and INAC (PR#291)

¹ These concerns are described in detail in section 3.6.3 of this report.

and local cabin owners (PR#290). Environment Canada expressed similar procedural concerns at the same time (PR#277).

In response, on March 15th, 2010, the Review Board opened the record for submissions only pertaining to routing in this portion of the transmission line (PR#296). It provided parties with additional time to get clarification of the alternate route proposal from Dezé, for parties to propose information requests and receive responses to them, and for parties to make final submissions.

On March 26th, 2010, in response to parties' concerns about a perceived lack of clarity on the proponent's preferred route (PR#290), Dezé stated that its preferred option was the East Arm route that crossed the Lockhart River, and specified that the Reliance adjustment was offered as a mitigation for the Board's consideration under subparagraph 128(1)(b)(ii) of the *Mackenzie Valley Resource Management Act* (PR#297). Dezé emphasized, when describing its routing options, that the flexibility regarding the routing would enable a project design that anticipated and avoided problems. Dezé further stated that, the careful examination of new routing alternatives that were not proposed prior to the hearing is evidence of the process working as intended (PR#287 p6).

3.6.2.1 Aesthetic impacts, wilderness values and the proposed national park

In its DAR, Dezé predicted the visual impacts of the proposed power line, considering the distance of the Lockhart route from selected key viewpoints. The effects of this route, Dezé said, will be moderate in magnitude, regional in geographic extent, and medium-term in duration because the transmission line would be removed following the project's closure. On this basis, Dezé concluded that these effects are "not significant to the preservation of tourism potential and wilderness character" (PR#74 p15.10.24).

Parks Canada, LKDFN, local property owners and others expressed concern about potential impacts to the proposed Thaidene Nene / East Arm National Park at several points during the EA process (e.g. PR#120 p117-124; PR#166; PR#181; PR#268; PR#299; PR#313; PR#316). However, the use of land for a transmission line was the only exemption to the 2007 Akaitcho Treaty 8 interim land withdrawal that prevents other types of industrial development in the area (PR#166).

In its report of December 11, 2009, LKDFN described its efforts to protect the area that is now the proposed National Park, in terms of aesthetic values in the area: (PR#169, p4):

Allowing industrial development to proceed will impact the significant tourism potential of the area by changing the recreational and aesthetic values which draw people there from around the world. We have been working for decades to protect the Thaidene Nene area, and to pursue the principle of "conservation first" before any further development proceeds in our traditional territory. The Desnethche – Reliance area is the jewel to the overall conservation vision...

LKDFN submitted written documentation demonstrating its efforts to protect the area, starting in 1975 (PR#170).

Parks Canada pointed out that the different routings, both of which are within the proposed boundaries of the proposed National Park, will cause different visual impacts that would affect the aesthetic and wilderness experience of visitors. Parks Canada states that Thaidene Nene is "a nationally significant

example of Canada's natural and cultural heritage" (PR#313 p3) and pointed out that a transmission line intrudes on the perceptual character of wilderness. Parks Canada conducted its own Viewshed analysis using GIS data provided by Dezé. It concluded that a transmission line along the Reliance adjustment would be visually prominent from five locations and visible in the background at one viewpoint. In contrast, a transmission line along the inland route (crossing the Lockhart) would be visually prominent from only one location and visible in the background at four viewpoints. Parks Canada stated that for the inland route, "(A) close look at the map indicates that a relatively small change in observer location could bring the line back into view. Final route selection must take this into careful consideration" (PR #313 p6).

Parks Canada also stated that the "commemorative integrity" of Old Fort Providence, a National Historic Site, is affected by changes to the viewscape, which is one of the key elements that contribute to the heritage character of the site. From this site, the Reliance adjustment would place the transmission line in the "foreground to middle-ground" of an observer's field of view, disturbing the view across the lake and having "an adverse effect on the commemorative integrity of the site" (PR #313 p6). Parks Canada recommends that the Reliance adjustment not be used.

Dezé has described various mitigations for visual impacts. These include using different types of poles, such as wooden poles or steel poles that naturally weather and oxidize, turning "greenish red" with rust, and (PR#120, p124), or painting towers to reduce visibility (PR#118 p180). Dezé has expressed its willingness to use low profile towers (PR#287 p6) and to use an underwater crossing between the Points (PR#297 p3). Dezé has also expressed its willingness to refine the pole configurations through the proposed routing committee (PR#260). For further details regarding this committee, see Section 3.6.2.4.

3.6.2.2 Other Reliance adjustment issues

Before the Reliance adjustment was identified, Environment Canada stated that if large flocks of migratory waterfowl are staging in the vicinity of the transmission line, this could "greatly increase" the risk of collision (PR#185 p11). Environment Canada related this to the Reliance adjustment in its proposed information requests of April 9th, 2010, as follows: (PR#300 p3):

In the proposed Reliance adjustment, the transmission line crosses directly over the small area of open water off Maufelly Point where large concentrations of geese gather each spring. [Environment Canada] is concerned that a transmission line over this important spring stopover location has the potential for significant adverse impacts to goose populations. There is potential for bird mortalities due to collisions with the transmission line, especially during windy weather or times with poor visibility. It is unknown whether the presence of the transmission line directly over the open water area may deter geese from using this area as a stopover location.

In its final submission of May 7, 2010, Environment Canada wrote that, depending on the route chosen and the presence of migratory birds, further studies may be required to ensure that mitigations such as visibility markers on lines are adequate to avoid potentially significant impacts to waterfowl populations (PR#309).

During the October 5th, 2009 technical session in Yellowknife, LKDFN Elder Albert Boucher raised a similar concern about waterfowl and ptarmigan colliding with transmission lines, particularly when the

birds fly at night. Elder Boucher stressed the importance of the issue because waterfowl are an important harvested species. He was concerned that collisions would waste many birds (PR#120 p135). The same point was raised earlier, during the technical session in Łutsël K'e on September 29th, 2009 (PR#116 p77). In the public hearing, Dezé recognized that waterfowl often fly into transmission lines, leading to mortalities (PR#209 p29).

The Reliance adjustment raised concerns from aviators. Pilot and cabin owner Ray Decorby noted that Reliance is a licensed aerodrome, and described its regional importance as an historical and current stopover and fuel cache for small aircraft from the Baker Lake area. Decorby stated that transmission lines along the Reliance route would pose safety risks to aircraft in certain wind conditions (PR#279). This point was raised in other submissions (e.g. PR#273; PR#279; PR#285; PR#314).

When Dezé revised its proposed route following the public hearing to include the Reliance adjustment, the Review Board made efforts to identify and notify property owners in the vicinity of Maufelly and Fairchild Points. Three of the property owners - cabin owners Spencer and Ray Decorby and Trophy Lodge owner Wallace Finalyson - participated jointly in the EA. Mr. Dave Olesen, resident and ecotourism operator in the area, also participated.

They argue that the Reliance adjustment should not be pursued due to aesthetic impacts that would diminish the wilderness values of the area, such as impacts on the proposed East Arm National Park, on wildlife, on aviation safety and heritage resources (PR#285 p5-6). Mr. Finalyson predicted the towers and power lines would change the view of the Trophy Lodge setting as a pristine wilderness area, thereby changing the wilderness experience of the Lodge clients and other area visitors, which in turn would have a negative impact on the economic viability of the Lodge itself. (PR#267).

Olesen raised issues similar to those of the other property owners, and also raised sustainability concerns about the project's reliance on historical water levels in consideration of changing climate trends. Olesen was concerned about the potential for induced development and its impacts on wilderness values in the area. He is opposed to the Reliance adjustment, noting that the narrows at Reliance are the historic gateway to Pike's Portage (PR#262).

The LKDFN identified the Reliance adjustment is located in the Kache area (PR#265). LKDFN's issues related to this area are discussed under the LKDFN Cultural Issues section of this report (Section 3.6.3).

3.6.2.3 Final route proposal

In its letter of March 26th, 2010 letter Dezé expressed its ultimate preference for the Lockhart route. Dezé described a meeting held with the LKDFN Chief and Council to discuss the issue. Dezé states (PR#297):

During this meeting, Dezé indicated that an inland alignment across the Lockhart River is preferable to the more costly, less reliable and more visible Reliance adjustment. As Dezé recognizes that the inland crossing of Desnedhe Che is a sacred area to the people of Łutsël K'e, various forms of compensation were discussed to mitigate any cultural effects. However, the LKDFN made it clear during this meeting that neither the Desnedhe Che crossing nor the Reliance adjustments were acceptable, and that both would be

opposed. As such, it appears that there is little to be gained by the Reliance adjustment, particularly as it relates to addressing cultural and spiritual concerns.

In its March 25th letter, (PR#297) Dezé clearly stated its proposal to cross the Lockhart River, described as “the most reliable and feasible option, with the least effect to the viewscape of Great Slave Lake or the proposed East Arm park” (PR#297). In its closing statement submitted after the examination of routing options during the extended period of the EA, Dezé reaffirmed this, saying “(PR#320):

... Dezé’s preferred option for the transmission line remains an inland crossing of the Lockhart River between Artillery Lake and Great Slave Lake. We also noted that while the evaluation of the Kache / Ft. Reliance route alternative was a worthwhile exercise to exhaust all possible options, the process has reaffirmed our original analysis and conclusion that an inland crossing of the Lockhart River across the Desnedhe Che area is the proposed and preferred alignment.

3.6.2.4 Proposed routing committee

Dezé has proposed to establish a routing committee comprised of representatives from the parties. This committee would “determine which of the options presented can be implemented and the mitigative measures necessary to reduce or eliminate adverse impacts” (PR#287 p5). This committee could assist with pole configurations and tower locations to reduce or eliminate visual impacts on the Reliance adjustment (p7). Dezé has also indicated that the routing committee could help to find the most suitable inland alignment.

Local cabin owners proposed information requests about the role of the routing committee in relation to the final routing decision, and whether the route could change again if there were future opportunities for public involvement (PR#301; 304). In response, Dezé reaffirmed that as the proponent, it “makes decisions with respect to all aspects of the project”. Dezé stated, in the context of the role of the routing committee, that it would make the final decision for river crossing location, after considering recommendations from the committee, the recommendations from the Review Board and regulators, design and construction plans and economics (PR#306 p9).

3.6.3 LKDFN cultural issues

Concerns from Łutsël K’e about the proposed routes were primarily related to cultural impacts. This section describes the evidence submitted by Łutsël K’e, including its response to the alternatives that arose in response to its concerns. The following sections examine the evidence regarding:

- LKDFN’s general views regarding the proposed development and the Lockhart River area;
- the location and boundaries of the area discussed;
- the nature of the sacred site;
- other sites and routes in the Lockhart River area;
- effects on the inter-generational transmission of cultural knowledge and experience;
- the views of LKDFN linking cultural loss with the specific social impact of increased suicide rates;
- community engagement issues; and,
- the final position of LKDFN following consideration of various routing alternatives.

3.6.3.1 Łutsël K'e Dene First Nation general position on cultural impacts

Before the public hearing in January, 2010, Dezé's proposed route was to cross the Lockhart River inland. At the public hearing and in written submission, LKDFN described the area as culturally important to the people of Łutsël K'e and said that it has consistently opposed development in the area in general, and across the Lockhart River in particular. LKDFN's position regarding this proposed route was summarized in its submission dated December 11th, 2009 and in its hearing presentation. In the December 11th, 2009 submission, LKDFN stated (PR#169):

The final analysis for Łutsël K'e on the Taltson Hydro Expansion is that the development will cause unmitigable impacts to community members of Łutsël K'e. Łutsël K'e's history of opposition to development in this area is globally known. Tsanku Theda ("The Old Lady of the Falls") and Desnethche (the Lockhart River) are the fundamental core of Łutsël K'e Denesoline cultural identity, the spiritual apex of our people. We do not support the present transmission line pathway and will continue to be in opposition to any development of towers, transmission lines, labour camps or any other disturbance this development wishes to bring into the Lockhart River area.

In the same document, LKDFN reinforced this point, stating (PR#169):

Desnethche (the Lockhart River) and Tsanku Theda (Parry Falls or The Old Lady of the Falls) are "the holiest of sacred places to the Denesoline people of Łutsël K'e"; (p1)

- "Merely contemplating the Desnethche River with transmission lines strung over its most holy waters is unmentionable"; (p1).
- "The entire Desnethche area remains the cultural heart of Łutsël K'e; it would be hard to find a single person who has not traveled there, the home to the most sacred area to our cultural heritage and history" (p5).

LKDFN views the proposed project as a "desecration" (PR#169). To support this, LKDFN submitted documentation, including Traditional Knowledge, to support their statements of the "extreme spiritual importance and cultural relevance of the Desnethche area" (PR#170).

During the hearing, LKDFN representatives stated that the transmission line cannot be constructed in the Desnethche Kache area, described as the area from Artillery Lake to Great Slave Lake. Łutsël K'e said:

"The whole length of the Lockhart River is sacred. This area doesn't embody just a few stories with some symbolic hold, but the very being of the people is woven into their land today, now, this minute... This area is off limits to development. It is the most important sacred cultural site of the Łutsël K'e Dene people" (PR#202).

LKDFN requested that the Review Board refer the project to an Environmental Impact Review (PR#169).

3.6.3.2 Defining the area

To understand the issues pertinent to the heritage sites and the cultural landscape, it is necessary to understand which geographic areas LKDFN referred to throughout the EA. This section of the report examines the evidence that identifies the area in question.

During the technical session of October 5th, 2009, LKDFN Elder Albert Boucher described the spiritual importance and healing powers of the river (P136, 139). Former Chief Archie Catholique later specified: “From the mouth of the Lockhart River then right up to Artillery Lake... that is the spiritual area that he’s talking about”.

In its submission of December 11th, 2009, Łutsël K’e indicated that Kache is the Fort Reliance area (PR#170). This matches the clarification in LKDFN’s final submission, which says “Desnedhe Che is the Lockhart River from Artillery Lake to Great Slave Lake, and Kache is located at the east end of Great Slave Lake, including Maufelly and Fairchild Points” (PR#315 p1). The same map shows Desnethche starting at the shore of Great Slave Lake¹ and extending upriver.

During the public hearing on January 14th, 2010, LKDFN referred to the area of the Lockhart River both as “Desnedhe Che” (or “Desnethche”) and the “Desnedhe Che/Kache area”. The area was defined by LKDFN at several points during its hearing presentation (PR#202).

- *“Desnedhe Che is the mouth of the Lockhart River to Artillery Lake; ... The Kache/Desnedhe Che area encompasses the Spiritual Gathering Area site on the shores of Great Slave Lake, up the river to the Falls to Artillery Lake”* (p5).
- *“There is no identifying areas within the Lockhart River Area we have defined that would mitigate the overall negative impacts of the staging and construction of transmission line towers over, through or across the Desnedhe Che-Kache Area. The area is slated for protection --this means the entire area from Artillery Lake to the Great Slave Lake”* (p8).
- *“Desnedhe Che is a sacred area from Artillery Lake Ts’akui to the Great Slave Lake”* (p16). [emphasis added]

At other points in the hearing, Desnedhe and Kache were referred to as a single area. LKDFN stated that “the proposed transmission line cannot be constructed in the Desnedche-Kache area which is Artillery Lake to Great Slave Lake”. A written submission from ex-Chief Adele Jonasson states that Kache/Desnethche “...is one and the same for me, my family and for the community members in Łutsël K’e” (PR#310).

Based on the above, the Review Board Except focussed particularly on the Lockhart River area during its deliberations, except where the evidence indicated it was appropriate to do otherwise.

¹ For clarity, this extends from 108°56’25”W with the mouth spanning from 68°47’12” to 68°47’18” N.

3.6.3.3 Healing and well-being

This section of the report describes the evidence put forward by LKDFN regarding the distinctive sacred nature of the Old Lady of the Falls.

The LKDFN have emphasized the importance of the Old Lady of the Falls as a healer, giver of strength and source of ongoing wellness. In its Dec. 11, 2009 submission, Chief Nitah wrote that “the life-giving myth and image of the Old Lady of the Falls is the religious icon next to the image of the Virgin Mary in every Łutsël K’e home” (PR#169 p2). In its hearing presentation, LKDFN described the value of the healing properties of the Old Lady of the Falls:

The walk to the Old Lady of the Falls is done by those needing healing and rejuvenation, others will travel to this site when the spirit or the creator deems them to, which is itself, a personal and intimate journey taken by personal, family or faith based inspiration (PR#202 p16).

During the hearing, Elder (and now Chief) Antoine Michel described multiple cases where people suffering from terminally ill cancer were healed by the Old Lady.

LKDFN Elder George Marlowe described the historic spirituality and healing of the Old Lady. He described the ill being carried on stretchers to the site for healing, and the crippled regaining use of their legs. Marlowe described his personal story, how he was suffering from cancer, and how the Old Lady cured him (PR#209 p183-189). Sayiz Catholique described how the Old Lady cured her parents’ infertility (PR#209 p205-207).

LKDFN youth Jake Basil told the Review Board of the power of the Old Lady of the Falls as a literal example of how the land takes care of the LKDFN (PR#209 p204). He said:

Our lakes, our rivers and our lands, it all means a lot to us. It is our heart, and we take care of it, and it takes care of us. It feeds us; it keeps us strong; it teaches us how to survive out on the land. When we go see Lady of the Falls, Ts’akui Theda, for spiritual healing, she lends us powerful energy, joyful energy, to heal us, to make us happy again.

Former LKDFN Chief Adele Jonasson describes the importance of the healing power and the requirement to protect it. She writes (PR#310):

This area must not be disturbed. This is the place where our spiritual connection begins and where our physical, mental, emotional and spiritual healing takes place in a very profound way, spiritually, for us. Many people do not understand the significance of the area nor the site where the “Old Lady of the Falls sits”. She has the power to heal in a very spiritual sense and the ability to empower people. She has helped me and others and will continue to heal many generations yet to come.

In his letter of Dec. 11th, 2009, Chief Nitah described the relationship between the healing power of the Old Lady of the Falls, the cultural identity of the Łutsël K’e Denesoline and the annual Desnethche Spiritual Gathering held at the mouth of the Lockhart River. Chief Nitah wrote (PR#169 p2):

Desnethche, the cornerstone to the Łutsël K'e Denesoline identity, has been underscored in aboriginal health and wellness indicators, through community based monitoring studies, documented through the transcripts of Elders, adults and youth. It is demonstrated through its hosting of the annual spiritual gathering at the mouth of the Lockhart River every year in August by the people of Łutsël K'e. The Desnethche Spiritual Gathering is always held in tandem with spiritual services, sweat lodges, a caribou hunt, and visits to Tsanku Theda, to gain spiritual wisdom or guidance, for the sick to seek healing whether ill in mind or body. The Lockhart Watershed is an undeniable cultural axiom for the Denesoline of the East Arm of Great Slave Lake.

During the hearing, Chief Nitah described how the spiritual practices related to the Old Lady of the Falls were kept secret from non-Dene for many years. He stated (PR#209 p174):

During the period of colonization when we as First Nations people were criminally and wrongly persecuted and forbidden from practising our spirituality, we went underground. And only recently when the Canadian law started recognizing us First Nations people as people, and our religions and spirituality that we started going back to Ts'akui Theda.

At the public hearing, the Review Board heard evidence from the Chief, former Chiefs, Elders and youths that crossing the Desnethche area would directly affect the Old Lady of the Falls. Youth Sayiz Catholique stated "As you can see, the importance of oral history ensures our cultural and spiritual survival. In one of the versions of the story, (Ts'akui Theda) says, 'I cannot be disturbed until the end of time'. Well, this development is going to disturb her" (PR#209 p205-7).

Elder George Marlowe described a similar concern, saying "If we put a hydro line across, in the future maybe the Old Lady will disappear" (PR#209 p189). Youth Jake Basil described his concern about the direct effect of the transmission line on the Old Lady, saying "It will not be good for Ts'akui Theda. She will not like it. She told us to protect her and keep the land healthy and strong, and the land will keep us strong..." (PR#209 p204).

LKDFN framed its hearing presentation in the strongest terms as "a matter of cultural survival" (PR#202). In the May 10th, 2010 submission of LKDFN, Chief Antoine Michel quoted a community member describing the cultural impact of any crossing of the area, saying: "It's like —like striking out our traditional values. If you cross that area it – it's no longer having meaning and spiritual values for us as Dene" (PR#315, p2).

3.6.3.4 Archaeological sites and the cultural landscape

This section describes evidence from LKDFN regarding the other sites and routes in the Lockhart River area besides the Old Lady of the Falls site. LKDFN provided documentation from various research programs (PR#170) documenting place names, stories, legends and traditional patterns of use to illustrate the "extreme cultural sensitivity and richness of the area" (PR#169 p2).

In its hearing presentation, LKDFN described some of the cultural components of the area besides the Old Lady at the Falls and the Lockhart River itself. Identified were: (PR#202 p8):

- legend locations
- burial sites
- cabin sites
- seasonal harvesting sites
- petroforms¹
- prayer areas
- travel routes spanning hundreds of years (PR#209 p180), and
- other important cultural sites in the area are known only to the Dene.

During the hearing, LKDFN emphasized that the combined meaning of all these elements in a cultural landscape is part of what makes this area of the utmost importance to the LKDFN (PR#209 p166). In its hearing presentation LKDFN stressed the following (PR#202, p8):

The area cannot be subject to micro-analysis, compartmentalized by zoning, identified by the creation of 'safe corridors' or given any other semantic jargon, piece-mealing or instituting any ad hoc buffer zones to satisfy what would be deemed adequate protection measures for Łutsël K'e Dene. There is no identifying areas within the Lockhart River Area we have defined that would mitigate the overall negative impacts of the staging and construction of transmission line towers over, through or across the Desnedhe Che-Kache Area. The area is slated for protection ---this means the entire area from Artillery Lake to the Great Slave.

This issue of deconstructing a cultural landscape into a collection of archaeological sites was addressed in the hearing by GNWT archaeologist Glen Mackay of the Prince of Wales Northern Heritage Centre, who told the Review Board (PR#290 p156):

The Proponents committed to altering their route such that (identified) archaeological sites can be avoided. So, in that sort of framework of archaeological impact assessment, you sort of end up with dots... on the map with a buffer around them to facilitate avoidance during project activities... But, of course... a landscape of cultural significance that's of such great importance to the Dene people can't really be characterized as dots on a map in that way. So the Prince of Wales Northern Heritage Centre does recognize that there's a cultural impact, a potential cultural impact, if infrastructure is built close to the Lady of the Falls site or across the Lockhart River.

3.6.3.5 Future use

This section describes one of the ways that LKDFN said that a power line across the Lockhart River would affect its culture in the long-term, by affecting the inter-generational transmission of cultural knowledge and experience. The evidence on this subject from various participants is described below.

¹ *Petroforms* are rocks or rock alignments that are physical elements that illustrate traditional stories and oral histories that are experienced and understood by observation on the ground and by voyaging through them.

Many participants from Łutsël K'e told the Review Board that they want this area to maintain its traditional values because they want their children to know their heritage the same way past generations have. This was expressed at the October 5th, 2009, technical sessions by former Chief Archie Catholique (PR#118 p108; p195). During the hearing on January 14th, 2010, elders Antoine Michel and George Marlowe raised the same concern (PR#209 p182; 189).

Three youths from Łutsël K'e made presentations at the hearing. A common theme in their presentations was the importance of the Old Lady of the Falls as a part of their cultural inheritance, which they wish to eventually pass along. Youth Desiree Jonasson told the Review Board the story of the origins of the Old Lady as it was told to her by Elder Zepp Casaway and former Chief Pierre Catholique. She concluded by emphasizing how the tradition crosses generations and how she wishes to ensure this continued, saying:

My first trip to the see the Old Lady of the Falls was when I was five years old. I walked to the falls with my grandmother. My grandmother showed me how to make a prayer offering and thank the Old Lady of the Falls. Ever since then I have been going to the spiritual site at Desnedche. One day I would like my children and grandchildren to experience the spiritual and healing powers of the Old Lady of the Falls. I want to ensure that Ts'akui Theda is protected from any and all types of resource development so that she continues to sit at Parry Falls for future generations. I pledge today to help protect the sacredness of the Old Lady of the Falls. (PR#209 p204)

Youth Jake Basil described his experience of the Old Lady of the Falls and his wish to share it with his children (PR#209 p204):

(T)his fall and last summer I went to Reliance with a gathering. It's so beautiful out there. You just have to see it for yourself to believe in her. It's so wonderful and it just makes you feel good inside. And I want... for my children to see it that way, as I saw it. For the next generation, I would like to have it the same, to always be the same.

During the September 29th, 2009 technical session in Łutsël K'e, youth Nathaniel Marlowe emphasized the inter-generational aspect of heritage and the need to have cultural options. He said to Dezé (PR#116, p107-8):

You guys are going to take away a big part of our life... I want to have a family here, raise them the traditional way... You want to do something that takes something away from us that our ancestors have had since the beginning. We've been raised here. I don't know what else to say. I just hope that you will find it in your heart to just let us live the way we want to live.

During the hearing, Sayiz Catholique referred to "our grandmother" (PR#209 p205-7) and the role she will have in the lives of future LKDFN members:

She has always helped us and she always will help us. We are the future generation. Our children and youth talk about their own children and their own future generation; that's how far ahead that they look. Our younger ones, they see it that far and they want to keep it like that. We will continue to keep our Dene people strong by ensuring the

survival of our culture and traditions by going out on the land. We will continue to strengthen our well-being, our bodies, our hearts, our minds, and our spirits by visiting our Grandmother as Desnedche.

In the LKDFN submission of December 11th, 2009, Chief Nitah emphasized that LKDFN is concerned that this project “has the potential to impact the long term ability of future generations to practice our way of life”, and emphasizes the physical, emotional, cultural and spiritual connection between Aboriginal people and the land (PR#169).

3.6.3.6 Cultural preservation and suicide rates

This section describes the evidence regarding the views of LKDFN linking cultural loss with the specific social impact of increased suicide rates. In LKDFN’s closing submission (PR#315) LKDFN Chief Antoine Michel cites a 1998 social research paper by Chandler and Lalonde that conducts empirical statistical analysis from 196 Aboriginal bands in BC. The results show a strong association indicating that communities that have taken active steps to preserve and rehabilitate their own cultures are those in which youth suicide rates are dramatically lower (PR#234 p1). In LKDFN’s final submission, Chief Michel writes that, based on his knowledge of the factors influencing health and well-being of Northern communities and specifically Łutsël K’e, he believes that: “an approval of the project is likely to have an impact on the community similar to those identified by Chandler and Lalonde” (PR#315 p3).

3.6.3.7 Community engagement issues

During the technical session on October 4th, 2009, Dezé specified that, due to the cultural sensitivity of the area, it deliberately refrained from choosing a proposed crossing location until Łutsël K’e specified the best crossing location (PR#118, P180). At the same session, LKDFN ex-Chief Archie Catholique indicated that this impact could not be avoided by crossing at a different location on the Lockhart River (PR#118, p196).

In the technical sessions, Dezé Chairman Don Balsillie stated that traditional users were interviewed as part of the land use work, but no-one was interviewed from Łutsël K’e. “We didn’t interview anyone from Łutsël K’e because the community took the position not to involve themselves in the project. So to try and interview individuals, it just wasn’t possible” (PR#118 p187). In its submission of February 22nd, 2010, Dezé indicated that it has “regrettably and despite repeated attempts”, been unable to engage in any meaningful dialogue and consultation with the LKDFN regarding the routing in the East Arm area since February 2008. As a result, it was not fully aware of the extent of Desnethche or the cultural significance of the area (PR#287 p6).

In its submission of December 11, 2009, LKDFN stated that even discussing it caused distress, saying: “The lack of acknowledgment (of the sacred nature of Desnethche and Ts’anku Theda) and the continual attacks government and industry have made in attempting to develop or disturb this sacred space has caused cumulative sorrow and undue stress to Elders, youth and Denesoline adults of Łutsël K’e... Merely contemplating or visualizing the Desnethche river area with transmission lines strung over its most holy of waters is unmentionable” (PR#169 p1).

During the hearing, LKDFN indicated that it was unwilling to meet because the proposal involved crossing the Lockhart River. LKDFN did not wish to support this. LKDFN stated that the proposal is

“causing stress and harm to them every day that they are met with the challenges of having to defend its continued sanctity into the future. The continued desire for industry to develop the area, lobbied through the government, through this EA process, is seen as a highest form of disrespect” (PR#202 p7).

LKDFN members also specified that they did not wish to share the most private and sacred aspects of their culture. As LKDFN member Sayiz Catholique put it, “There's no need for us to share our most sacred secrets in such a public way, you know. These are our most intimate secrets... That place is a special part of me” (PR#209 p205-7).

3.6.3.8 Final position of Łutsël K'e Dene First Nation

Over the course of the various routing alternatives that were raised by Dezé during the environmental assessment, the position of Łutsël K'e remained unchanged. The following quotations summarize the LKDFN's final position as described in its hearing presentation.

- *“This NO-GO area is the number one cultural NO ZONE (sic)for developments for Łutsël K'e Dene: The whole length of the Lockhart River is sacred. This area doesn't embody just a few stories story with some symbolic hold, but the very being of the people is woven into their land today, now, this minute”* (PR#202 p7)
- *“Łutsël K'e will never stray from protecting this area from time immemorial. The Old Lady is not to be disturbed until the end of time. This area cannot be violated with development from any source especially of a kind purely motivated by neither necessity nor humanitarian progress”* (PR#202 p16).
- *“As you can see, the importance of oral history ensures our cultural and spiritual survival. In one of the versions of the story, (Ts'akui Theda) says, "I cannot be disturbed until the end of time." Well, this development is going to disturb her. It's up to us to ensure her protection and we will do what we have to do at all costs to keep her safe. Whether or not this goes through, we won't sit by and let this happen. (209 p205-7)*

In its December 11th, 2009 submission, Łutsël K'e made it clear that it was not against the transmission line in general, it was against the proposed route, but it was open to alternate routings under certain conditions. LKDFN wrote (PR#169 p4):

We support development that respects our values and connections to our land, not diminishes it. In this light of compromise, Łutsël K'e would be willing to contemplate a transmission pathway that would not open up winter roads to the south for increased hunting pressure on declining caribou herds and would not disturb the Desnethche area with running transmission lines through it and over the Lockhart River... There needs to be an alternate routing to the northern potential customer. Łutsël K'e would be open to considering an alternate routing meeting these conditions.

During the hearing, the community's views were presented by Elders, youths, the Chief and every living former Chief participated in its presentation. Chief Nitah described the reason for this (PR#209 p172):

This issue transcends politics, as represented by the living chiefs here in our unified presentation to you that -- we did this to illustrate the level of concern that we have about the proposed project. The transmission line should not and will not cross the

Lockhart River, will not cross Desnedche. That's just the bottom line. We can't say it any more clearer than that.

In consideration of the presentation made by Łutsël K'e at the hearing, Dezé indicated that it would propose an alternative route to avoid crossing areas identified by LKDFN as sensitive (PR#210 p305). This led to the consideration of the Artillery and Reliance route adjustments described above. The LKDFN Wildlife, Lands and Environment Committee met in Łutsël K'e on February 10th and 11th, 2010, to discuss the Reliance adjustment (PR#265). LKDFN reported:

Obvious throughout the meeting was the dismay our community members have with this new alternative transmission line routing through the Kache (Reliance) region. Many members repeated that "we said 'No' to the transmission lines being routed around the east end of Great Slave Lake through Kache and Desnedhe Che" at the public hearing in January "and No means NO".

3.6.4 Review Board analysis and conclusions

The Review Board concludes, based on the evidence, that the Lockhart River area,¹ and in particular the Old Lady of the Falls, is of high cultural significance to the Aboriginal people that have historically used, and continue to use, the land. The record indicates that it has been an important area to the people of Łutsël K'e and their ancestors for centuries, and that it continues to be important to the people of Łutsël K'e. This evidence was not contested by the developer.

3.6.4.1 Cultural and social issues

The Review Board recognizes the increasing demand from communities that social, economic and cultural well-being be taken into full consideration during environmental impact assessment. In s.111 of the MVRMA, "impact on the environment" is specified to include "any effect on the social and cultural environment or on heritage resources".

The Review Board considers the assessment of social and cultural impacts to be an important aspect of environmental assessment. Section 115(b) of the MVRMA states that the Review Board is required to consider the social and cultural well-being of the residents and communities of the Mackenzie Valley. Subsection 115(c) states that the Review Board is required to consider "the importance of conservation to the well-being and way of life" of Aboriginal peoples. The Review Board considered these requirements when reviewing the evidence before it and forming determinations about this proposed development and its impacts.

¹ For clarity, throughout this document the Review Board refers to the variant spellings of "Desneche", "Desnedche", "Desnethche" area in English as "the Lockhart River area"; to the "Tsanku Theda", "Ts'akui Theda" area in English as "the Old Lady of the Falls", and to the "Kache" area in English as "the Reliance area".

A. Nature of the cultural impacts

The Review Board heard ample evidence from members of LKDFN that the Lockhart River, from the area surrounding the Old Lady of the Falls and along its entire length from Great Slave Lake to Artillery Lake is the single most important sacred place and cultural area for the people of Łutsël K'e.¹ The Review Board heard that the Lockhart River area is of immense importance in terms of historic and current uses, and that there is a direct and ongoing spiritual connection with the people of Łutsël K'e and this area. The Review Board particularly notes that Elders, youths and former Chiefs spoke powerfully of how spiritually significant the Lockhart River area is.

In the view of the Review Board, the testimony presented by Elders on cultural impacts was not based only on their personal views as individuals, but rather on traditional knowledge - the collected knowledge, values and beliefs that have been passed across generations. The Elders were speaking as holders of traditional knowledge. The Review Board takes such evidence very seriously. Section 115.1 of the MVRMA explicitly instructs the Review Board to consider traditional knowledge made available to it alongside scientific information. When identifying cultural impacts, the Review Board relies heavily on the testimony of the people who are a part of that culture.

The evidence presented by the Elders was further supported by numerous adults and youth. The LKDFN has consistently maintained that the Old Lady of the Falls and Lockhart River area are the fundamental core of Łutsël K'e Denesoline cultural identity, "the spiritual apex of our people" (PR#169), and describe this area as the "cultural heart" of the people of Łutsël K'e. Many members of the LKDFN all provided similar testimony to this effect.

The Review Board heard from a broad cross-section of the community spanning three generations, from Elders to community leaders to youth and noted the high level of participation at the public hearing. Approximately 25 members – almost 10 percent of the community - attended and participated in the hearing in Dettah. LKDFN indicated that many of these attendees had travelled approximately 240 kilometres across Great Slave Lake by snowmobile at their own expense, in mid-winter in the sub-arctic, to participate in the public hearing in Dettah. In the Review Board's opinion, this participation speaks to the extreme importance of the cultural issues from Łutsël K'e's perspective.

In both content and demeanour, presenters from Łutsël K'e spoke unanimously and eloquently in their testimonials that the Old Lady of the Falls and the Lockhart River area are of the highest spiritual and cultural importance. People fear that if a transmission line crosses the Lockhart River, it will be a desecration that will reduce its sacred nature and cultural value, which will reduce their ability to transmit their heritage and traditional practices across generations as has been done for centuries. In the view of the Review Board, this represents a significant cultural impact.

To the people of Łutsël K'e, the intrusion of industrial development in this area is not compatible with the values of the Lockhart River area as a cultural landscape. They view this as a desecration of a spiritual place. Representatives from the Yellowknives Dene First Nation expressed support for the position of the people of Łutsël K'e (PR#209 p253).

¹ See Section 3.6.3.2 for the location of the river mouth at Great Slave Lake.

During the hearing, representatives of Łutsël K'e told the Review Board that any crossing of the river, even at a point that is not visible at the location of Old Lady of the Falls, would be unacceptable. The Review Board notes the difficulty for people outside of Łutsël K'e Denesoline culture to grasp how changes to other parts of the river would spiritually affect the Old Lady of the Falls, when they do not change the Old Lady of the Falls location in a direct physical way. However, when identifying cultural impacts, the Review Board relies heavily on the testimony of the people who are a part of that culture. The people of Łutsël K'e have made it clear that, in their view, the Lockhart River area is sacred and any crossing of the Lockhart River would be a profound desecration. The Review Board accepts the evidence from the people of Łutsël K'e on this matter.

Łutsël K'e has supported its position that the Lockhart River area is culturally vital with documentation of the community's efforts to protect it over the past forty years. Based on this evidence, it is clear to the Review Board that the importance of Lockhart River area cannot be defined solely by its practical utility, because it is a spiritual area with an intrinsic and intangible cultural value to Aboriginal people.

Similarly, the Review Board is of the view that the degree of biophysical impact on the area is not always commensurate with the magnitude of the cultural impact experienced by the people who value it. The scale or type of project is not the main consideration in this case. The physical footprint of the transmission line towers is small, but the issues are much bigger because the proposed development is located in a landscape of such vital cultural importance. In this case, the Review Board heard that this development cannot be reconciled with the values placed on the area where it is proposed to go through. The Board notes that neither INAC nor the GNWT Prince of Wales Northern Heritage Centre were unable to offer up any possible solutions from their respective positions with respect to fiduciary responsibilities towards Aboriginal peoples and the management and protection of heritage resources, which includes cultural landscapes, when questioned at the public hearing.

The Review Board recognizes that spiritual matters are an important part of culture. This area has a great spiritual importance in its current state, and a transmission line would erode its cultural value to the LKDFN. The Review Board has heard and accepts evidence that the Lockhart River area holds such special value to Aboriginal people that changes to it are likely to cause significant adverse cultural impacts.

Measure 4

In order to prevent a significant cultural impact on LKDFN from a diminished cultural value of the Old Lady of the Falls sacred site due to the presence of industrial development, the transmission line will not cross the Lockhart River at any point, from the river mouth including the spiritual gathering site to Artillery Lake.

3.6.4.2 Other cultural issues and aesthetic impacts

The Review Board understands that there are other culturally important sites around the eastern end of the in the East Arm, such as the Kache area. LKDFN has made it clear that Kache and the Lockhart River area are often spoken of collectively. However, the Review Board has been told clearly by the people of Łutsël K'e that Old Lady of the Falls and the Lockhart River are its ultimate spiritual sites. It is based on this that the Old Lady of the Falls and the Lockhart River area require protection.

Dezé has demonstrated its willingness to work cooperatively to avoid problems. This was shown by its openness to selecting the most culturally acceptable crossing site as identified by LKDFN, by its willingness to mitigate visual impacts by changing tower design and by its proposal to run cable underwater for short lengths if necessary. Dézé has also been open to off-site mitigation including supporting annual gatherings, arts and storytelling (PR#126 p67), and direct compensation (PR#297 p2). Dézé has made reasonable efforts to consult with LKDFN, and has demonstrated its willingness to re-route to avoid cultural sensitivities where feasible. As Dézé is an Aboriginal majority-owned company based in the same region, the Review Board expects that it will be sensitive to Aboriginal cultural issues during detailed project design.

Dézé has indicated that it will engage a routing committee which will advise it on routing. The Review Board expects LKDFN to play a central role in this routing committee, and expect that the committee will be instrumental in helping Dézé avoid other cultural sites. Between LKDFN's knowledge of the cultural landscape including sites known only to the Dene (PR#202 p8), Dézé's willingness to avoid cultural sites, and the complete restriction on crossing the Lockhart River, the Review Board is satisfied that significant cultural impacts can be reasonably avoided. In the Review Board's opinion, the routing committee could avoid likely significant adverse cultural impacts on heritage resources outside of the Lockhart River area.

Measure 5

In order to mitigate significant impacts related to routing details, Dézé will create an advisory routing committee to identify specific areas of heritage resources and other local sensitivities that should be avoided by careful routing of the transmission line. This committee will also provide input on other mitigative options such as pole design, height and configurations.

On the subject of aesthetic impacts on the proposed East Arm National Park, the Review Board recognizes that one of the reasons Dézé returned to proposing the inland route is to avoid aesthetic impacts of other more visible routes in the East Arm National Park. The Review Board accepts Parks Canada's views on the relevance of aesthetic impacts in the proposed protected area, and acknowledges that these may affect a visitor's perception of wilderness and historical character.

Dézé has identified several means of reducing the visual impacts of the transmission line by modifying the height, design, colour and placement of the towers. Considering this, it is the Review Board's opinion that the residual aesthetic impacts on visitors, after these mitigations occur, do not carry the same weight of significance as a potential desecration of the most sacred site of a First Nation. Ensuring that the cultural identity of Łutsël K'e is protected for future generations is one of the reasons the East Arm National Park has been proposed. That cultural heritage is better protected by a transmission line route that does not cross Desnethche, even if it results in increased visual impacts on park visitors.

The Board notes that Dézé's visual impact mitigations are valuable. However, the visibility of lines in certain places may be relevant to aircraft safety and the potential for collisions by migrating waterfowl, as identified by local pilots and Environment Canada respectively. When mitigating visual impacts in highly visible locations, the Review Board expects Dézé to consider the views of Transport Canada regarding aircraft safety and those of Environment Canada regarding collisions by migrating waterfowl in addition to the views of Parks Canada.

The Review Board has considered the views of cabin owners in the area. Many of these concerns relate to visual impacts, for which the Board's views are described above. The Board further notes that these cabin owners do not have the right to expect exclusive use of the public lands they occupy. In the

Board's view, the developer's proposed mitigations regarding visual effects will be adequate to mitigate impacts on cabin owners.

With respect to Trophy Lodge, the Review Board recognizes that should the transmission line route pass close to the lodge or figure prominently within its viewshed, this could adversely affect its business. Dezé has stated that if the line should run along Maufelly and Fairchild Points, it would cross between the points underwater, and has proposed other visual mitigations¹. During the hearing, Dezé stated that it would take "every measure possible" to compensate those adversely affected by the development (PR#210 p313). In the Board's view, these mitigations will help reduce the potential significance of the visual impact and reduce any socio-economic effects that may occur if the transmission line is located in the vicinity of Trophy Lodge.

Suggestion 4

If the transmission line is routed close to Trophy Lodge or figures prominently within its viewshed, Dezé is encouraged to discuss potential mitigations with the owners of Trophy Lodge.

3.6.5 Socio-economic Impacts of the project

3.6.5.1 Submissions from the Parties

The Review Board considers the socio-economic impacts of proposed development along with the biophysical and cultural impacts. Various social impacts that overlap with other subjects have been covered in different sections of this report:

- social issues that are related to culture and heritage resources are included above in the section on LKDFN Cultural Issues (Section 3.6.3);
- impacts on wilderness character are described in the section on visual impacts in the proposed East Arm National Park (Sections 3.6.2.1 and 3.6.4.2);
- the relevance of caribou as a harvested species has been discussed in Section 3.1;
- potential economic impacts on Trophy Lodge are discussed in Section 3.6.2.2 and 3.6.4.2, and potential impacts on Nonacho Lake Fishing Camp are examined in Section 3.6.5;
- potential indirect economic benefits of extending the life of existing diamond mines through provision of affordable power is discussed with respect to sustainability (Section 3.7).

Legacy issues encompass a suite of concerns voiced during the environmental assessment by Aboriginal groups. These relate to the biophysical and cultural impacts from the historical flooding of Nonacho Lake as part of the original Twin Gorges hydroelectric development, drowning deaths on the Taltson River following hydrological changes from the Twin Gorges hydroelectric development, the relocation of the community of Rocher River at that time, and unresolved compensation issues related to these. These issues were raised by Aboriginal parties during technical sessions in Yellowknife (PR#120 p146-8) and Łutsël K'e (PR#116 p130-133), and during the public hearing (PR#210 175-177).

¹ See section 3.6.2.1 for details about proposed visual mitigations.

The Carter family owns and operates Nonacho Lake Fishing Camp and is concerned about the project's potential effects on their business. The Carters have described their concerns regarding impacts of drawdowns and a potential increase in the mercury level in the fish and water which the fishing camp depends on. The Carters have several concerns which they presented at the public hearing (PR#156; PR#209 pp52-53; PR#210 pp187-208; PR#200; PR#242; PR#243):

- the project will reduce the wilderness values that are important to their clientele. The project will create road access to Nonacho Lake, but the fishing camp is promoted as a secluded, pristine fly-in/fly-out only fishing destination;
- the security of the fishing camp in winter given new road access;
- direct disturbances from construction activities at the control structure;
- proposed camp locations adjacent to popular fishing spots such as the existing dam;
- increased hunting access.

Most of the remaining evidence about socio-economic impacts from the proposed project relates to beneficial socio-economic impacts arising from the project due to its Aboriginal partnership model and the socio-economic setting of the South Slave region.

This project is owned by a majority of Aboriginal partners from within the affected area. One third of the project is owned by the Akaitcho Energy Corporation, a business venture of the Akaitcho First Nations. One third is owned by the Métis Energy Company Ltd., a business venture of the NWT Métis Nation (PR#74 pES1). Benefits will flow to members of the Akaitcho First Nations and NWT Métis Nation. Dezé has identified the support of several First Nations including the Yellowknives Dene First Nation in Dettah and N'Dilo, Deninu K'ue First Nation in Fort Resolution, and Salt River First Nation and Smith's Landing First Nation in Fort Smith (PR#210 p312).

Dezé stated in the DAR (PR#74 p.ES13) that it is committed to providing opportunities for northern Aboriginal and Northwest Territories residents to participate in the Expansion Project. In the DAR Dezé stated that construction of the project would generate "considerable employment and business opportunities in the NWT, both in the economically depressed South Slave region and in all communities around the Great Slave Lake" (PR#74 p5.7)

Dezé states in the DAR that local residents would be "given priority for jobs". During the three year construction period the project would employ almost 700 workers. Employment decreases substantially during the operation phase, when only eight to ten workers would be needed annually (PR#74 pES8). Substantial economic benefits would continue to be achieved through the ownership structure (PR#74 p. 5.7).

In addition to direct jobs, Dezé estimates that there will be over 200 indirect jobs generated for supporting businesses such as catering companies, industrial suppliers and surveyors. Dezé says there would be nearly 250 induced jobs as well, all created within the NWT (PR#74 pES8).

During the hearing, the North Slave Métis Alliance made a presentation stating that it currently benefits economically from trucking to the diamond mines, and if these trucks are no longer necessary due to the availability of hydroelectric power, it could lose revenue. The North Slave Métis Alliance was also concerned that it had not been consulted, and that Dezé's heritage resource assessment did not adequately examine Métis heritage. (PR#209 p251)

At the hearing Dezé emphasized the project in a positive light for the people of the Northwest Territories. The project model is declared to be a “blueprint for future projects in the North” (PR#21 p. 298). Dan Grabke, Dezé’s managing director, stated that the partnership model allows all northerners, including First Nations and Métis, to share in the economic benefits and also allows them to have a say in how the project is developed and how the business is run (PR#210 p.298). He stated “we believe it is unprecedented, in that the economic returns of this project will flow to and stay in our communities.”

Don Balsillie, Dezé chairman, described, with great passion and conviction, the socio-economic context for the project in terms of past development and the South Slave region communities involved in the proposed project. Balsillie identified that the Pine Point mine left environmental and social impacts without benefits, that timber harvesting, the railroad and fishery have left few lasting community benefits. While other regions enjoy opportunities such as the mines in the North Slave and Tlicho regions, and communities along the Mackenzie River expect socio-economic benefits from oil and gas exploration and development, the South Slave region has few opportunities for economic development. In Balsillie’s words: “For too long... in this part of the world we have been marginalized, left on the sidelines, looking through the window of development projects where we said later that we should have, could have been a part of it” (PR#201 p308).

Balsillie told the Review Board how this has led to out-migration from the area, stating that 12 to 15 percent of people are “forced to leave their homeland to look for work elsewhere because there’s no development” (PR#210 P. 311). Balsillie makes reference of the benefits of the proposed project to the young people of the area, “especially the ones going to school and wanting to get an education, there’s going to be long term employment...” (PR#210 p.142).

3.6.5.2 Review Board analysis and conclusions

The Review Board recognizes that there are serious legacy issues, but that they all relate to an historical project by a different developer. What Dezé has proposed is a different project with different predicted impacts. The proposed project does not involve flooding any new areas or relocating any people. The Review Board is charged with assessing the proposed project, and has no role in making decisions about impacts or related compensation from historical developments.

Regarding potential impacts on Nonacho Lake Fishing Camp, the board notes that many of the concerns raised by the Carters have been addressed in other sections of this document. Potential impacts of drawdowns and increased mercury levels on fish in Nonacho Lake have been discussed in Section 3.4.2 and 3.4.3. In Section 3.1.1.6 the Review Board has required mitigation to limit any increase in public access using gates during the hauling seasons and berms after the hauling season. These mitigations partially address the security issue raised by the Carter family. With the mitigations in place, members of the public would have to ride 200 kilometres each way by snowmobile. The Review Board notes that Dezé has offered to have an employee stay at the camp in winter, and that the Carter family has declined the offer (PR#242 p4). The Review Board does not view security issues related to access as a likely significant socio-economic impact.

With respect to reduced wilderness values at Nonacho Lake Fishing Camp, the Review Board recognizes that no disturbance is likely during the operational phase, and most of the construction work at Nonacho Lake will be done over a single fifteen month span (PR#74 p6.5.50). The Board notes that Carters have identified the area near the existing dam as “one of the best fishing areas on Nonacho Lake” (PR#209 p53), despite its proximity to industrial infrastructure. With the mitigations to access, the

lake remains a fly-in only destination for the public. With respect to disturbance from construction, the developer has committed to “as little interruption as possible” and has committed to take “every measure possible” to compensate those adversely affected by the development (PR#210 p313). Specifically, with respect to the Nonacho Lake Fishing Camp, Dezé stated during the hearing that “if there is ongoing concern with what is happening with Dezé, we're open to much more dialogue... to ensure and give you comfort that we'll take every means possible to try and minimize any impacts that may be felt by your family in this particular regard” (PR#209 p62). In the Board’s view, its measures related to access, in combination with the short duration of the disturbance and Dezé’s commitments, will help reduce the potential significance of the impacts on wilderness values and reduce any socio-economic effects that may occur due to disturbance from construction of the control structure.

The Review Board accepts Dezé’s evidence regarding the overall socio-economic benefits of the proposed project. Northern ownership will be a direct economical benefit for the Aboriginal groups involved. Employment during the construction period is considerable, in an area without many other major economic development projects. Any extension to the life of the existing diamond mines also extends economic benefits, both directly and for related businesses, such as trucking. The Review Board agrees that the overall socio-economic impacts of the proposed project are likely to be beneficial.

3.7 Sustainability

Consideration of sustainability was included in the Terms of Reference for this EA, which included the following regarding sustainable development considerations (PR#56 p34):

The Review Board’s understanding of sustainable development is framed by the MVRMA’s Section 115 Guiding Principles to have regard to the protection of the social, cultural and economic well-being of residents and communities in the Mackenzie Valley, the importance of conservation to the well-being and way of life of the Aboriginal peoples of Canada and the capacity of renewable resources to meet future needs...

The proposed development’s contribution to sustainability and effects on future generations must be evaluated on the basis of:

- *the extent to which it makes a positive overall contribution towards environmental, social, cultural and economic elements of sustainability;*
- *how the planning and design takes into account the desire to contribute to sustainable development;*
- *how monitoring, management and reporting systems have incorporated indicators of sustainability; and*
- *the views of stakeholders and participants in the environmental assessment about whether the development promotes or threatens the pursuit of sustainable development.*

The Review Board’s consideration of the overall sustainability of the project includes a consideration of the project’s capacity to meet current needs while still meeting the needs of future generations, the efficiency of the use of resources, and the overall desirability of the project from a long-term perspective considering the land and people. Cultural issues have been examined, in the context of

potential impacts with consideration to future generations, in Section 3.6.3.5 and Section 3.6.4.1 above. This section considers the outcome, but focuses primarily on sustainability from ecological and socio-economic perspectives.

Regarding ecological effects, the Board notes that the hydroelectric generation harnessed by the proposed development largely exists already because of a past development. The existing reservoir is a result of the Twin Gorges Dam, built to provide electricity to the Pine Point Mine in 1964. It required considerable flooding both upstream of the dam and in Nonacho Lake. Numerous parties have raised the legacy issue of the biophysical, social and cultural impacts that occurred when the Twin Gorges facility was built. The mine closed in 1986, and the reservoir remains.

The present project proposes to use the existing reservoir, harnessing the untapped and underutilized hydrological potential that remains in the reservoir at Nonacho Lake from the existing Twin Gorges project. This effectively allows Dezé to create new benefits from the past without causing the impacts that were involved in the original Twin Gorges project. Several parties have indicated that the historical impacts from the past project were major.¹ In the Review Board's opinion, the present project provides additional benefit from the historical changes that caused those impacts. With the measures identified in this report, the project will do so without causing significant additional impacts. Using the existing infrastructure of a historical project to produce something valuable is a generally sustainable approach to development.

If this project provides affordable reliable power to the diamond mines, it is likely to improve their long-term economic viability. As Dezé notes in its DAR, with less expensive power, extending the life of the diamond mines is financially feasible (PR#74 p5.3.3.2). Ekati and Diavik's initial years of peak profitability are behind them. Ekati is now doing underground mining and Diavik is exploring underwater mining. With cheaper power than that provided by burning diesel fuel, the longevity of these mines could likely be extended. The biophysical impacts from the construction phase make possible the socio-economic benefits that result from the operation phase. Extending the lifespan of the mines maximizes these benefits.

In the Review Board's opinion, it is reasonable to expect that reduced power cost improves mine economics, extends the period for which the mines are viable, and effectively provides more benefits from the same construction impacts. By using a renewable resource (hydroelectric power) to extend the socio-economic benefits from the existing development of a non-renewable resource (the diamond mines), this project increases the overall sustainability of those projects as well.

The Board notes that Dezé has considered the economics of the project over the long-term. Dezé states that the proposed generation plant and transmission line would have life spans "far in excess of the current diamond mine operational lives as estimated by their owners" (PR#74 p5.6). In addition to potentially extending the lifespans of the diamond mines, Dezé notes that when these close, the project presents the potential to provide power to Yellowknife or southern customers, subject to market conditions. The Review Board notes that the proposed Avalon Rare Metals Nechalacho Rare Earth Elements project has energy requirements that have the potential to extend beyond the existing

¹ See the discussion of legacy issues in Section 3.6.5 for details.

diamond mines (PR#263). The Review Board recognizes that future options such as these are long-term considerations for project economics.

The *Mackenzie Valley Resource Management Act* requires the Review Board to “have regard to the protection of the social, cultural and economic well-being of residents and communities in the Mackenzie Valley” (subsection 115(b)). When considering this over the long term, this includes consideration of social sustainability issues.

The proposed development is the first majority Aboriginal-owned project of this scale in the Mackenzie Valley. The communities that are most directly involved in this include South Slave communities. These have not had the same opportunities for economic growth as North Slave communities have had from the diamond industry. An important purpose of the project is to provide Aboriginal communities with the benefit of local ownership of a long-term venture. In the Review Board’s view, assuming that Dezé’s financial assessment results are correct (PR#74 p5.11), this is an opportunity to give Aboriginal groups in the South Slave region the opportunity for wise long-term investment towards sustainable social benefits.

The Review Board also recognizes that the ownership of this project will keep much of the revenue in the affected area. Many major projects in the Northwest Territories use Northern resources but most of the revenue flows elsewhere. In the Review Board’s opinion, from an economic sustainability perspective, it is desirable for a project that relies on Northern resources to keep most of the revenue in the North, as the proposed project likely will.

The Review Board notes that this is the biggest economic development project in the NWT to be based on renewable resources. In a region where the major industries are largely based on mining non-renewable resources, this is significant from a sustainability perspective.

In terms of biophysical impacts, Section 3.5.1.2 of this report has described the Board’s conclusions regarding greenhouse gases. The impacts of climate change are expected to be greater in the North than in the rest of Canada. This project provides an important opportunity to substantially reduce the greenhouse gas emissions of the largest industrial developments in the NWT. Because climate trends have the potential to adversely affect many of the things that communities care most about, this is an important contribution of the project. Overall, this project increases the ecological sustainability of the NWT’s industrial development from the perspective of greenhouse gases.

To summarize the Review Board’s views regarding the sustainability of this project, the Review Board concludes that it:

- puts the existing infrastructure of past projects to efficient use in using the existing hydraulic potential created at Nonacho Lake for the Pine Point Mine;
- extends the benefits and long-term economic viability of the diamond mines while at the same time reducing their overall greenhouse gas emissions by replacing the use of fossil fuels;
- introduces a major renewable resource project in the NWT where the economy is based largely on non-renewable resources and on government transfer payments; and,
- provides opportunities to introduce sustainable economic benefits to the South Slave region that has had few benefits from past economic development.

Based on these considerations, and assuming that all the measures identified in this report are undertaken, the Review Board concludes that this is highly sustainable. In the Review Board's opinion, it is likely to lead to improved social and economic benefits while reducing the ecological impacts of the biggest industrial developments in the NWT.

4 Public concern

Subsection 128(1)(c) requires the Review Board to determine whether the proposed development is likely to be cause of significant public concern. In past environmental assessments, the Review Board has used various criteria to gauge the level of public concern, including how many people have expressed concern, how geographically widespread the concern is, and how directly the concern relates to the development activities proposed.

The Review Board notes that most of the communities directly involved with the proposed project are supportive of it, and much of the public concern has been expressed by one community. The Review Board further notes that most of the expressed public concerns relate to the particulars of the East Arm route and not to the project in general.

In the Review Board's opinion, the primary concerns voiced in this environmental assessment pertained to the subjects discussed in detail in Section 3.6. In many cases, these were serious concerns from the perspective of the people or organizations that expressed them. In the Review Board's view, these concerns all related to potentially significant impacts. For example, the Review Board accepts the evidence from Łutsël K'e and has concluded that the project, as proposed, is likely to result in significant adverse cultural impacts. The measures described in this report have mitigated any impacts that were potentially significant from the Review Board's perspective. The Review Board is of the opinion that by mitigating the underlying impacts, it had adequately addressed the public concerns that are based on those impacts.

5 Assessment decision

Having reviewed the relevant evidence and keeping to the discussion in Sections 3 and 4, the Review Board makes the following determinations:

- The project is likely to increase caribou mortality by increasing hunting access via winter roads. In the current vulnerable state of caribou populations, this is a significant impact. The Board has prescribed mitigations which will physically limit access to winter roads during and after each hauling season.¹
- The project is not likely to cause significant adverse impacts on fish from fluctuations in water levels in Nonacho Lake, nor from flow changes at the Tronka Chua gap, provided that DFO, when carrying out its regulatory duties, considers the results of the studies proposed by Dezé.²
- The ramping predicted by Dezé is likely to cause significant adverse impacts to wetlands, furbearers, fish and waterfowl in the Trudel Creek river system. This is due to relatively sudden hydrological changes in flow rates and water levels that vary considerably in magnitude and season from baseline and natural conditions. These events are likely to result from infrequent total outages and from more numerous partial outages, as well as from routine annual turbine maintenance. The Board has prescribed a measure that requires Dezé to increase bypass capacity at Twin Gorges, and to create adaptive management plans that include monitoring of waterfowl, furbearers and wetland re-establishment in the Trudel Creek river system.³
- Greenhouse gas emissions from the diamond mines, the biggest industrial developments in the NWT and the intended customers for this power from this expansion project, are likely to be substantially reduced by this project. This is likely a significant beneficial impact of the project.⁴
- The project as proposed crosses the Lockhart River, which is of the utmost spiritual importance to the people of Łutsël K'e. This is likely to cause significant cultural impacts. The Review Board has prescribed a measure preventing the transmission line from crossing the Lockhart River.⁵
- With respect to the proposed East Arm National Park, the developer has identified various types of mitigations to reduce visual impacts and reduce impacts to wilderness values in the area. The Review Board has considered issues related to the proposed park and to property owners in the area. It has prescribed a measure requiring the creation of an advisory routing committee to identify areas of local sensitivity and to advise Dezé on mitigative options such as pole design and route configuration.⁶
- In terms of socio-economic impacts, the impacts on the Nonacho Lake Fishing Camp are largely addressed by the developer's commitments and by the Review Board's other measures. The Review Board accepts Dezé's evidence that the project is likely to cause significant large-scale socio-economic benefits for Aboriginal communities in the South Slave, Akaitcho First Nations and NWT Métis Nation, and for the NWT as a whole.⁷

¹ See Section 3.1.1.6 for details.

² See Section 3.4.2 for details.

³ See Section 3.3.2.8 for details.

⁴ See Section 3.5 for details.

⁵ See Section 3.6.4 for details.

⁶ See Section 3.6.4.2 for details.

⁷ See Section 3.6.5 for details.

- From a sustainability perspective, the proposed project harnesses existing infrastructure, and is likely to extend the benefits of major non-renewable resource developments. This project introduces a major renewable resource project in a region with an economy based largely on non-renewable resources. The Review Board concludes that this is highly sustainable. It is likely to lead to improved social and economic benefits while reducing the ecological impacts of the biggest industrial developments in the NWT.¹

Throughout this environmental assessment, the Review Board collected and evaluated information from the developer, Aboriginal land users, traditional knowledge holders, and technical experts from government and communities.

Based on these considerations and considering commitments of the developer, the Review Board concludes that the Taltson Hydroelectric Expansion project, as proposed, is likely to be a cause of significant adverse environmental impacts under subsection 128(1)(b) of the Act. The Review Board recommends project approval subject to the measures described in this report.² In the Review Board's opinion, these measures will prevent the significant adverse impacts identified, without sacrificing the considerable ecological, social and economic benefits of this sustainable project.

¹ See Section 3.7 for details.

² These are listed in Appendix A.

Appendix A: Summary of measures and suggestions

The following is a summary of the Review Board's measures and suggestions. Each is followed by a reference to the relevant this report.

Measure 1

To prevent significant adverse impacts on caribou from increased hunting access, Dezé will put a gate at the Slave River end of the proposed winter road. This gate should use natural features to prevent circumvention if possible. It is preferable for this gate to be staffed. If Dezé is unable to obtain a lease for this purpose, then INAC, the GNWT and Dezé will collaborate to find another means to allow a gate at this location. (Section 3.1.1.6)

Measure 2

To prevent significant adverse impacts on caribou from increased hunting access, if Dezé is not permitted to block the road on Crown land at the end of each hauling season as proposed, Dezé will block the ice road on the Slave River using snow berms at the end of each hauling season. (Section 3.1.1.6)

Measure 3

In order to reduce or prevent significant adverse impacts from ramping to the valued ecological components of the Trudel Creek river system, the developer will:

- i. produce an adaptive management plan that includes monitoring the impacts of changes in water flows on waterfowl, furbearers and wetland re-establishment and regularly report these results and management actions taken to the regulatory authorities; and,
- ii. ensure that the proposed project has additional bypass capacity at the Twin Gorges Facility beyond what is proposed.

(Section 3.3.2.8)

Measure 4

In order to prevent a significant cultural impact on LKDFN from a diminished cultural value of the Old Lady of the Falls sacred site due to the presence of industrial development, the transmission line will not cross the Lockhart River at any point, from the river mouth at Fort Reliance, including the spiritual gathering site to Artillery Lake. (Section 3.6.4.1)

Measure 5

In order to mitigate significant adverse impacts related to routing details, Dezé will create an advisory routing committee to identify specific areas of heritage resources and other local sensitivities that should be avoided by careful routing of the transmission line. This committee will also provide input on other mitigative options such as pole design, height and configurations. (Section 3.6.4.2)

Suggestion 1

The GNWT should maintain a staffed check station on the proposed winter road at the Slave River to monitor harvest and road activity for purposes other than project construction. If results of this check station indicate any harvest of caribou cows, the GNWT and Dezé should identify and implement additional physical measures to prevent increased hunting access. (Section 3.1.1.6)

Suggestion 2

Dezé should examine the literature regarding transmission lines in the vicinity of barren ground caribou to determine if certain tower design features are preferable. If so, Dézé should incorporate these features in its project design to the extent feasible. (Section 3.2.2)

Suggestion 3

The Board encourages Dézé to conduct its monitoring in a manner that complements other efforts to study the Bathurst, Ahlak and Beverly herds where feasible, provided that this does not compromise Dézé's own monitoring objectives. (Section 3.2.2)

Suggestion 4

If the transmission line is routed close to Trophy Lodge or figures prominently within its viewshed, Dézé is encouraged to discuss potential mitigations with the owners of Trophy Lodge. (Section 3.6.4.2)

Appendix B: List of Public Registry documents

This appendix contains a list of documents and corresponding Public Registry documents. Physical copies of these documents are available at the Review Board office. With few exceptions, these documents may be viewed online at the Review Board website (www.reviewboard.ca).

The following initials are used in this appendix:

AD	Athabasca Denesuline
AEMP	Aquatic Effects Monitoring Program
BQCMB	Beverly and Qaminarjuak Caribou Management Board
DFO	Fisheries and Oceans Canada
DKFN	Deninu Kue First Nation
DRRC	Deline Renewable Resources Council
EA	Environmental Assessment
EC	Environment Canada
EMP	Environmental Monitoring Program
ENR	Environment and Natural Resources
GNWT	Government of the Northwest Territories
INAC	Indian and Northern Affairs Canada
IR	Information Request
LKDFN	łutsël K'e Dene First Nation
LUP	Land Use Plan
MVEIRB	Mackenzie Valley Environmental Impact Review Board
MVLWB	Mackenzie Valley Land and Water Board
NRCan	Natural Resources Canada
NSMA	North Slave Métis Alliance
NTEC	NWT Energy Corporation
NTMN	Northwest Territory Métis Nation
NTPC	NWT Power Corporation
PC	Parks Canada
T8TC	Treaty 8 Tribal Corporation
TC	Transport Canada
ToR	Terms of Reference

PR Item #	Document Name	Date Received	Originator
1	EA Referral by MVLWB for Dezé	17-Oct-07	MVLWB
2	Preliminary Screening Report Form and Reasons for Decision	17-Oct-07	MVLWB
3	MVEIRB Notification of Referral to Dezé	17-Oct-07	MVEIRB
4	Notice of EA Media Advertisement	1-Jan-99	MVEIRB
5	Canoe News Canada web page media release	26-Aug-07	Canoe News
6	Distribution list - Taltson Hydro Expansion Project	17-Oct-07	MVEIRB
7	Project Description - Taltson Hydro Expansion Project	1-Mar-07	Dezé
8	DKFN letter to MVLWB re: Dezé	19-Jul-07	DKFN
9	Notification of Community and Technical Scoping Sessions	21-Nov-07	MVEIRB
10	Issues Scoping Session Pamphlet	26-Nov-07	MVEIRB
11	Issues Scoping Session Pamphlet	26-Nov-07	MVEIRB
12	Technical Scoping Workshop	27-Nov-07	MVEIRB
13	Letter from Parks Canada to MVEIRB re: Scoping	2-Jan-08	PC
14	Note to File - Meeting with Dezé	4-Feb-08	MVEIRB
15	Report on Community and Technical Scoping Sessions	6-Feb-08	MVEIRB
16	Letter from Barbara Beck to MVEIRB - Rocher River	2-Nov-07	Barbara Beck
17	Compilation of Reviewer Comments from MVLWB Preliminary Screening	17-Sep-07	MVLWB
18	Dezé Preliminary Screening Responses	12-Oct-07	Dezé
19	Dezé Presentation - Project Description for YK Community Scoping Session	7-Dec-07	Dezé
20	Dezé Presentation - Project and Environmental Overview for Technical Scoping Session	7-Dec-07	Dezé
21	Letter from LKDFN to MVEIRB - Scoping Session	6-Feb-08	LKDFN
22	Consultant Contact Information for Dezé	11-Dec-07	Dezé
23	Summary of Community Project Information Sessions conducted by NTEC	5-Jun-07	NTEC
24	Dezé Consultation History and Plan	1-May-07	Dezé
25	Dezé LUP Application to MVLWB	6-Jun-07	Dezé
26	Taltson Hydro Expansion Project Baseline Report - 2003	8-Feb-08	Rescan
27	Autumn and Early Winter Wildlife Surveys - Taltson Expansion Project	8-Feb-08	Golder/NTPC
28	Wildlife and Wildlife Habitat Studies - Taltson Expansion Project	8-Feb-08	Golder/NTEC
29	Dezé Response to Public Comments - LUP Application	8-Feb-08	Dezé
30	Trudel Creek Minimum Flow Interim Report - Draft	8-Feb-08	Dezé
31	Letter from Golder to Dezé - Impacts to Rare Plants	8-Feb-08	Golder
32	Trudel Creek: Spring Low Flow Fisheries Assessment Data Report	8-Feb-08	NTPC
33	Cover letter - Supporting Documents for LUP Application	6-Jun-07	Dezé
34	Cover Letter - Response to Public Comments LUP and Water License Applications	8-Feb-08	Dezé
35	Letter from Łutsël K'e Dene First Nation - Cancellation of Scoping Session	11-Feb-08	LKDFN
36	Note to File - MVEIRB Meeting with Dezé	12-Feb-08	MVEIRB

PR Item #	Document Name	Date Received	Originator
37	DKFN Scoping Session Presentation	29-Nov-07	DKFN
38	MVEIRB Taltson Hydro Expansion Project EA Work Plan	20-Feb-08	MVEIRB
39	MVEIRB Draft ToR - Taltson Hydro Expansion Project DAR	20-Feb-08	MVEIRB
40	Note - Audio Recording of Community Scoping Session in Fort Smith	8-Feb-08	MVEIRB
41	Comment on Draft ToR from Ronnie and William Schaefer	21-Feb-08	R. and W. Schaefer
42	Note to File - February 22, 2008 Meeting with Dezé and MVLWB Reps.	22-Feb-08	MVEIRB
43	Notification Letter - <i>Species at Risk Act</i>	3-Mar-08	MVEIRB
44	GNWT Comments on Draft ToR and Work Plan	12-Mar-08	GNWT
45	Comments on Draft ToR and Work Plan from INAC	12-Mar-08	INAC
46	LKDFN Comments on Taltson Draft ToR and Work Plan	12-Mar-08	LKDFN
47	NSMA comments on Taltson Draft ToR and Work Plan	13-Mar-08	NSMA
48	NTMN comments on Taltson Draft ToR and Work Plan	12-Mar-08	NTMN
49	Dezé Gantt Chart for Taltson Project	13-Mar-08	Dezé
50	Dezé Comments on Taltson Draft ToR and Work Plan	12-Mar-08	Dezé
51	DFO Comments on Taltson Draft ToR and Work Plan	12-Mar-08	DFO
52	ADNT Comments on Taltson ToR	17-Mar-08	ADNT
53	Transport Canada Comments on Draft ToR and Work Plan	17-Mar-08	TC
54	Response from Environment Canada regarding SARA Notification	19-Mar-08	EC
55	MVEIRB letter to Dezé regarding ToR and Work Plan	28-Mar-08	MVEIRB
56	Final Terms of Reference for Taltson Expansion Project EA	28-Mar-08	MVEIRB
57	Final Work Plan for Taltson Expansion Project EA	28-Mar-08	MVEIRB
58	Summary of Łutsël K'e Scoping Session	28-Mar-08	MVEIRB
59	Letter from LKDFN to NTMN	1-Apr-08	LKDFN
60	Note to File - April 3, 2008 Meeting between MVEIRB, Dezé and Golder	3-Apr-08	MVEIRB
61	Correspondence between MVLWB and Terra-Firma Consultants	24-Apr-08	MVLWB
62	Note to File - May 30, 2008 Meeting with Dezé	30-May-08	MVEIRB
63	MSES Team CVs	18-Jun-08	MSES
64	SENES Team CVs	18-Jun-08	SENES
65	Notification of Disclosure of Experts	18-Jun-08	MVEIRB
66	Note to File - Site Visit	20-Jun-08	MVEIRB
67	Note to File - Engagement of Experts	3-Jul-08	MVEIRB
68	Note to File - September 15, 2008 Meeting with Dezé	1-Oct-08	MVEIRB
69	Letter to MVEIRB from Dezé - DAR Update	10-Oct-08	Dezé
70	Letter to MVEIRB from Dezé - Construction Methods Update	4-Nov-08	Dezé
71	Letter from Dezé to MVEIRB regarding DAR Submission Delay	28-Nov-08	Dezé
72	Note to File - February 25, 2009 Meeting with Dezé	25-Feb-09	MVEIRB
73	MVEIRB Notice of Conformity of DAR	25-Mar-09	MVEIRB
74	MVEIRB Notice of Receipt of DAR & Appendices	2-Mar-09	MVEIRB
75	Letter from MVEIRB - Next steps and work planning	28-Apr-09	MVEIRB

PR Item #	Document Name	Date Received	Originator
76	MVEIRB Workplan with updated timeline	28-Apr-09	MVEIRB
77	Letter from MVEIRB - Invitation to Technical Session	13-May-09	MVEIRB
78	Note to File - Phone Call from Don Jaque	22-May-09	MVEIRB
79	Letter from MVEIRB - Party Status	26-May-09	MVEIRB
80	Note to File - Requests for IR Deadline Extension	2-Jun-09	MVEIRB
81	Note to File - Baseline Water Data	5-Jun-09	MVEIRB
82	Letter from Dezé to MVEIRB - Park Boundaries	5-Jun-09	Dezé
83	Note to File - Clarification	9-Jun-09	MVEIRB
84	Letter from Dezé - DAR Clarification	12-Jun-09	Dezé
85	Letter from MVEIRB - Extension for IR Period & Requests for Party Status	25-Jun-09	MVEIRB
86	Flood Frequency Analysis for the Snare and Taltson Systems	18-Jun-09	NTPC/Dillon
87	Email from EC to Dezé - Potential for Acid Rock	12-Jul-09	EC
88	Email from DFO to Dezé - Usable Habitat	12-Jul-09	DFO
89	Email from EC to MVEIRB - Jet fuel	12-Jul-09	EC
90	IR Submission from DKFN	11-Jun-09	DKFN
91	IR Submission from NRCan	11-Jun-09	NRCan
92	IR Submission from Transport Canada	15-Jul-09	TC
93	IR Submission from EC	15-Jul-09	EC
94	IR Submission from GNWT	15-Jul-09	GNWT
95	IR Submission from DFO - Cover Letter	15-Jul-09	DFO
96	IR Submission from DFO	15-Jul-09	DFO
97	IR Submission from NSMA No.1	15-Jul-09	NSMA
98	IR Submission from NSMA No.2	15-Jul-09	NSMA
99	IR Submission from NSMA No.3	15-Jul-09	NSMA
100	IR Submission from NSMA No.4	15-Jul-09	NSMA
101	Responses from Dezé Energy to INAC	15-Jul-09	Dezé
102	Responses from Dezé Energy to INAC	15-Jul-09	INAC
103	IR Submission from INAC	11-Jun-09	INAC
104	Note to File - July 29, 2009 Meeting with Dezé	30-Jul-09	MVEIRB
105	Note to File - August 5, 2009 Meeting with Dezé	5-Aug-09	MVEIRB
106	Email from MVEIRB to LKDFN, T8TC - Requests for Extension	11-Aug-09	MVEIRB
107	Letter to Ft. Resolution, LKDFN, T8TC - Information Session in Łutsël K'e	11-Aug-09	MVEIRB
108	Letter from T8TC to MVEIRB re: IR Submission	17-Aug-09	T8TC
109	Email from LKDFN to MVEIRB re: Possible Information Session	26-Aug-09	LKDFN
110	Revised Workplan (updated schedule)	3-Sep-09	MVEIRB
111	Letter re: October Technical Session	10-Sep-09	MVEIRB
112	Draft Agenda for Technical Session	10-Sep-09	MVEIRB
113	Letter from MVEIRB re: Community meeting in Łutsël K'e	23-Sep-09	MVEIRB
114	Letter - Upcoming Yellowknife Technical Session	28-Sep-09	MVEIRB
115	IR Submission	28-Sep-09	NSMA

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116	Transcripts - Łutsël K'e Technical Session September 29, 2009	1-Oct-09	MVEIRB
117	Transcripts - Yellowknife Technical Session Day 1 - October 1, 2009	2-Oct-09	MVEIRB
118	Transcripts - Yellowknife Technical session Day 2 - October 2, 2009	2-Oct-09	MVEIRB
119	Template for Meeting Report	5-Oct-09	MVEIRB
120	Transcripts - Yellowknife Technical Session Day 3 - October 5, 2009	6-Oct-09	MVEIRB
121	Meeting Report with EC, ENR and Dezé - Incinerators	30-Oct-09	EC/ENR/Dezé
122	Meeting Report with DFO and Dezé - Weighted Habitat Exceedance Curves	30-Oct-09	DFO/Dezé
123	Meeting Report with DFO and Dezé - Entrainment	30-Oct-09	DFO/Dezé
124	Meeting Report with DFO and Dezé - Fish Stranding during Ramping Events	30-Oct-09	DFO/Dezé
125	Meeting Report with DFO and Dezé - Flow effects on water temperature	30-Oct-09	DFO/Dezé
126	Commitments from Dezé	2-Nov-09	Dezé
127	Appendix Commitment 10	30-Oct-09	DFO
128	Appendix to commitments 21 & 27	30-Oct-09	Cambria Gordon
129	Appendix to commitments 26 & 33	30-Oct-09	NTPC
130	Appendix to commitment to 26 & 33	30-Oct-09	NTPC
131	Appendix to commitment 28	30-Oct-09	DFO
132	Appendix to commitment 31 & 32	30-Oct-09	Rescan
133	Appendix to commitments 45 & 46	30-Oct-09	Dezé
134	Appendix to commitments 45 & 46	30-Oct-09	Dezé
135	Appendix to commitments 64	30-Oct-09	Dezé
136	Draft EMP	30-Oct-09	Dezé
137	Letter from MVEIRB - Comments on the Draft EMP	6-Nov-09	MVEIRB
138	Letter from MVEIRB - Upcoming activities	6-Nov-09	MVEIRB
139	DFO comments on Draft EMP	30-Nov-09	DFO
140	Meeting Report between Dezé and Parks Canada	30-Nov-09	PC/Dezé
141	Parks Canada comments on the Draft EMP	30-Nov-09	PC
142	Meeting Report between ENR and Dezé	30-Nov-09	ENR/Dezé
143	Email from LKDFN to MVEIRB - Hearings and Travel Assistance	2-Dec-09	LKDFN
144	Letter from MVEIRB - Pre-Hearing Conference	8-Dec-09	MVEIRB
145	Notice of Public Hearing	7-Dec-09	MVEIRB
146	Comments from INAC on Draft EMP	7-Dec-09	INAC
147	Email from DKFN - Travel Assistance	9-Dec-09	DKFN
148	Plain Language Summary of Aquatic Effects Monitoring Program Guidelines	7-Dec-09	INAC
149	AEMP Guidelines - Vol. 1	7-Dec-09	INAC
150	AEMP Guidelines - Vol. 4	7-Dec-09	INAC
151	AEMP Guidelines - Vol. 5	7-Dec-09	INAC
152	AEMP Guidelines - Vol. 6	7-Dec-09	INAC
153	AEMP Guidelines - Vol. 2	7-Dec-09	INAC
154	AEMP Guidelines - Vol. 3	7-Dec-09	INAC
155	Overview Report of AEMP Guidelines	7-Dec-09	INAC

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156	Letter from ML&T Lawyers - Carter Family Representative	10-Dec-09	ML&T Lawyers
157	Letter from ML&T Lawyers - Carter Family Party Status	11-Dec-09	ML&T Lawyers
158	Cover Letter for DFO Final Submission	11-Dec-09	DFO
159	DFO Final Submission Technical Review Comments	11-Dec-09	DFO
160	Submission from DFO on Adaptive Management Plan Requirements	11-Dec-09	DFO
161	EC Final Submission Technical Report	11-Dec-09	EC
162	Technical Document on Batch Waste Incineration	11-Dec-09	EC
163	INAC Final Submission Technical Report	11-Dec-09	INAC
164	Cover Letter for Technical Report from INAC	11-Dec-09	INAC
165	INAC E-mail Confirmation - Technical Report	11-Dec-09	INAC
166	Parks Canada Final Submission Technical Report	11-Dec-09	Parks Canada
167	Cover Letter from Parks Canada for Final Technical Report	11-Dec-09	Parks Canada
168	GNWT Final Submission Presentation	11-Dec-09	GNWT
169	LKDFN Final Submission	11-Dec-09	LKDFN
170	Supporting documents - LKDFN Submission	11-Dec-09	LKDFN
171	Letter of Support to Dezé from DKFN	15-Dec-09	DKFN
172	Letter from MVEIRB to GNWT - Information on Caribou	18-Dec-09	MVEIRB
173	Email - Carter family Party Status approval	21-Dec-09	MVEIRB
174	Updated IR #50	22-Dec-09	Dezé
175	Pre-hearing Conference - December 15, 2009 Meetings Notes	22-Dec-09	MVEIRB
176	Draft Agenda for Taltson EA Public Hearing - Dettah	24-Dec-09	MVEIRB
177	Deline Renewable Resources Council. Caribou Protection Measures Pilot	23-Dec-09	DRRC
178	Email - Participant Funding for Public Hearing	29-Dec-09	MVEIRB
179	Email - Letter of Concern from Charles Allooloo Brintnell	5-Jan-10	Charles Allooloo
180	Email - Letter of Concern from Francois Paulette	6-Jan-10	Francois Paulette
181	Presentation from Parks Canada	7-Jan-10	Parks Canada
182	Presentation from INAC	10-Jan-10	INAC
183	E-mail- Letter of Concern from Mary Rose Casaway	8-Jan-10	Mary Rose Casaway
184	Presentation from DFO	7-Jan-10	DFO
185	Presentation from EC	7-Jan-10	EC
186	E-mail - Letter of Concern from JW Poole	7-Jan-10	JW Poole
187	Hearing Agenda for Dezé Public Hearing - Dettah	8-Jan-10	MVEIRB
188	E-mail - Letter of Concern from Bryan Sutherland	8-Jan-10	Bryan Sutherland
189	E-mail - Letter of Concern from Elsie Casaway	9-Jan-10	Elsie Casaway
190	Letter from NRCan to MVEIRB - Additional information	21-Dec-09	NRCan
191	Letter of Concern from Dr. Ellen Bielawski	12-Jan-10	Dr. Ellen Bielawski
192	Presentation from TC	12-Jan-10	TC
193	Presentation from DKFN	12-Jan-10	DKFN
194	E-mail - Letter of Concern and History from Carter Family	12-Jan-10	Jean Carter
195	Alternatives Assessment Submission from Steve Ellis	12-Jan-10	Steve Ellis

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196	Meeting Report between Dezé and EC	12-Jan-10	EC/Dezé
197	Clarification from INAC in LKDFN Technical Report	12-Jan-10	INAC
198	E-mail - Letter of Concern from Captain Gold, Haida Nation, BC	9-Jan-10	Cpt. Gold
199	E-mail - Letter of Concern from Dr. Phil Lyver	11-Jan-10	Dr. Phil Lyver
200	Presentation from Carter family	12-Jan-10	Carter family
201	E-mail - Letter of Concern from Jennifer Jonasson	13-Jan-10	Jennier Jonasson
202	Presentation from LKDFN	13-Jan-10	LKDFN
203	Letter from NRCan	13-Jan-10	NRCan
204	Presentation from Fort Resolution Métis Council	12-Jan-10	FRMC
205	Presentation from GNWT	2-Jan-10	GNWT
206	Business, Employment and Training Policy Framework - Dezé	13-Jan-10	Dezé
207	Letter from GNWT to MVEIRB - Caribou Issues	13-Jan-10	GNWT
208	Shuttle Service Schedule for Hearing - Dettah	13-Jan-10	MVEIRB
209	Transcripts - Public Hearing Jan 14, 2010	18-Jan-10	MVEIRB
210	Public Hearing Transcripts for Jan 15, 2010	18-Jan-10	MVEIRB
211	Updated Presentation from Dezé	18-Jan-10	Dezé
212	Letter from DKFN to MVEIRB	6-Jan-10	DKFN
213	Information Request to GNWT from MVEIRB - Presentation on Caribou	21-Jan-10	MVEIRB
214	Compendium of Physical Access Control Measures	22-Jan-10	Dezé
215	BQCMB Backgrounder- Beverly Herd	27-Jan-10	BQCMB
216	BQCMB July 2009 News Release - Beverly Herd	27-Jan-10	BQCMB
217	GNWT Response to Caribou IR of Jan 21, 2010	27-Jan-10	GNWT
218	GNWT Caribou Presentation	27-Jan-10	GNWT
219	Technical Evaluation on Bathurst Caribou herd decline	27-Jan-10	GNWT
220	Comments from students in Łutsël K'e to Chief Nitah	13-Jan-10	Chief Nitah
221	October 2009 Caribou Workshop Report	27-Jan-10	GNWT
222	Additional Letters from Łutsël K'e Students to Chief Nitah	13-Jan-10	Chief Nitah
223	Updated Submission from Gordon Van Tighem	20-Jan-10	Gordon Van Tighem
224	Comments from Dr. Anne Kendrick	16-Jan-10	Dr. Anne Kendrick
225	Alternate Routes - Final Report - Transmission Alternatives Study	27-Jan-10	Dezé
226	Alternate Routes - DAR Chapter 8: Alternatives	27-Jan-10	Dezé
227	Alternate Routes - Transmission Alternatives Study - Executive Summary	27-Jan-10	Dezé
228	Alternate Routes - Taltson to Snap Lake Power Transmission via Great Slave Lake	27-Jan-10	Mariport Group
229	Alternate Routes - Dezé Cover Letter	27-Jan-10	Dezé
230	Comments on Dezé Energy Project from Dr. Brenda Parlee	20-Jan-10	Dr. Brenda Parlee
231	YKDFN Hearing Presentation Summary	29-Jan-10	YKDFN
232	INAC Clarification - Access to Crown Land	29-Jan-10	INAC
233	Letter of Concern from Rob Kesselring	29-Jan-10	Rob Kesselring

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234	Chandler and Lalonde - 1998 Cultural Continuity and Suicide Paper	29-Jan-10	Chandler and Lalonde
235	Comments from Marc Choyt supporting LKDFN	28-Jan-10	Marc Choyt
236	Note to File - Carter Extension Request	29-Jan-10	MVEIRB
237	INAC Submission - License of Occupation	29-Jan-10	INAC
238	DFO Response to Public Hearing	29-Jan-10	DFO
239	Dezé Commitments Cover Letter	29-Jan-10	Dezé
240	Dezé Table of Commitments	29-Jan-10	Dezé
241	Notice from MVEIRB - Partial Closure of Public Registry	29-Jan-10	MVEIRB
242	Carter Family Written Submission	29-Jan-10	ML&T Lawyers
243	Carter Family Submission- Appendices	29-Jan-10	Carter Family
244	NSMA Grouped Submissions for Taltson Project	29-Jan-10	NSMA
245	E-mail Notification to Wallace Finlayson	1-Feb-10	MVEIRB
246	E-mail Notification to Dave and Kristen Olesen	1-Feb-10	MVEIRB
247	E-mail notification to Roger Catling	2-Feb-10	MVEIRB
248	Note to File - Notifying People Near Fairchild Point	2-Feb-10	MVEIRB
249	Adjustment to Transmission Line Route	26-Jan-10	Dezé
250	Note to File - Feb.3, 2010 Decorby Conversation	3-Feb-10	MVEIRB
251	E-mails to Spencer and Ray Decorby	3-Feb-10	MVEIRB
252	Decorby E-mail - Waterfowl	4-Feb-10	Spencer Decorby
253	DAR Section 15	2-Mar-09	Dezé
254	INAC letter - Identification of Land Interests	4-Feb-10	INAC
255	Note to File- Temporary Contact Info	5-Feb-10	MVEIRB
256	Operational Statement from DFO - Under Water Cables	6-Feb-10	DFO
257	DFO Submission - In-water Construction Timing Windows	6-Feb-10	DFO
258	Note to File - Call from Wendy Botkin	4-Feb-10	MVEIRB
259	Email Correspondence between Dezé and EC	10-Feb-10	Dezé
260	Response from Dezé - Reliance Adjustment Transmission Re-routing	11-Feb-10	Dezé
261	NSMA submission - P.G Downes Journal of Travels	29-Jan-10	NSMA
262	Comments from David Olesen re: Alternate Route McLeod Bay	15-Feb-10	David Olesen
263	Avalon Rare Metals Inc. Presentation	15-Jan-10	Avalon Rare Metals
264	DKFN Submission for Undertaking # 3 Alternative Route	15-Feb-10	DKFN
265	LKDFN Comments on Alternate Route	15-Feb-10	LKDFN
266	Table of Commitments EC-20 Correction	17-Feb-10	Dezé
267	Submission from Wallace Finlayson re: Alternate Routing	17-Feb-10	Wallace Finlayson
268	Submission from Bren Kolson re: Alternate Routing	17-Feb-10	Bren Kolson
269	Submission from Jim Morris re: Alternate Routing	18-Feb-10	Jim Morris
270	Submission by Peter Dunn re: Alternate Routing	18-Feb-10	Peter Dunn
271	Submission from Ray Griffith re: Alternate Routing	18-Feb-10	Ray Griffith
272	Submission from Justine Crowe re: Alternate Routing	18-Feb-10	Justine Crowe

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273	Submission from Keith Shergold re: Alternate Routing	18-Feb-10	Keith Shergold
274	Submission from Athabasca Denesuline re: Alternate Routing	18-Feb-10	AD
275	Submission from Spencer Decorby re: Alternate Routing	18-Feb-10	Spencer Decorby
276	Submission from Noeline Villebrun re: Alternate Routing	18-Feb-10	Noeline Villebrun
277	Submission from EC re: Alternate Routing	18-Feb-10	EC
278	Submission from Roger Catling re: Alternate Routing	18-Feb-10	Roger Catling
279	Submission from Ray Decorby re: Alternate Routing	18-Feb-10	Ray Decorby
280	Comments from DFO re: Alternate Routing	18-Feb-10	DFO
281	Submission from Transport Canada re: Alternate Routing	18-Feb-10	TC
282	Submission from INAC re: Alternate Routing	18-Feb-10	INAC
283	Request for Ruling from Parks Canada	18-Feb-10	PC
284	Request for Ruling from NRCan	18-Feb-10	NRCan
285	Submission from Legal Rep of Decorbys and Finlayson - Alternate Routing	18-Feb-10	Letha MacLachlan
286	Taltson Hydroelectric Expansion - Requests for Rulings	19-Feb-10	MVEIRB
287	Final Submission (Closing Remarks) - Dezé	23-Feb-10	Dezé
288	Request for Clarification re: Trudel flows	24-Feb-10	MVEIRB
289	Dezé Comments on Request for Ruling	5-Mar-10	Dezé
290	Decorbys and Finlayson Comments on Request for Ruling	5-Mar-10	Decorby, Decorby and Finlayson
291	INAC Comments on Request for Ruling	4-Mar-10	INAC
292	Note to File - LKDFN comments on Request for Ruling	5-Mar-10	MVEIRB
293	GNWT Comments on Request for Ruling	5-Mar-10	GNWT
294	Dezé Letter re: Trudel Commitment, Revised Table	5-Mar-10	Dezé
295	Parks Canada Comments on Party Responses to Request for Ruling	10-Mar-10	PC
296	Notice on Additional Assessment- Kache/ Ft. Reliance Route	15-Mar-10	MVEIRB
297	Dezé - Final Position on Crossing Lockhart River	26-Mar-10	Dezé
298	Notice to Parties - IR	26-Mar-10	MVEIRB
299	Parks Canada Proposed IR	8-Apr-10	PC
300	Environment Canada Proposed IR	9-Apr-10	EC
301	Decorbys and Wallace Proposed IR	12-Apr-10	Letha MacLachlan
302	INAC Proposed IR	12-Apr-10	INAC
303	Notice to Parties - IR Received	13-Apr-10	MVEIRB
304	Note to File - April 15, 2010	15-Apr-10	MVEIRB
305	INAC Letter - Notification of Aboriginal Groups	16-Apr-10	INAC
306	IR Responses from Dezé	26-Apr-10	Dezé
307	Notice to Parties - Final Submissions	27-Apr-10	MVEIRB
308	MVEIRB Letter to INAC - Consultation	30-Apr-10	MVEIRB
309	EC Final Submission	7-May-10	EC
310	Adeline Jonasson Submission	10-May-10	Adelina Jonasson
311	INAC Letter - Aboriginal Notification	10-May-10	INAC

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312	INAC Closing Comments - Potential Route Adjustment	10-May-10	INAC
313	Parks Canada Final Submission	10-May-10	PC
314	Carter Family Final Submission	10-May-10	ML&T Lawyers
315	LKDFN Final Submission	10-May-10	LKDFN
316	Decorbys and Finalyson Final Submission	10-May-10	Decorby, Decorby and Finlayson
317	Dave Olesen Final Submission	10-May-10	Dave Olesen
318	Reasons for Decision - A Request for Ruling from Parks Canada	12-May-10	MVEIRB
319	Dezé Additional Assessment of Kache/Fort Reliance Alternate Routing	12-May-10	Dezé
320	MVEIRB Letter to LKDFN May 13, 2010	13-May-10	MVEIRB

Appendix C: Developer's *Table of Commitments*

The following is a partial summary of the commitments made by Dezé Energy Corporation Ltd. (Dezé) during the course of the environmental assessment of the Taltson Expansion Project. Dezé has made several additional commitments in response to government agencies. These are not listed here, but can be found in the *Table of Commitments* submitted by Dezé on March 5th, 2010 (PR#294). Please refer to the same document for the full wording and context of the commitments listed here.

Design Mitigation Features

DAR-ID#

1. Project would comply with water level and flow conditions in the existing Type 'A' water licence N1L4-0154 Northwest Territories Power Corporation.
2. No new flooding would occur under either expansion option during normal operating conditions. Maximum and minimum water elevations will not exceed those regulated pursuant to Type 'A' Water Licence N1L4-0154 Northwest Territories Power Corporation.
3. Dezé commits to evaluating the technical and economic feasibility of using turbines with fewer blades (fewer blades reducing the probability of fish mortality) and to providing the results of its feasibility analysis to regulatory authorities.
4. Dezé commits to implementing maintenance schedules designed to take only one turbine off-line at any one time. This will minimize ramping flows in Trudel Creek. Dezé also commits to work with the Northwest Territories Power Corporation when designing its maintenance schedules.
5. Dezé commits to establishing operational guidelines for controlled turbine shutdowns and start-ups (all turbine start-ups are controlled). Dezé recognizes that shutdown and start-up guidelines are typical for hydroelectric facilities across Canada and will form part of its overall management of the Taltson Expansion Project.
6. Dezé commits to maintaining a minimum flow of 4 m³/s in Trudel Creek.
7. Dezé commits to a gated bypass spillway adjacent to the existing Twin Gorges generation facility in order to maintain flows over and below Elsie Falls during planned and unplanned plant shutdowns, and to reduce excess spillage flows to Trudel Creek. The spillway would be opened in the event of an outage that could not be corrected quickly (i.e., before water spills over the South Valley Spillway into Trudel Creek) to release up to 30 m³/s of water into the tailrace of the Twin Gorges power facility.
8. Dezé commits to maintaining the newly installed flow gauge on Tazin River (2008) in order to provide real time water flow monitoring. The real time flow monitoring will contribute to flow management at Nonacho Lake.
9. Dezé commits to annual inspections and the application of the *Dam Safety Guidelines 2007*, and the companion series of *Technical Bulletins* in its processes and criteria for management of dam safety, including water conveyance and generation systems.
10. Dezé commits to storing routine replacement and repair equipment at the Northwest Territories Power Corporation Twin Gorges Facilities and at the Nonacho Control structure.
11. Dezé commits to a transmission tower design such that the phase-to-ground distance is wide enough and oriented such that large birds are unlikely to be electrocuted.
12. If permission from the mine owners is granted, Dezé intends to install substations within the lease boundaries of existing mines.

13. Dezé commits to positioning the transmission line crossing through the proposed East Arm National Park in consultation with Łutsël K'e and Parks Canada.
14. Dezé will not install overhead ground wires on the transmission line except near substations in order to reduce the potential for bird-wire collisions.
15. Dezé commits to investigating the feasibility and practicability of using bird diverters areas of high waterfowl density to facilitate bird avoidance of transmission lines and reduce bird-transmission line collisions.
16. Dezé commits to the use of existing camps where possible to avoid the construction of new camps during the construction phase.
17. Dezé commits to using the least possible area needed for the safe and efficient operation of the temporary camps and to the removal of the construction completion and winter road access.

Mitigation and Monitoring

General Construction

18. Dezé commits to the preparation of Draft and Final Environmental Management Plans (EMP). The EMPs will provide key management personnel, contractors, consultants, and visitors to the Project with guidance and procedures to avoid and/or minimize negative environmental effects through construction and operation of the Project. These EMPs would be finalized during detailed design and implemented prior to construction. Plans would include, at a minimum:
 - Materials and Waste Management
 - Erosion and Sediment Control Management
 - Vegetation Management
 - Human-Wildlife Conflict Management
 - Spill Contingency and Response Plan
19. Dezé commits to having a sufficient number of environmental monitors in place during construction to implement the Environmental Management Plans and mitigation, to conduct inspections, promptly document and report incidents, collect samples, manage spills, and participate in adaptive management planning if necessary. Monitors would also:
 - oversee issues such as camp waste disposal and human-wildlife conflicts;
 - document wildlife hazards or sensitivities near construction areas, communicate this information to construction managers, and implement the Human-Wildlife Conflict Management Plan; and
 - report any potential archaeological sites identified during Project construction, and ensure that all Project activity maintains a safe distance from all known archaeological sites.
20. Dezé commits to provide its entire staff with environmental sensitivity and awareness training.
21. Dezé commits that construction activities near caribou hunting camps will occur in winter, outside of the caribou hunting season.
22. Dezé commits that its construction activities will be planned and scheduled to avoid caribou migrations, and monitoring will be conducted to predict and avoid disturbance to caribou groups.
23. Dezé commits that when concrete works cannot be completed in the dry; that site specific operational and management plans would be developed with the contractor and submitted to DFO before conducting the concrete works.

24. Dezé commits to the use of DFO's *Protocols for Winter Water Withdrawal in the NWT* during construction (DFO 2005).
25. Dezé commits that before in-stream construction happens at Nonacho Lake that it will draw down the water levels at Nonacho Lake over a two-or more month period commencing in autumn to enable in-stream construction works to occur in the dry.
26. Portage trails interrupted by the Project infrastructure would be re-routed. This is likely limited to the portage trail around the rapids at the Nonacho Lake control structure, at the outflow of Nonacho Lake.

Roads and Access

27. Dezé commits to the use of existing winter access roads where practical (e.g., the Tibbitt to Contwoyto winter road, upgrading of existing Fort Smith to Twin Gorges winter road).
28. Dezé will not construct winter roads or temporary access trails within the proposed East Arm National Park 1970/1997 withdrawal area.
29. Dezé commits to restricting public use of all southern sector winter roads and to discourage and control winter road access by installing fencing and locked on privately held property at the beginning of the Twin Gorges to Nonacho Lake winter road (at Twin Gorges). Fencing will extend to inhibit detours around the gate and fence. The gate will be closed and locked when not in use by Dezé contractors for construction. The efficacy of these measures at preventing access will be monitored, and additional measures may be implemented.
30. Dezé commits to managing access along the winter roads by other users for non-Project purposes (i.e., Aboriginal land uses) with land users and agencies in consideration of traveler safety along the road and in and around the work sites. Dezé will document unauthorized use of the proposed winter roads from Fort Smith to Twin Gorges and from Twin Gorges to Nonacho Lake. Any evidence of wildlife harvesting, ice fishing, recreational snowmobiling, firewood harvesting, camping, or any other such activities would be recorded.
31. Dezé will ensure that there will be no recreational use of Project vehicles at any time during construction.
32. Dezé will adhere to the DFO *Operational Statements for Ice Bridges and Snow Fills in the NWT* for all winter road construction.
33. Dezé commits to maximizing the use of frozen lakes and rivers for the winter road.
34. Dezé commits that winter road portages will not exceed the minimum required width, unless required for construction or safety considerations.
35. Dezé commits to block the entrance to the Twin Gorges to Nonacho Lake winter road at the end of each hauling season (e.g., March) through the use of gates, snow berms, and slash (as well as for the Fort Smith to Twin Gorges winter road, if allowable).
36. Dezé commits to decommissioning all roads and staging areas at the end of the construction phase. Barriers will be placed across the lower portages to discourage future use.
37. Dezé commits to obtaining a Navigable Waters permit for all Project components that require permits, including the transmission line, barge landings, and in-stream works.
38. Dezé commits to a minimum flying altitude of 300 m for cargo and passenger aircraft when outside of the immediate Project area, as per ENR guidelines.

Transmission Line

39. Dezé commits to adhere to Transport Canada's *Aerodrome Standards and Recommended Practices* (Transport Canada 2005).
40. Dezé commits to implement the DFO *Operational Statement for Construction of Overhead Lines* during construction of the transmission line, and to use proven best management practices for road construction. In the event that the Project needs to deviate from the Op Statement, site specific mitigation plans will be developed and reviewed with DFO prior to construction activities at that site.
41. Dezé commits to avoid all known archaeological resources and cultural sites, or those discovered during future assessments, by a minimum of 50 metres.
42. Dezé commits that it will consult GNWT archaeologists in the event of changes to Project footprint, and conduct further archaeological surveys if so requested.
43. Dezé commits that the clearing of vegetation above the treeline will be limited to requirements for tower foundations and staging areas.
44. Dezé commits that vegetation clearing will occur outside of the migratory bird season (May 15 through July 31).
45. Dezé commits that it will not use herbicides to control vegetation.
46. Dezé will identify areas where construction activity may pass within 1.5 kilometre of a known raptor nest site during the nesting season. If a raptor nest is found within 1.5 kilometre of construction activity, construction managers will identify strategies to avoid the nest. ENR would be contacted for further advice if this is not achievable.

Post-Construction Monitoring

47. Dezé commits to the implementation of a post-construction environmental monitoring program that would be finalized during the permitting process, in consultation with the regulatory agencies and other stakeholders.
48. Dezé is committed to the use of adaptive management. Adaptive management plans would be developed and implemented if monitoring or follow-up detects effects beyond those predicted, unanticipated effects, or the need for improved or modified design features. This may include increased monitoring, changes in monitoring plans, or additional mitigation.

Employment

49. Dezé commits to developing an NWT Business, Employment and Training policy that would seek to maximize the employment of Northern Aboriginal persons and use of northern businesses, and provide them with the first opportunity to fill any available positions and bid on available contracts. This policy will include targets for Project procurement and employment. Targets and results will be reported annually during the construction period.
50. Dezé will seek to provide opportunities on a first preference basis for the Akaitcho Territory Government and its members and the Northwest Territory Métis Nation and its members and any business entities formed by any of them.
51. Dezé commits to having culturally aware employees and contractors and will provide cultural awareness programs and conflict resolution policies.
52. Dezé commits to work with existing Federal and GNWT programs to support work and life skills training for prospective employees in advance of Project initiation.

53. Dezé commits to provide briefings and presentations on the Project and its employment plans and policies to interested groups.
54. Dezé commits to participation in local and regional career fairs.
55. Dezé commits to identifying opportunities for student work placements or internships on the Project.
56. Dezé commits to engaging public and Aboriginal governments, schools, and Aurora College to support the efficient use of available training funds in support of the development of potential Project human resources.
57. Dezé would collaborate with *Aboriginal Human Resource Development Agreement (AHRDA)* holders' groups and the governments of NWT and Canada and their agencies to identify available funding to support education and training in advance and during the construction phase of the Project.
58. The Project commits to adhere to established processes and mechanisms for registration, documentation of work experience, and monitoring of apprentice performance on the Project in cooperation with the NWT Trades Qualification and Occupation Certification Board.
59. Dezé is committed to a healthy and safe workplace. The Project will establish policies to ensure that its camps are free from alcohol and drug usage; employee assistance program for its employees are available, and that contractor's adopt these practices as well as industry standard workplace safety training and programs.
60. Dezé commits to provide information on job opportunities for circulation to all South Slave regional communities.
61. Dezé commits to post job listings using available employment and career centres and electronic means.
62. Dezé commits to establishing an employment office for the Project in the South Slave region.
63. Dezé is committed to hiring Aboriginal and northern workers. Dezé would require its contractors and sub-contractors to establish Aboriginal and northern resident employment plans, policies, and practices, together with monitoring and reporting systems that comply with the Proponent's policies, commitments and agreements.
64. Dezé commits to prepare a plan to address the accommodation needs of temporary workers brought in or through communities to Project work sites with effected South Slave community governments.
65. Dezé commits to supporting northern business opportunities.
66. Dezé commits to providing environmental reporting routinely during Project construction.

New Commitments (From October Technical Session and Side-Bar Meeting Reports)

67. In-stream concrete works will be constructed in dry conditions. Monitoring will be conducted during concrete works that have potential to affect water bodies.
68. Dezé commits to investigating, during detailed design, additional entrainment mitigation measures that could be incorporated into the Project design to reduce potential for fish mortality, to monitoring the assumptions that the canal North Gorge intake canal fish use would be low and that adult and juvenile fish can escape the canal if they swim into it, and to discussing outcomes of the monitoring program with DFO and identify if additional monitoring or mitigation / adaptive management is required to protect fish populations.
69. Dezé also recognizes that limited dissolved oxygen environmental data is available for Zone 2, specifically Tronka Chua Lake, and that testing prior to Project construction, of the assumptions made to complete the effects assessment, such as fish species composition, habitat availability, lake depths, and winter dissolved oxygen is required.

70. Winter DO measurements will allow for verification of the model, and confirmation that the reduced flow will be sufficient to uphold the concentration of dissolved oxygen, as prescribed in the CCME guidelines for cold water, or similar DO concentrations to the baseline conditions. Fish and fish habitat information and DO testing in Tronka Chua Lake, as well as DO monitoring in Trudel system to verify the model, has been included in the Taltson Expansion Project Monitoring Program.
71. Dezé will continue to revise the power generation model and subsequently the Basin Model, to identify if a preferred operational scenario for both generation water balance and environmental effect mitigation is feasible.
72. Dezé commits to investigating, during detailed design, additional mitigation measures that could be incorporated into the Project design to reduce potential for fish mortality, to monitoring the assumptions that the canal North Gorge intake canal fish use would be low and that adult and juvenile fish can escape the canal if they swim into it, and to discussing outcomes of the monitoring program with DFO and identify if additional monitoring or mitigation / adaptive management is required to protect fish populations.
73. Dezé intends to work with people that travel on the Taltson River ice between Tsu Lake and Twin Gorges to develop a communication system to advise users of potential abrupt changes to river flows.
74. In 2007, Dezé installed temperature loggers in Trudel Creek and Gertrude Lake to record temperature conditions. These will remain in place pre-construction and during operations.
75. Dezé will incorporate a 50 kPa overpressure threshold for in-stream blasting, less than the published Canadian Guidelines.
76. Dezé will follow the GNWT open burning policies. Dezé will make re-useable materials available to local communities. Dezé will have an approved incinerator at camps that meets regulatory guidelines and is permitted as required.
Dezé commits to following the Environment Canada guidelines as presented in the Technical Document for Batch Waste Incineration and 6 Step Process. Dezé also commits to developing an Incineration Management Plan with annual reports.
77. Dezé will consider various offsite cultural mitigation options specific to the Lady of the Falls on the Lockhart River that contribute to their vitality and significance, such as annual gatherings, Dene and Métis arts and culture (including traditional knowledge collection), cross-cultural experiences for visitors, or a contribution towards an exhibition, as these relate to the Lady of the Falls on the Lockhart River.
78. For in-stream works, Dezé has committed to using a packaged, water-resistant explosive to reduce the amount of nitrate that could leach during deployment and detonation.
79. To control public access on the Fort Smith to Nonacho Lake winter road and associated temporary access trails, several measures are proposed. The winter road from Twin Gorges to Nonacho Lake would be closed with locked gates on private property, and only Project vehicles would be permitted to use the road. Fencing will extend from the gates into the adjacent forest/shrub to inhibit detouring around the gate. The gate would be closed and locked at the end of each hauling season. At the end of the final winter road season (i.e., February or March 2013), the start of the winter road at Twin Gorges would be permanently blocked with a combination of slash windrows (i.e., piled trees and other vegetation cleared for construction), by falling trees across the road, or blocking the road with boulders. Environmental monitors will record public use of the road.
80. Dezé commits to preparing a photomontage of the transmission line on the existing landscape from viewpoints within the proposed East Arm National Park, to assist with the assessment and

mitigation of aesthetic effects. Dezé will continue to work with Parks Canada on this and other issues related to the integrity of the proposed East Arm National Park.

81. Dezé will investigate different tower types that could reduce aesthetic effects, and will continue to discuss alternatives with Parks Canada and Łutsël K'e.
82. Dezé will develop a nest protection plan, that outlines strategies and mitigation intended to reduce effects to waterfowl nests within Trudel Creek during scheduled ramping events.
83. Dezé will investigate the feasibility of using tower designs with low nesting potential for ravens, and present these to Environment Canada for review.
84. To reduce risk of fish entrainment, Dezé commits to:
 - Investigating if screen sizes <100 mm [at the penstock] are effective in preventing applicable fish species and life stages from being entrained and if they are operationally feasible;
 - Incorporating a screen on the intake facilities for the Nonacho turbine, and investigating an operationally feasible mesh size that assists with fish entrainment mitigation;
 - Investigating technical feasibility of utilizing turbines with the least impact to fish (i.e. minimal blades etc.);
 - Developing a monitoring program to confirm the assumption that North Gorge intake canal fish use would be low and that adult and juvenile fish can escape the canal if they swim into it;
 - Discuss outcome of monitoring program with DFO and identify if additional monitoring or mitigation / adaptive management is required to protect fish populations.